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# IDENTIFYING THE DETERMINANTS OF SUCCESS FOR PURCHASE OF DEVELOPMENT RIGHTS BALLOT PROPOSALS IN MICHIGAN

By

Jason Keith Evans Ball

A THESIS

Submitted to
Michigan State University
In partial fulfillment of the requirements
for the degree of

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ABSTRACT

IDENTIFYING THE DETERMINANTS OF SUCCESS FOR PURCHASE OF DEVELOPMENT RIGHTS BALLOT PROPOSALS IN MICHIGAN

BY

Jason Keith Evans Ball

The purpose of this research is to test the hypothesis that higher socioeconomic status and increasing development pressure have a positive relationship with success of Purchase of Development Right ballot proposals in Michigan. In order to test this hypothesis a dataset has been created consisting of all minor civil divisions that have considered a PDR millage in Michigan and a range of variables relating to socioeconomic status, development pressure, and political influences. A bivariate correlation is used to evaluate the effect each independent variable has on the dependent variable, a stepwise regression based on select variables and a linear regression using all variables determine the degree to which the most significant variables as well as the entire model explain the variance in Michigan PDR millage votes.

The sum of this research is that PDR millages in Michigan have been more likely to pass in urban and suburban communities with a high level of educational attainment and low rates of owner occupancy that are located in counties where farmland value did not increase rapidly between 1987 and 2007. Other variables that were found to have a significant influence on the percent of "yes" votes for a PDR millage are total population, change in home value, home value, rural population, mobility of population, population density, percent population white, and support for George W. Bush in the 2004 presidential election.

This thesis is dedicated to my wife Heidi. Without her I would have never graduated with any remaining sanity or sense of humor.

# ACKNOWLEDGEMENTS

I would like to acknowledge the contributions of my primary professor, Dr. Patricia Machamer and committee members, Mark Wyckoff, and John Melcher. Your tremendous insight and willingness to help me see the forest through the trees in this project has been invaluable. In addition, a great deal of assistance on statistical methods was provided by Dr. John Schwietzer and Paul Curran, whose patience is much appreciated.

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# CHAPTER 1: INTRODUCTION

*"NEITHER NATURE NOR PEOPLE ALONE CAN PRODUCE HUMAN SUSTENANCE, BUT ONLY THE TWO TOGETHER, CULTURALLY WEDDED."*

-WENDELL BERRY, *THE UNSETTLING OF AMERICA, 1977*

The importance of preserving land in an undeveloped state is difficult to deny. Faith in the ability of "the market" to effectively direct growth has created a nation of sprawling development and with it environmental degradation, a loss of social capital, and a generation of Americans largely disconnected from the land that sustains them. The permanent preservation of land in an undeveloped state provides myriad benefits. In addition, it may provide a solution to urban sprawl. However, purchasing large amounts of land for use simply as open space to prevent the built environment from bleeding into the country side is not fiscally possible for government, nor is it a responsible use of land as a resource. A balance must be struck between preserving land, taking advantage of the resources provided by land, and creating prosperity for people.

Land is permanently preserved in four ways, property can be purchased out-right by a government or conservation organization, a conservation easement can be donated by a land owner to a conservation organization, a unit of government or organization can enter into an agreement to purchase a landowner's right to develop her land (purchase of development rights (PDR)), or a land owner in a designated "sending zone" can sell her development rights to a developer in a "receiving zone" to allow higher-density development (transfer of development rights (TDR)). Zoning, the most common tool

used to regulate the development of land is cheap and relatively effective, but it is impermanent and can be unpopular with landowners, especially if used to severely limit its use. Zoning districts are subject to political pressures and population shifts, and effective open space zoning requires twenty or more acres per dwelling, reducing the value of land without compensating owners. PDR (also known as purchase of conservation easements) and TDR both provide solutions to the impermanence and decrease of land value inherent to zoning without requiring the outright purchase of land.

The purpose of this research is to identify the factors that determine the success of Michigan ballot proposals to purchase the development rights to land. Nationwide and regional studies in the Northeast and West have consistently found that higher socioeconomic status is a strong predictor of the eventual success of land preservation ballot measures (Chapter 2 discusses this in detail). This research demonstrates that PDR millages in Michigan have been more likely to pass in communities with a high level of educational attainment and a low rate of owner occupancy that are located in counties where farmland value increased relatively slowly between 1987 and 2007. Although these findings do not necessarily coincide with previous research, significant differences exist between the characteristics of the datasets used, requiring further investigation.

The focus here is on PDR because local governments have not been explicitly enabled to implement TDR in Michigan. There are a variety of differences between the two tools, but most simply, since TDR is market-based it is less-expensive and is more complicated to implement. PDR relies on the fundamental principles of private property ownership to permanently preserve land while keeping it in private ownership. Just as a landowner has the right to farm her land or extract minerals, she also has a right to

develop it to its fullest permitted potential. Any one of these rights in land can be separated from the others, and sold or donated to another party. In the case of PDR, the right to develop land is purchased from a landowner by a private organization or unit of government, thereby maintaining the land's undeveloped state, while allowing the owner to retain other landowner rights and responsibilities. (Daniels & Bowers, 1997)

By no means is the purpose of this research to advocate for PDR as a silver bullet to the land use problems facing Michigan. However, the ability of PDR to preserve land in perpetuity while simultaneously keeping land in economic production provides a positive-sum solution in a land use game that is all too often viewed in zero-sum terms. Additionally, it must be emphasized that truly successful land preservation programs never occur in a vacuum. Successful land use decisions require long-range strategic planning, public involvement, and excellent leadership. Preserving a farm surrounded by 1-acre lots is a negative-sum result, the farmer views the business of farming as doomed, the residents are burdened with noise, dust, and odors, and the local government is faced with conflicting land uses that are difficult to reconcile. This hypothetical situation is entirely possible if land preservation efforts are not based on a comprehensive land use plan that is effectively implemented over a large area.

To-date, nineteen open space/farmland preservation millage votes to purchase development rights have taken place in eighteen Michigan jurisdictions, eight of which have passed.[1] Millages to purchase land out-right for public parks or open space are not considered. The nature of fee-simple purchases (all rights in land) is significantly

[1]Peninsula Township, in Grand Traverse County, the first Michigan jurisdiction to pass a PDR millage voted on, and passed a PDR millage in 1994 and 2002, both votes are included in the dataset.

different from PDR, and the prevalence of such programs is far too great for consideration in this context.

In order to frame the situation and the purpose of this research, the unique character of Michigan's physical and political attributes needs to be discussed briefly.

## The Unique Situation of Michigan

Michigan is facing challenges unlike any it has seen in the past. The core of its economy and the value-system of its people are in question as quality manufacturing jobs have fled the state at a feverish pace since the late 1990's. The deeply ingrained belief that a high school education and a strong back entitle a Michigan resident to a well-paying job on an assembly line is a thing of the past. In order to rectify this situation Michigan must turn its focus away from attracting the next big automotive factory and instead examine the assets that set the state apart from the rest of the country, and the world.

Michigan's most obvious asset, and arguably one of the most under-utilized is its natural resource base. In 1980, Michigan was home to 11 million acres of farmland and 18.2 million acres of forest land. Less than 3 million acres of land were developed. (Michigan Land Use Leadership Council, 2003) According to the 2007 Census of Agriculture, Michigan is still home to over 10 million acres of farmland and over 50,000 farms. (USDA National Agricultural Statistics Service, 2009) Furthermore, Michigan's farmland is especially valuable. The state ranks 31$^{st}$ nationally in number of acres devoted to farms, ranks 22$^{nd}$ in Market Value of Agriculture, and is 12$^{th}$ in Agricultural Market Value per acre (see Table 1.1).

**Table 1.1: Selected Michigan 2002 Census of Agriculture rankings (American Farmland Trust, 2007)**

| Statistic | National Rank |
|---|---|
| Number of Farms | 16 |
| Land in Farms | 31 |
| Market Value of Agriculture | 22 |
| Agricultural Market Value Per Acre | 12 |

More important than Michigan's sheer amount of farmland and open space is its ability to produce specialty crops and provide unique landscapes that do not exist elsewhere. Michigan produces crops that are vital to the national and global market and is blessed with the nation's second-most diverse agriculture. (Daniels & Bowers, 1997) As an example, in 2007 Michigan produced 230 million pounds of tart cherries, almost eighty percent of the tart cherries produced in the United States. (National Agricultural Statistics Service, 2007) Table 1.2 displays other Michigan agricultural products in the top ten in sales nationally. Additionally, Michigan is home to over 3,000 miles of Great Lakes shoreline, over 11,000 inland lakes, and 3.9 million acres of state forests. (Michigan Department of Natural Resources, 2008)

Despite its resources, the ever-increasing loss of farmland in Michigan since the middle of the 20$^{th}$ century has been well publicized. In the 1970's it was estimated that Michigan farmland was being converted to other uses at a rate of 300 acres per day (Governor's Task Force on the Future of Agriculture, 1970) and in 1994, a study commissioned by governor Engler estimated farmland loss at 240 acres per day. (Michigan Farmland Agriculture Development Task Force, 1994) In 1997 Norris et al.

**Table 1.2: Selected Michigan commodity values (National Agricultural Statistics Service, 2002)**

| Commodity | National Rank in Value of Sales |
|---|---|
| Fruit, Tree Nuts, and Berries | 5 |
| Nursery, Floriculture, Greenhouse, and Sod | 6 |
| Cut Christmas Trees and short rotation Woody Crops | 4 |
| Milk and other Dairy products from Cows | 8 |

conducted a land cover change analysis and totaled farmland loss from 1982 to 1997 at 1.5 million acres, or more than 13% of all the farmland in the state (more than 270 acres/day during the time period) (Norris, Soule, Weissert, Stuart, & Skole). Finally, in 2003 Governor Granholm signed an executive order creating the Michigan Land Use Leadership Council.

> "The Executive Order charged the council with studying and identifying trends, causes, and consequences of urban sprawl and providing recommendations to the governor and the legislature designed to minimize the negative effects of current and projected land use patterns on Michigan's environment and economy." (Michigan Land Use Leadership Council, 2003, p. 1)

Among other things, the final report of the Council found, "Funding available for the state's current PDR program is inadequate. Interest from farmers far outstrips available funding." (Michigan Land Use Leadership Council, 2003, p. 48)

The sum of these statistics is preserving farmland and open space in Michigan is vital to its future. In 1974, the Michigan Legislature adopted PA 116, the state's first farmland preservation program, largely as a result of reports estimating that Michigan

was losing farmland at a rate of 300 acres per day. (Norgaard, 1999) The program does not preserve farmland outright; instead it provides a significant tax break to encourage farmers to keep their land in agricultural use.

Owners of farmland participating in the PA 116 program enter into a development rights agreement with the state of Michigan; the agreement transfers the rights to develop their land to the state for at least 10 years. In return, the landowner receives a state income tax credit for the amount property taxes exceed 3.5% of household income, thereby effectively reducing farmland owners' property taxes without depleting the local tax base. Upon the expiration of the development rights agreement a lien is placed on the property equal to the tax credits from the previous seven years. The lien is due when the land is sold or converted to a non-agricultural use.

Income collected from the PA 116 program (liens paid) provides funding for the state Agricultural Preservation Fund. The primary purpose of the Agricultural Preservation Fund, created in 2000, is to provide money for state grants to local units of government to purchase development rights. Once administrative costs have been budgeted for, and grants to local units of government have been made, any money remaining in the fund in excess of $5 million may be used by the state to purchase development rights.

As of 2004, the state of Michigan PDR program had purchased 57 easements and protected over 13,000 acres of farmland at a price just over $2,000 per acre. (Adelaja, et al., 2006, p. 20) This is significantly less land than required for Michigan to maintain agriculture as a viable industry. In order to protect half the farmland vulnerable to

development in Michigan, over 800,000 acres would need to be preserved, at an estimated cost of around $2 billion. (Adelaja, et al., 2006) A possible solution to the short-coming in the state's ability to preserve the necessary land base is a concerted effort at the local level, "The amount of money allocated for open space protection by local and state governments exceeds the budget of the largest federal land protection program in the U.S., the Conservation Reserve Program." (Nelson, Uwasu, & Polasky, 2007, p. 380)

Local purchase of development rights programs are enabled in Michigan by the Michigan Zoning Enabling Act (MZEA) (PA 110 of 2006) and article I part 21 subpart 11 of the Natural Resources and Environmental Protection Act (NREPA) (MCL 324.2140-324.2144). The MZEA permits local units of government to adopt a PDR ordinance, fund a PDR program and provides specific requirements for operation of a PDR program. While NREPA permits governmental or private entities to acquire conservation easements, but provides no specific requirements for the operation of a preservation program. NREPA also provides guidelines for the state PDR program (PA 116) and creates a basis for granting money to local units of government..

According to the MZEA, a local legislative body must adopt a development rights ordinance in order to implement a PDR program. PDR programs in Michigan may only be used to protect "agricultural land and other eligible land." (2006 PA 110 §507(2) M.C.L. 125.3507(2)) Importantly, the PDR program is not meant to operate in isolation from other land use regulations, if the local unit of government has a zoning ordinance, the PDR program must, "be consistent with the plan...upon which the zoning ordinance is based." (2006 PA 110 §508(2) M.C.L. 125.3508(2))

The MZEA also permits a variety of financing options for local units of government to fund the purchase of development rights. The options for funding include general appropriations, general fund revenue, special assessment districts, and the issuance of bonds and notes. According to the Trust for Public Land's LandVote database, only four Michigan municipalities have voted on bond measures to preserve land since 1988, none of which have been for the purchase of development rights to farmland and/or open space.

## Rationale for Research

By 1994, almost half of the state's farmland was enrolled in the PA 116 program. (Norgaard, 1999) However, development pressures were high and the primary disadvantage of the PA 116 program, its impermanence, was apparent in many areas. That same year Peninsula Township, in Grand Traverse County, became the first Michigan jurisdiction, and the first jurisdiction in the Midwest, to consider taxing itself to preserve farmland. The campaign garnered national attention; the eventual vote for the program was covered by CBS and the New York Times, among others. (Bidwell, Westphal, Wunsch, & Berton, 1996) The millage passed, and the campaign was viewed as an outstanding success by local people as well as national farmland preservation advocates. In 2002, the township again voted to increase property taxes to preserve farmland, except this time the township voted to increase the original .75 mils tax to 2.0 mils. Both millages passed with over 55% of voters in support and a broad range of supporters from farmers, land use experts, and local officials.

In 1998, the next Michigan jurisdiction to consider taxing itself to preserve farmland, Washtenaw County, had a very different experience. After witnessing the steady conversion of farmland to residential and commercial uses, Washtenaw County attempted to adopt a PDR millage. The campaign was hotly contested, with approximately $600,000 combined being spent during the campaign by the pro and anti-millage campaigns. Despite the efforts of over 600 people volunteering for the pro-millage campaign (Lonick & Garfield, 2008) the millage was soundly defeated (57% voted against the millage).

A host of explanations were given for the millage failure; "In the post-election reprise, supporters saw the unexpected defeat mostly as a sign of resistance to a new tax but also to the complexity of the proposal. 'We failed to communicate the vision that connects the pieces,' observes Keith Schneider of the Michigan Land use Institute." (Myers, 1999, p. 13) Perhaps the most telling reason given for the millage's failure was, "We ran a stupid campaign." (Lonick & Garfield, 2008). The assumption made is not that voters did not want to preserve farmland, or even that they were not willing to increase taxes, but that they were convinced to vote against a millage based on misinformation and a well-run anti-millage campaign.

Since the 1998 Washtenaw County vote, seventeen other jurisdictions in Michigan have voted on a millage to purchase development rights to preserve farmland and/or open space. (Table 1.3) Of those seventeen jurisdictions, eight have passed such a millage, and nine rejected it. In Washtenaw County, five votes have taken place (four in townships and one in a city) since the failed county-wide millage vote, three of which have been successful. Thus it would seem that organizers in Washtenaw have developed

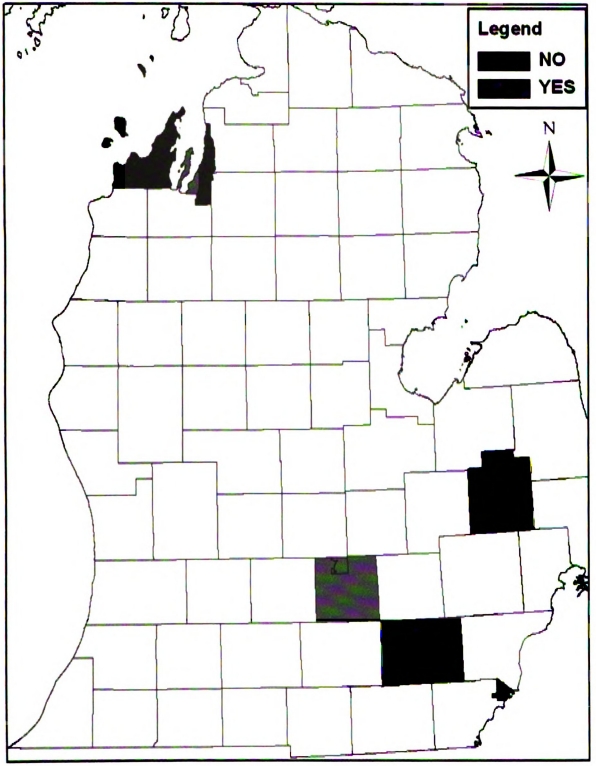
a recipe for success, but either that strategy is not applicable to the rest of the state, or it is not being employed appropriately. Figure 1.1 displays the location of each millage vote and its result.

**Table 1.3: PDR millage votes in michigan**

| Local Unit of Government | % Yes | Year |
|---|---|---|
| Peninsula Township 1994 | 55.8% | 1994 |
| Washtenaw County | 42.5% | 1998 |
| Meridian Township | 55.8% | 2000 |
| Peninsula Township 2002 | 59.0% | 2002 |
| Ann Arbor City | 67.4% | 2003 |
| Ann Arbor Township | 77.0% | 2003 |
| Acme Township | 55.6% | 2004 |
| Bridgewater Township | 45.6% | 2004 |
| Elk Rapids Township | 48.1% | 2004 |
| Milton Township | 40.5% | 2004 |
| Scio Township | 74.6% | 2004 |
| Torch Lake Township | 40.6% | 2004 |
| Whitewater Township | 47.4% | 2004 |
| Agusta Township | 42.5% | 2005 |
| Berlin Township | 22.1% | 2005 |
| Webster Township | 69.0% | 2005 |
| Lapeer County | 41.4% | 2006 |
| Leelanau County | 37.9% | 2006 |
| Ingham County | 50.3% | 2008 |

The divergence in results illustrated by the 1998 Washtenaw County and 1994 Peninsula Township PDR millage campaigns signifies the difficulty in predicting and understanding the likelihood of success of such millages in Michigan. The Trust for Public Land's LandVote database, which began recording information on every conservation ballot measure considered in the united states in 1998, shows that 83% of conservation property tax increases proposed across the United States since 1998 have been successful. (Kotchen & Powers, 2006) This stands in stark contrast to the success

**Figure 1.1: Millage vote location**



rate of PDR millage votes in Michigan (47%) and the rate of passage for all conservation property tax increases in Michigan (64%).

This project seeks to explain the variation in results of PDR millage votes in Michigan. Variables related to socioeconomic characteristics, development pressure, and political circumstances are compared with the percentage of "yes" votes in each jurisdiction that has voted on a PDR millage in Michigan using a linear regression analysis. The information provided by this analysis informs local units of government considering adoption of a PDR ordinance and/or millage of the influences that community characteristics have on support for land preservation using PDR. As a consequence, local decision makers will be more aware of the unique challenges and opportunities in their community and be able to increase the likelihood of a successful millage, thereby permanently preserving more open space land.

The following two chapters discuss relevant literature and the methodology of the research in detail. The final two chapters detail the results of the research and discuss those results.

# CHAPTER 2: LITERATURE REVIEW

## Introduction to Chapter 2

One note on semantics is necessary prior to reviewing the literature. The terms *farmland preservation* and *open space preservation* are closely related, but not interchangeable. *Open space preservation* includes preservation of farmland, forest lands, and wildlife habitat, generally any undeveloped land, but not city parks or sports fields; this land may or may not remain in private ownership. *Farmland preservation* is concerned solely with the preservation of land used for farming purposes, which generally remains in private ownership. The focus of this research is on PDR millages, which depending on the jurisdiction, may be used for the preservation of a variety of lands. The literature reviewed uses both terms, depending on the topic. Generally, earlier literature was focused on *farmland preservation*, but as the work becomes more current, the term *open space* is most common.

The influence of the characteristics of local populations on the manner in which they vote on open space preservation measures has been considered by a diverse range of disciplines since the mid 1970's. Researchers have hailed from Agricultural Economics, Planning, Geography, Political Science, Environmental Studies, and Natural Resource Management. This diversity of interest reflects the general applicability of open space preservation. However, the result of the diversity of disciplines is a diversity of approaches to testing similar hypotheses. This chapter begins by focusing on the theoretical aspects of PDR for open space preservation, briefly discusses national trends,

and then proceeds into a more focused review of strategies employed to understand the relationship of community characteristics to the likelihood of successful land preservation measures.

## Theoretical Basis of PDR and Open Space Preservation

The first question to be addressed when considering PDR and open space preservation is: What benefits does society gain from preserving open space? The answer to this question has varied in the literature. In an influential article, which painted agricultural preservation in a somewhat negative light, Gardner argued against the need for non-market based farmland preservation techniques, "it is difficult to see why the market will not allocate sufficient land to food and fiber production. The food and fiber sector of the economy is as competitive as any other, and food and fiber prices adjust rapidly to changing conditions in supply and demand." (Gardner, 1977, p. 1030) However, Gardner identified the inability of the market to provide for environmental amenities and open space, "In any case, in principle at least, the market will not provide the optimal quantity of these amenities; and there may be some justification for social action to remedy this market failure." (Gardner, 1977, p. 1031) In addition to framing the inherent difference between open space preservation and farmland preservation, Gardner also defined the rationale for farmland conservation.

> What society appears to get in the action of preserving agricultural land are at least four joint products...(a) 'sufficient' food and fiber to meet the nutritional requirements of a growing national and world population; (b) local economic benefits that derive from a viable agricultural industry; (c) open space and other

environmental amenities that accrue chiefly to urban residents; and (d) more efficient, orderly, and fiscally sound urban development." (Gardner, 1977, pp. 1028-1029)

In later works advocating for non market-based land preservation techniques, Gardner's summary of the benefits of agricultural land preservation remains largely intact. Kline and Wichelns stated, "the public's objectives for preserving farmland can be described generally as agricultural (preserving agricultural resources), environmental (protecting environmental resources), and municipal (managing the growth of towns and cities)." (Kline & Wlchelns, 1994, p. 224) Norris and Deaton also identified the basic arguments for farmland preservation, "These are 1) maintaining the supply of food, 2) local economic benefits, 3) growth management, and 4) preservation of environmental amenities." (Norris & Deaton, 2001)When considering farmland preservation specific to Michigan, Skjaerlund and Sheridan wrote,

> "The primary benefit of farmland preservation programs is to create a long-term business environment for farm operations with a local community – and in the process maintain the economic contribution of agriculture to the local economy, ensure a local food supply, and minimize the land use conflicts between farming operations and non-farm neighbors." (Skjaerlund & Sheridan, 2003, p. 10)

Skjaerlund and Sheridan's definition of public benefits reflects a common disconnect between farmland preservation and a desire for open space and environmental amenities. Farmland preservation programs are commonly meant to preserve farming as an industry

and way of life, which can come in conflict with the public's desire for an ideal rural setting.

Instead of considering the preferences of individuals, Duke and Lynch (2007) reviewed state conservation programs to identify states' perceived benefits of open space preservation, "states indicate five important goals (with the first three appearing most frequently): food security, environmental services, protection of rural amenities, planned development patterns, and a healthy local economy." (Duke & Lynch, 2007, p. 124) None of the common state goals identified by Duke and Lynch reference the conflict between farm uses and non-farm uses, a chief reason farmers sell their land for development. (Sherman, Milshaw, Wagner, & Freedgood, 1998)

Thomas Daniels, one of the foremost experts on the use of PDR, finds the primary benefits of PDR to be its fairness to landowners and its level of permanence. He argues for its distinct benefits over typical growth management tools, "In short, zoning is malleable and politically vulnerable, whereas PDRs are legally sound and afford more permanent protection for farmland." (Daniels T. , 1991, p. 425) However, he also points out the primary problem with PDR as it relates to planning, is its voluntary nature. "the voluntary aspect may affect the equity of the program: A well-to-do landowner may be able to afford to sell development rights whereas a poor landowner may need the higher returns from selling for nonfarm use." (Daniels T. , 1991, p. 424) An additional issue, also related to equity, is that PDR rewards landowners for public investments that create a demand for their land. (Wright, 1994) As access to public services (water, sewer) is provided, the value of farmland increases, as does the value of the development rights to the land.

In addition to questioning the public benefits gained from open space preservation, experts have also challenged the disconnected relationship between open space preservation and growth management.

> "While the advocates of farmland protection policies acknowledge that the amenity value of agricultural open space contributes to the need for these policies, they deny the growth management hypothesis, and respond that farmland policies are intended to protect critical agricultural resources." (Furseth, 1987, p. 49)

In a telephone survey of 850 residents of Mecklenberg County, North Carolina, Furseth examined respondents' level of support for farmland preservation and challenged the hypothesis that growth management is "designed by affluent suburbanites to exclude less affluent populations from moving into their communities." (Furseth, 1987, p. 50) The conclusion of the telephone surveys was that the majority of respondents (71 percent) support farmland preservation. However, older, female, higher-income, better-educated respondents were the strongest supporters of farmland protection. (Furseth, 1987)

Daniels and Lapping (2005), when considering the relationship between land preservation and smart growth, found, "Land markets have repeatedly failed to create satisfactory land use patterns and instead have fostered residential and commercial sprawl that wastes land resources, provides too little public open space, and destroys wildlife habitat." (Daniels & Lapping, 2005, p. 318) As a result, they advocate for incorporating open space preservation into smart growth policies. The current lack of cross-over between the two tools, both largely created in response to the same problem, sprawl, is both a problem and a great opportunity.

> "Striking a balance among the natural environment, working landscapes, and the built environment is one of the biggest challenges that local governments face. This means that planning for smart growth is at least twice as challenging as planning for growth alone—a reality that the smart growth literature has not recognized." (Daniels & Lapping, 2005, p. 326)

In addition to developing the theoretical basis of open space preservation, many efforts, like the study by Furseth, have been undertaken to define the public's preferences for open space preservation programs.

In 1996, Kline and Wichelns undertook research to understand the public's desire for farmland preservation. They conducted focus groups in Rhode Island Department of Motor Vehicles Offices and later surveyed participants in order to understand the public's beliefs about the purpose of the state PDR program.

> "Factor analysis...reveals a belief among the public that environmental objectives such as protecting groundwater and wildlife habitat, and preserving natural places should be important objectives of farmland preservation programs...agrarian objectives, such as providing local food and preserving farming as a way of life, should not be viewed as the most important objectives of preserving farmland." (Kline & Wilchens, 1996, p. 547)

Kline & Wichelns' 1996 focus groups found the five most important objectives of farmland preservation to be (from 1-5): Protecting groundwater, protecting wildlife habitat, preserving natural places, providing local food, and keeping farming as a way of life. (Kline & Wichelns, 1996, p. 541)

A similar study of the public's demand for farmland preservation was conducted by Norris and Deaton in Kent County, Michigan, with very different results from the Kline and Wichelns 1996 study. Phone surveys were conducted with 133 residents of the County; the survey population was split nearly 50-50 between urban and rural residents. The five opinions about the benefits of preserving farmland respondents agreed with most were (in order from 1-5): Farmland provides a sense of local heritage, farmland provides open space, farmland supports the local economy, farmland provides scenic beauty, and farmland prevents urban sprawl. (Norris & Deaton, 2002) Obviously, some basic differences between the geographies of Kent County and Rhode Island, in addition to differing research methods may contribute to the differences in results. However, the prevalence of "agrarian objectives," as defined by Kline and Wichelns, in the Norris and Deaton study is worth noting.

The theoretical basis for PDR and the public's relative support for a program's goals are extremely important when considering the reasons for success of a particular ballot measure. If the proposed program is focused on preserving farming as a way of life, but the public's desire for farmland is focused on preserving scenic vistas and open space, voters may be less inclined to increase taxes. More importantly, if the program's goals are not clear at the time a tax is voted on, and the tax is approved, the program runs the risk of preserving farmland in a manner contrary to the desires of the citizens paying for the program.

## National Trends and Case Studies

In order to frame the following analysis of open space preservation measures, a basic discussion of the prevalence of open space ballot measures and their general rate of passage on a national level is necessary. In 1998, the sudden explosion of land preservation and growth management measures appearing on state and local ballots across the United States gained national attention. "The local votes were quickly described as part of a national, dramatic grassroots rebellion against sprawl, an urgent call for preserving land, and a clear message of support for smart growth policies." (Myers, 1999) In the 1998 election, 240 local and state conservation ballot measures were considered (including Washtenaw County), 72 percent of which were approved, triggering over $7.5 billion in new spending. (Myers, 1999; Romero & Liserio, 2002; Kotchen & Powers, 2006) It is important to note that not all of these measures were for new taxes; many were funded using bonds or other means. Despite the high rate of overall success, unsuccessful high-profile campaigns were not uncommon. "In general, failed measures are perceived to result from an overly narrow focus, too little preparation, or overconfidence in voter support for a vague green measure." (Myers, 1999, p. 12)

Since 1998, the number of ballot measures considered nationally has varied significantly. The variation is based on the election cycle, more measures are considered in state and national election years than odd years, but it also tracks the relative health of the national economy. Table 2.1 is taken from the Trust for Public Land's LandVote database. The distribution of these measures is not equal across the country. Since 1988, 1,204 measures have been considered in Mid-Atlantic and Northeastern states, compared with 1,028 measures in the rest of the country. (Trust for Public Land, 2009)

**Table 2.1: National land conservation ballot measures**

| Year | Number of Measures | Number of Measures Passed | Total Funds Approved | Conservation Funds Approved |
|---|---|---|---|---|
| 1988 | 24 | 22 | $1,947,133,862 | $1,418,078,862 |
| 1989 | 29 | 22 | $1,409,488,521 | $937,676,870 |
| 1990 | 41 | 24 | $1,386,796,066 | $1,312,828,066 |
| 1991 | 16 | 10 | $187,802,360 | $168,157,360 |
| 1992 | 36 | 26 | $2,038,626,000 | $1,744,941,000 |
| 1993 | 22 | 18 | $578,315,860 | $551,137,753 |
| 1994 | 50 | 33 | $1,044,541,125 | $621,248,511 |
| 1995 | 41 | 33 | $1,234,512,844 | $1,114,619,344 |
| 1996 | 98 | 70 | $5,252,905,715 | $1,341,898,035 |
| 1997 | 81 | 67 | $2,590,953,306 | $768,714,321 |
| 1998 | 176 | 144 | $7,229,154,744 | $5,857,672,774 |
| 1999 | 107 | 95 | $2,423,294,502 | $2,172,135,868 |
| 2000 | 208 | 170 | $11,434,170,431 | $5,223,047,298 |
| 2001 | 198 | 138 | $1,802,683,640 | $1,369,510,437 |
| 2002 | 192 | 142 | $8,589,701,162 | $5,502,616,357 |
| 2003 | 133 | 99 | $1,791,915,328 | $1,275,871,985 |
| 2004 | 218 | 163 | $26,110,658,413 | $3,975,214,265 |
| 2005 | 141 | 111 | $2,618,811,630 | $1,598,003,889 |
| 2006 | 183 | 136 | $29,082,167,202 | $6,706,777,535 |
| 2007 | 99 | 65 | $2,244,755,926 | $1,951,415,707 |
| 2008 | 127 | 90 | $11,102,328,340 | $8,407,276,140 |
| 2009 | 10 | 5 | $287,393,960 | $248,397,987 |
| **TOTAL** | **2,230** | **1,683** | **$122,388,110,937** | **$54,267,240,364** |

Source: http://www.tpl.org/tier3_cd.cfm?content_item_id=12010&folder_id=2386

This difference in regional distribution is evident not only on the national level, but at the state and regional level as well. Figure 1.1displays the tendency of PDR millage votes to occur in Michigan jurisdictions located in the Southeast and Northwest corners of the Lower Peninsula.

Two of the most successful states in preserving open space and agricultural land have been Pennsylvania and Maryland, and two counties within those states, Lancaster County, Pennsylvania and Montgomery County, Maryland have been particularly

successful. "...about thirty-six thousand acres have been conserved using TDRs' [nationally] twenty–four thousand of those acres are in Montgomery County, Maryland." (Wright, 1994, p. 382)

Obviously the rest of the country has caught up to Montgomery County's use of TDR since the early 1990's, but Montgomery County is the gold standard for the tool, as the county had preserved over 51,000 acres as of 2004. (Wison & Paterson, 2002) The state of Maryland on the whole has been very successful in preserving land, largely due to its active growth management program. A wealth of land preservation programs have been established over the last four decades. In 1969, Maryland established Program Open Space, which authorized a real-estate transfer tax to fund land preservation. Additionally, the state has established the Maryland Environmental Trust, the Agricultural Land Preservation Program, and the Rural Legacy Program. (McMahon & Mastran, 2004)

Montgomery County has taken full advantage of all state programs, in addition to establishing effective local programs for land preservation. Much of the county's success can be attributed to a consistent commitment to long-range planning. As early as 1964 the county council was aware of the negative effects of unplanned growth, and adopted a regional plan to preserve the area's quality of life. In 1980, the county created a 93,000 acre Agricultural Reserve, where zoning required 25 acres per dwelling unit. (Wilson & Paterson, 2003)

Within the Agricultural Reserve there are a variety of programs that purchase development rights, although development rights transfer is much more prevalent. The

Rural Legacy Program, the Montgomery County Agricultural Easement Program, and the Maryland Agricultural Land Preservation Foundation have all purchased development rights in the county. Funding sources for the programs vary: the RLP is funded by the state real-estate transfer tax; the MALPF is funded through the real-estate transfer tax and an agricultural transfer tax; and the County Program is funded by proceeds from the agricultural transfer tax and general obligation bonds. (Wilson & Paterson, 2003) Overall, the success of Montgomery County would seem to be due to the variety of tools employed to achieve the same goal, preserving open space.

Like Montgomery County, Lancaster County has employed a variety of techniques to protect open space and has a history of effective long-range planning. In 1975 the County master plan identified 278,000 acres for preservation; this was followed by townships within the county adopting agricultural zoning on over 300,000 acres. (Daniels T. , 1998) Lancaster County has also created *Agricultural Security Areas*, designated areas where landowners have applied to their respective township for designation as a security area. The designation does not impose any additional regulation on land owners; however, it does provide some protection from nuisance suits and condemnation actions for landowners. Additionally, being located in a security area makes a landowner eligible for the county purchase of development rights program. As of 2002, the county had preserved approximately 55,000 acres. (Wilson & Paterson, 2003)

The Lancaster County Purchase of Conservation Easement (equivalent to PDR) Program is funded by a variety of sources. The county has previously received funding from the Federal Farm Bill, but the bulk of funding comes from state and county funds.

State funds are generated by a two-cent tax on cigarettes. The county matches funds provided by the state from the general fund or through bonds. (Wilson & Paterson, 2003)

It is important to note the differences between the variety of funding and programs in place in Lancaster and Montgomery Counties in comparison with the funding and program options available in Michigan. However, perhaps more important is the commitment to master planning in both counties that preceded open space preservation efforts.

## Community Characteristics and Open Space Preservation Measures

When attempting to predict/explain the success/failure of land preservation measures the literature generally considers variables related to three areas, two of which are commonly combined: 1) Socioeconomic data and political preference, and 2) land use change and development pressure. Studies considering socioeconomic data and/or land use change are the most common, and few studies consider one without the other, however, all studies considering political preference also consider socioeconomic data, thus the split. The difficulty in attributing political preference to votes taking place over a series of years, as political preferences may change based on candidates running in a particular election year makes it difficult to consider political factors alone. Socioeconomic data is also commonly conceived as a proxy for political preference. Following, studies are divided based on their primary area of concern, overlap between categories is unavoidable, but the division is helpful when considering the variety of literature.

### *Socioeconomic and political data*

In one of the earliest studies of the effect of socioeconomic data on voting results, Deacon and Shapiro constructed an econometric model to explain voter preferences for public (largely environmental) goods and evaluated it using a regression. The voting results from two California referenda were the dependent variables, and education, income, and political preference were among the independent variables. They found voters largely consider their self-interest, even when voting for collective goods, "observed voting responses were consistent with self-interest." (Deacon & Shapiro, 1975, p. 954) Additionally, it was found that conservative voters were more likely to vote against the measures, while more educated voters generally were supportive.

Kahn and Matsusaka (1997) evaluated voting patterns on environmental initiatives on a county-wide basis in California. Among the primary purposes of the study was determining whether political preference was relevant in such votes, or voters tended to vote based on self-interest, not political ideology. Variables included in an initial analysis, not considering political affiliation, included education, importance of resource-dependent industries, population, and income. In the initial analysis they found, "income matters for environmental voting. Moreover, the relationship between voting for environmental goods and income appears to be concave...concavity implies that it [the environment as a good] is normal for low-enough incomes and inferior for high-enough incomes." (Kahn & Matsusaka, 1997, p. 151) In order to evaluate the relative importance of party preference, Kahn and Matsusaka used two variables, results from the 1994 presidential vote and party registration. The presidential vote variable was most significant, and "while income and price explain most of the variation, it seems that party

preferences can be useful in explaining some of the residual variation." (Kahn & Matsusaka, 1997, p. 161)

Soleck, Mason, and Martin, in a review of voter support New Jersey's 1998 open space ballot measure, considered an array of variables, including the presence of federally or state protected lands, a variable unique to their analysis. The influence of location was significant in their analysis,

> "Although strong support was widespread, the highest levels of support were in northern and central New Jersey, and more specifically in areas known to be experiencing greater than average growth. In general, support was lowest in older urban areas and in communities in the southeastern part of the state." (Soleck, Mason, & Martin, 2004, p. 631)

Generally, Soleck et al. found voter support to be most highly correlated with higher socioeconomic status, and low voter support to be correlated with the presence of existing open space preservation programs, such as the Pinelands National Reserve.

In a study of the differences in voting behavior on environmental ballot measures between states, Salka evaluated county-wide voting data on state environmental measures in California, Colorado, Florida, Michigan, and Oregon. The primary question sought to be answered was whether or not the presence of resource-dependent industries had significant influence on voting behavior. A regression was used to correlate county voting data and socioeconomic and political variables. In summary, Salka found support for the Republican Party was negatively correlated, while a high level of education, and median income were positively correlated. Resource dependence, the primary subject of

the study, was found to be much more influential in western states than in non-western states.

Arguably the most detailed study was conducted by Nelson, Uwasu, and Polasky in 2007. They evaluated 718 municipal-level referenda that took place between 2000 and 2004 and, in addition to asking what factors affect the success of open space referenda, also asked what factors increase the chances of an open space referenda taking place. Variables considered included population density, tenure, percent change in number of households, percent change in farmland and the share of votes cast for Bush, Gore, and Nader in the 2000 presidential election. In summary, Nelson et al. found:

> "Our model estimates indicate that richer, more educated, faster growing areas – both in the municipality and in its surrounding environs – and environmentally concerned municipalities are much more likely to have open space referenda and subsequently pass the referenda...Increasing taxes to pay for open space significantly decreased support for open space referendum relative to bond financing or financing from existing taxes." (Nelson, Uwasu, & Polasky, 2007, p. 591)

Additionally, Nelson et al. found no evidence of selection bias among communities considering an open space preservation measure. "It appears that controlling for selection bias is relatively unimportant in analyzing referenda results." (Nelson, Uwasu, & Polasky, 2007)

Similarly, Kotchen and Powers (2006) considered all national open space preservation votes occurring between 1998 and 2006, and specifically analyzed all votes

taking place within New Jersey and Massachusetts. They tested many of the same variables tested by Nelson et al., in addition to a few others and unsurprisingly, many of the same conclusions were drawn. "Across the nation, jurisdictions that have held open-space referenda differ from national averages in several respects. They tend to have greater population growth, greater household incomes, greater home values, and greater home ownership rates." (Kotchen & Powers, 2006, p. 388) The primary difference between Kotchen and Power's analysis and Nelson et al. is the attention paid to financing mechanisms by Kotchen and Powers. When evaluating the effect of financing mechanism, and relative cost to voters, the relationship between support and cost was found to be concave, not linear. "At the local level—where spillin effects are likely to be small—higher funding rates tend to decrease voter support. At the state-county-level—where spillin effects are likely to be large—higher funding rates tend to increase voter support." (Kotchen & Powers, 2006, p. 388)

In two studies focused on the influence of the environment as a political issue, Anderson and Mizak (2006) and Davis and Wurth (2003) consider socioeconomic variables as well. Anderson and Mizak analyzed the influence of the socioeconomic characteristics of the constituencies of United States Senators on their voting patterns, finding,

> "the characteristics of districts and states, including the percentage of single people and the income per capita – items that are more reflective of urban rather than rural areas – are strong predictors of how a representative will vote. The strongest predictor that we find is whether or not the elected official is a Democrat." (Anderson & Mizak, 2006, p. 155)

Davis and Wurth considered similar questions, but used voter survey results following the 1996 presidential election. In addition to a variety of other predictors of support for presidential candidates, environmental spending was also considered. "Most important for our purposes, the results of the logit analysis support the hypothesis that the environmental spending variable is a statistically significant predictor of voter choice between Clinton and Dole." (Davis & Wurth, 2003, p. 737) Additionally, it was found that pressing for economic sacrifice on behalf of the environment was a dangerous political strategy.

***Land use change and development pressure***

Kline and Wichelns 1994 developed an economic model to "describe public support for farmland preservation programs as a function of local land use patterns and socio economic data." (Kline & Wlchelns, 1994, p. 223) The final conclusion of the model was development pressure is the best predictor of successful PDR referenda. Two versions of the model were created, one for Pennsylvania, and one for Rhode Island, the percentage of "yes" votes in local conservation referenda in was used as the dependent variable for both. Independent variables used were the percent of land in farms, percent change in population, and percent change in land and house values. Income and education variables were dropped from the model because they were not significant. "Results of this study suggest that PDR funding is most likely to be approved in places with the greatest increase in population and the greatest increase in land and house values." (Kline & Wlchelns, 1994, p. 232)

Pfeffer and Lapping 1995 considered the influence of type of farm on the success of PDR measures. The change in two types of farms, dairy and fruit was considered, in addition to change in population, and other socioeconomic variables.

> "fruit farms are of greatest relative importance in predicting public PDR support, followed by diary and then population. The effects of these changes are independent of the statistically significant control variables in the model: county population size, percentage of land in farms, whether the planner works as a consultant to a public or private organization, and whether a PDR program is available in the county." (Pfeffer & Lapping, 1995, p. 43)

The fruit farm versus dairy farm predictor indicates that when a jurisdiction provides residents with an ideal farm use (a beautiful, non-intrusive orchard) support is high, however, when a less-than desirable dairy farm is considered, preservation is not supported at the same rate. Pfeffer and Lapping concluded that a large portion of the popularity of PDR in the northeast stemmed from development pressure in urban fringe areas. "population growth stimulates demand for PDR, presumably as nonfarm residents strive to maintain the rural ideal they sought in moving to the area." (Pfeffer & Lapping, 1995, p. 44)

In a national study, Romero and Liserio (2002) attempted to determine whether sprawling communities were more likely to consider open space conservation measures, or if open space measures were a result of media "hype." In order to do so they compared all communities considering an open space measure with a control group of "sprawling communities" as defined by the Sierra Club's 1998 national report on the

subject. The final conclusion of the project was that, "smaller, wealthier, and whiter areas were the most likely to include open-space preservation measures on 1998 and 1999 ballots, regardless of whether actual sprawled development was apparent." (Romero & Liserio, 2002, p. 343) However, the primary measure of a community's level of sprawl was population density, which posed significant problems when comparing counties to cities and townships.

In response, Howell-Moroney tested the same hypothesis, using land use change analysis in addition to population density as a measure of urban sprawl. However, he limited his study to the Delaware Valley region, and included all municipalities, to account for the possible selection bias that exists when considering only communities that voted on a ballot measure. His results were quite different from Romero and Liserio's. "...population density is *negatively* related to open-space vote probability *and* is statistically significant. This is the exact opposite of Romero and Liserio's original result..." (Howell-Moroney, 2004a, p. 175) Howell-Moroney also accounted for the problem of using density as a comparison between jurisdictions by using land use change as an independent variable in a regression analysis. The result was that communities experiencing sprawl as defined by loss of open space and increase in acreage of single family dwellings were more likely to hold an open space vote. However, Howell-Moroney does not dismiss the potential for "hype" to influence votes on sprawl.

> "...it is certainly possible that citizen irrationality *can and does exist* as it relates to sprawl, *but* actual land use patterns and state incentives have the effect of spurring the planning bureaucracies in communities to initiate the process for getting open-space votes on the ballot." (Howell-Moroney, 2004a, p. 178)

The influence of local planning bureaucracies and state programs encouraging preservation programs are often ignored in studies of open space preservation measures, which Moroney investigated further.

In another study published in 2004, Howell-Moroney again considered the prevalence of open space votes in the Delaware Valley region. Using logistic regression, he found "higher levels of community socioeconomic status and higher levels of community growth were both associated with higher likelihoods of open space policy adoption." (Howell-Moroney, 2004b, p. 116) However, Howell-Moroney draws an additional inference from the data unique to his study. He argues that the prevalence of local open space preservation policies has a negative effect on efforts to establish regional planning. "If sprawl has the ability to demonstrate the efficacy of regionalism, it also has the ability to further entrench the localism of the status quo through locally based solutions." (Howell-Moroney, 2004b, p. 117)

In addition to studies considering the effect of community characteristics on the success of open space preservation measures, contingent valuation studies, measuring people's willingness to pay must also be considered. All such studies reviewed found at least some evidence to prove there are public benefits to private landscapes and environmental amenities or assume that such goods contain public benefit (Lindsey & Knapp, 1999; Schlapfer, Roschewitz, & Hanley, 2004) These studies are relevant because they evaluate willingness to pay based on socioeconomic data, "support for greenway projects, measured as willingness to pay and as willingness to donate...was greater among property owners than renters and greater among those who lived in the corridor than among those who did not." (Lindsey & Knapp, 1999, p. 309) Other studies found

education, gender, urban residence, farm occupation, use of parks, and distance to an urban growth boundary to be predictive of voting behavior. (Schlapfer, Roschewitz, & Hanley, 2004; Vossler, Kerkvliet, Polasky, & Gainntdinove, 2003) Additionally, all three studies cited herein found respondents to contingent valuation surveys consistently reported a higher willingness to pay than they expressed when given the opportunity to contribute or vote on a tax increase. "In all observed voting choices we identified as 'inconsistent,' stated willingness to pay was not marginally but indeed around 10 to 20 times higher than the costs of the (rejected) actual proposition." (Schlapfer, Roschewitz, & Hanley, 2004, p. 14)

# CHAPTER 3: METHODOLOGY

The hypothesis of this research is that the success of Michigan PDR millage votes, like the ballot measures discussed in Chapter 2, is tied to the characteristics of the community considering the millage. Specifically, that higher socioeconomic status and greater development pressure create support for PDR millages in Michigan. In order to test this hypothesis a dataset has been created consisting of all minor civil divisions that have considered a PDR millage in Michigan. A set of independent variables consisting of statistics relating to community characterstics, development pressure, and political circumstances was then chosen based on the literature review. The percent of "yes" votes in each MCD is used as the dependent variable. A bivariate correlation is used to evaluate the effect each independent variable has on the dependent variable, a stepwise regression based on select variables and a linear regression using all variables determines the degree to which the most significant variables as well as the entire model explain the variance in Michigan PDR millage votes.

## Datasets

The most challenging portion of this project was developing a conclusive set of Michigan jurisdictions that had voted on a PDR millage. In order to ensure no jurisdiction was missed, the Trust for Public Land's LandVote database was used in addition to discussions with state experts in land use and land preservation. The initial set of jurisdictions was created without assistance from the TPL's LandVote database, but the database was used for verification purposes. The database contained two townships (Berlin and Augusta) that were not part of the original dataset.

As of January 2009, eighteen Michigan jurisdictions have voted on nineteen PDR millage proposals (Peninsula Township approved a millage in 1994 and again in 2002). Although this is a fair number of millage votes to consider qualitatively, the dataset is too small to gather significant quantitative information from. The solution to this problem lies in one of the primary difficulties of working with the data, the variety of jurisdiction types (Table 3.1).

**Table 3.1: Jurisdictions and rate of success**

| Jurisdiction Type | Number of PDR Millage Votes | Number of PDR Millages Adopted | Success Rate |
|---|---|---|---|
| County | 4 | 1 | 25% |
| Township | 14 | 7 | 50% |
| City | 1 | 1 | 100% |
| Total | 19 | 9 | 47% |

Of the eighteen jurisdictions, four are counties. When county results are disaggregated, a consistent unit of analysis, Minor Civil Division (MCD), can be used throughout. All data available for an MCD considering a millage is also available for an MCD considering a county-wide millage, including vote totals by precinct. When the county vote results are replaced with individual MCD results, seventy-seven jurisdictions are added to the dataset (Appendix A lists all county MCDs). This provides distinct advantages to considering the relationship between percent yes votes and community characteristics in the initial nineteen jurisdictions. By disaggregating county vote results, the problems present in Romero and Liserio's (2002) comparison of density between counties and cities is avoided and the model's level of statistical significance increases

greatly. The final data set has a population of 92 (the four counties are dropped when all MCDs within each county are added (77+15=92)).

The use of MCDs also creates an opportunity for a unique analysis of select jurisdictions in Washtenaw County and one in Ingham County. Washtenaw County considered a county-wide PDR millage in 1998 that was unsuccessful. Since that time five townships and the City of Ann Arbor have considered a millage to purchase development rights. The same situation exists for Meridian Township in Ingham County; it approved a millage in 2000 and again considered a county-wide millage in 2008.

In order to consider development pressure influences, a second dataset is created at the county-level. Ideally, land use change information would be considered according to each MCD, but there is no reliable land use change data for the entire state of Michigan that is applicable to the time period considered by this project. Therefore, county-level land use change data provided by the Census of Agriculture is used instead. The mean percent "yes" votes in each county serves as the dependent variable for the county dataset.

## Analysis

The final MCD dataset consisting of 92 jurisdictions is used in a bivariate correlation and two regression analyses to determine the relative effect of the independent variables on the percent of "yes" votes in each jurisdiction. Romero and Lisero (2002), Salka (2003), and Solecki, Mason, and Martin (2004) used linear regressions to evaluate results. In this case a bivariate correlation and stepwise regression are used to control for the effect of multicollinearity. Multicollinearity occurs when independent variables are

highly correlated with each other, causing regression coefficient values to vary erratically. Because the socioeconomic data contained herein is intrinsically related, removing the influence of multicollinearity is a must in order to make reasonable conclusions about the influence of individual variables on percent "yes." Importantly, multicollinearity does not affect the predictive power of a model as a whole, it does greatly reduce the accuracy of individual coefficients within a model. Appendix B contains a correlation matrix of all independent variables, and illustrates the high level of correlation between them. Therefore, significance level, correlation values, coefficient signs, and coefficient values are used indicate the relative influence of each variable on support for Michigan PDR millage proposals.

The process of separating the influence of variables in order to obtain a reasonable model consisted of three steps. This is a method not used in the literature reviewed for this project. Due to unique characteristics of the data (small sample size, etc.) compared to other similar studies, multicollinearity must be addressed. First, a bivariate correlation indicates which independent variables have a significant correlation with percent "yes." Second, variables with a significant correlation are then separated from those without a significant correlation to remove some unnecessary noise in the data. Third, a linear regression is employed using percent "yes" as the dependent variable and the independent variables selected in the second step. Table 3.2 contains a description of each variable, its source, the subject it addresses, and the expected sign of the correlation value.

Other studies of open space ballot measures and community characteristics have employed a "log-odds ratio" of the percent of "yes" votes as a dependent variable

**Table 3.2 Independent variable description**

| Variable | Source | Area Addressed | Expected Sign |
|---|---|---|---|
| Total Population | 2000 and 1990 US Census | Community Characteristics | + |
| Percent of population rural | 2000 and 1990 US Census | Community Characteristics | - |
| Percent of population living in a different county five years prior | 2000 and 1990 US Census | Community Characteristics | - |
| Educational attainment | 2000 and 1990 US Census | Community Characteristics | + |
| Median household income | 2000 and 1990 US Census | Community Characteristics | + |
| Percent of owner-occupied housing | 2000 and 1990 US Census | Community Characteristics | + |
| Median age | 2000 and 1990 US Census | Community Characteristics | - |
| Median home value | 2000 and 1990 US Census | Community Characteristics | + |
| Percent change in population | 1980, 1990, and 2000 US Census | Development Pressure | + |
| Change in Percent Rural | 2000, 1990 and 1980 Census | Development Pressure | + |
| Percent change in home value | 2000, 1990 and 1980 US Census | Development Pressure | + |
| Percent change in number of households | 2000, 1990 and 1980 US Census | Development Pressure | + |
| Population density | 2000 and 1990 US Census and Michigan Center for Geographic Information | Development Pressure | + |
| Percent change in land in farms* | 1987-2007 US Census of Agriculture | Development Pressure | + |
| Percent change in value of farmland* | 1987-2007 US Census of Agriculture | Development Pressure | + |
| Voter turn-out | Individual County and Township Clerks Offices | Political | - |
| Percent of voters not casting a vote for the millage | Michigan Secretary of State | Political | - |
| Percent voting for Bush in 2004 | Michigan Secretary of State | Political | - |

*Available only at the County-level (this data is also available for the few major cities included in the study, but in order to maintain a consistent level of analysis, the county-level is used).

(Nelson, Uwasu, & Polasy, 2007; Kahn & Matsusaka, 1997; Kline & Wlchelns, 1994) This is a form of a model originally employed by Deacon and Shapiro (1975) that allows researchers to make inferences about voter preferences from aggregated election results and employ a logistic regression. (Kotchen & Powers, 2006) The purpose of the present research is not to understand voter preference. This research is concerned with characteristics of minor civil divisions that affect the percent of "yes" votes. Individual voter preference is not considered; therefore the log-odds ratio is not used as the dependent variable.

In addition, the same three steps are used to evaluate the county-level data to consider land use change data that cannot be evaluated at the MCD level. The mean percent "yes" value of all votes in each county in which a PDR vote has taken place is used as the dependent variable and percent land in farms change from 1987 to 2007 and change in value of farmland per acre from 1987 to 2007 are used as independent variables. Table 3.3 displays the mean vote result in each County. The alternative for aggregating vote results to the county-level is the success rate of votes within each county; this was not used due to the number of counties with a success rate of zero.

**Table 3.3: Development pressure county-level data**

| Jurisdiction | Mean Yes | Success Rate |
|---|---|---|
| Antrim | 0.430569667 | 0 |
| Grand Traverse | 0.54445 | 0.6 |
| Ingham | 0.53035 | 1 |
| Lapeer | 0.4136 | 0 |
| Leelanau | 0.3786 | 0 |
| Monroe | 0.220984215 | 0 |
| Washtenaw | 0.597914388 | 0.666666667 |

## Variables

In addition to using the TPL's database, voting data was gathered by contacting the clerks of local jurisdictions to obtain voter registration data and ballot language. Total ballots cast, used to calculate voter turn-out, was primarily taken from the Michigan Secretary of State's office website. The remaining variables were gathered from a combination of the 2000 and 1990 Census and 1987-2007 Census of Agriculture. (See Table 3.3)

Based on the literature, three general categories of variables affecting vote outcome were identified: 1) Community Characteristics, 2) Development Pressure, and 3) Political Influences. Community Characteristics includes typical socioeconomic statistics and other statistics like total population and median age that describe community type. Development pressure is difficult to measure in this context because consistent and reliable land use/land cover change data is not available for all townships in Michigan and Census of Agriculture land use data is only available at the county-level. Consequently, proxies for development pressure based on change in population, number of households, and home value are used in the MCD model and a separate model based on county-level development pressure data is used to consider land use and land value changes. Additionally, the change in percent of population rural is used to illustrate rate of urbanization, which was not done in the studies reviewed for this research. Of the three categories, the third is undoubtedly the most difficult to investigate, and nearly impossible to quantify with any significance due to the relatively small dataset of nineteen jurisdictions holding a PDR millage vote in Michigan. Unlike census statistics,

there is a limited ability to disaggregate political variables because the unit of analysis is the jurisdiction holding the vote.

As a result of discussions on methodology in Kline and Wichelns (1994) and Kotchen and Powers (2006) addressing the problem of abstention in open spaces votes, the percent of voters not casting a vote for a particular millage is added as a variable. This variable is created by subtracting the number of votes for and against a millage from the total number of ballots cast.

Some discussion of data sources used for the independent variables in Table 3.3 is necessary due to the span of time (fourteen years) considered in this analysis. 2000 US census data is used for all socioeconomic variables except for those associated with the Peninsula Township 1994 millage vote, for which 1990 data is used. Conversely, the 2000 census is used to evaluate the 1998 Washtenaw County millage because it provides a more accurate description of the County at the time of the vote than the 1990 census. Variables related to development pressure all measure the relative change of a value between 1990 and 2000, with the exception of Peninsula Township 1994, which uses 1980 and 1990 census data to measure change. The age of socioeconomic data compared to the date of millage vote is a concern for the most recent votes (see Table 1.3); however, American Community Survey data is only available for places with a population of 65,000 or more, which eliminates eighty-nine of the ninety-two MCDs.

# CHAPTER 4: RESULTS

Variable abbreviations were developed in order execute the three step process for testing the hypothesis that the success of Michigan PDR votes is positively related to socioeconomic status and development pressure. Table 4.1 explains independent variable abbreviations used in the analyses. The results of the tests run on each data set are then detailed in the subsequent sections, first the results of the MCD dataset are given, followed by the results of the County dataset, and finally the results are given of the hypothesis as it relates to the three variable areas examined.

**Table 4.1: Independent variable abbreviations**

| Abbreviation | Variable |
|---|---|
| Total Pop. | Total population |
| % Rural Pop. | Percent of population rural |
| % Rural Pop. Change | Percent change in rural population 1990-2000 |
| % Mobility | Percent of population living in a different county five years prior |
| Educational Attainment | Percent of population with a bachelors degree or higher |
| Median Income | Median household income |
| % Owner Occupied Housing | Percent of owner-occupied housing |
| Median Age | Median age |
| Median Home Value | Median home value |
| % Change Home Value | Percent change in home value 1990-2000 |
| % Change Households | Percent change in number of households 1990-2000 |
| Density | Persons per square mile |
| % Not Voting | Percent of voters not voting on the millage |
| Voter Turn-out | Percent of registered voters voting in the election |
| Bush Vote | Percent of votes for George W. Bush in 2004 |
| % White | Percent of White population |
| % Change Farmland Acres | Percent change in acres of farmland 1987-2007 |
| % Change Farmland Value | Percent change of value per acre of farmland 1987-2007 |

## MCD Dataset Results

Three separate tests were run on the MCD dataset. The results of the first, a bivariate correlation analysis are contained in Table 4.2. The bivariate correlation evaluates each variable independently, permitting one to consider the importance of each relative to the percent of "yes" votes (hereafter simply "Yes"). Of the sixteen variables considered in the MCD dataset, nine (Total Pop. % Rural Pop., % Mobility, Educational Attainment, % Owner Occupied Housing, % Change Home Value, Density, Bush Vote, and % White) are significant at the .01 level and one (Home Value) is significant at the .05 level. The correlation value for Educational Attainment (.542) is the closest to 1 or -1, the next-closest is % Owner Occupied Housing at -.472.

The MCD stepwise regression used a data set consisting of the above ten variables. The most significant variable when the entire model is considered is Educational Attainment; it alone explains 29% of the variance in Yes (Table 4.3). % Owner Occupied Housing is the only other independent variable chosen for the stepwise regression, it explained an additional 8% of the variance in Yes.

Finally, the MCD linear regression using all variables produced an adjusted $R^2$ value of .375, compared to the stepwise regression adjusted $R^2$ value of .361. This means the addition of the remaining fourteen variables explains only 1.4 percent of the variance in Yes. Tables 4.2 through 4.5 contain results of the MCD dataset analysis. Coefficient values from the linear regression are not considered due to the high degree of multicollinearity in the independent variables.

**Table 4.2: MCD bivariate correlation results**

| Variable | Pearson Correlation | Sig. (2-tailed) | N |
|---|---|---|---|
| Total Pop. | 361** | .000 | 92 |
| % Rural Pop. | -.423** | .000 | 92 |
| % Rural Pop. Change | -.073 | .491 | 92 |
| % Mobility | .354** | .001 | 92 |
| Educational Attainment | .542** | .000 | 92 |
| Median Income | -.064 | .544 | 92 |
| % Owner Occupied Housing | -.474** | .000 | 92 |
| Median Age | -.156 | .139 | 92 |
| Median Home Value | .261* | .012 | 92 |
| % Change Home Value | -.370** | .000 | 92 |
| % Change House Holds | .140 | .184 | 92 |
| Density | .358** | .000 | 92 |
| % No Vote | -.036 | .731 | 92 |
| Voter Turn-out | .007 | .944 | 92 |
| Bush Vote | -.358** | .000 | 92 |
| % White | -.271** | .009 | 92 |

*Correlation is significant at the .05 level. **Correlation is significant at the .01 level.

**Table 4.3: MCD stepwise regression model**

| Correlated MCD Stepwise Regression | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Change Statistics | |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change | F Change |
| 1 | .542[a] | .294 | .286 | .08866015065 | .294 | 37.494 |
| 2 | .613[b] | .375 | .361 | .08386193587 | .081 | 11.593 |

a. Predictors: (Constant), Educational Attainment
b. Predictors: (Constant), Educational Attainment, % Owner Occupied Housing

**Table 4.4: MCD stepwise regression coefficients**

| Correlated MCD Stepwise Regression | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 2 | (Constant) | .523 | .060 | N/A | 8.649 | .000 |
| | Educational Attainment | .253 | .054 | .422 | 4.641 | .000 |
| | % Owner Occupied Housing | -.217 | .064 | -.310 | -3.405 | .001 |

Dependent Variable: Yes

**Table 4.5: MCD linear regression model**

| MCD Linear Regression | | | | |
|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .702 | .493 | .375 | .08148296308 |

Dependent Variable: Yes

## County Dataset Results

The same process used to evaluate the MCD dataset is used on the County dataset. However, the dependent variable is different. The mean Yes value in each of the seven counties considered is used as the dependent variable in place of Yes. The correlation test indicates that one of the two independent variables, % Change in Farmland Value, is significant. Furthermore, % Change in Farmland Value has a correlation value very close to -1, of -.816. The other variable, % Change in Farmland Acres is not significantly correlated, but it too has a negative correlation value. Table 4.6 contains the County dataset correlation values.

**Table 4.6: County bivariate correlation results**

| Variable | Pearson Correlation | Sig (2-tailed) | N |
|---|---|---|---|
| % Change Farmland Acres | -.201 | .665 | 7 |
| % Change Farmland Value | -.816* | .025 | 7 |

*Correlation is significant at the .05 level

Because only one of the variables in the County dataset was significantly correlated with Yes, the stepwise regression had only one variable to choose from. However, % Change Farmland Value was significant, and when used alone in a regression analysis creates a model significant at the .01 level with an adjusted $R^2$ value of .598. When % Change Farmland Acres is added in a linear regression the adjusted $R^2$ value increases to .743; meaning although % Change Farmland Acres is not significant it adds explanatory power to the model, increasing the variance in mean Yes explained by approximately 15%. Tables 4.7 and 4.8 contain the County stepwise regression results and Table 4.9 contains the linear regression model results as well as all other model's significance values.

**Table 4.7: County stepwise regression model**

| County Stepwise Regression | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Change Statistics | |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change | F Change |
| 1 | .816[a] | .665 | .598 | .0803114 | .665 | 9.937 |

Predictors: (Constant), % Change Farmland Value

**Table 4.8: County stepwise regression coefficients**

| County Stepwise Regression | | | | | | |
|---|---|---|---|---|---|---|
| | | Unstandardized Coefficients | | Standardized Coefficients | | |
| Model | | B | Std. Error | Beta | t | Sig. |
| 1 | (Constant) | .783 | .111 | N/A | 7.032 | .001 |
| | % Change Farmland Value | -.270[a] | .086 | -.816 | -3.152 | .025 |

a. Dependent Variable: Mean Yes

Due to population size, the significance level of the MCD linear regression model is higher than the County linear regression model. However, the adjusted $R^2$ value of the County linear regression model is .743, and the adjusted $R^2$ value of the County stepwise regression is .598, both of which are higher than the MCD models (.375 and .361 respectively). The sum of these results is that the MCD model explains less of the variance in Yes than the County model explains in mean Yes.

**Table 4.9: Model significance**

| Model | N | $R^2$ | Adjusted $R^2$ | Sig. |
|---|---|---|---|---|
| Stepwise MCD | 92 | .375 | .361 | .000 |
| Stepwise County | 7 | .665 | .598 | .001 |
| Linear MCD | 92 | .493 | .375 | .000 |
| Linear County | 7 | .828 | .743 | .029 |

The above results are mixed as they relate to the hypothesis that Michigan PDR millage votes are influenced positively by socioeconomic status and increased development pressure. In the next three sections, the results are evaluated by variable category based on coefficient values and significance levels in the bivariate correlation and stepwise and linear regressions.

## Community Characteristics

In total, nine community characteristic variables were considered. Of those, seven (Total Pop., % Rural Pop., % Mobility, Educational Attainment,% Owner Occupied Housing, Median Home Value, and % White) have a significant correlation with Yes. (Table 4.10) However, when the hypothesis that Yes is positively correlated with higher socioeconomic status is tested based solely on coefficient signs it fails. Values typically positively related to high socioeconomic status; % Owner Occupied Housing, Median income, and % White, are negatively correlated with Yes. Additionally, Median Age and % Mobility were positively correlated with Yes, a result that was not anticipated.

**Table 4.10: Community characteristics variables**

| Variable | Correlation Sig. | Correlation | Stepwise Coefficient | Expected Sign |
|---|---|---|---|---|
| Educational Attainment** | .000 | .542 | .253 | + |
| % Owner Occupied Housing** | .000 | -.474 | -.217 | + |
| Total Pop.** | .000 | .361 | N/A | + |
| % Pop. Rural** | .000 | -.423 | N/A | - |
| % Mobility** | .001 | .354 | N/A | - |
| % White** | .009 | -.271 | N/A | + |
| Home Value* | .012 | .261 | N/A | + |
| Median Age | .139 | -.156 | N/A | - |
| Median Income | .544 | -.064 | N/A | + |

*Significant at the .05 level. **Significant at the .01 level.

Of the nine socioeconomic variables, two are significant in the stepwise regression, each at the .01 level (Table 4.10 and 4.4). Interestingly, the correlation values

of the two significant variables provide conflicting conclusions when testing the socioeconomic status hypothesis. If Yes is correlated with higher socioeconomic status, it should have risen with Educational Attainment and % Owner Occupied Housing. Instead, there is a significant negative correlation between % Owner Occupied Housing and Yes. For every 1% increase in owner-occupied housing the percent Yes is predicted to decrease by .217%. Educational Attainment, in contrast, has the highest level of significance, and it is positively correlated. Every 1% increase in Educational Attainment causes a .253% increase in Yes.

## Development Pressure

Development pressure variables are included in the MCD dataset as well as the County dataset. In the MCD bivariate correlation, three of the four variables relating to development pressure exhibit the expected sign. All variables are meant to positively measure development pressure, meaning as they increase so too does the pressure to develop land. The unexpected and significant negative correlation exhibited by % Change Home Value brings the hypothesis that development pressure is positively related to PDR millage support into question. (Table 4.11).

No development pressure variables were included in the MCD stepwise regression and of the four, only % Change Home Value and Density were included in the dataset used for the MCD stepwise regression (because they were the only significantly correlated variables). However, the significant correlation values of % Change Home Value and Density are of worth noting.

**Table 4.11: Development pressure MCD regression variables**

| Variable | Correlation Sig. | Correlation | Stepwise Coefficient | Expected Sign |
|---|---|---|---|---|
| % Change Home Value** | .000 | -.455 | -.082 | + |
| Density** | .000 | .358 | N/A | + |
| % Change Households | .169 | .145 | N/A | + |
| % Change Rural Pop. | .491 | .073 | N/A | + |

**Significant at the .01 level

Development pressure in terms of land use change is measured using data from the Census of Agriculture. The change in acres of farmland in each county is negatively correlated with mean Yes, but not significant; whereas the change in value of farmland by acre is negatively related to mean Yes in the stepwise regression and significant at the .05 level, an unexpected result (Table 4.12). For each 1% increase in the percent change of farmland by acre between 1987 and 2007 Yes is predicted to decrease by .270%. In other words, as the rate of increase of farmland value becomes greater, support for PDR millages lessens in Michigan.

**Table 4.12: County-level development pressure variables**

| Variable | Correlation Sig. | Correlation | Stepwise Coefficient | Expected Sign |
|---|---|---|---|---|
| % Change Farmland Value | .025 | -.816 | -.270 | + |
| % Change Farmland Acres | .665 | -.201 | N/A | + |

**Significant at the .05 level.

## Political Variables

Three political variables were considered in the bivariate correlation. Of the three, % No Vote and Voter Turn-out exhibited the expected negative relationship (Table 4.13). Bush Vote is negatively correlated with Yes, and is significant. No specific hypothesis was formulated for the political variables, but the significant relationship with Bush_Vote is of interest because the results of previous studies are mixed. Some found political party affiliation to be a significant determinate for support of land preservation (Anderson & Mizak, 2006; Deacon & Shapiro, 1975; Salka, 2003) while others found political preference to be unrelated (Kahn & Matsusaka, 1997; Nelson, Uwasu, & Polasky, 2007).

**Table 4.13: Political variables**

| Variable | Correlation Sig. | Correlation | Stepwise Coefficient | Expected Sign |
|---|---|---|---|---|
| % Not Voting | .731 | -.036 | N/A | - |
| Voter Turn-out | .944 | .007 | N/A | - |
| Bush Vote** | .000 | -.358 | .291 | - |

**Significant at the .01 level.

Although the sum of these results rejects the initial hypothesis that Yes will increase as development pressure and socioeconomic status increase, by no means are the results inconclusive. The final chapter discusses these results, makes suggestions for PDR millage campaigns based on them, and identifies future areas of research.

# CHAPTER 5: DISCUSSION

This chapter consists of four parts. It begins with a general discussion of the results detailed in Chapter Four and possible limitations of those results, areas for future research are discussed next, and the final section contains an overall conclusion from the project.

## Discussion of Results

The hypothesis that Yes is positively related to high socioeconomic status and development pressure must be rejected based on the information provided herein. This indicates one of two things, either the factors affecting PDR support in Michigan are different from those in other parts of the country or this study's methodology is different enough from previous studies to produce conflicting results.

The significant community characteristic variables in the bivariate correlation indicate that larger communities with little rural population, a relatively high rate of mobility, a well educated population, a low rate of owner occupancy, or high median home value have been most likely to support PDR millages in Michigan. Significant development pressure variables in the MCD and County datasets indicate that communities with home values increasing at a slow rate and high population density located in counties where land values are rising relatively slowly have been most likely to support PDR millages. The lone significant political variable, Bush Vote, indicates that communities that support democratic candidates for president have been more likely to support PDR millages. No specific hypothesis was formulated for the political variables,

but the significant relationship with Bush Vote is of interest because the results of previous studies are mixed. Some found political party affiliation to be a significant determinate for support of land preservation (Anderson & Mizak, 2006; Deacon & Shapiro, 1975; Salka, 2003) while others found political preference to be unrelated (Kahn & Matsusaka, 1997; Nelson, Uwasu, & Polasky, 2007).

The most important variables when all MCDs are considered are Educational Attainment and Owner Occupancy, which combined explain 36% of the variance in Yes. Whereas % Change in Farmland Value explains 59% of the variance in the aggregated County dataset.

While many of these variables reflect the expected relationship, the negative relationship of % Mobility, % Owner Occupied Housing, % Change Home Value, and % Change Farmland Value do not. This is indicative of PDR millage support in Ann Arbor in the city and Washtenaw County votes (67 and 54% yes) and in East Lansing in the Ingham County vote (71% yes), two cities that exhibit all of the aforementioned characteristics. The only other city with a population over 40,000, Lansing, also supported a PDR millage (52% yes).

In the MCD and County stepwise regressions these results are repeated. Educational Attainment is positively related to Yes (as anticipated), is the most significant variable, and explains the most variance. Conversely, the negative relationship of % Owner Occupied Housing to Yes is unexpected. The negative relationship between Yes and % Owner Occupied Housing in the MCD stepwise regression may be indicative of a broader trend signifying urban support for PDR

millages. Total Population and Density are positively correlated with Yes, and % Owner Occupied Housing, Bush Vote, and % White are negatively correlated, all of which typifies urban characteristics. Additionally, these five of variables are significantly correlated with each-other, with correlation values above .6. This emphasizes the need for controlling multicollinearity in the model, and supports the use of Owner Occupancy as a variable in the MCD stepwise regression because it measures the same variance as other urban indicators.

An additional qualitative analysis of the County dataset indicates that proximity to an urban area may have a positive effect on Yes. The three counties with a mean Yes value above fifty percent, Ingham, Washtenaw, and Grand Traverse contain two cities with a population over 100,000 (Lansing and Ann Arbor) and three cities with a population between 10,000 and 100,000 (Ypsilanti, East Lansing, and Traverse City). Whereas the four counties with a mean Yes vote under fifty percent contain only one city with a population over 10,000 (Monroe City in Monroe County).

The results of tests run on the County dataset, appear to conflict with the urban hypothesis, as farmland prices generally increase with proximity to urban areas but are negatively correlated with Yes. This means the greater the increase in value of farmland in a county the less support exists for PDR millages. In fact, the correlation value between land value change and percent "yes" was the correlation value closest to one or negative one (.-816, Table 4.6). Alone, this variable explains almost 60% of the variance in mean percent yes on PDR votes in the seven counties considered. However, a look at the data indicates the more urban counties studied in this context saw a smaller increase in farmland value than more rural counties. Washtenaw and Ingham counties saw an

increase in farmland per acre between 1987 and 2007 of between 80 and 90 percent, whereas more rural counties like Monroe and Antrim saw increases of over 150 percent (Table 5.1). The tendency of jurisdictions experiencing increases in farmland value not to support PDR millages reflects a common perception that farmers are the most burdened by property tax increases used to pay for the PDR programs, and therefore do not vote in favor of tax increases.

The influence of urbanity on the datasets prompted an additional analysis. While East Lansing and Ann Arbor are unique, in many ways their respective counties, Ingham and Washtenaw, are also unique when compared to the rest of the data. Both Ingham and Washtenaw counties have significantly higher populations than the other five counties considered (see Table 5.1), and the vast majority of the MCDs located within each can be considered urban or suburban, or at least in close proximity to a true urban area; whereas the remaining five counties are predominantly rural. Therefore, the MCD dataset was divided into two separate datasets. The Urban MCD dataset consists of all MCDs in Washtenaw and Ingham County (N=52) and the Rural MCD dataset consists of all remaining MCDs in Monroe, Lapeer, Grand Traverse, Leelanau, and Antrim Counties

**Table 5.1: Farmland value change**

| Jurisdiction | Mean Yes | Population | % Change Farmland Value |
|---|---|---|---|
| Washtenaw | 0.5979 | 322,895 | 80.0% |
| Ingham | 0.5303 | 279,320 | 89.2% |
| Lapeer | 0.413 | 87,904 | 101.3% |
| Grand Traverse | 0.5444 | 77,654 | 119.8% |
| Leelanau | 0.3786 | 21,119 | 139.6% |
| Antrim | 0.4305 | 23,110 | 164.7% |
| Monroe | 0.2209 | 145,945 | 180.7% |

(N=40). This division will evaluate the influence of the urban areas on the data to determine if different factors affect Yes in urban and rural jurisdictions.

The same three-step methodology was then applied. Table 5.2 contains all variables that exhibited a significant correlation with percent Yes in the MCD, Urban MCD, and Rural MCD datasets. The mean population in the Urban MCD dataset is

**Table 5.2: MCD datasets comparison**

| Variable | MCD Dataset | | Urban MCD Dataset | | Rural MCD Dataset | |
|---|---|---|---|---|---|---|
| | Pearson Correlation | Sig. (2-tailed) | Pearson Correlation | Sig. (2-tailed) | Pearson Correlation | Sig. (2-tailed) |
| Total Pop. | .361** | .000 | .420** | .002 | .271 | .099 |
| % Mobility | .354** | .001 | .311* | .025 | .271 | .099 |
| % White | -.271** | .009 | -.327* | .018 | -.028 | .866 |
| % Owner Occupied Housing | -.474** | .000 | -.485** | .000 | -.222 | .181 |
| Median Home Value | .261* | .012 | .296* | .033 | .037 | .826 |
| % Change Home Value | -.370** | .000 | -.595** | .000 | -.342* | .035 |
| Density | .358** | .000 | .395** | .004 | .273 | .097 |
| Bush Vote | -.358** | .000 | -.523** | .000 | .243 | .141 |
| Educational Attainment | .542** | .000 | .663** | .000 | .260 | .114 |
| % Rural Pop | -.423** | .000 | -.477** | .000 | -.367* | .024 |
| % Rural Pop. Change | -.073 | .491 | .114 | .420 | .452** | .004 |
| No Vote | -.036 | .731 | -.162 | .252 | .323* | .048 |

* Significant at the .05 level. **Significant at the .01 level.

15,144.06 and the mean Yes value is .42, whereas the mean population in the Rural MCD is 3,568.97 and the mean Yes value is .41. Compared to a mean population of 10,064.93 and mean Yes value of .42 in the MCD dataset. Appendix C contains descriptive statistics for all datasets.

The result of the Urban MCD and Rural MCD correlations indicate an additional phenomenon of the data; that rural MCDs are subject to different influences than urban MCDs. The Urban MCD correlation finds the same 10 significant variables found in the MCD dataset, all of which maintain the same sign. In contrast, the Rural MCD correlation finds 4 variables to be significant, two of which, % Rural Pop. Change and No Vote, were not significant in either of the other MCD datasets.

The regressions ran on the Rural and Urban datasets also produced results worth noting (see Table 5.2). Both produced higher linear regression adjusted $R^2$ values, and the stepwise Urban regression produced a higher adjusted $R^2$ value than the MCD stepwise regression. The linear Rural MCD regression explains the most variance; it explains 49.9% of the variance in Yes in rural jurisdictions. The fact that educational attainment is the only variable to be included in two stepwise regressions is illuminating; it suggests that Yes in each dataset is subject to different influences. Overall, the divergent characteristics of the Rural MCD and Urban MCD correlations and regressions indicate that the level of urbanity in a community has played a significant role in the approval of PDR millages in Michigan.

In addition to separating urban and rural MCDs, the additional analysis separated jurisdictions that supported PDR millages (urban) from those that did not (rural). The

**Table 5.3: MCD datasets regression comparison**

| Model | N | $R^2$ | Adjusted $R^2$ | Sig. |
|---|---|---|---|---|
| Stepwise MCD* | 92 | .375 | .361 | .000 |
| Linear MCD | 92 | .493 | .375 | .000 |
| Stepwise Urban** | 52 | .491 | .470 | .000 |
| Linear Urban | 52 | .611 | .433 | .001 |
| Stepwise Rural | 40 | .359 | .352 | .000 |
| Linear Rural | 40 | .715 | .499 | .006 |

*Predictors: Educational Attainment and Owner Occupancy. **Predictors: Educational Attainment and % Change Home Value. ***Predictors: % Rural Pop. Change and No Vote

Rural MCD dataset contains 5 MCDs, 13% of the dataset, that had a Yes value above 50% (Acme Township, Traverse City, Peninsula Township (twice), and Lapeer City), while the Urban MCD dataset contains 10 MCDs, 19% of the dataset, with a Yes value above 50% (Ann Arbor City (twice), Ann Arbor Township (twice), East Lansing City, Lansing City, Meridian Township (twice), Scio Township, and Webster Township).

The analysis of urban and rural MCDs permits three conclusions. 1) Of all 92 MCDs considered in this project, only 15 (16%) have a Yes value over 50%. This further emphasizes the role urban areas have played in passing PDR millages in Michigan. Moreover, in reality, only 11 jurisdictions have supported a PDR millage in Michigan due to the necessary double-count of jurisdictions that have considered a PDR millage twice (the Limitations and Future Research sections discuss this in more depth) 2) The variables considered in the MCD datasets have a different effect on Yes in rural jurisdictions than in urban and suburban jurisdictions. Specifically, % Rural Pop. Change and No Vote have the most influence on Yes in rural jurisdictions, but have no significant influence on Yes in urban and suburban jurisdictions. For each 1% increase in Change in

% Rural Pop. Change, Yes is predicted to increase by .249% and each 1% increase in No Vote causes a .828% increase in the predicted Yes value in rural jurisdictions (see Table 5.2). 3) The only variables to exhibit a significant correlation in all three datasets were % Change Home Value and % Rural Pop., which are both negatively correlated with Yes, and significantly positively correlated with each other (see Appendix B). This result makes obvious sense, areas with a high percentage of rural population did not experience increases in home value like those seen in suburban and urban jurisdictions in the 1990's.

## Limitations

Before one begins advocating for PDR millage campaigns in and around every urbanized area in Michigan, there are significant limitations to the above conclusions that must be discussed. Local ballot proposals are anything but an exact science. First and foremost, it must be stressed that this research seeks to explain why PDR millages in Michigan ***have*** passed; it ***does not*** predict support for them in the future. By no means do the regression models contained herein provide a model for choosing jurisdictions likely to pass such millages in the future (although this will make for interesting research when additional PDR millages occur in Michigan).

To further stress the explanatory, not predictive nature of the research, the data set is somewhat peculiar, and to a degree self-selecting. In order to vote on a PDR millage some level of support must already exist, otherwise a millage proposal would never be on the ballot. In addition, it is unlikely that the MCD dataset consisting of 92 local units of government is representative of the over 1800 local units of government in Michigan. For an example, East Lansing and Ann Arbor, the proverbial poster children for PDR

support in Michigan, are extremely unique cities. Due to the influence of Michigan State University and the University of Michigan both contain exceptionally large student populations and have community characteristics not replicated anywhere else in the state. Although Nelson et al. (2007) found no evidence of selection bias in their research; this data is likely subject to such a bias due to its smaller population size and state-specific nature. Therefore while this information characterizes jurisdictions that previously considered PDR millages, it may not be useful as a predictor of potential support for a PDR millage in a particular jurisdiction.

In addition to the explanatory focus of this research, some shortcomings of the MCD and county datasets must also be considered. A slight possibility exists that the MCD dataset is incomplete. Regardless of the vigor of the research effort, there is nothing stopping a sparsely populated township in an out-of-the-way county from quietly voting on a millage to purchase development rights to land, voting the millage down, and no one knowing about it other than citizens and township and county clerks. The Michigan Secretary of State office does not keep election data on local ballot proposals, nor does it collect information on local or special elections. Therefore it is conceivable that some jurisdiction has been missed. The County dataset has one obvious issue, the dependent variable is aggregated. Although the results of the correlation and regressions ran on it are significant, the aggregation of vote results to the county level does not consider the jurisdictions that have not considered a PDR millage. For example, Berlin Township is the only MCD in Monroe County to consider a PDR millage and while the county land use statistics may be applicable to individual townships, the level of support for PDR in Berlin Township is not applicable to the county as a whole.

A final note on the dataset is that some double-counting necessarily occurred. Six jurisdictions in this dataset considered both a county and local PDR millage. As a consequence, the values of all variables are repeated in these instances, with the exception of Yes, Voter Turn-out, and % No Vote.

The purpose and scope of PDR millages in Michigan vary; in this case the Meridian Township and the City of Ann Arbor millages are atypical. All other measures considered in this context have a significant farmland preservation component that is absent in the Meridian Township and Ann Arbor programs. The Ann Arbor measure stated its purpose as, "[to] provide funds for preservation and protection of parkland, open space, natural habitats and City sourcewaters by the acquisition and management of land and land rights both within and outside the City of Ann Arbor." The Meridian Township millage purpose is, "to provide funding for the purchase of land and/or conservation easements, improvement of natural habitat and management of land for the permanent preservation of open green spaces and natural features..." Although these proposals are different from the rest in that they lack a farmland preservation component, they list the purchase of rights to develop land (conservation easements in the Meridian case) as a purpose. This separates them from typical land acquisition millages because their interest is beyond the fee simple purchase of land. For this reason they are included, but it must be noted that a millage without a farmland preservation component is likely subject to different political factors than proposals with a farmland preservation focus.

The final limitation of the research is unavoidable. The results of the correlations and regressions describe the likelihood of particular communities to support a PDR millage, not particular people. Community characteristics describe an entire community,

and voter turn-out is never 100%. Therefore, characteristics like educational attainment may describe a community's population, but have no bearing on who shows up to cast a ballot.

## Future Research

An eight-hundred pound gorilla sits in the corner of this research. The political factors that influence PDR millage results are largely ignored. The various campaign strategies employed by pro and anti-millage campaigns are not considered. The different campaign strategies available in urban and rural jurisdictions may also contribute to the divergence in results between the Urban and Rural MCD datasets. This problem was also identified by Nelson, et al. (2007),

> "...many referendum details that could have affected voter behavior, including how the referenda was placed on the ballot, clearness of ballot language, degree of organized support/opposition to the measure, amount of information regarding the referendum distributed to the public, and the mood of the electorate at the time of the vote, are not readily observable." (Nelson, Uwasu, & Polasky, 2007)

These same short-comings exist within this research, but are more readily observable due to the small data set of Michigan jurisdictions considering a PDR millage.

One of the previously mentioned limitations of the data, double counting of jurisdictions voting on both a county and local PDR millage, may provide an opportunity for future research. In effect, these millages control for community characteristics so that the influence of political variables like campaign strategy can be isolated.

Some basic information about these unique jurisdictions can be considered in this context. All six of the jurisdictions that considered a local and county PDR millage (five in Washtenaw County: Ann Arbor City, Ann Arbor Township, Scio Township, Bridgewater Township, and Augusta Township, and one in Ingham County: Meridian Township) supported the local millage proposal at a higher rate. In Peninsula Township, the only jurisdiction to consider a local PDR millage twice, support for PDR increased in the second election even though the millage rate more than doubled. In 2002, prior to expiration of the 1994 millage proposal, Peninsula Township voters approved a new PDR millage of 2 mills, a 1.25 mill increase on the 1994 millage. Table 5.4 displays the results of these millage votes, the "2" following the jurisdiction name denotes a county millage.

**Table 5.4: Double-counted jurisdictions**

| Jurisdiction | Yes | % No Vote | Voter Turn-out | Election Type |
|---|---|---|---|---|
| Ann Arbor City | 67% | 0% | 26% | Local/Special |
| Ann Arbor City2 | 54% | 9% | 41% | State |
| Ann Arbor Township | 77% | 0% | 42% | Local/Special |
| Ann Arbor Township2 | 53% | 5% | 54% | State |
| Augusta Township | 42% | 1% | 24% | Local/Special |
| Augusta Township2 | 32% | 6% | 46% | State |
| Bridgewater Township | 46% | 4% | 74% | National |
| Bridgewater Township2 | 32% | 10% | 52% | State |
| Meridian Township | 56% | 14% | 66% | National |
| Meridian Township2 | 52% | 6% | 23% | Primary |
| Peninsula Township 1994 | 56% | 20% | 70% | National |
| Peninsula Township 2002 | 59% | 3% | 70% | State |
| Scio Township | 75% | 5% | 84% | National |
| Scio Township2 | 43% | 4% | 53% | State |
| Webster Township | 69% | 0% | 29% | Local/Special |
| Webster Township2 | 38% | 5% | 57% | State |

In addition to further investigating the affect of political factors, data reflecting land use/cover change would provide a significantly better measure of development pressure than the proxies employed here. Additional research involving all Michigan MCDs, using a binary independent variable, could also create a model with greater coefficient values and less multicollinearity.

## Final Conclusions

The sum of this research is that PDR millages in Michigan have been more likely to pass in urban and suburban communities with a high level of educational attainment and low rates of owner occupancy that are located in counties where farmland value did not increase rapidly between 1987 and 2007. Other variables that were found to have a significant influence on the percent of "yes" votes for a PDR millage are total population, change in home value, home value, rural population, mobility of population, population density, percent population white, and support for George W. Bush in the 2004 presidential election. However, these conclusions are tempered by the disproportional influence of urban jurisdictions, the small number of Michigan jurisdictions to consider a PDR millage, and the high degree of multicollinearity of the variables employed.

Overall, this project does not paint a clear picture of the determinants of success for PDR millages in Michigan. Basic characteristics of the data make this nearly impossible. This may be a result of poor design of the project; or it may indicate the importance of other factors not considered. Specifically, political campaign strategies, the status of planning institutions in the area, and land use/land cover change within each jurisdiction may exhibit a greater influence on success of PDR millages than community

characteristics, development pressure, and political factors (most of which are out of the control of local advocates and local officials). If factors other than those examined herein do in fact exhibit the greatest influence on PDR millages, this research may be a success simply because it dismisses the popular perception that growth management and land preservation is reserved for affluent communities. At least in Michigan, it may be possible to influence support for land preservation in less-affluent communities using proven campaign strategies (future research is needed to identify these strategies).

One final philosophical note on this research is necessary. This is an advocacy piece; the inherent assumption is that the passage of PDR millages is generally a good thing for Michigan. While this may be an obvious conclusion for many, some literature (Howell-Moroney, 2004b) and case studies indicate otherwise. In Lancaster and Montgomery Counties, two places where land preservation efforts have been particularly successful, master planning and preservation efforts are one and the same. While preserving land has intrinsic value; doing so without consideration of future land use planning wastes an opportunity to permanently direct growth to desired areas. For this reason a PDR millage at the local level, while a positive step in itself, should consider a regional, or at least county master plan in its selection criteria. Preserving an occasional parcel, or unsustainable blocks of farmland will only result in vacant farmland as increasing incompatible uses result in nuisance lawsuits and exacerbate the impermanence syndrome (Sherman, Milshaw, Wagner, & Freedgood, 1998). There are far too many benefits of considering future land use goals and land preservation together to not do so.

# APPENDIX A:
# COUNTY MINOR CIVIL DIVISIONS

**Table A.1: County MCDs**

| **Ingham County** | |
|---|---|
| Alaiedon Township | Locke Township |
| Aurelius Township | Mason City |
| Bunker Hill Township | Meridian Township |
| Delhi Township | Onondaga Township |
| East Lansing | Stockbridge Township |
| Ingham Township | Vevay Township |
| Lansing City | Wheatfield Township |
| Lansing Township | White Oak Township |
| Leroy Township | Williamston City |
| Leslie City | Williamston Township |
| Leslie Township | |
| **Lapeer County** | |
| Almont Township | Imlay City |
| Arcadia Township | Imlay Township |
| Attica Township | Lapeer City |
| Burlington Township | Lapeer Township |
| Burnside Township | Marathon Township |
| Deerfield Township | Mayfield Township |
| Dryden Township | Metamora Township |
| Elba Township | North Branch Township |
| Goodland Township | Oregon Township |
| Hadley Township | Rich Township |
| **Leelanau County** | |
| Bingham Township | Kasson Township |
| Centerville Township | Leelanau Township |
| Cleveland Township | Leland Township |
| Elmwood Township | Solon Township |
| Empire Township | Suttons Bay |
| Glen Arbor | Traverse City |

**Table A.1 continued**

| Washtenaw County | |
|---|---|
| Ann Arbor City | Pittsfield Township |
| Ann Arbor Township | Salem Township |
| Augusta Township | Saline City |
| Bridgewater Township | Saline Township |
| Dexter Township | Scio Township |
| Freedom Township | Sharon Township |
| Lima Township | Superior Township |
| Lodi Township | Sylvan Township |
| Lyndon Township | Webster Township |
| Manchester Township | York Township |
| Milan City | Ypsilanti City |
| Northfield Township | Ypsilanti Township |

# APPENDIX B: CORRELATION MATRIX

**Table B.1: MCD dataset independent variable correlations**

| | | Yes | Total Pop. | % Rural Pop. | Change Rural Pop. | % Mobility |
|---|---|---|---|---|---|---|
| Yes | Pearson Correlation | 1 | .361** | -.423** | 0.073 | .354** |
| Total Pop. | Pearson Correlation | .361** | 1 | -.557** | -0.023 | .275** |
| % Rural Pop. | Pearson Correlation | -.423** | -.557** | 1 | -.238* | -.226* |
| % Change Rural Pop. | Pearson Correlation | 0.073 | -0.023 | -.238* | 1 | -.211* |
| % Mobility | Pearson Correlation | .354** | .275** | -.226* | -.211* | 1 |
| Educational Attainment | Pearson Correlation | .542** | .422** | -.497** | .226* | .264* |
| Median Income | Pearson Correlation | -0.064 | -0.168 | 0.092 | .499** | -.382** |
| % Owner Occupied Housing | Pearson Correlation | -.474** | -.603** | .741** | .290** | -.532** |
| Median Age | Pearson Correlation | -0.156 | -.453** | .477** | 0.049 | -.213* |
| Home Value | Pearson Correlation | .261* | -0.034 | -0.073 | .278** | 0.124 |
| % Change Home Value | Pearson Correlation | -.370** | -.360** | .515** | -.321** | -0.11 |
| % Change Households | Pearson Correlation | 0.14 | -.211* | 0.133 | -0.204 | .409** |
| Density | Pearson Correlation | .358** | .741** | -.704** | -0.125 | .389** |
| % No Vote | Pearson Correlation | -0.036 | 0.05 | -0.201 | 0.009 | 0.107 |
| Turn-out | Pearson Correlation | 0.007 | -0.157 | 0.15 | 0.134 | .223* |
| Bush Vote | Pearson Correlation | -.358** | -.692** | .667** | 0.039 | -.259* |
| % White | Pearson Correlation | -.271** | -.537** | .630** | -0.039 | -.298** |

**Significant at the .01 level.
*Significant at the .05 level.

**Table B.1 continued**

| | | Educational Attainment | Median Income | % Owner Occupied Housing | Median Age | Home Value |
|---|---|---|---|---|---|---|
| Yes | Pearson Correlation | .542** | -0.064 | -.474** | -0.156 | .261* |
| Total Pop. | Pearson Correlation | .422** | -0.168 | -.603** | -.453** | -0.034 |
| % Rural Pop. | Pearson Correlation | -.497** | 0.092 | .741** | .477** | -0.073 |
| % Change Rural Pop. | Pearson Correlation | .226* | .499** | .290** | 0.049 | .278** |
| % Mobility | Pearson Correlation | .264* | -.382** | -.532** | -.213* | 0.124 |
| Educational Attainment | Pearson Correlation | 1 | .304** | -.389** | 0.079 | .700** |
| Med*ian Income | Pearson Correlation | .304** | 1 | .518** | .221* | .580** |
| % Owner Occupied Housing | Pearson Correlation | -.389** | .518** | 1 | .581** | 0.061 |
| Median Age | Pearson Correlation | 0.079 | .221* | .581** | 1 | .436** |
| Home Value | Pearson Correlation | .700** | .580** | 0.061 | .436** | 1 |
| % Change Home Value | Pearson Correlation | -.516** | -0.201 | .240* | 0.126 | -0.154 |
| % Change Households | Pearson Correlation | 0.106 | 0.012 | -0.04 | .325** | .389** |
| Density | Pearson Correlation | .353** | -.372** | -.825** | -.640** | -0.17 |
| % No Vote | Pearson Correlation | -0.072 | -.220* | -0.199 | -.257* | -.260* |
| Turn-out | Pearson Correlation | .408** | 0.131 | 0.142 | .629** | .540** |
| Bush Vote | Pearson Correlation | -.540** | 0.129 | .726** | .478** | -0.125 |
| % White | Pearson Correlation | -.421** | 0.111 | .655** | .494** | -0.086 |

**Significant at the .01 level.
*Significant at the .05 level.

**Table B.1 continued**

| | | % Change Home Value | % Change Households | Density | % No Vote | Turn-out |
|---|---|---|---|---|---|---|
| Yes | Pearson Correlation | -.370** | 0.14 | .358** | -0.036 | 0.007 |
| Total Pop. | Pearson Correlation | -.360** | -.211* | .741** | 0.05 | -0.157 |
| % Rural Pop. | Pearson Correlation | .515** | 0.133 | -.704** | -0.201 | 0.15 |
| % Change Rural Pop. | Pearson Correlation | -.321** | -0.204 | -0.125 | 0.009 | 0.134 |
| % Mobility | Pearson Correlation | -0.11 | .409** | .389** | 0.107 | .223* |
| Educational Attainment | Pearson Correlation | -.516** | 0.106 | .353** | -0.072 | .408** |
| Median Income | Pearson Correlation | -0.201 | 0.012 | -.372** | -.220* | 0.131 |
| % Owner Occupied Housing | Pearson Correlation | .240* | -0.04 | -.825** | -0.199 | 0.142 |
| Median Age | Pearson Correlation | 0.126 | .325** | -.640** | -.257* | .629** |
| Home Value | Pearson Correlation | -0.154 | .389** | -0.17 | -.260* | .540** |
| % Change Home Value | Pearson Correlation | 1 | .238* | -.351** | -0.058 | -0.079 |
| % Change Households | Pearson Correlation | .238* | 1 | -.265* | -.209* | .353** |
| Density | Pearson Correlation | -.351** | -.265* | 1 | .277** | -.248* |
| % No Vote | Pearson Correlation | -0.058 | -.209* | .277** | 1 | -0.1 |
| Turn-out | Pearson Correlation | -0.079 | .353** | -.248* | -0.1 | 1 |
| Bush Vote | Pearson Correlation | .328** | 0.169 | -.743** | -0.069 | 0.076 |
| % White | Pearson Correlation | .310** | 0.135 | -.607** | -0.171 | 0.078 |

**Significant at the .01 level.
*Significant at the .05 level.

**Table B.1 continued**

| | | Bush Vote | % White |
|---|---|---|---|
| Yes | Pearson Correlation | -.358** | -.271** |
| Total Pop. | Pearson Correlation | -.692** | -.537** |
| % Rural Pop. | Pearson Correlation | .667** | .630** |
| % Change Rural Pop. | Pearson Correlation | 0.039 | -0.039 |
| % Mobility | Pearson Correlation | -.259* | -.298** |
| Educational Attainment | Pearson Correlation | -.540** | -.421** |
| Median Income | Pearson Correlation | 0.129 | 0.111 |
| % Owner Occupied | Pearson Correlation | .726** | .655** |
| Median Age | Pearson Correlation | .478** | .494** |
| Home Value | Pearson Correlation | -0.125 | -0.086 |
| % Change Home Value | Pearson Correlation | .328** | .310** |
| % Change Households | Pearson Correlation | 0.169 | 0.135 |
| Density | Pearson Correlation | -.743** | -.607** |
| % No Vote | Pearson Correlation | -0.069 | -0.171 |
| Turn-out | Pearson Correlation | 0.076 | 0.078 |
| Bush Vote | Pearson Correlation | 1 | .788** |
| % White | Pearson Correlation | .788** | 1 |

**Significant at the .01 level.
*Significant at the .05 level.

# APPENDIX C: DESCRIPTIVE STATISTICS

**Table C.1 Rural MCD descriptive statistics**

| Variable | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Yes | 40 | .22 | .59 | .41 | .07 |
| Total Pop. | 40 | 788.00 | 9072.00 | 3568.97 | 2065.36 |
| %Pop. Rural | 40 | .00 | 1.00 | .87 | .26 |
| Change % Pop. Rural | 40 | .00 | .65 | .07 | .15 |
| Migration | 40 | .12 | .38 | .23 | .05 |
| Educational Attainment | 40 | .06 | .54 | .21 | .13 |
| Median Income | 40 | 32436.00 | 72381.00 | 50608.92 | 9058.26 |
| % Owner Occupied | 40 | .52 | .98 | .87 | .09 |
| Age | 40 | 32.40 | 52.60 | 39.43 | 5.07 |
| Median Home Value | 40 | 91400.00 | 298000.00 | 152184.21 | 41121.52 |
| % Change Home Value | 40 | .43 | 1.73 | 1.10 | .32 |
| % Change House Holds | 40 | .06 | .57 | .30 | .11 |
| Density | 40 | 22.31 | 1570.21 | 169.31 | 306.69 |
| No Vote | 40 | .01 | .20 | .06 | .04 |
| Turn Out | 40 | .15 | .86 | .44 | .26 |
| Bush Vote | 40 | .43 | .68 | .58 | .06 |
| % White | 40 | .74 | .99 | .96 | .04 |

**Table C.2: Urban MCD descriptive statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Yes | 52 | .27 | .77 | .42 | .12 |
| Total Pop. | 52 | 1177.00 | 114321.00 | 15144.06 | 27327.35 |
| %Pop. Rural | 52 | .00 | 1.00 | .56 | .43 |
| Change % Pop. Rural | 52 | -.03 | .52 | .10 | .16 |
| Migration | 52 | .10 | .57 | .21 | .10 |
| Educational Attainment | 52 | .09 | .79 | .34 | .19 |
| Median Income | 52 | 28217.00 | 90830.00 | 60480.98 | 15517.20 |
| % Owner Occupied | 52 | .32 | .95 | .79 | .17 |
| Age | 52 | 21.70 | 41.30 | 36.27 | 4.09 |
| Median Home Value | 52 | 73200.00 | 325300.00 | 166826.92 | 56571.41 |
| % Change Home Value | 52 | .45 | 1.25 | .83 | .21 |
| % Change House Holds | 52 | -.03 | .66 | .22 | .17 |
| Density | 52 | 32.29 | 5090.37 | 818.00 | 1291.75 |
| No Vote | 52 | .00 | .22 | .06 | .04 |
| Turn Out | 52 | .10 | .84 | .37 | .19 |
| Bush Vote | 52 | .20 | .64 | .50 | .11 |
| % White | 52 | .61 | .99 | .90 | .10 |

**Table C.3 MCD descriptive statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Yes | 92 | .22 | .77 | .42 | .10 |
| Total Pop. | 92 | 149.00 | 114321.00 | 10064.93 | 21314.28 |
| %Pop. Rural | 92 | .00 | 1.00 | .69 | .39 |
| Change % Pop. Rural | 92 | -.78 | .65 | .07 | .18 |
| Migration | 92 | .10 | .57 | .23 | .09 |
| Educational Attainment | 92 | .06 | .79 | .29 | .18 |
| Median Income | 92 | 19423.00 | 90830.00 | 55693.73 | 14519.31 |
| % Owner Occupied | 92 | .32 | .98 | .81 | .15 |
| Age | 91 | 21.70 | 52.60 | 37.69 | 4.81 |
| Median Home Value | 92 | 73200.00 | 325300.00 | 161430.43 | 50778.38 |
| % Change Home Value | 92 | .43 | 1.73 | .95 | .30 |
| % Change House Holds | 92 | -.03 | 1.86 | .27 | .23 |
| Density | 92 | 22.31 | 5090.37 | 539.54 | 1037.32 |
| No Vote | 92 | .00 | .22 | .06 | .04 |
| Turn Out | 92 | .10 | .88 | .41 | .22 |
| Bush Vote | 92 | .20 | .68 | .53 | .10 |
| % White | 92 | .61 | .99 | .93 | .09 |

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