MANAGERIAL TENURE, BUSINESS AGE AND SMALL BUSINESS DYNAMICS*

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Abstract

This paper studies a Census Bureau survey of the small business sector that contains information on business age, business size and other proxies for business quality, information, typically available on business data sets, as well as proxies for the quality of the manager of each business, information that is not common to such data sets. One of the key proxies for managerial quality is the length of time the manager has been running the business, that is, managerial tenure. With proxies for both the underlying quality of each business and for the quality of the manager running the business, we are able to begin separating the influences of the manager from that of the underlying business on such factors as business discontinuance and business transfer. An example of the questions we explore is: Holding business quality fixed, what is the impact of the manager on the probability of business discontinuance? Regarding this question, we find that managers have a large impact on the course of their businesses, in particular, among businesses of the same age, managerial tenure has a significant impact on the probability of business discontinuance and transfer.

Key words: managerial tenure, business dynamics

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I. Introduction

The performance of a business depends on a number of factors such as the overall state of the national economy and the prospects of the industry to which the business belongs. It also depends, of course, on the underlying quality of the business and on the quality of the manager running the business. In this paper we explore a Census Bureau survey of the "small" business sector, the Characteristics of Business Owners (CBO) survey, which contains information on business age, business size and other proxies for underlying business quality, information commonly available on business data sets, as well as a number of proxies for the quality of the manager at each business, information typically not included in these data sets. The key proxy of managerial quality, and the one on which we focus below, is the length of time the manager has been running the business, that is, the tenure of the manager at the business.

With proxies for the quality of both the underlying business and the manager running the business, it is possible to begin separating the influences of the manager from that of the underlying business on such factors as business survival and business transfer. Toward this end we ask a number of questions. Among them: Holding business quality fixed, what is the impact of the manager on such factors as business survival and transfer? Holding managerial quality fixed, how important is underlying business quality in determining such factors as business survival and transfer? With the answers, provided below, to these basic questions, it will be possible to develop theoretical frameworks to address other significant questions. For example, as described below, with the theoretical framework developed in Holmes and Schmitz (1992) we have been able to address the question: Do variations in managerial quality, or variations in business quality, play a more important role in explaining turnover dynamics in the U.S. small business population?

In the next section we discuss the motivation for studying the questions introduced above. We also briefly describe some of our findings. Before proceeding note that by underlying "business quality" we mean characteristics of

a business that are distinct from the manager. An example of such a characteristics is the convenience of the business location to customers.

II. Motivation and Brief Description of Findings

Consider the first question discussed above: Holding business quality fixed, what is the impact of the manager on such factors as business survival and transfer? The answer to this question has important implications for both modeling issues and design of policies toward business. Consider the theoretical or modeling issues involved. We show that in the small business population businesses often experience changes in the individual managing the business. If the identity of the individual running the business is *not* important for the performance of the business, in particular, for such factors as business survival and transfer, then in constructing models of business evolution it is reasonable that theories ignore these changes in management. If, however, the manager has significant impact on the course of the business then it seems important that attempts to model the evolution of businesses should address these changes in management.

Public policy toward business is also related to this question of managerial impact on business performance. For example, suppose the business manager has a significant impact on business performance. Suppose also that a significant part of the "quality" that a manager accumulates is specific to the business, as would be the case if there is substantial learning-by-doing at running a business. In such a case there is a significant loss in "managerial-capital" if a business is closed because of short-term losses caused by a temporary business downturn or sickness of the manager. In such circumstances public policies to prevent the loss of capital may be appropriate. Bankruptcy laws are often motivated by such considerations.

There are a number of proxies on the CBO for the quality of the manager running a business, such as the manager's age, education and tenure at the business. In the present context managerial tenure is likely to be proxying a

number of dimensions of managerial quality. Tenure will be a proxy for quality for example, if managers must spend a significant amount of time learning how to perform tasks at the business (learning-by-doing), or if there is a "matching" process between managers and businesses, or if "good" managers survive and bad managers do not. We find that managers have a large influence on the performance of businesses as measured by the probability of business discontinuance and business transfer. Holding business quality characteristics fixed, a number of managerial characteristics are found to have an impact on performance, including managerial age and education, but the key factor is the tenure of the manager at a business. We find that increases in managerial tenure are initially asociated with significant reductions in discontinuance rates. However, very long tenures at a business lead to increases in the probability of business closure. This is a result of "horizon" effects of business owners. For example, as discussed below, the longer a manager is running a business the more likely, everything else equal, is the individual close to retirement age. We also find that managerial tenure has a significant impact on the probability that a business is transferred to new management. Managers with longer tenure are less likely to transfer businesses that survive.

The second question discussed in the introduction, of whether, holding managerial quality fixed, business quality has an impact on business performance, takes on significnce given the finding concerning managers. For if business quality is significant in explaining performance, this would mean that both the manager and the business are important in understanding small business dynamics. This would mean that in modeling business evolution it is important to keep track of the identity of *both* the business and the manager running the business. In previous models of small business evolution the distinction between the business and the manager is not typically highlighted (see, e.g., Jovanovic (1982), Pakes and Ericson (1988), Hopenhayn (1988)).

The key proxy for business quality on the CBO is business age. Business age will be a signal of business quality if, for example, there are businesses

of different qualities and there is a selection process over business quality so that businesses of high quality are more likely to survive than those of low quality. We find that business quality has a large and statistically significant impact on business discontinuance. In particular, holding a number of managerial and business characteristics fixed, including the tenure of the manager running the business, we find that the probability of business failure declines in the age of the business.

We present a number of other findings regarding managerial tenure and business age below. It is easier to present the other findings once we have introduced the data set in detail. In fact, we have only discussed two of the six patterns that we identify in the CBO. With these six basic patterns it is possible to develop theoretical frameworks that can address significant issues in small business dynamics. In section V we briefly discuss how the patterns have enabled us to develop a framework (Holmes and Schmitz (1992)) to study the question: Do variations in managerial quality, or variations in business quality, play a more important role in explaining turnover dynamics in the U.S. small business population? This is not an insignificant question. For example, suppose it were the case that variation in managerial quality across businesses was negligible as compared to variation in business quality. This would be the case if managerial quality was proxying match quality, and that all matches tended to be good (or bad) matches. Then it would not make much difference who ran a particular business. In this case government imposed barriers to the reallocation of businesses across owners (for example, capital gains taxation) would result in negligible inefficiencies.

The remainder of the paper proceeds as follows. In the next section we discuss related literature. The Characteristics of Business Owners survey is descried in detail in the fourth section. Estimates of conditional probabilities of business discontinuance and business transfer, as functions of, among other things, managerial tenure and business age, are presented in section five. In this section we also discuss how the patterns can be used to construct

theoretical formulations about small business dynamics. The last section provides a brief conclusion.

III. Related Literature

The paper is related to a number of diverse areas of research, including the research in industrial organization examining business dynamics, the literature in labor evonomivs studying the effects of tenure on wages, job separations and other labor market variables, and the literature on the market for corporate control. We briefly discuss each in turn.

The empirical literature on business dynamics can usefully be divided into two groups, one examining the growth and failure of "large" businesses and manufacturing plants, the other studying the dynamics of self-employment. The first group of papers, including those by Davis and Haltiwanger (1991), Dunne, Roberts and Samuelson (1989), Evans (1987), and Pakes and Ericson (1988), typically have information concerning business characteristics, such as business age and size, but not regarding the manager running the business or plant. It is therefore not possible to explore the impact of the manager on the performance of the business.[1] The second group of papers, including those by Evans and Leighton (1989), Blanchflower and Meyer (1991), and Hamilton (1990), frequently have information about the quality of the manager, that is, the self-employed individual, but little information about the underlying business. For example, Blanchflower and Meyer, using an Australian data set, find that the probability of an individual leaving self-employment is decreasing in the tenure of the individual in self-employment. In calculating this conditional probability it is not possible to control for a number of important facts about the individual's business. It is not known whether the individual sells or dincontinues their business as they leave self-employment. The age of the business is also not

[1] A few other papers in this group have studied the issue of business transfer, for example, Lichtenberg and Siegel (1987), Ravenscraft and Scherer (1987) and Weiss (1983).

known. Perhaps most importantly, the tenure of the self-employed individual refers to tenure in self-employment and not tenure at the business the individual is currently managing. This lack of information about the business is typical of most data sets on self-employment. Each of these literatures, then, contains information on one dimension of the manager quality-business quality spectrum. The CBO provides data on both dimensions.

The CBO has been previously employed to examine the probability of business failure by Bates (1991). This study, however, did not exploit the dual information about managers and the businesses they ran that is available on the CBO. Bates did control for the tenure of the manager at the business but did not use the controls for business quality which are available on the data set. For example, Bates did not use the age of the business in regressions, nor were controls for the industry of the business employed.[2]

Since managing a business is a "job", the literature studying the effects of tenure of employees at jobs in the labor economics literature is certainly relevant.[3] The analysis below is distinct in two ways from the study of tenure in this literature. FIrst, in the labor economics literature information on the "position" in which the individual works, such as how old is the position, is typically not available. In the CBO the age of the position is equal to the age of the business. Second, it has long been recognized in the labor literature

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[2] Note that Bates did employ a control for how the manager acquired the business. He included a dummy variable which indicated whether the owner acquired a business that was already establishd or whether the owner had started the business himself. If one controls for managerial tenure, as Bates does, then this dummy variable is a proxy for the age of the business since the business run by a manager who started the business will be younger than the business run by a manager who acquired an established business. This is an imperfect proxy however, particularly given that the age of the business is available on the data set.

[3] For theoretical analysis of tenure in the labor economics literature see, for example, Jovanovic (1979) and MacDonald (1988).

that there is a correlation between tenure at a job and job separation (see, e.g., Mincer and Jovanovic (1981)). Recently, the literature has sought to determine if the decrease in job separations that accompany tenure are due to factors that make a job separation costly, for example, learning-by-doing at the job or a good match between the job and the individual, or factors such that a job separation would not e costly, for example, if good managers survive and bad managers do not (see, e.g., Altonji and Shakatko (1987) and Topel (1991)). Given limitations of our data, we will *not* be able to identify whether the increases in managerial quality which are being captured by tenure at a business are, in the language of the literature, specific to the business or are general and hence applicable to other businesses. Though we can not make this distinction, we can still determine the importance of the manager at the business, as well as compare the significance of managerial quality as compared to underlying business quality in determining business performance.

The role of the manager in the performance of a business is a central theme running throughout the corporate control literature. In an early and significant contribution to the corporate control literature, Manne (1967) argued that corporate control contests could be viewed as a means by which control of a business could be removed from an inefficient manager (or management team). The significant premiums paid to shareholders of acquired businesses have often been interpreted as evidence that management eams have significant impact on the fortunes of their businesses.

Recent research in the corporate control literature has been devoted to providing more direct evidence linking the performance and turnover of managers. If managers have a significant impact on business earnings then we should expect to see demotions and promotions based on the performance of a manager's division. A number of recent studies have shown that there is indeed a connection between the performance of a business and/or dividion and the turnover of the divisional manager (see, e.g., Blackwell, Brickley and Weisbach (1992), Coughlan and Schmidt (1985), Warner, Watts and Wruck (1988), Weisbach (1988)). These results are

related to our finding that the manager has a significant impact in the small business sector.

There are, of course, significant differences in the businesses that comprise the population from which the CBO is drawn and those studied in the corporate control literature. Two of the biggest differences are in size, the businesses studied here being very much smaller, and in organizational design, there being no separation of ownership and control in the CBO population. Despite these differences, or perhaps because of them, it is of interest to compare results obtainead in this paper with the corporate control literature. For example, we know that there is no "moral hazard" problem in the CBO which arises when there is separation of ownership and control. Hence, everything else equal, poor performance of a business in the CBO indicates low quality management. In a corporate control setting poor performance may be due to agency problems or to a low ability management (Griffin and Wiggins (1992)).

IV. The Characteristics of Business Owners (CBO) Survey

The 1982 CBO survey was a one-time survey of the small business sector. The sampling frame for the CBO survey was the universe of "small" business tax returns filed in 1982. These tax returns include sole-proprietorship, partnership and subchapter S corporation tax returns. In this universe of small businesses the owner of the business is typically the manager of the business as well.[4] Hence, in this paper we assume that the owner and manager are the same person, and use the terms interchangeably. Since a major purpose of the survey was to obtain information on the status of minority businesses, surveys were

[4] The CBO survey contains a question concerning how many hours the owner works at the business per week. Hence, we could specify that an owner is not the manager of the business if the owner worked less than x hours per week in the business. We experimented with excluding from the data set owners who worked less than x hours per week (for x equal to, among other values, 30 and 40). None of the results below are influenced by these retrictions.

mailed to the owners of each of about 21,000 businesses in each of five demographic groups. The five "panels" were "Hispanics," "Blacks," "Other Minorities," "Women," and "Non-minority Males." The survey also covered all industry groups (e.g., agriculture, manufacturing, retail services, and so on). The responses to this survey, combined with information from the 1982 tax returns of the businesses, such as receipts, employment, industry classification and legal form of organization, make up the CBO data base. A number of issues which arise in using the data set (such as survey non-response) are discussed in the Appendix.[5]

While the CBO is a one-time survey there are a number of retrospective quesitons which allow us to construct histories of businesses and managers. In addition to these retrospective questions, there are a number of questions which enable us to determine what, if anything, has changed in the status of the business, and of the manager at the business, over the period 1982-86. This is possible since the survey concerning the 1982 business was mailed in 1986. It is these questions which add "dynamic" dimensions to the CBO.

Regarding retrospective questions, the survey enables us to determine the age of the business and the tenure of the manager at the business. From the survey questions we can classify each business into one of 20 different categries defined by the age of the firm, the tenure of the manager at the business, and the "founder" status of the manager. Founder status is defined as follows. If the manager had started the business we refer to the individual as a founder; if the manager did not start the business, the person is called a nonfounder. These 20 categories can be found in Table 1. The "year-established" groupsing (e.g., "before 1960", "1960-69") indicate the age of the business. If a manager was not the founder of the business then it is possible to determine the year the individual acquired the business. The year-acquired groupings therefore indicate the tenure of the manager, those managers who have most recently acquired in a

[5] For other descriptions of the data set see Boden and Nucci (1989) and Nucci (1990).

year established category having the least tenure.[6] The year groups in Table 1 are the groupings which appeared on the survey instrument.[7]

Regarding the information obtained from the fact that the survey for the 1982 business was mailed in 1986, it is possible to determine whether each business is operating or not as of 1986. Those businesses that are not operating we classify as "discontinued." For businesses that are operating as of 1986, it is possible to determine whether the business has the same manager as in 1982 or a new manager. Businesses with the same manager we classify as "kept", while those with new managers we classify as "transferred."

The survey also contains other information concerning the manager, such as the manager's age, education, the demographic group to which the individual belongs and whether the manager had owned a previous business. There is also additional information regarding the business, such as business size, legal form of organization and the industry to which the business belongs.

The distribution of the sample of non-minority male businesses according to the year businesses were esablished, the year businesses were acquired and the founder status of the business is presented in the top panel of Table 1. We present summary statistics for a single panel since it is somewhat difficult to aggregate the data across demographic groups given the populations from which the panels were drawn overlap somewhat (e.g., there are black women who are part of

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[6] One of the advantages of the CBO is that business owners were asked directly if they had acquired their business, and if so, at what date. Consequently, it is easy to measure transfer in the data set. In many data sets, the only way transfer can be measured is by detecting changes in administrative records, changes which are sometimes difficult to track.

[7] Actually the year established grouping 1980-82 was broken down into the periods 1980-81 and 1982 on the survey instrument. Similarly, on the survey the year acquired groupings included the periods 1980-81 and 1982. We have merged these two most recent groupings, 1980-81 and 1982, into one grouping, 1980-82, since in tables reporting discontinuance and transfer below it will be necessary to combine these groups to satisfy disclosure requirements.

both the "Black" and "Women" populations). We present the non-minority male panel since the universe represented by this panel is almost twice as large as the combined populations of the other four panels.[8] Our statistical analysis below will incorporate data from all five panels.

Turning to the distribution in the top panel, the number 1516 in the first row and first column indicates that there were 1516 individuals who responded that their business was established before 1960. As is clear from the distribution, the transfer of the management of businesses is quantitatively significant. Though businesses owned by managers who did not start the business account for only about 4 percent of businesses established between 1980-82 (227 divided by 5392), they account for 21 percent of those established between 1960-69 and 51 percent of those eatblished before 1960.

Some information on the six distribution (size measured by receipts) is presented in the bottom panel of Table 1. The first number in each cell is the median receipt figure and the second (in parentheses) is the 75th percentile of the distribution for businesses in that cell.[9] For example, of businesses established before 1960 which are still owned by their founders, median receipts is 25.5 thousand dollars and the 75th percentile is 90.8 thousand dollars. Note that for founders there is a monotonicity in size (for both percentiles), with older businesses being larger than younger ones. There is a similar monotonicity in business age, holding tenure fixed (that is, looking within columns), for nonfounders. Holding age of business fixed (that is, looking within fows), there

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[8] The universe from which the non-minority male panel is drawn represents 6.7 million businesses which together accounted for 514 billion dollars of receipts in 1982 and 5.8 million in employment. The actual sample of white male businesses consists of 18,017 businesses.

[9] If there is a unique business which is the median (or 75th percentile) then we averaged that business' receipts with the receipts of the business with the next greatest and next lowest receipts. If there is not a unique business then we also average in the obvious wya. This was done to satisfy disclosure.

is a tendency for size to increase as tenure increases. This is true for the 75th percentile for all business ages except for businesses established before 1960, where size begins to fall with tenure after some point.[10] Finally, note that businesses owned by nonfounders are always bigger than those owned by founders. Hence, nonfounder businesses constitute a larger fraction of any given business age cohort if businesses are weighted by their size.

V. Business Discontinuance and Business Transfer

We begin the analysis of the data by presenting and discussing a few cross-tabulations. Since many of the important patterns in the data can be seen in simple tabulations, we feel it is a useful place to begin. The patterns will become more pronounced in regressions presented below, where we discuss the statistical and quantitative significance of the patterns. With parametric models we can also control for a larger number of variables. The first model we consider is the multinomial logit model. The second model is weighted least squares (in a spirit similar to that of Dunne, Roberts and Samuelson (1989)).

Cross-Tabulations

The fraction of all businesses that were discontinued and sold, as a function of the founder status of the manager, the year the manager acquired the business and the year the business was established are given in the top and bottom panels of Table 2.[11] Note that categories have been combined in the bottom panel of Table 2 to satisfy Census disclosure requirements. There are six patterns we wish to document in Table 2, with discussion to follow:

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[10] A similar finding will be found when examining discontinuance rates below. That is, discontinuance will fall in tenure up to some point and then may begin to increase.

[11] Transfer rates are defined as the number of businesses transferred as a fraction of those businesses that survived. The auzlitative results are the same if transfer was defined as a fraction of all businesses.

1. Examining nonfounder firms, and fixing the year established category, the probability of discontinuance declines, at least initially, in the tenure of the manager. For example, for businesses established between 1960-69, the discontinuance rate is highest at 24.4 percent for nonfounders who had acquired between 1980-82, falls to 22.0 percent for nonfounders who had acquired between 1976-79 and reaches a minimum of 9.5 percent for those who had aquired between 1970-75.

2. Examining nonfounder firms, and fixing the age of the business, the probability of transfer declines in the tenure of the manager.

3. Nonfounder firms acquired between 1980-82 hav higher discontinuance rates than founder firms for each year establisehd category except the "before 1960" category (in regressions it will be true for this category as well). Also founder firms of a given age have significantly lower transfer probabilities than nonfounder businesses of any business age and managerial tenure.

4. For businesses owned by nonfounders, fixing the tenure of the business owner, the probability of discontinuance declines in the age of the business (i.e. fixing any nonfounder column, discontinuance declines as we move up the column).

5. Examining nonfounder firms, and fixing the year established of a business, discontinuance, after an initial period of decline, increases in managerial tenure. Together with point 1 above, this indicates that discontinuance is typically "U"-shaped in managerial tenure. Discontinuance is high for nonfounders with the least tenure. It falls as wel increase tenure, reaching a minimum for those who had acquired between 1970-75, before it begins to increase with greater tenure.

6. Among founder firms there is also a U-shaped relationship between discontinuance and tenure (note that for founders managerial tenure equals business age).

The first two patterns indicate that nonfounders with short tenure have both a higher probability of closing and seling their business than nonfounders

with longer tenure (except for the longest tenures; see discussion below). This indicates that the manager at a business has an important impact on the course of the business.

The third pattern is listed separately from the first two for the following reasons. For a given year established category, managers of firms that started their business obviously have greater tenure than managers who acquired their business. But a comparison of founder and nonfounder firms of the same age involves more than simply a comparison of managerial tenures. This is because a nonfounder firm has been sold. The fact that a business has been sold may indicate, among other things, something about its underlying general quality. For example, in Holmes and Schmitz (1990) business transfer was a signal of high business quality.[12] So, when comparing founder and nonfounder businesses of the same business age, we are comparing the effects of tenure and, perhaps, business quality. More on this below.

The fourth pattern, that business discontinuance declines in the age of the business, is well known from previous work.[13] However, the result here is stronger. It says that this is also true among businesses whose managers have the same tenure at the business. The result indicates that underlying business quality also has an impact on the future course of the business.

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[12] There are two points to note regarding the third pattern. We expect that within a year established grouping that the nonfounder businesses are likely to be older than founder businesses since for a business to be a nonfounder business it must be started *and* transferred. Hence, as compared to founder businesses of the same year established group, nonfounders acquiring between 1980-82 have businesses that (1) are larger (both the median and 75th percentile for the nonfounder businesses acquired between 1980-82 are larger than those of founder businesses) and (2) are older. Despite nonfounder businesses being larger and, on average, older, which both usually mean lower discontinuance, they have higher failure rates.

[13] For an early reference, see Churchill (1955). For a reference using the CBO, but where managerial tenure is not controlled for, see Bates and Nucci (1989).

The fifth pattern, that discontinuance is U-shaped in tenure for nonfounders, is due in large part to the fact that some managers who acquired their businesses prior to 1960 are likely to be near retirement age in 1982. This causes discontinuance rates to increase after some point. One piece of evidence in this regard is that when we control for age of the individual in regressions below, the U-shaped pattern is less pronounced. Another interesting piece of evidence is avilable on the CBO. Those individuals who business had been discontinued were asked on the survey: "What is the PRINCIPAL reason your business is no longer operating?" The possible responses were "Insufficient Profit," "Personal (for example, health or conflicting family obligations, retirement)," "Inability to obtain required financing," and "Other." For the founder businesses established before 1960 that were discontinued, 78 percent of the owners gave "personal reasons" as the reason for discontinuance. In contrast, for the founder businesses establisehd between 1980-82 that were discontinued, only 32 percent gave personal reasons as the response. Regarding the other reasons for business closure, it is interesting to note that very few individuals (about 2 percent of the non-minority male panel) chose insufficient finance as the reason for discontinuance.[14]

The sixth pattern is listed separately from the fifth because founder firms have not been sold. This means that when we study founder firms through time we examine a single cohort of businesses.

We have examined a large numbe rof other cross-tabulations. For example, we have examined the tabulations in Table 2 within major industry groups, such as manufacturing, services and retail. The six patterns discussed above emerged

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[14] The role of finance in the founding and growth of small businesses is an issue which has received much recent attention. Note that while those answering the CBO survey indicate that access to financial capital is not a critical factor in their decision to discontinue their business, others have found that credit constraints are important in determining who enters self-employment. For these findings see Blanchflower and Oswals (1990) and Evans and Jovanovic (1989).

in each of these exercises, adding to our confidence that the results abvoe are robust.[15]

An Example of How Six Patterns Can Be "Used"

Before discussing the parametric models, we briefly sketch a model of small business evoluation that has been developed as a result of the derivation of the six patterns above. In the model, the business of a business depends on the match beween a business and manager and on the underlying quality of the business (Holmes and Schmitz (1992)). Businesses that have been sold tend to have higher general quality than firms establisehd the same year that hav never been sold. Also good matches between businesses and managers are not likely to be broken so that nonfounders tend to have lower average match quality than founders. These are the only differences, in the model, between founders and nonfounders and their businesses. Consequently, when comparing founder and nonfounder businesses of the same business age, we know that nonfounders own businesses of higher average quality but have poorer average matches than founders. The first difference tends to make nonfounder discontinuance rates lower than founder discontinuance rates, the second difference makes them higher. Therefore, if, for example, nonfounder businesses had lower failure rates than founder businesses of the same age, this would suggest that the fraction of high quality businesses owned by nonfounders is significantly higher than that owned by founders.

In the CBO we find that nonfounder businesses whose managers have short tenure have higher discontinuance rates than founder firms of the same age. Since the discontinuance rates of nonfounder businesses are higher, and not lower, the second effect discussed above, that nonfounders have poorer average

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[15] Some of the other tabulations we considered were as follows. We examined the tabulations in Table 2 within each demographic group, then within each demographic group and major industry group (in particular, manufacturing, services and retail), then within each demographic group, major industry group and size class (size class defined by receipts, with typically three or four size classes considered).

matches, is the dominant effect. That the poorer average match quality effect dominates the higher average business quality effect suggests that there is greater variation in match quality than in business quality. While this is only suggestive, we are able to use the third pattern, together with the others reported above, to estimate the model in Holmes and Schmitz (1992). The estimates from the model indicate that the variation in business quality is indeed small as compared to variations in match quality.

Multinomial Logit Model

The first parametric model we consider is the multinomial logit model. Letting Y denote the 1986 status of the 1982 business, we can classify each business as either kept by its original owner (Y=1), as discontinued (Y=2) or as transferred to new owners (Y=3). With X_b denoting the vector of regressors for business b, the multinomial logit model states that the conditional expectation function $P(Y=k|X_b)=p_{kb}$, is given by[16]

$$p_{1b} = \frac{1}{1+\sum_j \exp(X_b\beta_j)}$$

$$p_{kb} = \frac{\exp(X_b\beta_k)}{1+\sum_j \exp(X_b\beta_j)} \qquad k=2,3.$$

The effects of managerial tenure and business age are studied by the inclusion of dummy variables in the vector of reggressors X_b. In particular, there is a dummy variable for each year established grouping for those who started their business. For example, there is a dummy variable which equals one if an individual is an original founder and had started the business before 1960, the variable being zero otherwise. This dummy variable is denoted "F; B60"

[16] Note that this specification of transfer differs from that in Table 2. In that table the transfer rate was calculated as a fraction of surviving businesses, while here transfer is calculated as a fraction of all businesses.

(founder, business started before 1960) in Table 3. There are five such founder ("F") dummy variables corresponding to the five year established groupings. For those who have acquired their business there is a dummy variable for each possible year established and year acquired grouping. For example, there is a dummy variable which equals one if an individual is an owner of a business established before 1960, and if the individual acquired the business before 1960; the variable equals zero otherwise. The dummy variable is denoted "NF; A B60" (Nonfounder, acquired business before 1960). The variable appears directly under the variable "F; B60" since the business was established before 1960. There are fifteen such dummy variables for nonfounders. Therefore, there are a total of twenty dummy variables for business age, manageriaal tenure and founder status combinations. We include a constant in the regressions below and therefore must drop a dummy variable. We drop the dummy variable for founders of the most recently established businesses. Note that we include a row of "x's" in Table 3 to indicate this is the excluded group.

There are a number of other dummy variables in the X_b vector. There are dummy variables for major industry grouping. The list of industries can be found in Table 3 (Agriculture is the excluded industry). There are also dummy variables for the age of the manager (those of 65 are the excluded group). There are dummy variables for the educational attainment (in years) of the manager (the excluded group are those with 11 years or less of education). There is also a dummy variable for whether the manager had owned a prior business or not (those who had not owned a prior business are the excluded group). In the regressions below we use data from all the demographic groups and hence include a dummy variable for each group (the non-minority males are the excluded group). In regressions not reported here we also included dummy variables for how nonfounders acquired their businesses. The methods of acquisition were purchase, inherit, no investment (personal gift) and other. [17] These controls had

[17] Over three quarters of nonfounders acquired by purchasing, less than ten percent by inheritance.

essentially no impact on the estimated coefficients. We also included dummy variables for receipt size in regressions not reported here. These controls had very little impact on the estimates of the effect of managerial tenure and business age. The size controls did have an effect on some other coefficients. These effects are discussed below.

We first discuss the coefficient estimates on the nineteen business age and managerial tenure dummy variables. In order to facilitate reading these coefficients, they have been tabulated in Table 3a in a form similar to Table 2. Note that all but one of the coefficients in the disconntinuance panel of Table 3a are negative because businesses in each of the categories have lower discontinuance rates than the control businesses (those businesses owned by founders started between 1980-82). Since the effects of managerial tenure are a central concern of the paper, we have checked whether each number in Table 3a is statistically different from the number in the rightmost column in its row (i.e. its year established grouping). A "star" (*) next to a number in Table 3a indicates that the number is significantly different from the number in the most recent acquired column in its row at the 1 percent level, a "plus" (+) at the 5 percent level and a "hat" (^) at the ten percent level.

The patterns in the cross-tabulations discussed above are evident in the estimates from this model. As above, first consider the effects of tenure among nonfounder businesses on discontinuance rates. EEverything else equal, discontinuance rates initially decline in tenure. Those nonfounders with the least tenure have higher discontinuance rates than those managers who have the next least tenure (this follows from the fact that the reduction in discontinuance relative to the control group is smallest for businesses whose managers have the least tenure). For example, for businesses established before 1960, the difference between the coefficients for those acquiring between 1980-82

and those acquiring between 1976-79 is .679 (-.591-(-1.270)). This difference is significant at the 1 percent level.[18]

The second pattern described above is also clear. Within a year established grouping the most recently acquired businesses have the highest probability of transfer. There is a monotonicity in the effects of tenure on transfer probabilities. For example, for the oldest businesses the estimated coefficients for the tenure groups (from the least to greatest tenure) are 1.16, .982, .783, .748, and .544. Note also that the difference in transfer rates between those acqquiring in 1976-79 and those in 1980-82 is in many cases small. The diggest differences emerge when comparing those acquiring in 1980-82 and those acquiring before 1976-79.

Nonfounder firms acquired between 1980-82 have higher discontinuance rates than founder firms in each year established category. In the cross-tabulatins this was true as welll except for the before-1960 category.

There is a clear business age effect in each column of Table 3a. For nonfounders with a given managerial tenure, the probability of business discontinuance declines in the age of the business. For example, for those businesses acquired during 1976-79, the coefficients on the businesses established dummies for 1976-79, 1970-75, 1960-69 and before 1960 are -.636, -1.156, -1.151, -1.270, respectively. Note that the effect of age "flattens" our fairly quickly, an effect seen in the cross-tabulatins as well. There is also an age effect with regard to transfer. The older is a business the more likely it is to be transferred, though the age effect "flattens" out quickly.

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[18] This is verified in a straightforward manner. The random variable defined as the difference between these coefficients has a vaariance which is no larger than the sum of the variances oof the two coefficients. Squaringg and adding the standard errors for the coefficients given in Table 3 (.060 and .079), the variance of the difference is no larger than .0098 (with a standard deviation of .099). The realized difference is therefore over 6 standard deviations from zero.

In the cross-ttabulatins the probability of discontinuance as a function of managerial tenure, for nonfounder businnesses of the same age, increased after some point. In the regression this "turn-up" in discontinuance rates is much less pronounced. For example, in the 1970-75 year established row, there is a quantitatively large turn-up in discontinuance in the cross-tabulation while in the regression there is essentially no increase. In the regression, therefore, the main effect of tenure among nonfounders is the difference between those acquiring between 1980-82 and the other nonfounders.

The increase in discontinuance rates as tenure increases among founders is also less pronounced in the regression.

There are a number of significant patterns in the other variables in Table 3. Both the probability of discontinuance and transfer are "U"-shaped in the age of the manager, with the youngest and oldest managers having the highest turnover rates. Those who have owned a prior business have significantly lower discontinuane rates and higher transfer rates than those withhout such ownership experience. It is interesting to note that when we control for business size in regressions, prior business experience no longer has a significant effect on business closure probabilities (though it still has a large positive impact on the probability of transfer). Bothh the probability of discontinuance and transfer have an inverted "U"-shaped pattern in manager education, with the least and most educated managers having the lowest discontinuance and transfer rates. When we control for business size in the regression there is essentially no difference in the probability of failure across education groups except for the highest education group which has lower closure rates, while the transfer probabilities are not affected.

Women and Blacks have significantly higher, and Other Minorities have siggnificantly lower, failure rates than White Males. All panels have lower transfer rates than Whhite Males. Interestingly, when we control for business size, all groups have estimated failure rates that are lower than that for White

Males, the differences being significant for Blacks and Other Minorities. Transfer rates are not significantly affected by the size controls.

It is of some interest to compare the effects of managerial tenure on discontinuance with the effects of other managerial characteristics. THe main effect of tenure among nonfounders is the difference between those acquiring between 1980-82 and the rest. For busiensses established before 1960, the difference between the coefficients for those acquiring between 1980-82 and those acquiring between 1976-79 is .679. The difference in coefficients between tthose with 13-15 years of education and those with college or more is .169 (.078-(-.091)).[19] This difference in tenure therefore leads to larger differences in probability of discontinuance than the difference in education. This is perhaps not surprising since increases in education may add to managerial ability but it also increases the opportunity cost of remaining in the particular business. On the other hand, increases in managerial tenure presumably signal additions to managerial ability that are in some part specific to the particular business.

Since the multinomial logit model is a nonliinear model, the "size" of the differences in probability corresponding to the differences in coefficients above depends on "where" the model is evaluated. It will therefore be easier to arrive at quantitative measures in the context the weighted least squares model below.

Weighted Least Squares

We now turn to the seccond parametric model. This approach will provide a simple summary measure of the *magnitude* of the effect of managerial tenure on the likelihood of business discontinuance or transfer (we focus only on managerial tenure to economize on space). Our approach is to first calculate the

[19] The largest difference among demographic groups in coefficients is .170 (000-(-.170)), the difference between Other Minorities and White Males. Differences in coefficients due to manager age, not surprisingly, can be large. The difference in coefficients between those over 65 years of age and those 45-54 is .787 (.078-(-.091)).

effect of tenure within each 2-digit industry and then to take a weighted average of the separate effects in each industry. The weights are constructed to give the most weight to the 2-digit industries for which the estimate of the effect of tenure iis the most precise. One interpretation of this weighted average is the weighted least squares estimate of the linear probabilty model parameterization of this conditional probability.

To explain our procedure, we discuss how we calculated the numbers in the first row and first column of Table 4 (i.e., 10.4 and 3.4). First, we examine businesses in the nonminority male panel which were established before 1960 ("Eb60"). Among these businesses we then compare those nonfounder ("NF") businesses whose owners acquired such businesses between 1980-82 and those who acquired between 1970-75 ("A 70-75"). In particular, for each 2-digit industry we calculate the discontinuance rate for the two groups, subtract the discontinuance rate for those acquiring in 1970-75 from the discontinuance rate of those acquiiring in 1980-82, and calculate a weighted average of these differences across the 2-digit industries. The number 10.4 is this weighted average so that those businesses most recently acquired in this cell have on average a 10 percennt higher failure rate than those who managers acquired earlier. The weight of industry i equals the precision of the estimate of the difference in industry i relative to the prevision of the estimates from the other industries (the details are spelled out in a data appendix). Hence, industries with the most observatins have the greatest weights. Under the hypothesis that the difference in the discontinuance rates between those acquiring in 1980-82 and those acquiring in 1970-75 is constant across industries, then 10.4 is an unbiased estimate of this difference and 3.4 is the estimated standard deviation of the estimate.

In the same manner, each number in Table 4 represents a weighted average difference in the discontinunace rate between those acquiring in 1980-82 and those acquiring in an earlier period, holding fixed the age of the business. The first four columns control for demographic group, the final column aggregates

across the groups.[20] Note that we have also controlled for the effect of retirement by excluding those individuals age 55 or over in 1982.

The table makes clear that the effect of short tenure on discontinuance and transfer is quantitatively large. This is seen by comparing the *increases* in discontinuance in each cell due to short tenure with the *level* of discontinuance in that cell. For example, for those businesses established between 1970-75, nonfounders acquiring between 1980-82 have on average a discontinuance rate that is 10 percentage points higher than founders, which is more than half the *level* of the discontinuance rate for founders of this business age (the rate is about 17 percent for this group). This large percentage increase is typical of the increases in the table.

While the effects of short tenure are quantitatively large, the effects are sometimes not estimated with precision. That is, sometimes the standard errors of the estimates are relatively large. But the key points are that virtually all the numbers in the table are positive and that when we aggregate across the panels the numbers are large and significiant.

IV. Conclusion

A number of significant patterns have been documented. First, by examining businesses owned by nonfounders we were able to examine the effects of managerial tenure on the probability of discontinuance and transfer. These effects were estimated holding business age fixed. Managerial tenure at a business has a large quantitative impact on the probability of business closure and transfer. This indicates that managers have an important influence on the course of businesses. The effects of managerial tenure were also compared to the effects

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[20] Due to an oversight on our part we have not been able to include the Hispanic panel in this table. When we ran the programs constructing Table 4 we mistakenly omitted the Hispanics. SInce we only have access to the data at the Census Bureau, we are not able to include the Hispanics in this version of the Paper. Note, however, that previous analysis of this panel indicates it also has the same patterns found in Table 4.

of other managerial characteristics. Managerial tenure typically had a bigger impact than other variables, such as education, on the estimated probabilities.

By examining nonfounders we were also able to isolate the effect of business age, independent of managerial tenure, on turnover probabilities. That business age has an impact independent of the length of time a manager was running the business indicates that underlying business qualities play a large role in the course of the business. We also discussed a number of other patterns.

As briefly discussed in section V, with the basic patterns presented in this paper it is possible to construct theories of small business dynamics to address substantive questions. For example, by comparing businesses of the same business age owned by founders and nonfounders, we were able to compare the effects of different tenures, and in the context of the model in Holmes and Schmitz (1992), the average quality of business across the two groups. As discussed above, that nonfounder businesses had significantly higher failure rates than founder businesses of the same age suggests, in the context of the model, that variation in match quality is more significant than variation in business quality. THe analysis in Holmes and Schmitz (1992) supports this conclusion. We emphasize that there may be other potential models that assume other difference between founders and nonfounders. These models can also be estimated using the patterns described above and then can be compared with the model developed in Holmes and Schmitz (1992).

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Appendix A

This appendix discusses two questions that must be considered when using the Characteristics of Business Owners (CBO) survey to study business dynamics. The first question is how to treat multi-owner businesses. The second question is how important is survey and item nonresponse.

Multiple-Owner Businesses

About fifteen percent of the businesses in teh CBO are multi-owner businesses, the rest being single owner sole-proprietoships. If we are to include multi-owner businesses in the analysis, then care must be taken in constructing measures such as the founder status of the business and the tenure of the manager of the business. In a multi-owner business there may be owners who started the business and other owners who acquired their ownership share at a later date. Different owners will therefore have different responses to the founder/nonfounder and tenure questions.[21] While in principle it is possible to estimate discontinuance and transfer probabilities conditioned upon a general classification of the tenure status of the various owners, we instead use a procedure to assign each multiple-owner business a single tenure and founder/nonfounder status.[22]

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[21] If a business sampled by the Census was a multi-owner business then a survey was typically sent to each owner. While answers to some of the questions by the various owners will be the same, such as business age, there may be different responses to questions such as when the manager acquired his share of the business.

[22] As an example of how a general classification would work, consider all those businesses established before 1960 and which arre owned by two individuals who did not start the business. Among this group, consider those businesses in which at least one nonfounder acquired their ownership between 1960-69. We could then study the effects of managerial tenure in this group by examining how discontinuance and transfer probabilities varied with the tenure of the other manager. The difficulty with this approach is the large amount of data which it requires; in the CBO there are relatively few multi-owner businesses.

Conceptually there are at least two scenarios in which we can justify assigning a multi-owner business a single tenure and founder/nonfounder status. First, if owners of a business acquire and then sell ownership of the business as a "team," so that one team replaces another in a given business, we can conceive of business dynamics as operating at the level of the team. The tenure of the team is then the tenure assigned to the business. If owners do not operate as a team in this sense, then it will be appropriate to assign a single tenure status to a multi-owner business if some individual (or team as above) has primary responsibility for managing the business, the other owners being "silent partners" who have little to do with the operatins of the business. In such a case the tenure of the individual with primary responsibility for managing the business is the appropriate concept.

With this as background, we turn to the actual procedures used in constructing measures of tenure and founder/nonfounder status for multi-owner businesses. We constructed a number of data sets, each defined as to how multi-owner businesses were treated. We describe two of those data sets here. *Data Set 1.* Consider first the assignment of founder status to multi-owner businesses. There is evidence in the data that in many multii-owner businesses the owners acquire and exit the business as a team.[23] In the non-minority male panel of the CBO, 72 percent of the businesses are comprised of owners who have the same founder status (i.e., in these businesses the owners are all founders or all non-founders; the businesses owned by all non-founders make up nearly a third off these businesses). For these businesses, obviously, there is no

[23] For example, among two-owner businesses, the probability one owner is a nonfounder given the other owner is a founder is 13 percent, while the probability is 67 percentcc if the other owner is a nonfounder. As another example, the probability an owner still owns the business as of 1986 is 91 percent if the other owner retains ownership, while the probability is 25 percent if the other individual gives up ownership of the business. Finally, the period during which owners acquired their ownership of the business is the same across individuals for the vast majority of two-owner businesses.

difficulty assigning a founder status to the business. For the remaining 28 percent of the multi-owner businesses we make assignment of the founder status according to which owner (or team of owners) has the primarily responsibility for operatins at the business. Assuming hours worked at the business, whiich is aviilable on the CBO, is a reasonable proxy for management responsibility, we calculate the number of hours worked by those who are founders and the hours worked by those who are non-founders. If the hours worked by founders is greater then we define the business as a founder business.

The other major assignment - of tenure - is made in a similar manner. If the owners act as a team in the sense of having acquired the business at the same data then there is no difficulty in assigning tenure. If not, hen we again turn to the hours worked question. If based on the hours worked question the business was defined to be a founder business then the tenure is equal to the age of the business. If the business is a nonfounder business then managerial tenure is assigned based on when the business was acquired. If there are non-founders who acquired at different dates, then we define the tenure of the business to equal the tenure of those nonfounders who spend the greatest amount of time managing the business.

Data Set 2. The next data set we construct in a simpler fashion. For each multi-owner business we randomly selected the responses of a single owner to represent the team.[24] The founder status and tenure of the manager at the

[24] The actual steps taken to construct this data set are as follows. (We discuss the nonminority male panel. The same steps were taken for the other panels). There are responses for 16,901 sole-proprietorship which are by definition single-owner businesses. These responses were included in the data set (there are some cases where the same individual owns two proprietorships and these are treated as separate businesses). There are 1,926 partnerships and corporatins for which there is a response from at least one owner. For each of these businesses we randomly selected an owner from the set of responding owners. The prrocedure for choosing a "random" owner was a follows: we ranked owners by the last four digits of their social security number and then selected the owner with the smallest last four digits. This left us with a data set of 18,017=16,091+1,926

businesss is therefore that of the randomly chosen owner. The data set is analogous to that which would have been collected by the Census if they had surveyed only one owner of each business.

The estimates presented in the paper were derived from the second data set. The estimates are essentially the same for the first data set. This is not surprising given that 86 percent of the businesses in the sample are single-owner businesses.[25]

Nonresponse

There are two nonresponse issues, nonresponse to the survey and item nonresponse. The nonresponse rate to the survey is typical of other micro data sets collected by the Census Bureau. The response rate for the survey is over 80 percent on an owner basis (and higher, of course, on a business basis).

One concern with survey nonresponse is that the response rate for businesses which have been discontinued (or transferred) will be lower than the overall response rate so that the estimates of discontinuance rates will be biased downward. Not that a main concern addressed in this paper is *differences* in discontinuance rates. For example, we are interested in whether the discontinuance rate of nonfounders with the least tenure is greater than the discontinuance rate of founders of businesses of the same age. Though estimates

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businesses with the responses of a single owner for each business.

[25] We considered other data sets as well. For example, we constructed another data set comprised of only sole-proprietorships. Still another was constructed as follows. We let each owner on the data set represent a certain number of businesses. That number was determined as follows. If the number of businesses particular business "represented" was x (where x$1 is obtained from the sampling weights for businesses) and if there are n owners in the business then we let each owner represent x/n businesses. Again the results with these data sets are essentially the same as those in the paper.

of the level of discontinuance may be biased, the bias in the estimates of differences may be small.

We have explored these issues in Holmes and Schmitz (1991). In fact, the CBO provides an excellent opportunity to study the survey nonresponse issue since if a business was sampled each of its owners was also sampled. For some businesses there are owners who responded to the survey and some who did not. Holmes and Schmitz (1991) develops a procedure (using two-owner businesses) to identify the probability of survey nonresponse conditioned upon turnover status. We estimate that the probability that an owner does not respond given that the business was not discontinued is 19.8 percent. We estimate that the probability that an owner does not respond given that the business was discontinued is 27.7 percent. Given these estimated probabilities of response, the bias in the estimates of differences in discontinuance rates between founders and nonfounders with the least tenure will be very small.[26] For example, assume the discontinuance rate is 30 percent for one group and 25 percent for the other group. Then if we ignore the survey nonresponse bias we obtain an estimate (in expectation) of 27.8 and 23.6 percent for the discontinuance rates for the two groups respecctively. Our estimate of the difference would be 4.7 percent which is slightly below the true difference of 55 percent.

Item nonresponse is very small in the CBO for most questions. Response rates for questions are typically between 92 and 95 percent. The response to one question, however, requiires detailed discussion. This is the question on business age. When thhose owners who did not start their business were asked "When was your business established," a possible response was "Do not know." A number of nonfounders chose this response. Owners of businesses recently acquired were more likely to choose this answer than nonfounders who had acquired

[26] In the model of Holmes and Schmitz (1991c) it is assumed that the response rates do not vary between founders and nonfounders.

earlier.[27] In particular,, 28 percent of those who acquired between 1980-82 chose "Do not know" for the year the business was established, 17 percent of those acquiring between 1976-79, 15 percent of those acquiring between 1970-75 and 10 percent of those acquiring between 1960-69.

This nonresponse by some nonfounders to the business age question should not, a priori, lead to any bias in our estimates. However, if those who do not know when the business they acquired was established are somehow different from other nonfounders, potential bias problems might arise. In order to examine if these individuals are different, we compared, holding year acquired fixed (again, looking with columns in Table 2), discontinuance rates for nonfounders who did not know the age of their business with nonfounders who knew their business age. The discontinuance rate for the group which did not know their business age was about the same as the discontinuance rate for the nonfounders whose businesses were most recently established. This suggests that this group which does not know business age are somewhat different,, since it is unreasonable to assume that all of these businesses had been established in the most recent period.

One possible way to handle these nonfounders who did not know business age is to randomly assign them to the year established groupinigs. For those acquiring between 1980-82 and not knowing business age, we could randomly assign them to the year established groupings 80-82, 76-79, 70-75, 60-69 and before 1960. Since, as mentioned the group not knowing business age has a discontinuance rate roughly that of the year established grouping 80-82, this would increase the discontinuance rates for the other year established groupings, reducing the decline in discontinuance due to the age of the business, though the age effect would still be strong. If we conducted such an exercise for each year

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[27] We expect individuals who most recently acquired to check "Do not know" most often if only because there are more possible choices for year established. For example, if you acquired your business between 1960-69 then it is only possible that your business was established befor 1960 or between 1960-69. On the other hand, if you acquired your business between 1980-82, all five year established groupings are possible responses.

acquired grouping, then the age effect would be reduced somewhat for each year acquired grouping, then the age effect would be reduced somewhat for each year acquired group, but the exercise would lead to an *increase* in the effects of tenure. That is, the difference in discontinuance rates between the most recently acquired businesses and thhose with greater tenure (for a given year establisehd grouping) would increase. This is primarily due to the fact that the nonresponse to the age question is greatest (in absolute and percentage terms) for those who acquired between 1980-82. The estimates reported in the paper are based on a sample that excluded nonfounders who did not report business age. If we had included them the results would be essentially the same.

Appendix B

Description of Weighted Means Procedure

We describe the procedure for calculating the cell at the top left-hand corner of Table 6 (we use the same procedure for the remaining cells). Restrict attention only to white-male-owned firms established before 1960. Let group "S" (short tenure) be the subset of these firms acquired 1980-82 and group "L" (long tenure) be the subset acquired 1970-75 and index tensure category by K, k = S, L. Let j index two digit industries, j=1,...,J. Let n_{jk} denote the number of observatins in industry j and tenure category k and let the ith observation in industry j and tenure category k be called observation i,j,k. Let the variable $disc_{ijk}$ equal one if observation i,j,k, was discontinued and equal zero otherwise. Let m_{ijk} be the sampling weight of observation i,j,k (To obtain the universe populatins we sum m_{ijk} over all i, j, and k.).[28] Finally, let w_{ijk} be the relative sampling weight of observation i,j,k,

$$w_{ijk} \equiv \frac{m_{ijk}}{\sum_{i=1}^{n_{jk}} m_{ijk}}.$$

[28] The stratification within two-digit industries is at the state level.

(A.1)

Let p_{jk} be the fraction of all firms in two=digit industry j and tenure category k (k=S,L) in the underlying universe which were discontinued. Let $\hat{p}_{jk}$ be the sample analog.

$$\hat{p}_{jk} \equiv \sum_{i=1}^{n_{jk}} w_{ijk} \cdot disc_{ijk}$$

(A.2)

The sample analog $\hat{p}_{jk}$ is an unbiased estimate of p_{jk}. Let var ($\hat{p}_{jk}$) denote the variance of this estimate (we will discuss the issue of estimating this variance later).

Let δ_j / $p_{jS} - p_{jL}$ be the difference in the discontinuance rates between the short tenure and long tenure groups in industry j. Let δ_j / $\hat{p}_{jS} - \hat{p}_{jL}$ be the sample analog. This is an unbiased estimage of δ_j and has variance

$$var\ (\delta_j) = var(\hat{p}_{jS}) + var\ (\hat{p}_{jL}). \qquad (A.3)$$

Consider the hypothesis that the tenure effects δ_j on discontinuance rates are constant across industries j, i.e. $\delta_j = \delta$ all j. In this case, each δ_j is an unbiased estimate of δ. Straightforward calculations show that minimum variance, linear estimator of δ is obtained by weighting the separate estimate δ_i in each industry by its relative precision, i.e.

$$\hat{\delta} = \sum_{j=1}^{J} \lambda_j \cdot \hat{\delta}_j$$

(A.4)

where

$$\lambda_j \equiv \frac{var(\hat{\delta}_j)^{-1}}{\sum_{k=1}^{J} var(\hat{\delta}_k)^{-1}} \qquad (A.5)$$

Unfortunately, the variances var ($\hat{p}_{jk}$) which define the 8hrough (A.3) and (A.5)) are unobservable and hence we can not directly calculate δ. Our procedure is to estimate the var $\hat{p}_{jk}$) and substitute these estimates into (A.5) to obtain estimates of the appropriate weights 8_j. We substitute these weights into equation (A.4) and the resulting estimates are what are reported in table 6.

Note that these estimates of * are unbiased since the expectation of (A.4) is independent of the weights chosen under the maintained hypothesis that $*_j$ is constant across j.

It remains to describe our procedure for estimating var ($\hat{p}_{jk}$). Using the definition of $\hat{p}_{jk}$ given by (A.2),

$$var(\hat{p}_{jk}) \equiv \sum_{i=1}^{n_{jk}} w_{ijk}^2 \cdot \sigma_{ijk}^2 \qquad (A.6)$$

where $F^2_{i\ jk}$ is the variance of the Bernoulli variable disc $_{i,j,k}$. Letting p_{ijk} be the graction of firms discontinued in the sampling stratus occupied by firm i,j,k, we have F = p_{ijk}‰(1-p_{ijk}). The usual practice for estimating is to plug in for p_{ijk} the sample fraction within this stratum. THis avenue is not viable here because at the level of the stratum there are generally few observations so the empirical fraction is commonly zero or one within a stratum. In such a case the procedure yields an estimated variance of zero which we know to be untrue. In fact, this same problem arises even at the level of the two-digit industry, i.e. $\hat{p}_{i,j}$ is zero or one for some i and j. For this reason we take a step back and control only for the tenure category and let $\hat{p}_k$‰(1-$\hat{p}_k$ serve as our estimate of F . While there is variation in discontinuance rates across two-digit industries within tenure category k, there is substantially greater variation in the number of observations across industries. Hence most of the variation in var ($\hat{p}_{jk}$) across j is due to differences in the number of observations across industries and this variation is captured by our estimation method.

Table 1

Number of Businesses in Each Cell by Year Established, Year Acquired, and Founder Status

Nonminority Male Panel

Year Established	Founders	Nonfounders Year Acquired				
		Before 1960	1960-69	1970-75	1976-79	1980-82
Before 1960	1516	320	354	298	300	305
1960-1969	15543		80	107	106	106
1970-1975	2107			74	102	108
1976-1979	3020				117	161
1980-1982						227

Median and 75th Percentiles in Annual Business Receipts by Cell (in thousands), By Year Established, Year Acquired, and Founder Status

Nonminority Male Panel

Year Established	Founders	Nonfounders Year Acquired				
		Before 1960	1960-69	1970-75	1976-79	1980-82
Before 1960	25.5 (90.8)	44.6 (130.7)	60.0 (217.7)	68.6 (229.5)	81.5 (205.3)	31.6 (124.3)
1960-1969	21.7 (78.6)		66.3 (209.7)	55.0 (198.4)	56.8 (178.8)	28.2 (116.0)
1970-1975	19.2 (64.8)			25.4 (157.7)	41.5 (139.1)	27.5 (109.6)
1976-1979	15.1 (52.1)				20.9 (89.0)	16.3 (61.3)
1980-1982	5.8 (20.7)					5.2 (24.3)

Note: In each cell median receipts is the first number and the 75th percentile is the second number (in parentheses).

Table 2

Percent of Business Discontinued
By Year Established, Year Acquired and Founder Status
Non-Minority Male Panel

Percent of Businesses Discontinued

Year Established	Founders	Nonfounders Year Acquired				
		B1960	60-69	70--75	76-79	80-82
Before 1960	26.7	21.1	17.6	9.3	12.9	21.5
1960-69	21.8		19.4	9.5	22.0	24.4
1970-75	20.6			28.9	19.5	27.3
1976-79	26.2				35.8	38.9
1980-82	46.3					60.7

Percent of Businesses Transferred
Conditioned on Survival
By Year Established, Year Acquired and Founder Status
Non-Minority Male Panel

Percent of Businesses Transferred

Year Established	Founders	Nonfounders Year Acquired	
		Before 1980	1980-1982
Before 1960	5.3	14.3	19.0
1960-69	4.0	12.0	23.0
1970-75	3.3	17.8	18.7
1976-79	4.0	8.9	26.8
1980-82	5.3		16.0

Table 3

Paraameter Estimates from Multinomial Logit Model
of DISCONTINUANCE and TRANSFER
All Demographic Panels Combined

Variable	Discontinuance		Transfer		
	Coeffi cient	stand error	Coeffic ient	stand error	Mean of x
Constant	.424	.063	-2.97	.167	1
F; B60	-1.219	.040	-.292	.099	.07
NF; A B60	-1.397	.090	.544	.138	.01
NF; A 60-69	-1.393	.086	.748	.118	.01
NF; A 76-79	-1.270	.079	.982	.102	.02
NF; A 80-82	-.591	.060	1.16	.092	.02
F; 60-69	-1.327	.038	-.362	.092	.08
NF; A 60-69	-1.098	.123	.621	.199	.01
NF; A 70-75	-1.314	.129	.598	.188	.01
NF; A 80-82	-.750	.092	1.22	.128	
F; 70-75	-1.268	.031	-.563	.082	.12
NF; A 70-75	-1.132	.110	-.145	.246	.01
NF; A 76-79	-1.156	.116	1.15	.140	.01
NNF; A 80-82	-.776	.098	1.19	.134	.01
F; 76-79	-.834	.023	-.252	.064	.19
NF; A 76-79	-.636	.081	.674	.148	.01
NF; A 80-82	-.375	.076	1.39	.112	.01
F; 80-82	x	x	x	x	x
NF; A 80-82	.623	.051	.720	.127	.03
Agriculture	x	x	x	x	x
Mining	.068	.103	.185	.245	.01
Construction	-.022	.058	-.150	.169	.07
Manufacturing	-.144	.062	.201	.163	.05
Trucking	.189	.061	.505	.163	.05
Wholesale	.120	.078	.258	.199	.02

Retail		.339	.052		.859	.142	.22
Fire		-.075	.060		.481	.156	.07
Services		-.059	.051		.200	.142	.40
Miscellaneous		.162	.058		.207	.160	.07
OwnAge Less 25		-.102	.057		.348	.128	.03
OwnAge 25-34		-.496	.037		-.187	.088	.22
OwnAge 35-44		-.696	.035		-.356	.084	.29
OwnAge 45-54		-.787	.035		-.469	.083	.22
OwnAge 55-64		-.421	.035		.001	.081	.16
OwnAge 65+		x	x		x	x	x
No Prior Bus.		x	x		x	x	x
Prior Business		-.108	.023		.349	.047	.17
Education <12		x	x		x	x	x
Education 12		.025	.025		.119	.060	.28
Ed 13-15		.078	.027		.095	.065	.20
Education 16		-.091	.026		-.007	.062	.32
Panel Women		.122	.026		-.019	.057	.20
Panel Black		.103	.027		-.683	.072	.18
Panel Other		-.170	.027		-.165	.058	.20
Panel Hispanic		-.038	.027		-.275	.061	.20
Panel White		-.038	.027		-.275	.061	.20

Number of Observations = 73,500
Log-Likelihood = 53,705