Economic Policy and the Start-up, Survival, and Growth of Entrepreneurial Ventures

A Report Submitted to the Small Business Administration

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EXECUTIVE SUMMARY

We review recent empirical research on two critical aspects of entrepreneurial enterprises: (i) to what extent do the owners of such enterprises face constraints in capital markets, and (ii) how do entrepreneurs react to changes in their personal income tax situations? The research documents that:

- Liquidity constraints are present and have a detrimental effect on the vitality of the entrepreneurial sector. Because of lack of access to capital, entrepreneurial firms are less likely to survive and more likely to be undercapitalized.
- When marginal tax rates increase, entrepreneurs grow their businesses more slowly, are less likely to purchase capital, and are less likely to hire labor. If they do hire labor, their payrolls are smaller.

The findings have implications for the structure of small business policies, in general, and the ongoing debate over making the tax system more friendly to entrepreneurs, in particular. We employ the results to shed light on two strategies, cutting marginal tax rates for all taxpayers (including entrepreneurs) and targeted relief to the owners of small businesses, including preferential treatment of their capital gains. Our research supports the notion that marginal rate reductions will encourage entrepreneurship and are likely to be superior to providing financing directly to enterprises and other targeted approaches.

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1. INTRODUCTION

Entrepreneurs are central to many issues in public policy. Surprisingly, however, not much is known about the economic behavior of entrepreneurs. For example, during debates over income tax reform, Congress, the Administration, and policy analysts have access to a large corpus of research regarding the effects of income taxation on hours worked by wage and salary employees. In contrast, despite their importance to economic innovation, growth and vitality, there is a paucity of comparable information regarding the impact of income taxation on entrepreneurial enterprises. In recent years, however, considerable efforts have been made to remedy this deficiency. Through the use of data sets uniquely suited to studying the birth and evolution of entrepreneurial enterprises, several key questions relating to entrepreneurship have been studied:

- Who becomes an entrepreneur?
- What determines survival as an entrepreneur?
- Why do some entrepreneurial enterprises grow faster than others?
- Under what conditions do entrepreneurs hire additional labor for their enterprises?
- Under what conditions do entrepreneurs make capital investments in their enterprises?

The answers to these questions provide insights into unsettled issues that are pressing for academics and policy makers alike. For example, the impact of grant programs to help small businesses requires an understanding of the extent to which entrepreneurs may freely access debt and equity markets to finance their initial start-ups and/or capital expansions. Or, to take a current example, President Bush has proposed broad reductions in marginal tax rates under the individual income tax. Would we expect such rate changes to affect the number and growth of entrepreneurial enterprises?

To date, this research has been published in academic journals and written in the jargon of academics. The purpose of this document is to provide a summary of this recent research in a format accessible to policy makers so as to inform their decision-making process. In doing so, the focus is on two key issues:

- *Liquidity constraints*. Can entrepreneurs borrow freely in the capital markets? If not, then how do infusions of capital affect decisions to become an entrepreneur and how fast to grow the business? To what extent would more capital raise the survival rate of entrepreneurial enterprises?

- *Tax policy*. Entrepreneurs must decide how many employees to hire, how much capital to buy, and how fast to expand their businesses. How are these decisions affected by the entrepreneur's federal marginal tax rate?

This report summarizes research by us and three co-authors that is based on confidential tax return data at the U.S. Treasury. The data were analyzed by our co-authors, who are duly authorized Treasury employees.[1] The outline of the remainder is as follows. We review the liquidity constraint research in Section 2, and the tax policy material in Section 3. Section 4 concludes with a summary.

2. LIQUIDITY CONSTRAINTS AND ENTREPRENEURS

Many strategies for encouraging entrepreneurship focus on entrepreneurs' need for "seed money," building on the notion that people who want to start new businesses are often frustrated by lack of access to capital markets. Thus, for example, some have argued that pension funds for state and local government employees should try to invest in entrepreneurial concerns.

Why would this be necessary? A substantial theoretical literature explains how credit rationing can emerge even in a world in which all people are taking full advantage of their profit-

[1] In particular, neither the authors nor the Small Business Administration have access to these data. Robert Carroll, David Joulfaian, and Mark Rider, Office of Tax Analysis, U.S. Treasury analyzed these data.

making opportunities that are available to them. Hence, economists have taken seriously the hypothesis that capital market constraints may be an important determinant of the decision to become an entrepreneur. In particular, Holtz-Eakin, Joulfaian and Rosen [1994a] analyzes the extent to which lack of capital inhibits individuals from becoming entrepreneurs.

It is important to note, however, that the net quantity of entrepreneurs is just as dependent on departures from entrepreneurship as it is on the flows into entrepreneurship. Just as in the case of entry, a key issue in this context is the importance of access to capital. Do some entrepreneurs face liquidity constraints that starve their firms and increase the probability of failure? Even if they survive, are these entrepreneurs hobbled because they are undercapitalized? The notion that lack of capital inhibits the growth of small firms has been around at least since Adam Smith, who used the example of a small grocery store to illustrate this proposition. The owner of such an enterprise

> "must be able to read, write, and account, and must be a tolerable judge too of, perhaps, fifty or sixty different sorts of goods, their prices, qualities, and the markets where they are to be had cheapest. He must have all the knowledge, in short, that is necessary for a great merchant, *which nothing hinders him from becoming but the want of sufficient capital."* (italics added)

The second paper discussed in this section, based upon Holtz-Eakin, Joulfaian and Rosen [1994b], examines Smith's conjecture that lack of capital affects the survival and growth of entrepreneurial enterprises.

2.1 Conceptual Issues

Most empirical work on the impact of liquidity constraints on the decision to become an entrepreneur has been guided by straightforward logic: Some initial capital is required for setting up a new enterprise. If individuals can borrow freely in capital markets at the going rate of interest, then their ability to obtain capital, and hence, the decision to start the enterprise, should be independent of the prospective entrepreneur's personal financial position. Put another

way, if capital markets are perfect, then every entrepreneurial project promising a rate of return above the market will obtain funding, regardless of the financial fitness of the entrepreneur behind the venture. In contrast, if capital markets are imperfect, then potential entrepreneurs may not be able to borrow, and will therefore have to finance projects out of their own resources. In this case, individuals with few or no resources are less likely to be able to become entrepreneurs than those who have substantial resources. The decision to become an entrepreneur is *not* independent of the prospective entrepreneur's personal financial position.

These considerations suggest a possible strategy for determining whether or not liquidity constraints are present, and measuring their importance. Obtain a data set with information on a sample of individuals' self-employment status and assets (among other variables), and see whether the likelihood of being self-employed depends on the level of the individual's net assets. If it does, then one might conclude that liquidity constraints are present, and *vice versa*.[2]

Unfortunately, despite its appealing simplicity, there is a problem with this strategy. Suppose one finds that entrepreneurs have higher assets than wage-earners. Is this because the higher assets enabled them to become entrepreneurs, or because entrepreneurs are able to accumulate more wealth than wage-earners? We simply cannot know, and therefore it is not clear what such a correlation can tell us about the absence or presence of liquidity constraints.

A superior approach is to use *longitudinal data*, that is, data that track the behavior of the same individuals over time. This allows one to determine who *becomes* an entrepreneur over time (as opposed to who *is* an entrepreneur at a given point in time). This is an appealing approach for a variety of reasons. First, the policy motivation for this line of research is to determine which policies might be efficacious in encouraging entrepreneurship, *i.e.*, which policies will aid the transition process from wage-earning to entrepreneurship.

[2]See, for example, Meyer [1990] and Blanchflower and Oswald [1990].

Second, from a technical viewpoint, examining transitions has the advantage of using explanatory variables that are dated prior to the time the decision is taken. This reduces the likelihood that the explanatory variables are consequences of the decision to become an entrepreneur rather than its determinants. Timing issues are particularly cogent in investigations of the relationship between self-employment and personal assets. In particular, if we look at the relationship between wealth *before the individual makes the decision* and whether or not he or she becomes an entrepreneur, then we can hardly ascribe any positive correlation to the fact that he or she has accumulated wealth as an entrepreneur.[3]

Focusing on transitions in longitudinal data, thus, is appealing for both policy analysis and research design reasons. However, it does face a problem because individuals may accumulate wealth in anticipation of going into business. If so, wealth accumulated prior to becoming an entrepreneur may simply be a signal of the intensity of the individual's desire to become an entrepreneur, rather than an indicator of his ability to circumvent capital market constraints.

The research summarized in this section utilizes a unique set of data to circumvent this problem. The data consists of the 1981 and 1985 federal individual income tax returns of a group of people who received inheritances in 1982 and 1983, along with information about the size of their inheritances. Any individual who is a non-farm sole-proprietor must file a "Schedule C" with his or her tax return. Hence, we can examine who became a sole-proprietor between 1981 and 1985, and the extent to which the decision was influenced by the size of the inheritance. Since one cannot accumulate an inheritance "in advance," the receipt of an inheritance is about as close to a "natural experiment" as one is likely to get in this area. If owning a substantial stock of capital is important to starting a business, then those who receive a lump sum of capital should have a higher probability of doing so, *ceteris paribus*.

[3]See, for example, Evans and Leighton [1989].

Another advantage of our tax return data is that they allow examination of some seldom explored questions relating to the impact of liquidity constraints on the operation of new entrepreneurial enterprises. Specifically, we can investigate whether liquidity constraints influence the amount of capital invested in the firm, and if so, how large these effects may be.

All of these conceptual issues relating to entry to entrepreneurship apply symmetrically to exits from self-employment. That is, simply looking at the relationship between an individual's wealth and whether he or she survives as an entrepreneur will not tell us very much about the importance of borrowing constraints. The solution is the same—to look at individuals' transitions from entrepreneurship into wage-earning, and determine the extent to which they are influenced by receipt of inheritances.

2.2 Data

Construction of our data set began with an Internal Revenue Service (IRS) sample of estate tax records.[4] The IRS selected a one percent random sample of estate tax returns of people who died in 1982 and whose estate tax returns were filed in 1982 or 1983. In addition, every return with total assets over one million dollars was selected. The sample included over 8,500 individuals with gross estates over $300,000.

The next step was to match the estate tax returns with the decedents' personal income tax returns for 1980 through 1982, and with the beneficiaries' personal income tax returns for 1980 through 1982 and 1985. As noted below, we ended up with several thousand observations, certainly sufficient for making reliable statistical inferences.

Many empirical studies have utilized surveys designed principally to provide information about individuals' labor market status. In contrast, we have tax return data. The use of such data gives rise to several issues.

[4]All the data are proprietary and confidential. The actual analysis of the data was done by authorized employees of the U.S. Treasury.

Identifying entrepreneurs. A key problem faced by every empirical researcher in this area is making operational the notion of entrepreneurship. How do we know who is an entrepreneur? In the nonstatistical literature on this topic, entrepreneurs are characterized in terms of their daring, risk-taking, animal spirits, and so on:

> "To act with confidence beyond the range of familiar beacons and to overcome that [social] resistance requires aptitudes that are present in only a small fraction of the population and that define the entrepreneurial type..." (Schumpeter [1942], p. 132)

Those who do statistical work must settle for observable (and hence, more prosaic) criteria for classifying someone as an entrepreneur. In previous studies using surveys, the key criterion has been whether the individual classifies him or herself as being primarily self-employed, a natural choice if the data set focuses on labor market issues. With tax return data, the most sensible proxy for "entrepreneurship" is the presence of a Schedule C in the tax return.[5]

One possible concern is that the presence of Schedule C is more indicative of tax sheltering activity than entrepreneurial activity. For example, some economists report their consulting income and honoraria on Schedule C solely in order to be eligible for certain deductions. However, data from the 1985 *Statistics of Income* suggest that such personal service activities are undertaken by only a small proportion of Schedule C filers, about 16 percent.[6] And surely at least some of these activities reflect classical entrepreneurial behavior of the sort described by Schumpeter.

One can imagine several schemes for identifying which Schedule C filers are "serious" entrepreneurs. One possibility is that gross receipts be above some threshold level. But many

[5]The Characteristics of Business Owners data set created by the U.S. Census Bureau also uses a tax-based definition of entrepreneurship (see Holmes and Schmitz [1991]). However, these data characterize members of partnerships and Subchapter S corporations (from Schedule E) as well as sole-proprietors as "entrepreneurs." The inclusion of a Schedule E on a tax return may be more reflective of tax shelter activity than entrepreneurship. In the context of this study, a practical advantage of a Schedule C criterion is that, unlike Schedule E, it provides information that can be used to estimate the enterprise's capital stock.

start-up enterprises have low or even zero receipts. Another possibility is that the ratio of Schedule C income to earned income be above some threshold. But as already suggested, even "serious" entrepreneurs can have very low incomes. Another version of this idea is to identify people whose earned income falls by more than a threshold percentage when they make the transition to filing Schedule C. However, at the start of his or her career as a "serious" entrepreneur, an individual may not be ready to quit his or her job.[7]

We conclude that trying to weed out *ersatz* entrepreneurs from the population of Schedule C filers is not likely to be terribly fruitful. Nevertheless, we did experiment a bit with the criteria for being classified as an entrepreneur. Specifically, we required individuals not only to file a Schedule C, but also to have gross receipts exceeding various thresholds (e.g., $1000, $5,000) in order to be classified as entrepreneurs. We found that the results of such exercises were essentially the same as those from our basic data set.

Measurement of assets. The second issue that arises when using tax return data concerns the measurement of assets prior to becoming an entrepreneur. Conventional data sources rely on self-reported values of the stocks of various assets. The possible biases in such measures are well-known (see, for example, Avery, Elliehausen, and Kennickell [1988]). Tax return data do not contain information on stocks of assets *per se*. However, one can impute the value of a household's assets by capitalizing the flows of unearned income.

Even more promising, from the matched estate tax returns (Form 706, page 2), we have information on inheritances received after the first income tax return (in 1981) and before the second return (in 1985). As stressed above, inheritances are better than accumulated assets for

[6]This figure includes "business services" (advertising, management consulting, public relations, computer services, etc.) and "accounting and bookkeeping services."

[7]Further complications result from using annual data. A "serious" entrepreneur who makes the transition late in the year is likely to resemble a full-year, but "non-serious," entrepreneur.

purposes of examining the role of liquidity constraints.[8] Inheritance information from estate tax data has a second advantage: as Menchik [1988] has persuasively argued, administrative bequest records are likely to contain more accurate information than either self-reported or imputed measures.

Measuring capital acquisition. A third issue relates to the capital acquisition decision of new entrepreneurial enterprises. Previous studies have been able to ask virtually only one question relating to liquidity constraints: "Does the magnitude of an individual's assets affect the probability that he or she will become an entrepreneur?" While this is clearly an important question, liquidity constraints might have relatively little impact on whether someone sets up a firm, but at the same time have an important effect on the amount of capital acquired for the new firm. We use information on depreciation allowances on Schedule C to investigate this issue.

Measuring the health of the enterprise. A fourth issue concerns the health of existing enterprises. We would like to know not only whether liquidity constraints affect the decision to become an entrepreneur, but also how well his or her enterprise does. But how shall we measure the "vitality" of a firm's performance? A natural measure is its gross receipts, information that is included on the Schedule C. Another possible indicator is the firm's economic profits. However, we have no information on the amount of pre-existing capital invested in the enterprise, so we cannot compute economic profits. Instead, we use an admittedly imperfect alternative, reported net income or loss plus depreciation allowances, which we call "cash

[8]Blanchflower and Oswald [1990] included a gifts and inheritances variable in their cross-sectional analysis of the incidence of self-employment among young British males. It is not clear whether this variable is exogenous. The Blanchflower-Oswald sample, taken from the National Child Development Study in the United Kingdom, consists entirely of 23-year olds. In the United States, the average age for receiving an inheritance is considerably higher, about 47. (This computation was graciously done for us by Karl Scholz, using the 1986 Survey of Consumer Finances. For further details, see Gale and Scholz [forthcoming].) Assuming a comparable age at inheritance in the United Kingdom, a substantial portion of the transfers in the Blanchflower-Oswald data are probably gifts, and these gifts might have been made specifically to help the donees start businesses. We are grateful to Bruce Meyer for pointing this out to us.

flow."[9] In our empirical work, we estimated all of the models twice, once with receipts and once with cash flow, to see if the substantive results are robust with respect to the choice of performance measure. It turns out that the choice does not matter, so we discuss only the estimates based on the gross receipts measure.

2.3 Results: Liquidity Constraints and Entry in Entrepreneurship

The first part of our empirical strategy is to estimate how the probability of making a transition from wage-earning into entrepreneurship depends upon the amount of inheritance. An important complication is that the probability depends not only on the inheritance, but also on the economic and demographic characteristics of the individual. We use statistical techniques to control for a number of important economic and demographic variables that affect the decision to be an entrepreneur, thus isolating the "pure" inheritance effect. Our tax return data permit us to control, in particular, for:

Age. An individual's age may be correlated with his attitudes toward risk and toward the various nonpecuniary aspects of being an entrepreneur (such as being your own boss). In addition, age is related to the individual's years of labor market experience, and hence his or her human capital. While an explicit measure of experience would be preferable, no such measure is included in our data. In addition, work in the salaried sector may become relatively less attractive at retirement age, so we include a dichotomous variable that takes a value of 1 if the individual is 65 years or older, and 0 otherwise, and serves to isolate the independent allure of retirement.

Marital status and number of children. These two variables may affect tastes for working in the various modes, although the direction of their effect is not clear. Having to support a

[9]The Economic Recovery Tax Act of 1981 made depreciation schedules more generous in 1985 than they were in 1981. This change makes it problematic to compare incomes net of depreciation across the two years.

family, for example, might make a person less likely to undertake risky ventures. At the same time, however, the presence of family support might make it easier to get a new business going.

Employment status of donor. Dunn and Holtz-Eakin [2000], Hout and Rosen [2000] and others have documented that the probability that an individual is self-employed increases if his parents were also self-employed, in part because children acquire informal business experience from their parents. Of course, tax returns do not ask about parents' lifetime occupations. However, we were able to obtain the 1981 personal income tax returns of the individuals who made the bequests, and determined whether they included a Schedule C. We include a dichotomous variable indicating whether or not the decedent filed a Schedule C.

Assuming that this effect depends on the closeness of the relationship between the decedent and the beneficiary, we also include a variable that interacts the decedent's Schedule C variable with an indicator for whether the recipient is a son or a daughter. We anticipate that these two "taste" variables will raise the probability of self-employment on the assumption that children (and other relatives) of entrepreneurs are more likely to have entrepreneurial human capital imparted to them. Note, however, that these variables might also in some sense influence the resources available—children of entrepreneurs may be more likely to inherit businesses. Hence, one must exercise some caution in the interpretation of these variables.

Earnings. Previous studies have generally included some measure of earnings prior to the transition to entrepreneurship, and so do we. However, 1981 tax returns have data on family earnings only, which complicates the interpretation of this variable. If only one person in the family participates in the labor market, earnings may be viewed as representing what that person is giving up (the "opportunity cost") of entering entrepreneurship. In this case, high earnings would tend to depress the probability of becoming an entrepreneur, other things being the same. However, if both spouses work in the market, then high earnings may be indicative of the fact

that the family can expect a regular income flow even if an entrepreneurial venture does not do well. In this event, high earnings would tend to increase the probability of becoming an entrepreneur.[10]

Assets. Our data provide different amounts of information on various assets. Dividends and interest are reported on tax returns; with suitable assumptions on capitalization rates, we can impute the stock of assets that generated these flows and include it in the analysis.[11] We are unable to make any meaningful imputations on the value of owner-occupied housing, but on the basis of information on mortgage interest and property tax deductions, we can create a dichotomous variable indicating whether or not the family owns a home. The centerpiece of our analysis is the amount of the inheritance. As noted above, we view the inheritance as telling us something about the presence or absence of liquidity constraints. Specifically, if the size of an inheritance affects the probability of becoming an entrepreneur, this is consistent with the presence of liquidity constraints. It might be the case, however, that the impact of an inheritance depends on initial wealth, because people with substantial assets are less likely to be liquidity constrained. We therefore include a variable that interacts the initial level of liquid assets with the inheritance. If the liquidity constraint story is correct, this variable should have a negative sign because the same inheritance will have a smaller impact the larger are initial assets.

A word is in order about several conventional variables that we are unable to include because they are absent from tax returns. First, we have no information on race, and there is some evidence that the process generating self-employment decisions is different for blacks and whites (Hout and Rosen [2000]). As several studies have shown, blacks have much less wealth than whites (see Blau and Graham [1990]), and it is therefore unlikely that many blacks receive

[10]We experimented with a term that interacted earnings and the dichotomous marriage variable, with the hope of isolating the opportunity cost effect for single earners. This variable had no effect on the substantive results presented below. In addition, we estimated the model separately for joint and single returns. One cannot reject the null hypothesis that the process generating the transition into self-employment is the same for both types of returns.

substantial inheritances. For this reason, we believe that there are few, if any, blacks in our sample, and the potential problems from pooling together blacks and whites are minimal.

Another variable that might plausibly be included is years of education, which could affect both earnings capacity and attitudes toward risk. Education has been employed in virtually every previous study. Interestingly, Fuchs [1982], Evans and Leighton [1989], Evans and Jovanovic [1989] and Rees and Shah [1986] have all found that it is insignificant as a determinant of the self-employment decision. While this verdict is not unanimous (see Meyer [1990]), the evidence suggests that our forced omission of education may not be doing much harm to the analysis, although it likely complicates the interpretation of the earnings variable.

We use the probit statistical model to estimate the role of liquidity constraints, in particular, and of other variables in general. The full set of results is reported in column (1) of Appendix Table 2.1. For present purposes, the most noteworthy result is that the probability of making a transition to self-employment varies positively with inheritance, and the coefficient is statistically significant.[12] Further, the greater the magnitude of the individual's initial liquid assets, the smaller the incremental effect of inheritance. The results imply that a $100,000 inheritance increases the probability of a transition between 1981 and 1985 from 19.3 percent to 22.6 percent, or 3.3 percentage points. As usual, it is difficult to say whether such a change should be characterized as "large," but it is clearly not trivial.

The second part of the statistical strategy is to estimate how much the inheritance affects the firm's investment in depreciable assets, other things being the same. Again, the statistical procedure must take into account variables other than inheritance that could also affect investment. The full set of results is reported in column (2) of Appendix Table 2.1. The size of the inheritance has a positive effect on the amount of capital in the new enterprise, and again the

[11]There are no data on receipts of tax-exempt interest.
[12]That is, the chances of the positive relationship being a "fluke" or coincidence are quite small.

coefficient is statistically significant. This is consistent with the presence of liquidity constraints. The results imply that, on average, every $100 increase in inheritance increases purchases of depreciable assets by about $7. While this figure is not large, one must keep in mind that capital investment in new enterprises tends to be small. Thus, even this amount represents a substantial percentage increase in the level of assets. Conditional on making the transition to a sole-proprietorship with purchasing some depreciable capital, a 10 percent increase in inheritance increases spending on depreciable assets by about 5.2 percent.

2.4 Results: Liquidity Constraints and Entrepreneurial Survival

The focus of this part of the analysis is on what entrepreneurs who are already in business do after they receive their inheritances. A preliminary analysis of the data indicated that there are four options for such an individual: retirement, changing to employment as a wage and salary worker, continuing as a solo entrepreneur, and participation in a partnership or S corporation. Of the 1,892 returns that included a Schedule C in 1981, 220 also reported partnership/S corporation income; 840 also reported wage income; and 498 also reported both partnership/S corporation and wage income. Of course, the need to make some fairly arbitrary classifications is not unique to these data. For example, in the Survey of Income and Program Participation, a number of individuals report income from both wage and self-employment. Typically, classification is made on the basis of the individual's income or hours of work in each mode; see Meyer [1990]. However, we have no measure of income that meaningfully reflects the intensity of involvement in each mode.[13,14]

[13]An S-corporation is a corporation whose income is treated like that of a partnership—the income is taxed at the individual level and escapes the corporate "double tax." An S-corporation may have no more than 35 stockholders (75 beginning in 1997).

[14]Of course, an individual can file a Schedule C while also being involved in a partnership. For that matter, he can simultaneously be employed as a wage and salary worker as well. It is infeasible to estimate models of transitions out of and into all of the possible combinations of the various states. Therefore, we maintain the four-way classification, adopting the following algorithm for allocating individuals to the various modes. If an individual files a Schedule C, he is classified as an "entrepreneur," regardless of any other information included on the return. If an individual has partnership/S-corporation income but no Schedule C, he is categorized as being in a

Table 2.1. Inheritance and Transition Rates[a]

	Schedule C	Partnership/ S-corporation	Wages Only	Retirement	Total
Low Inheritance	362	74	91	10	537
($INH < \$25{,}000$)	0.674	0.138	0.170	0.0186	
	0.0202	0.0149	0.0162	0.0058	
Medium Inheritance	461	108	79	15	663
($\$25{,}000 \leq INH \leq \$150{,}000$)	0.6953	0.163	0.119	0.0226	
	0.0179	0.0143	0.0126	0.0058	
High Inheritance	529	95	46	22	692
($INH > \$150{,}000$)	0.765	0.137	0.0665	0.0318	
	0.0161	0.0131	0.0095	0.0067	
All	1352	277	216	47	1892
	0.715	0.146	0.114	0.0248	
	0.0104	0.0081	0.0073	0.0036	

[a]The first number in each cell is the number of individuals in that cell; the second number is the proportion of observations in the corresponding row that fall in that cell; and the third number is the standard deviation of the proportion.
Source: Holtz-Eakin, Joulfaian and Rosen [1994b].

The matrix in Table 2.1 contains information on the transitions made by members of our sample by size of inheritance. The columns of the matrix show the possible modes in 1985: remaining in Schedule C, being in a partnership/S-corporation and not having a Schedule C, earning wages and not having any business income, and retiring. The rows group the individuals into "low" (under $25,000), "medium" (between $25,000 and $150,000) and "high" (greater than $150,000) inheritance classes. The fourth row and fifth column provide corresponding summary information. The first figure in each cell is the number of individuals in that cell; the second number is the proportion of observations in the corresponding *row* that fall in that cell; and the third number is the standard deviation of the proportion. Thus, for example, the figures in the second row and first column tell us that of the entrepreneurs who received a mid-sized inheritance, 461 continued as entrepreneurs and this represents about 70 percent of the entrepreneurs who were in that inheritance class.

"partnership/S-corporation." If an individual has wage income but no Schedule C and no partnership/S-corporation, he is categorized as a "wage-earner." Finally, if he has none of the above, he is "retired."

According to Table 2.1, a substantial proportion of the entrepreneurial enterprises do not survive—only about 72 percent of the enterprises that were present in 1981 are alive in 1985. Moreover, the survival rate increases with inheritance, going from 67.4 percent in the low inheritance class to 76.5 percent in the high inheritance class, a difference that is statistically significant.[15] About 15 percent of the individuals who cease being entrepreneurs become involved in partnerships or S-corporations. However, there appears to be no obvious relationship between the propensity to enter a partnership/S-corporation and the size of inheritance. The third column indicates that the proportion that leave entrepreneurship for wage earning declines with the inheritance; these declines are also statistically significant. The last column shows that the proportion of entrepreneurs who retire altogether rises with inheritance. It is clear that the transition processes depend on the level of inheritance.

While the tendencies exhibited are generally sensible, common sense suggests that a number of other variables in addition to inheritance may affect transition decisions. As in our discussion of entry into self-employment, these variables include basic demographic and economic information such as age, marital status, and so on. In addition, we expect the prior economic performance of the enterprise to affect its viability. Hence, we also include gross receipts of the enterprise prior to the time that the decision is implemented.

Detailed estimates of the econometric model that allows us to take all these variables into account are presented in Appendix Table 2.2. Here we summarize the key results. First, receiving an inheritance exerts a statistically significant and positive effect on the probability that

[15]One might like to augment this analysis with information on the behavior of a control group receiving no inheritances. Unfortunately, income tax data do not identify recipients of inheritances, so it is not possible to construct such a sample. To allow at least a rough comparison we use a random sample of nearly 6.5 million schedule C filers drawn from 1981 tax returns. Because very few individuals receive inheritances, for all intents and purposes we can regard this as a "no-inheritance control group." In this sample, 66.2 percent survived as entrepreneurs until 1985, 3.2 percent made a transition to a partnership/S corporation, 29.1 percent became wage and salary earners, and 1.53 percent retired. Hence, as we move from the low-inheritance group to the no-inheritance control group, the tendencies in Table 2.1 persist. For example, the fraction of entrepreneurs who survive is greater for the low inheritance group than for the random sample.

an entrepreneur will stay in business rather than become a wage earner. Similarly, the level of liquid assets has a positive and statistically significant impact. These findings are consistent with the presence of liquidity constraints. A final (and unsurprising) finding is that the more successful the enterprise was prior to receiving an inheritance, the more likely the entrepreneur is to continue in business rather than become a wage earner.

The other two options available to the entrepreneur are moving to a partnership or S-corporation, or retiring altogether. We find that receipt of an inheritance makes it less likely that an individual will move to a partnership/S corporation. Further, consistent with earlier work on the relationship between inheritance and labor force behavior, inheritances are an inducement to retire.[16] Indeed, an increase in inheritance increases the odds of retirement relative both to joining a partnership, and remaining an entrepreneur.

So far, our focus has been on the qualitative effects of inheritance on transition probabilities. To investigate the quantitative impact, we simulated an increase in inheritance of $150,000 (in 1985 dollars). The result is that the probability of surviving as an entrepreneur rises by 0.013 (1.3 percentage points), which is virtually offset by a 0.014 (1.4 percentage points) *decline* in the probability of becoming a wage-earner. The impact on the remaining probabilities, while positive, is minuscule.

However, as suggested earlier, the influence of liquidity constraints may extend beyond the survival probability. In particular, firm performance as measured, say, by gross receipts may be affected. We therefore used the sample of individuals who remained as entrepreneurs to see if inheritance affected receipts in 1985. The results with respect to inheritance are quite striking (and highly significant from a statistical standpoint). To assess the quantitative implications of the estimate, note that the mean value of receipts in 1985 is $79,129. An inheritance of $150,000 would increase this to about $94,160, an increase of nearly 20 percent. In short, by relaxing

capital market constraints, inheritances have a substantial impact on the success of on-going concerns.

2.5 Policy Implications: Cautions and Caveats

We believe there is compelling statistical evidence that lack of access to capital markets has a detrimental effect on the vitality of the entrepreneurial sector. From a public policy standpoint, this result must be viewed with caution. It does suggest that well-targeted government programs that relieve liquidity constraints would indeed increase the number and strength of small businesses in the United States. However, it does not indicate whether the benefits would exceed the costs, and if so, by how much. Hence, while there would appear to be scope for public sector loan programs to small businesses, this would have to be approached on a case-by-case basis.

3. TAXES AND SMALL FIRMS

3.1 Conceptual Framework

We begin with a review of what economic theory leads one to expect regarding the impact of taxes on the growth of entrepreneurial enterprises. As will become clear, the bottom line is that theory alone yields no unambiguous predictions, highlighting the need for empirical studies to guide policy-making. Nevertheless, the analysis identifies the sources of the ambiguity and provides a useful framework for interpreting the empirical results.

As a start, ignore momentarily the impact of taxes on business survival, and focus on the decisions confronting an entrepreneur who will remain in business indefinitely. Suppose, for concreteness, that the entrepreneur faces a reduction in his marginal tax rate. This generates two conflicting effects. First, with a lower tax bite there is an increased reward for effort devoted to the enterprise. Typically, one would assume that this increases the entrepreneur's exertions. At

[16]See Holtz-Eakin, Joulfaian, and Rosen [1993].

the same time, however, even the old level of effort translates into greater after-tax profits. Thus, the entrepreneur may be tempted to enjoy these fruits by living a little better—consuming more goods and, also, leisure.[17] Notice that these two impacts move in opposite directions, so we cannot use theory alone to make a strong prediction about even the direction of the impact of taxes on entrepreneurial efforts.

Of course, we care not only about the overall growth of the entrepreneur's business, but also about the impact of taxes on the structure of entrepreneurial activities. How do taxes affect hiring of workers? The demand for new capital goods? The financial structure of the firm?

As it turns out, the fundamental ambiguity outlined above spills over into the effect of taxes on the myriad activities of the entrepreneurial venture. The entrepreneur produces output by combining his effort with purchased inputs such as hired labor, capital, materials, and so forth. If taxes alter the level of entrepreneurial effort, he or she may respond by re-balancing the mix of other inputs. The nature of the re-balancing, however, is not obvious. Some inputs are substitutes for owner's effort (one could hire a manager to supervise the operation) while others are complements (if the owner chooses to close on weekends, there is no need for an employee to handle the cash register). Hence, just like the owner's effort, the sign of the impact of taxes on the demands for the other components of the production process is ambiguous. If the effect on the usage of all inputs (including entrepreneurial effort) is ambiguous, so is the effect on output, and assuming the price of output is unaffected, so is the effect on receipts. It follows that the overall impact on the size of the business is theoretically ambiguous.

Of course, as is well-known, small businesses both start-up and fail at significant rates. Hence, we must also consider the implications of a tax reduction on the relative attractiveness of being an entrepreneur versus working in a wage and salary job. At first blush, one might

[17]Economists refer to the former effect as the "substitution effect" and the latter as the "income effect" These conflicting effects arise in many contexts. Because the two effects work in opposite directions, from

suppose that an income tax is neutral in this regard because income from all activities is taxed at the same rate. However, the decision is not determined exclusively by financial considerations, but rather by overall levels of satisfaction in each activity. In each case, a small reduction in taxes would raise after-tax earnings, which would permit either a wage-salary worker or an entrepreneur to purchase more goods and services. However, the satisfaction or "utility" associated with these additional goods will depend on all aspects of the lifestyle, and there is no reason to expect this to be the same in both types of jobs. Taxes, as a result, may affect the survival of small firms.

Our discussion follows the tradition of assuming that incentive effects are the main mechanism through which taxes affect economic outcomes. However, as the previous section has established, entrepreneurs are liquidity constrained. As a result, the increase in cash flow associated with a decrease in taxes will also increase the demand for capital, which in turn will increase the enterprise's output and receipts. Since the price incentive and liquidity constraint stories are not mutually exclusive, we will not make a serious attempt to choose between them in reviewing the evidence.

Which Tax Rate? The federal income tax confronts individuals with a variety of tax rates, depending on the type of income, the circumstances under which it is obtained, and so on. An important question is *which* tax rate is relevant? We have assumed that the relevant tax rate is that on ordinary income. In contrast, much of the popular discussion of this matter has focused on the capital gains tax rate. A writer in the *Wall Street Journal*, for example, stated that he was "of a class of entrepreneurs who feel shackled by the high capital gains tax in our country" and that his "companies would have grown better and faster" with a lower capital gains tax (Rigby [1996, p. A18]).

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introspection alone, the net impact is unclear.

To think about this matter, consider a variety of scenarios. In the first, an entrepreneur—we'll call her Smith—runs a simple consulting business and reports her income on Schedule C. Her only input is her time, and her receipts consist of payments for her advice. In this setting, there is no vehicle for "retained earnings" or "plowing funds back into the business" and the ordinary tax rate is the relevant one.

Suppose now that Smith not only uses her own time, she also purchases paper and hires an assistant. These purchased inputs are fully deductible against her receipts, but do not change the basic story. The ordinary income rate applies to the enterprise's net income.

Suppose further that Smith purchases capital assets, such as computers, office equipment, or even a structure to house her burgeoning business. If so, to the extent that her annual investment is under $24,000, it is fully deductible ("expensed") in the year of purchase.[18] Thus, the ordinary income tax rate is the relevant rate for determining the net cost of the investment. To the extent that investment exceeds $24,000, it must be depreciated; if so, the value of the depreciation allowances in any given year will depend on that year's ordinary income tax rates.

The assets generate income for the firm, which is taxed at ordinary rates on schedule C. The assets can also generate income for the firm if they appreciate in value and Smith sells them. If so, the appreciated-value component of such assets could be taxed at either the capital gains rate or the ordinary income tax rate. The key issue is whether an asset qualifies as a "capital asset" for the business. Capital assets are all assets *except* the company's "stock in trade" (inventory property), accounts receivable, copyrights and musical/literary materials, commodities, hedges and supplies. Thus, for example, if an art dealer sells a painting from inventory, then any appreciation in value is taxed as ordinary income.[19] It is certainly possible,

[18]See Section 179 of the Internal Revenue Code. For tax year 2000, the Section 179 expensing limit is $20,000. In tax years 2001 and 2002, it will rise to $24,000. In tax year 2003 and thereafter it will be $25,000.

[19]In contrast, if the dealer sells the art gallery itself, the income would be treated as a capital gain. Certain depreciable capital assets ("section 1231 assets") receive particularly favorable treatment. They receive capital

then, that for certain sole-proprietors the capital gains tax rate may be relevant in this context. We have no way of determining the importance of this possibility. It is interesting to note, however, that in any given year, considerably less than one-half of sole-proprietors make any capital investments at all (see below).

In the next scenario, Smith sells the company altogether. Suppose she sells the company for $100,000 in cash. The sales price will reflect not only appreciation of capital assets, but also intangible assets such as good will, going concern value, know-how, etc. For tax purposes, she subtracts her basis in the company from the $100,000, and the difference is taxed at the capital gains rate. We have no direct evidence relating to the importance of such transactions. However, in a recent careful analysis of 1985 data on capital gains realizations, sales of business assets by sole-proprietors were not sufficiently large even to merit attention as a separate item (Auten and Wilson [1999]).

Finally, suppose that Smith "goes public" with her firm. The key feature is that going public is not a taxable event *per se*. At the time of an initial public offering, the sole-proprietor receives shares in the new corporation, and the capital gains tax is not paid until such time as those shares are sold. At that time, the capital gains tax rate is applied to the difference between the sales of stock and Smith's basis in the stock. An initial public offering (IPO) is just one of several ways in which a business can be sold in whole or in part via some type of tax-free exchange. For example, Smith might receive stock in the acquiring company. For our purposes, the story is basically the same. The capital gains rate is not relevant until such time as the newly acquired stock is sold. If the stock is not sold before the owner's death, the capital appreciation may never be taxed at all.

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gains treatment when the aggregate of the gains from their sale is positive, but ordinary treatment of aggregate losses; i.e., the loss limitations do not apply.

Taking all these scenarios together, what can we conclude about the relevant tax rate? The theoretically ideal tax rate is a combination of the current ordinary income tax rate and the expected present discounted value of the relevant capital gains tax rate for that component which eventually is accorded capital gains treatment. However, the capital gains rate may or may not ever be applicable, and if so, one does not know how many years in the future. The expected present discounted value of the relevant capital gains rate for a sole-proprietor would in most cases probably be quite small, especially given the possibility that the enterprise may fail altogether. In light of all these considerations, as a practical matter, the ordinary tax rate seems the appropriate one to use in the analysis of the behavior of entrepreneurs.[20]

3.2 Data

Our research on the effect of taxes uses data drawn from the Statistics of Income Individual Tax Files for 1985 and 1988, which provides linked data on 62,159 taxpayers that are present in both years. These files contain detailed information on taxpayers' income and deductions taken from their Form 1040. To keep the research design relatively simple, we excluded from our sample taxpayers filing as heads-of-household, married filing separately, surviving spouses, taxpayers with duplicate (and likely erroneous) returns in either year, and those who reported income on a fiscal year basis.

Next, we selected only individuals aged 25 to 55 in 1985 in order to avoid complications that would arise because of younger sole-proprietors' labor market entry decisions and older sole-proprietors' impending retirements. We also eliminated taxpayers who were subject to the alternative minimum tax (AMT), as our tax calculator did not permit accurate computations of

[20]This analysis ignores the effect of capital gains taxes on the supply of capital; *e.g.*, venture capital. If lower capital gains taxes ease liquidity constraints via this channel, then it may increase firms' growth.

all taxpayers' marginal tax rates under the AMT.[21] Finally, we eliminated dependent returns and those who changed filing status between 1985 and 1988.

3.3 Taxes and the Growth of Small Firms

For this study, we refined our basic data to consist of those individuals who filed a Schedule C in both 1985 and 1988, of whom there are 6,817.[22] Upon reflection, one might suspect that sole-proprietors who survive until 1988 may not be "typical"—a random sample of the 1985 group would include some sole-proprietors that failed over the subsequent three years.[23] To shed some light on this issue, Appendix Table 3.1 summarizes how the income-generating activities of individuals who filed a Schedule C in 1985 changed from 1985 to 1988. Taken as a whole, the table indicates that the overall exit rate is much lower for those returns that have only schedule C income. Also, exits from sole-proprietorship are split roughly evenly between exits to another business form, wage-earning, and both another business form and wage-earning. A smaller fraction retires, not surprising given that we excluded individuals aged 56 and older in 1985. For those who begin with some wages in addition to Schedule C income (for joint-filers these may be the earnings of the spouse), there is a much greater propensity to move to strictly wages and wages plus business, and a lower propensity to move to purely business.

What are the characteristics of our small firms and their owners? Our sole-proprietors have much higher incomes than taxpayers as a whole, a finding that is consistent with earlier research. In 1985, the mean Adjusted Gross Income (AGI) in our sample of sole-proprietors was $177,267; the mean for all tax returns was $22,683. Also consistent with previous research (see, for example, Hamilton [2000]) is the tremendous variation in income among sole-proprietors—the standard deviation of AGI was $1,845,269. The distribution of sole-proprietors' incomes is

[21] More specifically, we generally observe AMT preferences only for taxpayers subject to the AMT. From an operational point of view, it is very difficult to calculate tentative AMT when holding income constant.

[22] We required those who filed a Schedule C in 1985 to have positive values for gross receipts.

also very skewed; median AGI was only $54,797. Not surprisingly, the key components of AGI exhibited qualitatively similar patterns. Mean wages and salaries on the returns were $116,572 (s.d. = $461,994), with a median of $25,413. Mean capital income (the sum of interest and dividends) was $50,140 (s.d. = $353,160), with a median of $2,197. In our context, it is particularly interesting to note the dispersion in net schedule C income—the mean in our sample was $95,726 (s.d. = $618,850), but the median only $6,593.

How large are enterprises owned by sole-proprietors? The size of an enterprise can be measured in several ways, including number of employees, units of output produced, and revenues. Various measures appear in the literature. Gentry and Hubbard [1998] focus on gross receipts. On the other hand, Evans [1987] studies employment, although he reports that analyses of firms' sales and employment growth rates yield similar results (p. 659). Tax return data include information only on revenues, so they are the focus of our analysis. Specifically, we use gross receipts from line 1(a) of Schedule C. Of course, two firms with the same gross receipts could be in very different financial health depending on their costs. Nevertheless, we choose to focus on gross rather than net receipts because tax data do not include information on economic costs and hence do not allow an economically meaningful measure of net receipts.

The sole-proprietors in our sample constitute an important component of entrepreneurial economic activity. Based on SOI sample weights, our original sample of 62,159 returns reported gross receipts of $473.8 billion—88 percent of the SOI total. The process of sample exclusions lowers the economic activity represented by the sample, but it remains significant. For example, our basic sample of 8,675 returns accounts for 59 percent ($320.8 billion) of the SOI total (those with positive receipts in both 1985 and 1988 account for 49 percent, or $266 billion).

[23]One concern is the possibility that even though a business fails the owner starts a new business that is also organized as a sole-proprietorship. Our data do not allow us to examine this issue directly.

Using another measure of their importance, the wage bill—payments by sole-proprietors to hired labor—yields a very similar pattern. Our basic sample of 8,675 returns comprises 62 percent ($266 billion) of the SOI estimate of total wage payments by sole-proprietors. By either measure, our sample accounts for a significant proportion of entrepreneurial activity.

Statistical Results. In Carroll, Holtz-Eakin, Rider and Rosen [2001], our goal was to isolate the effect of taxes among the many determinants of the rate of growth of sole-proprietors' receipts. Our starting point was the notion of the *tax price* facing an entrepreneur, defined as the proportion of the last dollar received by the entrepreneur that he or she gets to keep. This is just 1 minus the marginal tax rate. For example, an entrepreneur facing a marginal tax rate of 31 percent has a tax price of 0.69. An appropriate empirical specification posits that the growth rate of receipts between 1985 and 1988 depends upon the change in the tax price due to the Tax Reform Act of 1986 and other variables.

As before, we allow for the possibility that other variables affect growth as well. Age is related to one's experience in the job market and human capital accumulation. We also include marital status and the number of dependents, given the possibility that they may affect the entrepreneur's willingness to take risks and desire for leisure.

We include capital income as a measure of the individual's assets, which should affect entrepreneurial decision making in the presence of the kinds of capital market constraints discussed in the previous section. However, one should note that tax return data on capital income are generally quite poor. Our variable is the sum of reported dividends and interest; it omits capital gains and municipal bond interest, *inter alia*.[24] Hence, one must be cautious in using this variable as a test of the liquidity constraint hypothesis. Finally, using the principal business codes reported on Schedule C, we develop a set of dichotomous industry variables. These are intended to take into account industry-specific effects, such as the fact that demand

patterns, the parameters of the production technology, and profitable opportunities differ across industries.

A second major issue associated with the analysis is the threat of "two-way causality" in the tax price variable. Our goal is to find the effect of tax rates on firm growth. Unfortunately, marginal tax rates vary with income so as receipts go up, income increases, and so does the marginal tax rate. That is, tax rates affect growth *and* growth affects tax rates. The trick to isolating the independent effect of taxes on growth is a statistical technique ("instrumental variables") that relies on finding a change in each entrepreneur's tax price that is closely related to the change she actually faced but could not possibly stem from faster or slower growth. If found, such a change could only reflect one-way causality: the effect of taxes on growth.

We implement this tactic by taking advantage of the changes introduced by TRA86 itself. To begin, we compute each individual's marginal tax rate using the data and tax law for 1985.[25] Next we compute each individual's marginal tax rate using the data for 1985 (inflated to 1988 levels), but employing the tax law for 1988. Clearly, the change between the 1985 and the 1988 tax rates computed in this fashion is due entirely to modifications of the tax code. Essentially, this procedure removes the "wrong-way" causality by eliminating the part of the change in the tax price that is due to the growth of the entrepreneur's own income.

As mentioned earlier, the fact that we study individuals who were sole-proprietors in both 1985 and 1988 raises the issue of firm survival. To sort out the effect of taxes on growth *and* survival, we take advantage of a technique suggested by Heckman [1979]. Effectively, this involves incorporating a statistical model of survival into our model of growth.

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[24]Of course, other conventional data sets also lack information on important components of capital income.

[25]We compute our marginal tax rates using detailed tax calculators developed by the Office of Tax Analysis, U.S. Treasury and tailored for our panel. These calculators account for both the statutory rate schedule and the many implicit tax rates (*e.g.*, the post-TRA86 phase-out of tax benefits associated with the 15 percent tax bracket and the personal exemption) that arise from special features of the tax code. Our marginal tax rates include the SECA (Self-Employment Contributions Act) tax, and the Social Security tax for wage-earners.

The estimated parameters of our equation are presented in Appendix Table 3.2.[26] Here we focus on their implications. From our standpoint, the key result is that the greater the percentage increase in a sole-proprietor's tax price between 1985 and 1988, the greater the increase in the size of his or her business. This resolves the theoretical ambiguity with respect to the effect of the tax price that we discussed earlier. Specifically, the parameters in the appendix table imply that a decrease in a sole-proprietor's marginal tax rate from 50 percent to 33 percent would lead to an increase in his receipts by about 28 percent. While "large" effects are in the eye of the beholder, it appears that marginal tax rates have a substantial effect on the growth of entrepreneurial enterprises.

In any econometric model, an important question is whether the substantive results are sensitive to various assumptions that went into the construction of the model. In our context, it is interesting to know whether our finding of a positive effect of the tax price on firm growth depends on the way in which we controlled for other characteristics of the entrepreneur and her business. This question is particularly cogent given that some of the variables, such as marital status, might be correlated with business success for other reasons. To investigate this possibility, we re-estimated our model excluding all variables except the change in the tax price. The results so obtained are of similar magnitude and statistical reliability to those of the basic model.

We also subjected our equation to a variety of checks to determine whether the estimated relationship is sensitive to the data or specification. We included as an additional control variable the 1985 value of family wage and salary earnings, and also investigated the possible impact of the tax-base broadening associated with TRA86. Further, our basic approach assumed (for ease of analysis only) that the effect of taxes is the same in all industries. Perhaps, though,

[26]The survival model is a probit equation estimated using the sample of sole-proprietors in 1985. The dependent variable is equal to one if the individual survives as a sole-proprietor until 1988, and zero otherwise.

firms operating in some industries are more tax sensitive than others. We therefore estimated a variant of the basic model that allowed the tax-price effect to vary by industry. Taken together, the theme that emerged from the various exercises was that changes in entrepreneurs' tax rates have a significant impact on the growth of their enterprises, and the results are not sensitive to the particulars of our statistical analysis.

As one final check, we tightened the criteria for classifying Schedule C filers as entrepreneurs. First, we imposed the requirement that sole-proprietors reported $500 of gross business receipts and repeated our statistical analysis. Next, we raised the minimum threshold to $1,000 of business receipts, and then to $5,000. In each case, the bottom line remains the same—as tax rates increase, the growth of entrepreneurial enterprises decreases.

As noted above, our statistical design required that we allow for the fact that only some individuals survive as a sole-proprietor from 1985 to 1988. While we viewed this part of the model primarily as a means for obtaining reliable estimates of the effect of taxes on firm growth, it is of independent interest to see how the survival rate in self-employment depends on tax rates. The statistical results are reported in Appendix Table 3.3. Using a variety of techniques, we find that tax rates do not greatly affect survivorship probabilities. That is, although tax rates affect the growth of entrepreneurial enterprises conditional on surviving, the survival rates per se do not seem to be affected by tax rates.

3.4 Taxes and Capital Investment

It has been argued that tax policy should encourage entrepreneurs to invest in their businesses. Such arguments influenced, for example, the Omnibus Budget Reconciliation Act of 1993, which contained a number of provisions favoring investment in small businesses, including a 50 percent exclusion of long-term capital gains from certain small business investments. At the same time, there are concerns that the high marginal tax rates embodied in

that law have discouraged investment by entrepreneurs. As one business economist opined after high-end personal income tax rates were raised in 1993, "It means their cash flows will not grow as fast, and they will not have as much to plow back into their business" (*Wall Street Journal* [1994]).

Does tax policy affect the investment decisions of small businesses? Interestingly, most of the voluminous literature on taxes and investments focuses on aggregate business investment, or investment undertaken by large firms of the type represented (say) in the Compustat database.[27] Engen and Skinner [1996] point out there has been little systematic investigation of whether the tax system adversely affects entrepreneurial investment behavior. This is a significant omission given that entrepreneurial enterprises account for at least 10 percent of the economy's non-residential fixed investment.[28]

There are two possible ways in which the individual's personal income tax situation can affect this decision. First, taxes affect the demand for investment through their impact on the "user cost of capital." The user cost of capital is defined as the gross internal rate of return required of an investment such that it yields the market rate of return after all taxes and depreciation. The greater the user cost, the fewer the number of profitable projects. Hence, anything that drives up the user cost of capital reduces the amount of investment. In the simplest case, if the after-tax market return is 10 percent and an entrepreneur has a 50 percent tax rate, then the user cost of capital is 20 percent; *i.e.,* if investments yield 20 percent then the entrepreneur can pay taxes and still meet the market test. More generally, the user cost depends

[27]Chirinko [1993] provides an extensive survey of this literature.

[28]For purposes of this calculation, we think of entrepreneurial enterprises as consisting of sole-proprietorships plus some partnerships, *S* corporations, and small *C* corporations. We are only able to calculate the sole-proprietors' investment outlays, which thus serve as a lower bound for the total. From the Statistics of Income 1993 individual sample, we added up the investments recorded by sole-proprietors on Form 4562 (Depreciation and Amortization), and arrived at a figure of $63.3 billion. (This includes an estimate of investment that is expensed under Section 179.) This is 10.6 percent of nonresidential fixed investment in 1993, which was $598.8 billion, according to the *Survey of Current Business* (November/December) [1995]. Note, however, that the definition of investment in the National Income and Product Accounts is not quite the same as the tax definition. A reconciliation is contained in the *Survey of Current Business*.

upon differential taxation of capital gains, accelerated depreciation, investment tax credits, expensing, and a variety of other features of the tax code, particularly the marginal tax rate. The fact that changes in personal tax rates alter the user cost suggests that they may thereby influence investment decisions.

To implement this framework, we need data on both the entrepreneur's investment and her user cost of capital. Sole-proprietors do not report annual investment on their Schedule C. However, they do report depreciation deductions. Moreover, using the detailed information regarding the computation of these deductions reported on Form 4562 it is possible to identify which of these deductions are associated with capital purchased during the tax year under consideration.[29] Thus, we can determine whether the entrepreneur made any investment during the year and the associated expenditure. (To compute expenditures, we simply add up the amounts listed on Form 4562 indicating the cost or basis of investments made during the current year.)

A Preliminary Look at the Data. Table 3.1 provides some information on the number of sole-proprietorships in 1985 and 1988, and the extent to which they made capital purchases. Panel A of the table exhibits a 3x3 matrix comparing combinations of filing status and investment decisions in 1985 (rows) with corresponding measures for 1988 (columns). Consider, for example, the center entry. It indicates that 1,705 observations are sole-proprietors who did not make any investment in either 1985 or 1988. The second entry in this cell indicates that these observations constitute 57.3 percent of the entrepreneurs who did not have capital

[29]A number of our sole-proprietors were also involved with partnerships and/or *S* corporations. In these cases, we are not able to distinguish between investment done in the sole-proprietorship and investment done in one of the other entities. To the extent that the tax reform affected businesses' choices of organizational form, the inclusion of investment from *S* corporations and partnerships could bias our results. Partnerships are unlikely to be important in this context-*C* corporations converting to pass-through status probably tend not to become partnerships because limited liability is still available if they remain in corporate form as *S* corporations. While switches from *C* to *S* corporations are potentially important, when we excluded returns with any S-corporation income in either year, it had little effect on our substantive results.

outlays in 1985. In contrast, 459 or 15.4 percent moved from zero to positive investment, and 812 or 27.3 percent exited from sole-proprietorship entirely.

Table 3.1. Self-Employment Transitions and Investment Decisions[a]

Panel A. Investment Decisions and Self-Employment Status

		1988		
		No Schedule C	Schedule C No Investment	Schedule C Investment
1985	No Schedule C	13,252 (0.897)	1,222 (0.083)	304 (0.020)
	Schedule C, No Investment	812 (0.273)	1,705 (0.573)	459 (0.154)
	Schedule C, Investment	185 (0.123)	609 (0.406)	707 (0.471)

Panel B. Investment among Sole-Proprietors in 1985 and 1988

		1988	
		No Investment	Investment
1985	No Investment	1,705 (0.788)	459 (0.212)
	Investment	609 (0.463)	707 (0.537)

[a]The first entry in each cell is the number of observations. The second entry is the number of observations as a fraction of the total number of observations in the corresponding *row*.
Source: Carroll, Holtz-Eakin, Rider, and Rosen [2000b].

For the matrix as a whole, a couple of observations stand out. First, those who made an investment in 1985 are more likely to stop acquiring physical assets than to leave sole-proprietorship (40.6 percent versus 12.3 percent). Second, those without investment in 1985 are more likely to cease operations than add capital (27.3 percent versus 15.4 percent).

We focus mostly on individuals who were sole-proprietors in both 1985 and 1988, *i.e.*, those in the lower right hand 2x2 submatrix. Panel B of Table 3.1 replicates these cells, but provides frequencies contingent upon remaining a sole-proprietor. Within this sample, 79 percent of the individuals who made no investment in 1985 also made no investment in 1988,

and 54 percent of those who invested in 1985 also did so in 1988. Thus, there appears to be substantial persistence in the propensity to invest, a feature of the data that influences the design of our statistical analysis below. Another critical implication of the data in Panel B is that only a relatively small proportion—about one-third—of the sole-proprietors make any capital investments. This is consistent with earlier findings using different data that suggest that most small enterprises have no capital at all (see Meyer [1990]).

Table 3.2. Investment Decisions and Tax Rates[a]

Panel A. Lower Tax Rate in 1985

		1988	
		No Investment	Investment
1985	No Investment	923 (0.813)	213 (0.187)
	Investment	263 (0.557)	209 (0.443)

Panel B. Higher Tax Rate in 1985

		1988	
		No Investment	Investment
1985	No Investment	782 (0.761)	246 (0.239)
	Investment	346 (0.410)	498 (0.590)

[a]See note to Table 3.1. Panel (A) includes all sole-proprietors with 1985 marginal tax rates below 34 percent. Panel (B) contains the remainder.
Source: Carroll, Holtz-Eakin, Rider, and Rosen [2000b]

In Table 3.2, we divide our entrepreneurs into two groups, those with "lower" tax rates in 1985 (below 34 percent) and those with "higher" rates (34 percent and above). Relatively affluent people in the upper tax brackets received the largest tax rate reductions under TRA86. Hence, if there is anything to the story about higher tax rates discouraging entrepreneurs from investing, then we would expect those individuals who were initially in the higher brackets to have the largest increase in their propensity to make capital outlays. The figures in Table 3.2 appear to be consistent with this story. Of the sole-proprietors who had no investment and lower

tax rates in 1985, 18.7 percent made capital purchases in 1988. For those with higher tax rates in 1985, the figure was 23.9 percent. Similarly, 55.7 percent of the lower-tax-rate sole-proprietors who had capital expenditures in 1985 had no investment in 1988, while for the higher-tax-rate sole-proprietors, the figure was only 41.0 percent.

As noted above, investment decisions depend on the user cost of capital, of which marginal tax rates are only one component. The tax reform affected not only marginal tax rates, but also depreciation allowances and the investment tax credits. It turns out, however, that in our data changes in the user cost are primarily driven by changes in tax rates, so intuition derived from the latter translates directly to the former. Still, the user cost framework is more desirable in principle, so our statistical analysis focuses on changes in the user cost of capital.

The Investment Decision. Investment is typically studied either at the aggregate level or at the level of established corporations. Such studies can take for granted that each observation is associated with at least *some* investment. However, most sole-proprietors make no investments in physical capital, so understanding the decision of whether to invest at all is itself of considerable importance. Hence, our first goal is to estimate the determinants of the probability that a sole-proprietor made any investment in 1988.

What are the determinants of this probability? One factor is whether the firm has a history of making investments, *i.e.*, whether there was investment in 1985. Building on the 1985 investment decision, our discussion suggests that the 1988 decision will also be influenced by changes in the user cost of capital. Finally, and unlike the case in conventional analyses of investment using corporate data, it makes sense to include some demographic and economic information about the individual who is actually making the decision.[30] As noted above, tax returns contain some useful controls. Age is included because it is related to one's experience in

[30]The entrepreneur's investment decision is presumably made jointly with other input decisions, including the owner's supply of labor to the enterprise, which in turn depends on his personal characteristics.

the job market, human capital accumulation and, hence, the structure of the business. Marital status and the number of dependents may be related to attitudes towards risk.

As in our analysis of receipts growth, we include capital income as a measure of the individual's assets, which should affect entrepreneurial decision making in the presence of capital market constraints. Finally, using the principal business codes reported on Schedule C, we develop a set of dichotomous industry variables. These are intended to take into account the fact that the capital-intensity of the production technology differs across industries. Further, as suggested by Shleifer and Vishny [1992], investment opportunities within industries tend to move together, suggesting that a firm's industrial classification is a useful proxy for its investment opportunities.

The second major issue is the possibility of reverse causality. As mentioned earlier, as capital investment goes up, taxable income and the marginal tax rate decline, as does the user cost of capital, *ceteris paribus*. We address this problem using the same statistical strategy as earlier, namely using the Tax Reform Act of 1986 to isolate the one-way causality that runs from changes in tax rates (and the user cost) to investment, while eliminating the reverse channel.

Basic Results. The full results are shown in Appendix Table 3.4. Here we note the key substantive finding: the greater the percentage increase in a sole-proprietor's user cost of capital between 1985 and 1988, the lower the probability that he or she undertook capital outlays in 1988. Further, increases in the user cost are even more important for firms that already had some capital outlays than for firms with no history of investment. These relationships hold whether we look at the relationship between investment and the user cost in isolation, or if we include other variables in addition to the user cost.

As part of our general strategy of checking to ensure that our results are robust to reasonable changes in the research strategy, we repeated the analysis using a variety of different

variables, samples, and statistical procedures. Among the interesting results in this regard is the difference between investment in structures and equipment. TRA86 had different provisions for each type of investment. For structures, depreciation allowances were made less generous, while for equipment the major innovation was elimination of the investment tax credit. In short, both the underlying demands and the magnitudes of price changes might have differed across the two types of investment. We therefore conducted separate analyses for equipment and structures, and found that increases in the user cost reduce the propensity to invest both in equipment and structures.

To assess the quantitative significance of our results, we used our model to simulate the effect of a 10 percent rise in the user cost. The simulation suggests that the increase in the user cost lowers the mean probability of undertaking investment from 0.335 to 0.251, a decline of 25 percent.

An alternative approach to assessing the quantitative significance of our results is to focus directly on tax rates. To do so, we simulate the effect of raising the 1988 marginal tax rate of each individual in the sample by 5 percentage points. The mean probability of investment falls from 0.335 to 0.300, a decline of 10.4 percent. Using either metric, the estimates imply a substantial response of investment decisions to tax rates.

Investment Expenditures. Thus far we have focused on the important issue of whether taxes affect the probability that an entrepreneur makes any investment at all. However, we can learn as well a bit about the impact on the size of investments. Specifically, the supporting information associated with tax returns enables us to compute the dollar value of investment outlays in each year. The average investment in 1988 was $1,699. Recall, however, that only 33.5 percent of the firms had positive investment outlays in 1988. The large number of zeros

affects the interpretation of the mean—among those with positive spending, the mean outlay was $5,070 (with a standard deviation of $15,933).

Complete results are reported in the Appendix Table 3.4. Here we simply note that the statistical results support the notion that changes in the user cost and, thus, changes in tax rates have a statistically significant impact on entrepreneurs' investment expenditures. Further, the quantitative impact is substantial. The implied "elasticity" of investment expenditure with respect to the user cost is -1.78—a 10 percent increase in the user cost lowers investment outlays by 17.8 percent. This is quite a bit higher than the elasticity estimates based on corporate data which, according to Engen and Skinner [1996], range from -0.25 to -1.0. We conjecture that small businesses of the type in our sample are more likely to be liquidity constrained than corporations and the user cost may be picking up some of this effect.

As before, it is useful to provide a more direct measure of the impact of changes in tax rates. Our results imply that a five percentage point increase in marginal tax rates leads to a 9.9 percent decline in the mean investment expenditures. In short, changes in the user cost of capital induced by increases in marginal tax rates have a substantial impact on entrepreneurs' investment spending.

3.4. Taxes and the Hiring Decision

One reason for the public fascination with entrepreneurial enterprises is their putative ability to "create" jobs. But there is little research on the factors that determine entrepreneurs' hiring decisions. In particular, not much is known about the effect of an entrepreneur's personal income tax situation on his or her hiring decisions. A popular belief is that tax increases inhibit entrepreneurs from hiring labor. For example, after taxes were increased in 1993, Rigby [1994] quoted an entrepreneur who planned

> to reduce his labor force of 40 people to pay his firm's increased taxes... "...we will find ways to reduce labor costs. We may have to cut some people and give overtime to others to do their work."

As in the other studies discussed in this section, we investigate the hiring decision using data that are drawn from the Statistics of Income Individual Tax files for 1985 and 1988. Here we focus on individuals who filed a Schedule C in both 1985 and 1988, of whom there are 6,078.[31]

Sole-proprietors do not report the number of workers they employ on their Schedule C. However, they do report their wage bill. Whether the wage bill is positive or zero tells us whether the entrepreneur has hired any labor. Our main focus, therefore, is on the decision whether or not to hire labor. Changes in the wage bill itself are hard to interpret because one does not know if they are dominated by changes in wage per worker rather than the number of workers. Nevertheless, entrepreneurs' expenditures on labor inputs are of independent interest, so we also analyze how the wage bill changes in response to tax rate changes.

Table 3.3 provides some information on the number of sole-proprietorships in 1985 and 1988, and the extent to which they employed labor. Panel A of the table exhibits a 3x3 matrix comparing combinations of filing status and hiring decisions in 1985 (rows) with corresponding figures for 1988 (columns). Consider, for example, the center entry. It indicates that 3,632 observations are sole-proprietors who did not hire anybody in either 1985 or 1988. The second entry in this cell indicates that these observations constitute 67.9 percent of the entrepreneurs who did not hire anybody in 1985. In contrast, 375 or 7.0 percent moved from having no labor to having a positive wage bill, while 1,345 or 25.1 percent exited from sole-proprietorship entirely.

[31] As above, results drawn from such a sample might be subject to selectivity bias—sole-proprietors who survive until 1988 may not be a random sample of the 1985 group. However, when we expand our analysis of hiring decisions to include individuals who ceased filing a Schedule C between 1985 and 1988, no important differences emerge.

Table 3.3. Self-Employment Transitions and Hiring Decisions[a]

Panel A. Hiring Decisions and Self-Employment Status

		1988		
		No Schedule C	Schedule C No Wage Bill	Schedule C Wage Bill
1985	No Schedule C	17,486 [0.886]	2,066 [0.105]	180 [0.009]
	Schedule C, No Wage Bill	1,345 [0.251]	3,632 [0.679]	375 [0.070]
	Schedule C, Wage Bill	179 [0.080]	453 [0.201]	1,618 [0.719]

Panel B. Hiring Decisions among Sole-Proprietors in 1985 and 1988

		1988	
		No Wage Bill	Wage Bill
1985	No Wage Bill	3,632 [0.906]	375 [0.094]
	Wage Bill	453 [0.219]	1,618 [0.782]

[a]The first entry in each cell is the number of observations. The entry in square brackets is the number of observations as a fraction of the total number of observations in the corresponding *row*.
Source: Carroll, Holtz-Eakin, Rider, and Rosen [2000a].

For the matrix as a whole, three observations stand out. First, only 2,550 of the 27,334 returns—about 9.3 percent—had a positive wage bill in 1985, in large part because only 7,602 (or 27.8 percent) were sole-proprietors at all. Second, there is substantial persistence in hiring decisions. Of those without any workers in 1985, 67.9 percent also had none in 1988. Similarly, 71.9 percent of those who had employees in 1985 continued to have some in 1988. Lastly, those with workers in 1985 are more likely to stay in business but stop hiring workers than to leave self-employment altogether (20.1 percent versus 8.0 percent). However, those sole-proprietors without workers are more likely to end the sole-proprietorship than add employees (25.1 percent versus 7.0 percent).

As already noted, our basic sample consists of individuals who were sole-proprietors in both 1985 and 1988, *i.e.*, those in the lower right hand 2x2 submatrix. Panel B of Table 3.3 replicates these cells, but provides frequencies contingent upon remaining a sole-proprietor. In 1985, 34.1 percent of the sole-proprietors hired workers. This figure reflects the pattern found among OECD countries, in which most of the self-employed have no employees (see Lindh and Ohlsson [1996]). Between 1985 and 1988, 9.4 percent took on workers, while 21.9 percent ceased having a wage bill.

Table 3.4. Hiring Decisions and Tax Rates[a]

Panel A. Lower Tax Rate in 1985

		1988	
		No Wage Bill	Wage Bill
1985	No Wage Bill	1,849 [0.916]	168 [0.084]
	Wage Bill	220 [0.374]	369 [0.626]

Panel B. Higher Tax Rate in 1985

		1988	
		No Wage Bill	Wage Bill
1985	No Wage Bill	1,783 [0.896]	207 [0.104]
	Wage Bill	233 [0.157]	1.249 [0.843]

[a]See note to Table 3.3. Panel (A) includes all sole-proprietors with 1985 marginal tax rates below 34 percent. Panel (B) contains the remainder. The entry in square brackets is the proportion of observations in the corresponding row.
Source: Carroll, Holtz-Eakin, Rider, and Rosen [2000a]

Following the same tack that we used in the analysis of investment decisions, in Table 3.4 we divide this set of entrepreneurs into two groups, those with "low" tax rates in 1985 (below 34 percent) and those with "high" tax rates (34 percent and above). People in the upper tax brackets received the largest tax rate reductions under TRA86—the maximum statutory tax

rate went from 50 percent to 28 percent.[32] Hence, if there is anything to the story about high tax rates discouraging firms from hiring labor, then we would expect those individuals who were initially in the higher brackets to have the largest increase in their propensity to engage labor.[33] The figures in Table 3.4 are consistent with this story. Of the sole-proprietors who had no workers and low tax rates in 1985, 8.4 percent had workers in 1988. For those with high tax rates in 1985, the figure was 10.4 percent. Similarly, 37.4 percent of the low-tax-rate sole-proprietors who had labor in 1985 had no wage bill in 1988, while for the high-tax-rate sole-proprietors, the figure was only 15.7 percent.[34]

An immediate concern regarding the interpretation of the results in Table 3.4 is that high-income, "successful" individuals are simply different than those with low incomes and tax rates. In this view, these personal characteristics are the source of the differences in Table 3.4, not tax rates *per se*. In order to investigate this possibility, we estimated a similar set of transition matrices over a time period that did not contain a major tax reform, 1989 to 1993.[35] If the key factors determining hiring decisions are the observable or unobservable characteristics of high-income individuals, the pattern in Table 3.4 should be repeated in these data. Alternatively, if changes in tax rates are driving the results in Table 3.4, in the 1989 to 1993 transitions there should be no differences between high-income and low-income individuals.

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[32]Due to the phase-outs of personal exemptions and itemized deductions for high-income individuals, the effective marginal rates were higher than 28 percent for some people.

[33]This is similar to the approach taken by Eissa [1995] in her analysis of the impact of TRA86 on the labor supply of married women, and by Feldstein [1993] in his study of TRA86 and its effect on taxable income.

[34]In each case, these differences are statistically significant.

[35]This is, of course, a period one year longer than the 1985 to 1988 time period in Table 2. The years 1989 and 1993 were the only two years not straddling a major tax reform for which suitable data were available. (The modest changes during the 1989 to 1993 period are unlikely to affect this exercise. In 1990, the 33 percent "bubble" was replaced with a 31 percent rate. The cap on the Medicare Health Insurance payroll tax base was eliminated. There were changes in the high-end rates in 1993, but these were not enacted until late in the calendar year.) To the extent that this tax increase had an impact, it would tend to reduce in relative terms the transition rate of high-income individuals into self-employment. As seen below, we find this pattern in the 1989-1993 data, although it is not statistically significant. In 1988, the maximum statutory tax rate was 28 percent. For purposes of this exercise, "high-tax" individuals were those whose marginal tax rates exceeded 25 percent.

The data support the latter scenario. Our calculations indicate that among high-income, high-tax sole-proprietors with no workers in 1989, 20 percent had a wage bill 1993. Among low-tax individuals, the analogous percentage was *higher*, 30.4 percent, although the difference was not statistically significant. Similarly, among those high-tax individuals who had workers in 1989, 6 percent did not have workers in 1993 compared with a rate of 4.2 percent among low-tax individuals. Again, although not statistically different, the pattern is directly opposite to that in Table 3.4.

Statistical Analyses. The complete set of results for our model of labor demand by entrepreneurs is in Appendix Table 3.6. The key finding is that the greater the percentage increase in a sole-proprietor's tax price (*i.e.*, the greater the decline in the tax rate), the more likely that he or she hired some labor. Moreover, as in our other analyses, we are able to rule out the possibility of reverse causation; these estimates reflect the impact of the tax code on hiring decisions and not the reverse. Moreover, our results are not sensitive to the particulars of our decisions on the sample size and composition, specification of the variables under study, or statistical procedures.

To assess the quantitative significance of our results, we use the model to simulate the impact of a 10 percent rise in the tax price. For example, the top bracket rate currently is 39.6 percent. Reducing this rate to 33.2 percent would generate a 10 percent rise in the tax prices faced by entrepreneurs in this bracket. The simulation results indicate that the tax rate reduction increases the mean probability of employing labor from 0.215 to 0.241, or 12.1 percent, implying an elasticity of 1.21. It appears that marginal tax rates have a substantial effect on the propensity of entrepreneurs to hire workers.

Changes in the Wage Bill. As noted above, tax returns do not report the number of employees, but do include the size of the wage bill. The mean growth of the real wage bill for

our 1,618 firms between 1985 and 1988 was 0.245. Following the strategy of Table 3.4, we may divide these firms into two groups based on their tax rates in 1985. Doing so indicates that the mean percentage change in the wage bill for those 369 firms with "low" (below 34 percent) marginal tax rates is 0.125. In contrast, the figure for those with high tax rates is 0.265, a difference of 0.14.[36] Thus, there is suggestive evidence of a link between tax rates and the size of the wage bill.

Again, a more complete investigation of the relationship between changes in the wage bill and marginal tax rates confirms the basic insight (see the results in Appendix Table 3.7). The results suggest that when the entrepreneur's tax price increases by 10 percent, his wage bill increases by about 4 to 5 percent. As noted above, we are unable to decompose this change into the part due to an increased wage rate and a part due to more labor hired. But one way or the other, when their income tax rates go up, entrepreneurs spend less on labor. Our data do not allow us to say anything about what kinds of workers are affected by such changes. However, to the extent that the earnings of their workers are affected, it raises the possibility that taxes on high-income entrepreneurs may be shifted in part to lower-income employees, leading to counter-intuitive effects on the distribution of after-tax income.

3.4. Taxes and Entrepreneurs: Concluding Remarks

Policymakers have long been concerned about the possible inhibiting effects of taxes on small businesses, but not much is known about the relationship between tax rates and entrepreneurial decision-making. The papers summarized in this section have examined the impact of personal income taxes on three important decisions facing an entrepreneur: how fast to grow the firm; whether to invest in capital assets and if so, how much; and whether to hire workers? The short answer to all three questions is simple: taxes matter. As tax rates go up,

[36]The difference is statistically significant at the 1 percent level.

entrepreneurial enterprises grow at a slower rate, they buy less capital, and they are less likely to hire workers. These results are significant from a statistical point of view, and they are quantitatively important.

4. POLICY IMPLICATIONS AND CONCLUSIONS

We have examined two critical questions with respect to entrepreneurial enterprises. First, do the owners of such enterprises face constraints in capital markets? That is, do worthwhile projects go unfunded because entrepreneurs cannot borrow enough to finance them? Second, how do entrepreneurs react to changes in their personal income tax situations? In particular, when entrepreneurs' marginal tax rates increase, do they hire less capital and labor, and grow their enterprises more slowly? The answer to all these questions is yes—liquidity constraints are present and entrepreneurial behavior is sensitive to marginal tax rates.

These results have implications for the ongoing debate over proposals to make the tax system more friendly to entrepreneurs. Broadly speaking, we can imagine two strategies. One is to cut their marginal tax rates as part of a general program of rate reductions that would apply to all taxpayers. The other is to target relief to the owners of small businesses with special provisions that apply only to them. An example would be preferential tax treatment of capital gains associated with ownership of small businesses. Targeted relief is inherently complicated. One needs extensive rules to determine which businesses qualify and which do not. Equally important, by definition, they do nothing for *potential* entrepreneurs. In contrast, general rate reductions require no special rules, and they encourage individuals who are not yet entrepreneurs but are contemplating starting their own businesses. Of course, general rate reductions have other beneficial effects that have nothing to do with entrepreneurship *per se*, e.g., reducing incentives for tax avoidance, encouraging saving, and so on.

Our research supports the notion that one mechanism through which tax rate reductions encourage entrepreneurship is through increasing cash flow. One might therefore ask whether it would be good policy for the government simply to provide financing directly to these enterprises via, say, low-interest loans. Our results suggest that this would, indeed, increase the number and vitality of entrepreneurial enterprises. However, it is not clear that a general program organized along such lines would pass a cost-benefit test. Some firms do not receive loan finance, after all, because their projects are not very good. It is not clear whether a government agency has the information required to "pick winners." In short, although we find that entrepreneurial firms face liquidity constraints, it does not follow that programs of government loans and subsidies are appropriate.

Appendix Table 2.1. Transitions to Entrepreneurship and Investment in New Enterprises[a]

	All Observations		Decedent with No Schedule C	
	Transition to Schedule C (1)	Depreciable Assets (2)	Transition to Schedule C (3)	Depreciable Assets (4)
CONSTANT	-1.048	21,930	-0.9403	19,360
	(0.2757)	(49,113)	(0.2917)	(57,090)
AGE	0.01702	-1,184	0.009826	-1,251
	(0.01603)	(2,827)	(0.01689)	(3,281)
$AGE^2 \times 10^{-3}$	-0.4109	20,300	-0.3036	21,960
	(0.2035)	(35,913)	(0.2137)	(41,940)
AGE65	0.1590	-49,730	-0.08036	--
	(0.1872)	(70,630)	(0.1981)	
AGE?	-0.02181	-27,608	-0.1852	-29,390
	(0.3087)	(54,705)	(0.3300)	(64,220)
MARRIED	0.1163	5,261	0.1271	6,594
	(0.07080)	(10,191)	(0.07559)	(12,010)
CHILDREN	-0.06917	4,166	-0.06544	4,594
	(0.02851)	(4,352)	(0.02991)	(4,904)
W&S	1.516	32,370	1.768	43,650
	(1.362)	(196,500)	(1.399)	(226,200)
DC	0.05386	-8,905	--	--
	(0.09932)	(14,280)		
DC x Child	0.1732	-9,051	--	--
	(0.1531)	(19,970)		
LIQASSTS	0.1678	-7,919	0.1537	-4,006
	(0.1297)	(30,260)	(0.1334)	(35,000)
HOME	0.08351	-7,768	0.05508	-7,987
	(0.06731)	(10,150)	(0.07146)	(12,010)
INH	1.219	74,350	1.211	89,520
	(0.189)	(33,050)	(0.2047)	(38,078)
INH x LIQASSTS	-1.124	-45,710	-1.208	-75,033
	(0.5297)	(120,800)	(0.5674)	(134,300)
Loglikelihood	-1,463.7	-3,086	-1,276	-2,608
N	3,023	249	2,660	209

[a]Numbers in parentheses are standard errors. Variables are defined in the text of this appendix. Columns (1) and (3) are probit equations for making a transition from wage earning to self-employment between 1981 and 1985. Columns (2) and (4) are ordinary least squares equations for the value of depreciable assets in the new enterprise, conditional on assets being positive.
Source: Holtz-Eakin, Joulfaian, and Rosen [1994a]

Appendix Table 2.2. Multinomial Logit Analysis of Entrepreneurs' Transition Probabilities[a]

Variable	Survive as Entrepreneur (1)	Partnership/ S-Corporation (2)	Retire (3)
INH	1.637	1.558	1.968
	(0.5382)	(0.5881)	(0.8056)
AGE	0.1439	-0.06551	-0.06660
	(0.06951)	(0.08189)	(0.1495)
AGE^2	-1.640	0.5421	1.559
	(0.8531)	(1.011)	(1.795)
AGE(?)	3.692	-0.9994	2.884
	(1.526)	(1.769)	(3.024)
MARRIED	0.2789	0.1136	-1.014
	(0.2114)	(0.2620)	(0.4108)
KIDS	-0.04762	0.007679	-0.4166
	(0.07531)	(0.09148)	(0.2299)
DC	-0.1520	-0.1100	-0.5152
	(0.2785)	(0.3460)	(0.6977)
DC x CHILD	0.4304	0.3365	-11.22
	(0.3729)	(0.4458)	(181.2)
AGI	1.963	1.637	-.09119
	(1.871)	(1.925)	(3.036)
DBUS	0.3079	0.5104	0.3564
	(0.1691)	(0.2029)	(0.3812)
LIQASST	2.418	2.750	2.849
	(0.5627)	(0.5820)	(0.7112)
$LIQASST^2$	-0.2545	-0.3061	-0.2898
	(0.06458)	(0.06975)	(0.09264)
HOME	0.1934	0.5253	-0.6352
	(0.1808)	(0.2347)	(0.3903)
RECPT81	4.319	1.983	-1.656
	(1.411)	(1.625)	(4.213)
CONSTANT	-2.359	0.5304	-1.227
	(1.311)	(1.523)	(2.871)
Loglikelihood		-1488.0	
N		1,892	

[a]Figures in parentheses are standard errors. The "omitted category" is the transition to being a wage earner. Thus, each column shows the determinants of the log of the ratio of the probability of making a transition to the state described at the top of the column to the probability of making a transition to wage earning. Variables are defined in the text of this Appendix.
Source: Holtz-Eakin, Joulfaian, and Rosen [1994b].

Appendix Table 3.1. Transitions in Income-Generating Activity for Sole-Proprietors in 1985: 1985 versus 1988[a]

	Schedule C and No Wage-Salary Income in 1985	Schedule C and Wage-Salary Income in 1985
Exit Sole-proprietorship	0.0859	0.212
To Wage-Salary only	0.0290 (33.8%)	0.126 (59.3%)
To Business Income[b] only	0.0238 (27.7%)	0.00520 (2.4%)
To Wage-Salary and Business Income[b]	0.0226 (26.4%)	0.0791 (37.4%)
To Neither Wage-Salary nor Business Income[b]	0.0105 (12.2%)	0.0017 (0.8%)

[a]Each entry shows the fraction of sole-proprietors in 1985 who ceased filing a Schedule C in 1988, and in 1988 were engaged in the activity in the corresponding row. The figures in parentheses show the percentage of individuals in each column who are in the corresponding row.

[b]Business Income is income from a partnership or Subchapter S Corporation.

Source: Carroll, Holtz-Eakin, Rider and Rosen [2001].

Appendix Table 3.2. Analysis of Growth of Small-Firms' Receipts[a]

	(1)	(2)	(3)	(4)
INTERCEPT	-0.948	-0.712	-0.977	-0.989
	(0.574)	(0.0661)	(0.583)	(0.572)
$\Delta\ln(TAXPRICE)$	0.836	0.915	0.928	0.746
	(0.149)	(0.138)	(0.156)	(0.143)
AGE	0.268	---	0.370	0.489
	(2.80)		(2.83)	(2.78)
AGE^2	-0.788	---	-0.837	-0.988
	(3.38)		(3.39)	(3.33)
CAPINC	-0.128	---	-0.0827	-0.114
	(0.137)		(0.134)	(0.131)
MARRIED	0.0107	---	0.00672	0.0135
	(0.0737)		(0.0747)	(0.0735)
DEPENDENTS	0.150	---	0.156	0.152
	(0.174)		(0.176)	(0.173)
MFG	0.464	---	0.454	0.456
	(0.129)		(0.132)	(0.129)
WHOLESALE	-0.0127	---	-0.0306	-0.0246
	(0.138)		(0.139)	(0.136)
RETAIL	0.132	---	0.123	0.121
	(0.0867)		(0.0873)	(0.0855)
FINANCE	0.115	---	0.105	0.118
	(0.0832)		(0.0834)	(0.0828)
SERVICE	0.347	---	0.338	0.338
	(0.0581)		(0.0592)	(0.0576)
EARNINGS	---	---	-0.186	---
			(0.0831)	
$\Delta\ln(INCOME)$	---	---	---	0.0525
				(0.0171)
Inverse Mill's Ratio	2.18	2.13	2.22	2.16
	(0.160)	(0.162)	(0.165)	(0.158)
N	6,817	6,817	6,817	6,817

[a]The left-hand side variable in each equation is the log-difference in gross receipts between 1985 and 1988. Estimation is by instrumental variables, treating $\Delta\ln(TAXPRICE)$ as endogenous. Standard errors, which are in parentheses, are computed by bootstrapping methods. Variables are defined in Table 1, except for *EARNINGS* (household earnings in 1985) and $\Delta\ln(INCOME)$ (log difference in net income between 1985 and 1988). The latter variable is treated as endogenous. Source: Carroll, Holtz-Eakin, Rider, and Rosen [2001].

Appendix Table 3.3. Probit Analysis of Small-Firm Survival Decisions[a]

	(1)[b]	(2)[c]	(3)[d]	(4)[d]
INTERCEPT	-1.18	-1.26	-0.0994	-5.32
	(0.447)	(0.425)	(0.141)	(0.402)
Δln(*TAXPRICE*)	-0.137	-0.401	--	--
	(0.109)	(0.0836)		
ln(*TAXPRICE*)	--	--	-0.103	0.657
			(0.0335)	(0.0574)
AGE	-0.268	-0.0453	--	2.40
	(2.15)	(2.13)		(1.50)
AGE^2	0.803	0.612	--	-1.63
	(2.58)	(2.59)		(1.84)
CAPINC	-0.0565	-0.0464	--	0.240
	(0.0519	(0.0454)		(0.0296)
MARRIED	0.0148	0.0220	--	0.492
	(0.0604)	(0.0603)		(0.0425)
DEPENDENTS	-0.0834	-0.0720	--	-0.253
	(0.149)	(0.134)		(0.103)
MFG	0.0440	0.0393	--	7.01
	(0.112)	(0.109)		(87.2)
WHOLESALE	-0.259	-0.265	--	7.03
	(0.106)	(0.108)		(86.9)
RETAIL	-0.0994	-0.118	--	3.88
	(0.0490)	(0.0590)		(0.144)
FINANCE	-0.0875	-0.0938	--	7.05
	(0.0507)	(0.0597)		(38.8)
SERVICE	0.0798	0.0830		4.44
	(0.0389)	(0.0423)		(0.108)
R_{85}	0.192	0.197	--	---
	(0.00731)	(0.0069)		
N	8,675	8,675	31,034	31,034

[a]Probit Estimates. Figures in parentheses are standard errors. R_{85} denotes gross receipts and the other variables are as defined in Table 1.

[b]Column (1) is estimated over the sample of individuals who were sole-proprietors in 1985. The left hand side variable is one if the individual was also a sole-proprietor in 1988 and zero otherwise. The estimation is by instrumental variables, with the change in the log of tax price treated as endogenous.

[c]Column (2), like column (1), estimates the probability of surviving as a sole-proprietor from 1985 to 1988. However, the change in the log of the tax price is not instrumented.

[d]Columns (3) and (4) are estimated over the sample of sole-proprietors and wage-earners in 1985. The left hand side variable is one if the individual was a sole-proprietor in 1985 and zero otherwise. Source: Carroll, Holtz-Eakin, Rider, and Rosen [2001].

Appendix Table 3.4. Probit Analysis Of Small-Firm Decision to Invest[a]

	(1)	(2)	(3)	(4)
INTERCEPT	-0.795	-1.38	-0.794	-1.27
	(0.0304)	(0.607)	(0.0304)	(0.611)
$\%\Delta c$	-1.26	-1.33	-1.71	-1.86
	(0.400)	(0.419)	(0.500)	(0.536)
$\%\Delta c$ x I_{85}	-1.47	-1.41	-1.96	-1.88
	(0.584)	(0.586)	(0.716)	(0.722)
I_{85}	0.822	0.814	0.800	0.790
	(0.0472)	(0.0474)	(0.0478)	(0.0481)
AGE		3.13		2.81
		(3.07)		(3.09)
AGE^2		-4.58		-4.35
		(3.76)		(3.78)
CAPINC		0.0605		-0.0066
		(0.153)		(0.156)
MARRIED		0.0739		0.0727
		(0.0887)		(0.0892)
DEPENDENTS		-0.354		-0.404
		(0.203)		(0.205)
MFG		0.0754		0.0911
		(0.155)		(0.156)
WHOLESALE		0.159		0.162
		(0.171)		(0.171)
RETAIL		-0.0641		-0.0506
		(0.0979)		(0.0984)
FINANCE		0.0245		0.0149
		(0.0956)		(0.0960)
SERVICE		0.137		0.122
		(0.0650)		(0.0655)
N	3,480	3,480	3,480	3,480

[a]Figures in parentheses are standard errors. Variables are defined in Table 3. The dependent variable takes a value of 1 if the sole-proprietor purchased capital in 1988, and zero otherwise. Columns (3) and (4) show the results when the specifications in columns (1) and (2), respectively, are estimated using instrumental variables.
Source: Carroll, Holtz-Eakin, Rider, and Rosen [2000b].

Appendix Table 3.5. Analysis of Small-Firm Investment Expenditures[a]

	OLS	TOBIT	TWO-STAGE TOBIT
INTERCEPT	-4.84	-27.7	-22.2
	(4.69)	(10.3)	(9.80)
$\%\Delta c$	-17.4	-54.4	-67.0
	(2.44)	(5.26)	(6.30)
$\%\Delta c$ x E_{85}	6.48	7.13	8.24
	(0.142)	(0.262)	(0.259)
E_{85}	0.888	1.05	1.05
	(0.0160)	(0.0295)	(0.0283)
AGE	37.8	93.0	74.0
	(23.7)	(52.2)	(49.5)
AGE^2	-48.6	-130.0	-108.0
	(29.0)	(63.9)	(60.5)
CAPINC	-0.555	-0.194	-0.856
	(1.18)	(2.45)	(2.32)
MARRIED	-0.832	-0.607	0.633
	(0.686)	(1.49)	(1.41)
DEPENDENTS	1.040	-2.41	-3.24
	(1.57)	(3.39)	(3.23)
MFG	0.868	3.38	3.58
	(1.21)	(2.57)	(2.44)
WHOLESALE	-1.04	-0.355	-0.407
	(1.31)	(2.89)	(2.73)
RETAIL	-0.283	-1.26	-0.868
	(0.733)	(1.66)	(1.57)
FINANCE	-1.74	-2.53	-3.54
	(0.728)	(1.63)	(1.54)
SERVICE	-0.877	0.202	-0.0905
	(0.500)	(1.10)	(1.04)
N	3,480	3,480	3,480

[a]Figures in parentheses are standard errors. The sample consists of individuals who were sole-proprietors in 1985 and 1988. The dependent variable is the value of purchased capital in 1988.
Source: Carroll, Holtz-Eakin, Rider, and Rosen [2000b].

Appendix Table 3.6. Probit Analysis of Small-Firm Hiring Decision[a]

	(1)	(2)	(3)	(4)
INTERCEPT	-1.37	-1.31	-1.54	-1.70
	(0.0372)	(0.583)	(0.0351)	(0.541)
$\Delta ln(TAXPRICE)$	0.335	0.492	0.442	0.538
	(0.158)	(0.167)	(0.150)	(0.159)
$\Delta ln(TAXPRICE) \times L_{85}$	1.39	1.23	1.49	1.34
	(0.234)	(0.238)	(0.217)	(0.221)
L_{85}	1.80	1.81	1.74	1.75
	(0.0592)	(0.060)	(0.0545)	(0.0551)
AGE		-0.350		0.505
		(2.92)		(2.71)
AGE^2		-0.577		-1.30
		(3.52)		(3.27)
CAPINC		0.00439		0.00836
		(0.0796)		(0.0751)
MARRIED		-0.0254		-0.0247
		(0.0852)		(0.0796)
DEPENDENTS		0.131		0.104
		(0.174)		(0.161)
MFG		0.202		0.158
		(0.147)		(0.136)
WHOLESALE		0.224		0.126
		(0.149)		(0.137)
RETAIL		0.319		0.209
		(0.0861)		(0.0786)
FINANCE		-0.0116		0.0392
		(0.0830)		(0.0787)
SERVICE		0.226		0.242
		(0.0596)		(0.0557)
loglikelihood	-2,280.7	-2,261.0	-2,613.6	-2,597.0
N	6,078	6,078	7,602	7,602

[a]Standard errors in parentheses. Columns (1) and (2) consists only of individuals who were sole-proprietors in 1985 and 1988. The dependent variable is 1 if the sole-proprietor hired labor in 1988; zero otherwise. Columns (3) and (4) are expanded to include all individuals who were sole-proprietors in 1985, regardless of whether they were also sole-proprietors in 1988. The dependent variable is "stayed in business *and* employed labor."
Source: Carroll, Holtz-Eakin, Rider, and Rosen [2000a].

Appendix Table 3.7. Analysis of Percentage Changes in Small-Firms' Wage Bill[a]

	(1)	(2)	(3)
INTERCEPT	2.41	2.43	1.95
	(0.690)	(0.688)	(0.534)
$\Delta ln(TAXPRICE)$	0.410	0.555	0.318
	(0.134)	(0.147)	(0.0954)
AGE	-9.24	-9.38	-7.38
	(3.35)	(3.34)	(2.45)
AGE^2	9.13	9.24	7.35
	(3.98)	(3.97)	(2.83)
CAPINC	-0.180	-0.198	-0.112
	(0.111)	(0.111)	(0.112)
MARRIED	0.0331	0.0369	-0.0680
	(0.100)	(0.100)	(0.106)
DEPENDENTS	-0.247	-0.267	-0.0463
	(0.168)	(0.167)	(0.0583)
MFG	-0.158	-0.167	-0.0596
	(0.164)	(0.163)	(0.0896)
WHOLESALE	-0.167	-0.175	0.0401
	(0.162)	(0.161)	(0.102)
RETAIL	-0.0771	-0.0742	-0.0438
	(0.101)	(0.101)	(0.0817)
FINANCE	-0.0627	-0.0684	-0.00329
	(0.107)	(0.107)	(0.0924)
SERVICE	-0.0324	-0.0480	0.0221
	(0.0788)	(0.0788)	(0.0753)
N	1,618	1,618	1,618

[a]Dependent variable is percentage change in the real wage bill between 1985 and 1988. The sample consists of firms that employed labor in both years. Estimates in column (1) are OLS; column (2) 2SLS; and column (3) LAD. Standard errors are shown in parentheses. The LAD standard errors are computed using bootstrap methods with 500 replications.
Source: Carroll, Holtz-Eakin, Rider, and Rosen [2000a].

REFERENCES

Auten, Gerald and Janette Wilson. 1999. "Sales of Capital Assets Reported on Individual Income Tax Returns, 1985," *SOI Bulletin* (Spring): 113-136.

Avery, R., G. Elliehausen, and A. Kennickell. 1988. "Measuring Wealth with Survey Data: An Evaluation of the 1983 Survey of Consumer Finances," *The Review of Income and Wealth* (December): 339-370.

Bates, Timothy. 1990. "Entrepreneur Human Capital Impacts and Small Business Longevity," *The Review of Economics and Statistics*, 72: 551-559.

Blau, David M. 1987. "A Time-Series Analysis of Self-Employment in the United States," *Journal of Political Economy,* 95: 445-467.

Blau, F. and D. Graham. 1990. "Black-White Differences in Wealth and Asset Composition," *Quarterly Journal of Economics*, 105: 321-339.

Blanchflower, D. and A. Oswald. 1990. "What Makes an Entrepreneur?" mimeo, Economics Department. United Kingdom: Oxford University.

Bruce, Donald. 1999. "Taxes and Small Business Failure: Evidence from the Self-Employed," unpublished manuscript, Center for Business and Economic Research. Knoxville, TN: University of Tennessee, August.

Carroll, Robert, Douglas Holtz-Eakin, Mark Rider and Harvey S. Rosen. 2000a. "Income Taxes and Entrepreneurs' Use of Labor," *Journal of Labor Economics*, 18(2) (April): 324-351.

Carroll, Robert, Douglas Holtz-Eakin, Mark Rider, and Harvey S. Rosen. 2000b. "Entrepreneurs, Income Taxes, and Investment." In Joel B. Slemrod (ed.), *Does Atlas Shrug?* New York: Russell Sage Foundation, pp. 427-455.

Carroll, Robert, Douglas Holtz-Eakin, Mark Rider, and Harvey S. Rosen. 2001. "Personal Income Taxes and the Growth of Small Firms." In James Poterba (ed.), *Tax Policy and the Economy*. Cambridge, MA: MIT Press.

Carroll, Robert and David Joulfaian. 1995. "Taxes and Corporate Choice of Organizational Form," unpublished manuscript. Washington, DC: U.S. Department of Treasury.

Caves, Richard E. 1998. "Industrial Organization and New Findings on The Turnover and Mobility of Firms," *Journal of Economic Literature* (December): 1947-1982.

Domencich, Thomas and Daniel McFadden. 1975. *Urban Travel Demand.* Amsterdam: North Holland Publishing Company.

Dunn, Thomas and Douglas Holtz-Eakin. 2000. "Financial Capital, Human Capital, and the Transition to Self-Employment: Evidence from Intergenerational Links," *Journal of Labor Economics*, 18(2) (April): 282-305.

Efron, B. 1979. "Bootstrap Methods: Another Look at the Jacknife," *The Annals of Statistics*, 7(11): 1-26.

Engen, Eric and Jonathan Skinner. 1996. "Taxation and Economic Growth," *National Tax Journal,* 49 (December): 617-642.

Evans, David S. 1987. "Tests of Alternative Theories of Firm Growth," *Journal of Political Economy,* 95 (August): 657-674.

Evans, D. and B. Jovanovic. 1989. "An Estimated Model of Entrepreneurial Choice Under Liquidity Constraints," *Journal of Political Economy*, 97: 808-827.

Evans, D. and L. Leighton. 1989. "Some Empirical Aspects of Entrepreneurship," *American Economic Review*, 79: 519-535.

Fairlie, Robert W. and Bruce D. Meyer. 1999. "Trends in Self-Employment among White and Black Men: 1910-1990," NBER Working Paper No. 7182. Cambridge, MA: National Bureau of Economic Research, June.

Feenberg, Daniel. 1987. "Are Tax Price Models Really Identified: The Case of Charitable Giving," *National Tax Journal*, 40(4) (December): 629-633.

Fuchs, V. 1982. "Self-Employment and Labor-Force Participation of Older Males," *Journal of Human Resources*, 97: 339-357.

Gale, W. and K. Scholz. Forthcoming. "Intergenerational Transfers and the Accumulation of Wealth," *Journal of Economic Perspectives*.

Gentry, William M. and R. Glenn Hubbard. 1998. "Why Do the Wealthy Save So Much?: Saving and Investment Decisions of Entrepreneurs," unpublished manuscript, School of Business. New York: Columbia University, July.

Gentry, William M. and R. Glenn Hubbard. 2000. "Tax Policy and Entrepreneurial Entry," *American Economic Review*, 90 (May): 283-287.

Gordon, Roger and Jeff MacKie-Mason. 1997. "How Much Do Taxes Discourage Incorporation," *Journal of Finance* (June). 52(2): 477-505.

Hamilton, Barton Hughes. 2000. "Does Entrepreneurship Pay? An Empirical Analysis of the Returns to Self-Employment," *Journal of Political Economy*, 108 (June): 604-631.

Heckman, James J. 1979. "Sample Selection Bias as a Specification Error," *Econometrica*, 47: 153-61.

Heckman, J. 1976. "The Common Structure of Statistical Models of Truncation, Sample Selection, and Limited Dependent Variables and a Simple Estimator for Such Models," *Annals of Economic and Social Measurement*, 5(4): 475-492.

Holmes, T.J. and J.A. Schmitz. 1991. "Measuring Small Business Dynamics When Owners and Their Businesses Can Be Separately Identified," unpublished manuscript, Department of Economics. Hanover, NH: Dartmouth College.

Holtz-Eakin, D., D. Joulfaian, and H. S. Rosen. 1993. "The Carnegie Conjecture: An Empirical Examination," *Quarterly Journal of Economics*, CVIII: 413-435.

Holtz-Eakin, D., D. Joulfaian, and H. S. Rosen. 1994a. "Entrepreneurial Decisions and Liquidity Constraints," *RAND Journal of Economics* 25 (Summer): 334-347.

Holtz-Eakin, D., D. Joulfaian, and H. S. Rosen. 1994b. "Sticking It Out: Entrepreneurial Decisions and Liquidity Constraints," *Journal of Political Economy*, 102: 53-75.

Hout, Michael and Harvey S. Rosen. 2000. "Self-Employment, Family Background, and Race, *Journal of Human Resources,* 35 (Fall): 670-692.

Lee, Lung-Fei. 1983. "Generalized Econometric Models with Selectivity," *Econometrica*, 51 (March): 507-512.

Long, James E. 1982. "The Income Tax and Self-employment," *National Tax Journal*, 35: 31-42.

Menchik, P.L. 1988. "Unequal Estate Division: Is it Altruism, Reverse Bequests, or Simply Noise?" In D. Kessler and A. Masson (eds.), *Modeling the Accumulation and Distribution of Wealth.* Oxford: Clarendon Press, pp. 105-119.

Meyer, B. 1990. "Why Are There So Few Black Entrepreneurs?" NBER Working Paper No. 3537. Cambridge, MA: National Bureau of Economic Research.

Parker, Simon C. 1996. "A Time Series Model of Self-Employment," *Economica,* 63: 459-475.

Plesko, George. 1994. "The Role of Taxes in Organizational Choice: S-Conversions After the Tax Reform Act of 1986," unpublished manuscript, Department of Economics. Boston, MA: Northeastern University.

Rees, H. and A. Shah. 1986. "An Empirical Analysis of Self-Employment in the U.K.," *Journal of Applied Econometrics*, 2: 95-108.

Rigby, Larry. 1996. "What I'd Do With My Capital Gains," *Wall Street Journal*, April 30, p. A18.

Robson, Martin T. and Colin Wren. 1999. "Marginal and Average Tax Rates and the Incentive for Self-Employment," *Southern Economic Journal,* 65: 757-773.

Schumpeter, J. 1942. *Capitalism, Socialism and Democracy.* New York: Harper and Row Publications.

van Praag, C. Mirjam and Hans van Ophem. 1995. "Determinants of Willingness and Opportunity to Start as an Entrepreneur," *Kyklos*, 48: 513-540.

Wall Street Journal, 1994. "Sticker Shock: Increased Taxes Prompt Wealthy to Cut Spending," January 11, : A5.