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Essays on Property Tax Limitation Mechanisms

Bryan Shone
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a dissertation written by Bryan Shone entitled "Essays on Property Tax Limitation Mechanisms." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Economics.

Matthew N. Murray, Major Professor

We have read this dissertation and recommend its acceptance:

Donald J. Bruce, William F. Fox, Thomas P. Boehm

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

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ESSAYS ON PROPERTY TAX LIMITATION MECHANISMS

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Bryan M. Shone
August 2009

DEDICATION

This dissertation is dedicated to my parents, Mike Shone and Linda Shone, who will forever be my primary role models, and to my sister, Deanna Shone, who has offered incalculable encouragement, along with the rest of my family members for their inspiration and support, which has inevitably helped me reach many of my goals.

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regarding previous findings in the literature and empirical strategies, all of which are important to consider when developing a research project. Thomas Boehm also deserves recognition for his helpful comments – his participation has certainly improved this work. Additionally, LeAnn Luna played a major role in helping me develop my research skills. I'd also like to thank Jill Caviglia-Harris, my first mentor in the field of economics. She graciously opened doors for my career that have led to some of my greatest accomplishments.

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ABSTRACT

Over the last half-century, the United States has experienced a tax revolution at the local level of government. Driven by preferences of many residents to limit the size and growth of local government, the tax revolts have spread rapidly since the installment of Proposition 13 in the state of California in the late 1970s. Today, tax and expenditure limitations (TELs), such as property tax limits, have been implemented in the vast majority of states for a variety of reasons. This expansion in the use of TELs has raised three main questions among economists. First, why are TELs implemented to begin with? Second, do TELs achieve the objectives that they have been set out to accomplish? Lastly, are there any consequences or adverse effects of the implementation of TELs?

In this study, I shed light on each of these three questions with a primary focus on the use of county-level property tax assessment caps in the state of Maryland. The "Homestead Property Tax Credit" was reformed in Maryland in 1992 to allow each county-level government the right to set an assessment cap associated with owner-occupied property tax bills at any magnitude between zero and ten percent. This unique structure of the property tax allows for the empirical examination of the choice of magnitude of assessment caps in Essay 1 to further understand those characteristics associated with preferences for varying levels of residential property tax relief. Results suggest that substitutability among revenue sources and shocks to the housing market play a key role in the preferences for such tax relief.

In Essay 2, I examine an important consequence associated with targeted tax relief by empirically investigating shifts in the relative burden of the property tax. Results indicate that jurisdictions associated with preferences for higher levels of residential property tax relief may increase the level and share of non-residential property tax levies, shifting the relative burden of

the property tax from homeowners to businesses. The results in each of these two essays provide policymakers with important information regarding the effects of installing property tax limits at various magnitudes.

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1.A Abstract

Since the late 1970s, state and local governments in the United States (U.S.) have implemented various tax and expenditure limitations (TELs). The most common form of TELs used in the U.S. are property tax limits, which can theoretically be used to provide insurance against rapidly increasing property tax bills (Anderson 2006). Depending on the level of property tax relief chosen, public services could be compromised if revenue substitution does not help to maintain government spending after property tax limits have been installed. In this study, I establish an understanding of the choice of magnitude of property tax relief using panel data to examine the role that various factors play in the level of property tax assessment caps and property tax rates chosen by Maryland county governments. Since caps and rates do not fully explain whether or not property tax relief is binding, I also study which factors affect the extend to which property tax relief is binding – that is, whether the assessment cap is actually providing property tax relief to homeowners rather than simply acting as a nominal artifact of the local tax structure.

Maryland's assessment caps give county governments the right to determine the magnitude of local property tax relief, providing a natural setting to analyze these questions empirically. While prior studies have only examined the *existence* of property tax relief, this is the first study to analyze the way in which fiscal parameters, shocks to the housing market, and demographic characteristics affect the choice of *magnitude* of property tax relief. This is also the first study to provide empirical evidence supporting Anderson's (2006) insurance idea that suggests voters may care to maintain current levels of local public goods and services while simultaneously establishing a safety net against uncontrollable increases in owner-occupied

property tax bills by installing targeted property tax relief to homeowners only. Results indicate that revenue substitution effects are present to help maintain levels of government spending in light of property tax limitation mechanisms and housing market shocks affect the extent to which residential property tax relief is binding.

1.B Introduction

In 1976, House Bill 920 was passed in the state of Ohio, effectively restricting the amount of property taxes collected by Ohio's state and local government entities. Soon thereafter, California's implementation of Proposition 13 further triggered an assortment of comparable "tax revolts" that spread throughout the country. During the 1970s and 1980s, these tax revolts developed through the endorsement of various "tax and expenditure limitations" (TELs), originally designed to limit increases in revenues and expenditures that were caused by rapidly increasing property values (Hill et al. 2006). By 2002, all but four states had some version of a limitation on taxes or expenditures in place, either at the state or local level (National Conference of State Legislatures 2002).

As the popularity of TELs has increased, it is not surprising that a plethora of research has evolved to provide insight regarding why TELs are implemented to begin with, how TELs are installed, the effects of TELs on state and local government finances, structural modifications of state and local governments associated with TELs, and indirect effects of TELs. Implications of the existence of TELs have been found to range from limited revenues and expenditures (Preston and Ichniowski 1991, Shadbegian 1998) to declining student test scores (Figlio 1997) and even to declining home values (Bradbury et al. 2001). TELs can be voted for or against on a ballot or they can be imposed by elected government officials and depending upon the

jurisdiction, some TELs can even be overridden by local residents. Though the extent to which consequences of TELs transpire is not clear for each specific installment, all TELs provide researchers with a unique chance to study the effects of the choice to impose a constraint on state or local governments in a natural setting.

In this study, I focus on why TELs are implemented with a different approach compared to the prior literature. Instead of simply measuring the choice to implement a TEL, I measure the choice of magnitude of TELs using property tax assessment caps in Maryland. Prior research only considers the existence of TELs, which would be the equivalent of only considering the existence of a particular tax without bearing in mind the magnitude of that tax or its base/rate structure. Concentrating on the magnitude of TELs allows me to focus on the characteristics associated with citizens who prefer more tax relief and compare the results to characteristics of those citizens who prefer less relief. Presumably, voters consider the magnitude of property tax relief keeping in mind that local public goods and services may be cut accordingly.

I chose Maryland for my analysis because the structure of property tax assessment caps in Maryland provides a unique within-state laboratory to analyze the choice of magnitude of property tax relief. Beginning in 1992, the state of Maryland established the "Homestead Property Tax Credit," which caps the annual growth in taxable assessed value of each residential property at ten percent statewide.[1] In addition, the state government grants each county government the right to annually determine their own assessment cap at the magnitude of their choice as long as the caps are installed between zero percent and ten percent. Data provided by the Maryland State Department of Assessments and Taxation (SDAT) indicate that assessment

[1] Because the Homestead Property Tax Credit is equivalent to a property tax assessment cap, I refer to the credit as an "assessment cap" throughout this study.

caps have varied by county and by year since they were first implemented in the early 1990s. This variation allows for the opportunity to empirically examine the choice of magnitude of property tax relief made by county-level governments in Maryland.

I begin by empirically analyzing the role that various factors play in the choice of magnitude of property tax relief using a balanced panel of county-level data in Maryland over the years 1996 to 2006.[2] Since property tax rates represent a choice variable that is closely related to the choice of TEL magnitude, I first model the joint decision of the magnitude of the assessment caps and these rates. Overall, results indicate that counties with higher levels of local taxes other than the property tax are associated with higher levels of property tax relief, suggesting that these counties turn to other revenue sources to make up for any lost revenue from property tax limits. Additionally, counties with a greater increase in the growth of residential properties are associated with increased residential property tax relief, suggesting that shocks to the housing market play a role in the choice of magnitude of property tax relief.

Other noteworthy results relate to demographic characteristics of the population. Counties with a higher share of the population enrolled in k-12 public schools are associated with preferences for less property tax relief via assessment caps, likely because these residents prefer sufficient funding of local public services such as education. On the other hand, counties with a higher share of the population aged 65 years and older are sometimes found to be associated with preferences for more property tax relief via assessment caps. This is likely because these residents gain fewer direct benefits from public education.

[2] The only prior study to consider the magnitude of TELs is Shadbegian (1999). See the literature review for more on this study.

To further understand the factors that affect the magnitude of property tax relief chosen, I also examine the possibility that counties engage in strategic interactions – either yardstick competition or tax base competition – in determining each of the choice variables listed above (see the discussion below to understand the difference between yardstick competition and tax base competition). In the context of this study, yardstick competition refers to voters in the home county taking into account neighboring counties' choice variables such as property tax assessment caps and property tax rates when determining their own magnitudes of these variables. Most research regarding TELs lacks any consideration of these spatial effects. Results from this study indicate that strategic interactions may exist in determining the magnitude of property tax rates, though it appears that there are no neighboring effects in the choice of magnitude of the assessment caps.

Lastly, I empirically investigate which factors affect the extent to which property tax relief is binding in a given county based on the share of homeowners receiving residential property tax relief. Binding TELs may have greater implications for tax burdens and for the provision of local public services, so these models further consider the choice of magnitude of the assessment caps in Maryland counties. Since non-binding assessment caps may do nothing to change government behavior and should not be weighted equally to binding caps, this exercise sheds light on the characteristics associated with property tax relief that actually exists. Results from these models indicate that counties with higher growth in residential properties and a higher share of the population aged 65 years and older are associated with a greater share of recipients of property tax relief. In addition, spatial models indicate that counties with neighboring

jurisdictions granting relatively larger shares of homeowners with property tax relief are more likely to grant property tax relief to homeowners in the home county.

In addition to the contributions noted above, this study avoids several shortcomings that exist in the prior literature. By giving county governments in Maryland the choice to set their own assessment caps, I can analyze the choice of magnitude of property tax relief without suffering from shortcomings in previous within-state studies on TELs, which typically consider a statewide tax limit that lacks a counterexample. This shortcoming in much of the prior literature results in an insufficient understanding of how policies would have been affected in the absence of property tax limits (Dye and McGuire 1997). I am also able to avoid a common drawback among cross-state examinations of TELs, which cannot control for various differences in state and local government institutional characteristics (Dye and McGuire 1997). Since my panel reflects the entire population of Maryland counties, I minimize a significant portion of the ambiguity with regards to variation in government structure.

The remainder of this study is organized as follows. First, I provide background information on property tax limits in Maryland with a particular focus on assessment caps. A review of the pertinent literature is followed by the conceptual framework and an explanation of the empirical strategy. Lastly, I outline the empirical results, provide a general discussion of the results, and summarize the importance of the findings in this study.

1.C Motivation

Over the past quarter-century, TELs have spread across the U.S., most commonly in the form of property tax limits. Sparked primarily by California's Proposition 13, a variety of

property tax limits have since evolved, including property tax rate limits, assessment limits, revenue rollbacks, expenditure limits, and circuit breakers.[3] In this section, I introduce Maryland's property tax limits. This background information will pave the way for the review of the pertinent literature and the statistical analysis that follows.

Assessment Caps in Maryland

The main property tax limit of interest in this study comes in the form of an assessment limit (often referred to as an assessment cap), which simply limits the growth of a property's taxable assessed value. Property tax assessment caps may prevent significant increases in tax bills when property values are growing at a rapid pace. Maryland has both a state-level and local-level residential property tax. Assessment caps in Maryland were developed in 1977 when the state legislature passed a law requiring that any annual increase in assessed value of residential property over fifteen percent was effectively untaxed. Since the program technically reduced a homeowner's state-level property tax bill by providing a tax credit equal to the product of the statewide property tax rate and the amount of the assessed value in excess of the taxable assessed value, this ruling was titled the "Homestead Property Tax Credit." Though labeled a credit, the program was equivalent to a property tax assessment cap. The assessment caps were not – and still are not – coupled with a property tax rate limit. According to the Maryland SDAT (2008), the assessment caps were passed with the intention of limiting taxation of large annual assessment increases on owner-occupied property.[4]

[3] For a detailed description of property tax limits and further discussion regarding their consequences, see the National Conference of State Legislatures (2002). Other relevant studies include Hill et al. (2006), Brome and Saas (2006), Mullins and Wallin (2004), Baer (2003), and Preston and Ichniowski (1991).

[4] Through direct correspondence with SDAT, I was given information regarding institutional characteristics and reassessment processes in Maryland, along with unique data for the empirical analysis.

Some considerable modifications were made to the Homestead Property Tax Credit program in the early 1990s, all of which remain in place today. Beginning in 1992, Maryland's Homestead Property Tax Credit was reformed so that any annual assessment increase for a residential home that is greater than ten percent is effectively not taxable at the state level. The state of Maryland also granted each county-level government the right to set their own assessment cap below the statewide level of ten percent for county-level property taxes. In fact, county governments are allowed to set their assessment cap as low as zero percent as long as the assessment cap chosen is in increments of one percentage point between zero and ten percent. These local caps are the main focus of the analysis in this study.

Table 1.1 presents an example of the impacts of the Homestead Property Tax Credit on an individual property tax bill in 2007 under three different levels of property tax relief (three different assessment caps) holding the property tax rate constant.[5] For each assessment cap in the table (ten percent, five percent, and zero percent), I assume that the assessed value of an individual's nominal owner-occupied property increased from $221,103 in 2004 to $315,000 in 2007 – a 42.47 percent nominal increase.[6] These figures represent the actual statewide median home sales prices for Maryland in 2004 and 2007 (Maryland SDAT 2008).

The SDAT uses a phase-in method to calculate assessed values. That is, they take the change in assessed value from 2004 to 2007 (in this case $93,897) and divide it by three to get an average annual change in assessed value of $31,299. Therefore, the assessed value in 2007 is the

[5] All tables and figures are located at the end of this chapter in the Appendix. In Table 1.1, I assume a property tax rate of 0.9690 percent (or $0.9690 per $100 of assessed value), which represents the average county-level property tax rate in Maryland in 2007 (Maryland SDAT 2008).

[6] In Maryland, the SDAT is in charge of reassessing all homes. The state performs reassessments for each unit of owner-occupied property once every three years. Therefore, approximately one-third of all homes are reassessed in a given county each year. Only primary residences are allowed to receive property tax relief via assessment caps.

assessed value in 2004 ($221,103) plus $31,299, which is equal to $252,402.[7] If there were no assessment cap in place, this $252,402 would also be the *taxable* assessed value in 2007 and the property tax bill would simply be the property tax rate multiplied by this value ($2,446). Therefore, with no assessment cap installed, the tax liability is equivalent across all three columns in Table 1.1.

With an assessment cap installed, however, the taxable assessed values change depending on the magnitude of property tax relief provided by the caps. Under a scenario with a ten percent assessment cap, since the average annual change in assessed value is 14.16 percent (or one-third of the 42.47 percent overall change), this assessment cap is "binding" – that is, it will provide property tax relief to the homeowner.[8] The existence of the assessment cap results in a taxable assessed value of only $243,213, which is $9,189 below the taxable assessed value with no property tax relief in place. Therefore, the tax credit is equal to the product of the property tax rate and the amount over the taxable assessed value with the cap installed. This results in a property tax bill of $2,357, which is $89 lower than the property tax bill with no assessment cap in place.

Assuming a fixed property tax rate, as the assessment cap declines across columns in Table 1.1, the tax liability also declines, resulting in more property tax relief. If the same homeowner were located in a county with a five percent assessment cap, a tax credit of $196 would be provided, resulting in a tax liability of only $2,250. Similarly, if this homeowner were

[7] Similarly, the assessed value in 2008 would be $252,402 plus $31,299 (or $283,701) and the assessed value in 2009 would be $283,701 plus $31,299 (or $315,000). The assessed value in 2010 (a reassessment year) would be $315,000 plus one-third of the change in assessed value from 2007 to 2010.

[8] For the purposes of this study, an assessment cap is binding if it is less than the nominal annual growth in assessed value.

located in a county with a zero percent assessment cap, a tax credit of $303 would be provided, resulting in a tax liability of only $2,142.

As illustrated in Table 1.2, there exists considerable variation across counties and over time in the magnitude of assessment caps. In 1992, the first year in which counties were able to implement an assessment cap, the average county-level cap equaled 8.50 percent and only six county governments (out of Maryland's twenty-four) chose an assessment cap less than ten percent. By 2000, the average county-level assessment cap dropped to 7.71 percent and nine counties had assessment caps less than ten percent. Finally, in 2008 the average county-level assessment cap equaled 5.92 percent with nineteen counties choosing a cap less than ten percent. Only four counties that began with a cap equal to ten percent in 1992 remained at ten percent in 2008.

The process and timing whereby county governments determine the magnitude of their assessment caps plays a key role in this study, especially for the structure of the empirical estimation.[9] All Maryland counties follow the same fiscal year – July 1 through June 30. Beginning on July 1, the Maryland SDAT begins the assessment process for the new fiscal year. During October, the SDAT provides each county-level finance and budget office with preliminary numbers representing the residential assessable tax base according to the properties that have been assessed from July 1 through the end of September to give each county government some indication of the trends in assessed values at the beginning of the current fiscal year. By November 1, each county-level government chooses the magnitude of their assessment cap that will be applied to the current fiscal year. Later in the fiscal year (typically sometime in

[9] Information regarding the timing of the assessment cap was provided by Mr. Robert Young, Associate Director of the Maryland SDAT.

May), county officials set the property tax rate that will generate the community's preferred level of property tax revenue.

Other Property Tax Limits in Maryland

It is important to note that the use of a single property tax limit alone may not guarantee property tax relief. For example, either property tax rate limits or property tax assessment caps alone will not be able to achieve the goal of providing property tax relief since rapidly-increasing property values may result in considerable increases in property tax bills when the tax rate is held constant.[10] Therefore, it is not uncommon for government entities to use more than one property tax limit in harmony to achieve the objectives of providing property tax relief. Combining policy instruments can assure homeowners experiencing rapid changes in assessed values of some property tax relief.

A few Maryland counties have implemented property tax revenue caps, which limit the level or growth in property tax revenue to a fixed percentage that is often chosen to equal the growth in the Consumer Price Index (CPI). Beginning in 1992, only two counties in Maryland (Anne Arundel and Montgomery) had revenue caps installed. Currently, four counties in Maryland impose direct limits on property tax revenues – all of which impose restrictions on the *growth* of property tax revenues. These revenue caps are important to examine for two reasons. First, they may be installed for different reasons than assessment caps, which would necessitate further investigation of their presence. For example, property tax revenue caps often provide relief to all property taxpayers, including non-residential property owners who may not receive

[10] For instance, if a home is assessed at $100,000 in the current period at a property tax rate of one percent, this homeowner's property tax bill is $1,000. Assuming that this same homeowner experiences an increase in assessed value of $25,000, the assessed value in the second period is equal to $125,000. With the same tax rate, this tax bill would be $1,250, an increase in tax liability of 25.00 percent, suggesting that another property tax limit would need to be imposed to guarantee relief.

relief from assessment caps. Second, they may be used in unison with property tax assessment caps to achieve similar policy goals. For example, revenue caps and assessment caps may be used to provide increased relief together, suggesting that they are complementary policy tools.

In 1975, the state of Maryland implemented a circuit breaker program called the "Homeowner's Property Tax Credit," which provides a tax credit to homeowners whose property tax bills exceed a specified percentage of their household income.[11] Initially, the program provided property tax relief to relatively older homeowners, but it has broadened to include homeowners of all ages. Therefore, the current circuit breakers in Maryland apply to homeowners of all ages and are based solely on the relationship between property tax bills and household income.[12] These circuit breakers are important to consider in the empirical setup for the same reasons associated with the revenue caps described above.

1.D Literature Review

The thread of research that relates most to the current study examines why TELs have been installed. In the prior literature, there is not a consensus regarding why TELs are enacted. Since most state and local jurisdictions are entitled to their own preferences for government structure and local policy objectives, there may be several reasons for the implementation of TELs. A frequently cited reason for the rising popularity of TELs relates to the simple idea that residents prefer to limit or reduce the size and growth of government (Shadbegian 1996). However, this does not explain why TELs are almost always applied to property taxes as opposed to other local taxes. Perhaps, as has been widely documented, this is because the

[11] The "Homeowner's Property Tax Credit" (the circuit breakers) should not be confused with the "Homestead Property Tax Credit" (the assessment caps).
[12] For additional information on Maryland's circuit breakers, see Bowman (2006) and Baer (2003).

property tax is one of the least liked taxes. This is due to the transparency of the property tax and the way in which the tax is collected. Whereas an income tax is generally deducted before an individual receives a paycheck and a sales tax is typically paid before an individual receives the benefits of consuming a good or service, property taxes are often collected annually in relatively large amounts. The high visibility of the property tax leads to disgruntled taxpayers and increased debate as to whether or not local governments should implement property tax limits.[13]

A corresponding explanation offered in the literature relates to the concept that voters prefer to implement property tax limits rather than other TELs because residents feel as though the current use of the property tax within the optimal portfolio of tax instruments is not efficient.[14] Therefore, increasing property tax relief may shift reliance on other local tax mechanisms that many citizens may feel provide a more efficient tax portfolio.[15] Similar to this argument, Shadbegian and Jones (2005) find that shifting from property taxes to user charges in support of public goods and services could make it possible for property tax limits to increase local government efficiency.[16] In fact, Hill and Shone (2009) find evidence that Maryland's assessment caps do not influence the level of property tax revenue per capita but higher levels of property tax relief do affect the structure of total revenues at the local level because they are positively associated with sources of tax revenue other than the property tax.

[13] See Haveman and Sexton (2008) for a thorough discussion on property taxpayer discontent.
[14] See Courant et al. (1980) and Ladd and Wilson (1982) for more on this contention.
[15] This concept is consistent with O'Sullivan et al. (1995), who contend that voters are not dissatisfied with the size of local governments, but instead they aim to reform the property tax explicitly because they find it to be characterized differently than other local taxes (particularly the income tax, which is often more progressive than the property tax).
[16] For more on this idea, see Ladd and Wilson (1982), Shadbegian (1999), and Shadbegian (2003).

A final explanation presented by Anderson (2006) introduces the idea that property tax limits may have been imposed in order to provide homeowners with a form of insurance against rising property tax liabilities in the future.[17] As Anderson (2006) argues, it may not be the case that residents favor the implementation of a property tax limitation per se, but they may view these limits as a mode of protection against the risk of rapid growth in their property tax bills. It is not unusual to assume that individuals are interested in future tax liabilities, and for the purposes of the analysis in this study, this explanation compares favorably to a similar theory – that residents have demanded the establishment of property tax limits as a mechanism to protect themselves from something that neither they nor their elected officials can directly control – rapid increases in assessed values. Since assessment caps in Maryland counties only apply to primary residences of owner-occupied properties, homeowners may view the assessment caps as a means to provide insurance against rapid increases in tax bills relative to other property taxpayers, such as business owners. County residents witnessing relatively larger increases in assessed values will vote for elected officials who will implement assessment caps that provide relatively more property tax relief.

The only prior study to consider the magnitude of TELs was developed by Shadbegian (1999), who defines a dummy variable representing a "stringent" TEL if that TEL is lower than a specified percentage (i.e., five percent). In this study, I improve the empirical work by taking advantage of Maryland's county-level assessment caps, which are chosen within similar government structures under the same requirements (between zero and ten percent) across

[17] Before this study, no research had empirically tested Anderson's (2006) insurance concept.

counties.[18] Additionally, in separate empirical models I measure the likelihood that a property tax assessment cap is binding based on a rather concise definition (where a cap is binding if the median homeowner receives some positive amount of property tax relief) and the actual share of Homestead Property Tax Credit recipients as opposed to a rather loose definition (where some arbitrary percentage is chosen as a breaking point between binding and non-binding tax relief).

Finally, it is possible that there are spatial effects between neighboring counties in the choice of magnitude of property tax relief. If these effects exist, they could be caused by in-county preferences towards property tax assessment caps that are influenced by the choices made in other "neighboring" counties. This concept is referred to as yardstick competition, where policy outcomes in one jurisdiction provide a yardstick that voters in another jurisdiction might want to mimic.[19] It is also possible that counties compete for a larger tax base and attempt to attract more homeowners to generate additional property tax revenue by providing relatively higher levels of residential property tax relief. However, the cost of supporting one child in public schools is typically not made up for by one household entering a county unless the entering household generates significant increases in tax bases and revenues with low service demands, suggesting that yardstick competition may be more likely to take place.[20] This is the first study to examine spatial effects associated with the choice of magnitude of TELs.

[18] In Shadbegian (1999), the panel reflects data collected across many jurisdictions in the U.S., making it difficult to compare the types of TELs installed in different counties and making it especially difficult to determine if these TELs are "stringent."

[19] See Brueckner and Saavedra (2001) for more on strategic interactions in determining property tax rates, including a brief discussion on yardstick competition in this setting.

[20] The average annual county-level education spending per pupil equaled $3,924 from 1992 through 2005 (inflation-adjusted). In order to fully support one child, this requires an inflation-adjusted home value of approximately $397,075. However, during this time, the average inflation-adjusted home value was only $139,626 (or $257,449 short of the necessary level to fund one child).

1.E Conceptual Framework

In this section, I outline a conceptual framework that relates the choice of magnitude of property tax relief in Maryland to Anderson's (2006) insurance concept. First, I provide a general discussion of the median voter process and then I link the choices made by voters regarding property tax relief and property tax rates to the county government officials who implement these choices. Next, I summarize the control variables necessary to consider in the empirical analysis that follows.

A median voter model provides a sensible place to begin because the decisions central to this study entail county-level government choices in a democracy setting.[21] The median voter model was originally developed to represent a community's demand for public services. The process is simple – residents cast their votes on issues and the median voter's preferences represent those of the majority of voters in that jurisdiction as long as all preferences of individuals within that jurisdiction are single-peaked. The assumptions of the median voter model fit particularly well in this study compared to prior studies that only examine the existence of TELs because the choice of magnitude of Maryland's county-level assessment caps are arrayed on a single continuum.[22]

Previous studies typically consider TELs that are voted on by citizens on a formal ballot.[23] Since the decision regarding how much property tax relief to implement is not voted on by citizens in Maryland, the median voter's preferences are reflected in the decisions made by

[21] The median voter model was first developed by Bowen (1943). For further discussion regarding a median voter model in the context of TELs, see Alm and Skidmore (1999).
[22] The formal underlying assumptions of the median voter model include the following: a) a single issue can be arrayed on a continuum (say from high to low); b) preferences for each individual are single-peaked, and thus transitivity prevails; c) all individual utility functions for the public service are well-defined; and d) individuals vote only on a single issue. If these assumptions hold, the median voter cannot lose in a majority rule voting process.
[23] See Mullins and Joyce (1996) and Joyce and Mullins (1991).

elected county commissioners. The median voter framework is still appropriate in this situation because citizens inevitably vote on and elect the county commissioners who make decisions regarding property tax relief, property tax rates, and other choices.[24]

Voters try to minimize their tax bills while meeting their tastes for local public goods and services by electing government officials that closely resemble their preferences. Since short-term shocks may occur in the local housing market causing rapid increases in residential property tax bills, voters understand that there are times in which the size of the property tax base is not restricted. In the absence of residential property tax relief, unexpected increases in assessed values may create a wedge between marginal costs for public goods and services and the marginal benefits. In addition, sharply rising property tax burdens can create pressures on household finances by reducing liquidity. Therefore, in efforts to maintain optimal levels of local public goods and services (but also protect themselves against these short-run housing shocks), citizens elect county officials who will implement assessment caps and property tax rates that represent their preferred balance between tax relief and public good provision. Specifically, voting residents who are also homeowners may view property tax relief that applies only to residential property owners as a means of insurance against increasing tax bills relative to non-residential property owners.

In November of a given fiscal year, county commissioners choose an assessment cap associated with the preferences of the median voter that will provide insurance against rapidly increasing residential property tax bills but provide no insurance against increases in non-residential bills. Later in the fiscal year, the same county officials select a tax rate associated

[24] A model by Hettich and Winer (1988) closely relates to the theoretical concept in this study, but with more emphasis on government officials who maximize a support function based on the expected number of favorable votes.

with real property given two important pieces of information – the median voter's preferences for local public goods and services and the magnitude of property tax relief that was chosen back in November. This process draws a nice parallel to Anderson's (2006) insurance story because the insurance mechanism is determined well before the tax rate is chosen in every fiscal year.[25] Each of these choice variables can be used as dependent variables to capture those county characteristics that are significantly associated with different magnitudes of property tax relief and different levels of property tax rates.

Although this basic conceptual framework does not provide the precise specification for the empirical setup, it helps guide the empirical analysis. Since the insurance provided to homeowners in the form of property tax relief mechanisms may be intertwined with other tax parameters in the form of substitutes and complements, it is necessary to consider local revenue sources other than the property tax. Controlling for other local taxes and revenue sources provides insight regarding the role of property tax limits in an environment where multiple instruments are used to generate revenue. Prior research by Shadbegian (1999) suggests that property tax limits may indeed decrease property tax collections but other local taxes often make up for this lost revenue. Therefore, I hypothesize that in order to maintain levels of public good provision, counties with median voters preferring relatively high levels of property tax relief may choose to offset any lost revenue with increases in other local revenue sources, suggesting that tax parameters are generally used as substitutes with property tax relief.

It is also necessary to consider any factors that relate to shocks in the housing market that may affect the median voter's home price. Holding all else constant, I hypothesize that counties

[25] Although these choice variables are technically chosen at different times, they may be jointly determined for purposes of balancing the level of property tax relief while maintaining optimal levels of public services.

with median voters who experience sizeable (or more frequent) shocks to the housing market will prefer more insurance against rapid increases in property tax bills. Similarly, those counties with median voters with less housing appreciation or less frequent increases in home prices will likely prefer less insurance against rapid increases in property tax bills.

The magnitude of property tax relief is also dependent upon a variety of demographic and political variables because these characteristics capture the median voter's preferences for public good provision, which may differ both across counties and over time. The expected effects differ depending on the type of demographic or political variable being examined, so these hypotheses are discussed thoroughly in the sections to follow. Additionally, policy choices in other neighboring counties may provide signals for which policies may work well for voters in the home county. Therefore, spatial effects are also considered in the empirics. Specific measures used as explanatory variables are outlined in detail in later sections of this study.

1.F Empirical Strategy & Variable Descriptions

In this section, I introduce a set of reduced form empirical exercises that are used to test the research questions developed in this study. In the first exercise, I examine the role that various factors play in affecting the joint choice of magnitude of the assessment caps and property tax rates at the county level. I also include models that control for the censoring of the assessment caps since many county governments chose a cap of ten percent (the state-mandated maximum during the time period studied). Next, I examine the effects of neighboring-county choice variables on the level of assessment caps and tax rates in the home county. Lastly, I examine the role that a variety of factors play in affecting the extent to which property tax relief is binding to capture more than the sheer existence or magnitude of property tax relief. These

last two sets of models provide the primary results for this study since they are similar to the first two sets of models with the inclusion of spatial effects.

Along with the dependent variables, a variety of explanatory variables are defined in this section including tax parameters and local public finances aside from the property tax (testing for the possibility of revenue substitution), shocks to the housing market (testing the insurance theory discussed above), and factors that control for the demand for public goods and services. The variables and their basic definitions are introduced as well as hypotheses regarding the sign for each explanatory variable to help link the conceptual framework to the empirical structure. Data in this study come from several sources and Table 1.3 offers the names, definitions, and sources for all variables used in the empirical analysis. In the next section, descriptive statistics for each of the variables used in the empirical analysis are summarized in detail.

Dependent Variables

Several empirical models are presented in this study with different dependent variables that represent a key choice variable for county voters. In the first set of models, the dependent variables are equal to the magnitude of the assessment cap and the property tax rate chosen for each county-year observation in the panel. The assessment caps represent the main choice variable of interest (and have been summarized in detail in prior sections of this study) and they may be jointly determined with property tax rates, making it important to consider both choice variables in the empirics. In Maryland, the real property tax rate applies to all real property including residential and non-residential property.[26]

[26] After fiscal year 2000, Maryland introduced the "Truth in Taxation Act," which raised the assessment ratio for all property taxes from 40.00 percent to 100.00 percent and provided an offsetting reduction in tax rates. For the purposes of this study, I have corrected for this policy change such that property tax rates are comparable across counties and over time.

In the final set of models, I define two dependent variables that represent the extent to which property tax relief is binding. The first variable is a dummy variable equal to one if the assessment cap in a given county-year observation is less than or equal to the nominal growth rate in the median home sales price of residential property; otherwise, the dependent variable equals zero.[27] When equal to one, this measure suggests that the majority of homeowners received some positive amount of property tax relief. To check for robustness in these results, I also include the actual share of homeowners receiving property tax relief via county-level assessment caps as a separate dependent variable.

Explanatory Variables

There are three main sets of explanatory variables used in each empirical setup – tax parameters, shock variables to the housing market, and demand-side variables that capture preferences for public goods among median voters across counties.[28] The explanatory variables used in all of the empirical models are generally identical because the decision maker is the same and the choices all have similar structures and consequences. The assessment cap is very similar to the choice of the property tax rate with the exception that the cap is a form of property tax relief that is potentially given to residential property owners whereas the tax rate is applied to every non-residential property, such that all owner-occupied property owners are relieved at an equal rate when the tax rate is reduced.

[27] These are only "potentially" binding for several reasons. First, the analysis in this study is at the aggregate county level, not at the parcel level. Also, I only look at the growth in home sales prices rather than actual assessed values. Lastly, these are annual growth numbers and since the same properties are only reassessed every three years, the annual numbers are group-specific based on which one-third of residential properties are reassessed in that given year.

[28] Some of these demographic measures also relate to the county officials who ultimately determine the magnitude of property tax relief. Therefore, these explanatory variables consider the classic agency issues that may occur in the presence of a Leviathan-type government official.

Since the median voter is aware that there are alternative methods of collecting revenue to fund local public goods and services, various tax parameters must be considered as explanatory variables in each of the empirical models. Counties in Maryland raise revenue through income taxes, property taxes, other local taxes, and fines/fees. County-level governments also receive grants from state and federal governments.[29] Tax parameters may be used as complements or substitutes with property tax assessment caps and/or property tax rates. For example, in counties where the majority of voters prefer to use the property tax and other local taxes as complementary instruments to raise revenue, increased property tax relief will be associated with lower tax revenue from income taxes and other local taxes. On the other hand, if voters feel as though the property tax is simply too high relative to other county-level taxes, increased property tax relief will be associated with higher tax revenue from other sources of local revenue.

The first group of tax parameters used as explanatory variables consider complementarity and substitutability *within* the property tax. In the first set of models, I control for the simultaneous choice of the assessment caps and property tax rates. The relationship between the caps and the rates is unclear since county officials may simultaneously provide increased property tax relief by lowering both the assessment cap and the property tax rate (in which case they are complements) or they may use them as substitutes, providing relatively more relief to residential property owners through lower assessment caps (holding property tax rates constant). The second important measure related to the property tax is a simple dummy variable for those observations in which county officials implemented some form of a property tax revenue limit.

[29] The amount of grants received depends on county effort and county need. For more on Maryland's state and federal grants and the Thornton Formula, which redistributes funding for schools, see Scafidi (2008).

Though these limits are relatively uncommon in Maryland, it is important to control for their existence since counties may use revenue limits as complements or substitutes to the dependent variables in all three empirical exercises. Similarly, I control for the amount of circuit breaker tax relief by including the average circuit breaker credit, defined as the total inflation-adjusted circuit breaker tax relief granted to homeowners divided by the number of circuit breaker recipients.

To control for other local sources of revenue at the county level outside of the property tax, I use two more tax parameters. The first is the effective non-property tax rate, which is simply the amount of local revenue generated from any source other than local property taxes and intergovernmental revenue divided by total personal income. I hypothesize that the relationship between this measure and the dependent variables at hand are ambiguous because it is unclear whether median voters prefer to use other local revenue as substitutes or complements with assessment caps, property tax rates, and the extent to which property tax assessment caps are binding. The prior literature, however, has revealed that it is more likely that these tax parameters are used as substitutes.

The second non-property tax revenue measure is equal to the amount of inflation-adjusted intergovernmental revenue per capita received by county governments to reflect the aid that accrues to the median voter. Maryland counties receive intergovernmental revenue based on the Thornton Formula – a formula that is designed to redistribute money to those counties that show tax effort but also have need for funding. Therefore, these state and federal grants are separately controlled for since the amount of grant money received is not a direct choice variable for the home county. I hypothesize that the relationship between intergovernmental revenue and the

dependent variables are ambiguous for reasons similar to those listed above regarding substitutes and complements.

In accordance with the idea that property tax assessment caps offer insurance to homeowners by restricting growth in their tax bills, any possible shocks that might occur in the local housing market must be accounted for. Again, this is the first study to examine the effects of these shock variables on the choice of magnitude of property tax relief. The first measure used to control for potential shocks to the housing market is simply equal to the annual growth in the inflation-adjusted median home sales price.[30] Although the median home sales price does not represent the actual assessed value, the Maryland SDAT reassesses homes based on the market value of recent home sales prices of similar homes in the area (SDAT 2008). Therefore, the growth rate in inflation-adjusted median home sales price offers a nice control for the jump in the size of assessed values. A median voter experiencing higher growth in home prices is expected to prefer more property tax relief (lower assessment caps) and lower property tax rates relative to median voters experiencing relatively low growth in home prices.

Part of the shocks to the housing market must be captured using a measure for the amount of new construction taking place. To control for this, I include the annual growth rate of new, privately-owned single family building permits. A higher growth rate in permits is expected to be associated with less-binding property tax relief via assessment caps. Increased growth in building permits is associated with fewer residential properties that are eligible to receive property tax relief via assessment caps since new homes cannot receive relief for one full year (SDAT 2008). Therefore, counties with higher growth rates in new residential homes may be

[30] I drop the growth in inflation-adjusted median home sales prices in the models in which the dependent variable is a dummy variable representing whether or not the assessment caps are binding because this explanatory variable is highly correlated to the dependent variable at hand (based on how the dependent variable has been defined).

associated with a lower likelihood that assessment caps are potentially-binding for the majority of homeowners.

Since new construction (captured by the growth in building permits) may not fully explain the transformation of commercial properties (such as apartment complexes) to residential properties (i.e., condominiums), I include a final shock variable equal to the annual growth in residential properties. Basic supply and demand theory suggests that higher growth rates in residential properties – which may be caused by increased supply or increased demand for housing – will put ambiguous pressure on housing prices. Therefore, it is difficult to separate the sequence of events, leaving ambiguity in the empirical hypotheses. Nonetheless, it is worthwhile to control for the possible transformation of non-residential properties (which cannot receive property tax relief via assessment caps) into residential properties using the growth taxable residential parcels.

Finally, I control for the demand for local public goods and services by including variables that relate to the preferences of the median voter. Residents with different characteristics often have different preferences for the provision of public goods and services, which may result in dissimilar preferences for property tax relief amongst median voters across counties and over time. For example, explanatory measures that represent the median wealth or age of the population may have a significant impact on the magnitude of property tax relief chosen or the likelihood that it is binding. Political affiliations of the median voter also provide a valuable indication of the preferences for local public good provision.

The first set of demographic variables used represents the share of the population in a county that is enrolled in k-12 public schools. A higher share of the population enrolled in school is expected to be associated with preferences for less property tax relief (higher

assessment caps), higher property tax rates, and a lower likelihood that assessment caps are binding. These hypotheses are based on the premise that median voters that value k-12 education (such as parents with children in public schools) likely demand relatively higher levels of school funding compared to voters receiving fewer benefits from school funding. Since the property tax is the main source of funding for public schools, these results are expected to be rather significant. Similarly, I include a measure representing the share of the county population that is aged 65 years or older. I expect the opposite results for this explanatory variable since median voters who are more likely to represent the elderly population may have a lower preference for public school funding and they may have liquidity constraints that are more binding since they are less likely to be in the workforce.

I also include inflation-adjusted median household income on the right hand side to control for preferences of the median voter as they relate to income. Survey research by Joyce and Mullins (1991) and Mullins and Joyce (1996) suggest that those individuals with higher levels of income are more likely to be in favor of TEL implementation. Perhaps this result relates to the idea that median voters prefer to put less emphasis on the property tax, shifting to other local revenue sources. Higher levels of income also relate to a higher base for the local income tax, which suggests that median voters with more income are likely to prefer increased property tax relief (lower assessment caps and lower property tax rates), recognizing that they can substitute this lost revenue with increased revenue from the local income tax.

I include voter participation as a proxy for the level of community engagement among county residents. Political preferences may also play a role in the choice of magnitude of property tax relief or property tax rates. I include a measure for the share of the voting population that voted for a democratic candidate in the most recent gubernatorial or presidential

election.[31] I expect that median voters in counties with a higher share of the voting population that vote for democratic candidates are more likely to be democrats, who may be associated with preferences for less property tax relief and higher property tax rates since democrats typically have tastes for relatively more public goods and services.[32]

The final explanatory variable I use to control for differences in preferences for property tax relief is the natural log of the countywide population. Prior literature has shown that jurisdictions that are relatively more populated are associated with a greater likelihood of TEL existence. This is likely due to the fact that there may exist economies of scale in public service delivery such that local government officials can afford to provide increased property tax relief without jeopardizing local public good provision.

In some model specifications I have added a fourth set of explanatory variables that control for the possibility of spatial effects using two separate variables that are associated with neighboring counties' assessment caps, property tax rates, and the share of homestead recipients. These two measures are described in detail later in this study. Expectations are that if spatial effects do indeed take place (either in the form of yardstick competition or tax base competition), the coefficients on these estimates will be positive and significant, suggesting that median voters in the home county set their caps and rates either to mimic the situations taking place in neighboring counties (yardstick competition) or to compete for homeowners (tax base competition).

[31] Data for the share of democratic votes and voter participation changes by county-year observation every two years since presidential and gubernatorial elections each occur every four years. These numbers still provide a fair comparison for democratic voters since they represent shares of the population. Therefore, even if presidential elections draw greater turnout than gubernatorial elections, the denominator is always the number of total votes.
[32] Note that the share of democratic voters and voter participation may also capture effects associated with preferences of local government officials.

Empirical Strategy

In the first set of models, the research question relates to the role that various factors play on the choice of magnitude of assessment caps. Several modeling issues are associated with this choice. First, the caps are jointly determined with property tax rates. Therefore, I use a two-stage least squares model to examine the simultaneous choice of caps and rates using equations (1) and (2):

$$\delta_{jt} = \beta_0 + \beta_1 r_{jt} + \sum_{k=1}^{K} \beta_k X_k + \sum_{l=1}^{L} \beta_l Y_l + \sum_{m=1}^{M} \beta_m Z_m + \omega_t + \varepsilon_{jt} \quad (1)$$

$$r_{jt} = \alpha_0 + \alpha_1 \delta_{jt} + \sum_{k=1}^{K} \alpha_k X_k + \sum_{l=1}^{L} \alpha_l Y_l + \sum_{m=1}^{M} \alpha_m Z_m + \varphi_t + e_{jt} \quad (2)$$

where δ_{jt} represents the assessment cap in county j ($j = 1, \ldots, 24$) at time t ($t = 1996, \ldots, 2006$), r_{jt} represents the property tax rate in county j at time t, X_k represents a $Kx1$ vector of tax parameters associated with county j at time t, Y_l represents an $Lx1$ vector of explanatory variables that relate to shocks in the local housing market, Z_m represents an $Mx1$ vector of demographic and political characteristics of the median voter in county j at time t, ω_t and φ_t represent time fixed effects, and ε_{jt} and e_{jt} represent well-behaved error terms.

Since these choices are made both across counties and time, I include both time fixed effects and county fixed effects in the second model to evaluate the effects of the independent variables on the assessment caps by examining changes in the independent variables within groups. In this model, the slope coefficients are constant over individual counties and over time while the intercept varies over individual counties and over time, giving equations (3) and (4):

$$\delta_{jt} = \beta_0 + \beta_1 r_{jt} + \sum_{k=1}^{K} \beta_k X_k + \sum_{l=1}^{L} \beta_l Y_l + \sum_{m=1}^{M} \beta_m Z_m + \omega_t + \lambda_j + \varepsilon_{jt} \quad (3)$$

$$r_{jt} = \alpha_0 + \alpha_1 \delta_{jt} + \sum_{k=1}^{K} \alpha_k X_k + \sum_{l=1}^{L} \alpha_l Y_l + \sum_{m=1}^{M} \alpha_m Z_m + \varphi_t + \eta_j + e_{jt} \quad (4)$$

where λ_j and η_j represent the county-specific, time-constant errors and the remaining variables are equivalent to those in equations (1) and (2).

Another potential modeling issue relates to the censoring of the assessment caps at the state-mandated maximum of ten percent. Therefore, in the second set of empirical results, I use Tobit models to control for censoring at an upper level of ten percent.[33] Among the censoring results, I begin by specifying a standard Tobit model with time fixed effects included. Next, I use a random effects Tobit model to account for the use of panel data. Finally, I run two separate Tobit models (first without time fixed effects and then with time fixed effects included) where I instrument for the explanatory variable representing the property tax rate.

In the primary set of results, I use fixed effects panel models to regress the caps and the rates on the same set of explanatory variables with the addition of spatial factors. I also use the same set of explanatory variables to determine the role that these factors play in the extent to which property tax relief is binding. First, I examine the effects of the explanatory variables on the probability that the assessment cap is binding – that is, that the assessment cap is providing property tax relief to the majority of homeowners in a given county – using a simple fixed effects linear probability model. Additionally, I use a fixed effects panel model to determine the effects of the explanatory measures on the share of residential homeowners who were granted property tax relief via county-level assessment caps.

[33] I do not censor at the lower end of zero percent because only one county (Talbot) has ever installed a zero percent assessment cap over the course of the panel. On the contrary, approximately 155 county-year observations were censored at the upper level of ten percent, representing more than half of the 264 observations in the empirical models.

Spatial Effects

For each of the dependent variables, I include additional model specifications with an explanatory variable that captures the possibility of spatial effects. For dependent variables associated with assessment caps, this includes a measure for the neighboring counties' assessment caps and for dependent variables associated with property tax rates, this includes a measure for the neighboring counties' property tax rates. I also include an explanatory measure representing the neighboring counties' share of Homestead Property Tax Credit recipients in the final set of models where the dependent variable is equal to this share of recipients in the home-county.

In order to account for spatial effects, I must first assign those neighboring counties that may influence the choices made in the home county. Let $\sum_{i \neq j} W_{ji}\delta_{it}$ represent the neighboring counties' weighted assessment cap where W_{ji} defines the matrix that represents which counties are considered neighbors. Similarly, let $\sum_{i \neq j} W_{ji}r_{it}$ represent the neighboring counties' weighted property tax rate. Finally, let $\sum_{i \neq j} W_{ji}s_{it}$ represent the neighboring counties' weighted share of homeowners receiving property tax relief via assessment caps.[34]

A simple average of the bordering counties' choice variable offers a good starting point because voters in the home county are most familiar with their bordering counties due to commuting, cross-border shopping, media reports, etc. Therefore, let W_{ji} equal one if the home county j shares at least part of its border with county i. This is referred to as a simple contiguity-

[34] In models where the dependent variable is equal to a dummy variable for whether or not the assessment cap is potentially-binding, I use the weighted average of the nominal assessment caps as the explanatory variable capturing strategic interactions because it is not feasible to instrument an explanatory measure with a dummy variable.

weighted specification where the matrix is row standardized, meaning that the sum of the weights across a given row equals one. Thus, the terms $\sum_{i \neq j} W_{ji}\delta_{it}$, $\sum_{i \neq j} W_{ji}r_{it}$, and $\sum_{i \neq j} W_{ji}s_{it}$ are referred to as "Contiguity-Weighted" matrices representing the average of the neighboring counties' assessment caps, property tax rates, and shares of homestead recipients, respectively.

Because voters may look across county borders to compare property tax bills, spatial effects may be more common between counties that share larger borders. Therefore, a second weight matrix labeled the "Shared Border-Weighted" matrix is also included in a separate empirical specification for each dependent variable. This matrix continues to define only the counties that share borders with the home county as neighbors, but the terms $\sum_{i \neq j} W_{ji}\delta_{it}$, $\sum_{i \neq j} W_{ji}r_{it}$, and $\sum_{i \neq j} W_{ji}s_{it}$ now represent averages of the neighbors' assessment caps, property tax rates, and shares of homestead recipients with more weight placed on those neighboring counties that share proportionately more of the home county's border. An approximation of the distance shared for each contiguous county border was calculated to create weights for this measure.

In Maryland, Howard County shares its border with six other Maryland counties, representing the most of any county while Garrett County shares its border with only one other Maryland county (Allegany County). The majority of Maryland counties share their border with only two or three other Maryland counties. These weight matrices do not account for spatial effects across Maryland state lines because any TELs in bordering states are not directly comparable.[35]

[35] Maryland shares its border with Delaware, the District of Columbia, Pennsylvania, Virginia, and West Virginia.

Econometric Issues

Since property tax assessment caps and property tax rates may be determined jointly with some of the explanatory variables representing tax parameters and housing shock variables, estimation of many of these models are potentially subject to policy endogeneity. To eliminate potential bias in the estimation, either an instrumental variable technique must be used or the independent variables can be lagged. An appropriate instrument would require a variable that is significantly correlated with the potentially-endogenous explanatory variable but has no independent effect on the dependent variable at hand. Since no appropriate instruments have been found for which data are available, these variables are lagged by one period in the empirical analyses in each model specification.

The spatial characteristics of the explanatory variables used to account for strategic interaction effects bring about additional econometric issues (Brueckner 2003, Anselin 1999). Since neighboring counties may also engage in yardstick competition or tax base competition (similar to the home county), the explanatory measures are potentially endogenous. This occurs when the dependent variable at hand is not only a function of the explanatory variables of the home county, but also of the explanatory variables of the neighboring counties. Using simple ordinary least squares (OLS) would lead to inconsistent estimates of the coefficients if spatial lag dependence were ignored.

Applying Moran's *I*-test indicates that spatial lag dependence does indeed exist for many county-year observations in Maryland. Therefore, I accommodate a spatial lag model using a conventional instrumental variable approach to acquire consistent estimates of the parameters. The endogenous variable (the average neighbors' assessment cap, property tax rate, and share of homestead recipients) is instrumented by the weighted averages of the neighbor counties'

explanatory variables. Therefore, in the first stage of these models, I regress the contiguity-weighted dependent variable of the border counties on the weighted average independent variables of the border counties and these estimates are used as instruments for the explanatory variables that capture possible strategic interaction effects.

Another potential problem relates to spatial error dependence, where the error terms across neighboring counties are correlated. If spatial error dependence exists, the error vector is actually defined by the term $\varepsilon = \Omega W\varepsilon + \mu$ where W is the weight matrix, μ is a well-behaved error term, and Ω is an unknown parameter. Testing for spatial error dependence indicates that some observations revealed correlations in the error terms across Maryland counties. Although spatial error dependence may induce correlation in the error terms, an instrumental variable approach leads to consistent estimates of the coefficients (Kelejian and Prucha 1998). Therefore, an instrumental variable approach (as described above) is used in this study to avoid inconsistent estimates of the coefficients in light of both spatial lag and spatial error dependence.[36]

1.G Data

In this section, I provide a summary of the descriptive statistics to offer some background on the data used in the empirical analysis. I begin by outlining trends in residential property values in Maryland and show the relationship between these values and the county-level assessment caps. I also note some important trends in the explanatory variables before moving on to the results of the empirical exercises.

[36] See Anselin (1999) for more on spatial dependence.

Residential Property Values in Maryland

Homeowners in the state of Maryland have witnessed substantial increases in property values over the past two decades. As shown in Table 1.4, the average county-level increase in inflation-adjusted median home sales prices from 1995 to 2006 was 94.20 percent. Even Allegany County, the county with the least amount of growth in property values in Maryland over this period, saw inflation-adjusted median home sales prices increase at a rate of 27.60 percent. Meanwhile, Worcester County's inflation-adjusted median home sales price skyrocketed at a rate of 174.06 percent from 1995 to 2006. Other counties in Maryland that witnessed sizeable increases in inflation-adjusted median home sales prices during this time (over 100.00 percent) include Caroline County, Dorchester County, Queen Anne's County, and Talbot County.

Central to this study is the fact that while property values increased in Maryland, voters may have used property tax assessment caps to control the growth in residential property tax bills. Figure 1.1 shows the trend in the average county-level median home sales price growth and the trend in the average county-level assessment cap in Maryland over the years 1995-2006.[37] This figure illustrates that county officials may have responded to rapid growth in property values by providing increased property tax relief by way of implementing more constraining property tax assessment caps.

To offer further evidence that voters may have installed lower assessment caps to provide increased property tax relief, Table 1.5 compares the assessment caps chosen by Maryland county governments in 2006 to their respective annual growth in nominal median home sales

[37] Note that the average county-level median home sales price growth is in nominal terms in Figure 1.1 to give a better understanding of the relationship between the assessment caps and the values that determine whether or not these caps are potentially binding.

prices. Given that twenty-two out of twenty-four Maryland counties had higher growth in median home sales prices compared to their assessment caps, for the median homeowner in 91.67 percent of counties the assessment cap was potentially binding in 2006. In 2006 only Garrett County and Kent County did not have potentially binding property tax assessment caps, suggesting that the majority of homeowners in these counties did not receive property tax relief via assessment caps that year.

The numbers in Table 1.5 only apply to 2006, so it is worthwhile to show the percent share of Maryland counties that had potentially binding property tax assessment caps in Maryland for years prior to 2006. These shares are illustrated in Figure 1.2. Early in the time period studied a low percentage of counties had potentially binding assessment caps, but the share of counties with potentially binding assessment caps grew considerably. In particular, from 2000 through 2005 the share of Maryland counties with a potentially binding assessment cap increased from 12.50 percent to 95.83 percent.

Descriptive Statistics

Table 1.6 shows the descriptive statistics for the first year in the panel (1996), the last year in the panel (2006), and the entire panel (1996 – 2006) including means, standard deviations, minimum values, and maximum values.[38] The assessment caps declined over the course of the panel while property tax rates remained relatively constant. The average county-level assessment cap was 7.92 percent in 1996, decreasing to 6.50 percent in 2006. On average, property tax rates remained close to 1.00 percent from 1996 to 2006. Only 4.17 percent of counties had potentially binding assessment caps in 1996, while 91.67 percent of counties had

[38] All dollar values in this study are inflation-adjusted with a base year of 2000. In addition, some monetary variables are in per capita terms to control for differences in population. Due to data limitations noted below Table 1.6, some variables are not available for all years of the panel.

potentially binding caps in 2006. Similarly, 12.13 percent of homeowners received property tax relief via assessment caps in 1996, but this measure reached 46.87 percent in 2006.

The share of counties with a property tax revenue cap installed in 1996 was 8.33 percent but this number doubled by 2006. The average inflation-adjusted circuit breaker received by a homeowner in 1996 was $581 and by 2006 this figure reached an average of $759. The effective non-property tax rate (defined as all local tax collections from sources other than the property tax divided by total county personal income) increased significantly from 1.51 percent on average to 2.00 percent, suggesting that the average county attempted to collect more revenue from tax sources other than the property tax over the course of the panel. Inflation-adjusted intergovernmental revenue per capita, which is included to account for any state and federal aid received by the county's median voter, increased significantly from $779 to $1,110 over the course of the panel. Growth in inflation adjusted median home sales prices averaged approximately 6.40 percent per county-year observation. Residential properties grew by an average rate of 1.31 percent while the growth in new building permits for privately owned residential homes averaged 6.56 percent during this time.

The share of the population enrolled in k-12 public schools and the share of the population aged 65 and older remained relatively constant averaging 16.17 percent and 12.96 percent, respectively, from 1996 to 2006. Inflation-adjusted median household income increased from $47,689 in 1996 to $52,202 in 2006, representing growth of about 9.46 percent. The share of democratic votes, as measured by results from county-level presidential and gubernatorial elections, remained close to 43.83 percent over the course of the panel while voter participation averaged 48.38 percent. The average county-level population increased from 212,999 to 233,989 residents, representing growth of about 9.85 percent. I included the descriptive statistics for

explanatory variables associated with neighboring counties, though these measures closely follow the trends of their respective dependent variables that have already been noted above.

1.H Results

The results from the empirical models are shown in Tables 1.7 through 1.10, with the primary results being those that examine the spatial effects of assessment caps and property tax rates (Table 1.9) and the extent to which property tax relief is binding (Table 1.10). Before these primary results are presented, I include results associated with the joint determination of caps and rates in Table 1.7 and censoring models in Table 1.8.

Assessment Caps and Property Tax Rates

Results from the first set of empirical models in which the caps and rates are determined simultaneously are shown in Table 1.7. Time fixed effects are included as explanatory variables in both Models (1) and (2) and the second model also includes county fixed effects. Overall, the results indicate that a mix of tax parameters and demographic factors play a role in the choice of magnitude of property tax relief and property tax rates. Virtually no relationship exists between the housing shock variables and the magnitude of assessment caps chosen. This is likely due to the fact that nominal assessment caps – despite their magnitude – may not guarantee property tax relief and are therefore not necessarily binding. Since many of the assessment caps are non-binding, these results indicate that housing shocks do not play a significant role in the single choice of the magnitude of assessment caps, but they may still play a role in the extent to which property tax relief is potentially binding (which is analyzed in Table 1.10).

In Model (1) of Table 1.7, a one percentage point decline in the assessment cap (associated with providing homeowners with increased property tax relief) is associated with a 0.08 percentage point increase in the property tax rate. The results also indicate that the lagged average circuit breaker credit is positively and significantly related to the property tax rate in both Models (1) and (2). Specifically, a $100 increase in the lagged average circuit breaker credit is associated with between a 0.04 and 0.07 percentage point increase in the property tax rate. Similarly, in Model (2), counties with a property tax revenue cap are associated with higher property tax rates of about 0.05 percentage points. These results suggest that property tax relief mechanisms in the form of assessment caps, revenue caps, and circuit breakers may be used to lower residential property tax burdens while increasing the overall tax rate on property, a result that matches well with Anderson's (2006) insurance concept.

The lagged effective non-property tax rate is negatively and significantly related to the assessment caps in both models, suggesting that increases in this rate are associated with choices for increased property tax relief through lower assessment caps. More specifically, the results indicate that a one percentage point increase the lagged effective non-property tax rate is associated with a decline in the assessment cap between 1.49 and 1.71 percentage points and a 0.29 percentage point decrease in property tax rates. These results may provide evidence that higher non-property tax burdens are associated with an increased desire to protect residential taxpayers from sharply rising property tax burdens, illustrating the possibility of substitutability among tax instruments and other revenue sources at the county level.

There exists no significance in the relationship between the choice of magnitude of property tax relief and the lagged amount of intergovernmental revenue per capita. However, a

$100 increase in lagged inflation-adjusted intergovernmental revenue per capita is associated with a 0.08 percentage point increase in property tax rates. This result may reflect the idea that county governments that put forth greater "effort" via higher tax rates may receive more revenue per capita from state and federal grants, holding all else constant.

Few demographic factors are significantly related to the magnitude of the assessment cap in Table 1.7. An increase in the share of the county-level population enrolled in public schools is negatively related to the magnitude of property tax relief chosen by the median voter in both model specifications. The results indicate that a one percentage point increase in this share of the population is associated with about a 0.45 percentage point increase in the assessment cap in both models. These results suggest that voters who may value local public goods and services more (such as residents with children in public schools) may prefer less property tax relief in order to properly fund local public services such as education.

Model (2) provides further support for this contention as the relationship between the share of the population aged 65 years and older and the choice of magnitude of property tax relief is positive and significant. A one percentage point increase in this share of the population is associated with a 0.70 percentage point decline in assessment caps, suggesting that higher shares of residents that are older (who may not prefer to spend as much on local public education since they do not directly benefit from these expenditures) are associated with preferences for increased property tax relief.

There are also some interesting results associated with political preferences of the voting population. In Model (1), a one percentage point increase in the share of democratic votes is associated with a 0.13 percentage point decline in assessment caps and a 0.01 percentage point

decline in property tax rates. This result suggests that residents in counties with higher shares of democratic voters may prefer to use the property tax less than other available revenue sources in the portfolio of local taxation, possibly due to the regressive nature of the property tax. However, once county fixed effects are controlled for in Model (2), a one percentage point *increase* in the share of democratic votes is associated with a 0.05 percentage point increase in the assessment cap. Therefore, after controlling for county-specific unobservable factors, higher shares of democratic votes (which may be associated with preferences for fewer constraints on local government officials) are associated with preferences for less property tax relief.

Finally, the results in Model (1) indicate that voter participation is negatively and significantly related to the magnitude of assessment caps. A one percentage point increase in voter participation is associated with a 0.22 percentage point decline in assessment caps. This result could indicate one of two things. First, counties with higher levels of community engagement may be associated with preferences for more residential property tax relief. Also, government officials who attempt to establish a Leviathan-type presence may be associated with installing less residential property tax relief in order to maximize government revenues when voter participation is low.

Results in Table 1.8 are included to account for the possibility of upper censoring of the assessment caps at the state-mandated level of ten percent.[39] These results do not differ significantly from the results shown in Table 1.7 (or the primary results in Tables 1.9 and 1.10) and therefore they are not discussed in detail. Specifically, the main results associated with the

[39] Model (1) in Table 1.8 uses a simple Tobit model with time fixed effects while Model (2) accounts for panel effects by using a random effects Tobit with time fixed effects. Models (3) and (4) both use Tobit models and instrument for the property tax rate with the latter model including time fixed effects. In Models (2) through (4) of Table 1.8, McFadden's pseudo r-squared is used for a goodness of fit measure. See Gujarati (2003) for more on this measure.

censoring models are consistent with previous findings regarding revenue substitution within the property tax as property tax rates and average circuit breaker credits are both negatively related to the choice of magnitude of assessment caps in Models (1) and (4) in Table 1.8. The results also indicate that substitution across other revenue sources at the county level may exist as effective non-property tax rates are negatively associated with property tax relief in all four models of Table 1.8.

In addition to these findings, Table 1.8 provides evidence that larger housing shock measures may be associated with preferences for increased property tax relief. In all four models, increases in the lagged growth in residential properties are associated with lower assessment caps. These results may provide evidence that counties with an increased demand for owner-occupied housing may experience higher levels of appreciation, increasing the benefits gained from insurance against rapid increases in property tax bills for homeowners.

Similar to the previous set of models, the share of the population enrolled in public schools is significantly related to the choice of magnitude of property tax relief. Increases in this share of the population are associated with preferences for higher assessment caps. Also, in the first two models in Table 1.8, inflation-adjusted median household income is negatively and significantly related to the magnitude of assessment caps, suggesting that median voters with relatively higher levels of household income prefer more property tax relief. These results correspond well with survey research by Joyce and Mullins (1991) and Mullins and Joyce (1999) suggesting that individual voters with higher earnings are more likely to vote in favor of implementing TELs. Counties with median voters who have relatively high levels of income may rely on a larger income tax base to generate revenue for public goods and services, a result

that supports prior research regarding revenue substitution effects. Overall, the censoring models provide a good robustness check and the results are similar to those in the simultaneous equations models (Table 1.7) and the spatial models (Tables 1.9 and 1.10).

The primary results of this study are presented in Tables 1.9 and 1.10. The results in Table 1.9 are associated with fixed effects panel models (including time fixed effects) where the dependent variable is equal to the magnitude of the assessment caps in Models (1) and (2) and the property tax rates in Models (3) and (4). Each of these models includes a specific measure intended to capture the possibility of spatial effects across counties.

Although none of the explanatory variables associated with property taxes and other property tax relief mechanisms are significantly related to the choice of magnitude of assessment caps, revenue caps and average circuit breaker tax relief are both positively and significantly related to property tax rates in Models (3) and (4). Specifically, the results in both models suggest that counties with revenue caps installed are associated with a 0.03 percentage point increase in property tax rates and a $100 increase in the average circuit breaker credit is associated with a 0.04 percentage point increase in property tax rates. These results provide further evidence that property tax rates and property tax relief mechanisms may be used differently to achieve separate objectives.

Once again, the effective non-property tax rate is found to be negatively and statistically related to the assessment caps, indicating that residents prefer to increase residential property tax relief when there exist other available revenue sources (outside of the property tax) to maintain the provision of local public goods and services. Specifically, a one percentage point increase in the effective non-property tax rate is associated with a decline in the assessment cap from

anywhere between 1.82 and 1.90 percentage points. Similar to the results in Table 1.7, there appears to be no significant relationship between the housing shock variables and the magnitude of property tax relief or property tax rates (though the housing shocks do affect the extent to which property tax relief is binding in Table 1.10 as discussed below).

Although there exists no statistical relationship between the share of the population enrolled in k-12 public schools and the magnitude of residential property tax relief, the results in Models (1) and (2) indicate that a higher share of the population aged 65 years and older is associated with preferences for increased property tax relief. A one percentage point increase in this share of the population is associated with a decline in the assessment caps of 0.71 percentage points in Model (1) and a decline of 0.69 percentage points in Model (2). Therefore, counties with higher shares of relatively older residents who may have more binding liquidity constraints and may benefit less from public services such as education are found to prefer higher levels of property tax relief.

Also, in Models (1) and (2) in Table 1.9 a $1,000 increase in inflation-adjusted median household income is associated with a decline in assessment caps of 0.13 percentage points. Similar to the findings in the censoring models, these results are consistent with prior literature that suggests that individuals with more income tend to prefer higher levels of property tax relief. In Model (2) of Table 1.9, results also indicate that a one percentage point increase in the share of democratic votes is associated with preferences for less tax relief via assessment caps of 0.04 percentage points, suggesting that counties with higher shares of democratic voters may prefer to install fewer constraints on local government revenues.

There appear to be no significant spatial effects with regards to the choice of magnitude of property tax relief in Models (1) and (2), but Models (3) and (4) indicate that there is a positive and significant relationship between the home county's property tax rate and its neighbors' rates. In Model (3), the results indicate that a one percentage point increase in the average contiguity-weighted property tax rate is associated with a 0.77 percentage point increase in the home county's property tax rate. Similarly, in Model (4) a one percentage point increase in the shared border-weighted property tax rate is associated with a 0.63 percentage point increase in the home county's property tax rate. These results provide evidence that the median voter in the home county may either look to neighboring counties as a gauge when choosing the local property tax rate or the median voter may attempt to compete for homeowners in order to increase the property tax base.

Binding Assessment Caps

In the final set of empirical models, I examine the role that the same set of explanatory variables play on the probability that an assessment cap is potentially binding and on the share of homestead recipients. Table 1.10 presents the results of these models where the first dependent variable is equal to a dummy variable that represents whether or not the assessment cap is binding for the majority of homeowners. The second dependent variable is equal to the share of homeowners that actually received some positive level of property tax relief via assessment caps. The results in the first two models provide no significance, likely reflecting the fact that the dependent variable is inferior to the measure used in Models (3) and (4).[40] Therefore, I ignore the discussion of the results in Models (1) and (2).

[40] The binding assessment cap dummy variable used in Models (1) and (2) is only potentially-binding for reasons discussed earlier in this study. Not only may this measure be unable to fully capture the extent to which property tax

In the last two models in Table 1.10, there is no statistical relationship between any of the fiscal parameters and the share of homestead recipients, suggesting that revenue substitution does not play a role in the extent to which property tax relief is binding for homeowners. However, the lagged growth in residential properties is positively and statistically related to the share of homestead recipients, suggesting that shocks to the housing market play a role in the extent to which property tax relief is granted. Specifically, a one percentage point increase in the lagged growth of residential properties is associated with a 1.50 percentage point increase in the share of homestead recipients in Model (3) and a 1.36 percentage point increase in the share of homestead recipients in Model (4). These results indicate that higher demand for owner-occupied homes (which may lead to higher home prices) may result in a greater share of homeowners receiving property tax relief via assessment caps.

Counties with higher shares of the population that are aged 65 years and older are also associated with greater shares of homestead recipients. In fact, a one percentage point increase in this share of the population is associated with between a 4.33 and a 4.48 percentage point increase in the share of homestead recipients. Similarly, counties with a higher level of median household income are associated with a greater share of homestead recipients – a $1,000 increase in inflation-adjusted median household income is associated with between a 1.07 and a 1.09 percentage point increase in the share of homestead recipients. Each of these results matches well with previous findings in this study.

Finally, the shares of homestead recipients in neighboring counties appear be positively and significantly related to the share of homestead recipients in the home county. Specifically, a

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relief is binding, it also could be the case that residents prefer to provide at least some tax relief to a large share of homeowners. Models (3) and (4) examine this possibility.

one percentage point increase in the contiguity-weighted share of homestead recipients is associated with a 0.53 percentage point increase in the home county share of homestead recipients and a one percentage point increase in the shared border-weighted share of homestead recipients is associated with a 0.45 percentage point increase in the home county share of homestead recipients. Therefore, spatial effects may play a role in extent to which property tax relief is granted across counties.

Discussion of Results

Overall, the results from the empirical models provide evidence of revenue substitution effects between TELs and property tax rates and between TELs and other local revenue sources. These findings support similar revenue substitution effects found in prior research by Courant et al. (1980) and Ladd and Wilson (1982). Empirical findings indicate that substitutability among revenue sources for county-level governments is particularly present in the relationship between assessment caps and effective non-property tax rates. These results indicate that increased property tax relief is often made up for through higher income taxes, other taxes, or fines and fees at the local level.

In addition, the results indicate that housing shocks (particularly increases in the growth of residential properties) are associated with increased property tax relief. County-level assessment caps appear to extend binding property tax relief to larger shares of homeowners in counties where there are relatively large shocks to the housing market through higher growth in residential properties, which may cause higher home appreciation. These results not only support Anderson's (2006) insurance story, but they shed light on the importance of considering more than the sheer existence of TELs when analyzing the effects of property tax relief mechanisms.

The empirical models also provide interesting results regarding the demographic characteristics associated with the choice variables at hand. Counties with higher shares of the population enrolled in k-12 public schools are associated with preferences for lower magnitudes of property tax relief (higher assessment caps) and higher property tax rates. This is likely associated with the fact that these individuals receive more direct benefits from local public services such as education, so they prefer to maintain sufficient funding for schools.

It appears that spatial effects are present in the choice of magnitude of property tax rates and the share of homestead recipients. Voters in the home county look to neighboring counties and choose property tax rates that are positively related to their neighbors' rates, suggesting the possibility that traditional yardstick competition is taking place across Maryland counties. In addition, jurisdictions that are surrounded by counties with a relatively high share of homestead recipients are associated with higher levels of homestead recipients in-county, suggesting that the extent to which property tax relief is binding is also a function of choices made in neighboring counties.

1.I Conclusions

This study has established an understanding of the choice of magnitude of property tax relief using panel data to examine the role that various factors play in the level of property tax assessment caps and property tax rates chosen in Maryland county governments. Since caps and rates do not fully explain whether or not property tax relief is binding, I also study which factors affect the extent to which property tax relief is binding. Maryland's assessment caps give county governments the right to determine the magnitude of local property tax relief which provides a natural setting to analyze these questions empirically.

While prior studies have only examined the existence of property tax relief, this is the first study to analyze the way in which fiscal parameters, housing shock patterns, and demographic characteristics affect the choice of magnitude of property tax relief. In addition, this is the first study to examine whether an assessment cap is binding – that is, whether the assessment cap is actually providing property tax relief rather than simply acting as a nominal artifact of the local tax structure. Perhaps most importantly, this is the first study to provide empirical evidence in support of Anderson's (2006) insurance idea that suggests homeowners may care to maintain local public service provision while simultaneously establishing a safety net against uncontrollable increases in property tax bills. Evidence of revenue substitution effects in the presence of property tax limitation mechanisms further supports this contention.

The main policy implications of this study are threefold. First, it may be possible to impose constraints on some local government revenues without necessarily compromising the level of public goods and services. Since county governments have several ways to generate revenue and taxpayers across the U.S. have shown more and more distaste for the property tax, property tax relief may offer a situation in which the magnitude of such relief is often associated with substitutions in revenue production through higher effective non-property tax rates. Therefore, it is possible to simultaneously provide insurance against rapidly increasing property tax bills without compromising the level of local public goods and services.

Second, shocks to the housing market matter and higher magnitudes of property tax relief can insure homeowners against rapid increases in residential property tax bills. Those jurisdictions experiencing larger shocks to the housing market are associated with providing greater magnitudes of property tax relief and a greater share of recipients of property tax relief.

These findings may have implications for other TELs, especially in jurisdictions where voters have the ability to vote for the implementation of TELs at various magnitudes

Third, this study outlines those demographic attributes associated with jurisdictions that install relatively high levels of property tax relief versus those jurisdictions that implement relatively low levels of relief. Therefore, policymakers may now be aware of several demographic characteristics – such as higher shares of the population that are enrolled in public schools – that are typically associated with the decision to implement relatively lower magnitudes of property tax relief in efforts to maintain funding for local education. Policymakers may also understand that the possibility of spatial effects may exist, including the possibility of yardstick competition – where the preferences of voters in the home county are influenced by the choices made in other neighboring counties.

There are several suggestions for future research that relate to the findings in this study. When examining TELs, it is important to consider whether or not they are binding rather than focusing solely on their existence or even their magnitudes. Although parcel-level data may provide a better unit of examination to accurately assess the likelihood that a homeowner experiences binding property tax relief, this study provides the first step in analyzing factors associated with the extent to which property tax relief is binding. This is also one of a few studies to examine multiple TELs, which illustrates the importance of addressing differences in institutional characteristics across jurisdictions, including differences in property tax relief mechanisms.

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APPENDIX

Table 1.1: Homestead Property Tax Credits

	10% Assessment Cap	5% Assessment Cap	0% Assessment Cap
Assessed Value in 2004	$221,103	$221,103	$221,103
Assessed Value in 2007	$315,000	$315,000	$315,000
Overall Change in Assessed Value (2004-2007)	$93,897	$93,897	$93,897
Annual Change in Assessed Value (2004-2007)	$31,299	$31,299	$31,299
Taxable Assessed Value without Cap in 2007	$252,402	$252,402	$252,402
Tax Liability without Cap in 2007	$2,446	$2,446	$2,446
Taxable Assessed Value with Cap in 2007	$243,213	$232,158	$221,103
Non-Taxable Assessed Value with Cap in 2007	$9,189	$20,244	$31,299
Homestead Property Tax Credit in 2007	$89	$196	$303
Tax Liability with Cap in 2007	$2,357	$2,250	$2,142

Credit calculated based on a real property tax rate of $0.9690 per $100 of assessed value
All dollar values are nominal

Table 1.2: Maryland's Assessment Caps

County	1992	2000	2008
Allegany	10	10	10
Anne Arundel	10	4	2
Baltimore City	4	4	4
Baltimore County	4	4	4
Calvert	0	10	10
Caroline	10	10	5
Carroll	10	10	7
Cecil	10	10	8
Charles	10	5	7
Dorchester	10	10	5
Frederick	10	10	5
Garrett	10	10	5
Harford	6	10	9
Howard	5	5	5
Kent	5	5	5
Montgomery	10	10	10
Prince George's	10	3	3
Queen Anne's	10	10	5
Saint Mary's	10	5	5
Somerset	10	10	10
Talbot	10	0	0
Washington	10	10	5
Wicomico	10	10	10
Worcester	10	10	3
Average	8.50	7.71	5.92

Source: Maryland SDAT (2008)

Table 1.3: Variable Definitions & Source Notes

Variable Name	Definition	Source
Assessment Cap	The limit on the annual percentage increase in taxable assessed value for owner-occupied property	MD SDAT
Property Tax Rate	Real property tax rate per $100 of assessed value (applies to all real property in Maryland)	MD SDAT
Binding Assessment Cap	Dummy variable equal to one if the assessment cap is less than the annual growth in median home sales prices	Author's Calculations
Share Homestead Recipients	Number of homestead recipients divided by the number of residential properties	MD SDAT
Property Tax Revenue Cap	Dummy variable for whether or not there exists a property tax revenue cap	MD SDAT
Average Circuit Breaker Credit	Total circuit breaker relief divided by the number of circuit breaker recipients	MD SDAT
Effective Non-Property Tax Rate	Total local income and other tax revenue divided by total personal income	MD DLS
Intergovernmental Revenue Per Capita	Inflation-adjusted state and federal intergovernmental revenue per capita	MD DLS
Growth in Median Home Price	Annual percentage growth in inflation-adjusted median home sales price	MD SDAT
Growth in Building Permits	Annual percentage growth in new, privately-owned residential housing building permits	U.S. Census Bureau
Growth in Residential Properties	Annual percentage growth in the number of residential properties	MD SDAT
Share of Population Enrolled in School	Share of total county population enrolled in public k-12 schools	MD Report Card
Share of Population Aged 65 & Older	Share of total county population aged 65 years or older	U.S. Census Bureau
Median Household Income	Inflation-adjusted median household income	U.S. Census Bureau
Voter Participation	Number of votes divided by the population aged 20 years and above	U.S. Elections Atlas
Share of Democratic Votes	Share of democratic votes in the most recent Presidential or Gubernatorial Election	U.S. Elections Atlas
Natural Log of Population	Natural log of the total population	U.S. Census Bureau
Contiguity-Weighted Assessment Cap	Average of neighbors' assessment cap	Author's Calculations
Shared Border-Weighted Assessment Cap	Average of neighbors' assessment cap weighted by the length of the shared border	Author's Calculations
Contiguity-Weighted Property Tax Rate	Average of neighbors' real property tax rate	Author's Calculations
Shared Border-Weighted Property Tax Rate	Average of neighbors' real property tax rate weighted by the length of the shared border	Author's Calculations
Contiguity-Weighted Share Homestead Recipients	Average of neighbors' share of homestead recipients	Author's Calculations
Shared Border-Weighted Sh. Homestead Recipients	Average of neighbors' share of homestead recipients weighted by the length of the shared border	Author's Calculations

Table 1.4: Median Home Sales Prices

County	1995	2006	Percent Change
Allegany	$58,756	$74,974	27.60
Anne Arundel	$153,613	$286,060	86.22
Baltimore City	$67,795	$119,583	76.39
Baltimore County	$127,568	$213,542	67.39
Calvert	$141,180	$280,167	98.45
Caroline	$90,281	$226,418	150.79
Carroll	$157,172	$294,688	87.49
Cecil	$112,992	$220,290	94.96
Charles	$152,051	$286,146	88.19
Dorchester	$79,094	$187,917	137.59
Frederick	$146,890	$281,875	91.90
Garrett	$68,925	$116,167	68.54
Harford	$127,568	$222,083	74.09
Howard	$177,575	$340,813	91.93
Kent	$122,031	$210,979	72.89
Montgomery	$192,087	$363,021	88.99
Prince George's	$146,777	$269,063	83.31
Queen Anne's	$138,980	$320,313	130.47
Saint Mary's	$133,331	$250,484	87.87
Somerset	$71,185	$124,623	75.07
Talbot	$132,766	$314,508	136.89
Washington	$107,569	$206,944	92.38
Wicomico	$94,348	$167,417	77.45
Worcester	$93,501	$256,250	174.06
Average	$120,585	$234,763	94.20

All dollar values are inflation-adjusted (2000 dollars)
Source: Maryland SDAT (2008)

Table 1.5: Assessment Caps & Nominal Home Price Growth (2006)

County	Assessment Cap	Median Home Sales Price Growth	Binding?
Allegany	10	14.4	Binding
Anne Arundel	2	15.5	Binding
Baltimore City	4	13.4	Binding
Baltimore County	4	19.1	Binding
Calvert	10	13.5	Binding
Caroline	10	48.9	Binding
Carroll	7	16.9	Binding
Cecil	8	14.6	Binding
Charles	10	18.8	Binding
Dorchester	5	25.7	Binding
Frederick	5	17.0	Binding
Garrett	5	3.8	Non-Binding
Harford	10	13.0	Binding
Howard	5	17.4	Binding
Kent	5	2.9	Non-Binding
Montgomery	10	13.3	Binding
Prince George's	3	28.6	Binding
Queen Anne's	5	14.9	Binding
Saint Mary's	5	17.3	Binding
Somerset	10	14.0	Binding
Talbot	0	23.4	Binding
Washington	10	18.2	Binding
Wicomico	10	14.0	Binding
Worcester	3	3.4	Binding
Average	6.50	16.75	91.67% Binding

Source: Maryland SDAT (2008)

Table 1.6: Descriptive Statistics

Variable Name	*t* = 1996 (*n* = 24)				*t* = 2006 (*n* = 24)				*t* = 1996 - 2006 (*n* = 264)			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Assessment Cap	7.92	3.15	0.00	10.00	6.50	3.15	0.00	10.00	7.52	3.14	0.00	10.00
Property Tax Rate	0.97	0.33	0.38	2.34	1.00	0.30	0.54	2.31	1.00	0.30	0.38	2.34
Binding Assessment Cap	0.04	0.20	0.00	1.00	0.92	0.28	0.00	1.00	0.47	0.50	0.00	1.00
Share Homestead Recipients	12.13	12.57	1.28	42.97	46.87	20.68	7.38	76.81	15.32	19.42	0.28	76.81
Property Tax Revenue Cap	0.08	0.28	0.00	1.00	0.17	0.38	0.00	1.00	0.14	0.34	0.00	1.00
Average Circuit Breaker Credit	580.56	177.75	290.62	925.02	759.16	184.01	440.26	1,121.77	648.48	180.69	289.29	1,121.77
Effective Non-Property Tax Rate	1.51	0.29	1.08	2.04	2.00	0.39	1.34	3.01	1.67	0.34	1.03	3.01
Intergovernmental Revenue Per Capita	778.97	261.94	434.01	1,570.18	1,109.97	300.17	725.62	2,015.06	973.96	319.80	434.01	2,128.81
Growth in Median Home Price	-0.65	4.84	-14.35	6.06	13.10	8.87	-0.34	44.26	6.40	8.17	-14.35	44.26
Growth in Building Permits	3.00	43.21	-62.96	184.91	-21.79	22.70	-54.26	18.90	6.56	47.59	-95.43	376.09
Growth in Residential Properties	1.25	0.94	-0.10	2.92	1.92	1.38	-0.85	5.61	1.31	0.97	-0.85	6.26
Share of Population Enrolled in School	16.50	1.83	13.24	20.39	15.47	2.14	11.31	19.67	16.17	2.02	11.31	21.17
Share of Population Aged 65 & Older	12.89	4.06	7.20	20.90	13.21	4.03	8.07	22.03	12.96	3.93	7.20	22.03
Median Household Income	47,689.28	12,849.09	29,797.51	70,679.92	52,202.04	15,647.07	28,828.13	79,907.29	51,054.98	14,331.18	28,828.13	79,907.29
Share of Democratic Votes	45.46	11.24	31.89	79.34	43.78	12.86	29.33	79.30	43.83	13.15	20.37	82.57
Voter Participation	47.92	5.66	37.05	60.39	44.14	6.70	33.04	55.53	48.38	8.80	32.58	71.13
Population	212,999.40	266,639.10	18,864.00	824,793.00	233,988.60	283,103.40	19,983.00	932,131.00	224,060.90	270,818.00	18,864.00	932,131.00
Contiguity-Weighted Assessment Cap	7.67	1.93	4.00	10.00	6.40	1.89	3.00	10.00	7.40	1.97	3.00	10.00
Shared Border-Weighted Assessment Cap	7.66	2.01	4.00	10.00	6.25	1.97	3.08	10.00	7.33	2.13	3.08	10.00
Contiguity-Weighted Property Tax Rate	0.95	0.14	0.71	1.28	0.97	0.12	0.78	1.28	0.97	0.12	0.71	1.29
Shared Border-Weighted Property Tax Rate	0.95	0.15	0.69	1.41	0.98	0.13	0.76	1.43	0.97	0.13	0.69	1.44
Contiguity-Weighted Share Homestead Recipients	13.56	8.35	1.81	31.11	48.64	17.94	7.38	72.34	16.15	16.91	1.17	72.34
Shared Border-Weighted Sh. Homestead Recipients	13.57	8.82	1.79	32.68	49.31	18.27	7.38	73.02	16.09	17.07	0.92	73.02

All Dollar Values are Inflation-Adjusted (2000 Dollars)
Effective Non-Property Tax Rate data are for 1996 & 2005
Intergovernmental Revenue Per Capita data are for 1996 & 2005

Table 1.7: Empirical Results, 2SLS - Assessment Caps & Property Tax Rates

	Model (1): 2SLS with TFE		Model (2): 2SLS with TFE & CFE	
	Assessment Cap	Property Tax Rate	Assessment Cap	Property Tax Rate
	R-Sq. = 0.3201 *n = 264*	R-Sq. = 0.4579 *n = 264*	R-Sq. = 0.9197 *n = 264*	R-Sq. = 0.9819 *n = 264*
Explanatory Variable	Coefficient [Std. Error]	Coefficient [Std. Error]	Coefficient [Std. Error]	Coefficient [Std. Error]
Constant	10.63244 ***	-1.18506 **	20.37444 ***	-1.92018
	[3.5987730]	[0.5091790]	[6.6671320]	[2.2867040]
Assessment Cap		-0.07781 ***		-0.03740
		[0.0265430]		[0.0306246]
Property Tax Rate	1.21076		2.49061	
	[2.1600020]		[6.7515980]	
Property Tax Revenue Cap (*t-1*)	-0.26159	-0.08277	-0.00789	0.05103 **
	[0.6444826]	[0.0589510]	[0.6187093]	[0.0237119]
Average Circuit Breaker Credit (*t-1*)	0.00387	0.00071 ***	-0.00254	0.00035 ***
	[0.0033476]	[0.0002505]	[0.0031713]	[0.0001091]
Effective Non-Property Tax Rate (*t-1*)	-1.71223 **	-0.28631 ***	-1.49445 **	-0.04975
	[0.7660942]	[0.0846977]	[0.6626996]	[0.0667377]
Intergovernmental Revenue Per Capita (*t-1*)	-0.00114	0.00079 ***	-0.00025	-0.00001
	[0.0019836]	[0.0001018]	[0.0010842]	[0.0000525]
Growth in Median Home Price *(t-1)*	0.01773	0.00349	-0.00106	0.00051
	[0.0338301]	[0.0029911]	[0.0131313]	[0.0005983]
Growth in Building Permits *(t-1)*	-0.00420	-0.00002	0.00069	0.00009
	[0.0038651]	[0.0003556]	[0.0014633]	[0.0000777]
Growth in Residential Properties *(t-1)*	-0.27016	-0.03014 *	-0.06935	-0.00047
	[0.1726864]	[0.0172265]	[0.0723307]	[0.0039922]
Share of Population Enrolled in School	0.45279 ***	0.02587	0.43866 **	0.00477
	[0.1641713]	[0.0186667]	[0.1998966]	[0.0115919]
Share of Population Aged 65 & Older	0.20278	0.01033	-0.69616 ***	-0.01622
	[0.1237507]	[0.0077789]	[0.2382891]	[0.0228210]
Median Household Income	0.00004	0.00000	-0.00007	-0.00001 *
	[0.0000501]	[0.0000036]	[0.0000608]	[0.0000049]
Share of Democratic Votes	-0.12646 ***	-0.00934 ***	0.04890 *	0.00204
	[0.0270057]	[0.0031613]	[0.0269952]	[0.0017755]
Voter Participation	-0.21658 ***		0.01419	
	[0.0710599]		[0.0392748]	
Natural Log of Population		0.16019 ***		0.31348
		[0.0274000]		[0.2862519]

*Significant at 10%; **Significant at 5%; ***Significant at 1%

2SLS - Two Stage Least Squares; TFE - Time Fixed Effects; CFE - County Fixed Effects

All monetary variables are inflation-adjusted (2000 dollars)

Table 1.8: Empirical Results, Censoring Models - Assessment Caps

	Model (1): Tobit with TFE Assessment Cap R-Sq. = 0.1141 *n = 264*	Model (2): RE Tobit with TFE Assessment Cap R-Sq.^ = 0.5319 *n = 264*	Model (3): Tobit with IV Assessment Cap R-Sq.^ = 0.6250 *n = 264*	Model (4): Tobit with IV & TFE Assessment Cap R-Sq.^ = 0.6950 *n = 264*
Explanatory Variable	Coefficient [Std. Error]	Coefficient [Std. Error]	Coefficient [Std. Error]	Coefficient [Std. Error]
Constant	-14.21126	32.99315 **	6.96358	-58.57435 **
	[13.216450]	[15.863500]	[87.297000]	[23.383710]
Property Tax Rate *(t-1)*	-9.80527 ***	-2.83359	2.67813	-34.27268 ***
	[3.0477230]	[4.2440150]	[52.541990]	[10.491250]
Property Tax Revenue Cap (*t-1*)	0.04107	0.75057	0.56150	-1.42637
	[1.4387370]	[1.2268600]	[4.8539240]	[1.6977770]
Average Circuit Breaker Credit (*t-1*)	0.01253 *	-0.00876	0.00404	0.02587 ***
	[0.0065976]	[0.0054983]	[0.0113491]	[0.0092359]
Effective Non-Property Tax Rate (*t-1*)	-6.96461 ***	-3.10915 **	-5.16222	-10.38554 ***
	[1.7747570]	[1.2224870]	[10.777900]	[2.4633440]
Intergovernmental Revenue Per Capita (*t-1*)	0.00572	-0.00001	-0.00353	0.02607 ***
	[0.0039485]	[0.0024911]	[0.0303565]	[0.0093077]
Growth in Median Home Price *(t-1)*	0.08772	0.02183	0.09762	0.14422
	[0.0769439]	[0.0271231]	[0.1191139]	[0.0885399]
Growth in Building Permits *(t-1)*	-0.00627	0.00054	-0.00919	0.00225
	[0.0076968]	[0.0024908]	[0.0196694]	[0.0094018]
Growth in Residential Properties *(t-1)*	-1.08126 **	-0.38448 **	-0.87833 **	-1.17195 **
	[0.4172939]	[0.1761096]	[0.4223906]	[0.4563969]
Share of Population Enrolled in School	1.39059 ***	0.75376 **	1.44656 *	1.10180 **
	[0.3931904]	[0.3161501]	[0.8568538]	[0.4383672]
Share of Population Aged 65 & Older	0.16986	-0.80983 ***	0.00197	0.54811 **
	[0.2030708]	[0.2937629]	[0.7087554]	[0.2736190]
Median Household Income	-0.00015 *	-0.00021 **	-0.00014	-0.00011
	[0.0000858]	[0.0000924]	[0.0001008]	[0.0000960]
Share of Democratic Votes	-0.23009 ***	0.07307	-0.18501	-0.28820 ***
	[0.0593672]	[0.0545365]	[0.1239625]	[0.0703351]
Natural Log of Population	2.15575 **	-0.14979	0.23325	5.77693 ***
	[0.8268283]	[1.4222720]	[8.5431350]	[1.7519050]

*Significant at 10%; **Significant at 5%; ***Significant at 1%

TFE - Time Fixed Effects; RE - Random Effects; IV - Instrumental Variable

^McFadden's Pseudo R-Squared

All tobit models are only censored at the upper limit of 10

All monetary variables are inflation-adjusted (2000 dollars)

Table 1.9: Empirical Results, Spatial Models - Assessment Caps & Property Tax Rates

	Model (1): FE OLS with IV	Model (2): FE
	Assessment Cap	Assessm
	R-Sq. = 0.3014 *n = 264*	R-Sq. = 0.306
Explanatory Variable	Coefficient [Std. Error]	Coefficient
Constant	-81.82870 ***	-82.58
	[28.902390]	[28.303
Assessment Cap *(t-1)*		

Table 1.10: Empirical Results, Spatial Models - Binding Caps & Homestead Recipients

	Model (1): FE OLS with IV Binding Assessment Cap R-Sq. = 0.5732 *n = 288*	M I
Explanatory Variable	Coefficient [Std. Error]	
Constant	-14.10073 [9.2008880]	
Property Tax Rate *(t-1)*	-0.10963	

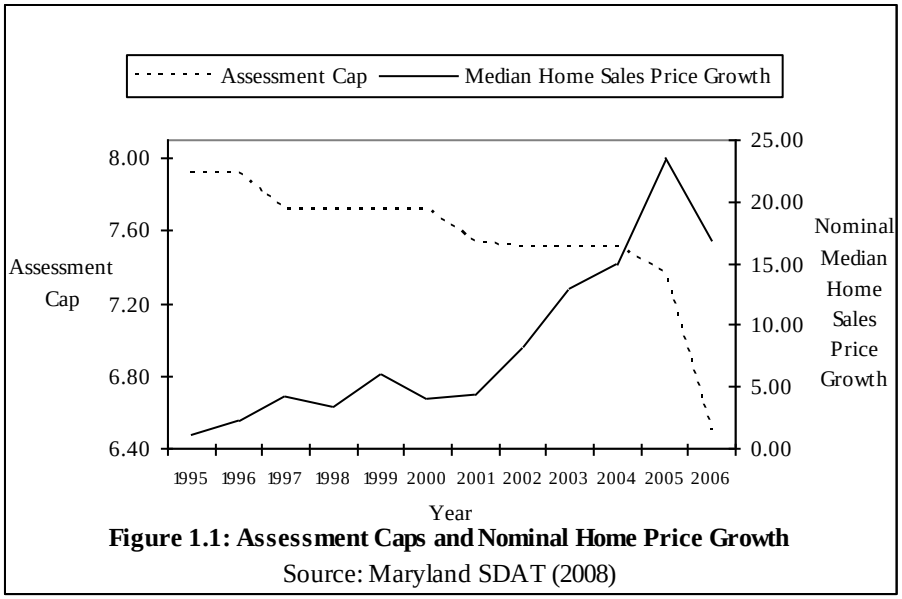

Figure 1.1: Assessment Caps and Nominal Home Price Growth

Source: Maryland SDAT (2008)

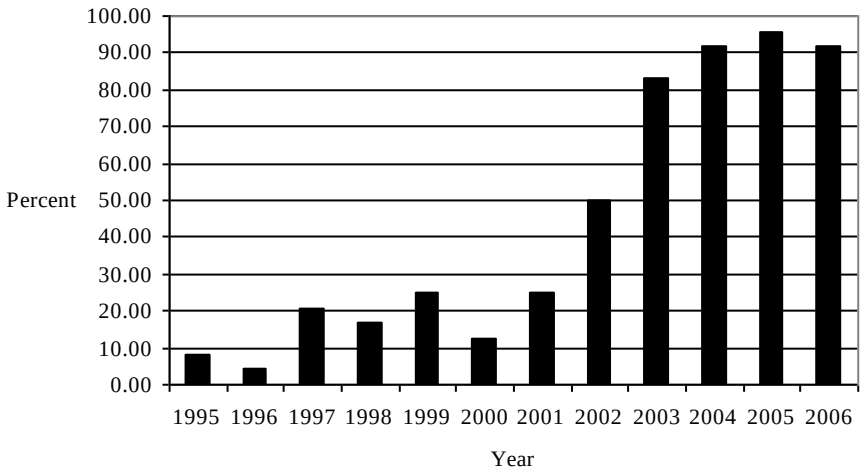

Figure 1.2: Share of Counties with Binding Assessment Caps

Source: Maryland SDAT (2008)

Part 2: Essay 2: Targeted Property Tax Relief and the Burden of Taxes by Property Classification

"During the real-estate boom of the first half of the decade, taxes soared for many non-homestead property owners when local governments did not roll back rates. Homestead property owners were shielded by *Save Our Homes*, the state's three percent cap on annual homestead assessment increases. The resulting 'tax shift' to non-homestead property owners was one of the rallying cries that brought property-tax reform to the public eye in 2006 and 2007."

"*Tax Plan Sets Off New Round of Debate,"* Miller (2009)

2.A Abstract

Tax and expenditure limitations (TELs) have become increasingly popular in the United States (U.S.) over the past half-century, especially in the form of property tax limits. In many instances, such as Florida's "Save Our Homes" program or Maryland's "Homestead Property Tax Credit," these limits only provide relief to residential homeowners. Targeted tax relief of this kind may theoretically shift the relative burden of the real property tax onto owners of other classifications of property. Without diminishing their preferred levels of public services, both homeowners and business owners may pressure government officials to provide specific relief mechanisms benefiting their respective group. In order to maximize supporting votes, local politicians must balance the preferences of these two groups of taxpayers by setting the optimal level of residential tax relief without causing businesses to migrate into other jurisdictions due to increases in the share of non-residential property tax levies. In this study I empirically examine the effects of the choice of magnitude of residential property tax relief on the levels and shares of taxes owed by residential and non-residential property owners. Results indicate that counties in Maryland whose government officials install relatively higher levels of residential property tax relief are associated with significant shifts in the burden of the real property tax bills from residential homeowners to non-residential businesses. These shifts could result in less economic

activity – including fewer jobs and lower levels of income – as mobile businesses may prefer to migrate to jurisdictions that install less property tax relief for homeowners.

2.B Introduction

Over the past half century, the use of TELs has escalated across the U.S. Most TELs limit property taxes and are often targeted to a specific group of property owners, such as residential homeowners. In the early 1990s, Florida's "Save Our Homes" initiative granted tax breaks to owners of homestead properties by limiting the annual increase in their taxable assessed values. Similarly, in Maryland in the late 1970s, a statewide program called the "Homestead Property Tax Credit" was installed to slow growth in property tax bills for residential homeowners by limiting annual growth in taxable assessed values to fifteen percent.

Since property taxes play a key role in supporting public education and other local services, homeowners may vote for politicians who maintain a preferred level of local government spending while simultaneously providing tax relief to minimize tax bills. Similarly, local business owners may view the property tax as a benefit tax, aiming to preserve government spending in order to keep a well-educated workforce at the local level and to provide funding for other local services such as well-maintained roads for the transportation of goods and services. However, just like homeowners, business owners prefer to minimize their tax liabilities.

Property tax relief mechanisms targeted to specific groups – such as the assessment caps in Florida and Maryland – may theoretically shift the relative burden of taxes towards other classifications of property. Therefore, TELs that are implemented to help protect residential homeowners from rapid increases in property tax bills may shift the relative burden of the tax onto businesses and other non-residential properties. This shift in the burden of the property tax

could have serious consequences for local economic activity, as relatively mobile businesses may take their economic activity elsewhere, potentially leaving communities with a smaller property tax base, higher levels of unemployment, or less income. Meanwhile, relatively immobile businesses may have to adjust to bearing a greater share of property tax burdens by increasing prices, lowering wages, or laying off workers.

In this study, I empirically analyze the extent to which these shifts in the burden of the property tax occur in the presence of residential property tax assessment caps in Maryland. After the "Homestead Property Tax Credit" program was reformed in the early 1990s, each county-level government in Maryland was given the option to determine the magnitude of property tax relief for residential property owners by limiting the annual increase in taxable assessed values at the magnitude of their choice between zero and ten percent. Figure 2.1 illustrates that the share of residential property owners receiving property tax relief via assessment caps has skyrocketed since the beginning of the decade – from 6.58 percent in 2001 to 58.30 percent in 2008.[41]

In Maryland, local politicians must find a balance between providing homeowners with insurance against rapid increases in property tax bills via assessment caps at the cost of shifting the tax burden onto non-residential property owners.[42] I model the consequences of decisions made by local politicians who choose the optimal level of residential property tax relief in efforts to maximize overall support for reelection. Since property taxes for businesses may be viewed as a tax on capital, relatively mobile capital may attempt to avoid shifts in the burden of the property tax caused by increased residential property tax relief by moving to areas where there is less property tax relief granted to homeowners. In order to maximize votes, politicians must

[41] All tables and figures are located at the end of this chapter in the Appendix.
[42] See Anderson (2006) for more on the contention that TELs provide homeowners with insurance against rapid increases in tax bills. Alternative perspectives regarding TELs suggest that they have been installed to either limit the size and growth of local governments or to improve efficiency associated with the optimal portfolio of taxation.

consider the consequences associated with businesses bearing a greater share of taxes when determining the optimal level of property tax relief for residential homeowners.

The empirical analyses in this study are broken into three main parts, all of which use county-level data in Maryland over the years 1999 to 2006. I begin by examining the effects of the choice of magnitude of residential property tax relief on the levels and shares of non-residential property tax levies (simply defined as the non-residential tax base times the property tax rate) to determine if property tax relief for homeowners has shifted the burden of real property taxes onto businesses. I also examine the effects of the extent of binding residential property tax relief (defined as a dummy variable equal to one if annual growth in the median home sales price is greater than the assessment cap) on the levels and shares of non-residential property tax levies since the nominal caps (particularly non-binding caps) may not fully capture the provision of tax relief to homeowners. Finally, I examine the effects of the assessment caps (both nominal and binding as mentioned above) on the level of residential tax levies.

Overall, results of this study indicate that higher levels of residential property tax relief shifted the burden of real property tax bills onto non-residential property owners. Specifically, a one percentage point decline in the assessment cap is associated with an $812,597 increase in non-residential property tax levies and a 1.83 percentage point increase in the share of non-residential property tax levies. As expected, these results are more pronounced when the nominal assessment caps are replaced with a dummy variable equal to one only when the caps are binding for the majority of homeowners. In general, the opposite results occur for residential homeowners.[43]

[43] The empirical models in this study shed light on the legal incidence associated with targeted property tax relief for homeowners. Future research should consider the economic incidence associated with these tax shifts as they may affect consumers through higher prices or employees through lower wages or increased layoffs.

This is the first study to examine the impact of property tax limits on shifts in the burden of the property tax in a setting where government officials within each jurisdiction determine the magnitude of property tax relief. Therefore, I do not focus on how the mere *existence* of TELs affects business property tax levies. Instead, I add to the literature further by focusing on how the *magnitude* of TELs may affect these revenues.[44] Since I am mostly interested in how the distribution of the property tax has changed across classes of property, I examine the *share* of property tax revenues paid by different groups in addition to the *levels* of property taxes. Finally, this is the first study to examine the possibility of shifts in the property tax caused by TELs in which the key variables change both across jurisdictions and over time.

The remainder of this study is organized as follows. First, I provide background information on property tax provisions and TELs at the local level. Additionally, I include information on property tax trends in Maryland counties. A review of the pertinent literature is followed by the conceptual framework and an explanation of the empirical strategy. Lastly, I outline the empirical results, provide a general discussion of the results, and summarize the importance of the findings in this study.

2.C Background

In this section, I briefly introduce the types of tax provisions used by government officials to provide targeted tax relief to different groups of taxpayers. Then I present stylized facts that relate to property classification and the presence of property tax relief from Maryland's county-level assessment caps. In particular, I break down trends in the burdens of property tax

[44] The only other study in the TEL literature that has considered the magnitude of property tax relief is by Shadbegian (1999), who examines the effects of a "stringent TEL" (defined as a TEL that is lower than a fixed level) on various revenue sources, including property taxes, income taxes, and other local revenues.

bills by classification. Introducing these trends will demonstrate the necessity for the empirical analysis that follows.

Property Tax Provisions and TELs

Since the first tax policy was implemented to generate revenue for the provision of local public goods and services, taxpayers have searched for ways to minimize, avoid, or even evade taxes. Research indicates that this type of behavior does indeed exist. Individuals and corporations have been found to donate money to charities to avoid taxes or migrate into other jurisdictions based on tax policies that are more favorable to them (Rosen and Gayer 2008).

Politics have increasingly played a role in attempts by taxpayers to influence government officials to install special property tax provisions such as subsidies, tax increment financing (TIF), and TELs. Subsidies in the form of tax credits are often granted to large corporations to provide added incentives to locate in a given jurisdiction, particularly when these corporations will provide job opportunities for local residents, boosting local income. In efforts to generate economic activity, TIF – where a government entity issues bonds to fund investments that are intended to spark economic growth in blighted areas – has also become increasingly popular (Dye and Merriman 2000).

This study focuses on the use of special tax provisions related to TELs, and more specifically, property tax limits.[45] Since government officials must respond to voter pressures in order to increase the likelihood of reelection, it is often the case that homeowners receive special tax treatment through TELs. Businesses and homeowners both attempt to influence government officials to decrease their respective tax burdens and politicians are forced to balance these

[45] Property tax limits include rate limits, assessment limits, revenue rollbacks, expenditure limits, and circuit breakers. For more on these limits and other TELs, see the National Conference of State Legislatures (2002).

conflicting influences in light of the fact that each group of taxpayers provides unique benefits to the local economy. Balancing the preferences of these two groups can be challenging, especially when many taxpayers are part of both groups. For example, homeowners that reside in the same county in which they work may have opposing incentives for the support of local government officials – on one hand they may prefer increased residential property tax relief and on the other hand they may be aware that sizeable shifts in the burden of the property tax may cause their employer to migrate to another jurisdiction.

Local government officials in Maryland counties have two key choice variables that affect property taxpayers differently. First, increased property tax relief through lower county-level assessment caps only provides property tax relief to residential homeowners. Business owners will oppose these residential tax credits to the extent that they result in higher tax bills for businesses. The second set of parameters that government officials may turn to include relief valves for businesses, such as subsidies, targeted tax incentives, TIF, or other types of TELs. Businesses that are highly sensitive to increases in the property tax may be more likely to remain in counties where government officials address tax shifts from assessment caps by granting businesses with these relief valves.[46] If residential property owners view special tax provisions for businesses to be unfair, they may vote for politicians who they believe will not implement policies that are advantageous to businesses. Vote-maximizing politicians must determine the proper mix of these choice parameters to enhance prospects for reelection.[47]

[46] This activity may actually increase the likelihood and magnitude of shifts in the burden of the property tax. Therefore, these relief valves are important to consider. Unfortunately, I cannot measure these relief mechanisms due to data limitations.

[47] Note that lowering property tax rates provides property tax relief to all owners of property equally since there are no unique assessment ratios that affect classes of property differently in Maryland counties. While lower tax rates may please homeowners and business owners, it comes at a high revenue cost. Therefore, targeted relief may be a more pragmatic means of capturing votes and maintaining service delivery.

Property Taxes in Maryland

In general, there are two groups of property taxpayers – residential property owners and non-residential property owners. For the purposes of this study, residential properties are defined as owner-occupied residential homes and condominiums while rental parcels (i.e., apartments and other residential rental units) are captured in the non-residential component. In Maryland, the three main types of non-residential properties include agricultural, commercial, and industrial properties. All properties in Maryland, including residential and non-residential properties are assessed at full market value.[48] Residential parcels by far make up the largest portion of taxable properties, averaging of 88.50 percent for the average county over the years 1990 to 2008. The remaining 11.50 percent of non-residential properties are shared almost equivalently by agricultural properties (6.12 percent) and commercial and industrial properties (5.38 percent).

Although the number of taxable properties represents almost a nine-to-one ratio of residential to non-residential properties, the splits between the assessable bases differ. Approximately 75.67 percent of the total assessable base in the average Maryland county comes from residential properties while the remaining 24.33 percent of the non-residential assessable base is split between agricultural property (5.71 percent) and commercial and industrial property (18.62 percent). These assessable base figures disregard any residential property tax relief associated with assessment caps.[49]

[48] In this study, I focus only on taxable properties. Therefore, those properties exempt from property taxation are not included (these properties made up about 3.41 percent of properties for the average county). Exempt properties include (but are not limited to) religious, charitable, fraternal, sororal, or educational properties.

[49] Note that Maryland has a statewide circuit breaker program. Although this program provides relief to homeowners only, it is ignored in this study because it is a *state funded* program. Similarly, some counties have installed property tax revenue caps, limiting revenue growth by a fixed percent. Since these revenue caps affect residential and non-residential property owners equivalently, they are also ignored in this study.

To give a better indication of the trends in assessable property values across property classification in Maryland counties, Table 2.1 shows the inflation-adjusted per-property (i.e., per taxable parcel) tax levies by classification for each Maryland county in 1999 and 2008. These values are calculated by taking the inflation-adjusted assessable base values by class, dividing them by the number of properties in the respective class, and multiplying this value by the property tax rate per $100 of assessed value. Therefore, these numbers represent the average tax payment for each property owner. From 1999 to 2008, residential tax bills grew by 72.42 percent while non-residential bills grew by 57.06 percent.

Figure 2.2 illustrates the assessed values of residential properties and non-residential properties, along with the assessed values of residential properties after the installment of the assessment caps.[50] Early on in this time period, there was little difference between the residential assessable base with or without property tax relief. In fact, in 1999 this difference only reached $22.16 million for the average county. However, in the second half of this time period, the difference in the residential assessable base began to intensify, reaching a gap of $4.01 billion in 2008 for the average county. This gap is associated with approximately $38.6 million in tax revenue that would have been generated without the implementation of county-level assessment caps. Meanwhile, over the ten-year time period, non-residential assessable bases on average grew at an annual rate of less than five percent through 2005, but then began to increase rapidly from 2006, 2007, and 2008.

This growth in tax relief might have several consequences. One obvious effect may be cuts in local public services. Alternatively, in order to maintain local public services, this tax

[50] Applying the property tax rate to these figures would give the tax levies for each group. Since the same tax rate is applied to each group of properties, this does not affect the shares in the current discussion.

relief for homeowners might be offset by increases in the share of taxes paid by non-residential property owners (or other local revenue sources). Although it is evident that a greater share of residential property owners received tax relief from assessment caps and the levels of the residential tax bases were lowered significantly by the caps, property tax bills may have increased at different rates for different classes of property over this time period.

These trends raise some important questions. How does the magnitude of residential property tax relief chosen affect the *levels* of tax bills paid by residential property owners versus non-residential property owners? How does the magnitude of residential property tax relief chosen affect the *shares* of property taxes paid by residential property owners versus non-residential property owners? Since nominal assessment caps may not capture the extent to which property tax relief is being granted to homeowners, do binding assessment caps affect the levels and shares of residential and non-residential tax levies? In order to find proper solutions to these questions, econometric modeling techniques must be developed in order to hold key variables constant. Before the econometric model is introduced, a review of the pertinent literature and an overview of the conceptual framework are presented.

2.D Literature Review

Prior literature that relates to this study can be separated into two main groups. First, there are studies that focus on the effects of TELs on the structure of local revenues and expenditures. These studies investigate the entire structure of local revenue portfolios (comparing property taxes to income taxes and other local taxes) rather than the distribution of the property tax (comparing levels of residential taxes to non-residential taxes). However, the link between these closely related research questions is worth discussing for some guidance in

the sections that follow. Second, there are a few studies that empirically examine tax burden shifts in light of property tax limits. These two groups of literature are reviewed to provide background for the conceptual framework and empirical analyses that follow.

Effects of TELs on the Structure of Local Revenues

A considerable amount of empirical work has focused on the effects of the existence of TELs on local government finances. Some studies examine the effects of the existence of a TEL on the levels of local revenue sources, such as property taxes, income taxes, other local taxes, and intergovernmental revenue received from state and federal grants.[51] Other studies apply the same empirical question to the expenditure side of the budget, typically examining the effects of TEL existence on local education spending.[52]

Aside from Alm and Skidmore (1999), studies in this area of the literature provide little discussion regarding the conceptual framework behind the empirical setup. Since these studies relate closely to well-developed theories based on the demand for public goods and services, extensive coverage of the theory is perhaps unnecessary. The basic median voter model applies, where government officials choose appropriate levels of the choice variables to maximize a social utility function representing the voting population within the jurisdiction.

In the context of these studies, the choice variables include the magnitude of local tax rates on property, income, and other taxes, the magnitudes of various fines and fees, and the determination of whether or not property tax relief is granted through the installment of a TEL. In essence, these variables are set to achieve some level of revenue that corresponds to the preferences of the median voter. Results of these studies are straightforward. TEL existence

[51] See Preseton and Ichniowski (1991), Mullins and Joyce (1996), Shadbegian (1998), Shadbegian (1999), Alm and Skidmore (1999), and Hill and Shone (2009).
[52] See Shadbegian and Jones (2005), Shadbegian (2003), and Poterba (1997).

decreases the level of overall tax revenues (mainly property taxes since most TELs are formed as property tax limits), but these losses in tax revenues are typically offset by increases in intergovernmental revenues or miscellaneous revenues, including fees and fines.[53]

Shifts in Property Tax Burdens

There is only one study – by Dye et al. (2006) – that bears a direct similarity to the application in this study. Dye et al. (2006) investigate shifts in the burden of the property tax using parcel-level data to understand the effects of a property tax limit on horizontal equity. The authors examine a policy change in which Cook County was the only Illinois county to install an optional seven percent cap on annual increases in residential property tax assessments.[54]

Two important differences between the assessment cap in Cook County and the caps in Maryland counties exist. First, counties in Illinois do not have an option regarding the magnitude of property tax relief to grant to homeowners – they can either install or not install the seven percent assessment cap. Additionally, the assessment cap in Cook County was not permanent when it was adopted in 2003, suggesting that residents and government officials may have been uncertain regarding the future existence of similar tax relief. Chicago was the only reassessment area in Cook County based on the triennial assessment process in Illinois. The findings in the case of Cook County suggest that declines in the tax burden for residential properties as a result of the installment of a seven percent assessment cap are paid for by an

[53] Prior research by Hill and Shone (2009) has already examined the effects of the magnitudes of Maryland's county-level assessment caps on various revenue sources. Results indicate that property tax limits in Maryland do not necessarily impact overall property tax revenue, suggesting that it is possible that there exist distributional shifts across taxpayer groups. However, increased property tax relief is associated with higher levels of other local tax revenue (such as income taxes).

[54] Other studies that research the same Cook County property tax limit include the Civic Federation (2006) and Houlihan (2005).

increase in the property taxes from non-residential property owners, including owners of commercial, industrial, rental, vacant, and ineligible residential properties.[55]

The main differences in this study relative to the prior literature are threefold. First, I advance the understanding of the effects of TELs on shifts in the burden of taxes by looking at magnitudes of property tax limits as opposed to their mere existence. Second, I focus on the effects of TEL magnitude on the levels of the property tax across separate taxpayer groups (residential versus non-residential). Finally, I use county-level data to examine the effects of property tax relief on the shares of taxes paid across jurisdictions and across time whereas Dye et al. (2006) are only able to examine the effects of the Cook County assessment cap for one jurisdiction in one year.

2.E Conceptual Framework

The theoretical approach taken in this study examines the consequences associated with a political equilibrium concept introduced by Hettich and Winer (1988) in which government officials attempt to maximize their expected political support. This model provides a realistic explanation for the actions taking place in Maryland counties regarding the choice of residential property tax relief because it relates closely to a median voter model while recognizing the possible tug of war between homeowners and businesses. While I do not estimate a structural model formally, this framework provides the foundation for the empirical analysis, which examines the consequences of a Hettich and Winer (1988) environment where targeted tax relief is provided to homeowners only.

[55] The Civic Federation (2006) estimates that residential property owners in Chicago received a 5.70 percent decline in property taxes compared to the situation in which no cap was installed. Eligible homeowners received an 11.50 percent reduction in their property tax bills while property tax bills increased by 4.50 percent for those residential property owners that were ineligible.

In a Hettich and Winer (1988) framework, county-elected officials in Maryland attempt to maximize a voter "support" function, which is equivalent to maximizing the number of favorable votes. The goal of candidates and incumbent officials is to be elected in the next term based on decisions made in the current tenure. County officials achieve this goal by maximizing the weighted sum of all votes where weights are based on the political influence of the voters at hand. Therefore, county officials maximize a support function, $\sum_{i=1}^{N} W_i E[v_i]$, where $E[v_i]$ represents the expected vote of individual i in the next election and W_i represents the weight based on some indication of political influence, such as interest group membership, personal wealth, or simply the size and presence of a particular taxpayer group.

According to the assumptions by Hettich and Winer (1988), all voters engage in the same taxable activity.[56] From the voter's perspective, the probability that one will vote in favor of a particular government official is linked positively to the net economic benefit that will be gained if that politician were to be elected. This net economic benefit is simply equal to the benefits from public goods and services less the income lost from taxation. Therefore, government officials aim to maximize the following support function:

$$S = \sum_{i=1}^{N} \{b_i(G) - c_i(t_i \cdot B_i)\} \quad (1)$$

[56] This assumption corresponds well with this study because I focus only on property taxation, which is enforced across several parcels of properties where different taxpayer groups (homeowners and business owners) contribute to local property tax revenues. Households consume residential property to live in while businesses consider property as an input to production.

where b_i represents the benefits from public goods and services (G) and c_i represents the costs associated with the provision of these public goods and services. These costs can be defined as the product of the tax rate, t_i, and the level of taxable activity, B_i, for individual i.[57]

Government officials maximize Equation (1) over the choice variables subject to two constraints. The first constraint is the government budget constraint:

$$G = \sum_{i=1}^{N} t_i \cdot B_i \tag{2}$$

The second constraint is voter i's utility-maximizing response to taxation with regards to the taxable activity:

$$B_i = B_i(t_i, x_i) \ , \qquad \partial B_i / \partial t_i < 0 \tag{3}$$

where x_i is a set of exogenous factors that explain the nature of the related variables to the taxable activity (such as owner-specific characteristics of the taxable property). Presumably, the quantity of the taxable activity, B_i, declines as the corresponding tax rate on that activity increases. In this study, the taxable activity can be thought of as ownership of a taxable property (residential, non-residential, or both).

The basic outcome of the Hettich and Winer (1988) model is that government officials may have the incentive to issue different tax prices to different groups of taxpayers (even within the same tax instrument) in order to maximize the likelihood of reelection. In other words, homeowners will have a different effective property tax rate relative to businesses after residential tax relief has been granted. Therefore, it is no wonder why complexity in the structure of modern tax codes is so prevalent. As Hettich and Winer (1988) note, this complexity

[57] In the theoretical model proposed by Hettich and Winer (1988), the authors include a term in addition to the product of the tax rate and the taxable activity that represents the deadweight loss (or welfare cost) of taxation. For simplicity, this welfare loss is assumed to be zero in this study.

is actually rational from the standpoint of the government officials. Furthermore, this model supports the idea that – given shocks to the taxable activity – government officials may attempt to reestablish the political equilibrium accordingly by tweaking the available tax parameters to maximize the weighted sum of expected votes. Therefore, government officials must be prepared to respond to changing economic conditions, administrative changes, and political influences when developing local tax systems.

In the context of the current study, different tax prices to different groups may result in shifts in the burden of the property tax. Therefore, this study aims to examine the consequences of implementing different tax prices to different groups of taxpayers. In Maryland counties, the main choice parameter for government officials that may affect the share of taxes paid by residential versus non-residential property owners are the assessment caps. If relatively more residential property tax relief is granted to homeowners, I hypothesize that this raises the relative tax price for non-residential business owners. Of course county officials could provide relief to all property owners by declining the property tax rate, but this may come at a high revenue cost. Therefore, pressure to maintain revenues and service levels while simultaneously providing tax relief may result in more relief to taxpayer groups that are more likely to vote.

Assuming that businesses view the property tax as a benefit tax, before any residential property tax relief has been granted, the balance between residential bills and non-residential bills is in equilibrium. Under this situation, some adverse effects may transpire if government officials grant property tax relief to homeowners. Those businesses that are relatively mobile may flee to other jurisdictions to avoid higher tax payments, disrupting local economic activity. If government officials attempt to provide these businesses with other targeted relief measures in efforts to offset losses by convincing them to stay in-county, shifts in the relative burden of the

property tax may become even more pronounced.[58] Businesses that have a greater number of relatively immobile factors (such as land and labor) and thus cannot flee easily may bear even greater levels and shares of property tax levies. For example, businesses that produce non-tradable goods and services, such as realtor agencies, newspapers, or dry cleaning facilities may witness higher tax bills. Consequences in this situation may include higher prices for goods and services provided by these businesses (passing increases in the burden of the tax onto consumers), less income provided to current employees of these businesses, or increases in layoffs. The objective in this study is to first examine the legal incidence associated with the assessment caps before investigating the economic incidence and the potential response of businesses to increased levels and shares of property tax bills.

Although votes for government officials may only be cast by county residents, it is common for many voters to reside in the same county in which they work. Therefore, it is likely that many resident voters may consider the effects that their vote may have on the business or company that they work for. Since residents may prefer that their employers remain profitable such that employment prospects and personal wages are unaffected by local tax policies, votes may be cast in favor of politicians that support businesses, giving business owners the incentive to remain in their current location. Other residents may vote for government officials who offer larger tax breaks for homeowners. Each voter must consider the consequences of voting for each candidate in order to maximize their net economic benefits.

[58] In this study I do not include factors that capture targeted incentives for businesses (such as business-specific subsidies or other tax provisions) due to data limitations. To the extent that data are available, future research should include these incentives to better understand the tradeoff businesses may face between bearing higher shares of the property tax while receiving some incentives to remain located in their current jurisdiction.

Linking the Conceptual Framework to the Empirics

Since homeowners are so important to electoral support functions, the empirical relationship between property tax relief via assessment caps and the levels and shares of residential taxes paid is hypothesized to be negative, suggesting that more property tax relief for homeowners is associated with a lower level and share of taxes paid by residential properties. Similarly, I expect the opposite results regarding the effects of residential tax relief on business property tax bills. However, there are other variables that may impact the shares of taxes paid by property classification. The conceptual framework based on Hettich and Winer's (1988) model of political equilibrium sheds light on key sets of parameters (aside from the assessment caps) to consider that may affect changes in the shares of property taxes paid by classification. Here I define the broad nature of these factors and in the next section I introduce the specific parameters used to capture these effects in the empirical analysis.

The first group of variables relates to the presence of non-residential property owners. Overall, I expect that if businesses have significant presence (through a greater number of non-residential property owners, a greater number of workers, a greater number of relatively large business establishments, a greater share of employees working for manufacturing businesses, etc.), these parameters will be associated with a higher level and share of taxes owed by non-residential property owners.[59] The second set of factors relates to the presence and preferences of homeowners, who may have more, less, or equal influence on politicians relative to businesses. I expect that if homeowners have a relatively significant presence (through a higher share of residential parcels, higher levels of personal income, higher home values, etc.),

[59] Note that some of these same variables may reflect the political costs of shifting the burden of taxes onto businesses. For example, counties with a greater presence of relatively "large" businesses maybe lose more economic activity (fewer jobs, lower income, and higher prices) if taxes are shifted more onto these businesses.

homeowners may bear a higher level and share of property taxes. The presence of both groups of taxpayers illustrates the necessity for the empirical analysis to control for a number of key variables to accurately determine the effects of property tax assessment caps in Maryland counties on the levels and shares of taxes paid across different classes of property.

2.F Empirical Strategy and Data

In this section I outline the setup for the empirical analysis, including econometric strategies and model specifications along with definitions, sources, and summary statistics associated with the data. County-level data were formed for the analysis, covering all twenty-four counties in Maryland (including Baltimore City separately from Baltimore County) over the years 1999 to 2006.[60] Throughout this section of the study, I refer to Tables 2.2 and 2.3, which list the names and definitions of the variables used in the empirics and the descriptive statistics for these variables.

Dependent Variables

There are several specifications for the dependent variables in this study. The first set relates to non-residential property taxes. I begin by regressing levels and shares of non-residential tax levies on the assessment caps (along with a variety of other explanatory measures). I also regress the level and share of residential tax levies on the same set of explanatory variables.[61] As an alternative measure, I regress these same set of dependent variables on a dummy variable equal to one if the assessment cap in a given county is "binding" (i.e., the cap is less than the annual percent change in the nominal median home sales price).

[60] Available data for the majority of the assessable tax base only date back to 1999.

[61] I do not report the results for the effects of the assessment caps on the share of residential taxes since these results are equivalent (other than the signs of the coefficients) to those empirical exercises that examine the effects of the caps on the share of non-residential taxes.

The first dependent variable, labeled as non-residential tax levies, is defined as the product of the inflation-adjusted non-residential tax base (in millions of dollars) and the property tax rate. This measure increased from $33.6 million to $41.6 million from 1999 to 2006, an increase of 23.81 percent. The second measure is the share of non-residential tax levies, defined as the inflation-adjusted non-residential property tax base divided by the total property tax base. Table 2.3 illustrates that this share has declined over the time period of this study from about 26.05 percent to 23.84 percent.[62]

The final two dependent variables used in this study are equivalent to the first two dependent variables defined above but for residential properties. First, I define residential tax levies as the product of the residential property tax base (in millions of inflation-adjusted dollars) and the property tax rate. In 1999, the average value for this measure equaled $96.5 million and by 2006 this measure reached an average of $128.2 million, an increase of 32.85 percent. The final dependent variable is equal to the share of residential tax levies. However, I do not show these results since they are simply the opposite of the results that show the relationship between the explanatory variables and the share of non-residential tax levies.

Explanatory Variables

The main explanatory variables of interest in this study are the county-level assessment caps, which correspond with the magnitude of property tax relief for residential property owners as chosen by county commissioners. Overall, I expect that increased residential property tax

[62] To check for robustness in the results, I regress two additional dependent variables that are defined similar to those above but for the *average* non-residential property owner on the same set of explanatory variables. I define the average non-residential tax levy simply as the non-residential tax levy defined above divided by the number of non-residential properties. In 1999, the average value for this measure was $3,772 and by 2006 this average reached $4,650. I also define another dependent variable as the average share of non-residential tax levies, defined as the average business owner's tax bill divided by the sum of the average business owner's tax bill and the average homeowner's tax bill. This measure on average equaled 73.28 percent in 1999 and 71.91 percent in 2006.

relief (through lower assessment caps) will increase the level and share of non-residential taxes. The average county-level assessment cap declined from 7.71 percent to 6.50 percent from 1999 to 2006, offering taxpayers greater tax relief. The assessment caps vary significantly across counties, but there is little within-county variation in the caps over this time period. Table 2.4 shows the assessment caps for each county in each year of the study to provide further evidence that within-county variation in the assessment caps is lacking. From 1999 to 2006, assessment caps in fourteen of the twenty-four counties in Maryland remained the same. Eight county governments lowered their caps, one county government increased their cap, and one county government both increased and decreased their cap at some point during this time.

The nominal assessment caps discussed above may not accurately depict the choice of magnitude of property tax relief since these caps may not be binding for a significant portion of homeowners. For example, a county with a five percent assessment cap may appear to offer increased property tax relief relative to a county with a ten percent assessment cap, but if the median homeowner in either of these two counties experiences home appreciation of only two percent, the caps are non-binding. Therefore, I substitute a dummy variable equal to one if the assessment cap is binding for the median homeowner in place of the nominal assessment caps to check for robustness in the results. This variable is defined as binding if the annual growth in the nominal home sales price is greater than the nominal assessment cap. The descriptive statistics indicate that approximately 25.00 percent of counties had a binding assessment cap in 1999 and by 2006 approximately 91.67 percent of counties had a binding cap.

In order to control for the possibility of substitution effects with regards to other local revenue sources, I include a measure equal to the effective non-property tax rate. This measure is equal to all local revenue collections aside from the property tax divided by aggregate county-

level personal income to provide an estimate for the average non-property tax rate. In 1999 this measure equaled 1.60 percent for the average county and by 2006 this measure increased to and average of 2.00 percent.

Aside from assessment caps and other local revenue collections, there are several other explanatory variables that are used in this study. First, I introduce the variables associated with the presence of non-residential property owners. Four measures were chosen to represent the presence of businesses and the effects of this presence on the property tax base. The first measure reflects the share of taxable non-residential properties, which equaled about 11.45 percent for the average county in Maryland during the time period in this study. I expect that higher shares of non-residential properties will be associated with a greater level and share of taxes owed by non-residential property owners since these properties make a greater share of the available taxable units.

The next explanatory variable is equal to the number of employees in a given county. This measure is intended to capture the size of the working population (as opposed to the size of the population that resides in a given county), which is positively correlated with business location. Since many workers in Maryland may commute across county lines, it is vital to capture these effects. A wide distribution in the number of employees existed across counties in 2006, with the minimum number of employees equaling 4,058 and the maximum reaching 426,478. On one hand I expect counties with a higher number of employees to be associated with higher levels and shares of non-residential taxes since workers require business properties to work in, raising the non-residential property tax base. On the other hand, employees often reside in the same county in which they work, suggesting that counties with higher numbers of employees are associated with higher levels of the residential tax base as well.

The third variable associated with businesses is equal to the number of businesses with 1,000 or more employees. This variable is intended to capture the number of relatively large businesses, which would typically require more and higher valued non-residential properties. Therefore, I expect this measure to have a positive and significant effect on the level and share of non-residential taxes. On the other hand, larger businesses may receive more tax breaks than smaller businesses since they provide more jobs and increase local personal income. The descriptive statistics indicate that the average county had approximately five large businesses over the time period studied, but this measure varied significantly across counties. At least one county had zero firms with 1,000 employees or more in 2006 while another county had 27 businesses with 1,000 or more employees in 2006.

Finally, I include the share of employees that work for manufacturing companies to capture the portion of the non-residential tax base that often provides the most significant levels of property tax revenue. Manufacturing businesses often have large amounts of capital, requiring large parcels of property for storage. Therefore, I expect that counties with a higher share of employees working for manufacturing firms as opposed to businesses in other sectors will be associated with a greater level and share of non-residential property taxes. From 1999 to 2006, approximately 10.46 percent of employees in the average county worked for a manufacturing firm.

The next set of explanatory variables relates to the characteristics of the population of residential homeowners. The first measure is equal to the share of the population aged 65 years and older, intended to capture the preferences of relatively older residents. The descriptive statistics in Table 2.3 illustrate that the average county-level share of the population aged 65 years and older equaled 12.98 percent. Although older residents may be less likely to be affected

by the migration of businesses (since many of them are retired on fixed levels of income), they may also be more likely to own a home. Therefore, even if this portion of the population prefers to shift the burden of property taxes onto businesses, it may be difficult to accomplish since many of these same residents are homeowners, which increases the residential property tax base.

Next, I include inflation-adjusted median household income levels. This measure is intended to capture the earnings of the residents within a given county. In 1999, the average county's inflation-adjusted median household income was $50,862, increasing to $52,202 by 2006. I expect that counties with residents who have a higher inflation-adjusted median household income will be associated with more expensive residential properties (assuming homes are considered normal goods), decreasing the level and share of non-residential property taxes. However, it is possible that counties with higher levels of income may rely less on the property tax and more on the local income tax relative to counties with lower levels of income. If this second explanation outweighs the first, it is possible that the effects of higher income on the level and share of taxes paid by groups may be ambiguous.

The last three explanatory variables control for factors that may be out of the control of residents but are important determinants of the level and share of taxes paid across groups. First, I include the unemployment rate – which equaled 4.38 percent for the average county from 1999 to 2006. This measure might capture cyclical aspects of the unemployment rate, but these effects on properties would be very small. Instead, I hypothesize that this measure provides some indication for the demand for residential properties. I expect that higher unemployment will be associated with lower levels of educational attainment and income, possibly decreasing homeownership, resulting in a greater level and share of non-residential property taxes.

Next, I include the overall population of the county to control for the size of the county in terms of number of residents. The average county-level population increased from 218,938 to 233,989 from 1999 to 2006, representing growth of about 6.87 percent. I expect that counties that are more populated will be associated with greater levels of property taxes for both residential and non-residential property owners, while the effects of the population on the dependent variables will be ambiguous on the shares of taxes paid across groups. Finally, I include the inflation-adjusted median home sales price to capture the value of residential properties from one year to the next. The average county had an inflation-adjusted median home sales price of $128,140 in 1999, but this value skyrocketed to $234,764 just eight years later, representing an increase of 83.21 percent. Higher home prices, which increase the residential tax base, are expected to be associated with a lower level and share of non-residential taxes.

Empirical Setup

The conceptual framework in this study indicates that the assessment caps will be endogenous with the dependent variables. Equations (4) and (5) illustrate the basic specification of these simultaneous equations:

$$D_j = \beta_0 + \beta_1 \delta_j + \sum_{k=1}^{K} \beta_k X_k + \omega_t + \varepsilon_j \quad (4)$$

$$\delta_j = \alpha_0 + \alpha_1 D_j + \sum_{l=1}^{L} \alpha_l X_l + \varphi_t + \mu_j \quad (5)$$

where D_j represents the dependent variable associated with the level or share of tax levies for non-residential and residential property owners in county j, δ_j represents the assessment cap in county j, X_k represents a vector of explanatory variables (described above), ω_t and φ_t represent

time fixed effects, and ε_j and μ_j represent well-behaved error terms.[63] These equations suggest that assessment caps are determined based on the level and share of taxes paid by groups and these values are also a function of the caps.

2.G Results

The results of this study are broken into two main components.[64] First, the results in Table 2.5 show the effects of the assessment caps – both nominal and binding – along with the remaining explanatory variables on the levels and shares of non-residential tax levies. I also discuss the results associated with the same set empirical specifications except that I define the dependent variables as the *average* levels and shares of non-residential property tax levies, though these results are not presented in the Appendix. Next, the results in Table 2.6 show the effects of the explanatory variables on the levels and shares of residential tax levies.

The main results of this study focus on the effects of the assessment caps on the level and share of non-residential property tax levies. As shown across the first two columns of Table 2.5 where the level and share of non-residential tax levies are regressed on the nominal assessment caps, the caps are negatively and significantly related to both measures of non-residential property taxes. Similarly, in column four of Table 2.5, the results indicate that counties with binding assessment caps are associated with higher shares of non-residential tax levies. These

[63] The vector of explanatory variables in Equation (5), X_l, is not equivalent to the explanatory variables in equation (4). This is partly to satisfy the order condition, which states that it is necessary for the number of predetermined variables in the system to be greater than or equal to the number of slope coefficients in the equation of interest (Studenmund 2001). The explanatory variables in Equation (5) are similar to those used in Essay 1 and therefore are not reported in the Appendix.

[64] Note that in each set of tables I do not present the results associated with the equations in the simultaneous equations model in which the assessment caps represent the dependent variables since these results are basically equivalent to those presented in Essay 1.

results confirm the expected hypotheses described above – lower assessment caps (and more binding assessment caps) increase the levels and shares of non-residential tax levies.

More specifically, a one percentage point decline in the assessment cap is associated with an $853,020 increase in non-residential tax levies and a 1.72 percentage point increase in the share of non-residential tax levies. Additionally, relative to counties without a binding assessment cap, counties with a binding assessment cap increase the share of non-residential tax levies by 3.81 percentage points. As noted previously, these results could raise concerns regarding local economic activity as non-residential property owners may prefer to migrate to jurisdictions that do not shift the relative burden of the property tax onto businesses.[65]

The results also indicate that the lagged effective non-property tax rate is negative and significantly related to the share of non-residential tax levies in Table 2.5. A one percentage point increase in the effective non-property tax rate is associated with between a 4.08 and a 5.01 percentage point decline in share of non-residential tax levies. These results may provide evidence that businesses have enough political influence to successfully raise other local revenues by increasing income taxes or fines and fees, particularly when targeted property tax limits are installed to shift the relative burden of property taxes onto businesses.

A variety of explanatory measures related to the presence of businesses are statistically related to the level and share of non-residential property taxes. In the first column of Table 2.5, the results indicate that higher shares of taxable properties that are non-residential are associated

[65] I also ran models in which the dependent variable is equal to a measure representing the overall *effective* property tax rate for all taxable properties (defined as total property tax revenue divided by the total property tax base). These results indicate that the assessment caps and effective property tax rates are negatively and significantly related. This finding sheds light on whether the caps are affecting the base or the rate on the left hand side in Table 2.5. Since the models regarding the *effective* property tax rate take into account the size of the tax base, the findings in Table 2.5 should be analyzed with caution since the caps have differing effects on nominal property tax rates and the effective property tax rates (see Essay 1 for more on the relationship between the caps and the nominal rates).

with a higher level of non-residential tax levies. In particular, a one percentage point increase in the share of non-residential properties is associated with a $445,370 increase in non-residential tax levies. Similarly, columns two and four illustrate that a one percentage point increase in the share of non-residential properties is associated with between a 0.18 and a 0.63 percentage point increase in the share of non-residential tax levies. These results confirm the hypothesis that a larger portion of taxable non-residential parcels is associated with a larger level and share of the property tax owed by this group.

The results also indicate that the number of employees in a given county has a positive and significant effect on the level and share of non-residential tax levies. In particular, an increase of 1,000 employees is associated with an increase in non-residential tax levies between $247,000 and $289,000 depending on the specification of the model. In addition, column four indicates that an increase of 1,000 employees is associated with 0.11 percentage point increase in the share of non-residential tax levies. These results provide evidence that counties with more workers may be associated with a larger number of businesses, resulting in higher non-residential property taxes.

Additionally, the results show that counties with more businesses with 1,000 or more employees are associated with a greater level of non-residential tax levies. An increase of one "large" business establishment is associated with between a $1.61 million and a $2.07 million increase in non-residential property tax levies. These results reiterate the results found above regarding the relationship between the number of employees and the level of non-residential tax levies. However, column four provides evidence that large businesses may have some political influence with regards to the share of taxes paid by non-residential property owners as a one unit

increase in the number of large businesses is associated with a 0.38 percentage point decline in the share of non-residential tax levies.

The final explanatory variable associated with the presence of businesses equals the share of employees that work in the manufacturing sector. The results match well with the hypotheses noted previously in this study – counties with a higher share of employees in manufacturing businesses relative to other sectors are associated with higher shares of property taxes owed by non-residential property owners since the manufacturing sector is associated with relatively large amounts of capital (which may require increased property for storage). More specifically, a one percentage point increase in the share of employees working for manufacturing businesses is associated with between a 0.28 and a 0.45 percentage point increase in the share of non-residential property tax levies.

A variety of explanatory variables associated with homeowners are also statistically related to the level and share of non-residential taxes. The share of the population aged 65 years and older is negatively and significantly related to both dependent variables in Table 2.5. In particular, a one percentage point increase in the share of the population aged 65 years and older is associated with between a $500,609 and a $638,455 decline in non-residential property tax levies and a 0.30 to 0.63 percentage point decline in the share of non-residential property tax levies. These results suggest that counties with a higher share of the population that is 65 years and older (who may be more likely to be retired and/or be associated with higher levels of homeownership relative to other residents) are associated with lower levels and shares of non-residential property tax levies.

The relationship between inflation-adjusted median household income and the dependent variables in Table 2.5 are significant in the third and fourth columns. A $1,000 increase in

inflation-adjusted median household income is associated with a $202,000 decline in non-residential property tax levies and a 0.31 percentage point decline in the share of non-residential tax levies. These results may provide evidence that individuals with more income may also purchase more expensive homes, possibly increasing residential taxes owed and decreasing taxes owed by businesses.

The results associated with the unemployment rate match well with the hypotheses formed earlier in this study. A one percentage point increase in the unemployment rate is associated with between a $1.87 million and a $2.85 million increase in non-residential tax levies and a 1.90 percentage point increase in the share of non-residential property tax levies. These results suggest that counties with higher levels of unemployment (which may be associated with lower levels of homeownership since unemployed citizens are less likely to own a home) increase the level and share of non-residential property taxes. The explanatory variable associated with population has a positive effect on the overall level of non-residential tax levies in columns one and three of Table 2.5, which is expected since businesses may prefer to locate where there is a higher demand for goods and services and a larger and more diversified labor force. However, increases in population are associated with lower shares of non-residential tax levies, suggesting that there may be economies of scale in the provision of local public goods and services.

Finally, the results in Table 2.5 associated with inflation-adjusted median home sales prices suggest that higher prices are associated with increases in the level and share of non-residential property tax levies. A $1,000 increase in the median home price is associated with between a $75,000 and a $99,000 increase in non-residential tax levies and a 0.03 percentage point increase in the share of non-residential tax levies. These results suggest that businesses

may co-locate in areas where housing prices are relatively high (which may be associated with a greater demand for housing) and where other property values are high as well, leading to an increase in non-residential tax levies.

In addition to the results presented in Table 2.5, I examine an equivalent set of models where the dependent variables are replaced with the *average* levels and shares of non-residential property tax levies.[66] The results associated with the explanatory variables (particularly the assessment caps) are similar to those presented above, suggesting that these results are robust across various model specifications. In particular, the results indicate that a one percentage point decline in the nominal assessment cap is associated with a $491 increase in the average non-residential property tax levy and a 3.12 percentage point increase in the average share of non-residential tax levies. Similarly, counties with binding assessment caps are associated with a 5.73 percentage point increase in the average share of non-residential property tax levies.

I also examine an equivalent set of models where the dependent variables were replaced with the levels and shares of commercial and industrial property tax levies to gain a better understanding of the effects of the explanatory variables on a specific group of non-residential property owners. Since the results are quite comparable to the baseline non-residential results, I do not present them in the Appendix. Overall, the effects of the nominal assessment caps on commercial and industrial properties were similar to those found in Table 2.5 but with higher magnitudes on the coefficients. A one percentage point decline in the nominal assessment cap is associated with a $2.03 million increase in commercial and industrial property tax levies. These

[66] Note that the same set of explanatory variables were used in these models with the exception that I have removed the share of non-residential properties since the numerator of this variable is now part of the dependent variable.

results suggest that relative to agricultural and other non-residential property owners, commercial and industrial property owners bear an even greater share of the shift in property tax burdens

Table 2.6 presents results associated with the effects of nominal and binding assessment caps on the level of residential tax levies.[67] Since the majority of the results in Table 2.6 are similar to those in the previous tables (with opposite signs), I do not discuss them in detail. The main explanatory variables of interest in this study provide further evidence of possible shifts in the relative burden of the property tax from homeowners to businesses. In column one of Table 2.6, the results indicate that a one percentage point decline in the nominal assessment cap is associated with a $5.80 million decline in residential tax levies. Similarly, results in column two indicate that relative to counties with a non-binding assessment cap for the median homeowner, counties with binding assessment caps are associated with a $33.47 million decrease in residential tax levies.

Discussion of Results

This study is the first of its kind to examine the effects of the choice of magnitude of residential property tax relief on the level and share of non-residential and residential tax levies. Overall, the empirical results indicate that counties with government officials who choose to provide homeowners with increased property tax relief through lower assessment caps are associated with higher levels and shares of non-residential property tax levies and lower levels and shares of residential property tax levies. As expected, binding residential property tax relief is associated with even larger increases levels and shares of non-residential tax levies. Therefore, the results of this study provide evidence that residential property tax relief via

[67] Recall that the share of residential tax levies are not presented because they are simply the opposite of the results associated with the share of non-residential tax levies presented in Table 2.5.

county-level assessment caps in Maryland may indeed cause shifts the burden of the property tax from homeowners to business owners.

The specific results from this study indicate that a one percentage point decline in the average county-level property tax assessment cap is associated with an $853,020 increase in non-residential property tax levies and a 1.72 percentage point increase in the share of non-residential property tax levies. Similarly, counties with binding assessment caps are associated with increases in the share of non-residential property tax levies of 3.81 percentage points. These results match well with findings from Dye et al. (2006), who use parcel-level data and find that a fixed assessment cap for residential property owners in Cook County, Illinois in 2003 resulted in a shift in the burden of property taxes from eligible residential homeowners to non-residential property owners and ineligible property owners.

Policymakers should consider consequences associated with these results when choosing the magnitude of property tax relief to install for homeowners. First, non-residential property owners may flee to other jurisdictions if assessment caps are set too low, further shifting taxes towards immobile businesses that cannot migrate. This may cause economic activity to decline in the local jurisdiction. For example, if relatively mobile companies flee as a result of shifts in the burden of the property tax, several jobs may be lost, resulting in lower income for some residents. Additionally, for those companies that are relatively immobile, shifts in the burden of the property tax may result in lower wages or lay offs for employees of these businesses in order to make up for increases in tax payments. Alternatively, these businesses may pass the tax increases onto consumers through higher prices. Therefore, economic activity may be negatively affected regardless of the responsiveness of local businesses to changes in the structure of the property tax.

2.H Conclusions

Many state and local governments in the U.S. have implemented TELs over the past fifty years, particularly in the form of property tax limits. For some government entities, these property tax limits have been installed with the purpose of providing tax relief to a targeted group of taxpayers. Florida's "Save Our Homes" program and Maryland's "Homestead Property Tax Credit" are both examples of targeted property tax relief intended to alleviate homeowners from rapid increases in property tax bills. However, non-residential property owners are often granted little or no property tax relief such that residential property tax limits may shift the relative burden of property taxes onto these businesses.

The purpose of this study is to expand the understanding of the consequences of targeted property tax relief by taking the first step in examining the effects of property tax assessment caps for homeowners on the levels and shares of taxes owed by non-residential property owners. This is the first study to investigate the issue of tax burden shifts across property classes in a setting where there exist varying magnitudes of property tax relief across jurisdictions. In addition, this is the first study to use data across jurisdictions and over time to analyze these research questions. Using county-level data in Maryland over the years 1999 to 2006, I find that increased residential property tax relief through lower assessment caps increases the level and share of non-residential tax levies considerably. These results match well with findings in a previous study regarding an assessment cap installed in Cook County, Illinois in 2003.

Several policy implications may stem from this work. First, if businesses are mobile, they could migrate to other jurisdictions in order to avoid increases in taxes owed, which may negatively affect economic activity by way of fewer jobs or less income. If a significant number of businesses flee, this further increases the shift in the burden of taxes paid by non-residential

property owners as there are fewer non-residential taxable parcels to support this portion of the tax base. Therefore, those businesses that are relatively immobile may need to cut wages, raise prices, or lay off employees to maintain economic profits in the short run.

While these shifts in burdens of the property tax have caused a stir in many states, including the "Save Our Homes" program in Florida and the assessment cap installed in Cook County in 2003, there have been actions taken in other states to eliminate possible shifts across classes of property. An interesting example of compromise between businesses and homeowners was established in Colorado in 1982 under the "Gallagher Amendment," which attached fixed percentages to the share of state property taxes collected by property owners across different classifications. Specifically, the amendment stated that 45.00 percent of all property taxes collected must come from residential properties while the remaining 55.00 percent must be collected from commercial properties (Hill et al. 2006).

Although this study applies to Maryland counties, the findings can be useful for other state and local governments as well. For example, this study provides evidence that residential property tax relief at higher magnitudes shifts a relatively larger portion of the property tax onto businesses. In addition, the magnitude of residential property tax relief may not capture the effects of property tax limits on levels or shares of taxes owed across property classification since it is possible that many nominal assessment caps are non-binding. Therefore, state and local government entities should consider the magnitude and the extent to which property tax relief may be binding when examining the impacts of TELs on various groups of taxpayers.

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APPENDIX

Table 2.1: Property Tax Levies

County	Residential			Non-Residential			Agricultural			Commercial & Industrial		
	1999	2008	Growth	1999	2008	Growth	1999	2008	Growth	1999	2008	Growth
Allegany	$427	$531	24.49%	$1,435	$1,523	6.14%	$454	$595	30.89%	$1,885	$1,932	2.48%
Anne Arudel	$1,360	$2,479	82.27%	$6,062	$10,119	66.93%	$1,525	$2,724	78.57%	$7,050	$11,587	64.37%
Baltimore City	$1,246	$1,983	59.14%	$9,476	$11,974	26.36%	$0	$0	0.00%	$9,476	$11,974	26.36%
Baltimore County	$1,363	$2,068	51.73%	$6,830	$8,548	25.15%	$1,589	$2,456	54.53%	$8,382	$10,304	22.94%
Calvert	$1,071	$1,966	83.61%	$2,490	$5,386	116.33%	$1,046	$1,713	63.73%	$4,932	$7,806	58.28%
Caroline	$682	$1,135	66.38%	$1,055	$1,473	39.65%	$734	$1,060	44.34%	$2,013	$2,444	21.42%
Carroll	$1,444	$2,476	71.49%	$2,347	$3,532	50.52%	$1,131	$1,874	65.77%	$4,572	$6,043	32.17%
Cecil	$883	$1,435	62.55%	$2,364	$3,905	65.21%	$1,398	$1,980	41.58%	$3,134	$4,611	47.12%
Charles	$1,137	$1,939	70.44%	$3,370	$7,874	133.64%	$1,108	$1,989	79.60%	$5,332	$7,469	40.10%
Dorchester	$531	$948	78.63%	$1,060	$1,428	34.66%	$620	$897	44.63%	$2,175	$2,634	21.12%
Frederick	$1,165	$1,947	67.14%	$3,123	$7,436	138.12%	$1,284	$2,229	73.61%	$5,023	$8,134	61.93%
Garrett	$628	$1,188	89.09%	$975	$1,297	33.02%	$531	$545	2.66%	$1,781	$2,450	37.55%
Harford	$1,291	$2,076	60.77%	$4,070	$5,739	41.02%	$1,465	$2,202	50.26%	$6,647	$8,974	35.01%
Howard	$1,820	$3,321	82.42%	$9,882	$14,672	48.47%	$1,849	$3,287	77.75%	$12,903	$16,862	30.68%
Kent	$811	$1,537	89.57%	$1,962	$2,806	43.02%	$1,389	$2,127	53.05%	$3,057	$4,215	37.90%
Montgomery	$1,889	$2,473	30.88%	$14,957	$14,496	-3.08%	$1,778	$2,102	18.17%	$18,115	$16,932	-6.53%
Prince George's	$1,164	$2,009	72.50%	$6,732	$15,084	124.07%	$210	$223	5.94%	$7,706	$12,747	65.42%
Queen Anne's	$1,121	$1,963	75.18%	$1,770	$2,697	52.37%	$1,309	$2,260	72.62%	$2,495	$3,380	35.44%
Saint Mary's	$881	$1,516	72.07%	$2,162	$3,430	58.69%	$1,034	$1,658	60.30%	$3,753	$4,718	25.72%
Somerset	$317	$680	114.21%	$542	$929	71.46%	$351	$555	58.07%	$1,044	$1,725	65.28%
Talbot	$939	$1,601	70.41%	$1,730	$2,308	33.37%	$1,400	$2,257	61.13%	$2,108	$2,367	12.29%
Washington	$845	$1,381	63.36%	$3,033	$4,868	60.47%	$1,071	$1,631	52.19%	$4,708	$6,598	40.14%
Wicomico	$600	$920	53.24%	$1,456	$1,825	25.38%	$465	$700	50.56%	$2,525	$2,756	9.15%
Worcester	$640	$1,579	146.48%	$1,638	$2,921	78.37%	$434	$600	38.42%	$2,744	$5,003	82.32%
Average	$1,011	$1,715	72.42%	$3,772	$5,678	57.06%	$1,007	$1,569	49.10%	$5,148	$6,819	36.19%

All dollar values inflation-adjusted (2000 dollars)

Source: Maryland SDAT (2008)

Table 2.2: Variable Definitions & Source Notes

Variable Name	Definition	Source
Non-Residential Tax Levies (millions)	Non-residential property tax base multiplied by the real property tax rate	MD SDAT
Share of Non-Residential Tax Levies	Non-residential tax levies divided by total property tax levies	MD SDAT
Residential Tax Levies (millions)	Residential property tax base multiplied by the real property tax rate	MD SDAT
Assessment Cap	The limit on the annual percentage increase in taxable assessed value for owner-occupied property	MD SDAT
Binding Assessment Cap	Dummy variable equal to one if the assessment cap is less than the annual growth in median home sales prices	Author's Calculations
Effective Non-Property Tax Rate	Total local income and other tax revenue divided by total personal income	MD DLS
Share of Non-Residential Properites	Number of taxable non-residential properties divided by total taxable properties	MD SDAT
Employees	Number of employees	U.S. Census Bureau
Large Business Establishments	Number of businesses with at least 1,000 employees	U.S. Census Bureau
Share of Manufacturing Employees	Number of employees working for manufacturing businesses divided by the total number of employees	U.S. Census Bureau
Share of Population Aged 65 & Over	Number of residents aged 65 and older divided by population	U.S. Census Bureau
Median Household Income	Inflation-adjusted median household income	U.S. Census Bureau
Unemployment Rate	Number of unemployeed residents divided by the labor force	Bureau of Labor Statistics
Population	Total population	U.S. Census Bureau
Median Home Sales Price	Inflation-adjusted median home sales price	MD SDAT

Table 2.3: Descriptive Statistics

Variable	*t* = 1999 (*n* = 24)				*t* = 2006 (*n* = 24)				*t* = 1999 - 2006 (*n* = 192)			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Non-Residential Tax Levies (millions)	33.63	47.34	1.80	160.48	41.55	56.24	2.50	209.55	36.84	49.91	1.77	209.55
Share of Non-Residential Tax Levies	26.05	5.81	12.27	35.02	23.84	5.56	10.23	34.12	25.40	5.87	10.23	36.69
Residential Tax Levies (millions)	96.50	130.75	3.78	516.01	128.21	167.48	6.51	712.84	108.07	141.72	3.77	712.84
Assessment Cap	7.71	3.17	0.00	10.00	6.50	3.15	0.00	10.00	7.42	3.15	0.00	10.00
Binding Assessment Cap	0.25	0.44	0.00	1.00	0.92	0.28	0.00	1.00	0.59	0.49	0.00	1.00
Effective Non-Property Tax Rate	1.60	0.28	1.13	2.20	2.00	0.39	1.34	3.01	1.73	0.35	1.03	3.01
Share of Non-Residential Properites	11.71	5.50	3.78	23.36	11.03	5.07	3.79	21.98	11.45	5.24	3.68	23.40
Employees	82,789.79	112,992.60	3,183.00	387,064.00	92,302.38	121,388.50	4,058.00	426,478.00	87,371.57	114,488.90	3,062.00	426,478.00
Large Business Establishments	4.71	8.16	0.00	28.00	4.42	7.35	0.00	27.00	4.59	7.70	0.00	31.00
Share of Manufacturing Employees	12.13	7.48	3.00	35.00	8.79	5.97	1.00	27.00	10.46	6.73	1.00	35.00
Share of Population Aged 65 & Over	12.88	3.99	7.43	20.54	13.21	4.03	8.07	22.03	12.98	3.92	7.43	22.03
Median Household Income	50,862.40	14,023.49	30,905.04	76,642.44	52,202.04	15,647.07	28,828.13	79,907.29	51,871.21	14,714.48	28,828.13	79,907.29
Unemployment Rate	4.30	2.26	1.80	9.00	4.14	1.05	2.90	6.40	4.38	1.36	1.80	9.00
Population	218,937.90	271,175.80	19,015.00	862,350.00	233,988.60	283,103.40	19,983.00	932,131.00	227,491.10	273,865.80	19,015.00	932,131.00
Median Home Sales Price	128,139.90	37,195.75	62,016.81	194,706.90	234,763.50	75,284.41	74,974.48	363,020.80	162,609.00	64,090.87	62,000.00	363,020.80

All monetary values inflation-adjusted (2000 dollars)

Effective Non-Property Tax Rate data are for 1999 & 2005

Table 2.4: Maryland's Assessment Caps

County	1999	2000	2001	2002	2003	2004	2005	2006
Allegany	10	10	10	10	10	10	10	10
Anne Arundel	4	4	4	4	4	4	2	2
Baltimore City	4	4	4	4	4	4	4	4
Baltimore County	4	4	4	4	4	4	4	4
Calvert	10	10	10	10	10	10	10	10
Caroline	10	10	10	10	10	10	10	10
Carroll	10	10	10	10	10	10	10	7
Cecil	10	10	10	10	10	10	10	8
Charles	5	5	5	5	5	5	10	10
Dorchester	10	10	10	10	10	10	10	5
Frederick	10	10	10	10	10	10	10	5
Garrett	10	10	5	5	5	5	5	5
Harford	10	10	10	10	10	10	10	10
Howard	5	5	5	5	5	5	5	5
Kent	5	5	5	5	5	5	5	5
Montgomery	10	10	10	10	10	10	10	10
Prince George's	3	3	4	3	3	3	2	3
Queen Anne's	10	10	10	10	10	10	10	5
Saint Mary's	5	5	5	5	5	5	5	5
Somerset	10	10	10	10	10	10	10	10
Talbot	0	0	0	0	0	0	0	0
Washington	10	10	10	10	10	10	10	10
Wicomico	10	10	10	10	10	10	10	10
Worcester	10	10	10	10	10	10	5	3
Average Cap	7.71	7.71	7.54	7.50	7.50	7.50	7.38	6.50

Source: Maryland SDAT (2008)

Table 2.5: Empirical Results, 2SLS - Non-Residential Property Taxes

	Non-Residential Tax Levies R-Sq. = 0.9887 *n = 192*	Share of Non-Res. Tax Levies R-Sq. = 0.2852 *n = 192*	Non-Residential Tax Levies R-Sq. = 0.9913 *n = 192*	Share of Non-Res. Tax Levies R-Sq. = 0.7103 *n = 192*
Explanatory Variable	Coefficient [Std. Error]	Coefficient [Std. Error]	Coefficient [Std. Error]	Coefficient [Std. Error]
Constant	-21.269170 **	29.462730 ***	-15.187900 **	37.607830 ***
	[8.5544400]	[7.9872120]	[7.2860640]	[4.9339700]
Assessment Cap	-0.853020 *	-1.716675 ***		
	[0.4740074]	[0.4425769]		
Binding Assessment Cap			0.125434	3.810837 ***
			[2.1155630]	[1.4326150]
Effective Non-Property Tax Rate (*t-1*)	2.039444	-4.082168 **	1.570039	-5.014221 ***
	[2.0013290]	[1.8686250]	[1.7417630]	[1.1794850]
Share of Non-Residential Properties	0.445370 **	0.625719 ***	0.217630	0.184168 *
	[0.2162562]	[0.2019166]	[0.1540461]	[0.1043168]
Employees	0.000247 ***	0.000027	0.000289 ***	0.000106 ***
	[0.0000424]	[0.0000396]	[0.0000312]	[0.0000211]
Large Business Establishments	2.070370 ***	0.481800	1.611060 ***	-0.382332 ***
	[0.3509843]	[0.3277112]	[0.2134098]	[0.1445167]
Share of Manufacturing Employees	0.044011	0.445587 ***	-0.055184	0.283102 ***
	[0.1105705]	[0.1032388]	[0.0866293]	[0.0586636]
Share of Population Aged 65 & Over	-0.638455 ***	-0.631519 ***	-0.500609 ***	-0.303772 ***
	[0.2039859]	[0.1904599]	[0.1689734]	[0.1144252]
Median Household Income	0.000027	0.000076	-0.000202 *	-0.000310 ***
	[0.0001747]	[0.0001631]	[0.0001128]	[0.0000764]
Unemployment Rate	2.848228 ***	1.898561 ***	1.872177 ***	-0.037942
	[0.7776163]	[0.7260541]	[0.4889581]	[0.3311122]
Population	0.000020 *	-0.000016 *	0.000017 *	-0.000022 ***
	[0.0000104]	[0.0000097]	[0.0000090]	[0.0000061]
Median Home Sales Price	0.000075 ***	-0.000006	0.000099 ***	0.000025 *
	[0.0000256]	[0.0000239]	[0.0000217]	[0.0000147]

*Significant at 10%; **Significant at 5%; ***Significant at 1%

All two-stage least squares (2SLS) models include time fixed effects

See Essay 1 for more on the results from the equations where the dependent variable is the assessment cap

All monetary variables are inflation-adjusted (2000 dollars); Non-Residential Tax Levies are in millions of dollars

Table 2.6: Empirical Results, 2SLS - Residential Property Taxes

	Residential Tax Levies R-Sq. = 0.9723 *n = 192*	Share of Residential Tax Levies R-Sq. = 0.9609 *n = 192*
Explanatory Variable	Coefficient [Std. Error]	Coefficient [Std. Error]
Constant	-182.349700 ***	-186.197300 ***
	[37.980430]	[42.632180]
Assessment Cap	5.802097 ***	
	[2.1045220]	
Binding Assessment Cap		-33.467060 ***
		[12.378570]
Effective Non-Property Tax Rate (*t-1*)	7.586915	10.664150
	[8.8856020]	[10.191390]
Share of Non-Residential Properties	1.036672	2.432033 ***
	[0.9601449]	[0.9013535]
Employees	0.001281 ***	0.001056 ***
	[0.0001884]	[0.0001823]
Large Business Establishments	-2.595867 *	-0.023608
	[1.5583180]	[1.2487020]
Share of Manufacturing Employees	-0.975719 **	-0.641429
	[0.4909164]	[0.5068849]
Share of Population Aged 65 & Over	3.286350 ***	1.887402 *
	[0.9056666]	[0.9886961]
Median Household Income	0.000690	0.001564 **
	[0.0007757]	[0.0006599]
Unemployment Rate	-1.151355	5.233067 *
	[3.4525000]	[2.8609880]
Population	0.000041	0.000058
	[0.0000461]	[0.0000525]
Median Home Sales Price	0.000271 **	0.000271 **
	[0.0001137]	[0.0001272]

*Significant at 10%; **Significant at 5%; ***Significant at 1%

All two-stage least squares (2SLS) models include time fixed effects

See Essay 1 for more on the results from the equations where the dependent variable is the assessment cap

All monetary variables are inflation-adjusted (2000 dollars); Residential Tax Levies are in millions of dollars

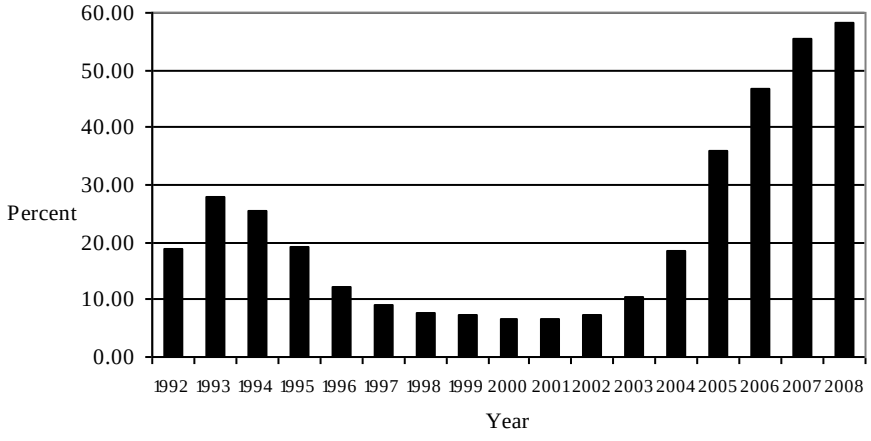

Figure 2.1: Share of Residential Properties Receiving Tax Relief
Source: Maryland SDAT (2008)

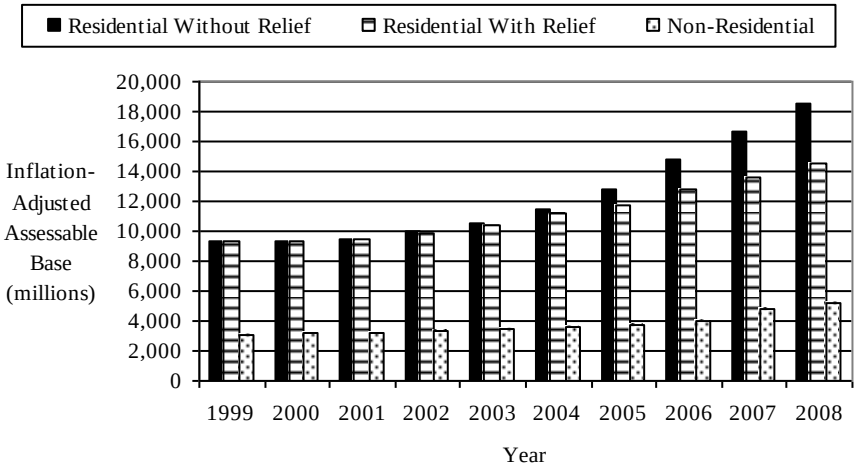

Figure 2.2: Real Property Assessable Bases

Source: Maryland SDAT (2008)

VITA

Bryan Michael Shone was born on August 1, 1982 in Silver Spring, Maryland. He graduated from Damascus High School in 2000 and proceeded to Salisbury University, where he received his B.A. with a major in economics and a minor in mathematics. Bryan then entered the Graduate School at the University of Tennessee, where in December of 2006 he obtained his M.A. in economics. Bryan then continued at the University of Tennessee in pursuit of his Ph.D. in economics. He accepted an offer to work for the United States Department of Defense in Arlington, VA beginning in the summer of 2009 after completion of his Ph.D.