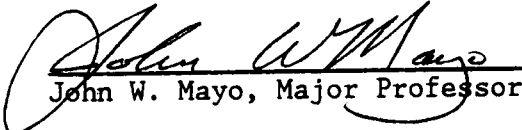


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John W. Mayo, Major Professor

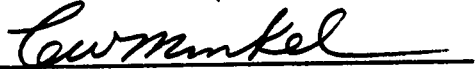
We have read this dissertation
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David M. Mandy

Ronald E. Shreve

Don P. Clark

Accepted for the Council:


Vice Provost
and Dean of the Graduate School

FIRM EXIT: AN EMPIRICAL INVESTIGATION

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Joseph Edward Flynn

August 1988

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To my Parents, Uncle Mike, and Susan

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ABSTRACT

The research in this dissertation hopes to fill some of the void in the economics literature by investigating firm exit from two perspectives: national and regional. This work consists of two essays on firm exit. The first models the determinants of firm exit in the manufacturing sector of the United States economy opened to international influences. The model is estimated using a two stage block-recursive system. In the first block many of the relationships that exist between profitability, concentration, and advertising are confirmed. The results from the first block are used in the second block where low profitability, declining industry growth, and competition from new entrants play an important role in the exit of firms. The data for this essay were gathered from various U.S. government sources. The second essay examines firm exit in a regional economy, namely Tennessee. Using the causality framework outlined in Granger (1969), the linkages implied by economic base theory (EBT) are investigated. First, the basic assumption of EBT that basic firm activity causes nonbasic activity is strongly confirmed. Moreover, the causal effects were found to occur both instantaneously and with a lag. Second, the implications of traditional EBT are not, however, uniformly supported. It was found that nonbasic activity caused basic activity both instantaneously and with a lag. Finally, the displacement of incumbent firms by new entrants was also tested. Displacement was found to exist. The data for this essay are from records supplied by the Tennessee Department of Employment Security.

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CHAPTER 1

INTRODUCTION

The purpose of this dissertation is to investigate firm exit in a more thorough fashion than currently exists in the economics literature. The exit phenomenon is as important an element of the structure-conduct-performance paradigm as is the entry phenomenon. However, in the economics literature a disproportionate amount of the effort has been directed toward the entry phenomenon.¹ Conversely, there are relatively few empirical investigations of firm exit, and even fewer theoretical models. The research in this dissertation hopes to fill some of the void in this literature by empirically investigating firm exit from two perspectives: national and regional.

This research is divided into two major essays. In Chapter 2 firm exit is examined from a national perspective for the manufacturing sector of the United States economy. Chapter 3 consists of an investigation of firm exit from a regional perspective, specifically within the state of Tennessee. What sets this research apart from previous work is the quality and scope of the data used in each essay.

Past studies of firm exit have, for the most part, been hindered by the data utilized. For example, some analysts, such as Mansfield (1962), Marcus (1967), and MacDonald (1986), use a limited data base.

¹For example, see Bain (1956), Modigliani (1958), Osborne (1964), Bhagwati (1970), Pyatt (1971), Kamien and Schwartz (1971 and 1972), Baron (1973), Orr (1974), Spence (1977), Dixit (1979), Baumol (1982), Demsetz (1982), and Hause and DuRietz (1984) just to name a few.

While in other works, a net measure of exit is utilized (see Duetsch (1984a)). Neither of these measures is totally satisfactory. First, when investigating exit, it is essential to include as many industries as possible because a larger sample will yield better statistical inferences. Second, if a net measure is used, it is possible for much of the activity in an industry to be masked in the figures. For example, an industry might have a net exit rate of zero, but actually experienced significant entry and exit. Much of the problem in these studies stems from a lack of good data on firm exit.

The data in Chapter 2 are from the U.S. Establishment and Enterprise Microdata file (USEEM) which is a subset of the Small Business Data Base (SBDB) assimilated by the Small Business Administration (SBA). The SBA constructed the USEEM file utilizing business data acquired from Dun and Bradstreet (D&B). An exit is defined to have occurred when a firm appears in D&B's records one year, is not there the following year, and cannot be traced. Hence, mergers and divestitures are not counted. A firm is defined as a business organization consisting of one or more establishments under the same ownership and control. The exit measure in this model is defined as the gross number of firms that have exited from an industry (as defined at the SIC four digit level) during the period 1978 to 1984.

Firm exit is specified as a function of industry profitability, size, growth, concentration, and efficient scale of operation, competition from new entrants, and international factors. However, since profitability and concentration are both specified as independent explanatory variables, a simultaneity bias may result. Therefore, the model is estimated as a block-recursive system. In the first block

profitability, concentration, and advertising intensity are specified as endogenous variables and estimated using two-stage least squares. Then the predicted values for profitability and concentration are substituted into the exit equation, which constitutes the second block.

The data in Chapter 3 are from a unique data base developed by the Tennessee Department of Employment Security and the Center for Business and Economic Research (CBER) at the University of Tennessee, Knoxville. The data consist of firm entry, firm exit, employment, and wages for all firms complying with the Tennessee Unemployment Insurance Program. The data are for the period 1973-1986 with over 95,000 firms included. For this model quarterly data on firm entries and exits, by industry, are utilized. Firm entry is defined as the date of first employment by the firm while firm exit is defined as the date of last employment by the firm. The data are seasonally adjusted using the Bureau of Census X-11 Seasonal Adjustment technique.

These data are used to investigate some of the linkages implied by economic base theory. Economic base theory (EBT) holds that total economic activity, in a region that is open to trade from other regions, will expand or contract in relation to the region's export revenues. More specifically, EBT identifies the increase in receipts from outside a region as the most important factor for regional economic growth. In other words, EBT holds that the export (or basic) sector of economic activity is determined exogenously, while regional (or nonbasic) activity is determined or caused by basic activities.

The economic influence of the basic sector is investigated using the causality framework put forth by Granger (1969, 1980) to ascertain the impact of firm exit in a regional economy. There are several

fundamental questions regarding the underlying nature and direction of causality in regional economic activity. For instance, does firm exit out of basic industries cause nonbasic firm exit? Could nonbasic firm exit be causally prior to basic firm exit? To what extent might entry into one region cause exit (or displacement) of firms within that region?

Since the raw data are at the firm level, it is necessary to aggregate the data both across industries and geographic regions to provide a meaningful and consistent examination of causality. Therefore, using the assignment method to provide a partition that is generally consistent with the spirit of economic base theory, as a base case, causality at a statewide level on the basis of manufacturing firms representing the basic sector and nonmanufacturing firms representing the nonbasic sector is tested.

Several more narrow industry and geographic partitions are also considered. In particular, to more narrowly define the nonbasic sector of a region, the nonmanufacturing sector is further disaggregated into the following categories: finance, insurance, and real estate (FIRE); trade (including both wholesale and retail trade); and services. Initially, the relationship between basic firm exit and nonbasic firm exit (including both nonmanufacturing and the above more narrowly defined categories) is tested on a statewide level. Following that, these relationships are tested in each grand division within the state of Tennessee: east, middle, and west. Finally, these relationships are also tested in rural versus urban counties. Displacement of incumbent firms by new entrants is also tested for the industry categories

described above in each grand division, and in urban versus rural counties.

In the next chapter, a model of the determinants of firm exit in the manufacturing sector of the U.S. economy is specified and estimated. Also included in Chapter 2 is a review of both the theoretical and empirical literature on firm exit. In Chapter 3, economic base theory is outlined and the literature that examines EBT in a temporal framework is reviewed. Also, the Granger causality methodology is outlined in detail along with the debate regarding its validity. Using the Granger methodology, EBT linkages are specified and estimated. Finally, in Chapter 4 the dissertation is concluded.

CHAPTER 2

THE DETERMINANTS OF FIRM EXIT IN AN OPEN ECONOMY

I. Introduction

In this chapter, a model of firm exit is specified and estimated for the manufacturing sector of the U.S. economy. Why should economists attempt to understand and explain the determinants of firm exit? One reason is that if exit is occurring in an industry without simultaneous entry then the industry may become more oligopolistic in nature. Consequently, the incumbent firms might experience an increase in market power which may lead to negative welfare effects. However, perhaps the most important reason is employment. When a firm exits jobs are lost. If jobs are lost in an important sector of the economy, such as manufacturing, then this loss of employment could begin a ripple effect throughout the rest of the economy.

Despite the abundant references to the terms "entry" and "exit" and the widely recognized role that entry and exit play in the structure-conduct-performance paradigm, it has not been at all clear what specific operational definitions of, say, "firm exit" should be used in empirical work. For instance, does exit mean withdrawal of producing assets from a market? Alternatively, should exit be taken as the withdrawal of capacity from a market? Or can we simply count the number of firms that ceased operations during some time period?

Ideally, examination of firm exit from each of these perspectives should be performed, since each would add some insight into the exit phenomenon. Unfortunately, it is not possible to quantify each of these

dimensions given current data sources. Past studies have focused on the number of firms that have ceased activity. However, some use data on just a few industries (Mansfield (1962), Marcus (1967), and MacDonald (1986)), or use a net measure of activity (entries minus exits) to account for exit (Duetsch (1984a)). Neither of these measures is totally satisfactory. First, when investigating exit, it is essential to include as many industries as possible because a larger sample will yield better inferences about an entire sector of the economy, such as manufacturing. Second, if a net measure is used it is possible for much of the activity in an industry to be masked in the figures. For example, an industry might have a net exit rate of zero, but actually experienced significant entry and exit. In this chapter, a measure of actual firm exit by industry (as defined at the SIC four digit level) is utilized.

Traditionally, the study of industrial organization has primarily concerned itself with applications to domestic markets. Similarly, the study of international trade theory has been cast in a general equilibrium framework. However, there is a growing literature that takes into account both market structure and international trade flows. Some of that literature includes Marvel (1980), Pugel (1980), Koo and Martin (1984), and Aw and Roberts (1985). One consistent finding in these studies is that import competition constrains domestic pricing and hence, profitability. In this chapter, the exit model is opened to international trade flows to determine the effect imports have on domestic firm exit. Moreover, the impact of imports on industry sales and employment levels is examined.

Finally, when contemplating an exit model it is tempting to assume that such a model is simply the inverse of an entry model. But unfortunately, this is not the case. In order for firm exit to be the negative of firm entry, it would be necessary for the factors that make entry less likely to also make exit more likely. For instance, low profits or declining growth within an industry would make exit more likely as well as entry less likely. In contrast, if there are high barriers to entry, exit is also less likely. For example, if a process requires a large sunk capital investment, then this may indicate that a firm already in this industry would weather any economic downturn rather than attempt to exit completely. Similarly, if scale economies are extensive then a firm may not want to cut back on production if demand softens. Clearly, any study of the determinants of exit should be separate from a study on entry, and it should not be assumed that one can just use the same model for both entry and exit.

In the next section, the past work in the area of firm exit is reviewed. In section III, the data and model specification are presented. Following that, in section IV, the estimation and empirical results are reported. In section V, the empirical results are extended to determine the industry sales and employment impacts. Finally, the chapter is concluded in section VI.

II. Past Work

Much of the theoretical work on firm entry and exit has dealt with entry and barriers to entry in the vein pioneered by Joe Bain (1956). However there are a few papers that concentrate on firm exit. One of the earliest papers that examines exit is the seminal work by Mansfield

(1962). In this paper Mansfield deals with entry, exit, and the growth of firms. He finds that the exit rate would decline if an industry's profitability rose or if the ratio of the average size of a firm to the minimum efficient size in that industry increases. Also, he found that small firms have relatively high exit rates and those that survive grow faster than larger firms.

In a more recent work, Gabszewicz and Thisse (1980) investigate entry and exit in a differentiated industry. From the assumptions of their simple economy, their model suggests that only a finite number of firms, n^* , can coexist in a differentiated industry. If more than n^* firms remain in the market, then they will necessarily struggle with each other, and this struggle will provoke exit by some of them.¹ This upper bound on the number of firms in an industry is shown not to hinder its tendency toward pure competition that potential and actual entry will induce.

In the Gabszewicz and Thisse model, the market is supplied at prices above the competitive result. As new entrants begin to supply the market, a decrease in the prices of the products sold occurs. The entry of a new firm is necessarily accompanied by the exit of another, due to the upper bound on the number of firms that can survive in the market. Although there is a fixed number of firms in the market, the equilibrium prices decrease to competitive levels as the number of entrants increase.

¹In their paper, what constitutes an actual entry or exit is not addressed. No mention is made of the actual means of production or what happens to those resources when an exit occurs.

In a declining industry, shrinking demand increases pressure for capacity to be reduced. Who exits first? This is the question addressed by Ghemawat and Nalebuff (1985). They focus on how relative size affects the order of exit. In their duopolistic model, the two firms make a dichotomous decision whether to continue to operate at current capacity levels or to exit the market costlessly and completely. Entry by other firms does not occur due to set-up costs, and reentry is not allowed. Their main conclusion is that survivability is inversely related to size. They contend that eventually in a declining industry, only the small firm will be profitable. It is this credible potential profitability that enables the small firm to force its larger rival to exit in toto. They also extend their analysis to an oligopoly.

There are two consequences of this result. First, since the larger firm exits first, there is an incentive to purchase the assets and merge with its smaller rival. Second, since firms rarely have identical costs it is possible for the larger firm to have a cost advantage over its smaller less efficient rival. But for the larger firm to outlast its smaller rival, it needs to have a large cost advantage.

Eriksson (1984) devises a model which shows how growth, entry, and exit are interrelated. In his model, he assumes perfect competition, constant long-run average costs, accelerated rising adjustment costs, and value maximizing firms. He also assumes stochastic differences in productivity between incumbent firms and potential entrants. All of the results of this model, for instance, the simultaneous entry and exit of firms, derive from these stochastic shocks. If the shock is positive, the firm continues to operate; if the shock is negative, then the firm

exits the industry. From this framework growth, entry, and exit are examined formally.

When modeling exit, he assumes some basic conditions that apply to all firms. First, he assumes there is a pool of potential buyers of the assets of every existing firm in the industry. Second, firms cannot sell off their assets slowly over time, consequently, when a firm decides to shut down (exit), it immediately disappears from the industry. Finally, since the firm's assets will have a lower value for alternative uses and actual exit is a resource consuming activity, costs of exit are incurred.²

In Eriksson's model, when the firm's present value is less than the value of its assets minus its exit costs, the owners will dissolve the firm by selling its assets to a buyer assumed above. The model generates several relationships. As the ratio of exit costs to the value of the firm's assets increase, i.e., the cost of exit is high, the mean rate of exit decreases. Also, the mean rate of exit decreases when output prices are increasing or production costs are falling. Furthermore, when the costs of exit are rising, this has the effect of lowering the rate of entry as well as lowering firm growth rates and output prices. An interesting relationship between the costs of entry and the cost of exit results from the model. When both the costs of entry and exit are high, both the rates of entry and exit are lower

² Similarly, he assumes there is a pool of potential entrants who are about to start production in the industry (whether these individuals are the same individuals that buy the assets of exiting firms is not made clear). Entry occurs when the expected present value of the new firm, minus investment costs, exceeds the cost of entry.

resulting in a more stable industry. But with higher costs of entry, output prices rise and the existing firms in the industry have a positive growth rate. On the other hand, when the costs of exit are high, the fall in the rate of exit leaves less room for the expansion of existing firms and the entry of new firms. Thus, output prices decrease and firms in the industry experience a negative growth rate. Hence, high costs of entry have a positive effect on the firms in an industry while high costs of exit have a negative effect.

Two more rigorous models of exit are derived by Fudenberg and Tirole (1986) and Friedman (1979). Friedman (1979) examines exit within a game theoretic framework. His purpose is to investigate the existence of a non-cooperative equilibrium. In such an equilibrium, no player can increase his payoff by altering his behavior. A player has the choice of exiting and collecting zero rather than remaining in the game indefinitely. Fudenberg and Tirole (1986) investigate exit in a duopoly. Each firm enters knowing its own costs, but not those of its opponent. The time of exit is the only strategic variable; therefore, the model is in essence, a "war of attrition." Their model has a unique equilibrium with the following form: firms with high costs never enter, firms with lower costs enter, but become discouraged and exit if their rivals persist long enough.

There are relatively few empirical studies that attempt to model firm exit. Much of the problem can be traced to inadequate data on firm exit. The first empirical model of firm exit was tested by Mansfield (1962). He found that as firms become smaller relative to the minimum efficient size of the industry and as the profitability of the industry decreases, firms are more likely to exit. Another early attempt to model

the determinants of firm exit was performed by Marcus (1967). In his model, the rate of firm exit is a function of the proportion of loss firms (PLF) in an industry (i.e., the proportion of firms earning zero or negative income as reported by the Internal Revenue Service at the three digit SIC level), the capital to output ratio to proxy sunk costs, and the firm's profit expectations proxied by the firm's realized rate of return for the next period. He finds a positive relationship with PLF and a negative relationship with the other variables as expected. Both of these early attempts suffer from serious data problems. The Mansfield model only uses four industries while the Marcus model only uses seventeen. Also, Marcus's model uses data that is highly aggregated, i.e., industry classification at the SIC two and three digit level.

A more recent work on exit by Caves and Porter (1976) examines barriers to exit. They consider these barriers as an element of market structure and as an ex ante determinant of market conduct and performance. They find that the presence of durable assets is a strong determinant of the persistence of low-profit businesses. Also, the influence of joint facilities³ used by businesses is supported as determining a firm's persistence in an industry from which others exit. The data consists of disguised financial and market information supplied by fifty-seven major North American corporations concerning 556

³Joint facilities include shared marketing channels as well as shared facilities and equipment. Both tangible facilities and intangible organizational arrangements that are integrated either backward or forward can also hinder a firm's ability to cease activity.

individual "businesses" that they operate. They use the data on those businesses and assume that the characteristics of those firms typifies the characteristics of the firm's industry. After making some exclusions, they are left with 89 observations.

Duetsch (1984a) also empirically examines the barriers to exit question. His data consists of 153 industries gathered from the census and survey of manufacturers, 1963-1972, published by the U.S. Department of Commerce. The amount of exit for each industry is measured on a net basis by calculating the decrease in the number of firms. He tests two barriers to exit: a structure barrier and a strategy barrier. The structure barrier is obtained by estimating the amount of assets needed to operate a plant of minimum efficient scale. The strategy barrier is obtained by calculating the proportion of all firms that have multiplant operations. He found that both of these measures impede exit.

Another work that attempts to specify some of the determinants of exit is in a paper by MacDonald (1986). His exit measure is defined as the gross number of exits that occur between 1976 and 1982. Mergers and name changes are not counted as exits if the facility remains in operation. He finds a weak inverse relationship between industry growth and exit, and a strong inverse relationship between capital commitment and exit. In the exit model, he does not test other possible determinants, although he uses them in his entry equation. It should be noted that this study is limited to forty-six food manufacturing industries.

Finally, a paper by Shapiro and Khemani (1987) explores the possible symmetry between barriers to entry and exit. Their exit measure is defined as the gross number of firms which cease operation by

closing all their plants during the period 1972 to 1976, and excludes exit by diversification and divestiture. Their data consists of a cross-section of 143 Canadian manufacturing industries. From the results of their exit specification, they do not find a significant relationship between their profitability and growth measures. Also, they find that high capital requirements, minimum efficient scale plant size, and multiplant operations all serve as barriers to exit. On the other hand, advertising and research and development expenditures do not appear to be barriers to exit. They include actual entry in their exit equation to test the displacement of incumbent firms. They find a strong displacement effect by entering firms.

All of the above models of exit are closed to international trade flows. In the model specified in the next section, trade flows are explicitly included. This model is a cross-section across U.S. manufacturing industries and factors such as import competition and trade barriers are taken into account. In the industrial organization literature most models that test the structure-conduct-performance paradigm are closed to international forces. There is, however, a small but growing number of open models examining many aspects of industrial organization. Similarly, the international trade literature has been primarily cast in the framework of general equilibrium models devoid of complications such as market structure and performance. However, there is a growing number of papers that examine the determinants of trade flows at the industry level based upon the theory of industrial structure-conduct-performance relationships. Following is a review of some of that literature.

Pagoulatos and Sorensen (1976) test the affect foreign trade and investment has on domestic industry profitability. Their results provide considerable support for the hypothesis that market structure influences industry profitability. For instance, they find that fewness of sellers is positively related to profit levels. The results from their international determinants indicate that industries that are faced with greater levels of import competition are less profitable. In particular, where import penetration is growing and the degree of import protection is lower, industries are less profitable. Their sample consists of 88 three digit SIC industry groups in 1967 for which they could also get matching international data. This study demonstrates that further analyses of the structure-conduct-performance relationship should be opened to international trade flows.

In a similar paper, Marvel (1980) estimates both the commodity composition of U.S. trade flows and the determinants of price-cost margins in U.S. manufacturing in a simultaneous context. His results suggest that imports tend to reduce domestic profitability, especially in high concentration industries, and that relatively higher profits attract imports. In this article, Marvel utilizes 382 industries at the four digit SIC level for a more complete cross-section of U.S. manufacturing.

Several other authors have opened the traditional structure-conduct-performance relationship to international trade flows. They include Pugel (1978 and 1980), Turner (1980), Koo and Martin (1984), Chou (1986), Aw and Roberts (1985), and Neumann, Böbel, and Haid (1985). These studies obtain many concurring results. For example, one consistent finding is that import competition constrains domestic

pricing with a greater effect in more highly concentrated industries. Turner (1980) uses the change in, rather than the level of, import share as a proxy for import penetration, and finds that imports have an effect on domestic concentration only when concentration in a particular industry is already rather high. Koo and Martin (1984) confirm the importance of scale economies for U.S. trade flows. In particular, scale economies promote trade flows in both directions unless concentration is very high. Chou (1986), for the case of Taiwan, investigates the role of government influences on trade and how that affects market structure by offsetting the potential impacts of imports on concentration and profitability.

Aw and Roberts (1985) examine the role of imports in a slightly different framework. They attempt to quantify the degree of substitutability between domestic inputs, inputs from developed countries (DC's), and inputs from newly industrializing countries (NIC's), in production for final demand. They find that U.S. imports from NIC's are complements with domestic labor while imports from DC's are substitutes. This implies that domestic commercial policies resulting in raising prices of imports from NIC's will lead to reductions in aggregate employment. This result does not necessarily hold for the entire economy, but rather, any gains in employment in the import competing sectors will be more than offset by employment losses in import using sectors.

III. The Model and Specification

As is evident from the extant empirical literature, there are only a few studies of firm exit, many of which have a substantive data

limitations. Previous studies of firm exit have either focused on barriers to exit or concentrated on a relatively few number of industries. The exit data used in this model are from the U.S. Establishment and Enterprise Microdata file (USEEM) which is a subset of the Small Business Data Base (SBDB) assimilated by the Small Business Administration (SBA). The SBA constructed the USEEM file utilizing business data acquired from Dun and Bradstreet (D&B). An exit is defined to have occurred when a firm appears in D&B's records one year, is not there the following year, and cannot be traced. Hence, mergers and divestitures are not counted. A firm is defined as a business organization consisting of one or more establishments under the same ownership and control.⁴ The exit measure in this model is defined as the gross number of firms that have exited from an industry (as defined at the SIC four digit level) during the period 1978 to 1984. Existing theory provides a general guide to the determinants of firm exit, which can be specified as:

$$\text{Firm exit} = f(\text{profitability, industry size, industry growth, efficient scale of operation, industry concentration, firm displacement (entry), import levels, trade restrictions}) \quad (1)$$

From the relationships explicit in this equation, a simultaneous bias may result, especially since both profitability and concentration are included in the specification. To answer these concerns it should be noted that the number of firms that enter and exit are measured over

⁴For a complete description of the data from this source see The State of Small Business: A Report of the President 1984, Appendix C.

the period 1978-84, the international variables are measured in the two years 1980 and 1984, while the structural variables are measured in the year 1977. It is assumed that firms make the decision to enter or exit after the various structural parameters are known. It is also assumed that the exit decision is influenced concurrently with trade flows. Therefore, any simultaneity bias resulting from estimating a single equation model implied by (1) are remote. However, it must be noted that profitability and concentration are both measured in the same year and are included as independent explanatory variables in the determinants of firm exit. Clark and Davies (1982), expanding on a theoretical rationale for expecting a relationship between profitability and concentration developed by Cowling and Waterson (1976), "show that, on further examination, this model implies a joint determination of margins [profitability] and concentration" (p.277). In a much earlier study Weiss (1971) also proposed that this relationship be examined in a simultaneous equation system. Subsequently, many studies have adopted a simultaneous framework when profitability and concentration are involved.⁵

In many studies of the relationship between profitability and market structure, a measure of advertising intensity has often been included as a structural variable. This follows the traditional belief that brand loyalty induced by advertising results in a barrier to entry,

⁵Some of these studies include Strickland and Weiss (1976), Pugel (1978 and 1980), Martin (1979), Pagoulatos and Sorensen (1981), and Chou (1986).

which helps firms achieve and maintain higher profits.⁶ The implied direction of causality runs from advertising intensity to profitability. However, there is theoretical work (Schmalensee (1972)) that suggests the direction of causality may run the other way. Specifically, higher profits may indeed induce greater advertising intensity. The more an additional unit of sales adds to profits the more firms will advertise. Once it is recognized that perhaps causality runs both ways, a simultaneous system needs to be specified.

Similarly, it has been argued (Pagoulatos and Sorensen (1981) and Martin (1979)) that causality runs both ways among other structural variables such as advertising and concentration. It has been argued that advertising is stimulated by concentration since demand for a product increases as advertising increases, thus leading to a possible increase in market share. On the other hand, it has often been maintained that advertising is a barrier to entry, and hence, is a determinant of higher concentration. Kessides (1986) confirms this barrier to entry hypothesis, but he also presents evidence that entrants perceive a greater likelihood of success in markets where advertising is important. Hence, not only are advertising and concentration simultaneously determined, but also it is not clear whether higher levels of advertising lead to increases or decreases in concentration.

⁶See Commanor and Wilson (1974) and subsequent literature including Demsetz (1979), Hirschey (1981), and Ayanian (1983) for opposing views.

Accepting these arguments dictates the need to specify a three equation simultaneous system when both concentration and profitability are included in the model. Therefore, the model to be specified in detail below takes the general form:

$$\text{Concentration} = f(\text{advertising, vector of exogenous variables}) \quad (2)$$

$$\text{Profitability} = f(\text{concentration, advertising, vector of exogenous variables}) \quad (3)$$

$$\text{Advertising} = f(\text{profitability, concentration, vector of exogenous variables}) \quad (4)$$

The system of equations (1), (2), (3), and (4) are estimated as a block-recursive system. Under a block-recursive system the estimating equations can be separated into blocks where the groups of equations are simultaneous within each block, but recursive across each block. Here equations (2), (3), and (4) constitute one block while equation (1) constitutes the other. Equations (2), (3), and (4) are estimated simultaneously using two-stage least squares and the predicted values for profitability and concentration will be substituted into equation (1) which is then estimated using OLS.⁷ This should eliminate any simultaneous bias present in the model.

The Concentration Equation

The concentration measure to be used here is the Census of Manufactures's concentration ratio representing the combined market share of the top four firms at the SIC four digit level. As indicated

⁷It is assumed that the error terms in equation (1) are not correlated with the error terms in equations (2), (3), and (4).

in Weiss (1974), the Census industries often do not reflect actual economic markets. There may actually be interindustry competition among separate Census industries that compete in the same economic market, and secondly, foreign trade may hamper the accuracy of the Census data since concentration figures only represent domestic shipments in the United States. Despite these problems, the four firm concentration ratio is used due to its availability at the SIC four digit level and its acceptance in the literature.

Many studies of concentration (such as Ornstein et al. (1973)) begin with the proposition that given perfectly competitive markets in long-run equilibrium, the number of firms is determined by the efficient scale of the firm relative to the total size of the market. Therefore, the size of the market is inversely related to concentration while the efficient scale of the firm is directly related to concentration. Market size here is proxied by the value of shipments (VOS) in each industry. Several alternative measures of minimum efficient scale (MES) have been used in the literature.⁸ Each of these measures utilizes Census establishment data. Given the firm level data in the SBA data base an alternative measure for MES similar to that of Kessides (1986) is employed. Specifically, MES is proxied by the average sales of a firm in industry i . A log transformation for both VOS and MES is used.

Not only is the size of the market and the minimum efficient scale of the firm controlled for, but also a cost disadvantage ratio (CDR) is

⁸For instance see Orr (1974), Turner (1980), Pugel (1980), Duetsch (1984b) and MacDonald (1986).

included to account for cost disadvantages suffered by firms of less than efficient scale. The CDR is calculated by dividing the value added per employee for large firms by the value added per employee for small firms.⁹ The expectation is that the greater the cost advantage is for large firms the higher would be the level of concentration.

Two additional variables are included in the concentration equation. The first is the advertising to sales ratio (ADV) to proxy advertising intensity in each industry. The affect of this variable cannot be predicted a priori. If advertising presents a barrier to entry then the expected sign would be positive. On the other hand, if potential entrants perceive a high level of advertising as correlated with a greater chance of success in the industry, then a higher level of advertising could have a negative effect on concentration. The second variable is the growth rate of output (GROWTHa) measured as the percentage change in the value of shipments between 1972 and 1977. Positive growth could represent two possibilities. First, growth in the size of the market could represent an expansion in market share by a few large companies in an oligopolistic industry. Second, the growth in output could represent an influx of new entrants and a decrease in concentration. Hence, there is no a priori expectation on the growth variable. The resulting concentration equation, including the expected signs, is specified as:

⁹ A large firm is assumed to have 100 or more employees.

$$CR4_i = \alpha_0 + \alpha_1 LVOS_i + \alpha_2 LMES_i + \alpha_3 CDR_i + \alpha_4 ADV_i + \alpha_5 GROWTHa_i + \varepsilon_i \quad (5)$$

(-) (+) (+) (?) (?)

A listing of the variables and their sources can be found in Table 2.1.

The Profitability Equation

When considering profitability in economic research there are two sources from which an industry's profitability is ascertained. First is the rate-of-return on equity (or assets) less taxes that is gathered from corporate reports or from Internal Revenue Service data. The problem with these rate-of-return measures is that various accounting practices can introduce biases into the values used in measuring profitability. For instance, assets may be valued at their original cost, thus not taking into account the presence of inflation. Secondly, assets might be written up or down, if, for instance, they have changed hands or the investment turned out badly. Also, it may be possible to use accounting methods which understate true profits for other reasons.

The other method for measuring profitability is the price-cost margin (PCM) calculated from Census data. Weiss (1974) favors this method as long as some account is taken of the capital differences among industries. He argues that "[t]he 'price-cost margin' seems closer to a measure of the relation price to marginal cost than the other measures used" (p. 199).¹⁰

The profit measure to be employed in this chapter is a variation of the standard price-cost margin similar to the one employed by Kessides

¹⁰For a counter-argument on PCM's see Liebowitz (1982).

Table 2.1

The Concentration Equation
Variable Definitions and Sources

Variables	Source
$CR4_i$ = Four firm concentration ratio in industry i	(1)
$LVOS_i$ = Log of value of shipments in industry i	(1)
$LMES_i$ = Log of average sales per firm in industry i	(2)
CDR_i = Ratio of the value added per employee of large firms to that of small firms in industry i	(1)
ADV_i = Advertising to sales ratio in industry i	(3)
$GROWTHa_i$ = Percentage change in the value of shipments in industry i between 1972 and 1977	(1)

Sources

1. 1977 Census of Manufactures
2. Small Business Administration Data Base
3. The Detailed Input-Output Structure of the U.S. Economy, 1977

(1986). Specifically, a modified version of the traditional PCM for each industry is given by: $PCM = (VA - PAY - SUP - KCOST) / VOS$, where VA = value added; PAY = payroll; SUP = supplemental payroll costs; KCOST = the cost of capital; and VOS = industry sales. The cost of capital measure is calculated by accounting for the opportunity cost of capital (assumed here to be 8%) and the rate of depreciation.¹¹

Higher profit levels may be maintained if barriers to entry can be erected in an industry. Theory suggests that advertising could be one such barrier. Also, as argued earlier, advertising should be more intense as higher profits are realized. Therefore, advertising should have a positive influence on profits.

Another factor that is likely to affect profits in an industry is its level of concentration (CR4) proxied here by the Census four firm concentration ratio. Concentration could conceivably influence profits in two ways. First, higher levels of concentration might increase firm interdependence and possible collusion among firms that might lead to higher profits in the industry. Alternatively, the so called efficient structure hypothesis (Demsetz (1973), McGee (1974), Peltzman (1977), and Brozen (1982)) contends that industry concentration is not a random

$$^{11}K COST = [(.08 + DCBS / GVDABS) * GVDABS] + [(.08 + DCME / GVDAME) * GVDAME]$$

where

DCBS = depreciation charges for buildings and structures
 DCME = depreciation charges for machines and equipment
 GVDABS = gross value of depreciable assets--buildings and structures
 GVDAME = gross value of depreciable assets--machines and equipment

All values from the 1977 Census of Manufactures.

event, but, on the contrary, the result of the superior efficiency of some firms. Firms that are more efficient than their rivals obtain a higher market share, and consequently, higher concentration results. Therefore, the efficient structure school contends that no relationship between concentration and profits exists.¹² Given this ongoing debate over the concentration-profits relationship, this coefficient has a non-negative expectation.

Two more variables are used in the profit equation. First, the growth rate in output (GROWTHa) is expected to have a positive influence on profits. Growth in output (as defined above) could reflect either an increase in demand or a decrease in costs both of which are likely to lead to higher profits. Second, a capital to output ratio, calculated as the gross value of depreciable assets divided by the value of shipments (KS), is used in the equation to control for differences in capital intensity across industries.

The profitability equation, including the expected signs, is therefore specified as:

$$\text{PCM}_i = \gamma_0 + \gamma_1 \text{ADV}_i + \gamma_2 \text{CR}^4_i + \gamma_3 \text{GROWTHa}_i + \gamma_4 \text{KS}_i + \epsilon_2 \quad (6)$$

(+) (≥0) (+) (+)

A listing of the variables and their sources can be found in Table 2.2.

The Advertising Equation

Advertising intensity is measured by the advertising to sales ratio (ADV) that is found in the Detailed Input-Output Structure of the U.S.

¹²For a discussion of this debate see Smirlock, Gilligan, and Marshall (1985).

Table 2.2
The Profitability Equation
Variable Definitions and Sources

Variables	Source
PCM_i = Price-cost margin in industry i	(1)
ADV_i = Advertising to sales ratio in industry i	(2)
$CR4_i$ = Four firm concentration ratio in industry i	(1)
$GROWTHa_i$ = Percentage change in the value of shipments in industry i between 1972 and 1977	(1)
KS_i = Capital to sales ratio in industry i	(1)

Sources

1. 1977 Census of Manufactures
2. The Detailed Input-Output Structure of the U.S. Economy, 1977

Economy for 1977. As indicated by the result in Dorfman and Steiner (1954), a higher level of concentration should lead to higher levels of advertising since, as Strickland and Weiss (1976) argue, "... the price elasticity of the demand curve faced by a firm is lower in more concentrated industries..." (p. 1109). Moreover, a higher level of concentration should lead to more advertising because as industries become more oligopolistic, advertising may become more of a weapon of rivalry than price competition.

Following Schmalensee (1972), who suggests that higher profits may indeed induce greater advertising intensity, the price-cost margin (PCM) described earlier is included in the equation with an expected positive influence on advertising intensity. Growth (as defined above) is also included in the advertising equation with an expected positive influence. As an industry is experiencing growth, likely from the introduction of a new product, advertising will be heavily employed. Also with demand growth, profits are likely to be higher to finance further advertising.

Therefore, the advertising equation, including the expected signs, is specified as:

$$\text{ADV}_i = \delta_0 + \delta_1 \text{CR4}_i + \delta_2 \text{PCM}_i + \delta_3 \text{GROWTH}_i + \varepsilon_i \quad (7)$$

(+) (+) (+)

A listing of the variables and their sources can be found in Table 2.3.

The Exit Equation

The estimation of principal interest in this chapter is the exit equation. As discussed earlier, the determinants of firm exit are modeled in an open economy. Two such determinants, profitability and

Table 2.3
The Advertising Equation
Variable Definitions and Sources

Variables	Source
ADV_i = Advertising to sales ratio in industry i	(1)
$CR4_i$ = Four firm concentration ratio in industry i	(2)
PCM_i = Price-cost margin in industry i	(2)
$GROWTHa_i$ = Percentage change in the value of shipments in industry i between 1972 and 1977	(2)

Sources

1. The Detailed Input-Output Structure of the U.S. Economy, 1977
2. 1977 Census of Manufactures

concentration, are first estimated simultaneously and then their predicted values are substituted into the exit equation. A firm's profitability is a very important determinant in the exit decision. As a firm fails to maintain an acceptable profit level it will decide to leave the industry. Thus, an inverse relationship between profitability and firm exit is expected.

The degree of concentration within an industry should be an important determinant of firm exit. In an industry that is highly concentrated, the firms are likely to be older and established. These industries are not likely to experience much dramatic change. On the other hand, industries that are highly concentrated are likely to be dominated by a few firms, and thus, much of the activity (entry and exit) is probably occurring on the competitive fringe. Therefore, the affect of the degree of concentration on industry firm exit is not hypothesized a priori.

The minimum efficient scale (MES) of operation in an industry is an important factor in the exit decision of a firm. Industries with a high MES are likely to be more capital intensive in nature. In these industries firms will resist exit as long as possible in order to minimize possible losses reflected in their sunk costs. Similarly, in industries with a relatively low efficient scale of operation, exit will be more likely because of the higher ease of exit. This higher ease of exit may stem from the fact that sunk costs may be lower in low MES industries, and consequently, the cost of exit is lower. MES is proxied by the average sales of a firm in industry i as before.

Another important determinant of firm exit is the displacement of incumbent firms by new entrants. This issue is dealt with by Gabszewicz

and Thisse (1980), and they demonstrated that displacement, at least theoretically, does occur. To test whether this actually occurs, gross firm entry into industry i (over the same period as firm exit) is included in the model. Entry should be positively related to firm exit.

Two more important elements of industry structure are employed as determinants of firm exit. First, industry growth (GROWTH) is an important factor that is likely to affect firm exit. Both theoretical and empirical evidence showing that industry growth positively influences entry has recently been presented (Hause and DuRietz (1984)). Conversely, firm exit and industry growth should be inversely related. Industry growth is calculated as the percentage change in the value of shipments between 1977 and 1982 for industry i . Second, to control for differences in industry size, the number of firms in an industry in 1977 is included. A firm here is defined as an entity that controls one or more establishments. This measure of firms closely corresponds to the definition of a firm from the SBA data base. The expectation is that larger industries will experience more exit.

The above specification is the basic model of the determinants of firm exit in the United States domestic economy. But, as was indicated in the previous section, international trade flows can have a significant impact on domestic market structure. Therefore, several measures of international trade flows will be included in the model.

A potentially important determinant of firm exit is the level of imports (M) entering the domestic economy. The level of imports is proxied by the change in the value of imports between 1980 and 1984. As import competition increases in an industry, it may become more difficult for domestic firms to survive. On the other hand, higher

import levels can be tolerated in a growing market without inducing firms to exit. Thus, a non-negative relationship between the level of imports and firm exit is expected. Similarly, the effect of imports from various subsets of countries is tested. The subsets that are tested include: developed countries--Australia, Belgium, Canada, France, West Germany, Japan, Netherlands, Sweden, Switzerland, United Kingdom (G10); and newly industrializing countries¹³--Brazil, Columbia, Hong Kong, Mexico, Philippines, Singapore, South Korea, and Taiwan (NIC). As in the case for all imports, the change in the value of imports between 1980 and 1984 from each of these country groups is tested to ascertain the impact that their imports have on U.S. firm exit.

In this specification, the role of exports is not explicitly included in the model for two fundamental reasons. First, data on industry exports were not readily available for inclusion in the model. Second, the effects of exports on domestic firm exits are assumed to be captured by variables that are included in the model. In particular, exports should be proxied well by accounting for industry growth. Where export activity is high, it is quite likely to be reflected in industry growth, a variable included in the model. Hence, it is assumed in this

¹³The definition of a NIC will follow that of Balassa (1981) and Mathieson (1979). Balassa (1981) defines a NIC as having per-capita income between \$1100 and \$3500 in 1978, and a manufacturing sector which represents at least 20% of gross domestic production in 1977. Mathieson (1979) defines a NIC as a country with rapid economic growth, large diverse industrial sectors, significant trade in the manufacturing sector, and aggressive development strategies. Both studies include all of the NIC's used here except the Philippines and Columbia, but these two are included because of their important role in U.S. trade. Both countries nearly satisfy all of Balassa's criteria.

estimation that the effect of exports on firm exit is accounted for without explicitly including an export measure.

Whether an industry is protected from import competition should play an important role in the survivability of inefficient firms in that industry. Two measures are used to test the importance of protection from imports: tariffs (T) and non-tariff barriers (NTB). First, firm exit should be inversely related to the level of tariff protection. Industries with high tariff rates should experience a persistence of inefficient domestic producers. The official ad valorem tariff rate is employed here. Second, the presence of non-tariff barriers should also be inversely related to firm exit for similar reasoning. To account for NTB's, a dummy variable taking the value of one in the presence of at least one NTB applying to an industry is used. In this model, it is assumed that NTB's are exogenous to the exit phenomenon. However, it could be argued that NTB's may be, in fact, endogenous. In a paper by Marvel and Ray (1983), they examine the determinants of tariffs and NTB's. They find that tariffs and NTB's are complementary. The data used in this model also reveal that those industries with nontariff protection have higher tariff rates. Specifically, in those industries without NTB protection the average tariff rate is 6.9%, while in industries with NTB protection the average tariff rate is 10.3%. Hence, further investigation regarding the nature of NTB's is warranted, however, it is beyond the scope of this research.

The exit equation, including the expected signs, is specified as:

$$X_i = \beta_0 + \beta_1 PCM_i + \beta_2 CR4_i + \beta_3 MES_i + \beta_4 E_i + \beta_5 GROWTH_i + \beta_6 FIRMS_i + \beta_7 M_i^j + \beta_8 T_i + \beta_9 NTB_i + \epsilon_i \quad (8)$$

(-) (?) (-) (+) (-) (+) (≥0) (-) (-)

A list of the variables and their sources can be found in Table 2.4.

Table 2.4
The Exit Equation
Variable Definitions and Sources

Variables	Source
X_i = Gross number of firms that exited industry i between 1978 and 1984	(1)
$\hat{PCM}_i$ = Price-cost margin in industry i (predicted)	(2)
$\hat{CR}_4_i$ = Four firm concentration ratio in industry i (predicted)	(2)
MES_i = Average sales per firm in industry i (millions of dollars)	(1)
E_i = Gross number of firms that entered industry i between 1978 and 1984	(1)
$GROWTH_i$ = Percentage change in the value of shipments in industry i between 1977 and 1982	(3)
$FIRMS_i$ = The number of firms in industry i in 1977	(3)
M_i^j = The value of imports into industry i from country group j (millions of dollars)	(4)
T_i = The official ad valorem tariff rate for industry i	(4)
NTB_i = Non-tariff barrier dummy--1 if at least one NTB is present 0 otherwise	(5)

Sources

1. Small Business Administration Data Base
2. 1977 Census of Manufactures
3. 1982 Census of Manufactures
4. U.S. Imports for Consumption and General Imports, 1980 and 1984
5. UNCTAD data files

IV. The Empirical Results

The 2SLS estimation results for the first block of equations is given in Table 2.5. The values in parentheses are the t-statistics associated with the estimated coefficients. As is evident from the table, most coefficients are statistically significant and are of the hypothesized sign. The estimation was based on a sample of 403 manufacturing industries.

The empirical findings from this model add support to the hypothesized interrelationships and feedback effects between advertising, concentration, and profitability put forth here and by others. The results indicate that profitability exerts a significant influence on advertising intensity, while advertising intensity significantly affects both profitability and concentration. Moreover, concentration exerts an important influence on advertising intensity and profitability.

First, consider the advertising coefficient in the concentration and profitability equations. In the concentration equation, advertising intensity variable has a significant negative coefficient suggesting that higher levels of advertising intensity leads to lower levels of concentration. This is consistent with Kessides's (1986) finding that potential entrants perceive a greater chance of survival in an industry where advertising is important. On the other hand, in the profitability equation, the positive and significant coefficient for advertising is also consistent with Kessides's (1986) finding that advertising may be sunk cost barrier to entry. While it is beyond the scope of this research to resolve this conflict, it should be noted that Kessides (1986) argues that the procompetitive effects of advertising dominate

Table 2.5
Two-Stage Least Squares Estimation
of the Simultaneous System^d

	Endogenous Variables		
	Advertising	Concentration	Price-cost Margin
ADV		-985.64 ^c (-1.82)	4.076 ^a (4.83)
CR4	0.0002 ^b (2.10)		-0.0009 ^c (-1.76)
PCM	0.2498 ^a (5.77)		
GROWTHa	0.0009 (0.83)	1.642 (1.21)	-0.0037 (-0.83)
LMES		9.494 ^a (8.30)	
LVOS		-7.173 ^a (-5.83)	
CDR		43.206 ^a (3.04)	
KS			0.025 (0.79)
Inter- cept	-0.039 ^a (-4.55)	-22.76 ^c (-1.68)	0.152 ^a (9.85)
$\bar{R}^2$	.09	.19	.06
Model F-value	14.96 ^a	19.79 ^a	7.97 ^a

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics are in parentheses

the entry barrier effects of advertising in industries where advertising is important.

Second, consider the concentration coefficient in the advertising and profitability equations. In the advertising equation, concentration has a positive influence on advertising supporting the contention that advertising has become a weapon of rivalry. Conversely, concentration has an unexpected negative influence on margins. This result supports neither the collusion hypothesis nor the efficient structure hypothesis discussed earlier. This result could be an artifact of a single year's (cross-sectional) observation of the PCM. Moreover, this result is not surprising given the mixed results in the literature. For instance, the results of Pugel (1980) and Chou (1986) support the collusion hypothesis. Conversely, Smirlock et al. (1984), Pagoulatos and Sorensen (1981), Martin (1979), and Caves et al. (1975) find either no relationship or a negative effect of concentration on profitability. For an exhaustive review of this relationship prior to 1974, see Weiss (1974).

Finally, consider the PCM coefficient in the advertising equation. As expected, higher profits do indeed induce greater advertising intensity as suggested by Schmalensee (1972). In the concentration equation, both size of the market and MES effect concentration in the expected direction. Also, as evident from the CDR coefficient, in industries where larger firms have a cost advantage over smaller rivals, these industries have a higher level of concentration. Neither growth nor the capital to sales ratio exert any significant influence in the model.

The results for the exit equation are given in Table 2.6.¹⁴ The results are encouraging with many significant coefficients and model F-values significant at the one percent level. Due to the imperfect concordance between import levels and tariff rates recorded at the detailed 7-digit Tariff Schedule of the United States Annotated (TSUSA) and the SIC classification, the sample is limited to 306 manufacturing industries.

The predicted values for margins and concentration both exert a significant influence on firm exit in the hypothesized direction. In industries where profitability is lower the exit of firms is higher. Also, in more concentrated industries there is less exit, perhaps indicating that there is less change in industries with a small number of producers.

To control for differences in the size of industries, the number of firms is included in the estimation. As expected, FIRMS has a positive and significant coefficient indicating that larger industries (in terms of the number of firms) have more exits. The negative sign on the growth variable indicates that in those industries where growth in the value of shipments is declining, the exit of firms is higher. Apparently, MES, as defined here, has little influence on the exit decision.

¹⁴The exit equation was also estimated using the actual values for profitability and concentration. The results were quantitatively similar to these results except for the coefficient on the PCM. This coefficient was statistically significant, but retained the wrong sign. Once simultaneity was controlled for by estimating the model using a block-recursive system, the coefficient on the PCM retained the hypothesized sign and remained statistically significant.

Table 2.6

Estimation of the Exit Equation,
All Manufacturing Industries^{d,e}

	Dependent Variable: Firm Exit (1978-84)			
	(1)	(2)	(3)	(4)
P $\hat{C}M$	-427.25 ^a (-3.67)	-436.25 ^a (-3.74)	-405.42 ^a (-3.19)	-391.79 ^a (-3.10)
C $\hat{R}4$	-2.52 ^a (-4.29)	-2.59 ^a (-4.43)	-2.35 ^a (-3.76)	-2.38 ^a (-3.80)
MES	-0.101 (-0.37)	-0.024 (-0.09)	-0.140 (-0.003)	0.033 (0.13)
E	0.454 ^a (42.33)	0.456 ^a (42.48)	0.456 ^a (40.89)	0.457 ^a (41.03)
GROWTH	-43.35 ^a (-2.57)	-41.60 ^a (-2.47)	-46.38 ^a (-2.52)	-47.41 ^a (-2.58)
FIRMS	0.068 ^a (10.28)	0.068 ^a (10.18)	0.066 ^a (9.42)	0.066 ^a (9.45)
M ^{Total}	0.012 ^b (2.17)			
M ^{G10}		0.011 (1.57)	0.008 (1.11)	
M ^{NIC}			0.050 ^c (1.81)	0.058 ^b (2.19)
T	-0.71 (-0.68)	-0.68 (-0.65)	-0.90 (-0.80)	-0.87 (-0.78)
NTB	27.24 ^b (2.00)	26.34 ^c (1.92)	28.30 ^c (1.94)	25.37 ^c (1.77)
Inter- cept	248.07 ^a (5.52)	253.11 ^a (5.64)	240.43 ^a (4.94)	238.11 ^a (5.63)

Table 2.6 (Continued)

	Dependent Variable: Firm Exit (1978-84)			
	(1)	(2)	(3)	(4)
$\bar{R}^2$	.96	.96	.96	.96
Model F-value	785.3 ^a	781.6 ^a	662.6 ^a	735.5 ^a

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

^eA collinearity diagnostic test derived in Belsley, Kuh, and Welsch (1980) was performed. The condition index value for each of the equations is well below the level they consider indicates that the degree of multicollinearity might be of concern.

Caves and Porter (1976) point out that industries vary in their rates of turnover and use an entry measure to proxy for one of the underlying forces that might speed the rate of exit. Similarly, Shapiro and Khemani (1987) include an entry measure to account for actual displacement of firms caused by successful entry. In both of these studies a significant positive relationship was expected and found. Here actual firm entry is included in the exit equation, and, similarly, a strong positive influence is found. This result suggests that successful entry by new firms fosters the exit of incumbent firms. Specifically, the entry of two new firms, ceterus paribus, leads to the demise of one firm in the manufacturing sector. This result is also consistent with the theoretical findings of Gabszewicz and Thisse (1980).

Now consider the influences of the international variables. Total imports into manufacturing industries, ceterus paribus, has a significant positive influence on firm exit. However, the effect is quantitatively small. Note that the coefficient on M^{Total} indicates that an increase of a million dollars in imports over this period led to .012 manufacturing firm exits, ceterus paribus. This suggests that other factors such as declining industry growth or increased competition from new domestic entrants are the driving force behind exits in manufacturing.

Given the significant positive relationship between imports and firm exit, imports are further disaggregated into more narrow groups of countries to ascertain which sector of imports might exert more influence. The coefficient on imports from the major industrialized countries (G10) is not significantly different from zero. Conversely,

imports from the NIC's seem to exert a much stronger influence on domestic firm exit. The estimated coefficient for the NIC's is much larger relative to that of the major industrialized countries.¹⁵

Specifically, for an increase of a million dollars in imports over this period led to .058 manufacturing firm exits, ceterus paribus. Note that this coefficient is five times as large as the coefficient on M^{Total} .

This result may reflect the NIC's growing threat in this sector of the U.S. economy.¹⁶ However, the presence of multinational firms may soften the threat of imports from the NIC's. As pointed out by Ohmae (1988), when U.S. companies move abroad, not only do they become local producers, but they also become big exporters--often to the U.S. About 20% of U.S. imports come from American affiliates overseas. Also, the U.S. share of manufacturing jobs has held steady over time. For example, among the U.S., Japan, Europe, and the NIC's, America's share of all manufacturing jobs was 27% in 1960 and was 30% in 1986. On the other hand, Europe's share has declined from 51% in 1960 to 32% in 1986. It seems that the European manufacturing sector is suffering more from imports than the American manufacturing sector.

¹⁵ Further results are reported in Table A.1 in the appendix. The imports from NIC's are further disaggregated into those from Asian NIC's (ANIC) and South American NIC's (SNIC). Also, the effect of imports from the U.S.'s five major trading partners (G5) is tested.

¹⁶ Aw and Roberts (1984) examine the rise in importance of imports from NIC's especially into the U.S. manufacturing sector. They show that manufacturing imports from NIC's has grown to about 20% of total U.S. manufactured imports. The increase in imports in manufactures over the 1980-84 period from the NIC's is \$27.2 billion.

The influence of protection in the manufacturing sector is tested with the remaining two variables. First, the tariff rate measure retains the hypothesized sign but is insignificant. This result is not surprising given the low levels of tariffs in the U.S. resulting from recent multilateral trade negotiations such as the Tokyo Round. Second, the NTB variable has a significant coefficient but with an unexpected positive sign. Marvel and Ray (1983) point out that "NTBs were introduced systematically in industries that were becoming increasingly vulnerable to competition from imports" (p. 190). This coupled with recent questions regarding the health of such industries may indicate that industries most susceptible to imports are gaining protection, however, it may not stem exits. Hence, the positive relationship found here may reflect that in declining industries firms are likely to exit regardless of the trade protection they are afforded. Taken together, the results from the international variables suggest that the limitation of imports arising from trade barriers have not significantly deterred the decline of the U.S. manufacturing sector.

V. Extensions and Refinements of the Exit Estimation

In the previous section, it is argued that the overall impact of imports in the manufacturing sector of the U.S. economy is small. However, some manufacturing industries, such as automobiles and steel, have experienced stiff competition from imports and have seen significant declines in employment levels in the 1980's. Therefore, in this section, the exit equation is estimated for various subsets of the manufacturing sector in an attempt to pinpoint the impact of imports. This impact is tested for the following subcategories of manufacturing

industries: consumer goods, producer goods, nondurable goods, and durable goods.¹⁷

The results of the consumer versus producer goods bifurcation is presented in Table 2.7. The explanatory power of this estimation is reflected in the high R^2 values and F-values significant at the .01 level. The sample consists of 83 consumer goods industries and 194 producer goods industries. Most of the variables retain their hypothesized sign and are significant. However, in the consumer goods estimation the profitability and concentration measures become insignificant. The variable of particular interest, M^{Total} , is positive and significant in both estimations. In the producer goods estimation, the import coefficient is nearly equal to that reported earlier. In contrast, the import coefficient is nearly twice as large in the consumer goods estimation. This suggests that consumer goods industries feel a greater impact from increased import competition.

In Table 2.8 the results of the nondurable goods versus durable goods estimation is reported. This bifurcation also yields estimations with high explanatory power. The sample consists of 120 nondurable goods industries and 157 durable goods industries. Most of the variables in these estimations retain their hypothesized signs and are significant. However, as before, some coefficients lose their statistical significance. Focusing on the import variable reveals that nondurable goods industries suffer exits due to imports while durable

¹⁷ The classification of industries into these categories follows that of Ornstein (1977).

Table 2.7

Estimation of the Exit Equation,
Consumer versus Producer Goods Industries^{d,e}

	Dependent Variable: Firm Exit (1978-84)	
	Consumer Goods Industries	Producer Goods Industries
P $\hat{C}M$	16.81 (0.12)	-488.63 ^b (-2.52)
C $\hat{R}4$	-0.517 (-0.85)	-2.48 ^a (-2.68)
MES	0.400 (1.06)	-0.230 (-0.61)
E	0.506 ^a (21.50)	0.450 ^a (36.55)
GROWTH	-35.40 (-1.39)	-44.73 ^b (-2.08)
FIRMS	0.173 ^a (9.18)	0.063 ^a (8.21)
M ^{Total}	0.023 ^b (2.42)	0.013 ^c (1.87)
T	1.72 ^b (2.03)	-1.81 (-0.91)
NTB	-13.92 (-1.01)	36.31 ^c (1.85)
Inter- cept	6.68 (0.13)	265.76 ^a (3.69)

Table 2.7 (Continued)

Dependent Variable: Firm Exit (1978-84)		
	Consumer Goods Industries	Producer Goods Industries
$\bar{R}^2$	.97	.96
Model	280.4 ^a	582.5 ^a
F-value		

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

^eA collinearity diagnostic test derived in Belsley, Kuh, and Welsch (1980) was performed. The condition index value for each of the equations is well below the level they consider indicates that the degree of multicollinearity might be of concern.

Table 2.8

Estimation of the Exit Equation,
Nondurable versus Durable Goods Industries^{d,e}

	Dependent Variable: Firm Exit (1978-84)	
	Nondurable Goods Industries	Durable Goods Industries
P $\hat{C}M$	-248.33 ^c (-1.79)	-179.05 (-1.26)
C $\hat{R}4$	-1.46 ^b (-2.09)	-1.25 ^c (-1.85)
MES	0.012 (0.04)	-0.283 (-0.65)
E	0.324 ^a (22.19)	0.648 ^a (37.46)
GROWTH	-19.69 (-0.63)	-100.57 ^a (-6.55)
FIRMS	0.180 ^a (13.94)	0.012 ^b (2.03)
M ^{Total}	0.033 ^a (2.99)	-0.003 (-0.46)
T	0.277 (0.24)	-0.572 (-0.37)
NTB	10.69 (0.62)	30.46 ^c (1.65)
Inter- cept	137.09 ^b (2.35)	144.03 ^a (2.83)

Table 2.8 (Continued)

Dependent Variable: Firm Exit (1978-84)		
	Nondurable Goods Industries	Durable Goods Industries
$\bar{R}^2$	.98	.96
Model	789.0 ^a	465.9 ^a
F-value		

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

^eA collinearity diagnostic test derived in Belsley, Kuh, and Welsch (1980) was performed. The condition index value for each of the equations is well below the level they consider indicates that the degree of multicollinearity might be of concern.

goods industries do not. Note that the magnitude of the import coefficient in the nondurable estimation is roughly three times as large as that reported in Table 2.6.

The coefficients on the import measures presented thus far, however, do not indicate explicitly the effect imports may have on industry sales or on industry employment levels. Therefore, to investigate the magnitude of these effects, the average sales lost to imports per industry and the average number of jobs lost to imports per industry are calculated using the M^{Total} coefficient.¹⁸ While the import coefficient may indicate a small impact overall, some industries may, in fact, be more substantially affected.

In Table 2.9 the sales and employment effects of imports into the manufacturing sector are reported. In the manufacturing sector as a whole, an average of \$298.3 million in sales are lost per industry resulting in an average of 1739 jobs lost per industry due to imports. These results indicate that over this period imports led to a 3.9% decline in manufacturing employment levels. Now consider the manufacturing subcategories defined earlier. Although the coefficients indicated that consumer goods industries experience more exits due to imports, it is the producer goods industries which loose more sales and jobs. Specifically, an average of 2500 jobs are lost in producer goods

¹⁸First the predicted value of firm exit is calculated by multiplying the change in imports by the coefficient on M^{Total} . Then the predicted value of exits is multiplied by the average sales of a firm in each industry to calculate the average sales lost to imports over this period. Finally, the average sales lost to imports is multiplied by the ratio of employees to sales for each industry to arrive at the number of jobs lost due to imports over this period.

Table 2.9
Sales and Employment Losses Due to Imports

	Average Sales Lost due to Imports per Industry (millions of dollars)	Average Employment Lost due to Imports per Industry (number of jobs)
All Manufactures	298.3	1739
Consumer Goods	47.9	773
Producer Goods	449.2	2500
Nondurable Goods	352.1	1715
Durable Goods	a	a
All Manufactures (less ten most impacted industries)	23.0	335

^aThese figures are not calculated due to the statistical insignificance of the import coefficient in this estimation.

industries as compared to 773 in consumer goods industries.

Alternatively, nondurable goods industries are impacted more than consumer goods industries, but less than producer goods industries with an average of 1715 jobs lost due to imports. Durable goods industries are not significantly affected by imports in this estimation.

Now focus on the ten industries that experienced the greatest impact on employment levels. These industries are highlighted in Table 2.10. As is evident from the figures in this table, 81.4% of the jobs lost in the manufacturing sector due to imports over this period occur in these industries. When these industries are removed from the sample, the resulting figures for sales and employment losses due to imports falls dramatically. In particular, an average of \$23 million in sales are lost and an average of 335 jobs are lost to foreign competition. These results indicate that apart from the ten industries listed in Table 2.10, imports over this period resulted in less than a 1% decline in overall manufacturing employment levels. Hence, as implied in the previous section, imports have a small impact on the majority of manufacturing industries.

VI. Summary and Conclusions

In this chapter the determinants of firm exit are investigated for the manufacturing sector of the U.S. economy, which has been subjected to growing international influences. Firm exit is modeled as a function of industry profitability, growth, concentration, MES, and size. To account for new competition in an industry, the number of new entrants is also included. The effects of international competition is captured by including imports into each industry. Protection is accounted for by

Table 2.10

Manufacturing Industries Most Impacted by Imports

SIC code	Industries Most Impacted	Employment Lost (number of jobs)
1. 3711	Motor Vehicles and Passenger Car Bodies	258,330
2. 3312	Steel Works, Blast Furnaces, and Rolling Mills	41,081
3. 3573	Electronic Computing Equipment	30,491
4. 2621	Paper Mills	17,180
5. 3011	Tires and Inner Tubes	16,525
6. 3714	Motor Vehicle Parts and Accessories	15,811
7. 3334	Primary Production of Aluminum	11,470
8. 2911	Petroleum Refining	12,717
9. 3721	Aircraft	9,787
10. 3651	Household Audio and Video Equipment	8,360
TOTAL		421,752

including measures for tariffs and nontariff barriers. This specification may result in a simultaneous bias between the profitability and concentration measures. To correct for this, the model is estimated using a block-recursive system. In the first block, a system of equations that includes profitability, concentration, and advertising as endogenous variables is estimated. Then, the predicted values for profitability and concentration are substituted into the second block consisting of the exit equation.

In the first block, many of the relationships that prior literature posits between profitability, concentration, and advertising are confirmed. Specifically, higher levels of advertising in an industry may signal to potential entrants a higher probability of success. On the other hand, advertising was also a determinant of higher profits, possibly indicating that it is a barrier to entry. Also, the effect of concentration on advertising intensity and profitability seems to suggest that in more concentrated industries, the rivalry among firms becomes more intense. Finally and without surprise, higher profits lead to greater advertising intensity.

The results of the exit equation show that, inter alia, low profitability and declining industry growth contribute to more firm exit. Also, as expected larger industries in terms of number of firms, experience more exits. Finally, a strong factor which seems to foster the exit of incumbent firms is the displacement that occurs with the entry of new firms.

International influences are also seen to have an impact on U.S. manufacturing firm exit. Specifically, imports into an industry have a positive, but rather small quantitative effect on firm exit. When the

impact of imports on manufacturing employment levels is investigated, it is found that imports led to a 3.9% decline in employment levels.

However, when the ten most affected industries are removed from the sample, the impact of imports on the remaining industries falls dramatically. In particular, employment levels decline by less than one percent. Protection by means of tariffs or other measures seem to have little influence on lowering the amount of exit in manufacturing.

CHAPTER 3

FIRM EXIT AND REGIONAL ECONOMIC ACTIVITY

I. Introduction

Urban and regional economic studies are quite often used as a basis for planning studies when addressing public problems such as sluggish regional activity, declining urban centers, and infrastructure needs of a region. For many of these studies, the primary theoretical basis is economic (export) base theory (EBT).¹ This theory is used to analyze the relationships between various sectors of a regional economy. EBT holds that total economic activity, in a region that is open to trade from other regions, will expand or contract in relation to the region's export revenues. More specifically, EBT identifies the increase in receipts from outside a region as the most important factor for regional economic growth. In other words, EBT holds that the export (or basic) sector of economic activity is determined exogenously, while regional (or nonbasic) activity is determined or caused by basic activities. Hence, as Williamson (1975) points out, "[f]or a small open region, export expansion ... is likely to be the dominant influence year after year on the growth of profits in the region both directly and

¹The theory dates back to a series of articles by Richard B. Andrews in Land Economics between May 1953 and February 1956. For an early rigorous treatment of economic base theory see Sirkin (1959). Subsequently, quite a few empirical analyses have drawn upon this theory and Richardson (1978) reviews many of them.

indirectly, through an induced multiple expansion of regional income and local demand" (p. 3).

In this chapter, the economic influence of the basic sector is investigated using a causality framework to ascertain the impact of firm exit in a regional economy. There are several fundamental questions regarding the underlying nature and direction of causality in regional economic activity. For instance, does firm exit out of basic industries cause nonbasic firm exit? Could nonbasic firm exit be causally prior to basic firm exit? To what extent might entry into one region cause exit (or displacement) of firms within that region?²

In this chapter these issues are addressed using the causality framework put forth by Granger (1969, 1980). Attitudes toward the causality framework adopted here vary widely, from those who advocate that it is impossible to define and test causality, to those who view causality more openly, and hence, believe it can be tested. Therefore, in the next section Granger's causality framework will be spelled out in detail along with a discussion of the nature of causality and how it might be determined from statistical inference. In section III, the data and model specification is presented. Following that, in section IV, the empirical results are reported, and finally in section V, the chapter is concluded.

²For complementary work on the entry phenomenon see Mayo and Flynn (1988).

II. The Analytical Framework

The model in this chapter intends to test the causal relationships between basic and nonbasic activity of exiting firms in a regional economy. The definition of causality is critical to the understanding and interpretation of the model. The causality methodology to be used is based on the work of C.W.J. Granger. Specifically, a general definition of causality is put forth by Granger (1980) given these axioms:

Axiom A. The past and present may cause the future, but the future cannot cause the past.

Axiom B. [U_t , all the information in the universe at time t ,] ... contains no redundant information, so that if some variable Z_n is functionally related to one or more variables, in a deterministic fashion, then Z_n should be excluded from ... [U_t].

Axiom C. All causal relationships remain constant in direction throughout time. (p. 330, 335)

Granger's definition of causality asserts "that X_{n+1} will consist of a part that can be explained by some proper information set, excluding Y_{n-j} ($j \geq 0$), plus an unexplained part. If the Y_{n-j} can be used to partly forecast the unexplained part of X_{n+1} , then Y is said to be a prima facie cause of X " (p. 349). In practice the quality of results one gets rests upon the sophistication of the technique chosen. Also, the definition relies heavily on Axiom A, and if one does not accept this axiom then the results are meaningless.

Given this later clarification, a more formal presentation of causality is expressed in Granger (1969). He begins by specifying a general causality model for the two variable case:

$$X_t + b_0 Y_t = \sum_{j=1}^m a_j X_{t-j} + \sum_{j=1}^m b_j Y_{t-j} + \varepsilon'_t \quad (1)$$

$$Y_t + c_0 X_t = \sum_{j=1}^m c_j X_{t-j} + \sum_{j=1}^m d_j Y_{t-j} + \varepsilon''_t \quad (2)$$

where

a_j, b_j, c_j, d_j = coefficients of the time series variables
 $\varepsilon'_t, \varepsilon''_t$ = uncorrelated white noise terms

If $b_0 = c_0 = 0$ then we have the simple causal model. Otherwise instantaneous causality exists in the model. Whether or not instantaneous causality occurs in the model relies on two factors. First, how fast one believes information flows through the economy, and second, the sampling period on which the data is based. For example, if quarterly data are used, the simple causal model may not be sufficient to explain the relationships between the variables. On the other hand, if weekly or even monthly data are used, then the simple causal model is all that would be required. Hence, a nonsimple causal model might be chosen, not because of the underlying economic theory, but because of the data being used.

Granger (1969) begins by assuming that if A_t is a stationary stochastic process, let $\bar{A}_t$ represent the set of past values $\{A_{t-j}, j=1,2,\dots, \infty\}$ and $\bar{\bar{A}}_t$ represent the set of past and present values $\{A_{t-j}, j=1,2,\dots, \infty\}$. Furthermore, let $\bar{A}(k)$ represent the set $\{A_{t-j}, j=k, k+1,\dots, \infty\}$. Denote the optimum, unbiased, least-squares predictor of A_t using the set of values B_t by $P_t(A|B)$. Thus for instance, $P_t(X|\bar{X})$ will be the optimum predictor of X_t using only past X_t . The predictive

error series will be denoted by $\varepsilon_t(A|B) = A_t - P_t(A|B)$. Also, let $\sigma^2(A|B)$ be the variance of $\varepsilon_t(A|B)$. Let U_t represent the series of all available information in the universe accumulated through time t , and let $U_t - Y_t$ denote all this information apart from the specified series Y_t . Granger (1969) then specifies the following causal definitions:

Definition 1: Causality. If $\sigma^2(X|\bar{U}) < \sigma^2(X|\bar{U}-Y)$, we say Y is causing X , denoted by $Y_t \rightarrow X_t$. We say that Y_t is causing X_t if we are better able to predict X_t using all available information than if information apart from Y_t had been used.

Definition 2: Feedback. If

$$\sigma^2(X|\bar{U}) < \sigma^2(X|\bar{U}-Y),$$

$$\sigma^2(Y|\bar{U}) < \sigma^2(Y|\bar{U}-X),$$

we say that feedback is occurring, which is denoted $Y_t \leftrightarrow X_t$, i.e., feedback is said to occur when X_t is causing Y_t and also Y_t is causing X_t .

Definition 3: Instantaneous Causality. If $\sigma^2(X|\bar{U}, \bar{Y}) < \sigma^2(X|\bar{U})$, we say that instantaneous causality $Y_t \rightarrow X_t$ is occurring. In other words, the current value of X_t is better "predicted" if the present value of Y_t is included in the "prediction" than if it is not.

Definition 4: Causality Lag. If $Y_t \rightarrow X_t$, we define the (integer) causality lag m to be the least value of k such that $\sigma^2(X|U-Y(k)) < \sigma^2(X|U-Y(k+1))$. Thus, knowing the values Y_{t-j} , $j = 0, 1, \dots, m-1$, will be of no help in improving the prediction of X_t . (pp. 428-29)

These definitions rest on the assumption that only stationary series are involved. In the nonstationary case, $\sigma^2(X|U)$ etc. will depend on time t and the existence of causality may differ over time.

The model specification of equations (1) and (2) allows for the possibility that X_t causes Y_t , that Y_t causes X_t , that there is bidirectional causality between X_t and Y_t , and that X_t and Y_t are independent of each other. Moreover, causality can occur instantaneously or with a lag. Specifically, if the b_j 's $\neq 0$, for $j > 0$,

then Y_t is said to cause (with a lag) X_t . Similarly, if the c_j 's $\neq 0$, for $j > 0$, then X_t is said to cause (with a lag) Y_t . The temporal variables exhibit instantaneous causality if $b_0 \neq 0$ (for $Y_t \rightarrow X_t$) or $c_0 \neq 0$ (for $X_t \rightarrow Y_t$).

If the coefficients of both equations (1) and (2) are considered together and both b_0 and c_0 are equal to zero, but the b_j 's and c_j 's, for $j > 0$, are nonzero, then the variables exhibit lagged bidirectional causality. Similarly, if the b_j 's and c_j 's, for $j > 0$, remain zero but b_0 and c_0 are nonzero, then the causality is bidirectional and instantaneous.

In his comprehensive work, Zellner (1978) examines the issue of causality and econometrics. He argues that causality should necessarily be considered in the context of an accepted theory. Specifically, he points to the definition proposed by Feigl (1953), "[t]he clarified concept of causality is defined in terms of predictability according to a law [or more generally, a set of laws]" (p. 408). This definition links causality not only to predictability, but also predictability according to a law or set of laws. He examines to what extent causation in the econometrics literature coincides with this definition of causality.

Zellner (1978) comes to several conclusions after reviewing Granger's (1969) causality criteria. First, Zellner argues that, in contrast to Feigl's definition of causality, Granger's definition is not very general and is inapplicable in many circumstances. In particular, Granger's definition simply involves a form of predictability with no mention of economic laws. Second, Zellner points out that other definitions, including Feigl's, do mention both predictability and laws.

Finally, when Granger's causality criteria are put in a form that is operational, various restrictions on economic laws covered by the definition are imposed. He concludes by arguing "that it is preferable to employ a more general definition of causality, such as Feigl's, which imposes only the restriction of predictability on forms of economic laws" (p. 50).³

Granger (1980) counters these arguments by pointing out that when making his definition operational, a particular theory may be helpful. But if the theory is specific in nature, this may be exactly what the causality test was designed to verify. In many fields there are many theories that are generally accepted to be true, whereas in economics such theories are difficult to find. He argues that Zellner (1978) never gives an example of a specific theory or law that is generally accepted by a majority of economists. Granger (1980) contends that one's own personal beliefs about causality testing will determine whether one would test causality based on a particular theory or not.

Temporal analysis of economic base theory has received some attention in the literature. Specifically, Giarrantani and McNelis (1980) test two theoretical structures of regional income determination. They focus on the role of export activity (the economic base) and agglomeration economies (service versus nonservice income) in regional growth. Using Granger's (1969) causality framework, their results suggest little causal interaction between export and residentiary income

³For another critical view of Granger (1969) causality see Jacobs et al. (1979) who contend that it is not possible to infer the direction of causation from observed correlations.

as is suggested by economic base theory, but their results do show strong bidirectional patterns between service and nonservice income. They conclude by contending that "[t]he evidence presented in this paper strongly argues that similar causality tests are warranted whenever sufficient time series permit in order to assess the performance of these theories under alternative measures of associated variables ..." (p. 245). Green and Albrecht (1979) utilize Granger's (1969) causality framework to determine whether it is proper to specify national variables as exogenous to a regional model. They conclude that national variables can usually be treated as distributed lags in a regional model. Specifically, if the region is large, the regional variable may cause the national variable.⁴

McNulty (1977) investigates a test of economic base theory which is designed to produce both short-run and long-run estimates of regional income multipliers. Specifically, he is concerned with the applicability of economic base theory in short-run analysis of economic fluctuations versus its use in the analysis of long-run regional growth. He argues that his results show that economic base theory performed well in the long-run, but provided a poor explanation of short-run regional economic development. Alternatively, Gerking and Isserman (1981) contend that McNulty's (1977) results were misinterpreted and do not actually support the long-run hypothesis. They argue that the bifurcation method used in dividing total economic activity into basic

⁴L'Esperance (1979), commenting on Green and Albrecht (1979), objects to Granger's (1969) methodology for testing causality on grounds similar to Zellner (1978).

and nonbasic activity is critical in determining whether the empirical estimates support either the long-run or short-run hypothesis. Gerking and Isserman (1981) conclude that on balance, McNulty's (1977) results support the short-run hypothesis.

III. The Data and Model Specification

The Granger (1969) causality framework lends itself to testing regional economic activity by regression analysis. Specifically, the causality of firm exit between basic and nonbasic industries is tested. It should be emphasized that the model specified below is not a direct test of EBT, per se; however, it does investigate some of the linkages that are important to understanding the relationship between basic and nonbasic activity. Also, one must recognize that an increase (decrease) in exports can be accommodated by several factors, such as:

- (1) expansion (contraction) within a firm's existing capacity,
- (2) expansion (contraction) of a firm's existing capacity at the same site, or
- (3) firm exit (entry)

Thus, firm exit (entry) is a potentially important part of the linkage between sectors, but it is not the only linkage in a regional economy. Given the general framework of the Granger (1969) analysis, many alternate specifications are possible. Specifically, data are needed which accurately capture firm exit in a regional economy, and the time lags on this data need to be appropriately specified for the given period of analysis.

The data to be utilized are from a unique data base developed by the Tennessee Department of Employment Security and the Center for

Business and Economic Research (CBER) at the University of Tennessee, Knoxville. The data consist of firm entry, firm exit, employment, and wages for all firms complying with the Tennessee Unemployment Insurance Program. The data are for the period 1973-1986 with over 95,000 firms included. For this model quarterly data on firm entries and exits, by SIC industry, are utilized.⁵ Firm entry is defined as the date of first employment by the firm while firm exit is defined as the date of last employment by the firm. Since stationary time series are required for the estimation, the data are seasonally adjusted using the Bureau of Census X-11 Seasonal Adjustment technique, and a time trend variable is included in the estimating equations.

Given these data on firm entries and exits, by SIC 4-digit industry and by county, some level of aggregation, both across industries and geographic regions is necessary to provide a meaningful and consistent examination of causality. It must be recognized that industries constituting the economic base may differ across regions.⁶ Accordingly, some caution should be exercised in extrapolating the results of any given economic base analysis from one region to another. Nevertheless, using the assignment method to provide a partition that is generally consistent with the spirit of economic base theory, as a base case, causality at a statewide level on the basis of manufacturing firms

⁵The actual number of exiting firms is used in the model instead of income and employment levels for these firms because the income and employment data for the 1970's is of unacceptable quality.

⁶For a detailed discussion of the problems in defining the economic base of a community see Tiebout (1962).

representing the basic sector and nonmanufacturing firms representing the nonbasic sector is tested.⁷

The basic exit model and variable definitions are:

$$X_t^{nb} = \alpha_0 + \beta_0 X_t^b + \sum_{j=1}^k \alpha_j X_{t-j}^{nb} + \sum_{j=1}^k \beta_j X_{t-j}^b + \psi T + \varepsilon_t' \quad (3)$$

$$X_t^b = \delta_0 + \gamma_0 X_t^{nb} + \sum_{j=1}^k \delta_j X_{t-j}^b + \sum_{j=1}^k \gamma_j X_{t-j}^{nb} + \psi T + \varepsilon_t'' \quad (4)$$

where

X_t^{nb} = nonbasic firm exit at time t

X_t^b = basic firm exit at time t

T = time trend variable

$\varepsilon_t', \varepsilon_t''$ = error terms

Several more narrow industry and geographic partitions are also considered. In particular, to more narrowly define the nonbasic sector of a region, the nonmanufacturing sector is further disaggregated into the following categories: finance, insurance, and real estate (FIRE); trade (including both wholesale and retail trade); and services. Initially, the relationship between basic firm exit and nonbasic firm exit (including both nonmanufacturing and the above more narrowly defined categories) is tested on a statewide level. Following that,

⁷The assignment method is one of four widely recognized methods for estimating exports in the literature. The other methods include: the location quotient, minimum requirement, and Mathur-Rosen. For a comprehensive treatment of the merits and weaknesses of each method see Isserman (1980).

these relationships are tested in each grand division within the state of Tennessee: east, middle, and west.⁸ Finally, these relationships are also tested in rural versus urban counties.

In the paper by Gabszewicz and Thisse (1980), it is shown, at least theoretically, that the entry of new firms into an industry can cause the exit of incumbents (see Chapter 2 for a more detailed account of this paper). Using Granger's (1969) causality framework it is possible to test whether the displacement of incumbent firms is occurring. Specifically, the model to be tested is:

$$X_t^i = \alpha_0 + \beta_0 E_t^i + \sum_{j=1}^k \alpha_j E_{t-j}^i + \sum_{j=1}^k \beta_j X_{t-j}^i + \psi T + \varepsilon_t''' \quad (5)$$

where

X_t^i = firm exit from industry category i at time t

E_t^i = firm entry into industry category i at time t

T = time trend variable

ε_t''' = error term

Displacement is tested for the industry categories described above in each grand division in Tennessee. Also, in a more narrow geographic specification, displacement in rural versus urban counties in each grand division is tested. A set of descriptive statistics for the variables used in equations (3), (4), and (5) are presented in Tables 3.1, 3.2, and 3.3.

⁸This partition (region) roughly corresponds to the set of counties in the eastern one-third, middle one-third, and western one-third of the state.

Table 3.1

Summary Statistics for Entry and Exit Data, 1973.1-1986.4

Variable	Description	Mean	Minimum Value	Maximum Value	Total
$X_t^{M,S}$	Number of manufacturing firm exits in quarter t, S	104.1	63	200	5828
$X_t^{NM,S}$	Number of nonmanufacturing firm exits in quarter t, S	1707.8	902	3410	95635
$X_t^{F,S}$	Number of FIRE firm exits in quarter t, S	116.6	45	293	6530
$X_t^{T,S}$	Number of trade firm exits in quarter t, S	667.0	338	1225	37353
$X_t^{S,S}$	Number of service firm exits in quarter t, S	487.9	225	905	27321
$X_t^{M,E}$	Number of manufacturing firm exits in quarter t, EGD	36.6	16	77	2051
$X_t^{NM,E}$	Number of nonmanufacturing firm exits in quarter t, EGD	573.6	300	1131	32120
$X_t^{F,E}$	Number of FIRE firm exits in quarter t, EGD	35.9	10	90	2010
$X_t^{T,E}$	Number of trade firm exits in quarter t, EGD	228.7	121	487	12806
$X_t^{S,E}$	Number of service firm exits in quarter t, EGD	161.2	66	310	9027

Table 3.1 (Continued)

Variable	Description	Mean	Minimum Value	Maximum Value	Total
$X_t^{M,M}$	Number of manufacturing firm exits in quarter t, MGD	38.0	18	74	2130
$X_t^{NM,M}$	Number of nonmanufacturing firm exits in quarter t, MGD	549.6	258	1016	30777
$X_t^{F,M}$	Number of FIRE firm exits in quarter t, MGD	41.1	12	113	2303
$X_t^{T,M}$	Number of trade firm exits in quarter t, MGD	214.2	106	359	11995
$X_t^{S,M}$	Number of service firm exits in quarter t, MGD	166.1	77	294	9299
$X_t^{M,W}$	Number of manufacturing firm exits in quarter t, WGD	25.1	13	50	1405
$X_t^{NM,W}$	Number of nonmanufacturing firm exits in quarter t, WGD	470.2	279	934	26330
$X_t^{F,W}$	Number of FIRE firm exits in quarter t, WGD	33.5	14	81	1876
$X_t^{T,W}$	Number of trade firm exits in quarter t, WGD	180.5	102	320	10106
$X_t^{S,W}$	Number of service firm exits in quarter t, WGD	143.5	60	274	8038
$X_t^{M,U}$	Number of manufacturing firm exits in quarter t, U	58.9	31	100	3298

Table 3.1 (Continued)

Variable	Description	Mean	Minimum Value	Maximum Value	Total
$X_t^{NM,U}$	Number of nonmanuf- turing firm exits in quarter t, U	1133.4	621	2242	63471
$X_t^{F,U}$	Number of FIRE firm exits in quarter t, U	92.5	36	247	5179
$X_t^{T,U}$	Number of trade firm exits in quarter t, U	420.6	265	742	23556
$X_t^{S,U}$	Number of service firm exits in quarter t, U	363.9	167	670	20377
$X_t^{M,R}$	Number of manufac- turing firm exits in quarter t, R	40.9	18	94	2288
$X_t^{NM,R}$	Number of nonmanuf- turing firm exits in quarter t, R	460.0	235	874	25759
$X_t^{F,R}$	Number of FIRE firm exits in quarter t, R	18.0	2	43	1010
$X_t^{T,R}$	Number of trade firm exits in quarter t, R	202.7	108	356	11351
$X_t^{S,R}$	Number of service firm exits in quarter t, R	106.9	48	207	5989
$X_t^{Tot,E}$	Total number of firm exits in quarter t, EGD	610.2	316	1208	34171
$X_t^{Tot,M}$	Total number of firm exits in quarter t, MGD	587.6	276	1090	32907

Table 3.1 (Continued)

Variable	Description	Mean	Minimum Value	Maximum Value	Total
$X_t^{\text{Tot},W}$	Total number of firm exits in quarter t, WGD	495.3	292	984	27735
$X_t^{\text{Tot},EU}$	Total number of firm exits in quarter t, EGD, U	438.1	223	899	24531
$X_t^{\text{Tot},MU}$	Total number of firm exits in quarter t, MGD, U	409.0	196	776	22906
$X_t^{\text{Tot},WU}$	Total number of firm exits in quarter t, WGD, U	345.2	185	704	19330
$X_t^{\text{Tot},ER}$	Total number of firm exits in quarter t, EGD, R	172.2	76	341	9645
$X_t^{\text{Tot},MR}$	Total number of firm exits in quarter t, MGD, R	178.6	76	339	10004
$X_t^{\text{Tot},WR}$	Total number of firm exits in quarter t, WGD, R	150.2	88	289	8411
$E_t^{\text{Tot},E}$	Total number of firm entries in quarter t, EGD	920.8	346	3344	51567
$E_t^{\text{Tot},M}$	Total number of firm entries in quarter t, MGD	888.6	313	3064	49760
$E_t^{\text{Tot},W}$	Total number of firm entries in quarter t, WGD	711.7	274	2732	39853
$E_t^{\text{Tot},EU}$	Total number of firm entries in quarter t, EGD, U	669.5	245	2482	37490

Table 3.1 (Continued)

Variable	Description	Mean	Minimum Value	Maximum Value	Total
$E_t^{Tot,MU}$	Total number of firm entries in quarter t, MGD, U	614.6	240	2036	34419
$E_t^{Tot,WU}$	Total number of firm entries in quarter t, WGD, U	511.8	206	1926	28658
$E_t^{Tot,ER}$	Total number of firm entries in quarter t, EGD, R	251.4	93	862	14077
$E_t^{Tot,MR}$	Total number of firm entries in quarter t, MGD, R	273.9	73	1028	15341
$E_t^{Tot,WR}$	Total number of firm entries in quarter t, WGD, R	199.9	62	806	11197
$E_t^{M,E}$	Number of manufacturing firm entries in quarter t, EGD	59.9	24	340	3353
$E_t^{NM,E}$	Number of nonmanufacturing firm entries in quarter t, EGD	861.0	322	3004	48214
$E_t^{F,E}$	Number of FIRE firm entries in quarter t, EGD	56.3	15	292	3155
$E_t^{T,E}$	Number of trade firm entries in quarter t, EGD	344.1	149	1402	19272
$E_t^{S,E}$	Number of service firm entries in quarter t, EGD	277.3	76	759	15531
$E_t^{M,M}$	Number of manufacturing firm entries in quarter t, MGD	60.9	22	354	3413

Table 3.1 (Continued)

Variable	Description	Mean	Minimum Value	Maximum Value	Total
$E_t^{NM,M}$	Number of nonmanufacturing firm entries in quarter t, MGD	827.6	291	2710	46347
$E_t^{F,M}$	Number of FIRE firm entries in quarter t, MGD	65.1	17	336	3644
$E_t^{T,M}$	Number of trade firm entries in quarter t, MGD	307.9	133	1181	17241
$E_t^{S,M}$	Number of service firm entries in quarter t, MGD	283.5	74	943	15878
$E_t^{M,W}$	Number of manufacturing firm entries in quarter t, WGD	40.3	18	286	2255
$E_t^{NM,W}$	Number of nonmanufacturing firm entries in quarter t, WGD	671.4	256	2446	37598
$E_t^{F,W}$	Number of FIRE firm entries in quarter t, WGD	47.6	17	295	2664
$E_t^{T,W}$	Number of trade firm entries in quarter t, WGD	255.2	114	1108	14289
$E_t^{S,W}$	Number of service firm entries in quarter t, WGD	230.7	63	1084	12920

Note: S= statewide
 EGD= east grand division
 MGD= middle grand division
 WGD= west grand division
 U= urban areas
 R= rural areas

Table 3.2

Employment and Income Summary Statistics for Entry Data^a

Industry	Average New Employment	First-Year Average Nominal Wage Rate per Employee for Entrants in 1985
Manufacturing	18.7	\$12,861
Nonmanufacturing	3.7	14,936
FIRE	2.4	20,372
Trade	3.9	14,933
Services	3.7	15,426

^aThese data are from Fox, et al. (1987).

Table 3.3

Employment and Income Summary Statistics for Exit Data^a

Industry	Average Employment Loss	Average Nominal Wage Rate per Employee for 1985 Exits
Manufacturing	8.5	\$14,234
Nonmanufacturing	2.5	12,541
FIRE	1.8	16,635
Trade	2.7	12,504
Services	2.4	12,419

^aThese data are from Fox, et al. (1987).

Given the specified equations above: (3), (4), and (5), a lag structure needs to be chosen that best fits the model. Given the nature of the data, the time frame specified, and the desire to conserve degrees of freedom, the independent variable is lagged 4, 6, and 8 quarters, while the dependent variable is lagged 4 quarters. On the question of specifying a lag length, Holmes and Hutton (1986) argue that Granger's (1980) definition of causality (see page 58) "... implies that if Y is truly not a prima facie cause of X then a variation in lag structure, j, will not produce a prima facie causal relationship. Consequently, a finding of statistically significant correlation between the dependent variable and causal regressors for any particular lag length is by definition evidence of prima facie causal relationship" (p. 1).

IV. The Empirical Results

Statewide

The results from the basic exit model are reported in Table 3.4. Both the R^2 's and the F-statistics indicate that the explanatory power of the overall models is quite good. Because the validity of causality tests is particularly vulnerable to the presence of serial correlation, a test suggested by Durbin (1970) is performed. Specifically, $\hat{\epsilon}_t$ is regressed on $\hat{\epsilon}_{t-1}$, the lagged dependent variable, and the set of remaining explanatory variables. In no case was the presence of serial correlation detected.

The estimations in Table 3.4 indicate the presence of both instantaneous and lagged causality from manufacturing firm exit to

Table 3.4
Statewide:
Nonmanufacturing - Manufacturing^d

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	15.07 ^a (10.47)	14.98 ^a (10.22)	15.01 ^a (9.57)			
X_t^{NM}				0.05 ^a (10.47)	0.05 ^a (10.02)	0.05 ^a (9.44)
X_{t-1}^{NM}	0.14 (1.01)	0.03 (0.17)	0.03 (0.17)	-0.01 (-0.72)	-0.003 (-0.33)	-0.003 (-0.36)
X_{t-2}^{NM}	-0.21 (-1.57)	-0.23 (-1.59)	-0.27 (-1.63)	0.02 ^b (2.00)	0.02 ^b (2.11)	0.02 ^b (2.03)
X_{t-3}^{NM}	0.29 ^b (2.07)	0.23 (1.55)	0.19 (1.13)	-0.01 (-1.64)	-0.01 (-1.37)	-0.10 (-1.17)
X_{t-4}^{NM}	-0.32 ^b (-2.20)	-0.30 ^b (-1.99)	-0.31 ^c (-1.84)	0.02 ^a (2.72)	0.02 ^b (2.62)	0.02 ^b (2.49)
X_{t-5}^{NM}					-0.001 (-0.11)	-0.001 (-0.08)
X_{t-6}^{NM}					-0.01 (-0.94)	-0.01 (-0.93)
X_{t-7}^{NM}						-0.002 (-0.42)
X_{t-8}^{NM}						0.003 (0.56)
X_{t-1}^M	-1.79 (-0.77)	0.25 (0.09)	0.14 (0.05)	0.09 (0.70)	0.06 (0.42)	0.06 (0.38)
X_{t-2}^M	5.44 ^b (2.34)	5.75 ^b (2.21)	6.20 ^b (2.19)	-0.31 ^b (-2.34)	-0.34 ^b (-2.45)	-0.34 ^b (-2.26)
X_{t-3}^M	-5.03 ^b (-2.01)	-4.11 (-1.58)	-1.12 (-1.12)	0.25 ^c (1.71)	0.22 (1.45)	0.19 (1.16)

Table 3.4 (Continued)

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	9.11 ^a (3.34)	8.40 ^a (3.00)	8.66 ^b (2.64)	-0.61 ^a (-4.22)	-0.59 (-3.94)	-0.59 ^a (-3.64)
X_{t-5}^M		2.19 (1.28)	2.16 (1.20)			
X_{t-6}^M		0.49 (0.27)	0.49 (0.27)			
X_{t-7}^M			0.72 (0.39)			
X_{t-8}^M			-0.04 (-0.02)			
Intercept	-519.54 ^b (-2.02)	-700.77 ^b (-2.15)	-755.22 ^c (-1.91)	49.41 ^a (3.74)	51.79 ^a (3.52)	51.21 ^a (3.08)
T	2.01 (0.65)	0.34 (0.10)	-0.19 (-0.05)	0.02 (0.10)	0.09 (0.46)	0.09 (0.37)
$\bar{R}^2$	.84	.83	.80	.80	.79	.77
Model F-value	27.90 ^a	20.24 ^a	14.67 ^a	21.64 ^a	16.59 ^a	12.42 ^a
F-test for lagged causality	4.19 ^a	2.31 ^c	1.25	3.06 ^b	1.97	1.22

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

nonmanufacturing firm exit.⁹ The coefficient on X_t^M , which is the indicator of instantaneous causality, is quite large relative to the average number of nonmanufacturing firm exits per quarter as compared to the coefficient on X_t^{NM} relative to the average number of manufacturing firm exits per quarter, and statistically significant. The test of causality from the lagged values of X^M also indicates lagged causality from X^M to X^{NM} . Specifically, the F-statistic for the set of X^M 's lagged one year is significant at the .01 level. No coefficients on individual X^M variables that are lagged more than one year are significant. Thus, it appears that the impact of manufacturing firm exit is felt largely within the year following exit.

In the latter columns of Table 3.4, (equations (4), (5), and (6)), both instantaneous and lagged causality are indicated in the estimation of manufacturing firm exit. Note that although statistically significant, the quantitative impact of nonmanufacturing firm exit on manufacturing firm exit is quite small relative to the average number of

⁹The basic exit model is estimated with variations on how the basic sector is defined to test the sensitivity of the bifurcation method used here. These results are reported in the appendix. In the first variation, presented in Table A.2, agricultural, mining, and manufacturing firms are included in the basic sector. In the second variation, presented in Table A.3, agricultural, mining, and those manufacturing firms which ship more than 25% of their output out of the East South Central (ESC) census region are included in the basic sector. Finally, a third variation is presented in Table A.4, where agricultural, mining, and those manufacturing firms which ship more than 50% of their output out of the ESC census region are included in the basic sector. In no case did these results differ greatly from those reported in Table 3.4. Thus, approximating the basic sector with manufacturing firms and the nonbasic sector with nonmanufacturing firms is an acceptable bifurcation of firms in a regional economy when investigating economic base theory issues.

manufacturing exits per quarter. Indeed, the short-run (within one quarter) response by manufacturing firms to an exit by a nonmanufacturing firm is only .05, whereas when a manufacturing firm exits its impact is much greater, causing fifteen nonmanufacturing firms to exit. As before, the lagged effects of nonmanufacturing firm exit seem to disappear after four quarters.

Now consider the employment and income implications resulting from the loss of a manufacturing firm. On average, the size of a manufacturing firm at the time of its exit is 8.5 employees, while for a nonmanufacturing firm it is 2.5 employees. Therefore, when a manufacturing firm exits, there is, on average a loss of about thirty-eight nonmanufacturing jobs immediately and about sixty when cumulative effects are considered (i.e., when all statistically significant coefficients are taken into account). Conversely, when a nonmanufacturing firm exits there is on average a loss of .43 jobs. On average, the nominal wage rate in 1985 was \$14,234 per employee for manufacturing firms and \$12,541 per employee for nonmanufacturing firms. The impact on income of each manufacturing firm exit in the short-run is \$477 thousand and \$752 thousand when lagged effects are considered. The income effect of a nonmanufacturing firm exit is, on average, \$6,121. On average 6831 nonmanufacturing firms exited per year over the period with an average loss of income (based on 1985 income levels) of \$214.2 million.¹⁰ To the extent that exits occurring in the basic sector are

¹⁰This must be balanced with the fact that there was an average of 10106 nonmanufacturing entrants per year over this same period with an
(Footnote Continued)

causing exits in the nonbasic sector, it is evident that the negative impacts resulting from such exits will be felt in the regional economy.¹¹

To ascertain the effects of manufacturing firm exit on more narrow areas of the nonbasic sector, nonmanufacturing is disaggregated into three categories: finance, insurance, and real estate (FIRE), trade (including both wholesale and retail trade), and services. The results from these estimations are given in Tables 3.5, 3.6, and 3.7, respectively. The relationship between manufacturing firm exit and these categories of nonmanufacturing exhibits both a strong bidirectional instantaneous causal effect, and a lagged effect of manufacturing firm exit on the exit of firms from these more narrowly defined categories.

First, consider the relationship between manufacturing exit and FIRE exit. In the short-run, the exit of one manufacturing firm causes the exit of about 1.5 FIRE firms. Also, the lagged effect of manufacturing exit is significant for four quarters, but not longer than that. The effect of FIRE exit on manufacturing exit, although statistically significant, is quantitatively small relative to the

(Footnote Continued)

average first year employment of 3.7 workers, and paying (in 1985) an average of \$14,936.

¹¹The employment and income effects associated with firm exit (here and below) should be interpreted with caution, in particular, they should not be construed as traditional regional multipliers, since they do not account for employment and income changes in surviving firms. Moreover, the firm, employment, and income comparisons highlighted here and below among the various industry and geographic sectors should be interpreted with caution since statistical tests are not performed to test their differences.

Table 3.5

Statewide:
Finance, Insurance and Real Estate - Manufacturing^d

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	1.49 ^a (8.00)	1.48 ^a (7.73)	1.46 ^a (7.33)			
X_t^F				0.41 ^a (8.00)	0.41 ^a (7.45)	0.41 ^a (6.97)
X_{t-1}^F	0.01 (0.04)	-0.09 (-0.56)	-0.12 (-0.71)	0.05 (0.68)	0.07 (0.86)	0.06 (0.63)
X_{t-2}^F	0.11 (0.77)	0.06 (0.41)	0.002 (0.01)	-0.03 (-0.34)	-0.02 (-0.28)	-0.03 (-0.35)
X_{t-3}^F	0.37 ^b (2.53)	0.32 ^b (2.12)	0.25 (1.45)	-0.18 ^b (-2.28)	-0.16 ^c (-1.91)	-0.17 ^c (-1.91)
X_{t-4}^F	-0.26 ^c (-1.70)	-0.23 (-1.45)	-0.26 (-1.51)	0.11 (1.31)	0.10 (1.16)	0.11 (1.21)
X_{t-5}^F					0.03 (0.58)	0.03 (0.58)
X_{t-6}^F					-0.03 (-0.60)	-0.03 (-0.56)
X_{t-7}^F						-0.04 (-0.71)
X_{t-8}^F						0.07 (1.21)
X_{t-1}^M	-0.02 (-0.07)	0.19 (0.58)	0.19 (0.56)	-0.03 (-0.21)	-0.05 (-0.28)	-0.05 (-0.27)
X_{t-2}^M	-0.08 (-0.29)	0.01 (0.02)	0.08 (0.26)	0.05 (0.35)	0.04 (0.23)	0.08 (0.46)
X_{t-3}^M	-0.68 ^b (-2.25)	-0.62 ^c (-1.98)	-0.44 (-1.26)	0.34 ^b (2.11)	0.30 ^c (1.74)	0.28 (1.49)

Table 3.5 (Continued)

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.76 ^b (2.41)	0.66 ^c (2.00)	0.72 ^c (2.03)	-0.41 ^b (-2.47)	-0.39 ^b (-2.23)	-0.38 ^c (-1.99)
X_{t-5}^M		0.29 (1.34)	0.28 (1.25)			
X_{t-6}^M		0.10 (0.47)	0.10 (0.42)			
X_{t-7}^M			0.27 (1.17)			
X_{t-8}^M			0.15 (0.64)			
Intercept	-56.26 (-1.51)	-91.03 ^c (-1.97)	-128.29 ^b (-2.29)	56.50 ^a (3.13)	56.78 ^a (2.76)	54.79 ^b (2.34)
T	-0.14 (-0.36)	-0.52 (-1.12)	-0.89 (-1.59)	0.32 (1.67)	0.35 (1.45)	0.30 (0.96)
$\bar{R}^2$	.69	.75	.75	.76	.76	.76
Model F-value	12.33 ^a	9.12 ^a	6.94 ^a	12.94 ^a	9.80 ^a	7.56 ^a
F-test for lagged causality	2.81 ^b	1.60	1.05	1.93	1.20	0.83

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.6

Statewide:
Wholesale and Retail Trade - Manufacturing^d

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	4.80 ^a (8.60)	4.81 ^a (8.37)	4.79 ^a (7.76)			
X_t^T				0.13 ^a (8.60)	0.14 ^a (8.15)	0.14 ^a (7.93)
X_{t-1}^T	0.28 ^c (1.98)	0.21 (1.27)	0.19 (1.09)	-0.03 (-1.27)	-0.03 (-0.95)	-0.03 (-0.92)
X_{t-2}^T	-0.08 (-0.53)	-0.09 (-0.55)	-0.12 (-0.71)	0.01 (0.50)	0.02 (0.75)	0.02 (0.92)
X_{t-3}^T	0.32 ^b (2.21)	0.28 ^c (1.86)	0.29 ^c (1.69)	-0.04 (-1.52)	-0.03 (-1.35)	-0.04 (-1.34)
X_{t-4}^T	-0.09 (-0.58)	-0.04 (-0.28)	-0.03 (-0.18)	0.03 (1.29)	0.03 (1.05)	0.03 (0.93)
X_{t-5}^T					0.003 (0.16)	0.001 (0.06)
X_{t-6}^T					-0.01 (-0.45)	-0.01 (-0.52)
X_{t-7}^T						-0.002 (-0.10)
X_{t-8}^T						0.02 (1.12)
X_{t-1}^M	-1.39 ^c (-1.68)	-0.93 (-0.98)	-0.81 (-0.80)	0.18 (1.30)	0.15 (1.03)	0.15 (0.94)
X_{t-2}^M	0.83 (0.99)	0.83 (0.88)	1.05 (1.04)	-0.08 (-0.60)	-0.12 (-0.81)	-0.92 (-0.92)
X_{t-3}^M	-1.88 ^b (-2.14)	-1.71 ^c (-1.89)	-1.71 (-1.66)	0.25 (1.64)	0.24 (1.53)	0.22 (1.33)

Table 3.6 (Continued)

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	2.00 ^b (2.17)	1.69 ^c (1.73)	1.57 (1.40)	-0.44 ^a (-3.02)	-0.41 ^b (-2.66)	-0.40 ^b (-2.42)
X_{t-5}^M		0.42 (0.62)	0.44 (0.63)			
X_{t-6}^M		-0.17 (-0.25)	-0.09 (-0.13)			
X_{t-7}^M			-0.09 (-0.13)			
X_{t-8}^M			-0.43 (-0.59)			
Inter- cept	-48.44 (-0.51)	-41.30 (-0.37)	-6.10 (-0.05)	32.97 ^b (2.19)	30.00 ^c (1.80)	23.04 (1.27)
T	-0.78 (-0.68)	-1.04 (-0.78)	-0.83 (-0.55)	0.29 (1.55)	0.32 (1.47)	0.24 (0.91)
$\bar{R}^2$	.78	.81	.80	.79	.79	.79
Model F-value	18.95 ^a	13.27 ^a	9.27 ^a	15.31 ^a	11.71 ^a	9.12 ^a
F-test for lagged causality	2.48 ^c	1.06	0.37	1.07	0.74	0.56

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.7

Statewide:
Health and Nonhealth Services - Manufacturing^d

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	2.93 ^a (8.32)	2.91 ^a (7.63)	2.97 ^a (7.77)			
X_t^S				0.21 ^a (8.32)	0.22 ^a (7.99)	0.22 ^a (7.95)
X_{t-1}^S	0.27 ^c (1.85)	0.26 (1.60)	0.22 (1.31)	-0.09 ^b (-2.47)	-0.09 ^b (-2.32)	-0.09 ^b (-2.31)
X_{t-2}^S	-0.22 (-1.57)	-0.23 (-1.44)	-0.22 (-1.36)	0.06 (1.58)	0.07 (1.62)	0.06 (1.53)
X_{t-3}^S	0.29 ^c (1.93)	0.25 (1.54)	0.28 (1.66)	-0.10 ^b (-2.59)	-0.10 ^b (-2.37)	-0.10 ^b (-2.36)
X_{t-4}^S	-0.34 ^b (-2.39)	-0.37 ^b (-2.34)	-0.43 ^b (-2.61)	0.09 ^b (2.24)	0.10 ^b (2.41)	0.12 ^b (2.67)
X_{t-5}^S					-0.01 (-0.32)	-0.01 (-0.25)
X_{t-6}^S					-0.04 (-1.33)	-0.04 (-1.27)
X_{t-7}^S						0.02 (0.86)
X_{t-8}^S						0.002 (0.09)
X_{t-1}^M	-0.88 (-1.63)	-0.86 (-1.41)	-0.71 (-1.11)	0.34 ^b (2.40)	0.36 ^b (2.44)	0.38 ^b (2.47)
X_{t-2}^M	1.26 ^b (2.44)	1.26 ^b (2.15)	1.24 ^b (2.13)	-0.27 ^c (-1.91)	-0.32 ^b (-2.10)	-0.31 ^c (-1.99)
X_{t-3}^M	-1.18 ^b (-2.03)	-1.09 ^c (-1.76)	-1.24 ^c (-1.94)	0.41 ^a (2.72)	0.39 ^b (2.50)	0.41 ^b (2.57)

Table 3.7 (Continued)

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	1.68 ^a (3.06)	1.78 ^a (2.93)	1.91 ^a (3.00)	-0.49 ^a (-3.38)	-0.54 ^a (-3.35)	-0.55 ^a (-3.36)
X_{t-5}^M		0.18 (0.42)	0.27 (0.64)			
X_{t-6}^M		-0.04 (-0.09)	0.13 (0.30)			
X_{t-7}^M			-0.31 (-0.73)			
X_{t-8}^M			-0.05 (-0.12)			
Intercept	-85.02 (-1.43)	-98.06 (-1.37)	103.33 (-1.35)	45.56 ^a (3.08)	56.11 ^a (3.22)	48.09 ^b (2.51)
T	6.19 ^a (3.27)	6.79 ^a (3.16)	7.52 ^a (3.45)	-0.74 (-1.32)	-0.54 (-0.81)	-0.98 (-1.33)
$\bar{R}^2$	.94	.95	.95	.79	.79	.81
Model F-value	79.16 ^a	55.27 ^a	46.38 ^a	14.97 ^a	11.77 ^a	9.93 ^a
F-test for lagged causality	3.44 ^b	1.51	1.47	3.40 ^b	2.34 ^c	2.03

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

average number of manufacturing exits per quarter, and there is no lagged effect.

Second, consider the relationship between manufacturing exit and trade exit. The short-run effects are largest for this industry category. Specifically, the exit of one manufacturing firm leads to the demise of about five trade firms. The lagged effect of manufacturing exit is significant for four quarters, but is insignificant for longer periods. The effect of trade exit on manufacturing exit is quantitatively small relative to the average number of manufacturing exits per quarter, and there is no lagged effect.

Finally, consider the causal linkages between manufacturing exit and services exit. Here, the short-run effects are significant with one manufacturing firm exit causing about three service firms to exit. There is a significant lagged effect on service exit from manufacturing exit, but only for a period of one year. Similarly, the effect of services exit on manufacturing exit is quantitatively small relative to the average number of manufacturing exits per quarter, and there is no lagged effect.

Now consider the employment and income effects of firm exit out of these industries. The average employment loss from a FIRE, trade, or service firm exit when a manufacturing firm exits is 7.6 employees. Conversely, the exit of a firm out of one of these sectors leads to an average of 2.2 jobs lost in the manufacturing sector. In FIRE, trade, and services the average wage rate per employee (in 1985) was \$13,853, and combining this with the fact that the average number of exits per year out of these three sectors over the period is 5086 firms, leads to an average income loss (based on 1985 income levels) of \$162 million.

This loss of income represents 76% of the total loss of income in the nonmanufacturing sector. In comparison, over this period an average of 412 manufacturing firms exited per year, which led to (based on 1985 income levels) an average income loss of \$5.9 million. Clearly--to the extent that manufacturing exits cause firms to exit out of these industries--the loss of FIRE, trade, and service firms, which arguably encompass the largest portion of nonbasic firms, will have a significant impact on the local economy. These results suggest that local policymakers should have a keen interest in keeping basic firms in their local economies.

Grand Divisions

In the previous subsection, the relationship between basic and nonbasic sectors of Tennessee was investigated on a statewide basis. In this subsection, the effect of basic firm activity on nonbasic activity is tested in more narrowly defined geographic regions. Specifically, exit is tested between manufacturing and nonmanufacturing firms (including the industry categories within nonmanufacturing) in each grand division within Tennessee.

First, consider the east grand division whose results are reported in Tables 3.8 - 3.11. From the coefficients of X_t^M and X_t^{NM} in Table 3.8, there is evidence of bidirectional instantaneous causality with the significant effect occurring with the exit of a manufacturing firm causing the exit of about eight nonmanufacturing firms in this eastern region. There is no lagged causality in either direction.

Now consider the effects of manufacturing firm exit on the firms within the specified nonmanufacturing industry categories. These

Table 3.8
East Grand Division:
Nonmanufacturing - Manufacturing^d

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	7.85 ^a (3.85)	8.26 ^a (3.70)	8.56 ^a (3.80)			
X_t^{NM}				0.03 ^a (3.85)	0.03 ^a (3.61)	0.03 ^a (3.32)
X_{t-1}^{NM}	0.08 (0.51)	0.08 (0.49)	0.14 (0.83)	-0.01 (-0.93)	-0.01 (-0.97)	-0.01 (-1.07)
X_{t-2}^{NM}	0.02 (0.14)	0.005 (0.03)	-0.03 (-0.19)	0.02 (1.65)	0.02 (1.68)	0.02 ^c (1.91)
X_{t-3}^{NM}	-0.08 (-0.46)	-0.10 (-0.56)	-0.14 (-0.79)	0.01 (1.38)	0.02 (1.43)	0.10 (1.27)
X_{t-4}^{NM}	-0.02 (-0.15)	-0.001 (-0.01)	0.07 (-0.41)	0.01 (1.10)	0.01 (0.81)	0.01 (0.80)
X_{t-5}^{NM}					0.01 (0.52)	0.01 (0.51)
X_{t-6}^{NM}					0.01 (1.07)	0.01 (0.86)
X_{t-7}^{NM}						0.01 (0.63)
X_{t-8}^{NM}						0.01 (0.68)
X_{t-1}^M	2.71 (1.24)	2.65 (1.06)	0.12 (0.04)	0.11 (0.77)	0.09 (0.56)	0.12 (0.78)
X_{t-2}^M	2.06 (0.96)	2.05 (0.82)	2.77 (1.09)	-0.12 (-0.83)	-0.12 (-0.83)	-0.18 (-1.16)
X_{t-3}^M	0.35 (0.16)	0.97 (0.40)	3.09 (1.23)	0.09 (0.62)	0.02 (0.15)	0.01 (0.05)

Table 3.8 (Continued)

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	1.95 (0.74)	2.11 (0.77)	0.49 (0.16)	-0.52 ^a (-3.39)	-0.53 ^a (-3.32)	-0.54 ^a (-3.19)
X_{t-5}^M		-0.58 (-0.23)	-1.16 (-0.45)			
X_{t-6}^M		-0.87 (-0.35)	-1.63 (-0.64)			
X_{t-7}^M			5.64 ^b (2.32)			
X_{t-8}^M			-2.62 (-1.04)			
Inter- cept	-38.13 (-0.40)	-14.36 (-0.13)	-35.31 (-0.31)	15.34 ^b (2.66)	13.68 ^b (2.26)	11.64 ^c (1.88)
T	2.39 (1.33)	2.41 (1.22)	1.33 (0.64)	-0.06 (-0.51)	-0.13 (-0.91)	-0.18 (-1.17)
$\bar{R}^2$	.74	.73	.75	.66	.69	.70
Model F-value	11.43 ^a	8.18 ^a	7.19 ^a	7.97 ^a	6.50 ^a	5.54 ^a
F-test for lagged causality	0.83	0.26	0.64	1.79	1.48	1.39

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.9

East Grand Division:
Finance, Insurance and Real Estate - Manufacturing^d

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	0.70 ^a (3.63)	0.65 ^a (3.11)	0.69 ^a (3.25)			
X_t^F				0.35 ^a (3.63)	0.35 ^a (3.48)	0.34 ^a (3.07)
X_{t-1}^F	0.10 (0.67)	0.07 (0.43)	-0.01 (-0.05)	-0.07 (-0.66)	-0.04 (-0.31)	-0.09 (-0.73)
X_{t-2}^F	0.24 (1.62)	0.20 (1.33)	0.18 (1.18)	-0.05 (-0.43)	-0.05 (-0.43)	-0.02 (-0.20)
X_{t-3}^F	0.25 ^c (1.71)	0.23 (1.53)	0.21 (1.41)	-0.03 (-0.30)	-0.06 (-0.52)	-0.02 (-0.19)
X_{t-4}^F	-0.22 (-1.52)	-0.21 (-1.31)	-0.20 (-1.35)	0.17 ^c (1.64)	0.13 (1.13)	0.14 (1.17)
X_{t-5}^F					0.09 (0.86)	0.04 (0.42)
X_{t-6}^F					0.03 (0.25)	0.01 (0.13)
X_{t-7}^F						0.04 (0.32)
X_{t-8}^F						0.15 (1.34)
X_{t-1}^M	0.37 ^c (1.72)	0.41 ^c (1.79)	0.27 (1.12)	0.10 (0.62)	0.06 (0.36)	0.07 (0.43)
X_{t-2}^M	-0.02 (-0.09)	0.08 (0.34)	0.12 (0.24)	0.07 (0.28)	0.04 (0.28)	0.02 (0.14)
X_{t-3}^M	-0.29 (-1.31)	-0.27 (-1.14)	-0.02 (-0.10)	0.30 ^b (1.95)	0.29 ^c (1.78)	0.23 (1.39)

Table 3.9 (Continued)

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.19 (0.78)	0.15 (0.57)	0.11 (0.42)	-0.47 ^a (-2.88)	-0.42 ^a (-2.45)	-0.41 ^b (-2.30)
X_{t-5}^M		-0.01 (-0.05)	-0.10 (-0.44)			
X_{t-6}^M		0.18 (0.72)	0.16 (0.22)			
X_{t-7}^M			0.60 ^b (2.49)			
X_{t-8}^M			0.05 (0.20)			
Inter- cept	-12.33 (-1.20)	-15.49 (-1.30)	-25.72 ^c (-1.95)	20.49 ^a (3.12)	19.52 ^a (2.83)	19.31 ^a (2.76)
T	0.02 (0.11)	-0.07 (-0.41)	-0.26 (-1.26)	0.10 (0.95)	0.07 (0.57)	-0.004 (-0.03)
$\bar{R}^2$	.59	.55	.57	.49	.48	.47
Model F-value	8.35 ^a	5.92 ^a	5.36 ^a	6.02 ^a	4.77 ^a	4.03 ^a
F-test for lagged causality	1.68	0.74	1.05	0.70	0.64	0.72

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.10

East Grand Division:
Wholesale and Retail Trade - Manufacturing^d

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	2.96 ^a (3.25)	2.80 ^a (2.80)	3.03 ^a (3.08)			
X_t^T				0.07 ^a (3.25)	0.07 ^a (3.00)	0.07 ^a (3.02)
X_{t-1}^T	0.13 (0.80)	0.15 (0.87)	0.19 (1.10)	-0.02 (-0.94)	-0.03 (-1.18)	-0.04 (-1.31)
X_{t-2}^T	-0.01 (-0.09)	-0.02 (-0.09)	-0.01 (-0.08)	0.04 (1.41)	0.04 (1.42)	0.04 (1.64)
X_{t-3}^T	-0.15 (-0.89)	-0.16 (-0.87)	-0.24 (-1.41)	0.05 ^c (1.92)	0.06 ^b (2.17)	0.05 ^c (1.84)
X_{t-4}^T	0.07 (0.44)	0.07 (0.42)	0.22 (1.23)	-0.003 (-0.12)	-0.01 (-0.23)	-0.01 (-0.36)
X_{t-5}^T		0.26 (1.44)			0.01 (0.42)	0.02 (0.71)
X_{t-6}^T					0.04 (1.36)	0.04 (1.33)
X_{t-7}^T						0.001 (0.04)
X_{t-8}^T						0.03 (1.10)
X_{t-1}^M	0.31 (0.33)	0.10 (0.09)	-1.08 (-0.99)	0.19 (1.30)	0.16 (1.07)	0.20 (1.32)
X_{t-2}^M	0.31 (0.35)	0.42 (0.38)	1.10 (1.05)	0.02 (0.15)	0.02 (0.18)	-0.03 (-0.21)
X_{t-3}^M	0.45 (0.48)	0.41 (0.41)	1.67 (1.63)	0.12 (0.88)	0.04 (0.23)	-0.005 (-0.03)

Table 3.10 (Continued)

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.68 (0.66)	0.88 (0.82)	-0.32 (-0.28)	-0.40 ^a (-2.74)	-0.41 ^a (-2.73)	-0.38 ^b (-2.31)
X_{t-5}^M		-1.38 (-1.23)	-1.11 (-1.06)			
X_{t-6}^M		0.26 (0.23)	0.16 (0.14)			
X_{t-7}^M			2.88 ^a (2.64)			
X_{t-8}^M			-1.75 (-1.56)			
Intercept	19.78 (0.43)	22.88 (0.45)	20.54 (0.41)	10.78 (1.60)	7.82 (1.09)	4.16 (0.55)
T	1.03 (1.13)	0.44 (0.43)	0.44 (0.46)	-0.03 (-0.23)	-0.13 (-0.78)	-0.22 (-1.13)
$\bar{R}^2$	.54	.51	.54	.52	.52	.52
Model F-value	7.01 ^a	4.99 ^a	4.88 ^a	6.49 ^a	5.45 ^a	4.65 ^a
F-test for lagged causality	0.27	0.31	0.67	1.77	1.58	1.44

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.11

East Grand Division:
Health and Nonhealth Services - Manufacturing^d

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	1.41 ^a (2.93)	1.54 ^a (2.95)	1.57 ^a (2.85)			
X_t^S				0.12 ^a (2.93)	0.12 ^a (2.78)	0.10 ^b (2.34)
X_{t-1}^S	0.19 (1.15)	0.22 (1.25)	0.27 (1.53)	-0.09 ^c (-1.90)	-0.09 ^c (-1.78)	-0.09 ^c (-1.87)
X_{t-2}^S	0.03 (0.15)	-0.02 (-0.10)	-0.03 (-0.18)	0.06 (1.19)	0.06 (1.13)	0.06 (1.29)
X_{t-3}^S	0.08 (0.48)	0.12 (0.68)	0.08 (0.41)	-0.05 (-1.11)	-0.05 (-1.03)	-0.06 (-1.26)
X_{t-4}^S	-0.08 (-0.49)	-0.07 (-0.38)	-0.04 (-0.22)	0.06 (1.30)	0.06 (1.11)	0.07 (1.32)
X_{t-5}^S					0.004 (0.08)	-0.01 (-0.11)
X_{t-6}^S					0.01 (0.18)	0.002 (0.03)
X_{t-7}^S						0.08 ^c (1.73)
X_{t-8}^S						-0.07 (-1.51)
X_{t-1}^M	0.23 (0.44)	-0.05 (-0.08)	-0.39 (-0.61)	0.33 ^b (2.23)	0.32 ^b (2.07)	0.44 ^a (2.73)
X_{t-2}^M	0.74 (1.54)	0.91 (1.54)	1.08 ^c (1.72)	-0.07 (-0.45)	-0.06 (-0.41)	-0.11 (-0.76)
X_{t-3}^M	-0.12 (-0.22)	-0.12 (-0.20)	0.14 (-0.22)	0.34 ^b (2.26)	0.34 ^b (2.11)	0.37 ^b (2.40)

Table 3.11 (Continued)

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.41 (0.67)	0.57 (0.89)	0.15 (0.21)	-0.47 ^a (-2.95)	-0.48 ^a (-2.71)	-0.52 ^a (-2.98)
X_{t-5}^M		-0.69 (-1.11)	-0.65 (-1.03)			
X_{t-6}^M		-0.10 (-0.16)	-0.09 (-0.14)			
X_{t-7}^M			0.91 (1.47)			
X_{t-8}^M			-0.74 (-1.19)			
Intercept	-21.05 (-0.91)	-9.66 (-0.36)	-9.32 (-0.32)	17.85 ^a (2.84)	17.52 ^b (2.54)	17.08 ^b (2.53)
T	1.74 ^b (2.43)	1.87 ^b (2.37)	1.85 ^b (2.18)	-0.05 (-0.22)	-0.09 (-0.34)	-0.02 (-0.05)
$\bar{R}^2$	.86	.85	.84	.49	.45	.50
Model F-value	31.50 ^a	23.29 ^a	18.73 ^a	5.89 ^a	4.37 ^a	4.35 ^a
F-test for lagged causality	0.89	0.44	0.41	1.63	0.93	1.47

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

results are reported in Tables 3.9, 3.10, and 3.11. In all cases there is evidence of bidirectional instantaneous causality with the larger effect occurring from manufacturing exit to FIRE, trade, or services exit. Specifically, the exit of one manufacturing firm causes about .75 of a FIRE firm exit, about three trade firm exits, and about 1.5 service firm exits in east Tennessee. Although statistically significant, the causality from each category to manufacturing firm exit is quantitatively small with no coefficient exceeding .35. In no case is there evidence of lagged causality in either direction.

Second, in Tables 3.12 - 3.15 are the results for the middle grand division. Examining the coefficients for X_t^M and X_t^{NM} in Table 3.12 between manufacturing exit and nonmanufacturing exit it is evident that bidirectional instantaneous causality is occurring in this grand division also. The order of magnitude is similar to that previously reported with the exit of one manufacturing firm causing about seven nonmanufacturing firms to exit. There is no evidence of lagged causality between manufacturing and nonmanufacturing.

In Tables 3.13, 3.14, and 3.15, the results between manufacturing exit and FIRE, trade, and services are reported for the middle grand division. In all cases instantaneous bidirectional causality is found. Specifically, the exit of one manufacturing firm leads to the exit of one FIRE firm, 2.5 trade firms, and about 1.5 service firms. In the other direction, an exit from of the nonmanufacturing groups never causes more than .38 of a manufacturing firm to exit. Curiously, the only lagged causality occurred from FIRE and trade to manufacturing exit. Although the coefficients are small, this may reflect the importance of these firms in this region of Tennessee.

Table 3.12

Middle Grand Division:
Nonmanufacturing - Manufacturing^d

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	6.71 ^a (5.78)	7.06 ^a (6.09)	7.35 ^a (5.80)			
X_t^{NM}				0.07 ^a (3.78)	0.07 ^a (5.90)	0.07 ^a (5.43)
X_{t-1}^{NM}	0.15 (0.90)	0.03 (0.15)	0.003 (0.02)	0.02 (1.12)	0.03 (1.52)	0.03 (1.43)
X_{t-2}^{NM}	0.12 (0.73)	0.11 (0.65)	0.14 (0.70)	-0.03 ^c (-1.80)	-0.03 ^c (-1.72)	-0.04 ^c (-1.83)
X_{t-3}^{NM}	0.21 (1.28)	0.18 (1.03)	0.17 (0.88)	-0.01 (-0.78)	-0.01 (-0.79)	-0.02 (-1.08)
X_{t-4}^{NM}	0.04 (0.27)	0.06 (0.36)	0.06 (0.32)	-0.001 (-0.08)	0.003 (-0.16)	0.001 (0.03)
X_{t-5}^{NM}					-0.005 (-0.40)	-.004 (-0.34)
X_{t-6}^{NM}					-0.001 (-0.08)	-0.003 (-0.23)
X_{t-7}^{NM}						0.007 (0.55)
X_{t-8}^{NM}						0.01 (0.59)
X_{t-1}^M	-1.09 (-0.68)	-1.18 (-0.11)	-0.07 (-0.04)	-0.09 (-0.59)	-0.16 (-0.96)	-0.17 (-0.97)
X_{t-2}^M	0.86 (0.54)	0.91 (0.55)	0.56 (0.31)	0.12 (0.74)	0.15 (0.89)	0.21 (1.12)
X_{t-3}^M	-1.48 (-0.93)	-1.42 (-0.87)	-1.49 (-0.83)	-0.03 (-0.17)	-0.01 (-0.06)	0.05 (0.27)

Table 3.12 (Continued)

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.64 (0.40)	0.29 (0.18)	0.30 (0.17)	-0.04 (-0.23)	-0.03 (-0.16)	-0.01 (-0.07)
X_{t-5}^M		1.71 (1.50)	1.97 (1.61)			
X_{t-6}^M		0.10 (0.09)	0.14 (0.12)			
X_{t-7}^M			0.32 (0.26)			
X_{t-8}^M			0.72 (0.56)			
Intercept	35.83 (0.44)	23.56 (0.27)	-19.82 (-0.19)	15.11 ^b (1.94)	10.24 (1.18)	10.16 (1.09)
T	0.60 (0.64)	0.31 (0.33)	0.17 (0.17)	0.06 (0.60)	0.06 (0.60)	0.03 (0.25)
$\bar{R}^2$	.77	.78	.76	.62	.67	.67
Model F-value	13.94 ^a	10.63 ^a	7.65 ^a	6.76 ^a	6.22 ^a	4.78 ^a
F-test for lagged causality	0.45	0.34	0.03	1.44	1.85	1.25

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.13

Middle Grand Division:
Finance, Insurance and Real Estate - Manufacturing^d

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	1.02 ^a (5.00)	1.02 ^a (4.95)	1.12 ^a (5.10)			
X_t^F				0.34 ^a (4.64)	0.38 ^a (5.05)	0.37 ^a (4.51)
X_{t-1}^F	0.13 (0.15)	0.03 (0.21)	-0.02 (-0.13)	0.08 (0.85)	0.13 (1.26)	0.11 (1.02)
X_{t-2}^F	0.27 ^b (2.29)	0.43 ^a (2.68)	0.44 ^a (2.41)	-0.32 ^a (-3.41)	-0.33 ^a (-3.56)	-0.39 ^a (-3.61)
X_{t-3}^F	-0.25 (-0.09)	0.08 (0.50)	0.03 (0.18)	-0.03 (-0.32)	0.01 (0.14)	-0.01 (-0.06)
X_{t-4}^F	-0.14 (-0.89)	-0.13 (-0.83)	-0.13 (-0.79)	0.03 (0.28)	0.08 (0.74)	0.10 (0.94)
X_{t-5}^F	0.32 ^b (2.45)				-0.07 (-0.87)	-0.08 (-0.89)
X_{t-6}^F					-0.12 (-1.34)	-0.13 (-1.42)
X_{t-7}^F						0.03 (0.39)
X_{t-8}^F						0.03 (1.39)
X_{t-1}^M	-0.15 (-0.57)	-0.10 (-0.36)	-0.11 (-0.38)	-0.05 (-0.30)	-0.10 (-0.58)	-0.08 (-0.45)
X_{t-2}^M	-0.22 (-0.85)	-0.29 (-1.07)	-0.36 (-1.26)	0.28 ^c (1.75)	0.30 ^c (1.91)	0.39 ^c (2.26)
X_{t-3}^M	0.17 (0.65)	-0.07 (-0.27)	-0.04 (-0.14)	-0.07 (-0.49)	-0.15 (-0.43)	-0.12 (-0.68)

Table 3.13 (Continued)

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	-0.07 (-0.30)	-0.08 (-0.31)	-0.04 (-0.17)	0.03 (0.24)	-0.01 (-0.04)	-0.04 (-0.27)
X_{t-5}^M		0.43 ^b (2.14)	0.48 ^b (2.32)			
X_{t-6}^M		0.26 (1.23)	0.31 (1.44)			
X_{t-7}^M			0.17 (0.76)			
X_{t-8}^M			0.31 (1.35)			
Intercept	-10.49 (-0.71)	-17.21 (-1.07)	-35.38 ^c (-1.85)	22.97 ^a (2.88)	25.32 ^a (2.81)	24.93 ^a (2.56)
T	-0.10 (-0.62)	-0.07 (-0.45)	-0.15 (-0.86)	0.13 (1.46)	0.24 ^b (2.19)	0.19 (1.37)
$\bar{R}^2$	.52	.50	.49	.43	.48	.46
Model F-value	6.02 ^a	5.16 ^a	4.22 ^a	4.90 ^a	4.81 ^a	3.81 ^a
F-test for lagged causality	0.38	1.05	0.91	3.39 ^b	3.40 ^b	2.42 ^c

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.14

Middle Grand Division:
Wholesale and Retail Trade - Manufacturing^d

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	2.54 ^a (5.26)	2.58 ^a (6.10)	2.61 ^a (5.65)			
X_t^T				0.16 ^a (5.26)	0.19 ^a (6.17)	0.20 ^a (5.59)
X_{t-1}^T	0.07 (0.49)	-0.09 (-0.71)	-0.12 (-0.89)	0.04 (1.18)	0.08 ^b (2.32)	0.08 ^b (2.15)
X_{t-2}^T	0.23 (1.48)	0.14 (0.99)	0.12 (0.77)	-0.12 ^a (-3.49)	-0.10 ^a (-2.94)	-0.10 ^b (-2.25)
X_{t-3}^T	0.22 (1.53)	0.29 ^b (2.09)	0.24 (1.61)	-0.05 (-0.83)	-0.05 (-1.37)	-0.06 (-1.40)
X_{t-4}^T	-0.001 (-0.01)	0.12 (0.91)	0.15 (1.10)	0.03 (0.73)	0.01 (0.31)	0.01 (0.27)
X_{t-5}^T					-0.02 (-0.55)	-0.02 (-0.50)
X_{t-6}^T					-0.04 (-1.25)	-0.04 (-1.22)
X_{t-7}^T						0.001 (0.02)
X_{t-8}^T						0.03 (0.59)
X_{t-1}^M	0.02 (0.04)	0.61 (1.20)	0.66 (1.24)	-0.05 (-0.38)	-0.20 (-1.47)	-0.22 (-1.45)
X_{t-2}^M	-0.001 (-0.001)	0.21 (0.41)	0.33 (0.57)	0.22 (1.50)	0.19 (1.37)	0.19 (1.19)
X_{t-3}^M	0.02 (0.03)	-0.33 (-0.71)	-0.31 (-0.64)	-0.14 (-1.12)	-0.11 (-0.79)	-0.07 (-0.47)

Table 3.14 (Continued)

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.18 (0.35)	-0.03 (-0.07)	-0.19 (-0.40)	-0.003 (-0.02)	-0.03 (-0.23)	-0.03 (-0.22)
X_{t-5}^M		0.28 (0.69)	0.39 (0.90)			
X_{t-6}^M		0.05 (0.12)	-0.04 (-0.10)			
X_{t-7}^M			-0.16 (-0.38)			
X_{t-8}^M			0.33 (0.74)			
Intercept	35.81 (0.97)	35.91 (1.08)	37.63 (1.01)	12.79 (1.41)	12.70 (1.32)	10.73 (0.99)
T	-0.58 (-1.69)	-0.87 ^a (-2.76)	-0.91 ^a (-2.75)	0.21 ^a (2.55)	0.32 ^a (3.65)	0.30 ^a (2.65)
$\bar{R}^2$	.46	.53	.47	.53	.62	.58
Model F-value	5.42 ^a	5.53 ^a	4.02 ^a	6.77 ^a	7.59 ^a	5.59 ^a
F-test for lagged causality	0.03	0.85	0.70	3.94 ^a	4.98 ^a	3.14 ^b

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.15

Middle Grand Division:
Health and Nonhealth Services - Manufacturing^d

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	1.46 ^a (3.89)	1.52 ^a (3.80)	1.61 ^a (3.86)			
X_t^S				0.18 ^a (3.89)	0.18 ^a (3.73)	0.21 ^a (4.27)
X_{t-1}^S	0.21 (1.36)	0.20 (1.20)	0.16 (0.94)	-0.02 (-0.38)	-0.01 (-0.22)	0.01 (0.16)
X_{t-2}^S	0.11 (0.67)	0.16 (0.90)	0.21 (1.16)	-0.10 (-1.80)	-0.11 ^c (-1.93)	-0.11 ^c (-1.94)
X_{t-3}^S	-0.01 (-0.07)	-0.03 (-0.17)	0.03 (0.15)	0.02 (0.40)	0.02 (0.30)	-0.01 (-0.19)
X_{t-4}^S	-0.14 (-0.88)	-0.13 (-0.76)	-0.22 (-1.18)	-0.01 (-0.19)	-0.01 (-0.23)	0.02 (0.34)
X_{t-5}^S					0.001 (0.03)	0.01 (0.30)
X_{t-6}^S					0.01 (0.30)	0.01 (0.20)
X_{t-7}^S						0.04 (0.73)
X_{t-8}^S						0.09 ^c (1.75)
X_{t-1}^M	-0.50 (-1.14)	-0.50 (-1.06)	-0.39 (-0.79)	0.05 (0.34)	0.04 (0.25)	-0.01 (-0.09)
X_{t-2}^M	-0.09 (-0.21)	-0.18 (-0.38)	-0.38 (-0.75)	0.15 (0.97)	0.21 (1.22)	0.24 (1.46)
X_{t-3}^M	-0.33 (-0.73)	-0.30 (-0.62)	-0.40 (-0.79)	-0.06 (-0.40)	-0.05 (-0.29)	0.02 (0.09)

Table 3.15 (Continued)

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.50 (1.14)	0.45 (0.96)	0.66 (1.33)	-0.04 (-0.26)	-0.001 (-0.004)	-0.06 (-0.34)
X_{t-5}^M		0.20 (0.50)	0.29 (0.70)			
X_{t-6}^M		-0.20 (-0.49)	-0.09 (-0.22)			
X_{t-7}^M			-0.28 (-0.68)			
X_{t-8}^M			0.12 (0.28)			
Inter- cept	38.24 (1.25)	37.62 (1.06)	29.90 (0.75)	22.21 ^b (2.11)	18.35 (1.45)	6.89 (0.51)
T	2.11 ^a (2.95)	2.02 ^a (2.60)	2.11 ^a (2.66)	-0.03 (-0.11)	-0.04 (-0.13)	-0.57 (-1.40)
$\bar{R}^2$	.86	.84	.83	.31	.30	.33
Model F-value	32.42 ^a	22.30 ^a	17.50 ^a	3.32 ^a	2.71 ^a	2.63 ^a
F-test for lagged causality	0.83	-0.01	0.09	0.98	0.86	1.16

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Finally, in Tables 3.16 - 3.19 the results for the west grand division are reported. The results are consistent with the other two regions and there is evidence of instantaneous bidirectional causality between manufacturing and nonmanufacturing exit, at least for shorter lag lengths. The coefficients indicate that for every manufacturing firm that exits, about six nonmanufacturing firms exit. In the other direction, the effect is very small and is only significant for the case of four lags on X^{NM} . There is no lagged causality evident between these sectors.

The results between manufacturing firm exit and exit from FIRE, trade, and services are reported in Tables 3.17, 3.18, 3.19, respectively. The order of magnitude is similar to that of the other regions. In particular, when one manufacturing firm exits, .75 of a FIRE firm exits, about two trade firms exit, and about 1.5 service firms exit. In the other direction, the effect is considerably smaller. The exit of one firm from one of these sectors never causes more than .17 of a manufacturing firm to exit. Also, except for one case, there is no evidence of lagged causality in either direction in west Tennessee.

When taken together, the results for each grand division are quite similar. Specifically, the major tenant of economic base theory that the basic sector is the driving influence in a regional economy is strongly upheld. In each region, the effect of an exit by a manufacturing firm leads to the exit of about seven nonmanufacturing firms. This translates into, on average, 17.5 jobs lost and an average income loss (based on 1985 figures) of \$220 thousand in each grand division for each manufacturing firm exit. While the effect in the other direction could, arguably, be deemed negligible. For example, an

Table 3.16

West Grand Division:
Nonmanufacturing - Manufacturing^d

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	5.73 ^c (2.01)	5.71 ^c (1.80)	5.62 (1.63)			
X_t^{NM}				0.02 ^c (2.01)	0.01 (1.32)	0.01 (1.24)
X_{t-1}^{NM}	0.04 (0.23)	0.04 (0.22)	0.04 (0.20)	0.02 ^c (1.79)	0.02 ^b (2.16)	0.02 (1.68)
X_{t-2}^{NM}	0.07 (0.41)	0.06 (0.36)	0.07 (0.34)	0.01 (1.27)	0.01 (1.05)	0.01 (0.96)
X_{t-3}^{NM}	0.12 (0.67)	0.12 (0.66)	0.12 (0.61)	0.002 (0.20)	0.002 (0.20)	-0.00001 (-0.002)
X_{t-4}^{NM}	-0.07 (-0.39)	-0.08 (-0.43)	-0.08 (-0.42)	0.01 (0.79)	0.01 (0.83)	0.01 (1.00)
X_{t-5}^{NM}					0.02 ^b (2.33)	0.02 ^b (2.23)
X_{t-6}^{NM}					-0.01 (-0.75)	-0.01 (-0.79)
X_{t-7}^{NM}						-0.002 (-0.20)
X_{t-8}^{NM}						0.01 (0.84)
X_{t-1}^M	0.95 (0.33)	1.50 (0.47)	1.40 (0.40)	-0.03 (-0.22)	-0.03 (-0.23)	0.01 (0.06)
X_{t-2}^M	-0.54 (-0.19)	-1.17 (-0.37)	-0.86 (-0.25)	-0.13 (-0.87)	-0.16 (-1.18)	-0.14 (-0.87)
X_{t-3}^M	-1.16 (-0.41)	-0.73 (-0.24)	-0.77 (-0.23)	0.26 ^c (1.81)	0.21 (1.47)	0.18 (1.16)

Table 3.16 (Continued)

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.61 (0.21)	0.33 (0.11)	0.41 (0.12)	-0.29 ^b (-2.10)	-0.36 ^b (-2.52)	-0.39 ^b (-2.51)
X_{t-5}^M		1.27 (0.43)	1.34 (0.41)			
X_{t-6}^M		-1.26 (-0.42)	-1.13 (-0.35)			
X_{t-7}^M			-0.58 (-0.18)			
X_{t-8}^M			-0.72 (-0.22)			
Inter- cept	204.26 ^b (2.07)	206.32 ^c (1.75)	222.84 (1.60)	4.56 (0.85)	5.43 (1.01)	4.51 (0.77)
T	1.88 (1.28)	1.95 (1.12)	2.25 (1.01)	0.05 (0.68)	0.03 (0.32)	0.01 (0.11)
$\bar{R}^2$	.33	.42	.40	.58	.60	.61
Model F-value	3.51 ^a	2.25 ^b	1.62	5.67 ^a	4.72 ^a	3.68 ^a
F-test for lagged causality	0.12	-0.36	-0.35	1.50	1.34	0.96

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.17

West Grand Division:
Finance, Insurance and Real Estate - Manufacturing^d

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	0.78 ^a (2.54)	0.75 ^b (2.23)	0.79 ^b (2.14)			
X_t^F				0.17 ^a (2.54)	0.15 ^b (2.30)	0.16 ^b (2.39)
X_{t-1}^F	-0.31 ^b (-2.02)	-0.32 ^c (-1.95)	-0.32 ^c (-1.84)	0.18 ^a (2.53)	0.21 ^a (3.05)	0.20 ^a (2.71)
X_{t-2}^F	-0.22 (-1.43)	-0.22 (-1.34)	-0.22 (-1.24)	0.08 (1.04)	0.11 (1.42)	0.11 (1.37)
X_{t-3}^F	-0.30 ^c (-1.96)	-0.29 ^c (-1.73)	-0.29 (-1.61)	0.02 (0.22)	0.02 (0.30)	0.01 (0.14)
X_{t-4}^F	-0.24 (-1.57)	-0.25 (-1.52)	-0.26 (-1.48)	0.07 (0.97)	0.09 (1.23)	0.08 (0.94)
X_{t-5}^F					0.19 ^a (2.96)	0.20 ^a (2.76)
X_{t-6}^F					-0.03 (-0.51)	-0.03 (-0.44)
X_{t-7}^F						-0.04 (-0.86)
X_{t-8}^F						0.10 (0.14)
X_{t-1}^M	0.73 ^b (2.24)	0.80 ^b (2.24)	0.75 ^c (1.92)	-0.08 (-0.49)	-0.06 (-0.38)	-0.05 (-0.29)
X_{t-2}^M	0.26 (0.81)	0.20 (0.54)	0.15 (0.34)	-0.12 (-0.77)	-0.15 (-1.00)	-0.05 (-0.44)
X_{t-3}^M	-0.09 (-0.29)	-0.06 (-0.16)	-0.04 (-0.10)	0.32 ^b (2.17)	0.22 (1.51)	0.23 (1.40)

Table 3.17 (Continued)

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.23 (0.72)	0.18 (0.52)	0.16 (0.40)	-0.27 ^c (-1.85)	-0.36 ^b (-2.46)	-0.37 ^b (-2.35)
X_{t-5}^M		0.20 (0.59)	0.22 (0.61)			
X_{t-6}^M		-0.05 (-0.15)	-0.10 (-0.27)			
X_{t-7}^M			0.14 (0.39)			
X_{t-8}^M			-0.01 (-0.02)			
Inter- cept	19.03 ^c (1.85)	17.61 (1.41)	17.75 (1.19)	8.04 ^c (1.65)	6.76 (1.34)	6.36 (1.05)
T	0.10 (0.68)	0.08 (0.44)	0.05 (0.24)	0.12 ^c (1.69)	0.08 (1.21)	0.10 (1.24)
$\bar{R}^2$	.24	.19	.11	.47	.52	.49
Model F-value	2.63 ^a	1.94 ^c	1.43	5.60 ^a	5.38 ^a	4.28 ^a
F-test for lagged causality	1.98	1.14	0.70	1.73	2.20 ^b	1.62

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.18

West Grand Division:
Wholesale and Retail Trade - Manufacturing^d

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	2.23 ^b (2.26)	2.02 ^c (1.89)	2.10 ^c (1.79)			
X_t^T				0.05 ^b (2.26)	0.03 (1.41)	0.04 (1.69)
X_{t-1}^T	0.12 (0.76)	0.09 (0.54)	0.09 (0.49)	0.03 (1.28)	0.03 (1.25)	0.03 (1.11)
X_{t-2}^T	0.16 (0.96)	0.15 (0.86)	0.14 (0.79)	0.01 (0.47)	0.004 (0.19)	0.01 (0.53)
X_{t-3}^T	0.20 (1.21)	0.21 (1.21)	0.21 (1.17)	-0.01 (-0.30)	-0.01 (-0.23)	-0.01 (-0.58)
X_{t-4}^T	-0.07 (-0.46)	-0.04 (-0.21)	-0.03 (-0.18)	0.01 (0.38)	0.01 (0.50)	0.02 (0.67)
X_{t-5}^T					0.03 (1.33)	0.03 (1.06)
X_{t-6}^T					-0.02 (-0.61)	-0.02 (-0.76)
X_{t-7}^T						-0.03 (-0.90)
X_{t-8}^T						0.03 (1.02)
X_{t-1}^M	-0.58 (-0.59)	-0.47 (-0.42)	-0.58 (-0.48)	0.06 (0.42)	0.06 (0.39)	0.10 (0.62)
X_{t-2}^M	0.07 (0.07)	-0.13 (-0.11)	-0.08 (-0.07)	-0.07 (-0.47)	-0.08 (-0.57)	-0.04 (-0.26)
X_{t-3}^M	-0.48 (-0.49)	-0.36 (-0.34)	-0.48 (-0.40)	0.28 ^b (1.98)	0.27 ^c (1.87)	0.27 ^c (1.83)

Table 3.18 (Continued)

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	1.14 (1.13)	0.92 (0.84)	1.09 (0.87)	-0.35 ^b (-2.46)	-0.39 ^b (-2.59)	-0.39 ^b (-2.53)
X_{t-5}^M		0.37 (0.35)	0.33 (0.29)			
X_{t-6}^M		-0.14 (-0.14)	-0.16 (-0.14)			
X_{t-7}^M			-0.23 (-0.20)			
X_{t-8}^M			0.05 (0.04)			
Inter- cept	52.28 (1.41)	57.91 (1.36)	60.67 (1.21)	5.93 (1.06)	7.32 (1.22)	4.98 (0.73)
T	-0.11 (-0.21)	-0.16 (-0.28)	-0.12 (-0.18)	0.14 ^b (2.01)	0.13 ^c (1.77)	0.12 (1.52)
$\bar{R}^2$	.24	.10	.002	.46	.38	.37
Model F-value	2.58 ^b	1.44	1.01	5.29 ^a	3.53 ^a	2.94 ^a
F-test for lagged causality	0.38	-0.41	-0.38	0.60	-0.06	0.16

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.19

West Grand Division:
Health and Nonhealth Services - Manufacturing^d

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	1.30 ^c (1.79)	1.47 ^c (1.76)	1.27 (1.43)			
X_t^S				0.06 ^c (1.79)	0.04 (1.18)	0.04 (1.13)
X_{t-1}^S	0.09 (0.59)	0.09 (0.51)	0.07 (0.38)	0.01 (0.23)	0.03 (1.00)	0.02 (0.52)
X_{t-2}^S	0.04 (0.27)	-0.01 (-0.04)	-0.002 (-0.01)	0.04 (1.34)	0.05 (1.51)	0.05 (1.55)
X_{t-3}^S	-0.14 (-0.86)	-0.15 (-0.86)	-0.23 (-1.24)	0.01 (0.20)	-0.002 (-0.05)	-0.01 (-0.32)
X_{t-4}^S	-0.14 (-0.86)	-0.17 (-0.96)	-0.19 (-1.01)	0.03 (0.78)	-0.03 (-0.86)	0.04 (1.33)
X_{t-5}^S					0.06 ^c (1.92)	0.07 ^b (2.20)
X_{t-6}^S					-0.04 (-1.17)	-0.04 (-1.30)
X_{t-7}^S						0.005 (0.12)
X_{t-8}^S						0.07 ^b (2.01)
X_{t-1}^M	0.99 (1.34)	1.17 (1.43)	1.56 ^c (1.74)	0.06 (0.36)	0.05 (0.35)	0.09 (0.52)
X_{t-2}^M	-0.53 (-0.74)	-0.64 (-0.77)	-0.37 (-0.40)	-0.06 (-0.42)	-0.15 (-1.00)	-0.13 (-0.74)
X_{t-3}^M	0.21 (0.29)	0.38 (0.47)	0.29 (0.33)	0.27 ^c (1.81)	0.25 ^c (1.69)	0.14 (0.88)

Table 3.19 (Continued)

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	-0.97 (-1.27)	-1.03 (-1.25)	-0.89 (-0.98)	-0.23 (-1.45)	-0.20 (-1.33)	-0.23 (-1.38)
X_{t-5}^M		0.23 (0.28)	0.17 (0.19)			
X_{t-6}^M		-0.65 (-0.76)	-0.40 (-0.44)			
X_{t-7}^M			-0.99 (-1.11)			
X_{t-8}^M			-0.15 (-0.16)			
Inter- cept	58.99 ^b (2.30)	63.76 ^b (2.01)	76.11 ^b (2.02)	8.91 (1.63)	9.73 ^c (1.83)	7.74 (1.42)
T	2.70 ^a (3.68)	2.99 ^a (3.21)	3.50 ^a (3.14)	-0.15 (-0.88)	-0.24 (-1.19)	-0.42 ^c (-1.90)
$\bar{R}^2$	.77	.73	.71	.41	.41	.44
Model F-value	18.07 ^a	12.16 ^a	9.15 ^a	4.59 ^a	3.85 ^a	3.64 ^a
F-test for lagged causality	0.77	-0.11	-0.12	0.72	0.83	1.17

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

average of .34 jobs are lost with an average income loss (based on 1985 income levels) of \$4,840 in each region. Based on these results, the causal activity takes place within one quarter and quickly dissipates after that. Also, these results indicate that an exit by a manufacturing firm affects the trade industries more heavily than other industry groups. This result is consistent with the results presented in Tables 3.5, 3.6, and 3.7 earlier.

Rural versus Urban

For a variety of reasons a special interest has developed among policymakers regarding the nature of firm exit in rural areas of Tennessee. Most obvious among these reasons is the fact that the exit of a given firm in rural areas will have a more pronounced direct affect on local economic activity than similar exits in more populous areas. Several somewhat more subtle, but no less real, fears exist regarding the fragility of economic activity in rural areas. For instance, some concerns have been raised that the loss of one or a few firms in rural areas may actually trigger relatively a larger pattern of subsequent firm exit than in urban areas. Such losses could be due to, say, the more narrow economic base and the sharp declines in the modest agglomeration economies in rural areas. In this subsection, the time series relationships of firm exit in rural versus urban areas are investigated with an eye toward providing tangible evidence regarding the validity, or lack thereof, of these fears.¹²

¹²Urban areas are defined by the counties that are part of the
(Footnote Continued)

The results for the rural areas of Tennessee are reported in Tables 3.20 - 3.23. From the coefficients on X_t^M and X_t^{NM} in Table 3.20, there is evidence of bidirectional instantaneous causality. Note that the effect running from manufacturing to nonmanufacturing firm exit is considerably greater than that of the opposite direction. Specifically, the exit of one manufacturing firm causes the exit of about four nonmanufacturing firms in rural areas. There is no evidence of a lagged causal effect in either direction.

Now consider the effect of manufacturing firm exit on the firms within the specified nonmanufacturing industry categories. These results are reported in Tables 3.21, 3.22, 3.23. In all cases there is evidence of instantaneous bidirectional causality with the larger effect occurring with the impact of a manufacturing firm exit. In rural areas the least impact occurs between manufacturing and FIRE firms. In both directions, the quantitative effect of an exit by one type of firm has little effect on the other type of firm. Also, there is no evidence of a lagged causal effect in either direction.

On the other hand, the effect of a manufacturing firm exit on that of trade and services firms in rural areas is much greater. These results are given in Tables 3.22 and 3.23. Specifically, the exit of a manufacturing firms leads to the exit of about 1.25 trade firms and one service firm. The effect in the opposite direction is much smaller as one would expect. The sensitivity of these two groups of firms to

(Footnote Continued)

Standard Metropolitan Areas (SMAs), while rural areas are given by the remaining counties.

Table 3.20

Rural Areas:
Nonmanufacturing - Manufacturing^d

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	4.29 ^a (3.19)	4.08 ^a (2.88)	4.32 ^a (2.74)			
X_t^{NM}				0.05 ^a (3.19)	0.04 ^a (2.79)	0.05 ^a (2.88)
X_{t-1}^{NM}	0.02 (0.10)	-0.02 (-0.14)	-0.03 (-0.18)	0.01 (0.83)	0.01 (0.72)	0.02 (0.82)
X_{t-2}^{NM}	0.19 (1.27)	0.19 (1.20)	0.14 (0.81)	-0.0003 (-0.02)	-0.001 (-0.03)	0.01 (0.34)
X_{t-3}^{NM}	0.34 ^b (2.34)	0.32 ^b (2.08)	0.27 (1.52)	-0.004 (-0.29)	-0.004 (-0.25)	0.001 (0.04)
X_{t-4}^{NM}	0.14 (0.87)	0.13 (0.77)	0.15 (0.82)	0.01 (0.79)	0.01 (0.80)	0.02 (1.08)
X_{t-5}^{NM}					0.004 (0.24)	0.01 (0.59)
X_{t-6}^{NM}					-0.002 (-0.15)	0.001 (0.05)
X_{t-7}^{NM}						-0.02 (-1.23)
X_{t-8}^{NM}						-0.01 (-0.91)
X_{t-1}^M	1.19 (0.85)	1.56 (1.02)	1.73 (1.05)	-0.07 (-0.49)	-0.07 (-0.42)	-0.09 (-0.57)
X_{t-2}^M	0.57 (0.41)	0.87 (0.55)	0.80 (0.48)	0.06 (0.44)	0.07 (0.43)	0.95 (0.29)
X_{t-3}^M	-2.40 ^c (-1.74)	-2.56 ^c (-1.70)	-1.79 (-1.05)	-0.03 (-0.18)	-0.03 (-0.17)	-0.07 (-0.45)

Table 3.20 (Continued)

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.62 (0.38)	-0.03 (-0.02)	0.46 (0.22)	-0.48 ^a (-3.14)	-0.51 ^a (-2.96)	-0.55 ^a (-3.14)
X_{t-5}^M		1.10 (0.63)	0.72 (0.37)			
X_{t-6}^M		0.32 (0.19)	-0.29 (-0.16)			
X_{t-7}^M			2.05 (1.15)			
X_{t-8}^M			-0.27 (-0.14)			
Intercept	-10.35 (-0.13)	-13.06 (-0.13)	-49.67 (-0.34)	25.98 ^a (3.58)	26.45 ^a (3.10)	29.07 ^a (3.21)
T	-0.52 (-0.52)	-0.81 (-0.70)	-1.26 (-0.89)	0.18 ^c (1.72)	0.17 (1.45)	0.28 ^b (2.09)
$\bar{R}^2$	.70	.68	.67	.58	.56	.60
Model F-value	9.62 ^a	6.48 ^a	4.70 ^a	5.56 ^a	3.97 ^a	3.53 ^a
F-test for lagged causality	0.99	0.10	-0.08	0.52	0.13	0.47

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.21

Rural Areas:
Finance, Insurance and Real Estate - Manufacturing^d

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	0.36 ^a (3.42)	0.32 ^a (2.96)	0.33 ^a (2.89)			
X_t^F				0.61 ^a (3.42)	0.57 ^a (2.88)	0.59 ^a (2.72)
X_{t-1}^F	0.07 (0.45)	-0.05 (-0.28)	-0.10 (-0.56)	0.01 (0.07)	-0.08 (-0.37)	-0.10 (-0.43)
X_{t-2}^F	0.24 (1.62)	0.20 (1.34)	0.16 (0.96)	-0.21 (-1.08)	-0.17 (-0.84)	-0.15 (-0.70)
X_{t-3}^F	0.26 ^c (1.77)	0.33 ^b (2.27)	0.28 ^c (1.72)	-0.12 (-0.60)	-0.16 (-0.78)	-0.16 (-0.72)
X_{t-4}^F	-0.15 (-0.98)	-0.08 (-0.54)	-0.08 (-0.49)	0.24 (1.22)	0.26 (1.30)	0.28 (1.27)
X_{t-5}^F					0.13 (0.66)	0.14 (0.63)
X_{t-6}^F					0.29 (1.40)	0.28 (1.26)
X_{t-7}^F						-0.16 (-0.70)
X_{t-8}^F						0.04 (0.17)
X_{t-1}^M	0.11 (0.97)	0.17 (1.38)	0.18 (1.43)	0.03 (0.18)	0.06 (0.40)	0.09 (0.56)
X_{t-2}^M	-0.17 (-1.47)	-0.11 (-0.84)	-0.11 (-0.80)	0.29 ^c (1.90)	0.31 ^b (2.01)	0.31 ^c (1.86)
X_{t-3}^M	-0.19 ^c (-1.71)	-0.27 ^b (-2.29)	-0.24 ^c (-1.82)	0.10 (0.65)	0.13 (0.82)	0.11 (0.65)

Table 3.21 (Continued)

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.23 ^c (1.85)	0.10 (0.68)	0.14 (0.90)	-0.50 ^a (-3.29)	-0.51 ^a (-3.19)	-0.53 ^a (-3.08)
X_{t-5}^M		0.16 (1.18)	0.15 (0.96)			
X_{t-6}^M		0.08 (0.59)	0.02 (0.12)			
X_{t-7}^M			0.13 (0.94)			
X_{t-8}^M			0.10 (0.68)			
Intercept	-5.83 (-0.85)	-7.47 (-0.92)	-13.77 (-1.38)	31.20 ^a (4.16)	28.04 ^a (3.33)	28.57 ^a (3.20)
T	0.09 (0.76)	0.02 (0.19)	-0.01 (-0.08)	0.13 (0.90)	-0.04 (-0.23)	0.01 (0.03)
$\bar{R}^2$	.55	.51	.46	.40	.39	.35
Model F-value	7.26 ^a	5.31 ^a	3.82 ^a	4.36 ^a	3.56 ^a	2.77 ^a
F-test for lagged causality	1.92	1.02	0.51	0.71	0.72	0.53

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.22

Rural Areas:
Wholesale and Retail Trade - Manufacturing^d

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	1.37 ^b (2.41)	1.26 ^b (2.24)	1.16 ^c (1.91)			
X_t^T				0.09 ^b (2.41)	0.07 (1.63)	0.08 (1.58)
X_{t-1}^T	0.07 (0.45)	-0.04 (-0.27)	-0.06 (-0.35)	0.02 (0.50)	0.01 (0.22)	0.02 (0.37)
X_{t-2}^T	0.20 (1.39)	0.17 (1.11)	0.14 (0.87)	-0.02 (-0.57)	-0.03 (-0.67)	-0.01 (-0.16)
X_{t-3}^T	0.30 ^b (2.04)	0.31 ^b (2.10)	0.30 ^c (1.88)	-0.01 (-0.20)	-0.01 (-0.20)	-0.003 (-0.26)
X_{t-4}^T	0.23 (1.45)	0.22 (1.39)	0.29 ^c (1.69)	0.05 (1.21)	0.05 (1.22)	0.06 (1.29)
X_{t-5}^T					0.05 (1.11)	0.05 (1.11)
X_{t-6}^T					-0.002 (-0.05)	-0.001 (-0.04)
X_{t-7}^T						-0.02 (-0.43)
X_{t-8}^T						-0.03 (-0.53)
X_{t-1}^M	0.61 (1.06)	0.84 (1.44)	0.88 (1.43)	-0.01 (-0.07)	0.004 (0.02)	-0.01 (-0.05)
X_{t-2}^M	0.09 (0.15)	0.45 (0.73)	0.40 (0.63)	0.15 (1.00)	0.19 (1.17)	0.17 (1.02)
X_{t-3}^M	-1.47 ^a (-2.58)	-1.49 ^a (-2.55)	-1.27 ^c (-1.97)	0.01 (0.05)	0.01 (0.09)	-0.01 (-0.06)

Table 3.22 (Continued)

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	-0.08 (-0.12)	-0.67 (-0.93)	-0.78 (-0.98)	-0.47 ^a (-2.86)	-0.54 ^a (-2.87)	-0.54 ^a (-2.76)
X_{t-5}^M		0.51 (0.73)	0.19 (0.24)			
X_{t-6}^M		0.69 (1.04)	0.55 (0.76)			
X_{t-7}^M			0.89 (1.24)			
X_{t-8}^M			-0.56 (-0.77)			
Intercept	25.16 (0.74)	21.99 (0.55)	24.78 (0.52)	22.21 ^a (2.72)	21.72 ^b (2.32)	20.55 ^b (2.00)
T	-0.16 (-0.38)	-0.42 (-0.90)	-0.45 (-0.83)	0.17 (1.60)	0.14 (1.09)	0.19 (1.29)
$\bar{R}^2$	.58	.54	.48	.42	.38	.35
Model F-value	7.94 ^a	5.74 ^a	4.09 ^a	4.63 ^a	3.49 ^a	2.80 ^a
F-test for lagged causality	5.46 ^a	3.05 ^b	1.76	0.60	0.37	0.36

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.23

Rural Areas:
Health and Nonhealth Services - Manufacturing^d

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	1.05 ^a (4.03)	1.05 ^a (3.84)	1.07 ^a (3.86)			
X_t^S				0.27 ^a (4.03)	0.29 ^a (4.08)	0.29 ^a (3.97)
X_{t-1}^S	-0.07 (-0.49)	-0.10 (-0.61)	-0.12 (-0.70)	0.04 (0.51)	0.03 (0.42)	0.02 (0.27)
X_{t-2}^S	-0.11 (-0.71)	-0.14 (-0.89)	-0.21 (-1.25)	0.06 (0.76)	0.10 (1.18)	0.11 (1.23)
X_{t-3}^S	0.13 (0.95)	0.06 (0.36)	0.01 (0.05)	0.01 (0.10)	0.02 (0.26)	0.02 (0.20)
X_{t-4}^S	-0.17 (-1.25)	-0.21 (-1.35)	-0.26 (-1.58)	0.04 (0.61)	0.08 (1.00)	0.10 (1.21)
X_{t-5}^S					-0.03 (-0.45)	-0.01 (-0.26)
X_{t-6}^S					0.05 (0.67)	0.06 (0.87)
X_{t-7}^S						-0.06 (-0.76)
X_{t-8}^S						-0.01 (-0.08)
X_{t-1}^M	0.25 (0.85)	0.37 (1.13)	0.46 (1.37)	0.003 (0.02)	-0.02 (-0.16)	-0.02 (-0.14)
X_{t-2}^M	0.54 ^c (1.81)	0.60 ^c (1.80)	0.64 ^c (1.88)	-0.02 (-0.14)	-0.06 (-0.36)	-0.04 (-0.26)
X_{t-3}^M	0.14 (0.48)	0.18 (0.54)	0.36 (1.03)	-0.10 (-0.66)	-0.14 (-0.86)	-0.17 (-1.01)

Table 3.23 (Continued)

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.41 (1.23)	0.51 (1.35)	0.57 (1.44)	-0.44 ^a (-2.77)	-0.53 ^a (-3.07)	-0.56 ^a (-3.13)
X_{t-5}^M		0.33 (0.92)	0.37 (0.95)			
X_{t-6}^M		-0.13 (-0.39)	-0.04 (-0.10)			
X_{t-7}^M			0.31 (0.89)			
X_{t-8}^M			-0.33 (-0.98)			
Intercept	-16.16 (-0.95)	-25.79 (-1.18)	-36.73 (-1.38)	29.86 ^a (4.04)	31.96 ^a (3.70)	34.43 ^a (3.66)
T	1.66 ^a (3.68)	1.88 ^a (3.66)	2.14 ^a (3.93)	-0.36 (-1.38)	-0.54 (-1.75)	-0.52 (-1.39)
$\bar{R}^2$	.86	.84	.84	.44	.42	.41
Model F-value	32.22 ^a	22.95 ^a	18.59 ^a	5.00 ^a	4.02 ^a	3.36 ^a
F-test for lagged causality	3.67 ^a	1.82	1.50	0.32	0.44	0.52

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

manufacturing exit in rural areas is suggested by the significance of the lagged coefficients of X^M . In both cases there is evidence of a lagged causal effect lasting about four quarters. This suggests that trade and service firms are especially vulnerable to manufacturing firm exits in rural areas.

The effect of manufacturing firm exit in urban areas is reported in Tables 3.24 - 3.27. Notice that there is evidence of instantaneous bidirectional causality as in the rural case, but that the magnitude of the coefficients, especially on X_t^M , are much larger. Specifically, one manufacturing exit leads to the exit of about thirteen nonmanufacturing firms in urban areas. This indicates that manufacturing firms in more populous areas have a greater impact, at least in the sheer number of firms, when an exit occurs.

The relationships between manufacturing firm exit and the exit of firms in more narrowly defined nonmanufacturing sectors are reported in Tables 3.25, 3.26, and 3.27 for urban areas. Note that the coefficients on X^M are considerably larger for urban areas than for rural areas. In particular, the exit of a manufacturing firm in urban areas leads to the demise of about 1.5 FIRE firms, four trade firms, and about three service firms. Similar to the rural case, both trade and service firms are affected by a lagged causal relationship to manufacturing exit. In both cases there is no evidence that the effects last longer than four quarters. In all cases the effect of a nonmanufacturing firm exit, either in total or disaggregated, has a minimal effect on manufacturing firm exit in urban areas.

Now consider the impacts associated with firm exit in urban and rural areas. Taken together this geographical partition yields some

Table 3.24
Urban Areas:
Nonmanufacturing - Manufacturing^d

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	12.92 ^a (5.61)	12.88 ^a (5.37)	12.83 ^a (5.00)			
X_t^{NM}				0.03 ^a (5.61)	0.03 ^a (5.31)	0.03 ^a (4.93)
X_{t-1}^{NM}	0.15 (0.97)	0.10 (0.63)	0.11 (0.62)	0.001 (0.08)	0.001 (0.20)	0.0003 (0.04)
X_{t-2}^{NM}	-0.08 (-0.48)	-0.10 (-0.60)	-0.09 (-0.49)	0.01 (1.46)	0.01 (1.53)	0.01 (1.39)
X_{t-3}^{NM}	0.11 (0.64)	0.11 (0.62)	0.12 (0.61)	-0.01 (-1.16)	-0.01 (-1.07)	-0.01 (-1.08)
X_{t-4}^{NM}	-0.22 (-1.31)	-0.24 (-1.39)	-0.23 (-1.23)	0.01 (1.16)	0.01 (1.22)	0.01 (1.13)
X_{t-5}^{NM}					0.01 (1.03)	0.01 (0.92)
X_{t-6}^{NM}					-0.005 (-0.69)	-0.01 (-0.88)
X_{t-7}^{NM}						0.01 (1.03)
X_{t-8}^{NM}						0.01 (1.39)
X_{t-1}^M	-1.78 (-0.61)	-1.10 (-0.35)	-0.81 (-0.24)	-0.03 (-0.20)	-0.03 (-0.18)	-0.05 (-0.29)
X_{t-2}^M	2.59 (0.92)	2.75 (0.89)	2.98 (0.90)	-0.14 (-0.97)	-0.17 (-1.15)	-0.18 (-1.14)
X_{t-3}^M	-1.25 (-0.39)	-1.34 (-0.39)	-1.25 (-0.33)	0.29 ^c (1.83)	0.26 (1.57)	0.24 (1.37)

Table 3.24 (Continued)

	Dependent Variable					
	Nonmanufacturing Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	6.22 ^c (1.97)	6.99 ^b (2.05)	6.93 ^c (1.80)	-0.28 ^c (-1.72)	-0.30 ^c (-1.73)	-0.28 (-1.54)
X_{t-5}^M		1.82 (0.71)	2.21 (0.79)			
X_{t-6}^M		0.99 (0.39)	0.81 (0.29)			
X_{t-7}^M			-1.01 (-0.36)			
X_{t-8}^M			-1.58 (-0.58)			
Intercept	3.12 (0.01)	-89.75 (-0.36)	-38.97 (-0.14)	15.81 (1.47)	14.88 (1.32)	10.49 (0.90)
T	2.90 (0.95)	1.43 (0.41)	1.99 (0.52)	-0.002 (-0.01)	-0.004 (-0.02)	-0.16 (-0.81)
$\bar{R}^2$	.75	.74	.73	.71	.72	.73
Model F-value	12.42 ^a	8.91 ^a	6.33 ^a	10.07 ^a	8.07 ^a	6.45 ^a
F-test for lagged causality	1.24	0.51	0.10	1.13	1.00	0.83

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.25

Urban Areas:
Finance, Insurance and Real Estate - Manufacturing^d

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	1.57 ^a (4.12)	1.51 ^a (3.92)	1.42 ^a (3.55)			
X_t^F				0.19 ^a (4.12)	0.18 ^a (3.87)	0.18 ^a (3.58)
X_{t-1}^F	0.02 (0.14)	-0.06 (-0.38)	-0.09 (-0.54)	0.07 (1.25)	0.09 (1.65)	0.07 (1.29)
X_{t-2}^F	0.06 (0.36)	0.01 (0.04)	-0.03 (-0.17)	0.06 (1.06)	0.05 (0.94)	0.04 (0.75)
X_{t-3}^F	0.12 (0.76)	0.07 (0.44)	0.03 (0.14)	-0.07 (-1.24)	-0.05 (-0.97)	-0.05 (-0.84)
X_{t-4}^F	-0.23 (-1.49)	-0.28 ^c (-1.77)	-0.32 ^c (-1.86)	0.03 (0.51)	0.03 (0.54)	0.04 (0.70)
X_{t-5}^F					0.08 (1.64)	0.07 (1.47)
X_{t-6}^F					-0.04 (-0.76)	-0.04 (-0.89)
X_{t-7}^F						0.005 (0.09)
X_{t-8}^F						0.06 (1.23)
X_{t-1}^M	0.22 (0.49)	0.41 (0.87)	0.42 (0.88)	-0.20 (-1.29)	-0.21 (-1.28)	-0.22 (-1.28)
X_{t-2}^M	0.07 (0.16)	0.18 (0.40)	0.31 (0.64)	-0.05 (-0.36)	-0.08 (-0.54)	-0.07 (-0.42)
X_{t-3}^M	-0.13 (-0.27)	-0.07 (-0.14)	0.16 (-0.30)	0.30 ^c (1.90)	0.22 (1.32)	0.17 (0.91)

Table 3.25 (Continued)

	Dependent Variable					
	FIRE Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	0.70 (1.51)	0.88 ^c (1.78)	0.88 ^c (1.67)	-0.16 (-0.97)	-0.18 (-1.08)	-0.18 (-0.96)
X_{t-5}^M		0.57 (1.43)	0.66 (1.57)			
X_{t-6}^M		0.47 (1.20)	0.56 (1.31)			
X_{t-7}^M			0.37 (0.86)			
X_{t-8}^M			-0.16 (-0.36)			
Inter- cept	-38.94 (-1.01)	-84.32 ^c (-1.93)	-100.59 ^b (-2.00)	32.33 ^b (2.60)	33.48 ^a (2.64)	33.35 ^b (2.49)
T	-0.23 (-0.52)	-0.89 ^c (-1.66)	-1.19 (-1.83)	0.26 ^c (1.77)	0.29 ^c (1.78)	0.24 (1.26)
$\bar{R}^2$	.40	.40	.36	.56	.57	.53
Model F-value	4.42 ^a	3.69 ^a	2.88 ^a	7.55 ^a	6.43 ^a	4.76 ^a
F-test for lagged causality	0.90	0.93	0.67	1.13	0.85	0.74

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.26
Urban Areas:
Wholesale and Retail Trade - Manufacturing^d

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	3.96 ^a (4.82)	3.91 ^a (4.62)	3.84 ^a (4.32)			
X_t^T				0.09 ^a (4.82)	0.09 ^a (4.51)	0.09 ^a (4.43)
X_{t-1}^T	0.26 (1.60)	0.21 (1.18)	0.19 (1.01)	-0.004 (-0.17)	-0.002 (-0.08)	-0.002 (-0.09)
X_{t-2}^T	-0.03 (-0.16)	-0.09 (-0.53)	-0.07 (-0.39)	0.01 (0.53)	0.02 (0.72)	0.02 (0.58)
X_{t-3}^T	0.15 (0.93)	0.16 (0.91)	0.15 (0.83)	-0.02 (-0.78)	-0.02 (-0.63)	-0.02 (-0.80)
X_{t-4}^T	-0.02 (-0.12)	-0.02 (-0.11)	-0.003 (-0.02)	0.01 (0.34)	0.01 (0.31)	0.01 (0.19)
X_{t-5}^T					0.01 (0.50)	0.01 (0.36)
X_{t-6}^T					-0.01 (-0.45)	-0.01 (-0.46)
X_{t-7}^T						0.01 (0.63)
X_{t-8}^T						0.03 (1.27)
X_{t-1}^M	-1.41 (-1.41)	-1.15 (-1.09)	-0.89 (-0.79)	0.02 (0.11)	0.01 (0.07)	-0.01 (-0.04)
X_{t-2}^M	0.58 (0.60)	0.83 (0.77)	0.98 (0.87)	-0.03 (-0.20)	-0.07 (-0.45)	-0.08 (-0.50)
X_{t-3}^M	-0.34 (-0.31)	-0.52 ^a (-0.45)	-0.31 (-0.25)	0.26 (1.63)	0.24 (1.46)	0.22 (1.29)

Table 3.26 (Continued)

	Dependent Variable					
	Trade Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	1.61 (1.53)	1.73 (1.55)	1.69 (1.36)	-0.22 (-1.39)	-0.23 (-1.35)	-0.22 (-1.23)
X_{t-5}^M		0.51 (0.54)	0.81 (0.79)			
X_{t-6}^M		0.77 (0.82)	0.65 (0.63)			
X_{t-7}^M			-0.45 (-0.24)			
X_{t-8}^M			-0.92 (-0.93)			
Intercept	29.74 (0.35)	5.59 (0.06)	30.17 (0.30)	13.69 (1.08)	11.77 (0.86)	4.94 (0.33)
T	-0.59 (-0.56)	-1.29 (-1.07)	-1.07 (-0.80)	0.20 (1.30)	0.23 (1.29)	0.11 (0.57)
$\bar{R}^2$	.55	.51	.45	.57	.55	.52
Model F-value	7.32 ^a	5.31 ^a	3.73 ^a	7.74 ^a	6.07 ^a	4.61 ^a
F-test for lagged causality	3.07 ^b	1.66	0.85	0.20	0.29	0.18

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.27

Urban Areas:
Health and Nonhealth Services - Manufacturing^d

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^M	2.71 ^a (4.02)	2.61 ^a (3.68)	2.77 ^a (3.72)			
X_t^S				0.10 ^a (4.02)	0.10 ^a (3.56)	0.10 ^a (3.56)
X_{t-1}^S	0.11 (0.67)	0.07 (0.40)	0.05 (0.30)	-0.01 (-0.17)	-0.0003 (-0.01)	0.01 (0.21)
X_{t-2}^S	0.00004 (0.00)	0.01 (0.08)	0.01 (0.08)	0.02 (0.53)	0.01 (0.46)	0.02 (0.50)
X_{t-3}^S	0.03 (0.15)	0.05 (0.28)	0.08 (0.42)	-0.05 (-1.57)	-0.05 ^c (-1.64)	-0.05 (-1.61)
X_{t-4}^S	-0.20 (-1.23)	-0.23 (-1.28)	-0.26 (-1.37)	0.02 (0.52)	0.02 (0.46)	0.02 (0.67)
X_{t-5}^S					0.02 (0.68)	0.03 (0.91)
X_{t-6}^S					-0.03 (-1.16)	-0.03 (-1.13)
X_{t-7}^S						0.04 (1.20)
X_{t-8}^S						0.03 (0.86)
X_{t-1}^M	-0.21 (-0.27)	-0.14 (-0.17)	-0.07 (-0.08)	-0.01 (-0.08)	0.01 (0.05)	-0.001 (-0.01)
X_{t-2}^M	0.04 (0.06)	-0.16 (-0.20)	-0.14 (-0.17)	0.03 (0.18)	0.02 (0.15)	0.03 (0.19)
X_{t-3}^M	-0.37 (-0.42)	-0.54 (-0.58)	-0.80 (-0.81)	0.39 ^b (2.47)	0.39 ^b (2.38)	0.41 ^b (2.47)

Table 3.27 (Continued)

	Dependent Variable					
	Services Firm Exit			Manufacturing Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^M	1.23 (1.44)	1.43 (1.54)	1.53 (1.49)	-0.16 (-0.95)	-0.15 (-0.83)	-0.13 (-0.70)
X_{t-5}^M		0.88 (1.15)	0.81 (0.99)			
X_{t-6}^M		0.26 (0.34)	0.30 (0.36)			
X_{t-7}^M			-0.41 (-0.49)			
X_{t-8}^M			-0.02 (-0.03)			
Inter- cept	28.53 (0.43)	-7.56 (-0.10)	2.18 (0.03)	20.38 (1.63)	22.25 (1.61)	11.32 (0.77)
T	5.51 ^a (2.93)	5.20 ^b (2.52)	5.70 ^a (2.61)	-0.21 (-0.52)	-0.07 (-0.14)	-0.73 (-1.22)
$\bar{R}^2$	.87	.86	.84	.53	.51	.51
Model F-value	35.38 ^a	25.30 ^a	18.94 ^a	6.85 ^a	5.32 ^a	4.47 ^a
F-test for lagged causality	2.50 ^c	1.17	0.69	0.72	0.58	0.67

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

interesting implications. The effect of a manufacturing firm exit in urban areas has a larger impact on the exit of nonmanufacturing firms than such exits have on nonmanufacturing firms in rural areas. However, this may be a result of the fact that there are just more firms in urban areas. Although the coefficients are smaller for rural areas, in relative terms, the effect of a manufacturing firm exit may actually have a greater impact on a rural economy than on an urban economy. For example, in both partitions a manufacturing firm exit causes about 1% of the total nonmanufacturing exits (this figure is based on the average quarterly exits over the period). Hence, in urban areas 32.5 jobs are lost with an average income loss (based on 1985 income levels) of \$408 thousand, while in rural areas the figures are 10 jobs lost with an average income loss of \$125 thousand per manufacturing firm exit.¹³ Although the impact is three times as large for urban areas, it could be argued that rural areas would have a more difficult time in absorbing such losses due to their more narrow economic base and modest agglomeration economies. Moreover, in both urban and rural areas, manufacturing exits appeared to effect trade and service firms more substantially and for a longer period of time. These results are consistent with the statewide results and may indicate the sensitivity trade and service firms have to major changes in the basic sector of their region.

¹³In the other direction, a nonmanufacturing firm exit caused about .04 manufacturing firms to exit in both urban and rural areas. This results in .34 jobs lost and an income loss of \$4,840 (based on 1985 income levels) in both urban and rural areas.

Displacement

One of the major tenants of the competitive model is the adjustment to long-run equilibrium that occurs with the free entry and exit of firms within a market. It is widely held that more efficient new entrants are likely to displace inefficient incumbents in an industry. Gabszewicz and Thisse (1980) provide a theoretical model that suggests this result. However, empirical evidence investigating this phenomenon is lacking. In Chapter 2 evidence is presented which suggests that the entry of two firms leads to the exit of one incumbent firm in the manufacturing sector of the U.S. economy. In this subsection, evidence of displacement within defined regions of Tennessee is presented.

To test the occurrence of displacement in Tennessee, the narrow regions defined earlier are utilized. Specifically, displacement is tested in each grand division: east, middle, and west. As a base case, all firms are included in the estimation to determine the overall impacts of firm entry into each grand division. The results from this estimation are reported in Tables 3.28, 3.29, and 3.30. Although the coefficients of determination are not overwhelming, in all cases the model F-statistics are significant at the .01 level. The models that perform best are those with the longer lag lengths on the independent variable. The coefficients on E_t^{Tot} indicate that the entry of two firms causes the exit of one incumbent firm. This result is especially strong for the middle and western grand divisions, and occurs in the short-run (within one quarter). There is no evidence of a lagged causal effect.

To narrow the region a little further, consider the displacement that occurs in rural versus urban areas in each grand division. The results for the rural areas are reported in Tables 3.31, 3.32, and 3.33.

Table 3.28

East Grand Division:
Displacement - All Firms^d

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_t^{Tot}	0.08 (0.87)	0.51 ^c (1.99)	0.45 (1.52)
X_{t-1}^{Tot}	0.26 (1.55)	0.31 ^c (1.78)	0.32 ^c (1.79)
X_{t-2}^{Tot}	0.28 (1.67)	0.25 (1.44)	0.31 (1.63)
X_{t-3}^{Tot}	0.09 (0.51)	0.08 (0.48)	-0.28 (-0.28)
X_{t-4}^{Tot}	0.07 (0.42)	0.14 (0.80)	0.14 (0.81)
X_{t-5}^{Tot}			
E_{t-1}^{Tot}	-0.05 (-0.59)	-0.41 (-1.51)	-0.53 ^c (-1.65)
E_{t-2}^{Tot}	-0.05 (-0.58)	-0.05 (-0.55)	-0.33 (-1.00)
E_{t-3}^{Tot}	0.06 (0.67)	0.08 (0.85)	0.63 ^b (2.23)
E_{t-4}^{Tot}	-0.09 (-0.98)	-0.06 (-0.66)	-0.11 (-1.07)
E_{t-5}^{Tot}		-0.03 (-0.35)	-0.09 (-0.90)
E_{t-6}^{Tot}		-0.06 (-0.67)	-0.09 (-0.96)

Table 3.28 (Continued)

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{Tot}			0.04 (0.36)
E_{t-8}^{Tot}			-0.01 (-0.20)
Inter- cept	202.60 (1.11)	151.77 (0.62)	206.53 (0.66)
T	1.49 (0.67)	0.32 (0.13)	0.49 (0.20)
$\bar{R}^2$	.53	.51	.50
Model F-value	6.70 ^a	5.28 ^a	4.32 ^a
F-test for lagged causality	0.50	0.49	0.53

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.29
 Middle Grand Division:
 Displacement - All Firms^d

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_t^{Tot}	0.08 (1.14)	0.48 ^a (3.22)	0.47 ^b (2.62)
X_{t-1}^{Tot}	0.22 (1.39)	0.32 ^c (1.96)	0.44 ^b (2.42)
X_{t-2}^{Tot}	0.12 (0.77)	0.18 (1.21)	0.10 (0.48)
X_{t-3}^{Tot}	0.07 (0.46)	-0.01 (-0.04)	-0.01 (-0.04)
X_{t-4}^{Tot}	0.13 (0.79)	0.10 (0.66)	0.19 (1.13)
X_{t-5}^{Tot}		0.30 ^b (2.02)	
E_{t-1}^{Tot}	-0.09 (-1.20)	-0.39 ^b (-2.38)	-0.59 ^a (-2.87)
E_{t-2}^{Tot}	0.02 (0.33)	0.03 (0.41)	0.27 (1.22)
E_{t-3}^{Tot}	0.03 (0.37)	0.05 (0.79)	-0.03 (-0.17)
E_{t-4}^{Tot}	0.03 (0.38)	0.07 (0.99)	0.04 (0.47)
E_{t-5}^{Tot}		-0.06 (-0.90)	-0.05 (-0.73)
E_{t-6}^{Tot}		0.03 (0.49)	0.02 (0.30)

Table 3.29 (Continued)

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{Tot}			0.08 (1.02)
E_{t-8}^{Tot}			-0.06 (-0.88)
Inter- cept	169.68 (1.07)	-75.87 (-0.46)	57.45 (0.31)
T	1.51 (0.97)	-1.02 (-0.61)	0.24 (0.14)
$\bar{R}^2$	.42	.47	.38
Model F-value	4.63 ^a	4.31 ^a	3.03 ^a
F-test for lagged causality	0.45	0.65	0.50

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.30
 West Grand Division:
 Displacement - All Firms^d

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_t^{Tot}	0.12 (1.56)	0.54 ^a (4.45)	0.65 ^a (4.24)
X_{t-1}^{Tot}	0.23 (1.55)	0.32 ^c (1.78)	0.41 ^b (1.79)
X_{t-2}^{Tot}	0.17 (1.00)	0.24 (1.62)	0.38 ^c (1.82)
X_{t-3}^{Tot}	0.08 (0.46)	-0.03 (-0.20)	0.01 (0.03)
X_{t-4}^{Tot}	-0.04 (-0.26)	-0.12 (-0.81)	-0.13 (-0.85)
X_{t-5}^{Tot}		0.29 ^b (2.05)	
E_{t-1}^{Tot}	-0.12 (-1.45)	-0.47 ^a (-3.33)	-0.48 ^b (-2.57)
E_{t-2}^{Tot}	0.02 (0.22)	0.01 (0.07)	-0.18 (-0.87)
E_{t-3}^{Tot}	0.02 (0.30)	0.08 (1.18)	0.12 (0.66)
E_{t-4}^{Tot}	-0.05 (-0.63)	0.02 (0.22)	0.03 (0.40)
E_{t-5}^{Tot}		-0.05 (-0.67)	-0.03 (-0.37)
E_{t-6}^{Tot}		-0.03 (-0.13)	-0.07 (-0.98)

Table 3.30 (Continued)

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{Tot}			0.12 (1.65)
E_{t-8}^{Tot}			-0.01 (-0.20)
Inter- cept	228.34 (1.56)	15.87 (0.10)	40.13 (0.21)
T	1.96 (1.38)	-0.06 (-0.05)	1.00 (0.74)
$\bar{R}^2$	.35	.52	.47
Model F-value	3.70 ^a	5.03 ^a	4.00 ^a
F-test for lagged causality	0.61	1.65	2.07

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.31
 East Grand Division:
 Rural Area Displacement - All Firms^d

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_t^{Tot}	0.01 (0.14)	-0.20 (-0.97)	-0.46 (-1.85)
X_{t-1}^{Tot}	0.27 (1.65)	0.32 ^c (1.96)	0.18 (1.07)
X_{t-2}^{Tot}	0.20 (1.25)	0.18 (1.08)	0.15 (0.90)
X_{t-3}^{Tot}	0.18 (1.10)	0.13 (0.75)	0.20 (1.16)
X_{t-4}^{Tot}	0.11 (0.67)	0.14 (0.86)	0.01 (0.04)
X_{t-5}^{Tot}			
E_{t-1}^{Tot}	0.05 (0.50)	0.21 (1.00)	-0.19 (-0.76)
E_{t-2}^{Tot}	0.05 (0.44)	0.05 (0.43)	0.22 (0.89)
E_{t-3}^{Tot}	0.12 (1.16)	0.06 (0.52)	0.60 ^b (2.46)
E_{t-4}^{Tot}	0.00 (0.00)	-0.01 (0.10)	-0.10 (0.90)
E_{t-5}^{Tot}		0.10 (0.95)	-0.03 (-0.29)
E_{t-6}^{Tot}		-0.13 (-1.26)	-0.12 (-1.15)

Table 3.31 (Continued)

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{Tot}			-0.002 (-0.02)
E_{t-8}^{Tot}			-0.09 (-0.86)
Inter- cept	4.94 (0.09)	22.97 (0.38)	130.16 ^c (1.73)
T	0.26 (0.49)	0.11 (0.18)	-0.001 (-0.002)
$\bar{R}^2$	.45	.42	.44
Model F-value	5.18 ^a	3.93 ^a	3.66 ^a
F-test for lagged causality	0.45	0.31	0.73

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.32

Middle Grand Division:
Rural Area Displacement - All Firms^d

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_t^{Tot}	0.05 (0.68)	0.10 (0.71)	0.06 (0.24)
X_{t-1}^{Tot}	0.37 ^b (2.30)	0.37 ^b (2.14)	0.38 ^b (2.09)
X_{t-2}^{Tot}	0.10 (0.57)	0.10 (0.54)	0.08 (0.37)
X_{t-3}^{Tot}	0.19 (1.12)	0.18 (0.96)	0.14 (0.70)
X_{t-4}^{Tot}	0.12 (0.73)	0.12 (0.66)	0.17 (0.88)
X_{t-5}^{Tot}			
E_{t-1}^{Tot}	-0.08 (-1.13)	-0.10 (-0.65)	-0.18 (1.01)
E_{t-2}^{Tot}	0.06 (0.85)	0.06 (0.70)	0.18 (1.06)
E_{t-3}^{Tot}	0.02 (0.28)	0.02 (0.20)	0.03 (0.20)
E_{t-4}^{Tot}	0.06 (0.85)	0.05 (0.68)	0.03 (0.34)
E_{t-5}^{Tot}		-0.02 (-0.20)	-0.02 (-0.26)
E_{t-6}^{Tot}		0.05 (0.68)	0.07 (0.87)

Table 3.32 (Continued)

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{Tot}			-0.01 (-0.14)
E_{t-8}^{Tot}			-0.05 (-0.64)
Inter- cept	5.83 (0.13)	-5.32 (-0.11)	12.90 (0.24)
T	0.24 (0.55)	0.25 (0.51)	0.09 (0.17)
$\bar{R}^2$	.55	.46	.39
Model F-value	7.11 ^a	4.45 ^a	3.13 ^a
F-test for lagged causality	0.83	-0.21	-0.32

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.33
West Grand Division:
Rural Area Displacement - All Firms^d

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_t^{Tot}	0.03 (0.32)	0.19 (1.47)	0.17 (1.05)
X_{t-1}^{Tot}	0.14 (0.85)	0.14 (0.83)	0.18 (1.03)
X_{t-2}^{Tot}	0.51 ^a (3.24)	0.56 ^a (3.38)	0.62 ^a (3.65)
X_{t-3}^{Tot}	0.17 (1.08)	0.17 (0.99)	0.09 (0.51)
X_{t-4}^{Tot}	-0.10 (-0.60)	-0.09 (-0.54)	-0.20 (-1.14)
X_{t-5}^{Tot}			
E_{t-1}^{Tot}	-0.07 (-0.81)	-0.23 (-1.62)	-0.34 ^b (-2.22)
E_{t-2}^{Tot}	0.05 (0.65)	0.07 (0.75)	0.02 (0.10)
E_{t-3}^{Tot}	0.10 (1.24)	0.10 (1.19)	0.34 ^b (2.15)
E_{t-4}^{Tot}	-0.10 (-1.24)	-0.04 (-0.44)	-0.10 (-1.00)
E_{t-5}^{Tot}		-0.07 (-0.83)	-0.12 (-1.29)
E_{t-6}^{Tot}		-0.01 (-0.18)	-0.07 (-0.76)

Table 3.33 (Continued)

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{Tot}			0.18 ^c (2.00)
E_{t-8}^{Tot}			-0.06 (-0.66)
Inter- cept	38.34 (0.93)	36.99 (0.84)	43.12 (0.82)
T	0.05 (0.16)	-0.04 (-0.11)	0.01 (-0.04)
$\bar{R}^2$	.34	.30	.34
Model F-value	3.63 ^a	2.76 ^a	2.75 ^a
F-test for lagged causality	0.91	0.58	1.03

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Although the F-statistics for the models indicate a statistically significant relationship between entry and exit in rural areas, the coefficients of interest, E_t^{Tot} , are for the most part insignificant. Since most of the coefficients on E_t^{Tot} and E_{t-i}^{Tot} , for $i = 1$ to 8, are insignificant, this implies that displacement in rural areas does not occur. In some of the models lagged entry coefficients are significant, but in no case is a lagged influence as a whole detected.

Now consider the urban areas in each grand division. These estimations are given in Tables 3.34, 3.35, and 3.36. The results for urban areas are quite different than those for rural areas. In urban areas, the statistically significant coefficients on E_t^{Tot} indicate that for every two firms that enter, the exit of one incumbent firm results. The magnitude of these coefficients are nearly equal to those reported earlier in each grand division as a whole. This suggests that much of the displacement that occurs due to new entrants takes place in urban areas. Perhaps urban firms are experiencing more competition from new entrants than firms in rural areas. In no case is there evidence of lagged causality in urban areas.

In his comprehensive work, Greenwood (1981) investigates migration and economic growth in the U.S. from several perspectives. One of his major findings is that in the country's largest Standard Metropolitan Areas (SMAs), a major portion of the increase in the labor force occurred primarily within the suburban areas surrounding the actual urban centers. Recall that the urban areas defined above consist of those counties which are part of the SMAs in Tennessee. Hence, evidence of this growth in the urban labor force can be obtained by investigating entry and exit activity occurring between urban and rural areas in

Table 3.34
 East Grand Division:
 Urban Area Displacement - All Firms^d

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_t^{Tot}	0.09 (1.10)	0.58 ^b (2.65)	0.55 ^b (2.16)
X_{t-1}^{Tot}	0.27 (0.91)	0.38 ^b (1.88)	0.39 ^c (2.22)
X_{t-2}^{Tot}	0.28 (1.66)	0.23 (1.35)	0.31 (1.54)
X_{t-3}^{Tot}	0.04 (0.21)	-0.03 (-0.18)	-0.14 (-0.71)
X_{t-4}^{Tot}	0.04 (0.23)	0.13 (0.81)	0.14 (0.81)
X_{t-5}^{Tot}			
E_{t-1}^{Tot}	0.05 (0.55)	-0.47 ^c (-2.02)	-0.53 ^c (-1.91)
E_{t-2}^{Tot}	0.07 (0.82)	-0.05 (-0.66)	-0.22 (-0.77)
E_{t-3}^{Tot}	0.05 (0.60)	0.06 (0.67)	0.37 (1.45)
E_{t-4}^{Tot}	-0.11 (-1.27)	-0.06 (-0.72)	-0.08 (-0.91)
E_{t-5}^{Tot}		-0.07 (-0.75)	-0.09 (-0.90)
E_{t-6}^{Tot}		-0.04 (-0.50)	-0.04 (-0.76)

Table 3.34 (Continued)

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{Tot}			-0.04 (-0.44)
E_{t-8}^{Tot}			-0.02 (-0.21)
Intercept	172.29 (1.44)	143.02 (0.86)	147.47 (0.68)
T	1.78 (1.06)	0.89 (0.48)	0.85 (0.41)
$\bar{R}^2$	.56	.59	.55
Model F-value	7.46 ^a	6.91 ^a	5.18 ^a
F-test for lagged causality	0.73	1.42	0.88

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.35
 Middle Grand Division:
 Urban Area Displacement - All Firms^d

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_t^{Tot}	0.10 (1.25)	0.54 ^a (3.92)	0.52 ^a (3.01)
X_{t-1}^{Tot}	0.14 (0.91)	0.27 ^c (1.76)	0.39 ^b (2.22)
X_{t-2}^{Tot}	0.08 (0.50)	0.14 (1.04)	0.03 (0.16)
X_{t-3}^{Tot}	0.04 (0.26)	-0.02 (-0.11)	-0.01 (-0.07)
X_{t-4}^{Tot}	0.08 (0.49)	0.06 (0.44)	0.12 (0.76)
X_{t-5}^{Tot}		0.34 ^b (2.44)	
E_{t-1}^{Tot}	-0.10 (-1.26)	-0.42 ^b (-2.71)	-0.61 ^a (-3.19)
E_{t-2}^{Tot}	0.02 (0.23)	0.01 (0.14)	0.25 (1.14)
E_{t-3}^{Tot}	0.02 (0.29)	0.05 (0.66)	-0.04 (-0.17)
E_{t-4}^{Tot}	0.02 (0.24)	0.08 (1.16)	0.03 (0.46)
E_{t-5}^{Tot}		-0.08 (-1.12)	-0.06 (-0.84)
E_{t-6}^{Tot}		0.02 (0.25)	0.001 (0.01)

Table 3.35 (Continued)

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{Tot}			0.10 (1.37)
E_{t-8}^{Tot}			-0.05 (-0.74)
Inter- cept	195.31 (1.66)	-4.46 (-0.04)	100.94 (0.79)
T	1.61 (1.37)	-0.65 (-0.54)	0.51 (0.37)
$\bar{R}^2$	.33	.47	.37
Model F-value	3.49 ^a	4.35 ^a	3.00 ^a
F-test for lagged causality	0.42	1.01	1.16

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.36

West Grand Division:
Urban Area Displacement - All Firms^d

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_t^{Tot}	0.49 ^a (4.34)	0.55 ^a (4.95)	0.58 ^a (4.53)
X_{t-1}^{Tot}	0.33 ^b (2.34)	0.52 ^a (3.40)	0.50 ^a (2.86)
X_{t-2}^{Tot}	0.16 (1.08)	0.12 (0.86)	0.19 (0.94)
X_{t-3}^{Tot}	0.08 (0.55)	-0.02 (-0.15)	-0.03 (-0.16)
X_{t-4}^{Tot}	-0.15 (-1.05)	-0.20 (-1.46)	-0.23 (-1.52)
X_{t-5}^{Tot}	0.32 ^b (2.37)	0.36 ^a (2.64)	0.36 ^b (2.32)
E_{t-1}^{Tot}	-0.14 ^b (-2.05)	-0.44 ^a (-3.28)	-0.44 ^a (-2.67)
E_{t-2}^{Tot}	-0.03 (-0.39)	-0.004 (-0.05)	-0.08 (-0.45)
E_{t-3}^{Tot}	0.02 (0.23)	0.06 (0.87)	0.08 (0.48)
E_{t-4}^{Tot}	0.04 (0.57)	0.05 (0.78)	0.06 (0.84)
E_{t-5}^{Tot}		-0.05 (-0.84)	-0.06 (-0.85)
E_{t-6}^{Tot}		0.02 (0.26)	0.002 (0.04)

Table 3.36 (Continued)

	Dependent Variable		
	Total Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{Tot}			0.06 (0.92)
E_{t-8}^{Tot}			-0.02 (-0.34)
Intercept	-73.30 (-0.69)	-7.10 (-0.06)	-14.96 (-0.12)
T	-0.37 (-0.32)	0.06 (0.05)	0.14 (0.12)
$\bar{R}^2$	.56	.59	.56
Model F-value	6.70 ^a	6.37 ^a	4.92 ^a
F-test for lagged causality	1.26	1.74	1.17

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Tennessee. Specifically, it is tested whether the entry of firms into urban areas is linked to the exit of firms out of rural areas and vice versa.

First, consider the linkages between firm entry into urban areas and firm exit out of rural areas. These results are reported in Tables 3.37, 3.38, and 3.39. These results indicate that four entries into urban areas are linked to, or "cause," one firm exit out of eastern and central rural areas, and that about seven urban entries "cause" one firm exit out of western rural areas. Second, consider the linkages in the other direction. These results are presented in Tables 3.40, 3.41, and 3.42. In almost every case, there is no evidence of rural firm entry "causing" urban firm exit. Taken together, these results support the findings articulated by Greenwood (1981) which indicate that the labor force is growing in the SMAs surrounding major urban centers.

Given the patterns revealed in the above estimations for all firms within a region, displacement is now tested for specific industry groups in each grand division. First consider the effect of new competition on manufacturing firms. The results from these estimations are reported in Tables 3.43, 3.44, and 3.45. These estimations indicate little displacement taking place among manufacturing firms in Tennessee. Most of the coefficients are insignificant, and many are of the wrong sign. These results suggest that the exit of manufacturing firms is caused more so by other factors rather than by competition from new entrants.

Alternatively, the estimates for the nonmanufacturing sector tell a different story. See Tables 3.46, 3.47, and 3.48 for these results. Specifically, the coefficients on E_t^{NM} indicate that for every two new entrants an exit of an incumbent firm occurs. This result is consistent

Table 3.37

East Grand Division:
Displacement - Urban Entry versus Rural Exit^d

	Dependent Variable		
	Rural Firm Exit		
	(1)	(2)	(3)
E_t^U	0.05 (1.43)	0.24 ^a (2.83)	0.22 ^b (2.19)
X_{t-1}^R	0.31 ^c (1.91)	0.33 ^b (2.01)	0.35 ^b (2.04)
X_{t-2}^R	0.21 (1.25)	0.17 (1.05)	0.19 (1.04)
X_{t-3}^R	0.16 (0.97)	0.15 (0.92)	0.05 (0.31)
X_{t-4}^R	0.14 (0.88)	0.25 (1.51)	0.26 (1.52)
X_{t-5}^R			
E_{t-1}^U	-0.04 (-0.99)	-0.11 (-1.27)	-0.14 (-1.33)
E_{t-2}^U	-0.002 (-0.05)	-0.008 (-0.22)	-0.08 (-0.76)
E_{t-3}^U	0.01 (0.31)	0.004 (0.11)	0.13 (1.37)
E_{t-4}^U	-0.01 (-0.38)	-0.003 (-0.09)	-0.01 (-0.40)
E_{t-5}^U		0.02 (0.55)	0.01 (0.38)
E_{t-6}^U		-0.05 (-1.47)	-0.06 ^c (-1.74)

Table 3.37 (Continued)

	Dependent Variable		
	Rural Firm Exit		
	(1)	(2)	(3)
E_{t-7}^U			0.01 (0.28)
E_{t-8}^U			-0.01 (-0.28)
Intercept	28.24 (0.57)	-17.62 (-0.27)	1.04 (0.01)
T	-0.02 (-0.04)	-0.61 (-1.06)	-0.53 (-0.88)
$\bar{R}^2$	.47	.47	.42
Model F-value	5.45 ^a	4.63 ^a	3.43 ^a
F-test for lagged causality	0.32	0.66	0.36

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.38
Middle Grand Division:
Displacement - Urban Entry versus Rural Exit^d

	Dependent Variable		
	Rural Firm Exit		
	(1)	(2)	(3)
E_t^U	0.05 (1.36)	0.23 ^a (3.38)	0.23 ^b (2.85)
X_{t-1}^R	0.43 ^a (2.70)	0.56 ^a (3.36)	0.58 ^a (3.18)
X_{t-2}^R	0.06 (0.36)	0.06 (0.36)	0.02 (0.12)
X_{t-3}^R	0.21 (1.25)	0.29 ^c (1.77)	0.34 ^c (1.66)
X_{t-4}^R	0.09 (0.52)	0.07 (0.44)	0.07 (0.37)
X_{t-5}^R			
E_{t-1}^U	-0.05 (-1.60)	-0.16 ^b (-2.22)	-0.17 ^c (-1.89)
E_{t-2}^U	0.02 (0.65)	0.01 (0.43)	0.04 (0.49)
E_{t-3}^U	0.003 (0.10)	-0.003 (-0.11)	-0.04 (-0.43)
E_{t-4}^U	0.02 (0.48)	0.02 (1.09)	0.04 (1.02)
E_{t-5}^U		-0.006 (-0.20)	-0.006 (-0.16)
E_{t-6}^U		-0.04 (-1.23)	-0.03 (-1.00)

Table 3.38 (Continued)

	Dependent Variable		
	Rural Firm Exit		
	(1)	(2)	(3)
E_{t-7}^U			0.004 (0.12)
E_{t-8}^U			-0.01 (-0.29)
Inter- cept	18.46 (0.43)	-17.22 (-0.37)	-18.55 (0.36)
T	0.02 (0.05)	-0.67 (-1.12)	-0.70 (-1.08)
$\bar{R}^2$	.55	.56	.49
Model F-value	7.26 ^a	6.26 ^a	4.25 ^a
F-test for lagged causality	0.72	1.06	0.34

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.39
 West Grand Division:
 Displacement - Urban Entry versus Rural Exit^d

	Dependent Variable		
	Rural Firm Exit		
	(1)	(2)	(3)
E_t^U	0.02 (0.73)	0.12 ^b (2.41)	0.15 ^a (2.86)
X_{t-1}^R	0.14 (0.89)	0.15 (0.89)	0.14 (0.79)
X_{t-2}^R	0.49 ^a (3.07)	0.49 ^a (3.15)	0.60 ^a (3.45)
X_{t-3}^R	0.18 (1.15)	0.21 (1.30)	0.22 (1.29)
X_{t-4}^R	-0.11 (-0.67)	-0.11 (-0.68)	-0.16 (-0.96)
X_{t-5}^R			
E_{t-1}^U	-0.02 (-0.65)	-0.07 (-1.29)	-0.06 (-1.01)
E_{t-2}^U	-0.001 (-0.07)	-0.001 (-0.40)	-0.07 (-1.26)
E_{t-3}^U	0.02 (0.65)	0.02 (0.77)	0.04 (0.69)
E_{t-4}^U	-0.03 (-0.88)	-0.01 (-0.31)	0.002 (0.05)
E_{t-5}^U		-0.004 (-0.14)	-0.008 (-0.26)
E_{t-6}^U		-0.04 (-1.44)	-0.05 ^c (-1.82)

Table 3.39 (Continued)

	Dependent Variable		
	Rural Firm Exit		
	(1)	(2)	(3)
E_{t-7}^U			0.03 (0.94)
E_{t-8}^U			0.03 (1.02)
Inter- cept	47.08 (1.22)	42.54 (0.95)	4.14 (0.08)
T	0.05 (0.16)	-0.14 (-0.41)	-0.13 (-0.36)
$\bar{R}^2$	.31	.34	.34
Model F-value	3.29 ^a	3.14 ^a	2.76 ^a
F-test for lagged causality	0.34	0.34	1.00

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.40

East Grand Division:
Displacement - Rural Entry versus Urban Exit^d

	Dependent Variable		
	Urban Firm Exit		
	(1)	(2)	(3)
E_t^R	-0.06 (-0.24)	-0.38 (-0.69)	-0.91 (-1.32)
X_{t-1}^U	0.24 (1.40)	0.23 (1.32)	0.19 (1.03)
X_{t-2}^U	0.28 ^c (1.65)	0.28 (1.57)	0.30 (1.60)
X_{t-3}^U	0.09 (0.49)	0.06 (0.31)	0.07 (0.35)
X_{t-4}^U	-0.02 (-0.12)	-0.02 (-0.08)	-0.09 (-0.47)
X_{t-5}^U			
E_{t-1}^R	-0.05 (-0.20)	0.21 (0.38)	-0.38 (-0.55)
E_{t-2}^R	-0.08 (-0.28)	-0.04 (-0.15)	0.56 (0.80)
E_{t-3}^R	0.15 (0.55)	0.12 (0.41)	0.72 (1.10)
E_{t-4}^R	-0.16 (-0.62)	-0.16 (-0.54)	-0.37 (-1.14)
E_{t-5}^R		-0.03 (-0.11)	-0.23 (-0.71)
E_{t-6}^R		-0.10 (-0.36)	-0.10 (-0.32)

Table 3.40 (Continued)

	Dependent Variable		
	Urban Firm Exit		
	(1)	(2)	(3)
E_{t-7}^R			0.07 (0.23)
E_{t-8}^R			-0.23 (-0.74)
Inter- cept	189.06 (1.32)	240.43 (1.38)	417.85 ^c (1.81)
T	1.75 (0.98)	1.72 (0.88)	1.32 (0.66)
$\bar{R}^2$	.52	.47	.43
Model F-value	6.63 ^a	4.64 ^a	3.58 ^a
F-test for lagged causality	0.19	-0.15	-0.08

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.41

Middle Grand Division:
Displacement - Rural Entry versus Urban Exit^d

	Dependent Variable		
	Urban Firm Exit		
	(1)	(2)	(3)
E_t^R	0.05 (0.28)	0.10 (0.32)	0.12 (0.34)
X_{t-1}^U	0.08 (0.52)	0.07 (0.42)	0.03 (0.19)
X_{t-2}^U	0.09 (0.56)	0.06 (0.33)	0.05 (0.23)
X_{t-3}^U	0.04 (0.27)	0.02 (0.09)	-0.02 (-0.10)
X_{t-4}^U	0.06 (0.37)	0.03 (0.20)	0.05 (0.27)
X_{t-5}^U			
E_{t-1}^R	-0.04 (-0.22)	0.02 (0.05)	-0.09 (-0.21)
E_{t-2}^R	-0.01 (-0.06)	-0.04 (0.22)	0.14 (0.35)
E_{t-3}^R	0.04 (0.26)	0.02 (0.14)	-0.04 (-0.12)
E_{t-4}^R	0.10 (0.65)	0.08 (0.47)	0.07 (0.39)
E_{t-5}^R		-0.12 (-0.67)	-0.13 (-0.71)
E_{t-6}^R		0.26 (1.60)	0.22 (1.20)

Table 3.41 (Continued)

	Dependent Variable		
	Urban Firm Exit		
	(1)	(2)	(3)
E_{t-7}^R			0.12 (0.62)
E_{t-8}^R			0.006 (0.03)
Inter- cept	203.37 ^c (1.77)	186.47 (1.54)	179.55 (1.24)
T	2.15 ^b (2.05)	2.47 ^b (2.20)	2.71 ^b (2.06)
$\bar{R}^2$	.30	.23	.13
Model F-value	3.16 ^a	2.24 ^b	1.52
F-test for lagged causality	0.19	-0.04	-0.22

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.42

West Grand Division:
Displacement - Rural Entry versus Urban Exit^d

	Dependent Variable		
	Urban Firm Exit		
	(1)	(2)	(3)
E_t^R	0.19 (0.90)	0.62 ^c (1.86)	0.60 (1.40)
X_{t-1}^U	0.23 (1.43)	0.31 ^c (1.83)	0.37 ^b (2.08)
X_{t-2}^U	0.02 (0.10)	0.04 (0.22)	-0.03 (-0.14)
X_{t-3}^U	-0.005 (-0.03)	-0.05 (-0.29)	-0.03 (-0.14)
X_{t-4}^U	-0.07 (-0.46)	-0.02 (-0.11)	-0.03 (-0.19)
X_{t-5}^U			
E_{t-1}^R	-0.38 ^c (-1.82)	-0.86 ^b (-2.41)	-1.06 ^a (-2.63)
E_{t-2}^R	0.19 (0.85)	0.24 (1.03)	0.40 (0.93)
E_{t-3}^R	-0.009 (-0.04)	-0.01 (-0.06)	0.03 (0.06)
E_{t-4}^R	-0.15 (-0.71)	-0.07 (-0.29)	-0.10 (-0.37)
E_{t-5}^R		0.05 (0.22)	0.02 (0.07)
E_{t-6}^R		-0.02 (-0.08)	-0.05 (-0.21)

Table 3.42 (Continued)

	Dependent Variable		
	Urban Firm Exit		
	(1)	(2)	(3)
E_{t-7}^R			0.31 (1.36)
E_{t-8}^R			-0.32 (-1.39)
Intercept	250.56 ^b (2.18)	197.93 (1.57)	223.62 (1.44)
T	2.50 ^b (2.18)	2.22 ^c (1.84)	2.09 ^c (1.70)
$\bar{R}^2$	.38	.35	.34
Model F-value	4.08 ^a	3.20 ^a	2.74 ^a
F-test for lagged causality	1.06	0.78	0.81

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.43
East Grand Division:
Displacement - Manufacturing^d

	Dependent Variable		
	Manufacturing Firm Exit		
	(1)	(2)	(3)
E_t^M	0.03 (0.69)	0.14 (1.08)	0.11 (0.78)
X_{t-1}^M	0.22 (1.41)	0.22 (1.33)	0.20 (1.15)
X_{t-2}^M	0.16 (1.03)	0.24 (1.44)	0.23 (1.35)
X_{t-3}^M	0.23 (1.42)	0.28 (1.64)	0.23 (1.25)
X_{t-4}^M	-0.28 (-1.64)	-0.26 (-1.49)	-0.24 (-1.25)
X_{t-5}^M			
E_{t-1}^M	0.02 (0.50)	0.01 (0.09)	0.03 (0.22)
E_{t-2}^M	-0.07 (-1.32)	-0.07 (-1.39)	-0.22 (-1.47)
E_{t-3}^M	0.05 (0.98)	0.04 (0.79)	0.14 (0.97)
E_{t-4}^M	0.03 (0.50)	0.04 (0.74)	0.04 (0.41)
E_{t-5}^M		-0.02 (-0.42)	-0.03 (-0.46)
E_{t-6}^M		-0.07 (-1.37)	-0.08 (-1.47)

Table 3.43 (Continued)

	Dependent Variable		
	Manufacturing Firm Exit		
	(1)	(2)	(3)
E_{t-7}^M			0.01 (0.19)
E_{t-8}^M			-0.07 (-1.33)
Inter- cept	15.00 (1.52)	13.13 (0.99)	23.33 (1.55)
T	0.20 (1.51)	0.10 (0.64)	0.09 (0.59)
$\bar{R}^2$	.26	.27	.25
Model F-value	2.80 ^a	2.53 ^b	2.09 ^b
F-test for lagged causality	0.71	0.97	0.83

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.44
 Middle Grand Division:
 Displacement - Manufacturing^d

	Dependent Variable		
	Manufacturing Firm Exit		
	(1)	(2)	(3)
E_t^M	0.01 (0.27)	-0.02 (-0.35)	-0.13 (-1.05)
X_{t-1}^M	-0.02 (-0.10)	-0.02 (-0.11)	-0.14 (-0.85)
X_{t-2}^M	0.09 (0.54)	0.12 (0.71)	0.13 (0.15)
X_{t-3}^M	-0.05 (-0.28)	-0.02 (-0.10)	0.04 (0.26)
X_{t-4}^M	-0.04 (-0.24)	-0.03 (-0.20)	0.07 (-0.40)
X_{t-5}^M			
E_{t-1}^M	0.05 (0.99)	0.21 ^c (1.76)	0.16 (1.42)
E_{t-2}^M	-0.03 (-0.52)	-0.04 (-0.69)	0.12 (1.00)
E_{t-3}^M	0.01 (0.24)	0.01 (0.13)	0.20 (1.61)
E_{t-4}^M	0.03 (0.53)	0.02 (0.34)	-0.03 (-0.56)
E_{t-5}^M		0.03 (0.58)	0.04 (0.55)
E_{t-6}^M		-0.001 (-0.04)	0.01 (0.10)

Table 3.44 (Continued)

	Dependent Variable		
	Manufacturing Firm Exit		
	(1)	(2)	(3)
E_{t-7}^M			0.05 (0.97)
E_{t-8}^M			-0.09 ^c (-1.90)
Inter- cept	27.39 ^b (2.15)	17.88 (1.04)	15.89 (0.86)
T	0.25 ^b (2.21)	0.24 ^c (1.96)	0.20 (1.60)
$\bar{R}^2$	.02	.02	.10
Model F-value	1.13	1.08	1.36
F-test for lagged causality	0.38	0.60	1.16

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.45
 West Grand Division:
 Displacement - Manufacturing^d

	Dependent Variable		
	Manufacturing Firm Exit		
	(1)	(2)	(3)
E_t^M	-0.03 (-1.05)	0.06 (0.52)	0.11 (0.76)
X_{t-1}^M	0.13 (0.87)	0.13 (0.84)	0.10 (0.63)
X_{t-2}^M	-0.04 (-0.28)	-0.01 (-0.10)	-0.07 (-0.46)
X_{t-3}^M	0.37 ^b (2.56)	0.33 ^b (2.27)	0.33 ^b (2.16)
X_{t-4}^M	-0.31 ^b (-2.16)	-0.35 ^b (-2.28)	-0.32 ^b (-1.99)
X_{t-5}^M			
E_{t-1}^M	-0.05 (-1.63)	-0.26 ^b (-2.12)	-0.23 (-1.65)
E_{t-2}^M	0.01 (0.41)	0.03 (0.76)	0.06 (0.39)
E_{t-3}^M	-0.03 (-0.92)	-0.02 (-0.65)	-0.21 (-1.58)
E_{t-4}^M	0.02 (0.55)	0.02 (0.61)	0.04 (1.11)
E_{t-5}^M		-0.03 (-0.71)	-0.01 (-0.36)
E_{t-6}^M		-0.01 (-0.34)	-0.01 (-0.33)

Table 3.45 (Continued)

	Dependent Variable		
	Manufacturing Firm Exit		
	(1)	(2)	(3)
E_{t-7}^M			0.002 (0.68)
E_{t-8}^M			0.004 (0.11)
Inter- cept	20.21 ^a (2.24)	25.64 ^a (2.26)	27.65 ^b (2.44)
T	0.16 ^b (2.24)	0.17 ^b (2.26)	0.20 ^b (2.44)
$\bar{R}^2$	.43	.36	.34
Model F-value	4.81 ^a	3.27 ^a	2.70 ^{ai}
F-test for lagged causality	1.10	0.31	0.38

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.46
 East Grand Division:
 Displacement - Nonmanufacturing^d

	Dependent Variable		
	Nonmanufacturing Firm Exit		
	(1)	(2)	(3)
E_t^{NM}	0.09 (0.97)	0.56 ^b (2.24)	0.54 ^c (1.86)
X_{t-1}^{NM}	0.27 (1.66)	0.35 ^c (1.98)	0.36 ^b (2.03)
X_{t-2}^{NM}	0.25 (1.49)	0.19 (1.07)	0.27 (1.42)
X_{t-3}^{NM}	0.08 (0.47)	0.10 (0.59)	-0.05 (-0.28)
X_{t-4}^{NM}	0.08 (0.48)	0.14 (0.80)	0.16 (0.94)
X_{t-5}^{NM}			
E_{t-1}^{NM}	-0.07 (-0.75)	-0.46 ^c (-1.75)	-0.59 ^c (-1.94)
E_{t-2}^{NM}	-0.06 (-0.57)	-0.06 (-0.59)	-0.39 (-1.21)
E_{t-3}^{NM}	0.07 (0.67)	0.08 (0.82)	0.68 ^b (2.41)
E_{t-4}^{NM}	-0.10 (-1.03)	-0.07 (-0.67)	-0.10 (-0.99)
E_{t-5}^{NM}		-0.01 (-0.10)	-0.07 (-0.67)
E_{t-6}^{NM}		-0.08 (-0.81)	-0.13 (-1.21)

Table 3.46 (Continued)

	Dependent Variable		
	Nonmanufacturing Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{NM}			0.03 (0.31)
E_{t-8}^{NM}			0.02 (0.17)
Inter- cept	204.92 (1.15)	159.49 (0.66)	167.68 (0.56)
T	1.54 (0.73)	0.46 (0.20)	0.42 (0.18)
$\bar{R}^2$	.53	.52	.52
Model F-value	6.85 ^a	5.51 ^a	4.65 ^a
F-test for lagged causality	0.59	0.64	0.73

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.47

Middle Grand Division:
Displacement - Nonmanufacturing^d

	Dependent Variable		
	Nonmanufacturing Firm Exit		
	(1)	(2)	(3)
E_t^{NM}	0.09 (1.16)	0.46 ^a (3.20)	0.49 ^a (2.85)
X_{t-1}^{NM}	0.23 (1.48)	0.31 ^c (1.94)	0.44 ^b (2.48)
X_{t-2}^{NM}	0.12 (0.73)	0.18 (1.18)	0.10 (0.54)
X_{t-3}^{NM}	0.09 (0.58)	0.01 (0.04)	0.01 (0.07)
X_{t-4}^{NM}	0.12 (0.75)	0.09 (0.62)	0.20 (1.22)
X_{t-5}^{NM}		0.31 ^b (2.08)	
E_{t-1}^{NM}	-0.10 (-1.34)	-0.40 ^b (-2.44)	-0.60 ^a (-3.02)
E_{t-2}^{NM}	0.03 (0.42)	0.04 (0.55)	0.29 (1.37)
E_{t-3}^{NM}	0.03 (0.35)	0.06 (0.79)	-0.08 (-0.39)
E_{t-4}^{NM}	0.03 (0.65)	0.07 (0.99)	0.05 (0.57)
E_{t-5}^{NM}		-0.07 (-0.98)	-0.06 (-0.78)
E_{t-6}^{NM}		0.04 (0.57)	0.03 (0.37)

Table 3.47 (Continued)

	Dependent Variable		
	Nonmanufacturing Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{NM}			0.09 (1.20)
E_{t-8}^{NM}			-0.07 (0.90)
Inter- cept	145.52 (1.03)	-69.11 (-0.48)	23.61 (0.15)
T	1.33 (0.91)	-1.03 (-0.66)	0.04 (0.02)
$\bar{R}^2$	.44	.49	.41
Model F-value	5.06 ^a	4.58 ^a	3.35 ^a
F-test for lagged causality	0.55	0.65	0.59

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.48
 West Grand Division:
 Displacement - Nonmanufacturing^d

	Dependent Variable		
	Nonmanufacturing Firm Exit		
	(1)	(2)	(3)
E_t^{NM}	0.16 ^c (1.93)	0.58 ^a (4.83)	0.66 ^a (4.58)
X_{t-1}^{NM}	0.25 (1.53)	0.49 ^a (3.08)	0.49 ^a (2.78)
X_{t-2}^{NM}	0.18 (1.05)	0.23 (1.57)	0.35 ^c (1.74)
X_{t-3}^{NM}	0.09 (0.56)	-0.02 (-0.11)	-0.11 (-0.53)
X_{t-4}^{NM}	-0.06 (-0.35)	-0.14 (-0.97)	-0.19 (-1.30)
X_{t-5}^{NM}		0.32 ^b (2.26)	0.33 ^b (2.20)
E_{t-1}^{NM}	-0.13 (-1.51)	-0.50 ^a (-3.42)	-0.56 ^a (-3.02)
E_{t-2}^{NM}	0.02 (0.20)	0.004 (0.05)	-0.16 (-0.80)
E_{t-3}^{NM}	0.02 (0.19)	0.08 (1.04)	0.24 (1.30)
E_{t-4}^{NM}	-0.05 (-0.54)	0.04 (0.52)	0.05 (0.59)
E_{t-5}^{NM}		-0.08 (-1.00)	-0.11 (-1.31)
E_{t-6}^{NM}		0.01 (0.19)	-0.03 (-0.34)

Table 3.48 (Continued)

	Dependent Variable		
	Nonmanufacturing Firm Exit		
	(1)	(2)	(3)
E_{t-7}^{NM}			0.13 ^c (1.76)
E_{t-8}^{NM}			-0.04 (-0.53)
Inter- cept	196.30 (1.41)	-18.47 (-0.13)	50.94 (-0.30)
T	1.73 (1.29)	-0.28 (-0.22)	-0.21 (-0.16)
$\bar{R}^2$	.35	.54	.54
Model F-value	3.77 ^a	5.34 ^a	4.65 ^a
F-test for lagged causality	0.66	1.81	1.65

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

with the initial displacement estimations in this subsection. In all cases, the F-statistics are significant at the .01 level indicating that the explanatory power of the model is quite good. As before, there is no evidence of a lagged causal effect.

To further explore displacement among nonmanufacturing firms in Tennessee, the nonmanufacturing sector is disaggregated into the three industry categories used earlier in this section. First consider the results among FIRE firms which are reported in Tables 3.49, 3.50, and 3.51. Once again, firms in this category are less susceptible to the entry of new firms.

Second, in Tables 3.52, 3.53, and 3.54 the results for trade firms are reported. Surprisingly, the coefficients on the E^T variables indicate neither instantaneous nor lagged causal effects from entry to exit. Given the nature of trade firms, especially retail trade, one would expect that new competition may indeed cause some incumbents to exit, but apparently, at least in this estimation, this is not the case. However, this is not true for the service sector. See Tables 3.55, 3.56, and 3.57 for these results. In particular, the estimations suggest that new competition does cause the exit of incumbents. Specifically, the coefficients show that an incumbent firm exits after approximately four new firms enter. Also, at least for the middle and western regions, there is evidence of a lagged causal effect from entry to exit. The explanatory power of these models is reflected in the high R^2 's and F-statistics. These results indicate the sensitivity of service industry firms to new competition. Given the nature of many service firms this result is not surprising.

Table 3.49

East Grand Division:
Displacement - Finance, Insurance and Real Estate^d

	Dependent Variable		
	FIRE Firm Exit		
	(1)	(2)	(3)
E_t^F	-0.06 (-0.56)	-0.06 (-0.29)	-0.14 (-0.61)
X_{t-1}^F	0.25 (1.59)	0.25 (1.51)	0.29 ^c (1.73)
X_{t-2}^F	0.21 (1.32)	0.23 (1.26)	0.21 (1.12)
X_{t-3}^F	0.26 (1.65)	0.23 (1.32)	0.09 (0.49)
X_{t-4}^F	-0.12 (-0.74)	-0.11 (-0.64)	0.02 (0.11)
X_{t-5}^F			
E_{t-1}^F	-0.03 (-0.30)	-0.05 (-0.24)	0.06 (0.28)
E_{t-2}^F	-0.14 (-1.37)	-0.12 (-1.06)	-0.55 ^b (-2.24)
E_{t-3}^F	0.06 (0.55)	0.04 (0.40)	0.38 (1.58)
E_{t-4}^F	-0.04 (-0.38)	-0.01 (-0.07)	-0.07 (-0.62)
E_{t-5}^F		-0.10 (-0.86)	-0.11 (-0.94)
E_{t-6}^F		0.06 (0.58)	0.04 (0.30)

Table 3.49 (Continued)

	Dependent Variable		
	FIRE Firm Exit		
	(1)	(2)	(3)
E_{t-7}^F			0.05 (0.48)
E_{t-8}^F			-0.12 (-1.14)
Inter- cept	21.84 ^c (1.70)	23.09 (1.25)	34.16 (1.54)
T	0.16 (0.94)	0.16 (0.88)	0.18 (0.92)
$\bar{R}^2$	.42	.34	.34
Model F-value	4.75 ^a	3.10 ^a	2.77 ^a
F-test for lagged causality	0.61	-0.10	0.28

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.50

Middle Grand Division:
Displacement - Finance, Insurance and Real Estate^d

	Dependent Variable		
	FIRE Firm Exit		
	(1)	(2)	(3)
E_t^F	0.21 ^c (1.77)	0.10 (0.40)	0.17 (0.66)
X_{t-1}^F	0.10 (0.64)	0.11 (0.69)	0.10 (0.57)
X_{t-2}^F	0.21 (1.33)	0.17 (1.05)	0.19 (1.10)
X_{t-3}^F	0.15 (0.91)	0.14 (0.82)	0.18 (0.94)
X_{t-4}^F	-0.14 (-0.85)	-0.16 (-0.89)	-0.14 (-0.72)
X_{t-5}^F			
E_{t-1}^F	-0.07 (-0.57)	-0.01 (-0.02)	0.07 (0.27)
E_{t-2}^F	-0.07 (-0.56)	-0.05 (-0.37)	-0.23 (-0.93)
E_{t-3}^F	-0.13 (-1.11)	-0.12 (-0.93)	-0.27 (-1.11)
E_{t-4}^F	-0.04 (-0.38)	-0.02 (-0.17)	0.01 (0.09)
E_{t-5}^F		-0.10 (-0.81)	-0.10 (-0.70)
E_{t-6}^F		0.06 (0.48)	0.04 (0.31)

Table 3.50 (Continued)

	Dependent Variable		
	FIRE Firm Exit		
	(1)	(2)	(3)
E_{t-7}^F			0.02 (0.18)
E_{t-8}^F			0.07 (-0.53)
Inter- cept	29.98 ^b (2.09)	35.52 (1.63)	31.77 (1.30)
T	0.20 (1.11)	0.25 (0.89)	0.33 (1.08)
$\bar{R}^2$	.18	.12	.06
Model F-value	2.11 ^b	1.55	1.22
F-test for lagged causality	1.34	0.75	0.55

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.51

West Grand Division:
Displacement - Finance, Insurance and Real Estate^d

	Dependent Variable		
	FIRE Firm Exit		
	(1)	(2)	(3)
E_t^F	-0.11 (-1.16)	-0.30 (-1.60)	-0.35 ^c (-1.71)
X_{t-1}^F	-0.18 (-1.16)	-0.23 (-1.43)	-0.25 (-1.49)
X_{t-2}^F	-0.14 (-0.96)	-0.23 (-1.50)	-0.24 (-1.53)
X_{t-3}^F	-0.31 ^b (-2.11)	-0.36 ^b (-2.39)	-0.35 ^b (-2.22)
X_{t-4}^F	-0.32 ^b (-2.07)	-0.33 ^b (-2.12)	-0.35 ^b (-2.07)
X_{t-5}^F			
E_{t-1}^F	-0.09 (-0.95)	-0.35 (-2.04)	-0.34 (-1.61)
E_{t-2}^F	-0.09 (-0.99)	-0.01 (-0.13)	-0.02 (-0.11)
E_{t-3}^F	-0.05 (-0.56)	-0.06 (-0.63)	-0.12 (-0.61)
E_{t-4}^F	-0.003 (-0.04)	-0.03 (-0.34)	-0.02 (-0.18)
E_{t-5}^F		-0.04 (-0.42)	-0.03 (-0.25)
E_{t-6}^F		0.14 (1.40)	0.18 (1.58)

Table 3.51 (Continued)

	Dependent Variable		
	FIRE Firm Exit		
	(1)	(2)	(3)
E_{t-7}^F			-0.11 (-0.86)
E_{t-8}^F			-0.07 (-0.55)
Inter- cept	68.92 ^a (4.40)	83.79 ^a (4.64)	94.98 ^a (4.30)
T	0.44 ^a (3.51)	0.59 ^a (3.94)	0.56 ^a (3.22)
$\bar{R}^2$	.12	.15	.13
Model F-value	1.72	1.72	1.52
F-test for lagged causality	0.87	1.18	1.06

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.52
 East Grand Division:
 Displacement - Wholesale and Retail Trade^d

	Dependent Variable		
	Trade Firm Exit		
	(1)	(2)	(3)
E_t^T	-0.15 (-0.76)	-0.28 (-1.23)	-0.45 ^c (-1.80)
X_{t-1}^T	0.13 (0.80)	0.13 (0.73)	0.06 (0.35)
X_{t-2}^T	0.17 (0.99)	0.19 (1.09)	0.16 (0.86)
X_{t-3}^T	0.06 (0.33)	0.05 (0.31)	0.05 (0.29)
X_{t-4}^T	0.04 (0.25)	0.03 (0.19)	-0.02 (-0.09)
X_{t-5}^T	0.31 ^c (1.84)		
E_{t-1}^T	-0.02 (-0.20)	0.10 (0.44)	-0.02 (-0.08)
E_{t-2}^T	-0.05 (-0.62)	-0.05 (-0.55)	0.09 (-0.34)
E_{t-3}^T	0.004 (0.04)	-0.01 (-0.09)	0.22 (0.94)
E_{t-4}^T	-0.04 (-0.41)	-0.04 (-0.40)	-0.08 (-0.85)
E_{t-5}^T		-0.14 (-1.42)	-0.18 ^c (-1.80)
E_{t-6}^T		-0.03 (-0.26)	-0.03 (-0.30)

Table 3.52 (Continued)

	Dependent Variable		
	Trade Firm Exit		
	(1)	(2)	(3)
E_{t-7}^T			-0.02 (0.18)
E_{t-8}^T			-0.13 (-1.32)
Inter- cept	149.91 (1.44)	258.89 ^c (1.90)	353.32 (2.21)
T	0.17 (0.16)	0.88 (0.86)	0.92 (0.90)
$\bar{R}^2$	.41	.35	.32
Model F-value	4.20 ^a	3.23 ^a	2.60 ^b
F-test for lagged causality	0.14	0.11	0.19

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.53

Middle Grand Division:
Displacement - Wholesale and Retail Trade^d

	Dependent Variable		
	Trade Firm Exit		
	(1)	(2)	(3)
E_t^T	0.01 (0.13)	0.01 (0.05)	-0.13 (-0.70)
X_{t-1}^T	0.33 ^b (0.80)	0.27 (0.73)	0.22 (0.35)
X_{t-2}^T	0.04 (0.23)	0.02 (0.10)	-0.02 (-0.02)
X_{t-3}^T	0.18 (1.12)	0.16 (0.95)	0.17 (1.02)
X_{t-4}^T	0.21 (1.38)	0.20 (1.21)	0.16 (0.94)
X_{t-5}^T			
E_{t-1}^T	-0.07 (-1.27)	0.05 (0.27)	-0.08 (-0.42)
E_{t-2}^T	0.04 (0.71)	0.01 (0.22)	0.40 ^b (2.17)
E_{t-3}^T	0.06 (1.08)	0.04 (0.59)	-0.07 (-0.38)
E_{t-4}^T	-0.01 (-0.15)	-0.02 (-0.31)	-0.06 (-0.92)
E_{t-5}^T		0.01 (0.20)	0.02 (0.34)
E_{t-6}^T		0.01 (0.18)	0.04 (0.59)

Table 3.53 (Continued)

	Dependent Variable		
	Trade Firm Exit		
	(1)	(2)	(3)
E_{t-7}^T			-0.04 (0.69)
E_{t-8}^T			-0.04 (-0.64)
Inter- cept	49.17 (0.84)	48.56 (0.74)	104.95 (1.30)
T	-0.10 (-0.32)	-0.05 (-0.16)	-0.15 (-0.42)
$\bar{R}^2$	.36	.12	.08
Model F-value	3.86 ^a	1.56	1.30
F-test for lagged causality	0.79	-1.00	-0.57

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

Table 3.54

West Grand Division:
Displacement - Wholesale and Retail Trade^d

	Dependent Variable		
	Trade Firm Exit		
	(1)	(2)	(3)
E_t^T	-0.05 (-0.72)	0.11 (0.45)	0.08 (0.30)
X_{t-1}^T	0.18 (1.09)	0.16 (1.02)	0.12 (0.70)
X_{t-2}^T	0.17 (1.04)	0.13 (0.76)	0.15 (0.83)
X_{t-3}^T	0.21 (1.27)	0.15 (0.95)	0.10 (0.57)
X_{t-4}^T	-0.04 (-0.26)	-0.09 (-0.56)	0.01 (0.03)
X_{t-5}^T		0.39 ^b (2.44)	
E_{t-1}^T	-0.03 (-0.35)	-0.07 (-0.28)	-0.32 (-1.10)
E_{t-2}^T	0.001 (0.02)	-0.02 (-0.32)	0.30 (1.09)
E_{t-3}^T	0.01 (0.10)	0.03 (0.46)	-0.21 (-0.86)
E_{t-4}^T	-0.04 (-0.52)	0.003 (0.04)	-0.04 (-0.45)
E_{t-5}^T		-0.06 (-0.85)	-0.12 (-1.45)
E_{t-6}^T		0.02 (0.27)	0.03 (0.33)

Table 3.54 (Continued)

	Dependent Variable		
	Trade Firm Exit		
	(1)	(2)	(3)
E_{t-7}^T			-0.08 (-1.05)
E_{t-8}^T			-0.17 ^b (-2.20)
Intercept	112.45 (1.61)	52.05 (0.51)	262.75 ^b (2.08)
T	0.13 (0.30)	-0.16 (-0.35)	-0.45 (-0.88)
$\bar{R}^2$	.17	.16	.12
Model F-value	2.04 ^c	1.74 ^c	1.46
F-test for lagged causality	0.09	0.04	0.38

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.55
 East Grand Division:
 Displacement - Health and Nonhealth Services^d

	Dependent Variable		
	Services Firm Exit		
	(1)	(2)	(3)
E_t^S	0.25 ^a (3.84)	0.41 ^a (5.21)	0.41 ^a (4.60)
X_{t-1}^S	0.32 ^c (1.93)	0.51 ^a (2.82)	0.51 ^a (2.74)
X_{t-2}^S	0.18 (1.01)	0.13 (0.74)	0.14 (0.68)
X_{t-3}^S	-0.03 (-0.15)	0.03 (0.16)	0.03 (0.17)
X_{t-4}^S	0.06 (0.33)	0.01 (0.07)	-0.05 (-0.27)
X_{t-5}^S			
E_{t-1}^S	-0.06 (-0.76)	-0.21 ^c (-1.95)	-0.24 ^c (-2.01)
E_{t-2}^S	-0.02 (-0.22)	-0.02 (-0.20)	-0.05 (-0.37)
E_{t-3}^S	0.04 (0.55)	0.002 (0.03)	0.03 (0.24)
E_{t-4}^S	-0.11 (-1.47)	-0.08 (-1.10)	-0.08 (-1.03)
E_{t-5}^S		0.09 (1.37)	0.09 (1.35)
E_{t-6}^S		-0.05 (-0.86)	-0.06 (-0.91)

Table 3.55 (Continued)

	Dependent Variable		
	Services Firm Exit		
	(1)	(2)	(3)
E_{t-7}^S			0.05 (0.77)
E_{t-8}^S			-0.06 (-0.85)
Inter- cept	13.99 (0.62)	0.36 (0.01)	8.27 (0.22)
T	1.20 ^c (1.77)	0.51 (0.66)	0.71 (0.76)
$\bar{R}^2$	.87	.89	.88
Model F-value	35.12 ^a	33.03 ^a	25.04 ^a
F-test for lagged causality	0.78	1.96	1.27

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.56

Middle Grand Division:
Displacement - Health and Nonhealth Services^d

	Dependent Variable		
	Services Firm Exit		
	(1)	(2)	(3)
E_t^S	0.18 ^a (3.49)	0.25 ^a (4.30)	0.25 ^a (4.47)
X_{t-1}^S	0.23 (1.56)	0.32 ^b (2.01)	0.24 (1.38)
X_{t-2}^S	-0.11 (-0.72)	0.02 (0.14)	0.04 (0.21)
X_{t-3}^S	-0.08 (-0.52)	-0.10 (-0.67)	-0.24 (-1.40)
X_{t-4}^S	-0.13 (-0.84)	-0.13 (-0.85)	-0.16 (-0.96)
X_{t-5}^S		0.23 (1.57)	
E_{t-1}^S	-0.10 ^c (-1.71)	-0.13 ^c (-1.97)	-0.15 ^b (-2.13)
E_{t-2}^S	0.05 (0.83)	0.01 (0.20)	-0.01 (-0.17)
E_{t-3}^S	-0.001 (-0.03)	0.01 (0.17)	0.04 (0.51)
E_{t-4}^S	0.14 ^b (2.41)	0.15 ^a (2.74)	0.14 ^b (2.74)
E_{t-5}^S		-0.04 (-0.60)	0.004 (0.09)
E_{t-6}^S		-0.05 (-0.85)	-0.06 (-1.20)

Table 3.56 (Continued)

	Dependent Variable		
	Services Firm Exit		
	(1)	(2)	(3)
E_{t-7}^S			0.09 ^c (1.69)
E_{t-8}^S			0.08 (1.50)
Inter- cept	46.56 ^c (2.01)	22.83 (0.88)	28.01 (1.21)
T	2.09 ^a (2.77)	1.05 (1.19)	1.85 ^b (2.40)
$\bar{R}^2$	.87	.87	.87
Model F-value	33.89 ^a	26.05 ^a	23.26 ^a
F-test for lagged causality	2.23 ^c	1.54	1.77

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

Table 3.57

West Grand Division:
Displacement - Health and Nonhealth Services^d

	Dependent Variable		
	Services Firm Exit		
	(1)	(2)	(3)
E_t^S	0.27 ^a (6.65)	0.27 ^a (6.62)	0.28 ^a (7.05)
X_{t-1}^S	0.39 ^a (2.73)	0.54 ^a (3.16)	0.57 ^a (2.97)
X_{t-2}^S	0.25 ^c (1.74)	0.13 (0.89)	-0.02 (-0.10)
X_{t-3}^S	-0.15 (-1.05)	-0.15 (-1.05)	-0.08 (-0.46)
X_{t-4}^S	-0.13 (-0.94)	-0.07 (-0.52)	-0.08 (-0.53)
X_{t-5}^S	0.40 ^a (3.54)	0.27 ^c (1.90)	0.22 (1.52)
E_{t-1}^S	-0.06 (-1.29)	-0.10 ^c (-1.67)	-0.11 ^c (-1.76)
E_{t-2}^S	-0.04 (-0.84)	-0.03 (-0.58)	-0.01 (-0.12)
E_{t-3}^S	0.06 (1.24)	0.05 (1.04)	0.05 (0.79)
E_{t-4}^S	-0.03 (-0.66)	-0.05 (-1.06)	-0.05 (-0.98)
E_{t-5}^S		0.10 ^c (1.91)	0.10 ^b (2.04)
E_{t-6}^S		-0.07 (-1.49)	-0.10 ^b (-2.00)

Table 3.57 (Continued)

	Dependent Variable		
	Services Firm Exit		
	(1)	(2)	(3)
E_{t-7}^S			0.10 ^c (1.93)
E_{t-8}^S			0.02 (0.49)
Inter- cept	-4.04 (-0.23)	0.25 (0.01)	-9.89 (-0.57)
T	-0.01 (-0.02)	0.16 (0.23)	0.25 (0.38)
$\bar{R}^2$	.87	.88	.88
Model F-value	32.78 ^a	27.89 ^a	24.52 ^a
F-test for lagged causality	1.01	1.16	1.38

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

V. Summary and Conclusions

In this chapter a variety of relationships regarding firm exit and firm displacement are investigated. These relationships are summarized in Table 3.58. Several basic results emerged. First, the fundamental assumption of economic base theory, that basic firm activity causes nonbasic firm activity is strongly confirmed. Manufacturing firm exit is seen to cause the exit of fifteen nonmanufacturing firms on a statewide basis. Moreover, the exit of a manufacturing firm has both an instantaneous and lagged causal effect on nonmanufacturing firm exit. These relationships are also confirmed when nonmanufacturing is disaggregated into more narrow categories. Specifically, the exit of a manufacturing firm causes the exit of about 1.5 FIRE firms, about five trade firms, and about three service firms on a statewide basis.

These relationships are again tested for more narrowly defined regions of Tennessee. The effect of a manufacturing firm exit is seen to have a quantitatively large impact in these smaller regions also. Economic base theory is also tested in rural versus urban areas. The large effect of a manufacturing firm exit (in sheer number of firms) is found once more. Specifically, a manufacturing firm exit leads to the demise of about thirteen nonmanufacturing firms in urban areas and about four nonmanufacturing firms in rural areas. However, the greater impact may actually be felt in the rural areas of the state.

The implications of traditional economic base theory are not, however, uniformly supported. For instance, contrary to the foundations of economic base theory, instantaneous and lagged causal effects from nonmanufacturing firm exit to manufacturing firm exit are found. While this effect is statistically quite strong, the magnitude of this

Table 3.58
Summary of Causality Tests

	Instantaneous Causality (within one quarter)	Lagged Causality
Statewide:		
M → NM	*	*
NM → M	*	*
M → F	*	*
F → M	*	
M → T	*	*
T → M	*	
M → S	*	*
S → M	*	*
Grand Divisions:		
M → NM	E, M, W	
NM → M	E, M, W	
M → F	E, M, W	
F → M	E, M, W	M, W
M → T	E, M, W	
T → M	E, M, W	M
M → S	E, M, W	
S → M	E, M, W	
Urban and Rural Areas:		
M → NM	U, R	
NM → M	U, R	
M → F	U, R	
F → M	U, R	
M → T	U, R	U, R
T → M	U, R	
M → S	U, R	U, R
S → M	U, R	

Table 3.58 (Continued)

	Instantaneous Causality (within one quarter)	Lagged Causality
Displacement		
Grand Divisions Statewide:		
$E \rightarrow X$	E,M,W	
Grand Divisions Rural Areas:		
$E \rightarrow X$		
Grand Divisions Urban Areas:		
$E \rightarrow X$	E,M,W	
Grand Divisions Urban vs. Rural:		
$E^U \rightarrow X^R$	E,M,W	
$E^R \rightarrow X^U$	W	

Note: M = Manufacturing
 NM = Nonmanufacturing
 F = FIRE
 T = Trade
 S = Services
 E = Entry
 X = Exit
 U = Urban
 R = Rural

feedback is found to be quite small. For example, the results indicate that each exit of a nonmanufacturing firm causes the exit of only .05 manufacturing firms.

In this chapter, the displacement of incumbent firms by new entrants is also tested. The regions tested were confined to the three grand divisions within the state: east, middle, and west. The displacement of incumbent firms is found to exist. For example, among all firms, it is determined that the entry of two new firms caused the exit of an incumbent firm in each grand division. When urban versus rural areas in each grand division are compared, it is found that displacement occurs in only urban areas. Specifically, the entry of two new firms leads to the demise of one incumbent firm. Also, the cross-linkages between urban entry (exit) and rural exit (entry) are investigated. The results indicate that urban entry is linked to rural exit while, on the other hand, no statistical relationship is found between rural entry and urban exit.

A disaggregated analysis provided several insights into the similarities and differences across regions for the displacement that occurs within an industry. It is discovered that no displacement occurred among manufacturing firms, while a more substantial displacement effect is found among nonmanufacturing firms in each region. A further disaggregation of the nonmanufacturing sector revealed that no displacement occurred among FIRE and trade firms, while a significant displacement effect is discovered among service firms. For example, the entry of about four service firms leads to the demise of one incumbent service firm in each grand division.

CHAPTER 4

CONCLUSION

This dissertation has made several contributions to the economics literature regarding the much neglected topic of firm exit. In Chapter 2, firm exit is investigated from a national perspective, while in Chapter 3 exit is examined in a regional context. For the first time, the determinants of firm exit are investigated across the entire manufacturing sector of the U.S. economy. The exit model is opened to international trade flows to determine the effect of import competition on domestic firms. Moreover, the results shed some light on the degree that the U.S. manufacturing sector is, in fact, losing jobs to foreign competition. This research also tested the nature and direction of causality within a regional economy. Does basic firm exit have an impact on nonbasic firm exit? The much assumed causality in economic base theory is strongly supported. Also, the displacement of incumbent firms by new entrants within a region is investigated.

The results presented in Chapter 2 yield many inferences on the exit decision of manufacturing firms. For example, falling profits (as proxied by the PCM) and declining industry growth leads to higher levels of firm exit. This intuitive result is supported with strong statistical evidence. A factor that also plays a major role in the exit of firms is competition from new entrants. The results suggest that successful entry by new firms fosters the exit of incumbent firms. Inefficient producers are being forced out by new competition as theory would suggest. Another interesting result is revealed by the

concentration-exit relationship. In particular, it is found that in industries with higher levels of concentration, less exit occurs. This coincides with the result that industries with a large number of firms experience more exits.

The variables of principal interest for public policy are the international variables. Imports into manufacturing industries do have a statistically significant affect on exits in this sector, however, as the coefficient indicates, it is quite small. Moreover, when imports are disaggregated to include only those imports from our major trading partners (which account for about 80% of the imports into manufacturing industries), no statistical relationship is found. On the other hand, when imports are disaggregated into those from the newly industrialized countries, a statistically significant relationship is found. Although the coefficient on the NIC variable is somewhat larger, it still indicates a rather small impact. It seems that the imports from the NIC's represent a growing threat in this sector. However, to put things in perspective, many U.S. multinational firms are producers in NIC's and export their overseas production into the U.S. When the impact of imports on manufacturing employment levels is investigated, it is found that imports led to a less than one percent decline in employment levels when the ten most impacted industries are removed from the sample. Hence, overall, one could argue that imports into manufacturing industries have had a negligible affect on the decision of domestic producers to exit. In addition, the coefficients on the variables representing the degree of protection for this sector show that protectionist measures do not decrease the amount of domestic manufacturing firm exit.

Turning to Chapter 3, the results presented here yield much regarding firm exit, economic base theory, and regional economic activity. Several basic results emerged. First, the fundamental assumption of economic base theory, that basic firm activity causes nonbasic firm activity is strongly confirmed. In arriving at this result, the assignment method for bifurcating basic and nonbasic activity is used. Specifically, manufacturing firms are assumed to constitute the basic sector while nonmanufacturing firms are assumed to represent the nonbasic sector. Sensitivity tests were run to test the validity of this method. These tests revealed no serious problems with the method used here. Manufacturing firm exit is seen to cause the exit of fifteen nonmanufacturing firms on a statewide basis. Moreover, the exit of a manufacturing firm has both an instantaneous and lagged causal effect on nonmanufacturing firm exit. These relationships are also confirmed when nonmanufacturing was disaggregated into more narrow categories. Specifically, the exit of a manufacturing firm causes the exit of about 1.5 FIRE firms, about five trade firms, and about three service firms on a statewide basis.

The implications of traditional economic base theory are not, however, uniformly supported. For instance, contrary to the foundations of economic base theory, instantaneous and lagged causal effects from nonmanufacturing firm exit to manufacturing firm exit are found. While these effects are statistically quite strong, the magnitude of this feedback is found to be quite small. For example, the results indicate that each exit of a nonmanufacturing firm causes the exit of only .05 manufacturing firms.

These relationships are again tested for more narrowly defined regions of Tennessee. The effect of a manufacturing firm exit is seen to have a quantitatively large impact in these smaller regions also. Economic base linkages are also tested in rural versus urban areas. The large effect of a manufacturing firm exit (in sheer number of firms) is found once more. Specifically, a manufacturing firm exit leads to the demise of about thirteen nonmanufacturing firms in urban areas and about four nonmanufacturing firms in rural areas. However, the greater impact may actually be felt in the rural areas of the state. Moreover, in both urban and rural areas, manufacturing exits appeared to affect trade and service firms more substantially and for a longer period of time than FIRE firms. These results are consistent with the statewide results and may indicate the sensitivity trade and service firms have to major changes in the basic sector of their region.

In Chapter 3 the displacement of incumbent firms by new entrants is also tested. The displacement of incumbent firms is found to exist. The regions tested were confined to the three grand divisions within Tennessee. It is discovered that no displacement occurred among manufacturing firms, while a more substantial displacement effect is found among nonmanufacturing firms in each region. A further disaggregation of the nonmanufacturing sector revealed that no displacement occurred among FIRE and trade firms, while a significant displacement effect is discovered among service firms. Among all firms, it is determined that the entry of two new firms caused the exit of an incumbent firm in each grand division. When urban versus rural areas in each grand division are compared, it is found that displacement occurs in only urban areas. Specifically, the entry of two new firms leads to

the demise of one incumbent firm. Also, the cross-linkages between urban entry (exit) and rural exit (entry) are investigated. The results indicate that urban entry is linked to rural exit while, on the other hand, no statistical relationship is found between rural entry and urban exit.

The results presented in Chapter 3 support the fundamental tenants of economic base theory and shed some light on the effects of firm exit in a regional economy. The exit of a basic sector firm can have substantial effects on the surrounding economy. For instance, trade and service firms seem to be particularly sensitive to basic sector activity. Moreover, service firms seem to be more susceptible to displacement from new entrants than do other industries. Basic sector firms have a greater affect in urban areas in terms of the number of firms involved, however, relative to the size of the local economy, basic firm exits in rural areas may have a greater impact.

Taken together, the results in Chapters 2 and 3 yield much information on firm exit. This dissertation has contributed to the economics literature by providing a much more comprehensive investigation of a topic that has, in general, received little attention.

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APPENDIX

Table A.1

Estimation of the Exit Equation, Further Results^{d,e}

	Dependent Variable: Firm Exit (1978-84)			
	(1)	(2)	(3)	(4)
P _{CM}	-440.35 ^a (-3.77)	-405.00 ^a (-3.35)	-410.54 ^a (-3.33)	-403.42 ^a (-3.17)
CR ₄	-2.61 ^a (-4.46)	-2.53 ^a (-4.14)	-2.51 ^a (-4.15)	-2.35 ^a (-3.76)
MES	-0.00001 (-0.06)	0.0001 (0.37)	0.0001 (0.45)	-0.0001 (-0.49)
E	0.456 ^a (42.41)	0.457 ^a (42.15)	0.457 ^a (40.97)	0.457 ^a (40.77)
G7782	-41.28 ^b (-2.45)	-42.01 ^b (-2.43)	-49.20 ^a (-2.68)	-45.67 ^a (-2.47)
FIRMS	0.068 ^a (10.17)	0.068 ^a (10.01)	0.066 ^a (9.50)	0.065 ^a (9.39)
M ^{G5}	0.011 (1.57)			
M ^{G10}				0.008 (1.05)
M ^{SNIC}		0.098 ^c (1.90)		0.073 (1.33)
M ^{ANIC}			0.056 (1.60)	0.038 (1.06)
T	-0.64 (-0.61)	-0.56 (-0.52)	-0.81 (-0.72)	-0.81 (-0.72)
NTB	26.86 ^b (1.95)	21.73 (1.56)	27.78 ^b (1.95)	27.73 ^c (1.89)
Inter- cept	254.22 ^a (5.64)	243.74 ^a (5.18)	246.98 ^a (5.24)	239.59 ^a (4.92)

Table A.1 (Continued)

	Dependent Variable: Firm Exit (1978-84)			
	(1)	(2)	(3)	(4)
$\bar{R}^2$	.96	.96	.96	.96
Model	779.9 ^a	761.8 ^a	738.7 ^a	600.7 ^a
F-value				

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

^eA collinearity diagnostic test derived in Belsley, Kuh, and Welsch (1980) was performed. The condition index value for each of the equations is well below the level they consider indicates that the degree of multicollinearity might be of concern.

Table A.2

Statewide:
Nonbasic - Basic, Variation 1^{d,e}

	Dependent Variable					
	Nonbasic Firm Exit			Basic Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^B	11.18 ^a (13.02)	11.26 ^a (11.84)	11.61 ^a (11.40)			
X_t^{NB}				0.07 ^a (13.02)	0.07 ^a (12.17)	0.07 ^a (11.76)
X_{t-1}^{NB}	0.04 (0.33)	0.05 (0.32)	0.04 (0.25)	-0.001 (-0.12)	-0.001 (-0.09)	-0.005 (-0.42)
X_{t-2}^{NB}	-0.35 ^b (-2.58)	-0.36 ^b (-2.38)	-0.34 ^b (-2.20)	0.03 ^a (3.03)	0.03 ^a (2.96)	0.03 ^a (2.76)
X_{t-3}^{NB}	0.16 (1.12)	0.16 (1.06)	0.22 (1.33)	-0.02 (-1.34)	-0.01 (-1.24)	-0.02 ^c (-1.72)
X_{t-4}^{NB}	-0.42 ^a (-2.83)	-0.42 ^b (-2.62)	-0.41 ^b (-2.38)	0.03 ^a (2.86)	0.03 ^a (2.67)	0.03 ^b (2.53)
X_{t-5}^{NB}					0.01 (0.96)	0.004 (0.72)
X_{t-6}^{NB}					-0.004 (-0.66)	-0.006 (-0.93)
X_{t-7}^{NB}						0.01 ^c (1.76)
X_{t-8}^{NB}						0.001 (0.20)
X_{t-1}^B	-1.00 (-0.59)	-1.04 (-0.55)	-0.93 (-0.45)	0.09 (0.63)	0.10 (0.68)	0.14 (0.95)
X_{t-2}^B	3.87 ^b (2.34)	3.96 ^b (2.11)	3.73 ^c (1.92)	-0.31 ^b (-2.35)	-0.33 ^b (-2.35)	-0.32 ^b (-2.28)
X_{t-3}^B	-2.68 (-1.58)	-2.70 (-1.48)	-3.50 ^c (-1.76)	0.28 ^b (2.08)	0.26 ^c (1.82)	0.33 ^b (2.31)

Table A.2 (Continued)

	Dependent Variable					
	Nonbasic Firm Exit			Basic Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^B	6.21 ^a (3.51)	6.21 ^a (3.18)	6.30 ^a (2.89)	-0.51 ^a (-3.57)	-0.49 ^a (-3.22)	-0.49 ^a (-3.13)
X_{t-5}^B		-0.25 (-0.24)	-0.13 (-0.12)			
X_{t-6}^B		-0.07 (-0.07)	0.04 (0.04)			
X_{t-7}^B			-0.60 (-0.55)			
X_{t-8}^B			0.28 (0.25)			
Inter- cept	2.52 (0.02)	27.30 (0.16)	-23.27 (-0.13)	10.23 (0.86)	8.97 (0.69)	8.35 (0.63)
T	6.58 ^b (2.45)	6.83 ^b (2.26)	7.00 ^b (2.13)	-0.44 ^b (-1.98)	-0.46 ^c (1.78)	-0.58 ^b (2.17)
$\bar{R}^2$	.88	.86	.85	.87	.86	.86
Model F-value	39.85 ^a	27.05 ^a	20.78 ^a	36.09 ^a	26.29 ^a	21.84 ^a
F-test for lagged causality	4.45 ^a	1.90	1.29	4.46 ^a	2.37 ^c	2.03

^aSignificant at the .01 level

^bSignificant at the .05 level

^cSignificant at the .10 level

^dt-statistics in parentheses

^eVariation 1: Basic = Agricultural, mining, and all
manufacturing firms.

Nonbasic = Remaining firms.

Table A.3
Statewide:
Nonbasic - Basic, Variation 2^{d,e}

	Dependent Variable					
	Nonbasic Firm Exit			Basic Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^B	12.05 ^a (12.61)	12.24 ^a (11.46)	12.50 ^a (10.94)			
X_t^{NB}				0.07 ^a (12.61)	0.07 ^a (11.78)	0.06 ^a (11.44)
X_{t-1}^{NB}	0.14 (1.00)	0.16 (1.02)	0.15 (0.95)	-0.01 (-0.84)	-0.01 (-0.81)	-0.01 (-1.13)
X_{t-2}^{NB}	-0.33 ^b (-2.40)	-0.35 ^b (-2.26)	-0.34 ^b (-2.09)	0.03 ^a (2.92)	0.03 ^a (2.88)	0.03 ^a (2.71)
X_{t-3}^{NB}	0.18 (1.30)	0.20 (1.30)	0.24 (1.45)	-0.02 (-1.60)	-0.02 (-1.60)	-0.02 ^b (-2.11)
X_{t-4}^{NB}	-0.38 ^b (-2.61)	-0.39 ^b (-2.47)	-0.38 ^b (-2.15)	0.03 ^a (2.71)	0.03 ^b (2.51)	0.03 ^b (2.42)
X_{t-5}^{NB}					0.004 (0.63)	0.002 (0.37)
X_{t-6}^{NB}					-0.003 (-0.55)	-0.005 (-0.88)
X_{t-7}^{NB}						0.01 ^c (1.94)
X_{t-8}^{NB}						0.004 (0.71)
X_{t-1}^B	-1.99 (-1.08)	-2.31 (-1.09)	-2.13 (-0.94)	0.16 (1.17)	0.18 (1.22)	0.21 (1.40)
X_{t-2}^B	3.62 ^b (2.05)	3.90 ^c (1.90)	3.76 ^c (1.74)	-0.28 ^b (-2.11)	-0.29 ^b (-2.13)	-0.28 ^b (-2.08)
X_{t-3}^B	-3.21 ^c (-1.78)	-3.37 ^c (-1.73)	-3.96 ^c (-1.81)	0.32 ^b (2.45)	0.32 ^b (2.30)	0.38 ^a (2.79)

Table A.3 (Continued)

	Dependent Variable					
	Nonbasic Firm Exit			Basic Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^B	6.62 ^a (3.49)	6.75 ^a (3.23)	6.64 ^a (2.79)	-0.51 ^a (-3.65)	-0.49 ^a (-3.27)	-0.49 ^a (-3.20)
X_{t-5}^B		-0.54 (-0.45)	-0.33 (-0.26)			
X_{t-6}^B		-0.01 (-0.01)	0.13 (0.11)			
X_{t-7}^B			-0.54 (-0.44)			
X_{t-8}^B			-0.25 (-0.20)			
Inter- cept	3.66 (0.02)	34.11 (0.20)	-0.28 (-0.001)	10.09 (0.90)	9.15 (0.73)	6.60 (0.53)
T	4.07 (1.52)	4.45 (1.48)	4.97 (1.49)	-0.21 (-1.03)	-0.21 (0.90)	-0.40 (1.65)
$\bar{R}^2$	.88	.86	.85	.88	.86	.87
Model F-value	37.52 ^a	25.72 ^a	19.45 ^a	36.73 ^a	26.55 ^a	22.75 ^a
F-test for lagged causality	4.05 ^a	1.75	1.12	3.81 ^a	2.00	1.92

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses

^eVariation 2: Basic = Agricultural, mining, and those
 manufacturing firms which ship more
 than 25% of their output out of the
 East South Central census region.

Nonbasic = Remaining firms.

Table A.4
Statewide:
Nonbasic - Basic, Variation 3^{d,e}

	Dependent Variable					
	Nonbasic Firm Exit			Basic Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_t^B	13.40 ^a (10.90)	13.45 ^a (10.06)	13.81 ^a (9.74)			
X_t^{NB}				0.06 ^a (10.90)	0.06 ^a (10.38)	0.05 ^a (9.89)
X_{t-1}^{NB}	0.26 ^c (1.80)	0.27 ^c (1.70)	0.25 (1.50)	-0.01 (-1.40)	-0.01 (-1.26)	-0.02 (-1.50)
X_{t-2}^{NB}	-0.22 (-1.53)	-0.26 (-1.60)	-0.27 (-1.66)	0.02 ^b (2.02)	0.02 ^b (2.10)	0.02 ^b (2.09)
X_{t-3}^{NB}	0.25 ^c (1.69)	0.29 ^c (1.73)	0.28 (1.62)	-0.02 ^c (-1.82)	-0.02 ^c (-1.85)	-0.02 ^b (-2.04)
X_{t-4}^{NB}	-0.25 ^c (-1.71)	-0.28 ^c (-1.72)	-0.31 ^c (-1.74)	0.02 ^c (1.82)	0.02 ^c (1.81)	0.02 ^c (1.92)
X_{t-5}^{NB}					0.001 (0.19)	0.001 (0.08)
X_{t-6}^{NB}					-0.01 (-1.31)	-0.008 (-1.44)
X_{t-7}^{NB}						0.007 (1.21)
X_{t-8}^{NB}						0.001 (0.11)
X_{t-1}^B	-3.35 (-1.50)	-3.73 (-1.51)	-3.57 (-1.36)	0.19 (1.31)	0.20 (1.33)	0.24 (1.50)
X_{t-2}^B	2.65 (1.24)	3.33 (1.36)	3.42 (1.35)	-0.17 (-1.26)	-0.20 (-1.42)	-0.22 (-1.54)
X_{t-3}^B	-4.40 ^b (-2.04)	-4.82 ^b (-2.02)	-5.07 ^c (-1.93)	0.35 ^a (2.58)	0.37 ^b (2.54)	0.39 ^a (2.67)

Table A.4 (Continued)

	Dependent Variable					
	Nonbasic Firm Exit			Basic Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
X_{t-4}^B	5.98 ^a (2.65)	6.21 ^a (2.50)	6.78 ^a (2.44)	-0.40 ^a (-2.81)	-0.40 ^a (-2.58)	-0.43 ^a (-2.71)
X_{t-5}^B		-0.36 (-0.24)	-0.32 (-0.21)			
X_{t-6}^B		0.99 (0.67)	1.05 (0.69)			
X_{t-7}^B			0.06 (0.04)			
X_{t-8}^B			1.10 (0.73)			
Inter- cept	-78.59 (-0.41)	-118.54 (-0.54)	-243.96 (-0.99)	18.41 (1.54)	23.05 ^c (1.73)	23.67 (1.65)
T	2.96 (0.99)	2.55 (0.75)	1.78 (0.49)	-0.09 (-0.44)	-0.01 (-0.03)	-0.11 (-0.45)
$\bar{R}^2$	.85	.82	.81	.83	.81	.80
Model F-value	29.17 ^a	20.02 ^a	15.41 ^a	25.78 ^a	18.80 ^a	14.78 ^a
F-test for lagged causality	2.73 ^b	1.04	0.72	2.17 ^c	1.11	0.86

^aSignificant at the .01 level^bSignificant at the .05 level^cSignificant at the .10 level^dt-statistics in parentheses^eVariation 2: Basic = Agricultural, mining, and those manufacturing firms which ship more than 50% of their output out of the East South Central census region.

Nonbasic = Remaining firms.

VITA

Joseph Edward Flynn was born in Houston, Texas on July 17, 1962. He attended elementary schools in that city and Fargo, North Dakota. He attended high schools in Fargo, North Dakota; Des Moines, Iowa; and Germantown, Tennessee. He graduated from Germantown High School in May 1980. The following September he entered Memphis State University, and in August 1984 he received a Bachelor of Science degree with a major in Mathematics. In the fall of 1984 he accepted a graduate assistantship at The University of Tennessee, Knoxville and began study towards a Doctor of Philosophy degree with a major in economics. While completing the requirements for the Ph.D., he was awarded a Master of Arts degree with a major in economics in December of 1986. The Ph.D. was awarded in August 1988.

The author is a member of two honor societies: Omicron Delta Kappa and Mortar Board. The author is also a member of three professional organizations: the American Economic Association, the Southern Economic Association, and the National Association of Business Economists. Mr. Flynn will be employed by the Federal Communications Commission in Washington, D.C. after graduation.