2003

Essays on political constraints, incentives, and individual economic behavior

Steven F. Kreft
West Virginia University

Essays on Political Constraints, Incentives, and Individual Economic Behavior

Steven F. Kreft

Dissertation Submitted to the
College of Business and Economics at
West Virginia University
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Economics

Russell S. Sobel, Ph.D., Chair
William N. Trumbull, Ph.D.
Ronald J. Balvers, Ph.D.
Stratford M. Douglas, Ph.D.
Mehmet S. Tosun, Ph.D.

Department of Economics

Morgantown, West Virginia
2003

Keywords: political constraints, incentives, individual economic behavior

ABSTRACT

Essays on Political Constraints, Incentives, and Individual Economic Behavior

Steven F. Kreft

This dissertation is a collection of papers that features applications of public choice theory to the relationship between political constraints, incentives, and individual economic behavior. The first chapter introduces the two meanings of political constraints—(i) constraints *self-imposed on* the political process and (ii) constraints *created by* the political process; reviews the public choice literature on political constraints and incentives; and outlines the research agenda for the dissertation. Chapter 2 examines the possible inefficiencies that may be produced by politicians pursuing their own self interests by comparing two forms of city government. More specifically, comparisons are made between professionally trained city managers and popularly elected mayors, and results show that city managers have a relative efficiency advantage over elected mayors. Chapter 3 analyzes how minimum drinking age laws influence drinking behavior by examining the incentive for underage U.S. citizens to cross international border crossings to avoid the nationally uniform 21-year-old drinking age. Results show that the occurrence of alcohol-related motor-vehicle fatalities, the most serious outcome of mixing drinking and driving, increases as proximity to the nearest border crossing decreases. Chapter 4 enhances the reported link between entrepreneurship and economic growth, tests the causal relationship between venture funding and entrepreneurial activity, and ultimately reveals which policies create a good environment for entrepreneurship. Results show that entrepreneurial activity draws venture funding to an area, and not vice versa. Therefore, the results suggest that enacting policies consistent with economic freedom, such as low taxes, low regulations, and secure property rights that provide a good environment for attracting or developing individual entrepreneurs, are the appropriate economic development policies. Chapter 5 summarizes the major findings of the research chapters, reviews the importance of the major findings, and proposes areas of future research.

ACKNOWLEDGMENTS

I wish to thank my wife, Elham, for her continued assistance, unwavering encouragement, and good-natured harassment throughout the completion of this dissertation. Ellie has always given me the incentive to be the best that I can be, and succeed in all that I set out to do.

I am indebted to my dissertation chair, Russell S. Sobel, for all of his professional and personal guidance provided during my dissertation process and throughout my time spent in the economics doctoral program. Russ not only taught me a lot about economics, but he also gave me a well-grounded understanding of the skills needed to be successful in my current and future academic research and teaching. I will always appreciate the knowledge that Russ has bestowed upon me.

I would like to thank my remaining committee members, William N. Trumbull, Ronald J. Balvers, Stratford M. Douglas, and Mehmet S. Tosun, for all their productive suggestions and useful advice. Their participation helped to improve the overall quality of this dissertation.

I would also like to thank the Economics faculty at Florida Southern College that gave me the basic tools and intuition needed to understand economics and ultimately pushed me to pursue a graduate degree in Economics.

Finally, I would like to thank my family for their unyielding confidence in my success. And I would like to give a special thanks to my parents, Margaret and Frank, for all their support throughout my many years of education—to you, I am always indebted.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

TABLES:

FIGURES:

Chapter 1

Political Constraints, Incentives, and Individual Economic Behavior

1.1 Introduction

In *The Wealth of Nations,* Adam Smith wrote "It is not from the benevolence of the butcher, the brewer, or the baker, that we can expect our dinner, but from their regard to their own interest." This idea that individual self-interest is the primary factor that motivates individual behavior has long been applied to most areas of economic thought; however, it wasn't until recently that it was used to analyze the behavior of individuals in government. Public Choice theory argues that each government official is ultimately in office to achieve the goals of their own self-interest. Therefore, Public Choice theory allows economists to analyze the behavior of individuals in government by using the same tools that they employ to analyze individual economic behavior—the idea that individual incentives matter, even for government officials.

One aspect of public choice analysis focuses on the effect that political constraints have on individual economic behavior. Generally, the term "political constraint" can have two different meanings—(i) constraints *self-imposed on* the political process and (ii) constraints *created by* the political process. The first meaning, constraints self-imposed on the political process, refers to constraints that limit a government official's ability to pursue his/her own self-interest. These constraining forces include such things as constitutional laws, voting rules, election mechanisms, and many other factors. The second meaning, constraints created by the political process, refers to the government-created constraints imposed on individual participants of the economy. These

constraining forces are such things as an established and enforced system of private property, a legal system of laws and regulations, enactment of mandatory taxes, and many other factors.

Pertaining to the first meaning of political constraints—those that are self-imposed on the political process, much of the ongoing public choice literature is devoted to analyzing constitutional laws, voting rules, and election mechanisms. Several influential authors have stressed the role of constitutions in limiting the coercive powers of government and protecting the rights of citizens. For example, Nobel Laureate James Buchanan (1990), who literally founded the field of constitutional economics, insists on the importance of constitutional rules to limit the powers of government. Likewise, Holcombe (1991) states that the optimal constitution would prevent governments from performing inefficient activities, while at the same time, allowing it to engage in efficient activities. In order to achieve this relationship, the author believes a constitution needs to contain a clearly defined set of rules for the government to follow, in order to enforce a clearly defined structure of rights under which citizens function. The rules should include specific voting procedures, such as unanimous or majority voting rules; well defined sources for government funds, such as different types of permissible taxation policies; a framework for a judicial system to perform conflict resolution; and finally, should incorporate a mechanism for amending new rules to the constitution as the times change. Again, constitutional constraints (rules) are needed to constrain government officials, who are rationally self-motivated, from enacting policies and projects that only serve their own self interest regardless of the economic ramifications.

However, as the literature on the political process and voting mechanisms has shown, politicians have found ways to make choices that achieve their own self interests despite the constraints imposed upon them. The political process model developed by Downs (1957) shows that political representatives, in the context of a democracy, will try to align their political positioning with the median voter's preferences under majority voting. This comes from the election, or re-election, motivation of each elected official. Political representatives are vote maximizers, and thus, their ultimate goal is to achieve at least a majority of the eligible votes. The median voter's desired production of any public good or service does not necessarily align itself with the efficient level of production; It just ensures that the politician, who gains the median voter's support, will garner a majority of the votes in any election.

Romer and Rosenthal (1978) criticize the median voter model and claim that the median voter theory does not adequately represent the political process. The authors argue that politicians propose voting choices to the electorate, and if a dominant group exists in the vote-proposal process, it will have monopoly power in setting the voting agenda. This monopoly-powered agenda setter may or may not offer the median voter's preferences. In this context the agenda setter will offer voters a "take-it or leave-it" choice, where "leaving-it" refers to going back to a status quo. The electorate is assumed to not be able to influence the voting agenda because of the agenda setter's monopoly power and the lack of immediate political competition. The distortions in the vote-proposal process may lead to further inefficiencies, in that the monopoly power of politicians can lead to excessive levels of public good production.

Another efficiency criticism of government that comes from the incentive to vote maximize is based on the occurrence of rent-seeking special interest groups, which politicians will have incentive to align with in order to gain more political support. Tullock (1967) noted that the dollars rent-seeking individuals spend on political influence will be equal to the dollars such individuals expect to receive from the implementation of the desired government policy or project. The rent-seeking expenditures are seen as a waste of resources, because they are expenditures that would not have occurred without the presence of the government projects. Also, Tullock (1967) argues that in many instances, one group will undertake expenditures solely to counter the political influence of another group's political influence. The author argues that these counter-productive rent-seeking expenditures are completely wasteful in the eyes of society as a whole. They are expenditures undertaken solely to try and transfer resources from one group to another, which is clearly an inefficient process.

Weingast, Shepsle, and Johnsen (1981) develop a model of how legislators distort their cost-benefit analysis when trying to achieve their own goal of vote maximizing in their own district. The authors basically model the district of an elected politician as a special interest group that tries to maximize its benefits regardless of the costs put on other districts. The authors assume that the benefits of government projects are concentrated in individual districts, while the costs are widespread over all districts. The district maximizes its benefits through the efforts of its legislator; therefore, the legislator has incentive to advocate policies that correspond to the district's wishes. More specifically, the legislator will have incentive to count some of the in-district resource costs as benefits, which goes against normal economic accounting practices. For

example, the district's citizens that are hired to labor on the government projects will not be seen as labor costs, but will instead be viewed as increased employment for the district. Obviously, the costs of employing the labor are spread over many districts, while the one district's constituents will receive all the benefits of the increased employment.

The districting system developed by Weingast, Shepsle, and Johnsen (1981) allows for legislators to distort costs even further. Since the costs are spread over many districts, the districts will each have incentives to raise their costs because they are counting on only having to pay a fraction of those increases. However, if every district has incentive to inflate costs, they will all end up having to pay for each other's inefficiencies. This is the basic theme of the Weingast, Shepsle, and Johnsen (1981) paper, that politicians systematically alter their cost-benefit accounting procedures to inflate benefits and decrease their share of costs, so they ultimately implement inefficient projects. The projects are inefficient in the sense that they are not the preferred outcomes resulting from normal economic accounting criteria.

Another practice of politicians inflating perceived benefits from a project, while making the projects future costs unclear has been coined the "shortsightedness effect" in government. Again this rests on the idea that elected government officials have the incentive to inflate the perceived benefits of any project in order to maximize their influence on voters; while, at the same time, politicians have the incentive to hide the true costs of the project. Often times this is achieved by enacting projects that have clearly visible, immediate benefits, but have future costs that are difficult for voters to identify. An example of the shortsightedness of government is clearly seen whenever governments undertake projects that are financed through borrowing. The project will benefit voters

upon its completion, but the costs will come in the form of higher future taxes because of the borrowed funds. This distortion of the cost benefit accounting system will again, often lead to inefficient projects being undertaken more often than if the benefits and costs where clearly defined.

In addition to politicians being characterized as vote maximizers, bureaucratic government officials have been modeled as budget maximizers, which will ultimately distort the efficiency of government. Niskanen (1968) and Brennan and Buchanan (1980) have developed models of political leviathans where bureaucracies are seen to be monopolies that provide governments with their services. In this regard, bureaucracies will use their monopoly power to maximize their utility functions, which have been assumed to contain many power- and prestige-type variables. The model implies that bureaucracies can be thought of as budget maximizers, regardless of their motivations for existence, because larger budgets will always bring higher utility levels. In contrast to their industrial-type counterparts, the political monopolies will tend to overproduce public goods and services, ultimately inflating the size of government.

The second meaning of political constraints—those that are created by the political process, deals with the constraining forces that government imposes on individuals participating in the economy. Again, these constraining forces are such things as an established and enforced system of private property, a legal system of laws and regulations, enactment of mandatory taxes, and many other factors. Economists believe that individuals are rationally self interested, and therefore, pursue actions that maximize their individual utility. This idea that individual self-interest is the primary factor that motivates individual behavior has long been applied to most areas of economic thought.

Also, the notion that individuals have to make these rational choices under the constraints that are created by the political process has long been applied by various strands of economic literature. The applications range from the analysis of law and economics, to the study of crime and economics, to the examination of the economic impact of taxes.

1.2 Dissertation Research Agenda

There are three research chapters included in this dissertation that will present specific applications of the two meanings of political constraints. Specifically, Chapter 2 deals with the constraints that are self-imposed on the political process and the incentives for politicians to avoid such constraints to pursue their own interests. While, Chapters 3 and 4 deal with the constraints that are created by the political process and the influence that they have on individual economic behavior.

Chapter 2 of this dissertation deals with a specific example of the possible inefficiencies that may be produced by politicians pursuing their own self interests. The chapter compares and contrasts two forms of city government, ultimately comparing professionally trained city managers to popular elected mayors in order to predict efficiency differences in the two forms of government. The motivation is that the elected officials will be subject to many of the efficiencies brought on by incentives to vote maximize, while the professionally trained city manager, who is removed from direct voting influences, will perform more efficiently relative to the popularly elected mayor. However, since the city manager is one-step removed from the political process, it might give more room for the city manager to shirk—work at the less than normal rate of

productivity. [1] Therefore, comparisons of the two forms of government may be complicated by contrasting predictions of individual behavior and result in no significant differences in efficiency.

Previous research has concluded that there are no efficiency differences between elected mayor-council (EMC) and council-manager (CM) city governments. What remains then, is a puzzle as to why so many cities are switching from an EMC form to a CM form. The previous literature only examined a limited array of common governmental expenditures, while this chapter provides an alternative method of testing the relative efficiency of the two forms of government. Relying on capitalization theory of local public services and taxes, I develop a hedonic price model for home sales occurring in the six largest Ohio metropolitan areas. Results show that houses within a CM city have a pricing premium that can be attributed to the greater efficiency of the CM form of government.

Chapters 3 and 4 present specific examples on how certain laws and government policies effect individual economic choices and activities. Chapter 3 analyzes how minimum drinking age laws influence the behavior of underage citizens. More specifically, it examines the incentive for underage U.S. citizens to cross international border crossings, into countries with lower drinking ages, to avoid the nationally uniform 21-year-old drinking age. The chapter models the occurrence of alcohol-related motor-vehicle fatalities, the most serious outcome of mixing drinking and driving, and tests for any border crossing effects. More specifically, I model the occurrence of motor-vehicle fatalities in Michigan counties, for drivers aged nineteen and twenty, and all-aged drivers,

[1] See Bender and Lott (1996) for a detailed review of the literature on shirking.

to test if the lower Ontario drinking age of nineteen creates a significant border crossing effect. Results show that, after controlling for the determinants of motor vehicle fatalities that are supported by the literature, the county's proximity to the nearest border crossing significantly impacts the occurrence of alcohol-related motor-vehicle fatalities. Specifically, the occurrence of motor-vehicle fatalities increases as the distance from the nearest border crossing decreases, where the increased fatalities place a larger cost burden on the counties that are closest to the border crossings.

The first part of Chapter 4 enhances the reported link between entrepreneurship and economic growth by performing state-panel causality tests between economic growth and two measures of entrepreneurship—sole proprietors and patent activity. Results show a one-way causal relationship from entrepreneurship to economic growth. With the recognition that entrepreneurial activity is a key factor in economic growth, many local governments have begun to enact policies targeted at promoting entrepreneurship. One frequently cited strategy for promoting entrepreneurial activity is to attract large amounts of venture capital, in the hopes of inducing more entrepreneurial activity. The next section of this chapter tests the direction of causality between venture capital and entrepreneurial activity and finds that it is the presence of entrepreneurial activity that draws venture funding to an area, and not vice versa.

Thus, the question remains of what policies can create or promote greater levels of entrepreneurship. To answer this question, I model the determinants of state-level entrepreneurial growth and conclude that, after controlling for various demographic and economic influences, the level of economic freedom in a state, measured by a composite index of several various state taxes and regulations, is a significant determinant of the

growth of entrepreneurship. Thus, my results imply that enacting policies consistent with economic freedom, such as low taxes, low regulations, and secure property rights that provide a good environment for attracting or developing individual entrepreneurs, are the appropriate economic development policies.

Finally, Chapter 5 concludes the dissertation by reviewing the major findings of each of the research chapters and highlighting the importance of each. The concluding chapter also provides prospects for future research in the areas that each research chapter pertains to.

Chapter 2

An Efficiency Comparison of City Managers and Elected Mayors

2.1 Introduction

Historically, the majority of U.S. city governments have adopted either an elected mayor-council (EMC) form of government or a council-manager (CM) form. Several economists and political scientists have attempted to find efficiency differences between these two competing forms of city government. The hypothesized difference is based on the theory that a professionally trained city manager has an efficiency advantage over a popularly elected mayor in administering city taxes and producing local public goods. However, past studies that analyze different cities' common government expenditures have found no significant differences in the two forms of government. The analysis of "common" governmental expenditures refers to the fact that the studies limited their analysis to only expenditures that comprise significant portions of almost all city spending, which generally included expenditures on police protection, fire protection, and refuse collection.

The finding of no difference in efficiency is surprising given the current trend toward cities adopting the CM form of government. As reported by the International City/County Management Association (ICMA), the CM government is currently the fastest growing form of U.S. city government. According to the ICMA, an average of 67 U.S. cities per year have adopted the CM form of government since 1981, while the EMC form of government lost an average of 20 cities per year. The city governments making

the transition from the EMC form to the CM form have to receive some kind of benefits from the transition, or else, there would be no reason to make the switch.

The purpose of this chapter is to use a different methodology to search for efficiency differences between the two forms of government in order to provide one possible explanation for the recent trend towards adopting the CM form of city government. In order to build upon the previous literature's use of common government expenditures, and account for the other services offered by a city government, this chapter relies on the theory that local public services, and the taxes to finance them, are capitalized into housing prices. This chapter contends that the common expenditures alone are not adequate enough to fully capture the differences in the spending patterns of the two competing forms of government. Rather, analysis of city taxes and production of local public goods will better capture the scope of the cities' public service capabilities, and help reveal efficiency differences in the two forms of government, if they exist.

House-selling prices for 1991 home sales were analyzed for the six largest metropolitan areas in Ohio. Specifically, house-selling prices for homes located in the metropolitan areas of Akron, Cincinnati, Cleveland, Columbus, Dayton, and Toledo, (including both central cities and several surrounding cities) were estimated using a log-linear hedonic technique. Results show that houses within a CM city have a pricing premium that can be attributed to the relative efficiency advantage of the CM form of government. Furthermore, houses within a metropolitan area, which has a CM central-city government, have a pricing premium that can be attributed to the relative efficiency of the CM form of government.

The set up of this chapter is as follows. Section 2.2 will further characterize the two forms of city government, with emphasis on the position of city manager in the CM form, and mayor in the EMC form. Section 2.3 will present the previous city government research. Section 2.4 will highlight the current trend towards adopting the CM form of government in the United States and Ohio. Section 2.5 will set up the hedonic price model to be estimated and describe the data incorporated in the estimation process. Section 2.6 will outline the estimation results. Finally, Section 2.7 will present concluding remarks on the implications of the estimation results.

2.2 Characteristics of City Managers and Elected Mayors

The major distinction between the two forms of government is who controls the power to make decisions about city budgeting and basic day-to-day city government operations. Generally, the city manager in the CM form, or the mayor in the EMC form, controls the day-to-day administering of the city operations. Typically, these two city officials have different educational backgrounds, occupational experiences, and political motivations, which should influence the way city taxes are levied and local public services are produced by each form of government.

The CM government consists of a city council, a city manager, and a ceremonial mayor. The city council is comprised of elected officials and is responsible for general city policy making. However, the city council hires a professional city manager that provides policy advice, conducts the daily city government operations, hires and fires city personnel, and is responsible for the city budget preparation. The mayor of the CM government is often selected from within the council members or is popularly elected by

the city residents, and is reserved for only ceremonial purposes with no regular administrative responsibilities.[2]

The CM form of government was a product of the progressive government reform movement that started in the early 1900s in response to corruption and inefficiencies that were becoming apparent in major eastern U.S. cities.[3] As stated by White (1927), city managers have a deep obligation to conduct the affairs of the city with integrity and efficiency, without acting in a partisan manor. Clearly, the movement envisioned professional, nonpartisan, political administrators that would efficiently run the day-to-day operations of the city. Professional city managers are typically hired based on their educational background, experience, and administrative ability, without regard to their political views.[4]

The city manager position was also envisioned as a way to ensure that public policies would be designed to promote long-term city growth and development. This can be seen in the fact that city managers are not legally limited in the number of years they can serve a given city. As long as city mangers appease their city council members, their

[2] Svara (1987) noted that the role of a CM mayor has often been overlooked in past research, and argued that this practice should not persist. The author used data from several interviews with mayors, council members, and city managers to argue that CM mayor's conduct in office can significantly influence how well a CM government performs. The author noted that cooperation between the CM mayor and the city manager can produce significant improvements in governmental performance.

[3] According to the IMCA, the first recognized city manager position was instituted in 1908 by Staunton, Virginia, and the first large U.S. city to institute a city manager was Dayton, Ohio, in 1914.

[4] According to the ICMA, *State of the Profession Survey, 2000*, sixty percent of all city managers earned a master's of public or business administration, or other administrative master's degree.

terms of city services can be quite prolonged.[5] This will allow the city manager to enact tax policies and expenditure schemes that promote long-term efficiency in the production of local public services.

In contrast to the ceremonial mayor in the CM form of government, the mayor in the EMC form has most of the political authority. The EMC mayor is popularly elected and has the responsibility for day-to-day operations, hiring and firing department heads, and preparing and administering the budget. The EMC government has an elected city council that performs some legislative duties; however, the authoritative mayor usually limits the council's political power. The EMC mayor's term of service varies in length at the discretion of each city's bylaws (usually two to four years), and the number of terms the mayor can serve may be limited according to the practices of the city.

Theoretically, the professionally trained city manager should provide efficiency gains over a popularly elected mayor. More specifically, the political skills that lead to a mayor's election do not necessarily correspond with administrative abilities. Weingast, Shepsle, and Johnson (1981) have shown that politicians consistently overstate the benefits of a given project, in order to gain popular support for their programs. The altering of the cost-benefit accounting of government projects, drives the political process away from efficiency. The inefficient cost-benefit behavior is brought on by the fact that politicians are vote maximizers and only care about the issues that are currently relevant to their jurisdictions. In this respect, the CM government may prove to be more efficient than the EMC form because the city managers are trained in public administration and are not directly subject to the voting pressures that lead to the administrative inefficiencies.

[5] According to the ICMA, *State of the Profession Survey, 2000*, the average tenure of a city manager is currently 17.4 years.

Also, the fact that the average city manager's tenure is quite prolonged shows that they are removed from the "short-sighted" political pressures to temporarily appeal to voters. The prolonged service to a given city allows the city manager to direct the city towards long-term efficiency, growth, and development, which contrasts the political motivation of mayors to produce short-term benefits with unclear future costs. Despite the hypothesized efficiency advantage of city managers, past studies have not found any significant differences between the two forms of government.

2.3 Previous City Government Research

Booms (1966) analyzes the determinants of per capita city expenditures on police protection, fire protection, highways, sanitation, and public health for cities in Ohio and Michigan. He shows that there are significant differences in the per capita expenditures of CM and EMC cities. Specifically, the CM cities have lower per capita public spending levels than EMC cities. This result would support the hypothesis that CM governments are relatively more efficient than EMC forms. However, Boom's findings have not been supported by more recent empirical analyses.

Deno and Mehay (1987) used a median voter model approach to directly test Booms' (1966) findings. The authors argue that both the mayor of the EMC government and the city council of the CM government have strong incentive to offer public goods in accordance with the median voter's wishes. If the elected officials deviate from the median position, those politicians face the threat of being replaced by candidates who do reflect the preferences of the majority of voters. Since the city council of the CM government is in control of hiring and firing the city manager, the city council will put

pressure on the manager to enact policies that are in line with the median voter's preferences. This implies that the median voter model should not find significant differences in the expenditures of the two government forms.

Deno and Mehay (1987) use a similar data set as Booms (1966), including observations only from Michigan and Ohio, and find no significant expenditure differences in the two forms of government. The authors then extend their analysis beyond the two states and include 191 randomly selected US cities. The authors again find no significant difference in expenditures of the two forms of government.[6] The authors attribute these results to the idea that, regardless of city management structure, both forms of government will have strong incentives to gravitate to the same level of public expenditures: the level most preferred by the median voter.

Modeling city government as a multi-product firm, Hayes and Chang (1990) show that there is no relative efficiency gain associated with CM governments. The government's 'outputs' are the services provided by the city, and the decision maker's objective function is to minimize costs. The authors analyze three services offered by the two forms of city government (police protection, fire protection, and refuse collection) and find no difference in relative efficiency. The authors propose that the city manager, once hired, might not have a strong incentive to improve the efficiency of the city government. Instead, the city manager may only have incentive to please the city council,

[6] Deno and Mehay (1987) also tested if the city form of government affected municipal wages and compensation levels for all municipal employees, and then more specifically for police and fire personnel. The authors concluded that no significant differences could be found in the total labor compensation provided by the two forms of government. Other studies have analyzed the effects of city government structure on wages and have found no conclusive evidence to support differences between the two forms of government; see Ehrenberg (1973), Ehrenberg and Goldstein (1975), Bartel and Lewin (1981), and O'Brien (1992, 1995).

which controls the longevity of the manager's tenure. This would again strengthen the link between the voters and the city manager, which would cause the CM production of local public goods to correspond closely with the EMC produced local goods.

Davis and Hayes (1993) construct efficiency measures for 141 Illinois municipal police departments based on the costs of producing police protection services and the estimated output of police services generated. The authors use the efficiency measures to test if police department efficiency is influenced by the presence of a city manager. The authors' findings show that the presence of a city manager has no significant impact on the police department efficiency measures. This result is consistent with the existing literature that finds no efficiency differences between the two forms of government.

2.4 The Trend Toward City Managers

Despite the fact that numerous studies have shown that the CM form of government has no relative efficiency advantage, it is currently the fastest growing form of government in the United States. Table 2.1 shows a comparison of the percent of US and Ohio cities with CM and EMC forms of government, for selected years between 1976 and 1999.

Table 2.1 Percent of U.S. and Ohio Cities by Form of Government, 1976-1999

	1976	1981	1986	1991	1996	1999
U.S. Total						
Elected Mayor-Council	58%	57%	55%	53%	49%	43%
Council-Manager	32%	34%	35%	37%	42%	49%
Ohio Total						
Elected Mayor-Council	80%	79%	78%	76%	74%	70%
Council-Manager	20%	21%	22%	24%	26%	30%

Note: Percentages may not sum to 100 because of omitted forms of government.
Source: ICMA, *The Municipal Year Book*, (1976-1999).

As shown in Table 2.1, the percent of CM cities has been growing since 1976 for all U.S. cities and Ohio cities, while the percent of EMC cities has been steadily decreasing. Specifically, the EMC form of government lost fifteen percent of the share of U.S. cities and lost ten percent of the share of Ohio cities, between 1976 and 1999. During the same time period, the CM form of government gained seventeen percent of the share of U.S. cities and gained ten percent of the share of Ohio cities. The fact that the EMC form of government is losing cities while the CM form of government is gaining cities has recently made the CM form the most popular among U.S. cities.

Again, the aim of this chapter is to use an alternative method of testing for efficiency differences in the two forms of government in order to provide some explanation of why the trend towards the CM form of government is occurring. The city governments making the transition to a CM form have to receive some kind of benefits from the transition, or else there would be no reason to make the transition. The benefits received may be in the form of efficiency gains brought on by the presence of a professional city manager. Such efficiency gains may have gone undetected by earlier research of local government structure because of the emphasis on analyzing only a limited set of common government expenditures.

The analysis of common governmental expenditures refers to the fact that the studies limited their analysis to only the expenditure categories comprising a significant portion of city spending. Booms (1966) analyzes per capita city expenditures on police protection, fire protection, highways, sanitation, and public health. Deno and Mehay (1987) analyze expenditures on police protection, fire protection, sewerage, highways,

interest on local debt, and general administration. Hayes and Chang (1990) analyze expenditures on three city government services: police protection, fire protection, and garbage collection. Finally, Davis and Hayes (1993) analyze the efficiency of local police departments.

This analysis of a limited array of expenditures may not be adequate to fully capture the differences in the spending patterns of the two forms of government. More specifically, by analyzing only a limited array of expenditure types, previous studies may have missed any relative efficiency differences in the two forms of government. The efficiency differences could show up as an increase in the quality of the common city public services. Also, as acknowledged by Hayes and Chang (1990), the efficiency differences may be captured in smaller city budget expenditure areas. Ultimately, the total value of the public services offered by each city needs to be analyzed, along with the taxes that are used to finance the public services. Following this logic, the sum total difference between the two forms of government should be reflected in the house-selling prices of those areas. In other words, the value of the local public goods, the taxes used to finance those goods, and any efficiency advantages to the CM form of government should be capitalized into the house-selling prices.

In summary, it is variation in the value and efficiency of the public services produced, rather than simply the expenditures on those services, that may show the differences in the two forms of city government. Duffy-Deno and Dalenberg (1990) provides evidence contrary to the popular finding that city form of government does not matter, by analyzing 26 cities' capital usage rates employed to produce local public goods. Although the authors do not directly test for efficiency differences, they show that

EMC cities consistently have significantly higher capital-input usage rates than CM cities.

Duffy-Deno and Dalenberg (1990) argue that the institutional differences in the two forms of government cause each to take different views on the role for capital inputs. Specifically, professional city managers may view capital and labor as simply inputs in a production function, while mayors may intend to use the inputs as political assets. Thus, the higher EMC capital-input usage rates are produced by the incentive of mayors to undertake more highly visible public works projects in order to influence public opinion, which may be undertaken in disregard to efficiency accounting criteria. Ultimately, the authors' findings suggest that the manner in which public goods are produced by the two forms of government does matter, and this may have relative efficiency implications. Again, the task of analyzing the manner of producing local public goods will be carried out through the analysis of house-selling prices, which reflect the capitalized value of both the local public goods and the city government taxes that were used to finance the public goods.

2.5 Hedonic Price Model and Data Description

Generally, the hedonic price model estimates house-selling prices as a function of several characteristics. More specifically, house-selling prices are dependent on structural house characteristics, city characteristics, and governmental influences. The hedonic price model contends that a house-selling price can be estimated as a function of the structural characteristics of the house, city characteristics of the residence location, and the form of

city government. The selling price in the hedonic model framework, adapted to include the city form of government influence, generally takes the following form:

$$P_H = P_H (S, C, G) \qquad (2.1)$$

where P_H is the house-selling price, S is a vector of structural house characteristics (such as house size, lot size, and number of bathrooms), C is a vector of city characteristics (such as property taxes and expenditures on local public goods), and G is the city form of government.

The focus of this chapter is on the influence that a city's form of government has on selling prices of homes in that jurisdiction. It is hypothesized that the differences in tax policies and variations in the value of local public services may reveal efficiency differences between the two forms of city government, which the hedonic price estimation technique lends itself to directly testing. The hedonic price model analysis imbeds the theory that the value of local public services, and the taxes to finance them, are capitalized into house-selling prices.[7]

More specifically, higher property taxes will lead to lower house-selling prices, while improvements in the value (quality or quantity) of local public services offered by a city government will lead to higher house-selling prices. Therefore, the net effect of the two local government functions is what is actually being capitalized into the house-selling prices.[8] In other words, the selling prices pick up the influence of the value of the public services provided, net of the cost of the city property taxes used to finance them.

---

[7] For relevant literature on the capitalization of local public services into house values refer to Oates (1969), Rosen and Fullerton (1977), Brueckner (1979), or Yinger (1982).

[8] It should be noted that state government influences are also capitalized into house-selling prices; however, these influences are held constant because all the home sales are from cities within Ohio.

If the value of the public services outweighs the cost of the taxes, then the net effect of the city government is positive, which shows the city government is operating efficiently.[9] A positive net effect would result in higher house-selling prices, which shows that more efficient city governments will have higher selling prices, ceteris paribus. Following this logic, it is hypothesized that professional city managers will conduct the city government affairs more efficiently relative to the EMC form of government. City managers can achieve this relative efficiency advantage by increasing the value of their public goods, or by decreasing the imposed costs of taxation. For example, city managers may produce more valuable public services given the same costs of taxation of the EMC government. Also, city managers may impose less costs of taxation to produce the same value of public goods as the EMC government.[10] Regardless of the method of producing the CM efficiency gains, if they exist, they will show up as a pricing premium in the estimation of the house-selling prices.

The house prices that are estimated were from houses sold in 1991 in the six largest Ohio metropolitan areas, including central cities and several surrounding cities. The six central cities include Akron, Cincinnati, Cleveland, Columbus, Dayton, and Toledo.[11] Analysis of Ohio house sales is beneficial in order to directly compare to earlier

[9] Likewise, if the costs of taxation outweigh the value of the public services, then the net effect of the government influence would be negative, implying that the government is operating inefficiently.

[10] It also is feasible for city managers to produce more valuable public goods while, at the same time, decreasing the imposed cost of taxation, which again would result in a more significant and positive net effect of the city government.

[11] The surrounding cities that were included in this study, based on data availability, were the following: Barberton, Brunswick, Cuyahoga Falls, Elyria, Fairborn, Fairfield, Gahanna, Hamilton, Kent, Lorain, Mentor, Middletown, North Olmsted, Reynoldsburg, Stow, and Westerville. These sixteen cities, along with the six central cities listed above, were the 22 cities included in the full sample analysis that follows.

studies such as Booms (1966) and Deno and Mehay (1987), which both studied the expenditures of Ohio city governments. Table 2.2 shows the data distribution among the six Ohio metropolitan areas and the two forms of city government classified by central city.

Table 2.2 Data Distribution Among Ohio Cities and Forms of Government

Metropolitan Area	Central City Form of Government (a)	Number of Observed House Sales (b)	Percent of Total Observed House Sales
Akron	Elected Mayor-Council	4,078	11%
Cincinnati	Council-Manager	6,520	17%
Cleveland	Elected Mayor-Council	11,866	32%
Columbus	Elected Mayor-Council	6,272	17%
Dayton	Council-Manager	5,743	15%
Toledo	Council-Manager	2,962	8%

Sources: (a) ICMA, *The Municipal Year Book*, (1991); (b) Amerestate, *Pace Net Data Set*, (1991).

The six central cities are spilt fifty-fifty between the two forms of city government; Cincinnati, Dayton, and Toledo had the CM form of government, while Akron, Cleveland, and Columbus had the EMC form. The house sales are somewhat evenly distributed between the two forms of government, with roughly 40 percent of the house sales occurring in CM cities and 60 percent occurring in EMC cities. This even distribution of house sales across the two forms of government is beneficial in testing for differences in the two forms of government.

The house-selling prices and house structural characteristics are based on the data set used by Haurin and Brasington (1996, 2001) and Brasington (1999, 2000, 2001). The data set includes only single-family detached dwellings. Also, any houses were eliminated that had a lot size greater than two acres to avoid inclusion of farming

locations. Next, all houses were eliminated that sold for more than $400,000 or less than $10,000. Houses selling for more than $400,000 were deemed unrepresentative, and houses selling under $10,000 were suspected of being gifts between family members or generally uninhabitable. The authors also deflated the house-selling prices according to constructed metro area deflators.

There are two different samples of house sales that are estimated. First, a full sample of house sales occurring in 22 Ohio cities, as described earlier, is estimated. There were 37,441 home sales used in the estimation of the full sample, and the mean deflated house-selling price was $69,312. Second, a set of regressions was run that only included home sales in the six central cities. This analysis serves to check the robustness of the findings from the full sample estimation process. There were 31,274 home sales used in the estimation of the central-city sample, and the mean deflated house-selling price was $69,243.

Table 2.3 presents summary statistics, definitions, and sources for the dependent and independent variables used in the estimation process. The structural house characteristics follow closely what has been used in previous hedonic price model analysis. There are dummy variables included in the estimation process to account for the CM form of government. By testing if the CM dummy variables are significant after controlling for city-specific influences such as public expenditures and taxes, the current study can provide evidence on whether the influence of the CM form of government is more highly valued in the housing market. Any such capitalization will capture the difference between the two forms of government, and therefore, reflect the value that residents place on the relative efficiency of the CM form of government.

Table 2.3 Summary Statistics, Definitions, and Sources for Variables

Variable Name (definition) (source)	Mean	St. Dev.
Dependent Variables		
House-Selling Price (Deflated house transaction amount, full sample, 1991) (a)	69,312	41,572
Log Price (Natural log of the deflated house transaction amount, full sample, 1991)	10.97	0.61
House-Selling Price (Deflated house transaction amount, only MSA central cities, 1991) (a)	69,243	43,137
Log Price (Natural log of the deflated house transaction amount, only MSA central cities, 1991)	10.96	0.63
Independent Variables		
Council-Manager City (Dummy =1 if CM form of city government in 1991) (b)	0.44	0.49
Council-Manager Central City (Dummy =1 if CM form of MSA central-city government in 1991) (b)	0.41	0.49
Property Tax Rate (Residential property tax millage rate net of tax reduction factors, 1991) (c)	51.89	6.48
Total Government Expenditures (City government expenditure in ten millions of dollars, 1990-1991) (d)	36,6714	20,1875
Civilian Unemployment Rate (Civilian labor force percent unemployed, 1991) (d)	7.29	1.93
Growth of Housing Units (Percent change of housing units from 1980-1990) (d)	2.41	12.20
9^{th}-Grade Proficiency (Average passage rate of the State of Ohio 9^{th}-grade proficiency test, 1990-1991) (e)	33.86	18.49
Burglary and Larceny Crime rate (Burglary and larceny crimes per thousand population, 1991) (f)	7.77	23.55
Air Conditioning (Dummy =1 if the house has central air-conditioning) (a)	0.34	0.47
Fireplace (Dummy =1 if the house has a fireplace) (a)	0.37	0.48
Lot Size (Size of the lot in thousands of square feet) (a)	9.75	8.34
Age (Age of the house in years) (a)	45.16	23.98
House Size (Size of the house in thousands of square feet) (a)	1.43	0.49
Garage Size (Size of the garage in thousands of square feet) (a)	0.32	0.19
Full Bathrooms (Number of full bathrooms) (a)	1.27	0.48
Part Bathrooms (Number of partial bathrooms) (a)	0.31	0.48
Unenclosed Porches (Number of unenclosed porches) (a)	0.79	0.74
Enclosed Porches (Number of enclosed porches) (a)	0.16	0.39
Patio (Dummy =1 if the house has a patio) (a)	0.20	0.40
Deck (Dummy =1 if the house has a deck) (a)	0.10	0.30
Pool (Dummy =1 if the house has a pool) (a)	0.01	0.11

Note: The mean and standard deviation values reported for the independent variables are for the full sample of Ohio cities.

Sources: (a) Amerestate, *Pace Net Data Set*, (1991); (b) ICMA, *The Municipal Year Book*, (1991); (c) Ohio Department of Taxation, *Property Tax Millage Rates*, (1991); (d) U.S. Census, *County and City Data Book*, (1994); (e) Ohio Department of Education, *Ohio 9^{th}-Grade Proficiency Test Passage Rates* (1990-1991); (f) Office of Criminal Justice Services, State of Ohio, *Crime by County 1993*, (1994).

Specifically, two different CM dummy variables were included in the full sample estimation to capture both city and central city effects.[12] The CM city government dummy variable is equal to one if the house is located in a city with the CM form of government and is used to test the relative efficiency advantage of being in a CM city over an EMC city. The CM city dummy variable will be significant and positive if professional city managers offer local public services that are valued more than those offered by EMC mayors, net of the tax burden for each form of government.

The performance of the central-city government should not only influence the selling prices of homes located in its borders, but also the selling prices of the homes located within the metropolitan area. This comes from the fact that many residents of the surrounding cities work or recreate in, or travel through, the central city. The CM central-city government dummy variable is equal to one if the house is located in a metropolitan area where the central city has a CM form of government, and this variable is used to test the relative efficiency advantage of being in a CM-run metropolitan area over an EMC-run metropolitan area. Again, the CM central-city dummy variable will be significant and positive if professional city managers offer local public services that are valued more than those offered by EMC mayors, net of the tax burden for each form of government.

City-specific measures of property tax rates, total government expenditures, unemployment rates, and housing unit growth are used to control for the city-specific influences affecting house-selling prices in each regression. The property tax rate and the total government expenditure are included to directly control for the finances of each city.

[12] Only one city form of government dummy variable is included in the estimation of the central-city sample of house-selling prices, which is equal to one if the central-city has a CM form of government.

General capitalization theory states that higher property tax rates result in lower house-selling prices, while greater public expenditures results in higher house-selling prices. This generalization comes from the notion that the property taxes are a cost imposed on the city residents, while the public goods, produced by government expenditures, are a benefit received by the residents. Thus, the property tax rate is expected to carry a negative sign and the total government expenditure is expected to carry a positive sign.

The city unemployment rate and housing growth variables are included to better characterize each city's economic activity. The city unemployment rates are included to directly control for the level of job availability (capacity) in each city. Cities with lower unemployment rates, or higher job availability, are relatively more attractive to live and work in than those cities experiencing high levels of unemployment, or lower job availability. Thus, the unemployment rate is expected to carry a negative sign showing that more job availability (low unemployment) exerts a positive influence on house-selling prices. The growth of housing units is included to directly control for the supply of housing market in each city. The housing growth rate is expected to carry a negative sign because increased levels of supply are typically followed by decreased prices.

Two outcome variables, measuring school quality and police protection, are included in various regressions to serve as robustness checks to the influence that CM governments have on the quality of public goods.[13] As supported by the findings of Brasington (1999), the housing market consistently values proficiency test scores as a

[13] Because of the limited degrees of freedom, especially when estimating the central-city only sample, the measures of school quality and police protection are reported at the school-district level. The smaller and more defined measurement area will better characterize the specific-area influences of schooling and policing that affect each house value, while still serving the purpose of controlling for such influences.

measure of school quality. Therefore, the average passage rate of the State of Ohio 9th-grade proficiency test is included in selected regressions to control for school quality, and is expected to carry a positive sign, showing that increased school quality positively influences house-selling prices. In order to control for the level of police protection, a burglary and larceny crime rate, measured per one thousand residents, is included in selected regressions. Burglary and Larceny crimes are chosen because they are a direct measure of the threat imposed on the protection of the private property of homeowners. The burglary-larceny crime rate should be negatively correlated with house-selling prices, showing that high crime areas have lower house-selling prices.

2.6 Estimation Results

The log-linear hedonic price function was estimated using least squares regression analysis. The hedonic price function relates the house-selling price to the structural characteristics of the home, the city characteristics of the residence location, and the form of the city government. The econometric model can be written as follows:

$$\ln P_{Hi} = \beta_0 + \sum_{m=1}^{M} \beta_m S_{m,i} + \sum_{n=1}^{N} \beta_n C_{n,i} + \beta_p G_{p,i} + \varepsilon_I \qquad (2.2)$$

where, $\ln P_{Hi}$ is the natural log of the selling price for house *i*, $S_{m,i}$ is the measure of the m^{th} structural variable for house *i*, $C_{n,i}$ is the measure of the n^{th} city characteristic for the residence location of house *i*, and $G_{p,i}$ is the city form of government for the residence location of house *i*.

Table 2.4 Log-Linear Hedonic Estimates of Ohio Metro House-Selling Prices (Full Sample)
37,441 Observed House Sales in 1991(Absolute value of t-stats)

	[a]	[b]	[c]	[d]
Council-Manager City Government	0.0222*	0.0280**	0.0344**	0.0403***
	(1.67)	(2.12)	(2.46)	(2.90)
Council-Manager Central-City Government	0.0493***	0.0438***	0.0436***	0.0380***
	(3.58)	(3.19)	(3.02)	(2.65)
Property Tax Rate	-0.0033***	-0.0032***	-0.0063***	-0.0061***
	(7.60)	(7.30)	(13.76)	(13.48)
Total Government Expenditures ($10,000,000)	0.0020***	0.0020***	0.0017***	0.0017***
	(15.70)	(15.78)	(13.03)	(13.11)
Civilian Unemployment Rate	-0.0271***	-0.0268***	-0.0421***	-0.0418***
	(15.10)	(14.96)	(22.62)	(22.49)
Growth of Housing Units	-0.0020***	-0.0021***	-0.0025***	-0.0026***
	(6.21)	(6.65)	(7.44)	(7.88)
9^{th}-Grade Proficiency	0.0077***	0.0077***		
	(60.49)	(60.49)		
Burglary and Larceny Crime Rate	-0.0003***		-0.0003***	
	(3.98)		(3.85)	
Air Conditioning	0.1037***	0.1037***	0.1196***	0.1196***
	(20.79)	(20.79)	(22.93)	(22.92)
Fireplace	0.1285***	0.1289***	0.1510***	0.1514***
	(26.78)	(26.87)	(30.14)	(30.22)
Lot Size (1,000 sq. ft.)	0.0111***	0.0111***	0.0191***	0.0192***
	(17.34)	(17.37)	(29.23)	(29.26)
Lot Size Squared	-0.0001***	-0.0001***	-0.0002***	-0.0002***
	(11.29)	(11.35)	(18.48)	(18.53)
Age	0.0025***	0.0025***	0.0014***	0.0014***
	(7.25)	(7.20)	(3.93)	(3.88)
Age Squared	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(26.43)	(26.37)	(25.10)	(25.04)
House Size (1,000 sq. ft.)	0.4897***	0.4892***	0.4960***	0.4955***
	(25.08)	(25.05)	(24.24)	(24.21)
House Size Squared	-0.0430***	-0.0429***	-0.0376***	-0.0374***
	(7.89)	(7.86)	(6.58)	(6.55)
Garage Size (1,000 sq. ft.)	0.7161***	0.7170***	0.7746***	0.7756***
	(27.77)	(27.80)	(28.69)	(28.73)
Garage Size Squared	-0.6662***	-0.6671***	-0.7259***	-0.7268***
	(17.04)	(17.06)	(17.72)	(17.74)
Full Bathrooms	0.0457***	0.0460***	0.0623***	0.0626***
	(8.18)	(8.23)	(10.65)	(10.70)
Part Bathrooms	0.0749***	0.0752***	0.0906***	0.0909***
	(15.39)	(15.47)	(17.80)	(17.87)
Unenclosed Porches	-0.0039	-0.0040	-0.0081**	-0.0082**
	(1.20)	(1.21)	(2.36)	(2.38)
Enclosed Porches	0.0045	0.0045	0.0101*	0.0102*
	(0.81)	(0.82)	(1.74)	(1.74)
Patio	0.0262***	0.0253***	0.0256***	0.0246***
	(4.80)	(4.64)	(4.48)	(4.32)
Deck	0.0872***	0.0874***	0.1032***	0.1034***
	(12.72)	(12.74)	(14.38)	(14.40)
Pool	0.0399**	0.0394**	0.0363**	0.0358**
	(2.35)	(2.32)	(2.04)	(2.01)
Constant	9.6786***	9.6811***	9.8154***	9.8179***
	(296.58)	(296.66)	(287.76)	(287.83)
R-squared	0.64	0.64	0.61	0.61

Significance levels are represented by: *** 1%, ** 5%, * 10%

Quarter of sale dummy variables were included in each regression, and are available upon request to the author.

The log-linear hedonic price estimates for the full sample of Ohio cities are presented in Table 2.4. The house structural characteristics all have signs and significant levels that are generally supported in the hedonic house price literature. The city characteristics (property tax rate, total government expenditures, unemployment rate, and housing growth) all had the expected signs and remained significant throughout the four specifications. Also, the outcome variables (school quality and police protection) had the expected signs and remained significant in the regressions that they were included in.

The focus of this chapter is primarily on the differences in the two major forms of city government. Thus the variables that are of particular interest to test for relative efficiency differences are the two CM dummy variables. These two dummy variables are designed to test the effect that CM governments have on house-selling prices relative to the influence of EMC governments. After controlling for city taxes and expenditures, along with other city characteristics and outcome variables, the two CM dummy variables remain significant and positive throughout the four regression specifications.

The finding of positive and significant coefficient estimates for the CM dummy variables imply that there is a positive net effect of the CM form of government relative to the EMC form. In other words, professional city managers offer local public services that are valued more than EMC mayors, net of the tax burden of each form of government. The results support the hypothesis that the presence of a city manager produces a relative efficiency advantage for the CM form of government over the EMC form. In other words, adopting a CM form of government increases the house-selling price of homes located in CM cities, or CM-run metropolitan areas, relative to those

located in EMC areas, which can be attributed to the efficiency gains produced by the professional city manager.

In order to serve as a final robustness check the same regressions were run using only data from the six central cities. Also, in comparing the magnitude and significance of the two CM dummy variables, both city and central city, the metropolitan area CM dummy seems to exert a stronger influence on the house-selling prices. Implying that the central-city government form may matter more than the form of government of the surrounding cities. Likewise, there may be a stronger CM influence on the houses located within the central cities. Estimating just the house-selling prices occurring in central cities will reveal if the CM effect on house-selling prices is more or less pronounced in the central cities of the metropolitan areas.

The estimation results for the central-city sample of home sales are reported in Table 2.5. The only structural difference is that only one CM dummy was needed to test for relative city form of government efficiency differences. The results do not differ substantially from those reported for the full sample estimation. All variables retained their expected signs and most retained significance throughout all four regressions. The one striking difference is the coefficient estimate on the CM dummy variable, which appears significantly larger than the estimates from the full sample. This reveals that the presence of a city manager has a stronger affect in central cities.

Table 2.5: Log-Linear Hedonic Estimates of Ohio Metro House-Selling Prices (Central Cities)
31,274 Observed House Sales in 1991 (Absolute value of t-stats)

	[a]	[b]	[c]	[d]
Council-Manager City Government	0.1491***	0.1501***	0.1712***	0.1722***
	(9.58)	(9.65)	(10.52)	(10.59)
Property Tax Rate	-0.0061*	-0.0064*	-0.0124***	-0.0127***
	(1.62)	(1.70)	(3.16)	(3.25)
Total Government Expenditures ($10,000,000)	0.0051***	0.0051***	0.0062***	0.0062***
	(21.57)	(21.55)	(25.04)	(25.02)
Civilian Unemployment Rate	-0.0265***	-0.0272***	-0.0386***	-0.0393***
	(5.26)	(5.42)	(7.34)	(7.50)
Growth of Housing Units	-0.0052***	-0.0054***	-0.0092***	-0.0094***
	(5.35)	(5.56)	(9.09)	(9.31)
9^{th}-Grade Proficiency	0.0075***	0.0075***		
	(54.07)	(54.07)		
Burglary and Larceny Crime Rate	-0.0002*		-0.0002	
	(1.66)		(1.59)	
Air Conditioning	0.1069***	0.1070***	0.1246***	0.1247***
	(19.06)	(19.07)	(21.28)	(21.29)
Fireplace	0.1400***	0.1402***	0.1660***	0.1662***
	(26.14)	(26.18)	(29.76)	(29.80)
Lot Size (1,000 sq. ft.)	0.0098***	0.0098***	0.0181***	0.0181***
	(13.68)	(13.65)	(24.57)	(24.54)
Lot Size Squared	-0.0001***	-0.0001***	-0.0002***	-0.0002***
	(8.80)	(8.80)	(15.65)	(15.65)
Age	0.0042***	0.0041***	0.0028***	0.0027***
	(10.59)	(10.55)	(6.76)	(6.72)
Age Squared	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(27.54)	(27.50)	(25.84)	(25.81)
House Size (1,000 sq. ft.)	0.4839***	0.4837***	0.5023***	0.5021***
	(22.51)	(22.50)	(22.34)	(22.34)
House Size Squared	-0.0388***	-0.0387***	-0.0369***	-0.0368***
	(6.49)	(6.48)	(5.90)	(5.89)
Garage Size (1,000 sq. ft.)	0.7244***	0.7249***	0.7658***	0.7663***
	(24.76)	(24.77)	(25.04)	(25.05)
Garage Size Squared	-0.6574***	-0.6580***	-0.6982***	-0.6988***
	(14.90)	(14.91)	(15.13)	(15.15)
Full Bathrooms	0.0549***	0.0551***	0.0737***	0.0739***
	(8.72)	(8.77)	(11.22)	(11.26)
Part Bathrooms	0.0834***	0.0837***	0.1014***	0.1016***
	(15.28)	(15.33)	(17.79)	(17.84)
Unenclosed Porches	-0.0059	-0.0058	-0.0063*	-0.0062*
	(1.59)	(1.58)	(1.62)	(1.62)
Enclosed Porches	0.0046	0.0046	0.0101	0.0101
	(0.75)	(0.74)	(1.56)	(1.56)
Patio	0.0248***	0.0245***	0.0303***	0.0301***
	(3.82)	(3.79)	(4.47)	(4.44)
Deck	0.0914***	0.0915***	0.1090***	0.1091***
	(11.69)	(11.69)	(13.33)	(13.34)
Pool	0.0279	0.0274	0.0235	0.0230
	(1.43)	(1.41)	(1.15)	(1.13)
Constant	9.9627***	9.9835***	10.4964***	10.5172***
	(43.16)	(43.31)	(43.52)	(43.67)
R-squared	0.65	0.65	0.61	0.61

Significance levels are represented by: *** 1%, ** 5%, * 10%
Quarter of sale dummy variables were included in each regression, and are available upon request to the author.

The percent effect of the CM government's influence on house-selling prices cannot be directly interpreted by the coefficient estimates appearing in Tables 2.4 and 2.5 because of the semi-logarithmic nature of the hedonic regression technique. Following the approach of Halvorsen and Palmquist (1980), the percentage effect that the CM form has on house-selling prices can be calculated as follows:

$$\alpha = [\exp(\beta) - 1] * 100 \qquad (2.3)$$

where, α is the percent effect of the CM form, and β is the coefficient estimate of the council-manager dummy variable. Calculations of the percentage effects were performed for the four regression specifications, for both the full and central city samples, and are presented in Table 2.6.

Table 2.6 Percent Effect and Marginal Implicit Price of the Council-Manager Form of Government

	[a]	[b]	[c]	[d]
Full Sample of Ohio Cities $\bar{P}_H$ = \$69,312				
Council-Manager City Government				
Percent Effect (α)	2.24%	2.84%	3.50%	4.11%
Implicit Price (ρ)	\$1,553	\$1,968	\$2,426	\$2,849
Council-Manager Central City Government				
Percent Effect (α)	5.05%	4.48%	4.46%	3.87%
Implicit Price (ρ)	\$3,500	\$3,105	\$3,091	\$2,682
Council Manager City and Central City Government				
Percent Effect (α)	7.41%	7.44%	8.11%	8.14%
Implicit Price (ρ)	\$5,136	\$5,157	\$5,621	\$5,642
Only Ohio Central Cities $\bar{P}_H$ = \$69,243				
Council-Manager City Government				
Percent Effect (α)	16.08%	16.20%	18.67%	18.79%
Implicit Price (ρ)	\$11,134	\$11,217	\$12,928	\$13,011

Looking at the calculated percent effects for the full sample of Ohio cities shows that the CM central-city government form does exert a stronger impact on house-selling prices then the CM city government in three of the four regressions. The CM central-city government impact ranges from a low of 3.87% in specification [d] to a high of 5.05% in specification [a]. While, the CM city government impact ranges from a low of 2.24% in specification [a] to a high of 4.11% in specification [d]. These two dummy variables capture the separate effects of (i) a house being located in a CM city relative to an EMC city, and (ii) a house being located in a CM-run metropolitan area relative to an EMC-run metropolitan area. However, they do not capture the combined effect of being in a CM city that is located in a CM-run metropolitan area. In order to capture the combined impact, the two coefficient estimates were combined and then used to calculate the percent effect (also presented in Table 2.6).[14] The combined effect of a house located in a CM city and CM-run metropolitan area ranged from a low of 7.41% in specification [a] to a high of 8.14% in specification [d].

Looking at the calculated percent effects for the sample of Ohio central cities shows that the CM city government form does exert a strong impact on house-selling prices. The percent effects ranged from a low of 16.08% in specification [a] to a high of 18.79% in specification [d]. Again, these percent effects are the impact of the CM form of government relative to the EMC form, after controlling for several city-specific influences and outcome variables that have traditionally been shown to affect house-selling prices. The fact that the percent affects are positive, significant, and quite large

[14] To get the combined percent effect the following calculation was used:
$\alpha = [\exp(\beta_1 + \beta_2) - 1] * 100$, where β_1 is the coefficient estimate of the CM city dummy, and β_2 is the coefficient estimate of the CM central-city dummy.

shows that the city form of government does matter. Specifically, CM governments outperform EMC governments, which results in a significant pricing premium for houses located in those areas.

The calculated percentage effects were used to calculate the marginal implicit price (pricing premium) of adopting a CM form of government.[15] Calculations of the marginal implicit price of the CM government, evaluated at the mean house-selling price, are produced using the following formula and are also presented in Table 2.6:

$$\rho = \alpha \cdot \bar{P}_H \qquad (2.4)$$

where, ρ is the marginal implicit price of the CM government, and $\bar{P}_H$ is the mean house-selling price of the sample.

The marginal implicit price of the CM government is essentially the pricing premium that home owners would be willing to pay to live in a house located in a CM city, or CM-run metropolitan area, relative to living in the same house in a EMC area. The implicit prices from the full sample of Ohio cities show that residents would, on average, pay about $2,000 more to own a house in a CM city and about $3,000 more to own a house in a CM-run metropolitan area, relative to owning a house in a EMC area. Also, the results show that residents would, on average, pay over $5,000 to own a house in a CM city located in a CM-run metropolitan area. When considering the central-city sample of house sales, results show that central-city residents would, on average, pay around $12,000 to own a house in a CM central-city relative to an EMC central-city.

[15] In order for the calculated marginal implicit prices to reveal true implicit prices of each attribute, the assumption that individual preferences are weakly separable in housing and its attributes has to be made. More specifically, this assumption makes the demands for the various attributes independent of the prices of the other goods.

Again, the pricing premiums can be attributed to the fact that professional city managers offer a superior basket of local public goods relative to EMC mayors, net of the tax burden created to finance the production of the local public goods.

2.7 Conclusion

The majority of U.S. city governments have adopted either an EMC form of government or a CM form. Several studies have attempted to find efficiency differences between the two competing forms of city government, where the hypothesized difference is based on the theory that a professional city manager has an efficiency advantage over a popularly elected mayor in the production of local public goods. However, past studies have shown no significant differences in the two forms of city government, which is surprising given the current trend of U.S. cities adopting the CM form of government.

This chapter used an alternative method of testing for city government efficiency differences and showed that efficiency differences do exist between the two forms of government. This finding provides some insight into the growing trend towards adopting the CM form of city government. More specifically, to build upon the use of common government expenditures and account for the total value of public services offered by a city government, the alternative method relies on the theory that local public services and taxes are capitalized into housing prices. It is hypothesized that analysis of all the public goods and services offered by a locality will better capture the scope of the cities expenditures, and help reveal differences in the two forms of government. Where, if the efficiency advantages exist, they will show up in a pricing premium. Results show that houses within a CM city, or CM-run metropolitan area, have a significant pricing

premium that can solely be attributed to the relative efficiency of the CM form of government over the EMC form.

These results contribute to the literature in that they are the first results since Booms (1966) that point to significant efficiency differences in the two forms of city government. Booms (1966) findings are supported in the fact that the CM form of government has a relative efficiency advantage over the EMC form. The efficiency advantage can also be used to explain the current U.S. trend towards adopting the CM form of city government. The cities making the transition to the CM form of government have to receive some benefits from the change, and the benefits may come in the form of efficiency gains. Finally, the alternative methodology employed to show the CM government's relative efficiency advantage sheds some doubt on the use of common government expenditures to test for differences in city forms of government. The results point to the fact that variations in the total value of the public services produced, and the efficiency of the manner in which they were produced, may be better suited to reveal differences in the two forms of city government.

Chapter 3

Minimum Drinking Age Laws and International Border Crossings

3.1 Introduction

> "I would say 75 percent (go over the Detroit bridge drunk). There's a lot. To be honest with you, I don't even think half of those (kids) are even of age. We just hope they make it across the bridge without killing someone else. Once they make it over, they're Detroit's problem."
>
> ~Canadian Customs Official
>
> In "The Bridge to Adulthood," Michigan State University: *State News.*

One of the most serious consequences of mixing alcohol consumption and driving is motor-vehicle fatalities. The National Highway Traffic Safety Administration (NHTSA) found that 38 percent of all U.S. traffic fatalities in 1999 were alcohol related.[16] In that same year, the NHTSA found that 40 percent of all traffic fatalities occurring in Michigan were alcohol related. Alcohol-related motor-vehicle accidents impose substantial costs on society. The Public Services Research Institute estimated that, in 1998, alcohol-related crashes in the U.S. cost the public more than $110 billion and alcohol-related crashes in Michigan cost $3.7 billion.[17]

Economists and social scientists have analyzed the effect that different state alcohol policies have on the deterrence of drinking and driving, and thus, the occurrence of alcohol-related motor-vehicle fatalities. These studies have generally examined the

[16] The National Highway Traffic Safety Administration considers an accident to be alcohol related if at least one driver had a blood-alcohol content (BAC) level of 0.01 or above. The data presented in this paragraph can be found in the following references: the NHTSA data is from the U.S. Department of Transportation, *Traffic Safety Facts 1999*; and the cost data is from Jensen, Miller, and Covington (1999).

[17] According to Jensen, Miller, and Covington (1999) the only U.S. states that experienced higher alcohol-related crash costs than Michigan in 1998 were California ($11.0 billion), Texas ($10.5 billion), Florida ($6.6 billion), and Pennsylvania ($4.0 billion).

effects of changes in state minimum drinking age laws, alcohol taxes, and other legislation aimed at drunk drivers. One area that has not been examined is the effect that international border crossings, connecting nations with different drinking ages, have on motor-vehicle fatalities in the areas around the border crossings.

In the United States, individual state drinking age laws are now uniformly set at twenty-one; however many states share borders with Canada or Mexico, where drinking age laws are lower. For example, Michigan's current legal drinking age is twenty-one, while Ontario, Canada's minimum drinking age is nineteen. In this chapter I hypothesize that, because of the difference in the legal drinking age, many nineteen and twenty-year-old drivers will cross the Michigan-Ontario border to obtain and consume alcohol. Accordingly, the presence of the border crossings should increase alcohol consumption, and the traffic fatalities that come along with it, among individuals aged nineteen and twenty.

In this chapter, I analyze the impact of the difference in Michigan and Ontario minimum drinking age laws on the occurrence of motor-vehicle fatalities in the Michigan counties that are nearer to the international border crossings.[18] I explore the impact that the Michigan-Ontario border crossings have on motor-vehicle fatalities for all-age drivers and, more specifically, for drivers aged nineteen and twenty. My results show that the closer the county is to a border crossing, the higher motor-vehicle fatalities for all-aged drivers and for drivers aged nineteen and twenty it will have.

[18] The aim of this chapter is not to make judgments over which minimum drinking age law is more appropriate. Rather I aim to analyze and quantify the impact of the border crossings, given the fact that two different minimum drinking age laws exist.

The border crossing impact is then quantified in terms of the costs from lives lost that are imposed on the counties nearer to the border crossing. The results show that the three border crossing counties, on average, have a cost burden beyond the average Michigan county, which can be attributed to the increased alcohol-related motor-vehicle fatalities produced by the international border crossings. More specifically, the border-crossing counties will face a cost burden above the average Michigan county's costs that is roughly $166.5 million more for motor-vehicle fatalities of all-aged drivers and $11.1 million more for fatalities of nineteen and twenty-year-old drivers; and these additional costs are strictly because of the presence of the border crossings. One policy implication that comes from the costs imposed on the border crossing counties, is that the border crossing patrols need to devote more resources to preventing alcohol-impaired border crossing traffic.

The set up of the chapter is as follows. Section 3.2 will present the relevant alcohol policy research literature. Section 3.3 will briefly characterize the Michigan-Ontario border crossings and detail the measure of distance. Section 3.4 will set up the count model used to estimate the determinants of Michigan motor-vehicle fatalities and describe the data incorporated in the estimation process. Section 3.5 will outline the estimation results. Finally, Section 3.6 will present possible policy implications and concluding remarks.

3.2 Alcohol Policy Research

Previous studies of U.S. alcohol policies have mainly been concerned with analyzing the differences in state policies and their resulting affects on motor-vehicle fatalities.

Specifically, there have been several studies that analyze state-level programs instituted to deter alcohol-impaired driving, in order to test which policies are more effective. The studies have analyzed policies that restrict the availability of alcohol, such as drinking age laws, alcohol taxes, and other alcohol laws. [19]

There have been several state-level studies that have shown that increases in the minimum drinking age will result in fewer alcohol-related motor-vehicle fatalities. Wagenaar (1983) found that increases in the legal drinking ages in Maine, Michigan, New York, and Pennsylvania produced significant reductions in alcohol-related motor-vehicle crashes among young drivers aged eighteen to twenty. Wagenaar (1986) confirmed these findings for Michigan, and showed that the higher drinking age led to long-term reductions in motor-vehicle crashes among young drivers. Legge (1991) extended Wagenaar's analysis of Michigan by analyzing different measures of traffic fatalities and found evidence supporting the conclusion that the increase in Michigan's drinking age led to reduced motor-vehicle fatalities for young drivers.

Other statewide studies of legal drinking age changes have incorporated additional methods of deterrence and have found results similar to those presented above. Wilkinson (1987) found that increasing the minimum drinking age and closing drinking outlets earlier were effective policies in reducing the number of motor-vehicle fatalities.

[19] An overview of the economics of alcohol policies (such as taxation, availability controls, and minimum drinking ages) is presented in the collection of papers published by the U.S. Department of Health and Human Services: National Institute on Alcohol Abuse and Alcoholism (1991), entitled: *Economics and the Prevention of Alcohol-Related Problems.*

Legge and Park (1994) concluded that enactment of illegal per se rules and increases in the legal drinking age significantly decrease motor-vehicle fatalities.[20]

In addition to legal drinking age laws, some studies have analyzed the effect that beer taxes have on alcohol consumption and alcohol-related motor-vehicle fatalities.[21] Ruhm (1996) studied cross-state variations in drinking ages and beer taxes and found that higher legal drinking ages and larger beer taxes significantly lower the rate of motor-vehicle fatalities. Dee (1999) used estimates that were not based on observed state-specific attributes and showed that beer taxes have an insignificant impact on teen drinking (18 to 20 year olds), while movements to higher legal drinking ages substantially reduced teen traffic fatalities. Mast, Benson, and Rasmussen (1999) found that, after other policies impacting beer consumption are controlled for, beer taxes do not significantly affect alcohol-related motor-vehicle fatalities. However, the authors found that a higher drinking age is negatively related to alcohol-related motor-vehicle fatalities. Young and Likens (2000) also showed that the legal drinking age has a statistically significant and negative relationship with total, youth, and alcohol-related traffic fatalities, while beer taxes seemingly do not.

My study is closely related to this literature in that it is an extension of the legal drinking age law analysis. Here, however, I am testing the effect that international differences in drinking ages have on the occurrence of motor-vehicle fatalities near the

---

[20] Illegal per se rules define a specific blood alcohol concentration, when detected in drivers, as conclusive evidence of drunk driving.

[21] There has been some research on the effect that different U.S. state alcohol tax policies have on cross-border alcohol sales. For example, Beard, Gant, and Saba (1997) found that border-crossing activity, induced by tax avoidance, is a significant determinant of state alcohol sales in the United States. The authors also included a 0-1 dummy variable to account for states with Canadian borders, and found that Canadians cross the border to by liquor.

border crossings. The results of the previous literature suggest that the lower dinking age in Ontario will lead to higher alcohol-related driving fatalities; some of which will occur on the Michigan side of the border.[22] As the Canadian customs official said in the opening quote, "once they make it over (the bridge), they're Detroit's problem."

There have also been some studies analyzing county level differences in alcohol availability policies to see if they help explain local level motor-vehicle fatalities. The two studies presented below analyze the effect that a county's decision to prohibit alcohol sales (become "dry") has on motor-vehicle fatalities.[23] Winn and Giacopassi (1993) found that dry counties in Kentucky have a lower rate of alcohol-related motor-vehicle fatalities. While Baughman, Conlin, Dickert-Conlin, and Pepper (2001) showed that counties in Texas that only allowed the sale of beer and wine experienced decreased alcohol-related traffic accidents, and counties that allowed the sale of higher alcohol-content liquor increased the risk of traffic accidents within their borders. The authors note that the decrease in driving fatalities produced from allowing the sale of beer and wine may be attributed to the fact that it gives some residents less incentive to drive to non-prohibitive counties to consume alcohol. Generally, the authors rationalized that the reduction in the distance traveled to obtain alcohol and the consumption of lower alcohol-content beer resulted in less motor-vehicle fatalities.

---

[22] There has been some research performed on the effects of drinking age changes in Canada. Such studies as Simpson, Beirness, Mayhew, and Donelson (1985) and Mayhew and Simpson (1990) have shown that lowering the drinking age in Ontario resulted in higher alcohol-related crashes in young drivers, and that raising the drinking age produced less alcohol-related crashes in young drivers.

[23] It should be noted that dry county analysis does not apply to Michigan during the analyzed time period because there were no counties that specifically prohibited the sale of alcoholic beverages.

Michigan county residents that are aged nineteen or twenty have to drive to the nearest border crossing in order to legally obtain and consume alcohol. This is essentially increasing the travel distance needed to obtain alcohol, and thus, will result in more fatalities in the counties that are near the border crossing. However, some counties are relatively far from the border crossings and may not be in reasonable travel distance to take advantage of the drinking age differences. Therefore, the border-crossing travel effect decreases as a county's distance from the crossing increases.

3.3 Characteristics of the Michigan-Ontario Border Crossings

Analysis of Michigan and Ontario is a good choice because there are only three major border crossings between the two areas. Also, Michigan is isolated from other outside influences because of the surrounding Great Lakes. The three border crossings are located in Detroit (Wayne county), Port Huron (St. Clair county), and Sault Ste. Marie (Chippewa county). The Detroit border crossing is generally the dominant Michigan-Ontario crossing as measured by total incoming personal vehicles. The U.S. Bureau of Transportation Statistics reported that, in 1997, the Detroit crossing had over 7.4 million incoming personal vehicles; while Port Huron had roughly 2.0 million and Sault Ste. Marie had just over 1.6 million vehicles.

In this chapter I hypothesize that the Michigan-Ontario border crossings affect the alcohol available to nineteen and twenty-year-old residents of Michigan, and therefore, influence the state's motor-vehicle fatalities. More specifically, the border crossings' effects on motor-vehicle fatalities are strongest in the counties surrounding the border crossings, and dissipate out as the distance from the border crossing increases. Also, each

border crossing is going to influence a different set of Michigan counties; specifically, each crossing will have an effect on the motor-vehicle fatalities of the counties that are in close proximity to that crossing. Therefore, the distance from each county seat to the nearest border crossings, measured in actual road mileage, is included in my analysis to measure the border crossing effect. This distance variable is expected to be significant and have a negative sign to show that as distance from a border crossing increases, motor-vehicle fatalities will decrease.

Michigan residents aged nineteen or twenty have incentive to cross the border to take advantage of the differences in legal drinking ages, which may be especially true for college students studying in Michigan. As stated in the MSU *State News* article, "The Bridge to Adulthood," many college students cross the borders and "the goals are simple: get legal, get drunk, get back across the border without the hassle of Windsor Police." There is a significant population of college students in the counties that are near the Michigan border crossings, which puts many nineteen and twenty year old students within reasonable driving distances to take advantage of the drinking age differences. For example, Wayne State University in Detroit (Wayne County); the University of Michigan in Ann Arbor (Washtenaw County); Michigan State University in Lansing (Ingham County); and Northern Michigan University in Marquette (Marquette County) are all in close proximity to a Michigan-Ontario border crossing.[24]

[24] Wayne State University (annual enrollment 30,000) is closest to the Detroit border crossing being located in Detroit, the University of Michigan (annual enrollment over 40,000) is about 40 miles from Detroit, Michigan State University (annual enrollment over 40,000) is within 100 miles of Detroit and Port Huron, and Northern Michigan University (annual enrollment 10,000) is under 150 miles from Sault Ste. Marie.

There is an additional crossing incentive that may affect nineteen and twenty-year-old Michigan residents, as well as residents twenty-one and older—legal casinos.[25] Ontario has had an established casino since 1994, Casino Windsor, while Michigan has just recently allowed casinos to move into Detroit in the later part of 1999. The lack of casinos in Michigan gives incentives to those residents over the age of nineteen, who wish to gamble, to cross the border where casinos are permitted. This is an incentive for Michigan residence nineteen and older because, like the province's drinking age, Ontario's legal gambling age is set at nineteen. It is not the aim of this chapter to analyze the effects that gambling traffic has on motor-vehicle fatalities in Michigan; rather it is to measure the effect that the lower Ontario drinking age, and the ensuing underage border crossing traffic, has on motor-vehicle fatalities in Michigan. However, the gambling incentive to cross the border is mentioned because it seems reasonable that casinos, which offer free drinks to gambling patrons, create an atmosphere that is somewhat conducive to alcohol consumption.

3.4 Count Model and Data Description

Following the approach of Mast, Benson, and Rasmussen (1999), two measures of motor-vehicle fatalities were used to test the effect that the border crossings have on Michigan counties: total fatalities and alcohol-related fatalities.[26] The authors have noted the advantages and disadvantages of both measures, and concluded that using total fatalities

[25] For more information on gambling-induced travel refer to Garrett and Marsh (2002). The authors found that cross-border lottery shopping between U.S. states significantly influences state-generated lottery revenue. Specifically, states are vulnerable to significant revenue losses because of competition from neighboring state lotteries.

[26] Both of these measures are consistent with measures used in the literature and were obtained from the NHTSA's Fatal Accident Reporting System (FARS).

will conceptually give the best estimates of total life saving capabilities of any anti-drunk driving policy; while alcohol-related fatalities will best estimate total drunk driving deterrence. More specifically, the authors note that the use of total fatalities is optimal when estimating the costs of lives lost because "alcohol is involved to some degree in all categories of fatal motor vehicle accidents." The aim of this chapter is to try and quantify the impact of the border crossings in terms of the costs of lives lost imposed on the counties nearer to the border crossing. Therefore, the results to be particularly highlighted are those dealing with the regressions using total fatalities.[27]

Each measure of fatalities, total and alcohol-related, is also broken down by age of driver; more specifically, into fatalities involving all-aged drivers and fatalities involving drivers aged nineteen and twenty. So there were a total of four dependent variables used in the estimation process, each measuring the fatalities that occurred in Michigan counties between 1995 and 1999. Table 3.1 presents summary statistics, definitions, and sources for the dependent and independent variables used in the estimation process.

[27] The results to be reported involving alcohol-related fatalities do entirely support the findings of the regressions run with total fatalities, and will be used to show the robustness of my results. It should be noted that the use of alcohol-related fatalities has been debated in the literature over the accuracy of the alcohol-involvement measure because it is a subjective assessment made by police officers. For more information on the controversy over the alcohol-related measure refer to Winn and Giacopassi (1993) and Baughman, Conlin, Dickert-Conlin, and Pepper (2001).

Table 3.1 Summary Statistics, Definitions, and Sources for Variables

Variable Name (definition) (source)	Mean	St. Dev.
Dependent Variables		
Total Fatalities, All Aged Drivers (total traffic deaths) (a)	87.1	153.7
Total Fatalities, 19 to 20 year old Drivers (total traffic deaths involving a Driver aged 19 or 20) (a)	4.5	7.4
Alcohol Related Fatalities, All Aged Drivers (traffic deaths involving drivers with BAC > 0.01) (a)	24.4	41.6
Alcohol Related Fatalities, 19 to 20 year old Drivers (traffic deaths involving 19 to 20 year old drivers with BAC > 0.01) (a)	1.3	2.1
Independent Variables		
Distance from County Seat to Nearest Border Crossing (road travel measured in hundreds of miles from county seat to closest border crossing) (b)	1.4	0.7
Population (population aged 16 and older, measured in thousands of persons) (c)	91.6	215.5
Underage Population (population aged 19 and 20, measured in thousands of persons) (c)	3.5	7.7
Unemployment Rate (civilian unemployment rate) (d)	5.5	2.2
Per Capita Income (local area per capita personal income, measured in thousands of dollars) (e)	22.7	4.7
Police Employment (number of sworn officers, measured in hundreds of officers) (f)	2.6	9.0
Licensed Bars (number of licensed bars, measured in tens of bars) (g)	2.1	4.2
Vehicle Miles Traveled (estimated miles annually traveled by vehicles, measured in hundred millions of miles) (h)	5.8	1.1
DUI arrest share of total arrests (DUI arrests / total arrests) (i)	20.0	6.8

Sources: (a) U.S. Department of Transportation, Fatal Accident Reporting System, 1995-1999; (b) MapQuest Online Road Mileage Distance Calculator; (c) U.S. Census Bureau, 1999; (d) Michigan Department of Career Development, 1999; (e) U.S. Bureau of Economic Analysis, 1999; (f) U.S. Census of Governments, 1997; (g) Michigan State University, County Tourism Profiles, 1997; (h) Michigan Department of Transportation, 1997; (i) Michigan State Police, 1999

Other than the measure of distance to the nearest border crossing, the independent variables follow closely what has been used in the previous literature. As mentioned in Section III, the distance from each county seat to the nearest border crossings, measured in actual road mileage, is included to capture the border crossing effect. The distance variable is expected to be significant and have a negative sign to show that as distance from a border crossing decreases, motor-vehicle fatalities will increase in occurrence.

The socio-economic variables that are controlled for include the following: population, unemployment rate, per capita income, police employment, the number of licensed bars, and the average vehicle miles traveled. Population is expected to have a positive and significant impact on motor-vehicle fatalities.[28] The unemployment rate is expected to carry a negative sign because alcohol consumption in bars and restaurants is assumed to fall during economic downturns. The per capita income is expected to have a negative sign because, as incomes rise, the opportunity cost of taking the risk of drunk driving increases; therefore, the activity should be avoided by higher income earners, which would reduce the occurrence of motor-vehicle fatalities. Police employment is expected to carry a negative sign because more police enforcement of traffic laws, should reduce the number of traffic violations, of which drunk-driving is included. The number of licensed bars should have a positive sign showing that increased alcohol availability will lead to more alcohol consumption, and the things that come along with it. Finally,

[28] Fatalities per capita were not incorporated into the count model because dependent variables need to be non-negative integers, so division by population would leave non-integer values for all the fatality measures. Population is controlled for and all specifications show a significant and positive relationship between fatalities and the number of persons in each county.

the average vehicle miles traveled should carry a positive sign, showing that more miles driven, on average, should result in more motor-vehicle fatalities.

The one variable that may be a newer contribution to the explanations of motor-vehicle fatalities is the DUI share of total arrests. Benson, Mast and Rasmussen (2000) used this criminology-based measure in their attempt to better model how police deterrent efforts were dispersed in a given location. If the DUI share of total arrest increases for a given area, then more police efforts are focused on deterring drunk driving in that area. This measure is expected to have a negative sign in my estimation, to show that as more resources are allocated to deterring drunk driving, less motor-vehicle fatalities will occur.

The motor-vehicle fatalities of a specific county are modeled based on the expectation that a fatality will occur in that county. The fatalities that occur in a given county will be dependent on the county-specific socio-economic factors presented in Table 1, and also, on the location of the county in proximity to the border crossings. The location of the county is important for capturing the effect of the border crossing and is measured as the distance from the county seat to the nearest border crossing.

In order to model the occurrence of the traffic fatalities in each county, a count model estimation technique was used. Given the nature of the data, the count method was particularly useful in modeling the traffic fatalities involving drivers aged nineteen and twenty because there were limited occurrences in most counties between 1995 and 1999. In fact some counties experienced no motor-vehicle fatalities involving drivers aged nineteen or twenty during that time span. Simple OLS techniques would be inconsistent in estimating such count style data, so the count model was a logical choice for estimation technique.

The count model is based on a Poisson distribution and follows the general framework presented below. In order to assure a non-negative expectation of the observed motor-vehicle fatalities, the explanatory variables are modeled as:

$$E(Y_i \mid X_i) = \lambda_i = \exp(\beta' X_i), \quad i = 1,\ldots, n \qquad (3.1)$$

where the subscript (i) denotes the county (of which n = 83 Michigan counties), X_i is a matrix of explanatory variables, β is a vector of coefficients, and Y_i is the observed motor-vehicle fatality values. The observed motor-vehicle fatality values are assumed to be drawings from a Poisson distribution with parameter λ_i. Therefore, the probability function of the traffic fatalities is given as:

$$f(Y_i) = \lambda_i^{Yi} e^{-\lambda i} / Y_i! \qquad (3.2)$$

The estimation process involves convergence to a unique maximum of the following log-likelihood function.

$$\ln L = \Sigma_i [-\lambda_i + Y_i \beta' X_i - \ln Y_i!] \text{ , where } i = 1\ldots n \qquad (3.3)$$

The Poisson count model has a limiting assumption that the conditional variance of Y_i equals its conditional mean. In the case that the conditional mean and variance are not equal, the data are said to exhibit overdispersion. A regression-based test for overdispersion was performed on each regression specification for all four dependent variables.[29] The motor-vehicle fatalities involving drivers aged nineteen and twenty, show no evidence of over dispersion. So the Poisson model is appropriate to estimate the fatalities involving nineteen and twenty-year-old drivers. However, the test results give

[29] LIMDEP uses a regression-based test for overdispersion developed by Cameron and Trividi (1990) that tests the null hypothesis that the mean and variance are equal. Basically, the test uses an overdispersion parameter, which, if found to be significantly different from zero, shows evidence of overdispersion. The overdispersion parameters are reported along with the regression results in Tables 3.2 and 3.3.

evidence that the motor-vehicle fatalities involving all aged drivers are overdispersed. Therefore, the all-aged fatalities are modeled using a Negative Binomial count regression, which is commonly used to deal with the problem of overdispersion. Generally, the Negative Binomial model imbeds the Poisson model, but allows for the conditional mean and variance to differ.[30]

3.5 Estimation Results

The Negative Binomial count model estimation results of total and alcohol-related fatalities involving all-aged drivers are presented in Table 3.2. The Negative Binomial goodness of fit is measured by a Chi-squared test statistic. The Chi-squared test statistics are presented in the last row of Table 3.2 and all remain significant at the 1% level for each regression specification, which shows an overall good fit of the model of motor-vehicle fatalities involving all-aged drivers.

The Poisson count model estimation results of total and alcohol-related fatalities involving drivers aged nineteen and twenty are presented in Table 3.3. The Poisson goodness of fit can be measured by an R-squared value developed by Cameron and Windmeijer (1993). The R-squared values are presented in the last row of Table 3.3, and show that the estimated models can explain between sixty and seventy percent of the motor-vehicle fatalities, which is a good fit of the data.

[30] For further discussion and development of the Poisson and Negative Binomial count model refer to Greene (2000), Chapter 19.

Table 3.2 Negative Binomial Estimates of Motor-Vehicle Fatalities for All-Aged Michigan Drivers
Marginal Effects (absolute value of t-stats)

	Total Fatalities			Alcohol-Related Fatalities		
	[1]	[2]	[3]	[4]	[5]	[6]
Distance from County Seat to Nearest Border Crossing (100 road miles)	-27.56*** (6.35)	-27.43*** (6.93)	-38.80*** (3.82)	-8.15*** (3.99)	-8.13*** (4.02)	-8.75*** (2.71)
constant	508.25*** (19.31)	492.31*** (19.24)	589.24*** (10.46)	122.88*** (9.67)	120.55*** (9.72)	115.29*** (2.93)
Population (1,000 persons)	4.80*** (3.14)	5.62*** (3.83)	9.11*** (3.64)	1.60** (2.08)	1.72** (2.30)	2.56** (2.19)
Unemployment Rate	-17.74*** (9.89)	-18.95*** (10.97)	-22.59*** (6.93)	-5.51*** (6.29)	-5.70*** (6.90)	-5.69*** (4.90)
Per Capita Income ($1,000)	-1.74** (2.07)	-1.80** (2.21)	-4.17*** (2.61)	-0.99** (2.32)	-1.00** (2.41)	-0.63 (0.97)
Police Employment (100 officers)	-9.29*** (2.70)	-9.83*** (2.89)	-8.57** (2.46)	-3.06 (1.30)	-3.15 (1.40)	-2.90 (1.52)
Licensed Bars (10 bars)	13.84*** (6.05)	15.34*** (7.11)	11.56*** (2.89)	4.33*** (4.54)	4.56*** (4.87)	4.36** (2.48)
Vehicle Miles Traveled (100,000,000 miles)	2.45* (1.65)	1.94 (1.43)		0.77 (0.91)	0.70 (0.86)	
DUI arrest share of total arrests	-1.11*** (2.80)			-0.17 (0.75)		
Overdispersion Parameter	0.03*** (10.87)	0.02*** (11.78)	0.09*** (9.74)	0.04*** (5.47)	0.04*** (5.47)	0.29*** (4.84)
Number of Observations	83	83	83	83	83	83
Chi-squared	429.92***	434.89***	586.57***	121.70***	121.82***	195.82***

Significance levels are represented by: *** 1%, ** 5%, * 10%
The National Highway Traffic Safety Administration defines alcohol-related accidents as involving a driver with a BAC of 0.01 or greater.

Table 3.3 Poisson Estimates of Motor-Vehicle Fatalities for Michigan Drivers Aged 19 and 20 Marginal Effects (absolute value of t-stat)

	Total Fatalities			Alcohol-Related Fatalities		
	[1]	[2]	[3]	[4]	[5]	[6]
Distance from County Seat to Nearest Border Crossing (100 road miles)	-2.10** (2.45)	-2.10** (2.45)	-2.12** (2.49)	-0.67* (1.65)	-0.67* (1.64)	-0.69* (1.70)
constant	17.18*** (3.08)	16.87*** (3.14)	14.96*** (3.73)	4.14 (1.46)	4.49 (1.62)	3.02 (1.43)
Underage Population (1,000 persons)	0.33** (1.96)	0.34** (2.23)	0.36** (2.37)	0.16* (1.82)	0.14* (1.74)	0.15** (1.99)
Unemployment Rate	-1.24*** (3.13)	-1.26*** (3.32)	-1.21*** (3.29)	-0.37* (1.84)	-0.33* (1.78)	-0.30* (1.66)
Per Capita Income ($1,000)	-0.19 (0.99)	-0.19 (0.99)	-0.11 (0.95)	-0.13 (1.26)	-0.13 (1.23)	-0.06 (0.97)
Police Employment (100 officers)	-0.54*** (3.05)	-0.55*** (3.23)	-0.51*** (3.38)	-0.29*** (3.28)	-0.27*** (3.32)	-0.24*** (3.51)
Licensed Bars (10 bars)	0.78** (2.53)	0.81*** (2.94)	0.87*** (3.44)	0.37*** (2.56)	0.33*** (2.67)	0.37*** (3.32)
Vehicle Miles Traveled (100,000,000 miles)	0.09 (0.57)	0.08 (0.54)		0.05 (0.66)	0.06 (0.82)	
DUI arrest share of total arrests	-0.02 (0.20)			-0.03 (0.56)		
Overdispersion Parameter	0.04 (1.10)	0.04 (1.10)	0.11 (1.44)	0.01 (0.03)	0.01 (0.06)	0.01 (0.12)
Number of Observations	83	83	83	83	83	83
R-squared	0.76	0.76	0.76	0.59	0.59	0.58

Significance levels are represented by: *** 1%, ** 5%, * 10%
The National Highway Traffic Safety Administration defines alcohol-related accidents as involving a driver with a BAC of 0.01 or greater.
The reported R-square values are based on calculations developed by Cameron and Windmeijer (1993).

The figures that are presented in both tables (Tables 3.2 and 3.3) are the marginal effects that each independent variable has on the various measures of fatalities. Also, the same three regression specifications are run for each of the four measures of fatalities, where each specification only differs by the exclusion of the DUI share of total arrests or the average vehicle miles traveled.[31]

All the socio-economic control variables have the expected signs as outlined in Section IV, and vary across regression specifications according to significance and magnitude of their effect. The focus of this chapter is primarily on the incentive for underage Michigan residents to cross international borders to legally consume alcohol, so the variable of particular interest in this study is the measure of distance from the county seats to the nearest border crossing. The distance variable is designed to capture the border-crossing effect, in that, as the distance to the border crossing gets smaller, motor-vehicle fatalities increase. The distance measure remains significant and negative throughout all the regression specifications, showing that the distance a county is from the border crossing does significantly influence its motor-vehicle fatalities. More specifically, the closer the county is to the border crossing, it will have higher total and alcohol-related fatalities for all-aged drivers, and for drivers age nineteen and twenty.

[31] The DUI share of total arrests was excluded from regression specifications [2], [3], [5], and [6] for two reasons. First, because it is a rather new contribution to the literature and its importance in the modeling of motor-vehicle fatalities is still being developed. Second, because the variable did not generally exert a significant influence on the different measures of motor-vehicle fatalities from a policy impact point of view. The DUI share however was shown to significantly reduce the total fatalities involving all-aged drivers. Also, the DUI share retained its negative sign throughout the regression specifications it was included in. The vehicle miles traveled were also excluded from regression specifications [3] and [6] because the variable did not generally exert a significant influence on the different measures of motor-vehicle fatalities in any of the specifications it was included in.

In order to quantify the border crossing effect, the regressions involving total fatalities of all-aged drivers and drivers aged nineteen and twenty will be highlighted. The use of total fatalities is founded in the statements by Mast, Benson, and Rasmussen (1999), that a measure of total fatalities will conceptually give the best estimates of total life saving capabilities of any anti-drunk driving policy. This statement supports the use of total fatalities to capture the entire cost burden of lives lost due to drunk driving behavior. The analysis that follows will begin with examination of total fatalities involving all aged drivers, and continue on to analysis of total fatalities involving nineteen and twenty-year-old drivers. It should be noted that the total fatalities of all-aged drivers do include the fatalities of nineteen and twenty-year-old drivers. Also, as noted by Mast, Benson, and Rasmussen (1999), "alcohol is involved to some degree in all categories of fatal motor vehicle accidents," so the total fatality measure is all inclusive of alcohol-related fatalities.

Examining the results for total fatalities of all aged drivers, which are presented in Table 2, shows that a county's proximity to a border crossing significantly influences motor-vehicle fatalities. More specifically, as distance from the border crossing increases, the county will experience less motor vehicle fatalities. The marginal effects of the distance variable that are presented in specifications [1], [2], and [3] reveal that, as distance from the nearest border crossing is increased by one hundred road miles, motor vehicle fatalities decrease by roughly 30. In other words, a border-crossing county, when compared to a county located one hundred miles away, has approximately 30 more motor-vehicle fatalities involving all-aged drivers, on average over the five years analyzed. Given that the average Michigan county is 150 miles from the nearest border

crossing, the estimated model implies that the three border crossing counties experience roughly 45 more motor-vehicle fatalities than the average Michigan county between 1995 and 1999, strictly because of their proximity to the international border.

These additional motor-vehicle fatalities that are a result of the border-crossing effect impose a significant cost on the border crossing counties. According to the cost estimates produced by Jensen, Miller, and Covington (1999), the average motor-vehicle fatality in Michigan, which resulted from impaired driving, costs $3.7 million.[32] This means that the border-crossing counties, which experience 45 more motor-vehicle fatalities of all-aged drivers than the average Michigan county, will shoulder a cost burden of roughly $166.5 million more than the average Michigan county, strictly because of their proximity to the border crossings.

Looking more specifically at the results for total fatalities of nineteen and twenty-year-old drivers, which are presented in Table 3, shows that a county's proximity to a border crossing, again, significantly influences motor-vehicle fatalities. The marginal effects of the distance variable that are presented in specifications [1], [2], and [3] reveal that, as distance from the nearest border crossing is increased by one hundred road miles, motor vehicle fatalities involving nineteen and twenty-year-old drivers decrease by two deaths. Recalling that the average Michigan county is 150 miles from the nearest border crossing, the estimated model implies that each border crossing county experiences roughly three more motor-vehicle fatalities of nineteen and twenty-year-old drivers than the average Michigan county between 1995 and 1999, strictly because of their proximity to the international border. Three fatalities may not seem significant in magnitude.

[32] Jensen, Miller, and Covington (1999) separate the $3.7 million fatality costs into $1.4 million in monetary costs, and $2.3 million in quality of life losses.

However, after taking into account the fact that, between 1995 and 1999, twenty-four percent of the Michigan counties did not experience even one motor-vehicle fatality involving a nineteen or twenty-year-old driver; the three additional fatalities created by the border crossing effect seem more significant.

The additional motor-vehicle fatalities resulting from the border-crossing effect impose a significant cost on the border crossing counties. Recalling the cost estimates produced by Jensen, Miller, and Covington (1999), the border-crossing counties, which experience three more motor-vehicle fatalities of nineteen and twenty-year-old drivers than the average Michigan county, will shoulder a cost burden of $11.1 million more than the average Michigan county, strictly because of their proximity to the border crossings.

Predicted fatalities were obtained for selected Michigan counties in order to highlight the differences between the fatalities of border crossing counties and non-border crossing counties in Michigan. More specifically, predictions of total fatalities for all-aged drivers and nineteen and twenty-year-old drivers were obtained for the three border crossing counties and also for the three control (non-border crossing) counties of comparable socio-economic backgrounds.[33] The predicted fatalities for each county were then used to calculate the cost burden of the fatalities, based on the Jensen, Miller, and Covington (1999) estimate of the average cost for an alcohol-related motor-vehicle fatality occurring in Michigan. Both the predicted fatalities, and the resulting costs estimates are presented in Table 3.4.

[33] The pairings of border-crossing counties and control counties were based on population, underage population, per capita income, and unemployment measures.

Table 3.4 Predicted Number of Total Motor-Vehicle Fatalities and Fatality Costs for Selected Michigan Counties

	All-Aged Drivers		19 and 20 Year-Old Drivers	
County Name	Total Fatalities	Costs (millions)	Total Fatalities	Costs (millions)
Chippewa (Sault Ste. Marie)	62.5	$231	3.8	$14
Alpena	35.5	$131	1.6	$6
St. Clair (Port Huron)	153.8	$569	10.0	$37
Saginaw	114.2	$423	5.9	$22
Wayne (Detroit)	1268.1	$4,692	55.4	$205
Oakland	524.3	$1,940	20.3	$75

Note: Pairings of border crossing counties and control counties were based on population, underage population, per capita income, and unemployment measures.

The results presented in Table 3.4 really help to highlight the differences in motor-vehicle fatalities between border crossing counties and non-border crossing counties of comparable socio-economic background. In each pairing, the border-crossing county had substantially higher predicted motor-vehicle fatalities, and therefore, significantly higher fatality costs imposed on the county. It is the costs of the lives lost that have raised a lot of concern in the Michigan areas close to the Michigan-Ontario border crossings.

This chapter was not intended to judge which drinking age is better, Michigan's age of 21 or Ontario's age of 19; rather this chapter has tried to quantify the cost impact of the border crossing activity that has been produced by the difference in drinking ages. However the fatality costs that are imposed on the border crossing counties need to be addressed with some policy implications. One implication is that the border crossing

patrol officers, for both Michigan and Ontario, need to devote more resources to the prevention of alcohol-impaired border-crossing Americans.

Inspection of the DUI share measures for each Michigan county showed that Wayne county (the county where Detroit is located) has the lowest police effort to deter drunk driving out of all Michigan counties, in 1999. Also, the other two border crossing counties, and many of the counties that surround them, have relatively low measures of police determent of drunk driving. With the low levels of DUI deterrence efforts, more drivers can drink and drive undetected in the counties around the border crossings, and this allows higher levels of motor-vehicle fatalities to occur in those counties.

The prevention of impaired border crossing activity can obviously be improved. This is exemplified by a statement made by an officer of the Detroit Police Department, in the State News article "The Bridge to Adulthood," who stated that the Detroit police had "no knowledge" of Americans returning from Windsor drunk. This statement directly contradicts the statement made by the Canadian border patrol in the opening of this chapter that 75 percent of the Michigan kids cross drunk. If the Michigan and Ontario police and border patrols improve and cooperate in their drunk-driving prevention efforts, some motor-vehicle fatalities will be avoided. Previous studies have shown conclusive evidence that increasing the resources devoted to drunk driving prevention decreases the occurrence of motor-vehicle fatalities, the most serious outcome of mixing alcohol and driving. Most recently, Benson, Mast, and Rasmussen (2000) have shown that police deterrence efforts can significantly increase the probability of arrest for drunk driving, and therefore, will decrease the occurrence of motor-vehicle fatalities.

3.6 Conclusion

In this chapter, I explore the impact that Michigan-Ontario border crossings have on the motor-vehicle fatalities that occurred in Michigan counties. The results show that the closer the county is to an international border crossing, it will have higher alcohol-related motor-vehicle fatalities for drivers aged nineteen and twenty, and more generally for all aged-drivers. This finding lends support to the hypothesis that the lower drinking age in Ontario gives incentive for underage Michigan residents to cross the border in order to consume and purchase alcohol. Specifically, the added consumption of alcohol produced by the lower drinking age, when mixed with driving, has been shown to increase alcohol-related fatalities in the counties near a Michigan-Ontario border crossing.

The border crossing impact was quantified in terms of the costs from lives lost that are imposed on the counties nearer to the border crossing. Specifically, the border-crossing counties will face a cost burden above the average Michigan county's costs that is roughly $166.5 million more for motor-vehicle fatalities of all-aged drivers and $11.1 million more for fatalities of nineteen and twenty-year-old drivers. One policy implication that comes from the costs imposed on the border crossing counties, is that the border crossing patrols need to devote more resources to preventing alcohol-impaired border crossing traffic. Ultimately, some cooperative policies against impaired border crossing activity, between the Michigan and Ontario border patrols, may be needed to thwart some of the motor-vehicle fatalities produced by the border crossing effect. Although, this study focused on Michigan-Ontario border crossings, many other U.S. states share borders with Canada and Mexico, where drinking ages are currently lower than twenty-one. My findings suggest that international border crossings significantly

influence alcohol-related driving fatalities in the areas near the crossings. Therefore, the international border effect should be included in future studies that attempt to model the motor-vehicle fatalities of states that have such crossings.

Chapter 4

Public Policy, Entrepreneurship, and Economic Growth

4.1 Introduction

An entrepreneur is an individual who assumes the financial risk of developing or managing a new venture, where the venture is based on a new idea or an innovative way of performing a task. The 'entrepreneurial spirit' is something that has long been associated with the driving force behind economic progress and growth. Joseph Schumpeter (1942) stated that the key to the success of markets lies in the spirits of entrepreneurs who persist in developing new products and technologies, and succeed at ultimately reducing production costs. Kaiser (1990) modeled the entrepreneur based on many historical characterizations, including the Schumpeterian innovator, and concluded that the major characteristics of the entrepreneur—innovator, risk taker, and resource allocator—are complementary and inseparable facets of entrepreneurship. Kirzner (1997) argues that the entrepreneurial discovery process is vital to the effectiveness of markets, where discovery entails entrepreneurs discovering profit opportunities by trial and error. In this same respect, Jenner (1998) models the Schumpeterian entrepreneurial process as a dynamic process were entrepreneurs search for new combinations of products and production techniques that will led to increased productivity and economic growth.

Recently, the conceptual link between entrepreneurship and economic growth has received renewed interest by economists. The finding that increased entrepreneurial activity leads to greater economic growth is now well founded at both the national and local level. For example, Reynolds, Hay, and Camp (1999) show that a country’s level of entrepreneurial activity explains a significant portion of the differences in national

economic growth rates. In addition to the national link between entrepreneurship and economic growth, recent studies have focused more attention on the local level. According to Henderson (2002), entrepreneurs significantly impact local economies by fostering localized job creation, increasing wealth and incomes, and ultimately helping to connect local economies to the larger, global economy.

Based on the increasing awareness of the role of entrepreneurs in driving economic growth, state and local economic development efforts have been more heavily directed toward promoting entrepreneurship. These development efforts have mainly focused on reducing the financial constraints that entrepreneurs face either through preferential loans to new businesses, as those supported by the Small Business Administration, or preferential tax treatment for new or small businesses. One such policy that has recently gained popularity is to devote public resources toward attracting and building a larger amount of venture capital to encourage entrepreneurial activity. This development strategy is largely based on casual observation that areas with larger amounts of entrepreneurial activity generally tend to also have a larger amount of venture capital.

A recent, controversial policy alternative has been popularized by Richard Florida (2002) in his book *The Rise of the Creative Class*. The author proposes that instead of focusing on developing capital inputs, development efforts should be focused toward making areas more attractive to bring in and nourish creative, entrepreneurial *individuals*. Florida (2002) traces the growing role of creativity in our economy by documenting many fundamental changes in American society.

In this chapter it is proposed that the main difference between these competing development strategies is a question of the direction of causation between entrepreneurial activity and the quantity of venture capital. The analysis then proceeds to answer this 'which comes first, the chicken or the egg' question with an empirical test to determine whether it is more venture capital that causes more entrepreneurial activity in an area, or whether the presence of more entrepreneurial activity simply, and automatically, causes more venture capital to flow into an area.[34] Not only is this an interesting academic question, but it also has significant implications for how best to direct the limited resources available for state and local economic development efforts. Quite simply put, the question is whether it is best to devote development efforts toward bringing in venture funds (or alternatively, focusing on building formal angel investment groups) or to focus on efforts to encourage more entrepreneurial activity among individuals in an area (or alternatively, to attract entrepreneurs to the area). Even more interesting is the possibility that there is causation running simultaneously in both directions between venture capital and entrepreneurial activity. If these two phenomenon have this type of relationship, development efforts will only be successful if resources are devoted *simultaneously* to promoting both larger venture funds and encouraging entrepreneurial activity among individuals.

Section 4.2 of the chapter proceeds by discussing the relationship between entrepreneurial activity and economic growth. In Section 4.3 analysis proceeds to uncover the direction of causality between venture capital and entrepreneurial activity.

[34] Thurman and Fisher (1988) attempt to empirically answer the question of which came first the chicken or the egg, by running Granger causality tests between U.S. egg production and chicken populations and conclude that the egg came first.

Based on these results, Section 4.4 considers the issue of which government policies best stimulate the underlying causal factors that promote entrepreneurship. Finally, Section 4.5 will present concluding remarks.

4.2 The Relationship Between Entrepreneurial Activity and Economic Growth

Entrepreneurship is increasingly becoming recognized as a key factor contributing to economic growth. As argued by Minniti (1999), entrepreneurs are the catalysts for economic growth because they create a networking externality that promotes the creation of new ideas and new market formations. The finding that increased entrepreneurial activity leads to greater economic growth has been well founded at both the national and local levels. For example, Reynolds, Hay, and Camp (1999) show that one-third of the differences in national economic growth rates can be attributed to the level of entrepreneurship in each country. Supporting these findings, Zacharakis, Bygrave, and Sheperd (2000) study sixteen developed economies and find that entrepreneurial activity explains approximately one-half of the differences in GDP growth between countries. More recently, Henderson (2002) argues that entrepreneurs significantly impact economic activity at a more local level through fostering localized job creation, increasing wealth and local incomes, and connecting local economies to the larger, global economy.

Table 4.1 Summary Statistics, Definitions, and Sources for Variables

Variable Name (source)	Description	Mean (st. dev.)
Causality Test Variables		
Annual GSP Growth (a)	Annual percent change in Gross State Product, calculated as: ((GSPt – GSPt-1)/ GSPt-1)	6.67 (4.30)
Sole Proprietorship (a)	Annual Nonfarm proprietors employment as revealed through income tax data	389,608.14 (466,830.31)
Patent Activity (b)	Number of annual utility patents granted in the U.S., which are received for all general U.S. inventions	1,028.63 (1,589.51)
Venture Capital Investment (c)	Venture capital investment to U.S. companies (from all sources, including non-U.S.) in millions of current dollars	426.06 (1,012.92)
Entrepreneurial Growth Variables		
Sole Proprietor Growth (a)	Percent change in Nonfarm proprietors employment (NPE), calculated as: ((NPE2000 – NPE1996)/ NPE1996)	10.98 (4.77)
Patent Growth (b)	Percent change in patents granted (PAT), calculated as: ((PAT2000—PAT1996)/PAT1996)	7.54 (19.45)
Economic Freedom Index (d)	Composite index measure of state policies that affect individual economic freedom	6.68 (0.50)
Death Tax Law (e)	Dummy=1 if the state levies an estate, inheritance, or gift tax beyond the federal rate	0.32 (0.47)
Tax Limitation Law (f)	Dummy=1 if the state has enacted some form of supermajority tax limitation law	0.28 (0.45)
Minimum Wage (g)	State minimum wage rate in dollars	4.78 (0.11)
Percent with High School Degree (h)	Percent of population receiving a high school degree as their highest level of education (%)	82.88 (4.90)
Percent with College Degree (h)	Percent of population receiving a 4-yr. college degree as their highest level of education (%)	22.99 (4.35)
Percent Males (i)	Percent of the labor force that is male (%)	53.38 (1.19)
Percent White (i)	Percent of the labor force that is White (%)	84.98 (11.78)
Median Age (h)	Median age of the population	34.15 (1.70)
Unemployment Rate (i)	Civilian unemployment rate	5.15 (1.16)
Percent Union Membership (i)	Percent of the labor force holding union membership (%)	12.75 (5.75)
Percent Service Employment (i)	Percent of the labor force that is employed in service industries (%)	21.48 (3.48)
Violent Crime Rate (j)	Number of violent crimes per 100,000 population, which includes murder, rape, robbery, and assault offenses	505.84 (251.95)

Sources: (a) U.S. BEA, *State and Local Area Data;* (b) U.S. Patent and Trademark Office, *Utility Patent Counts by Country/State and Yea* (2001); (c) PricewaterhouseCoopers / Thomson Venture Economics / NVCA Moneytree, *Venture Capital Profiles* (2002); (d) Karabegovic, Amela; Fred McMahon and Dexter Samida. *Economic Freedom of North America* (2002); (e) CCH Incorporated, *State Estate Taxes*, (2002); (f) Americans for Tax Reform, *Tax Limitation Amendment & Supermajority in the States* (2002); (g) Macpherson, David, *State Minimum Wage Data*; (h) U.S. Census Bureau, *Statistical Abstracts of the United States*; (i) U.S. BLS, *State and Area Labor Force Statistics*; (j) U.S. Bureau of Justice Statistics, *FBI's Uniform Crime Reports.*

In order to enhance the existing evidence on the link between entrepreneurship and economic growth for current purposes, I perform state level panel causality tests on state annual gross state product (GSP) growth rates and two measures of entrepreneurial activity. More specifically, the measures of entrepreneurial activity include sole proprietorships and patent activity.[35] Descriptions of all variables used in this chapter, along with the sources of this data, are given in Table 4.1.

The first measure of entrepreneurial activity, sole proprietorships, has been widely supported in the literature as a good proxy for the level of entrepreneurship. The Bureau of Economic Analysis reports the number of sole proprietors based on federal income tax forms filed by individuals of each state.[36] The second measure of entrepreneurship, patent activity, is new to this chapter, and is measured as the number of utility patents (those received for general inventions or innovations) granted annually in each state. The logic behind patent activity as a measure of entrepreneurship rests in the notion that the most

[35] My analysis, using causality tests, add to the robustness of the observations made by the previous literature that link high entrepreneurial activity to increased economic growth because the causality tests allow for reverse causation running from economic growth to the level of entrepreneurial activity.

[36] Although the measure of sole proprietors as an indicator of entrepreneurship is widely supported in the literature, there is a possible short-coming of this measure in that it includes both *high-growth* entrepreneurs and *lifestyle* entrepreneurs. For a discussion on these two types of entrepreneurs refer to Henderson (2002). Ideally, a measure that just captures high-growth entrepreneurs would be more advantageous in modeling the innovative and growth orientated functions of entrepreneurship. However, the existing measure of sole proprietors will be used in this chapter's analysis to parallel what has been used in the prior literature, and will be compared to the new measure of patent activity that this chapter contributes as another indicator of entrepreneurship that is designed to better capture the innovative, and more growth-orientated outcome of entrepreneurship.

direct and visible outcome of the entrepreneurial process is innovation, which should be reflected in the quantity of patents.[37]

The causality test procedure used here builds on the Granger (1969) and Sims (1972) causality framework by modifying the test to incorporate the pooled time-series properties of all the fifty states. One problem that may arise in using the pooled state data is that the differences across states may be significant enough to bias the true time series information that is available in the data. Following the approach of Blomstrom, Lipsey, and Zejan (1996) and Farr, Lord, and Wolfenbarger (1998), state intercept dummies were included in each regression specification to avoid the possible bias of cross state differences by controlling for any state-specific influences.[38] Specifically, the effect of the state intercept dummies is to remove the cross-sectional differences of the states, while leaving only the time series variations to be analyzed.

[37] Ideally, a more superior measure of patent activity would be to measure the number of patent applications per state, however this data, to my knowledge, does not exist at the state level. The applications data would be superior because it would not only account for the patent activity that was successful (those granted patent rights), but also those innovated activities that did not result in a granted patent right. Also, the time period between when a patent application is submitted and when the granted patent is received can be somewhat prolonged. However, referring to the survey of Griliches (1990) there is generally a 65% patent application granting rate in the United States, and from 1880 to 1989, patent grants have followed closely with the trend of patent applications (refer to Griliches (1990) Figure 1, p.1664). Therefore, the patent grants should be a reasonable measure of patent activity in the states.

[38] The state intercept dummy parameter estimates are not reported with the causality regression results but are available on request.

The general Granger-Sims causality test of two variables X and Y, modified for state panel data can be seen in the following equations, where equation (4.1) tests causality running from X to Y, and equation (4.2) tests causality running from Y to X. [39]

$$Y_{t,i} = \alpha_i + \sum_{m=1}^{M} \alpha_m Y_{t-m,i} + \sum_{n=1}^{N} \alpha_n X_{t-n,i} + \varepsilon_{t,i} \qquad (4.1)$$

$$X_{t,i} = \beta_i + \sum_{v=1}^{V} \beta_v X_{t-v,i} + \sum_{w=1}^{W} \beta_w Y_{t-w,i} + \delta_{t,i} \qquad (4.2)$$

Note that the subscript *i* refers to the corresponding state observation; the error terms $\varepsilon_{t,i}$ and $\delta_{t,i}$ are assumed to be white noise; and, the number of lagged values (M and N or V and W) of the independent variables are chosen to adequately capture the relationship between X and Y.

To check for a one-way causal relationship, both directions of causality have to be investigated. To test if X Granger causes Y, equation (4.1) is estimated with and without the lagged X variables, and then an F-test is performed to test the null hypothesis that $\alpha_n = 0$ for n=1,…,N. Rejecting the null hypothesis would show that X Granger causes Y. To test if Y Granger causes X, equation (4.2) is estimated with and without the lagged Y variables, and then an F-test is performed to test the null hypothesis that $\beta_w = 0$ for w=1,…,W. Rejecting the null hypothesis would show that Y Granger causes X.

[39] The modified Granger-Sims framework will be used in this section to test the causality between entrepreneurship and economic growth, and will also be used in Section III to test the causality between entrepreneurship and venture capital investment.

This general framework is used to run causality tests between annual GSP growth, sole proprietorships, and patent activity in the United States between 1980-2000, and the results are presented in Table 4.2.[40] The results show that there is a one-way causal relationship between entrepreneurship and economic growth. Specifically, the level of sole proprietors was found to Granger cause GSP growth (specifications 1 and 3 in Table 4.2), and the level of patent activity was shown to Granger cause GSP growth (specifications 2 and 5 in Table 4.2). Also, tests were performed to determine the direction of causality between the two measures of entrepreneurship, and the tests revealed that dual causality exists between sole proprietors and patent activity (specifications 4 and 6 in Table 4.2). The dual causality result is not surprising considering they are both used to measure entrepreneurial activity.

The causality results, showing a one-way causal relationship running from state entrepreneurship to economic growth strengthen the well-documented link between entrepreneurship and economic growth. Also, the state-level analysis seems to bridge the gap between the national and local links of entrepreneurs to economic growth. In order to check the robustness of these results, several other specifications of causality tests were performed using various measures of economic growth and entrepreneurial activity. The

[40] The Granger-Sims test structure reported in Table 4.2 includes only one lag of the independent variables, in part, because of the limited number of observations and also to conserve on degrees of freedom. However, causality tests were run using two lags of the independent variables and the results are virtually identical to the results presented in Table 4.2. It should be noted that a more simplified t-test can be run in the causality tests that incorporate only one lag, however, the more general F-test is also acceptable.

results are presented in the appendix of this dissertation, and generally support the overall finding that entrepreneurial activity causes economic growth.[41]

The next question that has to be addressed then is "what factors contribute to the formation, or attraction, of entrepreneurial activity that is the driving force behind economic growth?" One variable that has been widely supported in the literature as a major determinant of entrepreneurial activity is the amount of venture capital investment, or lending to small businesses, that is available to entrepreneurs. The next section of this chapter will use the same modified Granger-Sims causality framework to explore the direction of causality between venture capital funding and entrepreneurial activity.

[41] In order to check the robustness of the results presented in Table 4.2, the same causality tests were performed on per capita measures of GSP growth and entrepreneurial activity. (The descriptive statistics for all variables introduced in the Appendix are presented in Table A.1.) Specifically, causality tests were run between per capita GSP growth, sole proprietors per 1,000 employees, and patents per 1,000 employees. The results of this exercise are presented in Appendix Table A.2, and generally follow the results presented in Table 4.2. The per capita causality results show that a dual causal relation exists between sole proprietors per capita and per capita GSP growth; patents per capita Granger cause per capita GSP growth; and a dual causal relation exists between sole proprietors per capita and patents per capita. A final robustness check was performed by running the same causality tests on per capita measures of GSP growth and the growth of entrepreneurial activity. Specifically, causality tests were run between per capita GSP growth, per capita sole proprietor growth, and per capita patent growth. The results of this exercise are presented in Appendix Table A.3, and generally follow the results presented in Table 4.2. The per capita causality results show that no causal relation exists between per capita sole proprietor growth and per capita GSP growth (however, per capita sole proprietor growth Granger causes per capita GSP growth at the 14% significance level); no causal relation exists between per capita patent growth and per capita GSP growth (however, per capita patent growth Granger causes per capita GSP growth at the 12% significance level); and per capita sole proprietor growth causes per capita patent growth. In general, the results of the robustness checks give some additional support to the overall finding that entrepreneurs cause economic growth.

Table 4.2 Causality Test Results between State Entrepreneurial Activity and Economic Growth (absolute t-statistics in parenthesis)

	Annual GSP Growth		Sole Proprietors		Patent Activity	
	(1)	(2)	(3)	(4)	(5)	(6)
Annual GSP Growth (t-1) (percent)	0.266*** (9.06)	0.281*** (9.69)	92.764 (0.65)		0.680 (0.46)	
Sole Proprietors (t-1) (thousands of proprietors)	0.004*** (3.36)		995.288*** (196.66)	955.720*** (101.36)		0.819*** (8.49)
Patent Activity (t-1) (hundreds of patents)		0.037* (1.73)		943.388*** (4.82)	107.054*** (98.93)	92.468*** (46.20)
Result/Finding	Sole Proprietors Causes GSP Growth	Patent Activity Causes GSP Growth	GSP Growth Causes Sole Proprietors	Patent Activity Causes Sole Proprietors	GSP Growth Causes Patent Activity	Sole Proprietors Causes Patent Activity
F-statistic [1, 998]	11.30***	3.00*	0.42	23.24***	0.22	72.07***
Number of Observations	1050	1050	1050	1050	1050	1050
R-squared	0.17	0.16	0.99	0.99	0.98	0.99

Significance Levels are represented by the following: ***1%, **5%, *10%
Note: State Dummy Variables were included in each regression specification, and the estimated coefficients are available upon request to the author.

4.3 The Relationship Between Venture Capital and Entrepreneurial Activity

One variable that has been widely supported in the literature as a major determinant of entrepreneurial activity is the amount of venture capital investment, or lending to small businesses, that is available to entrepreneurs. The Corporation for Enterprise Development (2001), lists eight core elements of an infrastructure necessary for supporting entrepreneurship, where six of the eight elements revolved around the financing that was available for potential entrepreneurs. Also, highlighting the importance of financing, Henderson (2002) states that the availability of financial resources in an area, especially venture capital investment, is vital to developing entrepreneurs. However, one important idea that has generally been over looked by previous authors is the notion that venture capital investment may be endogenous to the model of entrepreneurial activity. More specifically, it is hard to determine if the venture capital investment is creating entrepreneurship, or if the investment is simply flowing to the states that already have significant levels of entrepreneurial activity.

The causal relationship between entrepreneurial activity and venture capital investment is important for policy makers, because if venture capital causes entrepreneurship, policy makers should target their limited development resources toward promoting venture capital investment in their state. However, if venture capital investment simply follows entrepreneurial activity, then policy makers should focus attention on creating a positive environment that encourages individual entrepreneurs, and the venture funding will take care of itself as a consequence.

Table 4.3 Causality Test Results between State Entrepreneurial Activity and Venture Capital Investment (absolute t-statistics in parenthesis)

	Venture Capital Investment		Sole Proprietors		Patent Activity	
	(1)	(2)	(3)	(4)	(5)	(6)
Venture Capital Investment (t-1) (millions of dollars)	0.428*** (8.42)	0.214*** (4.39)	-0.441 (0.55)		0.002 (0.14)	
Sole Proprietors (t-1) (thousands of proprietors)	4.558*** (5.39)		969.335*** (72.18)	926.330*** (53.61)		1.728*** (6.15)
Patent Activity (t-1) (hundreds of patents)		146.664*** (11.60)		791.404*** (2.94)	90.124*** (23.32)	69.845*** (15.98)
Result/Finding	Sole Proprietors Causes Venture Capital	Patent Activity Causes Venture Capital	Venture Capital Causes Sole Proprietors	Patent Activity Causes Sole Proprietors	Venture Capital Causes Patent Activity	Sole Proprietors Causes Patent Activity
F-statistic [1,334]	29.11***	134.66***	0.30	8.65***	0.02	37.87***
Number of Observations	378	378	378	378	378	378
R-squared	0.61	0.70	0.99	0.99	0.98	0.98

Significance Levels are represented by the following: ***1%, **5%, *10%
Note: State Dummy Variables were included in each regression specification, and the estimated coefficients are available upon request to the author. Also, California was omitted as an outlier.

The modified Granger-Sims causality framework presented in the previous section is used to run causality tests between venture capital investment and the two measures of entrepreneurial activity—sole proprietorships and patent activity—in the United States between 1992-2001 and the results are presented in Table 4.3.[42] The measure of venture capital investment is constructed by PricewaterhouseCoopers / Thomson Venture Economics / NVCA Moneytree (2002) and includes cash-for-equity investments by professional venture capital firms in private emerging companies in the United States, where the venture capital firm can be based in the United States or abroad.[43] It should be noted that the term 'professional venture capital firm' refers to the following types of firms: Small Business Investment Companies (SBICs), venture arms of corporations, institutions, investment banks, and similar entities whose primary activity is venture capital investing.

[42] Due to data limitations on venture capital investment Alaska, Hawaii, North Dakota, South Dakota, Vermont, West Virginia, and Wyoming were not included in the causality tests between entrepreneurship and venture capital investment. Also, the California observations were suppressed because standard outlier tests revealed that California is a statistical outlier in venture capital investment. Specifically, California's observations had standardized residuals that were greater than 2.5 standard deviations from the mean in absolute value. Casual observation of California's annual share of U.S. venture capital investment reveals that the state receives roughly 35% of the total investments, on average over the sample period. The next two states receiving the next largest levels of venture capital (Texas and Massachusetts) combine to only account for roughly 12% of the total investments, on average over the sample period.

[43] It should be acknowledge that this measure of venture capital is capturing the equilibrium quantity of venture capital that simultaneously reflects both the quantity demand and quantity supplied of venture funding, which may not be the best measure for causality testing that in general tries to establish time priority of events. A more appropriate measure of venture capital would be a latent variable supply of venture funding that matters more in this causality testing framework. However, such a variable does not exist to my knowledge, so the available measure of venture capital will have to serve as a second best alternative.

The causality tests results between the measures of state entrepreneurial activity and venture capital investment (presented in Table 4.3) show that a one-way causal relationship exists between state entrepreneurship and venture capital investment.[44] Specifically, the level of sole proprietors was found to Granger cause venture capital (specifications 1 and 3 in Table 4.3), and the level of patent activity was shown to Granger cause venture capital (specifications 2 and 5 in Table 4.3). Again, tests were performed to determine the direction of causality between the two measures of state entrepreneurship, and the tests revealed that dual causality exists between sole proprietors and patent activity (specifications 4 and 6 in Table 4.3). [45]

The causality results, showing a one-way causal relationship running from state entrepreneurship to venture capital investment shows that venture capital investment funds are simply flowing to the areas with already established entrepreneurial activity. In other words, the answer to this chicken and egg problem is that entrepreneurs come first, and venture capital follows. One explanation of this finding is that venture capital

[44] Again, the Granger-Sims structure includes only one lag of the independent variable for the reasons stated earlier, but also, this one-lag relationship seems to best reflect the highly mobile characteristics of venture capital investment, which freely and rapidly respond to ever-changing market conditions. It should be noted that the causality tests were run using two-lags of the independent variables and the results were not substantially different from the ones reported in Table 4.3. The only difference is that there is a weak dual-causality relation found between patent activity and venture capital investment at the 10% confidence level.

[45] In order to check the robustness of the results presented in Table 4.3, the same causality tests were performed on per capita measures of venture funding and entrepreneurial activity. Specifically, causality tests were run between venture capital investment per firm, sole proprietors per 1,000 employees, and patents per 1,000 employees. The results of this exercise are presented in Appendix Table A.4, and generally enhance the results presented in Table 4.3. The per capita causality results show that no causal relation exists between sole proprietors per capita and venture capital per firm; patents per capita Granger cause venture capital per firm; and sole proprietors per capita Granger cause patents per capita. Clearly, these results support the finding that venture capital investment does not cause entrepreneurial activity.

investment is inherently more mobile than labor; which would imply that, as entrepreneurship rises in a particular geographic area, new venture capital tends to automatically, and freely, flows to fund the entrepreneurial activity in the area.[46]

It is important to note that the results do not contradict the idea that venture capital is important in the entrepreneurial process. In fact, the results are most consistent with the literature on entrepreneurial survival suggesting that once an entrepreneurial venture is started, that venture funding significantly increases the chances of survival for the new venture.[47] What the results do say, however, is that focusing development efforts on bringing in more venture or angel funding will not be an effective method of encouraging the higher levels of entrepreneurial activity necessary for economic growth. Rather, attracting and promoting underlying entrepreneurial activity must be the focus of development efforts and venture funding will automatically flow into the area activity.

4.4 State Policies that Promote Entrepreneurship

The empirical results from Section III suggest that entrepreneurial activity (measured by patents and sole proprietorships) tends to be the underlying factor that attracts more

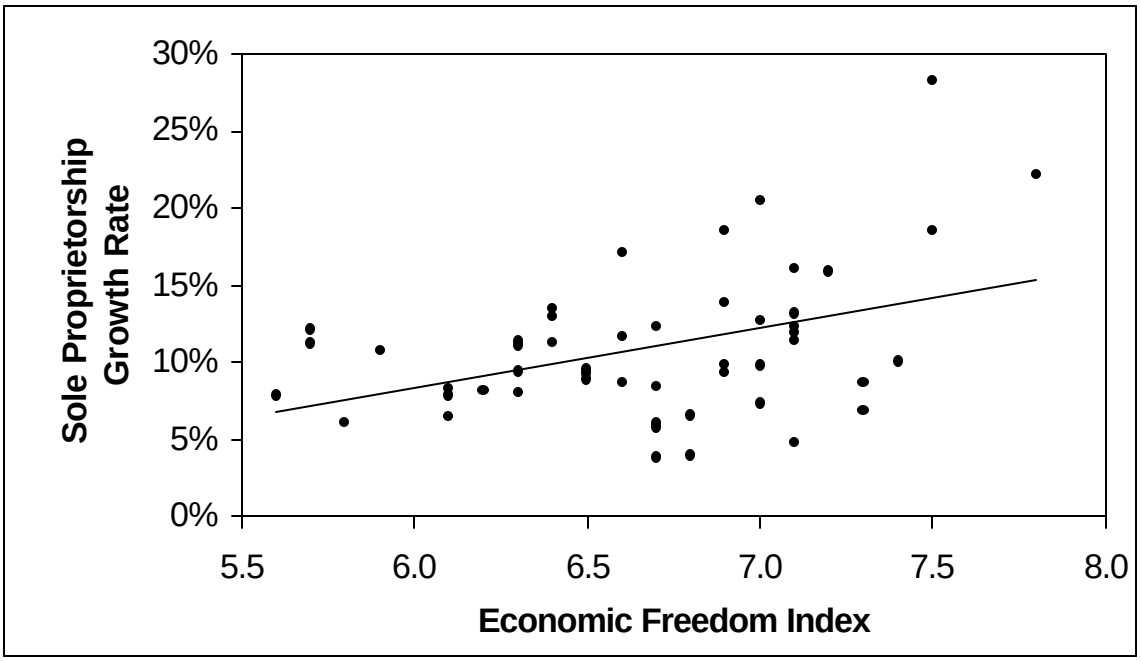
[46] This finding that entrepreneurial activity causes financing, and the earlier finding that entrepreneurial activity causes economic growth may help to shed light on a puzzle that is prevalent in another strand of the economic growth literature. As noted by Shan, Morris, and Sun (2001), the puzzle is over the causal relationship between financial development and economic growth, were the authors report that no conclusive evidence exists on the direction of causality. More specifically, Shan, Morris, and Sun (2001) find dual causality between the financial development of OECD countries and their corresponding economic growth rates. Our results suggest that entrepreneurial activity causes both economic growth and financial investment flows; therefore, the finding of dual causality may come from the fact that the entrepreneurial activity is driving both measures simultaneously.

[47] Bates (1990), Holtz-Eakin, Joulfaian, and Rosen (1994), and Blanchflower and Oswald (1998) all present evidence that financing is key to the survival of entrepreneurial ventures.

venture capital to an area. The remaining question is then how to structure government policy to encourage more entrepreneurial activity among individuals in an area (either by making current residents more entrepreneurial or by attracting new entrepreneurs to the area). One such structure for government policy is suggested by another strand of literature attempting to explain economic growth differentials across countries by differences in a well-constructed 'index of economic freedom.' Generally these indexes attempt to condense into a single number the degree of economic freedom individuals have in a geographic area in several key categories such as low taxes, low regulations, and secure property rights. Studies using these indices such as Gwartney and Lawson (2002), Farr, Lord, and Wolfenbarger (1998), and Gwartney, Lawson, and Holcombe (1999), have generally found that countries with a higher economic freedom score not only have larger per capita incomes, but also tend to have higher *rates* of economic growth.

In this chapter it is proposed that the 'missing link' that has yet to be demonstrated between economic freedom and economic growth is entrepreneurial activity. That is, underlying economic freedoms generate growth *because* they promote underlying entrepreneurial activity, which is then the source of economic growth. To illustrate the relationship between economic freedom and entrepreneurial activity, Figure 4.1 shows the relationship between state economic freedom scores and the growth rate of sole proprietors from 1996 to 2000. The scatter plot of the raw data is supported by a simple regression line fit between the two variables. The positive correlation can be seen clearly in the figure, which shows that the states with more economic freedom experienced higher growth rates in entrepreneurship.

Figure 4.1 Relationship between State Economic Freedom and Growth of Entrepreneurial Activity



While this relationship between economic freedom and economic growth has never directly been tested in the literature, this view is highlighted by Lee (1991) who writes:

> no matter how fertile the seeds of entrepreneurship, they wither without the proper economic soil. In order for entrepreneurship to germinate, take root, and yield the fruit of economic progress it has to be nourished by the right mixture of freedom and accountability, a mixture that can only be provided by a free market economy. The productivity of all economic activity is enhanced greatly by the freedom and discipline found only in market economies. [Lee (1991), p. 50]

To verify this hypothesis, and to more rigorously test the link between freedom and entrepreneurship, I gathered data across U.S. states on the growth of entrepreneurial activity in each state, other key factors that have previously been shown to be correlated with entrepreneurial activity for that state, and the degree of economic freedom in the state. State control variables were chosen in a manner that is consistent with the variables

proposed in the previous literature. However, in modeling entrepreneurship, the existing literature has mainly focused on the question of what characterizes an individual entrepreneur. [48] So this analysis, which aggregates up to the state level, will be the first attempt to model the existing states' environments for entrepreneurship.

There are three somewhat different strands of literature aiming to explain entrepreneurs. First, there are the studies looking at different demographic characteristics of the individuals pursuing entrepreneurship. Second there are the studies that have looked at more economic influences leading to entrepreneurship. Finally, there are those studies that aim to analyze which policies affect entrepreneurial activities.

Evans and Leighton (1989) model individual entrepreneurs and find that an individual's age, gender, and work experience affect the decision to enter or stay in entrepreneurial activities. Bates (1990) shows that an individual's human capital, in other words educational background, is a significant determinant in the entrepreneurial process. Schiller and Crewson (1997) also conclude that demographics matter, showing that the influences of age, education, and experience affect men and women differently in the decisions to supply entrepreneurial activity. Most recently, Cowling (2000) confirms that age, gender, and education are key variables in determining what individuals become entrepreneurs.

[48] The model that has been developed by the existing literature has focused on explaining individual entrepreneurs measured as sole proprietors, or more generally the self-employed. This chapter has introduced another indicator of entrepreneurial activity, patent activity, so the existing model of entrepreneurship will also be applied to modeling the determinants of patents. However, it should be noted that the two indicators of entrepreneurship are quite different in nature, so the existing model of sole proprietors may behave differently when applied to modeling the determinants of patent activity. In any event, applying the existing model of entrepreneurship to this new indicator of entrepreneurial activity is a useful exercise.

The economic influences on entrepreneurial activity have mainly focused on an individual's inheritance or financial gifts received, or the incentives to be your own boss. Note that the financial inheritances do not work in the same manner as venture capital. The inheritance matters more in the decision to become an entrepreneur, while the venture capital matters more once that decision is made. The importance of an individual's personal finances is found to hold true in Holtz-Eakin, Joulfaian, and Rosen (1994), who analyze the behavior of a group of sole proprietors that received significant inheritances and found that they are more likely to start and survive in an entrepreneurial endeavor than those proprietors without substantial personal finances. Blanchflower and Oswald (1998) used various micro data sets of the self-employed to answer the question of what makes an entrepreneur. The authors show that personal financing is one of the most important factors leading to self-employment, noting that the probability of self-employment depends positively on an individual's inheritance or financial gifts received. In regards to the managerial gains of entrepreneurship, Wiggins (1995) focuses on the incentives of ownership in explaining small business entrepreneurial activity. In line with this argument, Hamilton (2000) claims that many individuals choose to be entrepreneurs because self-employment offers significant non-pecuniary benefits such as "being your own boss."

More relevant to the aims of this research is the strand of literature focusing on policy influences on entrepreneurship. Blau (1987) uses time series data on U.S. self employment and generally concludes that high marginal tax rates produce higher rates of self employment because the higher taxes give workers the incentive to leave wage-and-salary jobs and move into entrepreneurial activity where they can more easily evade the

taxes. Kayne (1999) performs a general state policy inventory survey to report on what state policies are in place to support entrepreneurial activities. The author finds that certain states are making efforts to reduce taxes and business regulations, improve venture capital networking, and increase support for education in support of entrepreneurship. Returning the focus to tax influences, Bruce (2000) examines income and payroll taxes of the self-employed and wage-and-salary workers to see if tax differentials affect the choice to be self employed. The author finds that the differential tax treatment of wage-and-salary and self-employment income significantly affects the probability of leaving self employment for a wage-and-salary job. Bruce (2002) extends his original work to allow for the endogeneity of individual tax rates, and the author finds that taxes have mixed effects on the level of entrepreneurial activity. Bruce's results highlight the overall findings of the previous literature that have not presented conclusive evidence on the relationship between tax rates and entrepreneurial activity, and have at best, shown only a weak relationship holds.[49]

Building on the existing literature, the current analysis will be the first to perform a comprehensive study of state policies in the fifty states and their effects on the environment for entrepreneurship. Annual growth rates of sole proprietorships, as a measure of state entrepreneurial growth, will be estimated empirically based on various explanatory variables that are supported by the literature. For example, the demographic make up and the underlying economic characteristics of each state should influence the state's ability to generate entrepreneurial activity.

[49] For a good revue of the literature on the relationship between taxes and entrepreneurship refer to Bruce (2002).

The variables included to capture the demographic characteristics of entrepreneurs are population statistics on the median age, percent males, percent white, percent receiving a high school education, and percent receiving a college education are controlled for in each regression specification. The median age could have either a positive or negative effect on entrepreneurship. One argument is that as age increases you become more likely to become an entrepreneur because you have more built up human capital, and you have more business experience that might lead you into starting your own business. However, as an individual's age increases they may also become more income-risk-averse. Since entrepreneurial ventures are characterized by increased risk, they may be undertaken by younger, more risk-loving individuals.

The percent males and percent white could also carry either a positive or negative sign. Past studies have not shown conclusive evidence in either direction for either variable, but more evidence has supported the notion that women and minorities are less likely to become entrepreneurs. However, recent market trends have shown a movement towards women and minority owned businesses, particularly since the Small Business Administration has devoted efforts towards targeting women and minorities for new entrepreneurial ventures.[50] So, this might drive the estimates of percent males and percent white to carry a negative sign.

Finally, the influence of an individual's level of education has also had mixed results in the literature. In particular, there has been some evidence that entrepreneurial activity is heightened by both low levels of education (high school diploma) and very

[50] For more information on the Small Business Administrations efforts towards women and minorities, and more generally on the increasing role of women and minority owned businesses, refer to U.S. Small Business Administration, *Women in Business, 2001* and *Minorities in Business 2001*.

high levels of education (advanced degrees, such as doctors and lawyers that are usually classified as proprietors). Therefore, the signs on percent high school and percent college could be either positive or negative. However, evidence might point to the finding that high school education leads to greater entrepreneurial activity, while college education leads to less entrepreneurial activity.[51]

Also, other state demographic variables were incorporated in each regression to capture the economic differences in the states, which include such variables as the unemployment rate, percent union members, percent employed in service industries, and crime rates. The unemployment rate is expected to exert a positive influence on state entrepreneurship because less employment opportunities would give more incentives for individuals to start their own businesses. The percent union membership is expected to carry a negative sign because union members are more prone to seek wage-and-salary jobs in the unionized industries. As noted by Blau (1987), the industries in which entrepreneurship is more relatively common are typically the service and retail trade sectors. Thus, the percent in services industry is expected to carry a positive sign because it is more attractive, and somewhat easier, for entrepreneurs to pursue ventures in a service industry.[52] The crime rate is expected to carry a negative sign because crime is a direct threat to the rewards of entrepreneurship. Entrepreneurs will inherently gravitate to those areas that have better property right protection; more specifically, those areas that

[51] A further, informal, explanation, which came in part from conversations with Don Bruce, may be that a high school education gives an individual the basic training and understanding needed to start his or her own business without specifying a certain way of thinking or performing tasks, while a college education trains an individual to think in a more specialized field, which maybe better suited for a wage-and-salary job.

[52] The BLS refers to a service industry as the following: transportation, communications, electric, gas, and sanitary services; wholesale trade; retail trade; finance insurance, and real estate; and services.

have a greater probability of being able to keep and enjoy the benefits of entrepreneurship.

In addition to the basic model of entrepreneurial activity, several state policy variables were incorporated in the estimation process to see which, if any, significantly affect the state's ability to generate underlying entrepreneurial activity. For example, different state laws and taxes, such as tax limitation laws, inheritance or death taxes, and minimum wage laws were included as possible influences on the state environment for entrepreneurship. Tax limitation laws require a supermajority of votes to increase or impose taxes, which can serve as a means to keep the growth of taxes, and government in general, in check. Less involvement of government may lead to a more suitable environment for creativity and entrepreneurial activity, so the tax limitation law is expected to be positively correlated with entrepreneurship.

Recall that Holtz-Eakin, Joulfaian, and Rosen (1994) and Blanchflower and Oswald (1998) find evidence that an individual's inheritance increases the probability of entering and succeeding in an entrepreneurial venture. Thus, death taxes and inheritance taxes, which directly reduce the ability of entrepreneurs to pass on their entrepreneurial gains to fund future generations of entrepreneurs, should lead to less entrepreneurial activity in the states that enact such laws. More directly related to the analysis of death taxes, Holtz-Eakin (1999), in a survey of the literature on estate taxes, concludes that entrepreneurs are more likely to bare the burden of estate taxes because they are inherently more exposed to the taxation of wealth accumulation. This direct affect of estate taxes on the rewards of entrepreneurship should lead to less entrepreneurial

activity. In other words, the presence of higher state death taxes is expected to be negatively correlated with entrepreneurial activity in the states.

Finally, some states have elected to adopt minimum wage laws that set their minimum wage at a higher level than the national minimum wage. The minimum wage may have two effects on entrepreneurial ability. First, it serves as a disincentive to transition from wage employment to entrepreneurship, because the pay is higher. Second, it serves as a proxy for the labor costs of opening your own business. Essentially, entrepreneurs starting their own business will have to pay their employees the higher minimum wage if they start their business in one of the states with the higher minimum wage. Thus, the minimum wage is expected to carry a negative sign.

As noted earlier, one of the propositions of this chapter is that a state's underlying economic freedom is an essential determinant of the state's ability to create and attract entrepreneurial activity. Karabegovic, McMahon, and Samida (2002) have developed an economic freedom index score for each state, which is a composite index measure of many state policies that affect the economic freedom of individuals in that state. More specifically, the index is based on the size of government, discriminatory taxation, the degree of business regulation, and labor market flexibility.[53] The economic freedom index is expected to carry a positive sign showing that more economic freedom will create and attract more entrepreneurial activity.

[53] The three index areas include the following indicators: the size of government is based on general government purchases, transfer payments, and subsidies; the discriminatory taxation is based on total government revenue, income tax rates and thresholds, indirect taxes, and sales taxes; and the labor market flexibility is based on minimum wage earnings, government employment, and occupational licensing.

In order to be consistent with the earlier causality analysis, the testing of which state policies and characteristics influence entrepreneurship will involve a unique method of modeling. Specifically, the analysis focuses on what policies and characteristics were in place in each state that led to their different experiences of growth in entrepreneurial activity during the current sample period. To implement this methodology, only the values of the state explanatory variables in the initial year are used to see which variables significantly impact each state's growth rate of entrepreneurship over the following five years. This technique still tries to get at the heart of causality, in that it takes the existing state characteristics at one point in time and asks what characteristics lead to entrepreneurial growth in the next time period. For example, it tests whether those states with more economic freedom in 1996 experienced more entrepreneurial growth over the next five years relative to those states with less economic freedom.

The estimated determinants of entrepreneurial growth are presented in Tables 4.4 and 4.5, and the formal estimated regression takes the following general functional form.

$$EGR_i = \beta_i + \sum_{x=1}^{X} \beta_x DEM_{x,i} + \sum_{y=1}^{Y} \beta_y POL_{y,i} + \beta_z FREE_i \quad (4.3)$$

where EGR_i is the growth rate of sole proprietors, or patent activity, from 1996-2000 in state *i*, DEM_i is a set of demographic and economic control variables for state *i*, POL_i is a set of political variables for state *i*, and $FREE_i$ is the economic freedom index for state *i*. Note that the explanatory variables are all from 1996. Also, note that the regression specifications differ only by what state policies are included in addition to the economic freedom index.

Table 4.4 Estimated Determinants of State Entrepreneurial Growth, 1996-2000
Dependent Variable: State Sole Proprietor Growth Rates
(absolute t-statistics in parenthesis)

	(1)	(2)	(3)	(4)
State Policy Variables				
Economic Freedom Index	3.429***	3.425***	3.625***	3.514***
	(3.18)	(3.19)	(3.44)	(3.19)
Death Tax Law	-2.087**	-2.149**	-2.164**	
	(2.11)	(2.18)	(2.20)	
Tax Limitation Law	0.877	1.060		
	(0.77)	(0.94)		
Minimum Wage	-7.134			
	(0.95)			
State Control Variables				
Constant	23.835	-10.047	-16.719	-13.436
	(0.48)	(0.29)	(0.49)	(0.37)
Percent with High School Degree	0.471**	0.378**	0.424***	0.483***
	(2.49)	(2.34)	(2.76)	(3.04)
Percent with College Degree	-0.465***	-0.441***	-0.474***	-0.510***
	(2.93)	(2.82)	(3.11)	(3.21)
Percent Males	-0.332	-0.270	-0.259	-0.366
	(0.60)	(0.49)	(0.47)	(0.64)
Percent White	-0.083	-0.043	-0.050	-0.039
	(1.21)	(0.80)	(0.93)	(0.71)
Median Age	-0.728*	-0.684*	-0.634*	-0.772**
	(1.97)	(1.87)	(1.76)	(2.07)
Unemployment Rate	1.728**	1.428**	1.541**	1.766***
	(2.59)	(2.44)	(2.69)	(2.99)
Percent Union Membership	-0.450***	-0.465***	-0.502***	-0.515***
	(3.73)	(3.90)	(4.45)	(4.36)
Percent Service Employment	0.834***	0.837***	0.866***	0.922***
	(4.65)	(4.68)	(4.91)	(5.05)
Violent Crime Rate	-0.002	-0.001	-0.001	-0.001
	(0.75)	(0.50)	(0.40)	(0.34)
Number of Observations	50	50	50	50
R-squared	0.69	0.69	0.68	0.64

Significance Levels are represented by the following: ***1%, **5%, *10

Table 4.5 Estimated Determinants of State Entrepreneurial Growth, 1996-2000
Dependent Variable: State Patent Activity Growth Rates
(absolute t-statistics in parenthesis)

	(1)	(2)	(3)	(4)
State Policy Variables				
Economic Freedom Index	1.871	1.885	3.985	3.965
	(0.30)	(0.31)	(0.65)	(0.65)
Death Tax Law	-0.436	-0.244	-0.400	
	(0.08)	(0.04)	(0.07)	
Tax Limitation Law	11.680*	11.113*		
	(1.78)	(1.74)		
Minimum Wage	22.204			
	(0.52)			
State Control Variables				
Constant	-224.034	-118.572	-188.554	-187.947
	(0.78)	(0.60)	(0.94)	(0.95)
Percent with High School Degree	-1.856*	-1.568*	-1.084	-1.073
	(1.71)	(1.71)	(1.20)	(1.23)
Percent with College Degree	0.552	0.477	0.133	0.127
	(0.61)	(0.54)	(0.15)	(0.15)
Percent Males	5.596*	5.404*	5.522*	5.502*
	(1.77)	(1.74)	(1.73)	(1.75)
Percent White	0.221	0.096	0.023	0.025
	(0.56)	(0.31)	(0.07)	(0.08)
Median Age	0.017	-0.119	0.401	0.376
	(0.01)	(0.06)	(0.19)	(0.18)
Unemployment Rate	-7.796**	-6.862**	-5.676*	-5.634*
	(2.04)	(2.06)	(1.70)	(1.74)
Percent Union Membership	0.028	0.077	-0.305	-0.307
	(0.04)	(0.11)	(0.46)	(0.47)
Percent Service Employment	-0.708	-0.719	-0.421	-0.411
	(0.69)	(0.71)	(0.41)	(0.41)
Violent Crime Rate	-0.024	-0.026*	-0.024	-0.024
	(1.57)	(1.81)	(1.59)	(1.61)
Number of Observations	50	50	50	50
R-squared	0.40	0.39	0.34	0.34

Significance Levels are represented by the following: ***1%, **5%, *10

The first part of the results discussion will focus on the estimated determinants of sole proprietors because this is the measure that follows what has been analyzed extensively in the previous literature and is the indicator of entrepreneurial activity that the model was intended for. The second part of the results discussion will focus on the estimated determinants of patent activity, and will make relevant comparisons to the results presented for the sole proprietorship measure.

Referring to the estimated determinants of sole proprietor growth, presented in Table 4.4, the economic freedom index is significant at the 1% level or better in all four regressions. Thus, the states with the most economic freedom in 1996 had the highest subsequent growth of entrepreneurial activity over the next five years, as measured by sole proprietors. Therefore, states policy makers need to ensure economic freedom exists in their state in order to promote entrepreneurial growth. It is important to point out, however, that economic freedom consists of an environment of low taxes, low regulations, and secure private property rights, and these factors do not simply work individually, but rather only as a complementary group.

Out of the remaining three policy variables, the only one that was found to significantly influence state entrepreneurial growth was the presence of state death (inheritance) taxes. In the three specifications when it is included, state death (inheritance) taxes are found to be highly significant in explaining the growth of entrepreneurial activity. Specifically, the presence of state death taxes beyond the federal level exerts a negative influence on the growth of state entrepreneurial activity. There are two possible explanations for this relationship. First, as supported by Holtz-Eakin (1999), high death taxes directly reduce the reward from entrepreneurship and lower the ability of

the entrepreneur to pass on wealth to his or her children. Second, many studies, such as Holtz-Eakin, Joulfaian, and Rosen (1994) and Blanchflower and Oswald (1998), have found inheritance to be a significant factor increasing the likelihood of an individual becoming an entrepreneur. The reason for this is that inheritance often provides the seed funding necessary to develop and finance a new venture up until the point at which it becomes possible to secure outside debt or venture funding. The other two policy variables (minimum wage rate and the presence of a tax limitation law) are insignificant in the regression specifications in which they are included.

The economic control variables that were consistently significant (and all of the expected signs) were the unemployment rate, percent union membership, and percent service-sector employment. This shows that the characteristics of the state economies are also major determinants of the growth of state entrepreneurial activity. Furthermore, the results show that states with high unemployment rates, or low availability of employment opportunities, experience more growth of entrepreneurial activity because of the added incentives for individuals to start their own business (or create their own employment opportunities). Also, the findings suggest that highly unionized states experience less growth in entrepreneurial activity, while states that are characterized as having larger service sectors in their economies experience more growth in entrepreneurial activity. The final economic control variable, the crime rate, was found to be insignificant in all the regression specifications.

The demographic control variables that were consistently significant (and all of the expected signs) were the percent with high school degree, percent with college degree, and median age. This shows that the demographic characteristics of the

individuals participating in the state economies are also major determinants of the growth of state entrepreneurship. Specifically, the percent of the population receiving a high school education exerts a positive and significant influence on state entrepreneurial growth, while the percent of the population receiving a college education exerts a negative and significant influence on state entrepreneurial growth. Also, younger state populations are found to experience increased entrepreneurial growth. The other two demographic variables (percent males and percent white) are insignificant in all regressions.

Focusing attention on the determinants of patent activity growth that are presented in Table 4.5, reveals that the two indicators of entrepreneurial activity are quite different in nature.[54] Out of the policy variables, only tax limitation laws exerted a significant influence on patent growth rates. The results show that those states with tax limitation laws experience higher growth rates of entrepreneurial activity relative to those states without such laws. This finding lends some support to the notion of creating a suitable environment for entrepreneurs by keeping taxes low, in that the tax limitation laws require a super majority vote to increase taxes. The freedom index and death taxes both retained their expected signs, but did not retain significance in any of the regressions that they were included. The finding that freedom does not significantly influence patent activity is somewhat surprising, and may be the product of the model that is used to estimate the determinants of patent activity. The finding of no significant influence of death taxes is somewhat less surprising given that they inherently affect individual

[54] It should be noted again that the original model of entrepreneurial activity was designed to explain sole proprietors, or more generally the self-employed, so the control variables, when applied to patent activity may have understandably different influences.

business owners rather than corporate firms, which generally are credited with a majority of the patents granted in the United States.[55]

The only economic variable that exerted a significant impact on patent activity throughout each regression was the unemployment rate. However, the unemployment rate switched to a negative sign, where it was found to carry a positive sign when modeling sole proprietors. Again this difference comes from the fact that the two indicators of entrepreneurial activity are inherently different. The negative impact of unemployment on patent activity suggest that high unemployment states experience less patent activity growth. This can be attributed to the fact that when state economies take downturns (as characterized by unemployment increases) corporations often respond by first cutting research and development efforts, which will directly decrease the innovative capacity of that state. The violent crime rate was found to negatively impact patent activity and was significant in one of the four regressions it was included. This shows that protection of property is a key determinant of entrepreneurial growth. The percent service and percent union were not found to significantly impact patent activity growth, however, it is interesting to note that both variables switched signs (percent service became negative, and percent union became positive). This shows that when modeling patent activity, states characterized as having mostly service industries will have less patent activity, and states characterized as having high levels of union membership will produce more patent activity. These results seem to make intuitive sense in that more industrial, unionized industries may be more driven towards innovation and invention than service industries.

[55] According to Griliches (1990) roughly 73 percent of U.S. patents go to corporations, while about 25 percent are received by individual inventors.

Out of the demographic control variables, only percent high school education and percent males exerted a significant influence on patent activity. It is interesting to note that the two measures of educational attainment switched signs when comparing to the results for the estimated determinants of sole proprietorships. Specifically, as the percent of the labor force that only receives a high school education increases, the resulting patent activity significantly decreases. While, as the percent of the labor force receiving a college education increases, the resulting level of patent activity increases. This follows the conventional logic that higher educational attainment will lead to more innovative capacity for individuals, which is needed to produce patents. In addition to the finding that education significantly impacts patent activity, the percent of the labor force that is male exerts a positive and significant influence on patent activity; however, the percent white and median age did not significantly influence patent activity.

Taken as a whole, the results from the previous two sections have significant policy implications for state and local development agencies.[56] To encourage economic growth, localities must encourage entrepreneurial activity, and to do so, they must focus on creating an environment consistent with economic freedom, rather than focusing efforts on bringing in more venture capital to the area. Again, a state's economic freedom consists of an environment of low taxes, low regulations, and secure private property rights, where these factors collectively work to produce economic freedoms.

[56] In order to check the robustness of the results from both Table 4.4 and Table 4.5, the same regressions were run using per capita measures of the two dependent variables; specifically, per capita proprietor growth and per capita patent growth. The results of this exercise are presented in the Appendix Tables A.5 and A.6 respectively, and the results generally support the findings when using the non-per capita growth rates as presented in Tables 4.4 and Table 4.5.

Low taxes, for example, by themselves will not encourage entrepreneurial activity without the other factors (such as low regulations and secure property rights) in place.

4.5 Conclusion

The chapter began by demonstrating that the previously documented link between entrepreneurial activity and economic growth also holds up in comparisons among U.S. states. Local economic development efforts have recently recognized this link and have begun to enact policies specifically targeted at increasing entrepreneurial activity. Many localities have focused these efforts toward forming formal angel networks and attracting new venture capital investment funds. The underlying, but unsubstantiated, assumption is that more venture capital will cause more successful entrepreneurial activity to arise. Recently, however, some have questioned whether the limited resources available for development efforts would be better directed toward attracting and nurturing individual entrepreneurs.

The state panel causality tests performed in this chapter conclude that there is a one-way causal relationship between state entrepreneurial activity and venture capital investment, but that the direction of this causal relationship is that entrepreneurial activity causes an inflow of venture funding, and not vice versa. Because entrepreneurial activity tends to be the underlying factor that automatically and naturally attracts more venture capital to an area, economic development policies should focus on creating an environment attractive to individual entrepreneurs, rather than on attracting venture capital.

Data on the growth of entrepreneurial activity, other key factors that have previously been shown to be correlated with entrepreneurial activity, and the degree of economic freedom were gathered individually for all fifty states. Generally, the results support the notion that an area's overall economic freedom, created by the state's public policies, significantly impacts the underlying level of entrepreneurial activity. Put simply, an environment of low taxes, low regulations, and secure private property rights is what is necessary to encourage the entrepreneurial activity that is vital to produce economic growth.

In addition to the clear implications that the results have for economic development efforts, they also provide a significant contribution to the growing literature on the relationship between economic freedom and economic growth. This relationship has previously been demonstrated across countries, and the results show that this relationship also holds across U.S. states. Most importantly, these results fill in the 'missing link' in this well-documented relationship. In particular results show that the conduit between economic freedom and economic growth is entrepreneurial activity. That is, underlying economic freedoms generate growth *because* they promote underlying entrepreneurial activity. In addition to the contributions mentioned above, my analysis also calls attention to the importance of the measure of entrepreneurial activity that is used to model entrepreneurship.

This chapter introduces a new indicator of entrepreneurial activity—patent activity—that was shown to behave quite differently from the more conventional measure of sole proprietors. The difference can be attributed to the fact that the patents are capturing the direct outcome of high-growth entrepreneurial ventures, while the sole

proprietorship measure is inherently also capturing the lifestyle entrepreneur. Clearly more effort needs to be devoted to designing a new indicator of entrepreneurial activity, one that has the ability to distinguish between lifestyle entrepreneurship and high-growth entrepreneurial activity. In order to accomplish this task, an entrepreneurial index may need to be created that weights such indicators as sole proprietors and patent activity to get an overall composite index of an area's entrepreneurial activity.

Chapter 5

Conclusion and Areas of Future Research

One aspect of public choice analysis focuses on the effect that political constraints have on individual economic behavior. Generally, the term "political constraint" can have two different meanings. The first meaning refers to the constraints that are *self-imposed on* the political process, which include such things as constitutional laws, voting rules, election mechanisms, and many other factors. The second meaning refers to the constraints that are *created by* the political process and imposed on the individuals who participate in the economy, which include such things as an established and enforced system of private property, a legal system of laws and regulations, enactment of mandatory taxes, and many other factors.

The notion that individuals, including both political and market participants, make rational choices under a given set of constraints, which are often created by the political process, has long been applied by various strands of economic literature. For example, economists are analyzing the economic implications of constitutions, voting mechanisms, different laws and regulations (and the crimes that result from disobeying them), and various aspects of taxation. This dissertation contributes to this vast literature dealing with choices under constraints by presenting specific applications of the two meanings of political constraints.

These specific applications are contained in the three research chapters of this dissertation. Chapter 2 analyzes of the constraints that are self-imposed on the political process and the incentives for politicians to avoid such constraints in pursuit of their own interests, by comparing the efficiency of two distinctly different forms of city

government. The next two chapters present analysis of the constraints that are created by the political process and how they influence individual economic behavior. Chapter 3 investigates the effect that the U.S. minimum drinking age law has on the behavior of underage citizens that are located in areas that share borders with nations having lower drinking ages. Chapter 4 examines the effect that state policies, such as tax structures and regulations, has on the choice of individuals to pursue entrepreneurial ventures.

The remainder of the current chapter will (i) summarize the major findings of each of the three research chapters, (ii) highlight the importance of each finding in regards to the existing literature, and (iii) propose suggestions for future research.

Chapter 2 compares and contrasts two forms of city government, ultimately comparing professionally trained city managers to popular elected mayors in order to predict efficiency differences in the two forms of government. The motivation is that the elected officials will be subject to many of the efficiencies brought on by incentives to vote maximize; while the professionally trained city manager, who is removed from direct voting influences, will perform more efficiently relative to the popularly elected mayor. Previous research, that examines a limited array of common government expenditures, has concluded that there are no efficiency differences between elected mayor-council (EMC) and council-manager (CM) city governments. What remains then, is a puzzle as to why so many cities are switching from an EMC form to a CM form. Relying on capitalization theory of local public services and taxes, I propose an alternative method for testing efficiency difference in the two forms of government, which specifically involves developing a hedonic price model for home sales occurring in the six largest Ohio metropolitan areas. Results show that houses within a CM city have a

significant pricing premium that can be attributed to the greater efficiency of the CM form of government. More specifically, the CM pricing premium is more pronounced in the central cities that were analyzed, which suggests that the influence of the city manager may vary between central cities and the surrounding cities.

These results make an important contribution to the literature in that they are the first results since Booms (1966) that point to significant efficiency differences in the two forms of city government. Also, the efficiency advantage can be used to explain the current trend towards adopting the CM form of city government in the United States. The cities making the transition to the CM form of government have to receive some benefits from the change, and the benefits may come in the form of efficiency gains. Finally, the alternative methodology employed sheds some doubt on the use of common government expenditures to test for differences in city forms of government. The results point to the fact that variations in the total value of the public services produced, and the efficiency of the manner in which they were produced, may be better suited to reveal differences in the two forms of city government.

There are a few extensions of this line of research that may be worth investigating. First, the finding that the CM influence is more pronounced in the central city housing market could be further examined. Second, additional methods of testing the two forms of government could be performed. Such as, looking at business start-ups (business growth) in different cities to see if city managers promote more business activity. Also, analysis of city population migration could prove to be beneficial, under the Tiebout-type assumption that cities offering a superior basket of public goods will attract more residents (net in-migration). A simple test of these two hypotheses would be

to see if CM cities have significantly higher business start-up rates or population in-migration rates than EMC cities. Clearly my findings, of significant efficiency differences that were not found by the previous literature, suggests that the issue still needs further investigation beyond what has been previously examined.

Chapter 3 analyzes how minimum drinking age laws influence the behavior of underage citizens. More specifically, it examines the incentive for underage U.S. citizens to cross international borders into countries with lower drinking ages to avoid the nationally uniform 21-year-old drinking age. The chapter models the occurrence of alcohol-related motor-vehicle fatalities, the most serious outcome of mixing drinking and driving, and tests for any border crossing effects. More specifically, I model the occurrence of motor-vehicle fatalities in Michigan counties, for drivers aged nineteen and twenty, and all-aged drivers, to test if the lower Ontario drinking age of nineteen creates a significant border crossing effect. Results show that, after controlling for the determinants of motor vehicle fatalities that are supported by the literature, the county's proximity to the nearest border crossing significantly impacts the occurrence of alcohol-related motor-vehicle fatalities. Specifically, the occurrence of motor-vehicle fatalities increases as the distance from the nearest border crossing decreases, where the increased fatalities place a larger cost burden on the counties that are closest to the border crossings.

The results of this chapter make an important contribution to the literature in that it builds of the existing minimum drinking age literature by extending it to a more national context. The finding that international border crossings between nations with different drinking ages significantly impact alcohol-related motor-vehicle fatalities

reinforces the widely accepted finding that drinking ages matter in respect to drinking and driving deterrence.

Although, this study focused on Michigan-Ontario border crossings, many other U.S. states share borders with Canada and Mexico, where drinking ages are currently lower than twenty-one. The analysis performed in this chapter could be extended to analysis of several other states with international border crossings. Also, given that there was a period of time in which the fifty states did not all have a uniform drinking age, this methodology could be applied to more historical data to test if there was a border crossing effect between the states that had varying dinking ages.

Chapter 4 focuses attention on the effects that state policies have on the level of entrepreneurship in each state. The chapter begins by performing causality tests between entrepreneurship and economic growth and shows that a one-way causal relationship runs from entrepreneurship to economic growth. This result serves to enhance the robustness of the well-supported link between entrepreneurship and economic growth. With the recognition that entrepreneurial activity is a key factor in economic growth, it is relevant to analyze the effects that various state policies have in promoting entrepreneurship. One frequently cited strategy for promoting entrepreneurial activity is to attract large amounts of venture capital, in the hopes of inducing more entrepreneurial activity. However, further causality tests performed on the relationship between venture capital investment and entrepreneurial activity show that it is the presence of entrepreneurial activity that draws venture funding to an area, and not vice versa.

In order to further investigate what policies significantly affect the level of entrepreneurship, I estimate the determinants of state-level entrepreneurial growth.

Results show that, after controlling for various demographic and economic influences, the level of economic freedom in a state, measured by a composite index of several various state taxes and regulations, is a significant determinant of the growth of entrepreneurship. Thus, the results imply that enacting policies consistent with economic freedom, such as low taxes, low regulations, and secure property rights that provide a good environment for attracting or developing individual entrepreneurs, are the appropriate economic development policies.

The results presented in this chapter contribute to the literature in several ways. First, the results enhance the well-established link between entrepreneurship and economic growth, by showing that the link still holds when aggregating to the state-level. Also, the causality tests that were employed allow for dual causality, but find a strong one-way causal relationship, which many prior studies had shown by making more informal observations.

Second, the causality results performed on the relationship between entrepreneurial activity and venture capital investment suggest that policymakers should not devote resources to attracting venture funds to their states. Rather, they should focus attention on creating a suitable environment for creating or attracting entrepreneurs. One method of creating a suitable environment is to enact policies in a manner that ensures that economic freedoms exist. The link between economic freedom and entrepreneurship is also a significant finding in that it helps to better explain the recently reported link between economic freedom and economic growth. In particular the results suggest that the conduit between economic freedom and economic growth is entrepreneurial activity.

That is, underlying economic freedoms generate growth because they promote underlying entrepreneurial activity.

Third, this study is the first comprehensive analysis of the determinants of entrepreneurship performed at the state level. The findings are in-line with the prior analysis of entrepreneurship, which either focuses on individual entrepreneurs or aggregates observations to the national level. This preliminary analysis of the impact that state policies have on entrepreneurship opens up a new line of economic investigation, where this new path has much to be explored. Following what has already been done at the national level, further analysis could focus on the individual effects of several different state tax structures. Also, a wide variety of state taxes could be analyzed to see which, if any, exert a significant influence of the environment for entrepreneurship through a more rigorous time-series analysis of state policies and entrepreneurship. In any event, given the renewed interest in the role of entrepreneurs in the economy, further investigation of the determinants of state entrepreneurship does seem like it would be a particularly fruitful exercise.

Finally, this chapter introduces a new indicator of entrepreneurial activity—patent activity—that was shown to behave quite differently from the more conventional measure of sole proprietors. Clearly more effort needs to be devoted to designing a new indicator of entrepreneurial activity, one that has the ability to distinguish between lifestyle entrepreneurship and high-growth entrepreneurial activity. In order to accomplish this task, an entrepreneurial index may need to be created that weights such indicators as sole proprietors and patent activity to get an overall composite index of an area's entrepreneurial activity.

APPENDIX

Table A.1 Summary Statistics and Definitions for Variables used in the Appendix

Variable Name (source)	Description	Mean (st. dev.)
Causality Test Variables		
Per Capita GSP Growth	Annual percent change in Gross State Product per employee, calculated as: ((GSPPCt – GSPPCt-1)/ GSPPCt-1)	4.44 (3.41)
Sole Proprietors Per Capita	Annual Sole proprietor employment per 1,000 employees.	145.53 (25.32)
Proprietors Per Capita Growth	Annual percent change in Sole Proprietors per employee, calculated as: ((PROPPCt – PROPPCt-1)/ PROPPCt-1)	1.29 (3.46)
Patents Per Capita	Number of annual utility patents granted in the U.S per 1,000 employees.	0.31 (0.21)
Patents Per Capita Growth	Annual percent change in patents per employee, calculated as: ((PATPCt – PATPCt-1)/ PATPCt-1)	4.93 (17.34)
Venture Capital Per Firm	Venture capital investment per existing U.S. firm.	3139.92 (7238.07)
Entrepreneurial Growth Variables		
Per Capita Proprietor Growth	Percent change in Sole Proprietors per employee, calculated as: ((PROPPC2000 – PROPPC1996)/ PROPPC1996)	1.68 (2.84)
Per Capita Patent Growth	Percent change in patents granted per employee, calculated as: ((PATPC2000—PATPC1996)/PATPC1996)	3.19 (18.37)

APPENDIX

Table A.2 Causality Test Results between State Entrepreneurial Activity and Economic Growth (absolute t-statistics in parenthesis)

	Annual Per Capita GSP Growth		Sole Proprietors Per Capita		Patents Per Capita	
	(1)	(2)	(3)	(4)	(5)	(6)
Annual Per Capita GSP Growth (t-1) (percent)	0.223*** (6.98)	0.279*** (9.56)	-0.283*** (7.58)		-0.001 (0.18)	
Sole Proprietors Per Capita (t-1) (proprietors per 1,000 employees)	0.049*** (4.54)		0.820*** (63.99)	0.847*** (63.77)		0.002* (1.61)
Patents Per Capita (t-1) (patents per 1,000 employees)		2.761** (2.01)		4.773*** (2.62)	1.031*** (61.96)	1.017*** (54.83)
Result/Finding	Proprietors Per Capita Causes Per Capita GSP Growth	Patents Per Capita Causes Per Capita GSP Growth	Per Capita GSP Growth Causes Proprietors Per Capita	Patents Per Capita Causes Proprietors Per Capita	Per Capita GSP Growth Causes Patents Per Capita	Proprietors Per Capita Causes Patents Per Capita
F-statistic [1, 998]	20.59***	4.03**	57.38***	6.85***	0.03	2.59*
Number of Observations	1050	1050	1050	1050	1050	1050
R-squared	0.18	0.16	0.97	0.97	0.95	0.95

Significance Levels are represented by the following: ***1%, **5%, *10%
Note: State Dummy Variables were included in each regression specification, and the estimated coefficients are available upon request to the author.

APPENDIX

Table A.3 Causality Test Results between State Entrepreneurial Activity and Economic Growth (absolute t-statistics in parenthesis)

	Annual Per Capita GSP Growth		Proprietors Per Capita Growth		Patents Per Capita Growth	
	(1)	(2)	(3)	(4)	(5)	(6)
Annual Per Capita GSP Growth (t-1) (percent)	0.297*** (10.02)	0.284*** (9.84)	-0.016 (0.64)		-0.091 (0.79)	
Proprietors Per Capita Growth (t-1) (percent)	0.053 (1.44)		-0.084*** (2.63)	-0.080*** (2.57)		-0.285** (1.99)
Patents Per Capita Growth (t-1) (percent)		0.010		-0.002 (0.43)	-0.357*** (13.34)	-0.359*** (13.44)
Result/Finding	Proprietors Per Capita Growth Causes Per Capita GSP Growth	Patents Per Capita Growth Causes Per Capita GSP Growth	Per Capita GSP Growth Causes Proprietors Per Capita Growth	Patents Per Capita Growth Causes Proprietors Per Capita Growth	Per Capita GSP Growth Causes Patents Per Capita Growth	Proprietors Per Capita Growth Causes Patents Per Capita Growth
F-statistic [1, 998]	2.08	2.31	0.40	0.18	0.62	3.94**
Number of Observations	1050	1050	1050	1050	1050	1050
R-squared	0.16	0.16	0.02	0.02	0.18	0.18

Significance Levels are represented by the following: ***1%, **5%, *10%

Note: State Dummy Variables were included in each regression specification, and the estimated coefficients are available upon request to the author.

APPENDIX

Table A.4 Causality Test Results between State Entrepreneurial Activity and Venture Capital Investment (absolute t-statistics in parenthesis)

	Venture Capital Per Firm		Sole Proprietors Per Capita		Patents Per Capita	
	(1)	(2)	(3)	(4)	(5)	(6)
Venture Capital Per Firm (t-1) (dollars per firm)	1.902*** (40.96)	1.862*** (39.46)	-0.001 (1.24)		-0.001 (1.52)	
Sole Proprietors Per Capita (t-1) (proprietors per 1,000 employees)	40.845 (1.52)		0.765*** (25.81)	0.766*** (26.23)		0.002*** (3.29)
Patents Per Capita (t-1) (patents per 1,000 employees)		5133.750*** (3.23)		2.624 (1.55)	1.080*** (28.65)	1.016*** (28.52)
Result/Finding	Sole Proprietors Per Capita Causes Venture Capital Per Firm	Patents Per Capita Causes Venture Capital Per Firm	Venture Capital Per Firm Causes Sole Proprietors Per Capita	Patents Per Capita Causes Sole Proprietors Per Capita	Venture Capital Per Firm Causes Patents Per Capita	Sole Proprietors Per Capita Causes Patents Per Capita
F-statistic [1,334]	2.29	10.45***	1.55	2.41	2.32	10.86***
Number of Observations	378	378	378	378	378	378
R-squared	0.91	0.91	0.98	0.98	0.96	0.96

Significance Levels are represented by the following: ***1%, **5%, *10%

Note: State Dummy Variables were included in each regression specification, and the estimated coefficients are available upon request to the author.

APPENDIX

Table A.5 Estimated Determinants of State Entrepreneurial Growth1996-2000
Dependent Variable: State Per Capita Proprietor Growth Rates
(absolute t-statistics in parenthesis)

	(1)	(2)	(3)	(4)
State Policy Variables				
Economic Freedom Index	1.924**	1.919**	1.901**	1.848**
	(2.49)	(2.45)	(2.51)	(2.41)
Death Tax Law	-0.962	-1.031	-1.029	
	(1.36)	(1.43)	(1.45)	
Tax Limitation Law	0.299	0.096		
	(0.37)	(0.12)		
Minimum Wage	-7.958			
	(1.48)			
State Control Variables				
Constant	101.115***	63.319**	63.926**	65.488**
	(2.81)	(2.48)	(2.59)	(2.62)
Percent with High School Degree	0.268*	0.165	0.160	0.188*
	(1.97)	(1.39)	(1.44)	(1.69)
Percent with College Degree	-0.468***	-0.442***	-0.439***	-0.456***
	(4.11)	(3.87)	(3.99)	(4.12)
Percent Males	-1.301***	-1.232***	-1.233***	-1.284***
	(3.29)	(3.09)	(3.13)	(3.23)
Percent White	-0.071	-0.026	-0.025	-0.020
	(1.44)	(0.66)	(0.66)	(0.52)
Median Age	-0.607**	-0.558**	-0.562**	-0.628**
	(2.29)	(2.10)	(2.16)	(2.42)
Unemployment Rate	1.524***	1.189***	1.178***	1.286***
	(3.19)	(2.78)	(2.86)	(3.12)
Percent Union Membership	-0.111	-0.128	-0.125	-0.131
	(1.28)	(1.47)	(1.54)	(1.59)
Percent Service Employment	0.245*	0.249*	0.246*	0.273**
	(1.90)	(1.91)	(1.94)	(2.14)
Violent Crime Rate	-0.002	-0.001	-0.001	-0.001
	(0.80)	(0.40)	(0.42)	(0.38)
Number of Observations	50	50	50	50
R-squared	0.56	0.53	0.53	0.50

Significance Levels are represented by the following: ***1%, **5%, *10

APPENDIX

Table A.6 Estimated Determinants of State Entrepreneurial Growth 1996-2000
Dependent Variable: State Per Capita Patent Growth Rates
(absolute t-statistics in parenthesis)

	(1)	(2)	(3)	(4)
State Policy Variables				
Economic Freedom Index	1.242	1.255	3.245	3.250
	(0.22)	(0.22)	(0.56)	(0.57)
Death Tax Law	0.069	0.243	0.096	
	(0.01)	(0.05)	(0.02)	
Tax Limitation Law	11.049*	10.534*		
	(1.80)	(1.76)		
Minimum Wage	20.179			
	(0.50)			
State Control Variables				
Constant	-169.178	-73.332	-139.666	-139.811
	(0.63)	(0.39)	(0.75)	(0.76)
Percent with High School Degree	-1.879*	-1.618*	-1.158	-1.161
	(1.85)	(1.88)	(1.38)	(1.42)
Percent with College Degree	0.495	0.427	0.101	0.103
	(0.58)	(0.51)	(0.12)	(0.13)
Percent Males	4.865*	4.690	4.802	4.807
	(1.65)	(1.61)	(1.61)	(1.63)
Percent White	0.223	0.109	0.039	0.039
	(0.60)	(0.38)	(0.14)	(0.14)
Median Age	-0.013	-0.137	0.356	0.362
	(0.01)	(0.07)	(0.18)	(0.19)
Unemployment Rate	-7.619**	-6.770**	-5.646*	-5.656*
	(2.13)	(2.18)	(1.80)	(1.86)
Percent Union Membership	0.143	0.188	-0.174	-0.173
	(0.22)	(0.30)	(0.28)	(0.29)
Percent Service Employment	-0.966	-0.976	-0.693	-0.696
	(1.01)	(1.03)	(0.72)	(0.74)
Violent Crime Rate	-0.221	-0.241*	-0.022	-0.022
	(1.54)	(1.77)	(1.56)	(1.58)
Number of Observations	50	50	50	50
R-squared	0.41	0.40	0.35	0.35

Significance Levels are represented by the following: ***1%, **5%, *10

References

Amerestate, *Pace Net Data Set*, (1991), Cincinnati, Ohio.

Americans for Tax Reform, *Tax Limitation Amendment & Supermajority in the States* (2002).

Bartel, Ann. and David Lewin, "Wages and Unionism in the Public Sector: The Case of Police," *Review of Economics and Statistics*, v63, n1 (February 1981): 53-59.

Bates, Timothy "Entrepreneur Human Capital Inputs and Small Business Longevity." *Review of Economics and Statistics*, v72, n4 (November 1990): 551-559.

Baughman, Reagan; Michael Conlin, Stacy Dickert-Conlin, and John Pepper. "Slippery when Wet: The Effects of Local Alcohol Access Laws on Highway Safety." *Journal of Health Economics*, (November 2001): 1091-1098.

Beard, Randolph T.; Paula A. Gant, and Richard P. Saba. "Border-Crossing Sales, Tax Avoidance, and State Tax Policies: An Application to Alcohol." *Southern Economic Journal*, v64, No.1, (July 1997): 293-306.

Bender, Bruce and John R. Lott, Jr. "Legislator Voting and Shirking: A Critical Review of the Literature," *Public Choice*, v87, n 1-2 (April 1996): 67-100.

Benson, Bruce L.; Brent D. Mast, and David W. Rasmussen. "Can Police Deter Drunk Driving?" *Applied Economics*, v32, No.3, (February 2000): 357-366.

Blanchflower, David G. and Andrew J. Oswald. "What makes an Entrepreneur?" *Journal of Labor Economics*, v16, n1 (January 1998): 26-60.

Blau, David M. "A Time-Series Analysis of Self-Employment in the United States." *Journal of Political Economy*, v95, n3 (June 1987): 445-467.

Blomstrom, Magnus; Robert E. Lipsey and Mario Zejan. "Is Fixed Investment the Key to Economic Growth?" *The Quarterly Journal of Economics*, v111, n1 (February 1996): 269-276.

Booms, Bernard, "City Government Form and Public Expenditures," *National Tax Journal*, v19, n2 (June 1966): 187-199.

Brasington, David M., "Which Measures of School Quality Does the Housing Market Value?" *Journal of Real Estate Research*, v18, n3 (November 1999): 395-413.

Brasington, David M., "Demand and Supply of Public School Quality in Metropolitan Areas: The Role of Private Schools," *Journal of Regional Science*, v40, n3 (August 2000): 583-605.

Brasington, David M., "Capitalization and Community Size," *Journal of Urban Economics*, v50, n3 (November 2001): 385-395.

Brennan, Geoffrey and James M. Buchanan. *The Power to Tax*. Chap. 2, Cambridge; Cambridge University Press, 1980.

Bruce, Donald "Effects of the United States Tax System on Transitions Into Self-Employment." *Labour Economics*, v7, n5 (September 2000): 545-574.

Bruce, Donald "Taxes and Entrepreneurial Endurance: Evidence from the Self-Employed." *National Tax Journal*, v55, n1 (March 2002): 5-24.

Brueckner, Jan K., "Property Values, Local Public Expenditure and Economic Efficiency," *Journal of Public Economics*, v11, n2 (April 1979): 223-245.

Buchanan, James M., "The Domain of Constitutional Economics," *Constitutional Political Economy* 1, No.1 (Winter 1990), pp. 1-18.

Cameron, A., and P. Trivedi. "Regression Based Tests for Overdispersion in the Poisson Model." *Journal of Econometrics*, v46, (1990): 347-364.

Cameron, C., and F. Windmeijer. "R-squared Measures for Count Data Regression Models with Applications to Health Care Utilization." *Working Paper No. 93-24*, Department of Economics, University of California, Davis, (1993).

CCH Incorporated, *State Estate Taxes*, (2002).

Corporation for Enterprise Development. *Infrastructure for Entrepreneurial Development: A Scan of Ten Southern States.* Mary Reynolds Babcock Foundation. (April 2001).

Cowling, Marc. "Are Entrepreneurs Different Across Countries?" *Applied Economic Letters*, v7, n12 (December 2000): 785-789.

Davis, Michael L. and Kathy Hayes, "The Demand for Good Government," *Review of Economics and Statistics*, v75, n1 (February 1993): 148-152.

Dee, Thomas S. "State Alcohol Policies, Teen Drinking and Traffic Fatalities." *Journal of Public Economics*, v72, (1999): 289-315.

Deno, Kevin T and Stephen L. Mehay, "Municipal Management Structure and Fiscal Performance: Do City Managers Make a Difference?" *Southern Economic Journal*, v53, n3 (January 1987): 627-642.

Downs, Anthony, *An Economic Theory of Democracy*. New York: Harper & Row, (1957).

Duffy-Deno, Kevin T. and Douglas R. Dalenberg, "Do Institutions Matter? An Empirical Note." *National Tax Journal*, v 43, n2 (June 1990):207-215.

Ehrenberg, Ronald G., "Municipal Government Structure, Unionization, and the Wages of Firefighters," *Industrial and Labor Relations Review*, v27, n1 (October 1973): 36-48.

Ehrenberg, Ronald G. and Gerald S. Goldstein, "A Model of Public Sector Wage Determination," *Journal of Urban Economics*, v2, (June 1975): 223-245.

Evans, David S. and Linda S. Leighton. "Some Empirical Aspects of Entrepreneurship." *American Economic Review*, v79, n3 (June 1989): 519-535.

Farr, W. Ken; Richard A. Lord, and J. Larry Wolfenbarger. "Economic Freedom, Political Freedom, and Economic Well-Being: A Causality Analysis." *Cato Journal*, v18, n2 (Fall 1998): 247-262.

Florida, Richard. *The Rise of the Creative Class: and How It's Transforming Work, Leisure, Community and Everyday Life.* New York, NY: Basic Books, 2002.

Garrett, Thomas A. and Thomas L. Marsh. "The Revenue Impacts of Cross-Border Lottery Shopping in the Presence of Spatial Autocorrelation." *Regional Science and Urban Economics,* v32, No.4, (July 2002): 501-519.

Granger, C.W.J. "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods," *Econometrica*, v37, n3, (July 1969):424-438.

Greene, William H., *Econometric Analysis*, Fourth Edition, Prentice-Hall, Inc.: Upper Saddle River, New Jersey, (2000).

Griliches, Zvi "Patent Statistics as Economic Indicators: A Survey." *Journal of Economic Literature*, v28, n4 (December 1990): 1161-1707.

Gwartney, James D., Robert A. Lawson, and Randall G. Holcombe, "Economic Freedom and the Environment for Economic Growth." *Journal of Institutional and Theoretical Economics*, v155, n4 (December 1999): 1-21.

Gwartney, James D. and Robert A. Lawson. *Economic Freedom of the World: 2002 Annual Report*. Vancouver: The Fraser Institute: 2002.

Halvorsen, Robert and Raymond Palmquist, "The Interpretation of Dummy Variables in Semilogarithmic Equations," *American Economic Review*, v70, n3 (June 1980): 474-475.

Hamilton, Barton H. "Does Entrepreneurship Pay? An Empirical Analysis of the Returns to Self-Employment." *Journal of Political Economy*, v108, n3 (June 2000): 604-31.

Haurin, Donald R. and David M. Brasington, "School Quality and Real House Prices: Inter- and Intrametropolitan Effects," *Journal of Housing Economics*, v5, n4 (December 1996): 351-368.

Haurin, Donald R. and David M. Brasington, "Educational Outcomes and House Values: A Test of the Value-Added Approach," Working Paper, (2001) Tulane University.

Hayes, Kathy and Semoon Chang, "The Relative Efficiency of City Manager and Mayor-Council Forms of Government," *Southern Economic Journal*, v57, n1 (July 1990): 167-177.

Henderson, Jason. "Building the Rural Economy with High-Growth Entrepreneurs." *Federal Reserve Bank of Kansas City Economic Review*, v87, n3 (3rd Quarter 2002): 45-70.

Holcombe, Randall G., "Constitutions as Constraints: A Case Study of Three American Constitutions," *Constitutional Political Economy* 2, No.3 (Fall 1991): pp.303-328.

Holtz-Eakin, Douglas. "The Death Tax: Investments, Employment, and Entrepreneurs." *Tax Notes*, v84, n5 (August 2, 1999): 782-791.

Holtz-Eakin, Douglas; David Joulfaian and Harvey S. Rosen. "Sticking It Out: Entrepreneurial Survival and Liquidity Constraints." *Journal of Political Economy*, v102, n1 (February 1994): 53-75.

International City/County Management Association. *The Municipal Year Books* (1976-2000), Washington, DC.

International City/County Management Association. *State of the Profession Survey* 2000, Washington, DC.

Jenner, Richard A. "Endogenous Schumpeterian Growth, The Productivity Slowdown, and Entrepreneurial Dynamics." *Small Business Economics*, v11, n4 (December 1998): 343-351.

Jensen, Alan F.; Ted R. Miller, and Kenya L. Covington. *Impaired Driving State Cost Fact Sheets.* Public Services Research Institute: Landover, MD. (1999).

Kaiser, Carl P. "Entrepreneurship and Resource Allocation." *Eastern Economic Journal*, v16, n1 (Jan.-March 1990): 9-20.

Karabegovic, Amela; Fred McMahon and Dexter Samida; with Glenn Mitchell and Chris Schlegel. *Economic Freedom of North America*. The Fraser Institute, Canada and the National Center for Policy Analysis, United States of America. (2002)

Kayne, Jay. *State Entrepreneurship Policies and Programs.* Kansas City, Missouri: Kauffman Center for Entrepreneurial Leadership, (November 1999).

Kirzner, Isreal M. "Entrepreneurial Discovery and the Competitive Market Process: An Austrian Approach." *Journal of Economic Literature*, v35, n1 (March 1997): 60-85.

Lee, Dwight R. "The Seeds of Entrepreneurship." *The Journal of Private Enterprise*, v7, n1 (Fall 1991): 20-35.

Legge, Jerome S. Jr., *Traffic Safety Reform in the United States and Great Britain*, University of Pittsburgh Press: Pittsburgh, PA, (1991).

Legge, Jerome S. Jr. and Joonghoon Park. "Policies to Reduce Alcohol-Impaired Driving: Evaluating Elements of Deterence." *Social Science Quarterly*, v75, No.3, (September 1994): 594-606.

Macpherson, David, *State Minimum Wage Data*

MapQuest, *Online Road Mileage Distance Calculator*, 2002, MapQuest.com, Inc., Mountville, PA

Mast, Brent D.; Bruce L. Benson, and David W. Rasmussen. "Beer Taxation and Alcohol-Related Traffic Fatalities." *Southern Economic Journal*, v66, No.2, (October 1999): 214-249.

Mayhew, D.R. and H.M. Simpson. "New to the Road. Young Drivers and Novice Drivers: Similar Problems and Solutions?" Ottawa, Ontario: Traffic Injury Research Foundation (1990).

Michigan Department of Career Development, Employment Service Agency, Office of Labor Market Information. (1999) *County civilian unemployment rates*. Lansing, Michigan: State of Michigan.

Michigan Department of Transportation, Bureau of Transportation Planning. (1997) *Annual vehicle miles traveled*. Lansing, Michigan: State of Michigan.

Michigan State Police Department, Criminal Justice Information Center. (1999) *Uniform Crime Report*. Lansing, Michigan: State of Michigan.

Michigan State University, Tourism Resource Center, (2000) *County Tourism Profiles*, East Lansing, Michigan.

Minniti, Maria. "Entrepreneurial Activity and Economic Growth." *Global Business and Economics Review*, v1, n1 (June 1999): 31-42.

Niskanen, William A., "Nonmarket Decision Making: The Peculiar Economics of Bureacracy," *American Economic Review* 58, (May 1968): pp. 293-305.

Oates, Wallace E., "The Effects of Property Taxes and Local Public Spending on Property Values: An Emperical Study of Tax Capitalization and the Tiebout Hypothesis," *Journal of Political Economy*, v77, n6 (November 1969): 957-971.

O'Brien, Kevin M., "Form of Government and Collective Bargaining Outcomes," *Public Finance Quarterly*, v20, n1 (January 1992): 64-76.

O'Brien, Kevin M., "Does It Matter Who Bargains for the Municipality? Evidence from Police and Firefighter Bargaining Outcomes," *Journal of Economics*, v21, n2 (Fall 1995): 107-114.

Office of Criminal Justice Services, State of Ohio, *Crime by County 1993*, Columbus, Ohio, (1994).

Ohio Department of Education, Division of Information Management Services, *Ohio 9th-Grade Proficiency Test Passage Rates*, Columbus, Ohio (1990-1991).

Ohio Department of Taxation, *Property Tax Millage Rates*, Columbus, Ohio (1991).

PricewaterhouseCoopers / Thomson Venture Economics / NVCA Moneytree, *Venture Capital Profiles* (2002).

Reynolds, Paul D.; Michael Hay, and S. Michael Camp. *Global Entrepreneurship Monitor*. Kansas City, Missouri: Kauffman Center for Entrepreneurial Leadership, (1999).

Robinson, Charles. "Intoxicated State: Part Two: The Bridge to Adulthood." Michigan State University, *State News*, (November, 1998).

Romer, Thomas and Howard Rosenthal, "Political Resource Allocation, Controlled Agendas, and the Status Quo," *Public Choice* 33, No.4 (1978): pp.27-43

Rosen, Harvey S. and David J. Fullerton, "A Note on Local Tax Rates, Public Benefit Levels, and Property Values," *Journal of Political Economy*, v85, n2 (April 1977): 433-440.

Ruhm, Christopher J. "Alcohol Policies and Highway Vehicle Fatalities." *Journal of Health Economics*, v15, (August 1996): 435-454.

Schiller, Bradley R. and Philip E. Crewson. "Entrepreneurial Origins: A longitudinal Inquiry." *Economic Inquiry*, v35, n3 (July 1997): 523-31.

Schumpeter, Joseph A. *Capitalism, Socialism, and Democracy*. New York: Harper, 1942.

Shan, Jordan Z.; Alan G. Morris and Fiona Sun. "Financial Development and Economic Growth: An Egg-and-Chicken Problem?" *Review of International Economics*, v9, n3 (August 2001): 443-454.

Simpson, H.M., D.J. Beirness, D.R. Mayhew, and A.C. Donelson. "Alcohol-Specific Controls: Implications for Road Safety." Ottawa, Ontario: Traffic Injury Research Foundation (1985).

Sims, Christopher A. "Money, Income, and Causality." *American Economic Review*, v62, n4 (September 1972): 540-552.

Smith, Adam. *An Inquiry into the Nature and Causes of the Wealth of Nations,* (1776).

Svara, James H., "Mayoral Leadership in Council-Manager Cities: Preconditions Versus Preconceptions," *The Journal of Politics*, v49, n1 (February 1987): 207-227.

Thurman, Walter N. and Mark E. Fisher. "Chickens, Eggs, and Causality, or Which Came First?" *American Journal of Agricultural Economics*, v70, n2 (May 1988): 237-238.

Tullock, Gordon, "The Welfare Cost of Tariffs, Monopolies, and Theft," *Western Economic Journal* 5, No.3 (June 1967): pp.224-232.

United States Department of Commerce, Bureau of Economic Analysis. (1999) *Local area personal income.* Washington, D.C.: Government Printing Office.

United States Department of Commerce, Bureau of Economic Analysis, *State and Local Area Data*, Washington, D.C.

United States Department of Commerce, Census Bureau, Population Division, *County and City Data Book*, (1994), Washington, D.C.: Government Printing Office.

United States Department of Commerce, Census Bureau, Population Division. (1999) *County population estimates*. Washington, D.C.: Government Printing Office.

United States Department of Commerce, Census Bureau, *Statistical Abstracts of the United States*, Washington, D.C.

United States Department of Commerce, Census of Governments. (1997) *Local government police protection employment*. Washington, D.C.: Government Printing Office.

United States Department of Health and Human Services, National Institute on Alcohol Abuse and Alcoholism. (1991) *Economics and the Prevention of Alcohol-Related Problems,* Research Monograph No.25, Washington, D.C.: Government Printing Office.

United States Department of Justice, Bureau of Justice Statistics, *FBI's Uniform Crime Reports,* Washington, D.C.

United States Department of Labor, Bureau of Labor Statistics, *State and Area Labor Force Statistics*, Washington, D.C.

United States Department of Transportation, Bureau of Transportation Statistics, US Customs Service: Mission Support Services: Office of Field Operations. (1997) *Incoming Personal Vehicle Crossings*, Washington, D.C.: Government Printing Office.

United States Department of Transportation, National Highway Traffic Safety Administration. (1999) *Traffic Safety Facts 1999*, Washington, D.C.: Government Printing Office.

United States Department of Transportation, National Highway Traffic Safety Administration. (1995-1999) *Fatal Accident Reporting System (FARS)*. Washington, D.C.: Government Printing Office.

United States Patent and Trademark Office, *Utility Patent Counts by Country/State and Year*, Washington, D.C. (2001).

United States Small Business Administration, Office of Advocacy, *Women in Business, 2001*, Washington, DC (October, 2001).

United States Small Business Administration, Office of Advocacy, *Minorities in Business, 2001*, Washington, DC (November, 2001).

Wagenaar, Alexander C. *Alcohol, Young Drivers, and Traffic Accidents: Effects of Minimum-Age Laws,* Lexington Books: Lexington, MA, (1983).

Wagenaar, Alexander C. Preventing Highway Crashes by Raising the Legal Minimum Age for Drinking: The Michigan Experience 6 Years Later." *Journal of Safety Research*, v17, No.3, (Fall 1986):101-109.

Weingast, Barry R., Kenneth A. Shepsle, and Christopher Johnsen, "The Political Economy of Benefits and Costs: A Neoclassical Approach to Distributive Politics," *Journal of Political Economy,* v89, n4 (August 1981): 642-664.

White, Leonard D., (1927) *The City Manager*. Chicago, Illinois: The University of Chicago Press.

Wiggins, Steven N. "Entrepreneurial Enterprises, Endogenous Ownership, and the Limits to Firm Size." *Economic Inquiry*, v33, n1 (January 1995): 54-69.

Wilkinson, James T. "Reducing Drunken Driving: Which Policies are Most Effective?" *Southern Economic Journal*, v54, No.2, (October 1987): 322-334.

Winn, Russell G. and David Giaocopassi. "Effects of County-Level Alcohol Prohibition on Motor Vehicle Accidents." *Social Science Quarterly*, v74, No.4, (December 1993): 783-792.

Yinger, John, "Capitalization and the Theory of Local Public Finance," *Journal of Political Economy*, v90, n5 (October 1982): 917-943.

Young, Douglas J. and Thomas W. Likens. "Alcohol Regulation and Fatalities." *International Review of Law and Economics*, v20, No.1 (March 2000): 107-126.

Zacharakis, Andrew L.; William D. Bygrave and Dean A. Shepherd. *Global Entrepreneurship Monitor: National Entrepreneurship Assessment: United States of America.* Kansas City, Missouri: Kauffman Center for Entrepreneurial Leadership, (2000).