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Evidence from Maryland's Priority Funding Areas

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Many state growth management programs in the United States are nearing 40 years of existence, and academic literature evaluating the effects of these programs is almost as old. Several of these programs, such those in Oregon and Florida, were studied extensively in the 1990's and early 2000's (DeGrove, 1989 and 1992; Bollens 1992 and 1993; Gale, 1992; Knaap and Nelson, 1992; Downs, 1994; Burby and May, 1997; Blanco, 1998; Weitz and Moore, 1998; Nelson, 1999; Weitz, 1999; Nicholas and Steiner, 2000; Carruthers, 2002; Anthony, 2004; Wassmer, 2006). Despite the large and growing literature on these growth management programs, a majority of these papers focus solely on the organization, structures, and goals of the plans themselves. Only a fraction of these papers offer any empirical insight into the effectiveness of the programs (Knaap and Nelson, 1992; Nelson, 1999; Carruthers, 2002; Anthony, 2004; Wassmer, 2006).

Additionally, few of the aforementioned studies evaluate one state alone. Rather, they attempt to analyze state growth management solely in an interstate context. This can be problematic for several reasons. First, the goals and enforcement mechanisms of state growth management programs are often very different between individual states. This can make comparative analyses difficult to interpret. Second, there are often heterogeneous state-level effects of urban growth that are difficult to discern from the growth management program itself. Few studies have utilized the proper techniques to detangle these effects from one another. And third, the interpretation of findings can be misleading. Can the success of a growth management program really be measured among the performance of other growth management states? Or is a "race-with-yourself" evaluation over time more appropriate?

The efficacy of these programs is of great interest to politicians, practitioners and scholars alike. This is because hundreds of millions of tax dollars are spent every year on growth management efforts, which can potentially have large impacts upon the built and natural environment, the local and regional economy, and the political structure of intergovernmental relations. The goals of most of these state planning programs is to successfully manage, coordinate, and foster urban growth in a manner that leads to "a 'good' built environment at minimum environmental, economic, and fiscal costs," (Nelson, 1999; Jacobs, 1978; Lee, 1981; Lynch, 1981; Calthorpe, 1989). In order to achieve these goals, many states establish large state-funded planning departments that seek to more centrally regulate the development industry. Developers, homebuilders, architects, landowners, and other industry "players" contribute hundreds of millions dollars annually to the local and regional economy. The success of this industry can be drastically impacted by these regulations. On the other hand, these regulations can enhance quality of life through the preservation of open space, natural resources, and

public services. Thus achieving these goals in an effective and efficient manner with minimal side effects is an important task that effects a wide-range of individuals and industry "players." As such, analyses of these programs can help politicians create and reform policy, help practitioners implement programs, and help scholars develop methods of analysis and evaluation.

This paper continues the work of these studies by analyzing the effectiveness of Maryland's Growth Management program using a more comprehensive framework. Instead of an interstate comparison of the program, however, this work focuses upon the performance of one aspect of the program over time. This element is analyzed in both an interstate and intrastate framework to compare the effects of the program within Maryland and among its neighbors. Thus, evaluations of the growth management program and of analytical methods are both outcomes of this study.

Scope of Study

In 1997, the State of Maryland passed the Smart Growth and Neighborhood Conservation initiative. One linchpin of this initiative is the Priority Funding Areas (PFA) Act of 1997, which designates state funding to local and county governments for "smart" and "well-planned" economic growth and urban development. A clear goal of the Smart Growth initiative and PFA Act is to increase the availability of housing types throughout the state. This can easily be seen within the official documentation itself: two of the state's ten principles of the Smart Growth initiative are 1) "to take advantage of compact building design," and 2) "to create housing opportunities and choices." In the PFA documentation on "fostering well-planned development," one of the state's definitions of well-planned development is "an integrated mix of land uses and housing types." Thus, one important question of policy effectiveness is clear, "did the availability of housing types in Maryland increase as a result of the Smart Growth initiative and PFA act of 1997?"

This paper addresses this question by analyzing relative changes in approved building permit types in Maryland at two different scales. First, an *inter*state analysis between Maryland and neighboring states is conducted at the county level to determine if the distribution of housing types in the state of Maryland grew differently than adjacent states over the 1990-2004 time period. Second, an *intra*state analysis of housing types within Maryland is conducted to determine if the percentage of growth within a PFA affects the overall balance of housing choices within the county. Both empirical approaches will use a ratio of residential building permit types (Multifamily Units /Single-Family Units) as a measure of housing choice, and a variety of control variables that are also hypothesized to effect the distribution of housing types.

Findings indicate that at the state level, Maryland did not grow in a significantly different manner when compared to neighboring states. However, the intrastate findings indicate growth within PFAs had significantly higher ratios of multifamily housing choice when compared to non-PFAs. This evidence suggests PFAs have helped improve the balance of housing choices in Maryland, and that the Smart Growth and Neighborhood Conservation act has partially achieved its stated goals.

The paper is organized as follows: section II offers a review of previous growth management literature and a brief description of Maryland's Growth Management

program; Section III presents the theoretical and empirical model; Section IV describes the data, hypotheses, and results; and Section V concludes.

II. Literature Review and Growth Management in Maryland

When looking at scholarly literature concerning state growth management, a typology arises. Specifically, the literature can be sorted into three types of studies: (1) papers that summarize and compare the general purpose, organization, and goals of state growth management as an idea; (2) studies that analyze the elements of specific program(s) and/or its growth over time; and (3) research that evaluates the efficacy and outcomes of one or more programs. In following literature review, the major works of each classification are briefly summarized. Additionally, background information on Maryland's Smart Growth Initiative and PFA act is provided in the second subsection.

Studies of Growth Management as an Idea

Some of the first works on state growth management focuses primarily on the general concepts and goals of growth management as a conceptual idea. One of the earliest studies was a report issued by an American Institute of Planners (AIP) Committee on State Planning (1959). This report called for the inclusion of planning as a function into state government in order to protect resource degradation and uncontrolled metropolitan expansion. In addition, the report focused upon new ways of fostering communication among government departments, innovated approaches of department organization, and detailed activities and responsibilities of state planning staff.

Another early influential work was that by the American Law Institute (1974). The Model Land Development Code is often regarded as one of the most important works concerning state planning during the quiet revolution of the 1960's and 1970's. It addressed important legal issues of state planning, such as coordination of land use authority between state and local governments, the implementation of formal plans as a precursor to land use regulation, and issues concerning the application of eminent domain. The code also influenced the formation of many growth management regimes, such as Florida's program, where several elements of the code were translated directly into the growth management legislation. Areas of Critical State Concern, Developments of Regional Impact, the State Land Planning Agency, and the State Land Development Plan are all parts of Florida's Growth Management program that are derived from The Model Land Development Code.

Other early works, such as Rosebaugh (1976), concentrate on developing specific roles of state planning departments. He argues that state planning can be more effective as a "policy-coordinating" tool rather than an intervening regulator of physical development. This idea represented a shift in planning theory at the time, which suggested a movement away traditional design-based planning efforts towards more management and policy oriented goals. Rosebaugh also gathered data on state planning agencies across the United States and created a model for evaluation of their effectiveness. Academics and practitioners alike have utilized many aspects of this model for their evaluations of state planning programs.

In 1996, The American Planning Association (APA) published a guidebook entitled *Model Statutes for Planning and the Management of Change*, which presents new avenues of thought surrounding the formation of state planning regimes. In contrast to The Model Land Development Code, the APA guidebook suggests no one framework of state growth management. In several chapters devoted to state planning, a variety of alternative planning schemes are presented in order to better accommodate different needs of individual states. Many elements of the Model Land Development Code are included in the guidebook, such as designating areas of critical state concern and regulating areas of regional impact. Other sections offer information on tax policies, land use regulations, housing, economic development, transportation, and comprehensive planning.

Theoretical work on the link between growth management and affordable housing is very limited. Voith and Crawford (2004) offer one of the first conceptual looks at what effects growth management might have on the provision of multifamily and affordable housing. Using "soft" economic theory to explain the impact on supply and demand, they generally conclude that the effects of growth management on housing markets are theoretically ambiguous. However, they do offer strong theoretical arguments that support increases in the supply of more affordable multifamily units. Furthermore, growth management may also increase the affordability of housing by encouraging job-growth in areas that already have an inexpensive supply of residential units. The theoretical model in the next section presents their arguments in more detail.

Studies of Specific Growth Management Programs

Most of the scholarly work on state growth management focuses on individual growth management programs. The most frequently studied program is Oregon's 1973 Land Conservation and Development Act, which was the first of its kind in the continental United States. One of the more comprehensive studies on this program is Knaap and Nelson's 1992 book, *The Regulated Landscape*, reviews the program in its entirety through documentation of its history, detailed description of its mechanics, and assessment of the goals and outcomes. Of keen interest to scholars of growth management is Oregon's Senate Bill 100. This bill, passed in 1973, requires local governments to create state-approved comprehensive land use plans, make land use decisions that are consistent with these plans, and establish urban growth boundaries (UGBs) to protect valuable agricultural land and open space. Simply put, a UGB determines where growth can and cannot occur in an urban area. Land within the boundaries is available for development, while all land outside is strictly reserved for rural uses. These UGBs are important natural experiments for policy analysts because they were the first of its kind to be adopted anywhere in the United States. As such, there are many academic papers that attempt to analyze the impact of the UGBs on developed land in Oregon.

Other important elements of the program include open space preservation, local plan consistency requirements, affordable housing guidelines, economic development, and citizen oversight (DeGrove, 1994). Oregon's Land Conservation and Development Act is also believed to have influenced the formation of other growth management programs. Programs in Florida, New Jersey, Washington, and Maine all mimic some

elements of Oregon's approach (DeGrove, 1994). For example, Washington State uses UGBs to guide development in urban areas, and Maine's ten state planning goals share those of Oregon's. Other descriptive studies of Oregon's growth management program include Knaap (1987, 1990, 1994), Liberty (1992), Little (1974), Nelson (1992, 1994), Sullivan (1993,1994).

Other scholarly works on specific growth management programs have compared several different programs using an interstate framework. DeGrove's (1984) book is one of the more well known studies that focuses specifically on the organization, implementation, and political climates of growth management in seven states. Individual chapters are devoted to programs in Hawaii, Florida, Vermont, California, Oregon, Colorado, and North Carolina, which offer a comprehensive comparison among all seven states. Bollens (1992) expands DeGrove's (1984) work from seven to thirteen states and finds that state planning objectives have changed drastically since the "first wave" of programs emerged in the early 1970s. He argues that states have shifted the focus of their programs from strong statewide growth control to more cooperative local-state growth management partnerships. This shift, he argues, has allowed the paths of each program to evolve in different manners. For instance, Oregon has continued to utilize UGBs to restrict growth, while Florida has implemented infrastructure concurrency requirements that use a "pay-as-you-grow" approach, and New Jersey uses a state-city negotiation process.

Weitz (1999) offers an extremely exhaustive review of the literature on growth management. His annotated bibliography reviews over 250 books, articles, and reports that cover growth management programs in almost 40 states. Additionally, Weitz thoroughly describes each of the six Model Land Development Code elements, and provides examples from actual state plans. Despite the comprehensive list of growth management work, Weitz argues that there still lacks a clear definition of state growth. However, He suggests two defining characteristics of state growth management: (1) that comprehensive planning is required or encouraged for cities and regions; and (2) that state planning agencies exist to review and approve local these plans. These characteristics are present in well-known growth management states, such as Florida and Oregon, as well as in smaller and newer states as Maryland and Washington.

Although the above works offer invaluable insight into the structure and mechanics of growth management programs, they offer little or no evaluation of policy success. And while the growth management literature offers many reviews and descriptions of these programs, systematic empirical evaluations remain scarce. This leaves a gap in the academic literature concerning the appropriate empirical methods of policy analysis, as well as much-needed reviews for planning practitioners. Select empirical evaluations of these programs are presented below.

Empirical Works on Growth Management

The work of Burby and May (1997) is considered one of the first comprehensive empirical evaluations of growth management schemes (Weitz, 1999). They evaluate the goals and approaches of state planning by comparing programs in California, North Carolina, Florida, Texas, and Washington. Using local development data for these states, the effectiveness of state programs with and without strong planning mandates is

compared. Amongst their findings they conclude that while state programs exhibit many differences in program organization and objectives, the effectiveness of growth management programs can be improved when: (1) plans encourage or mandate local governments to develop their own plans; (2) relevant agencies seek to achieve state plan goals, and (3) governments (both state and local) have strong plan implementation efforts. While their attempts to measure growth management via indices of plan element effectiveness is innovative, they fail to control for changes in the outcome and predictor variables over time. This can lead to biased estimates because of omitted variables and other state-specific effects.

Nelson's (1999) paper analyzes the effectiveness of growth management in Florida and Oregon by comparing growth in these states with growth in Georgia, a comparable state that lacks state growth management. He finds that the

> "…growth management-states of Oregon and Florida appear to fare better in containing urban sprawl, preserving farmland, providing more accessibility between land uses via the automobile and transit, consuming less energy, and minimizing tax increases than Georgia, a *laissez-faire* state."

Though his data covers growth over a ten-year time period, his methods do not specifically measure growth management, *per se*. Thus, from a policy perspective the positive effects of growth management cannot be attributed to any particular policy or mandate. Additionally, his methodology does not control for other intervening factors that could influence the outcome of development, such as changes in income, industry, and agricultural productivity.

Carruthers (2002) offers a comparative analysis of five growth management states: California, Florida, Georgia, Oregon, and Washington. Using metropolitan-level longitudinal data on these states, as well as seven other non-growth management states, his results show that metropolitan areas with strong consistency mandates and enforcement mechanisms grew denser than areas with weaker mandates and mechanisms. He concludes that state programs should shift their priorities to policy enforcement and growth boundaries to effectively mitigate the undesirable side effects of rapid, unmanaged urban growth. The interpretation of his findings is rather elementary, however, because the effects of growth management are measured simply by the age of the state-planning mandate. No specific indicators of individual elements are included in the model, so it is difficult to attribute effectiveness to particular policies growth management mechanisms.

Using an almost identical data set and methodological approach as Carruthers (2002), Anthony (2004) analyzes the effectiveness of state growth management in limiting sprawl. His paper analyzes changes in density in 49 states, and captures the effects of 13 state growth management programs by using dummy variables and length-of-program indicators. He finds that although most states declined in density between 1982 and 1997, those states with growth management programs experienced lower decline. Furthermore, he concludes that although state programs reduced declines in density, they did not have a significant impact on eliminating urban sprawl. The limitations of this study are similar to those of Carruthers (2002) and Nelson (1999).

Wassmer (2006) offers a recent study on the effects of urban containment and state growth management on the size of U.S. urban areas. His study is one of the first of

its kind to properly dissect the different elements of growth management and test their effectiveness empirically. Dummy variables are used to capture the effects of urban containment and state growth management, the impacts of qualitative characteristics of these policies (restrictive vs. accommodating; vertical vs. horizontal vs. internal consistency), and the length of implementation. He finds that state growth management programs are only effective at reducing the size of metropolitan areas if they have strong vertical and horizontal consistency requirements. Though these findings are robust, the data is limited to the year 2000, and thus the impacts of policy changes, economic conditions, and other time-varying characteristics are ignored.

As shown above, scholarly literature on state growth management is limited. Even scarcer is work on the effects of state growth management on the provision of housing.

Growth Management in Maryland

Growth management efforts in Maryland first appeared in 1974, when legislation was passed that allowed the State Department of Planning to advise and encourage land use decision makers to take action that is consistent with the general welfare of the State and its citizens. Eighteen years later, the 1992 Economic Growth, Resource Protection, and Planning Act was passed. This was perhaps the true beginning of modern growth management in Maryland, as it shifted state goals from advisory to compulsory elements of local comprehensive planning. Specifically, the 1992 act called for development to be concentrated in suitable areas, for the protection of environmentally sensitive areas, and for the allocation of funding to local governments to achieve these goals.

However, more substantial pieces of legislation were passed in 1997 that are collectively known as The Smart Growth Priority Funding Areas Act of 1997. This act addresses important issues of growth management through five components: local funding, infill development, jobs-housing balance, economic development, and rural land conservation. A description from the Maryland Department of Planning Website (http://www.mdp.state.md.us/smartintro.htm) states that:

> "Smart Growth directs the State to target programs and funding to support established communities and locally designated growth areas, and to protect rural areas. The Priority Funding Areas Act provides a geographic focus for the State's investment in growth-related infrastructure. The remaining four components complement this geographic focus by targeting specific State resources to preserve land outside of Priority Funding Areas, to encourage growth inside Priority Funding Areas, and to ensure that existing communities continue to provide a high quality of life for their residents,"

Along with specific pieces of legislation that address each of these components, the state adopted four goals and ten principles of smart growth. These four goals of smart growth are to:

1) Support existing communities by targeting resources to support development in areas where infrastructure exists;
2) Save the most valuable natural resources before they are forever lost;
3) Save taxpayers from the high cost of building infrastructure to serve development that has spread far from our traditional population centers; and

4) Provide Marylanders with a high quality of life, whether they choose to live in a rural community, suburb, small town, or city.

To help achieve these four goals, the state adopted 10 principles of smart growth that are designed to guide development in specific directions. These are to:

1) Mix land uses
2) Take advantage of compact building design
3) Create housing opportunities and choices
4) Create walkable communities
5) Foster distinctive, attractive communities with a strong sense of plan
6) Preserve open space, farmland, natural beauty, and critical environmental areas
7) Provide a variety of transportation options
8) Strengthen and direct development to existing communities
9) Make development decisions predictable, fair, and cost effective, and
10) Encourage community and stakeholder collaboration in development decisions.

As seen above, issues of housing are of great interest to state policy-makers in Maryland. Specifically, a number of these growth management principles directly address the provision of multifamily and affordable housing. Principles 2 and 3 directly encourage the construction of multifamily structures and multifamily units, respectively. While principle 2 encourages denser housing, such as multifamily structures, principle 3 advocates an increase in both multifamily and total housing units.

To encourage the practice of these guidelines, the PFA Act designates specific areas that are eligible for state funding if local governments' plans and approved development projects meets the objectives of these goals and principles. Projects covered by the PFA act include highways, sewer and water construction, housing improvement, economic development assistance, and state leases or construction of new office facilities. In addition to these state infrastructure subsidies, the Smart Growth legislation also encourages the use of density bonuses for developers who build a percentage of at or below market rate housing units.

III. The Theoretical and Empirical Model

The Theoretical Model

Before the question "*Does* growth management affect housing affordability" is addressed, a more important question of *How* it affects housing affordability must be discussed. The common notion in most academic literature is that growth management necessarily reduces housing affordability. This is for three reasons. First, growth management is assumed to reduce the supply of developable land. This can lead to higher land costs for homebuilders and higher housing prices for consumers. Second,

many growth management programs strive to make grow pay for itself by forcing developers to pay for infrastructure needs. This increase in input costs is also likely to be passed onto the consumer in the form higher housing prices. And third, growth management could increase the demand by for housing by making communities more attractive. At face value, these theoretical arguments appear to have merit, and are supported by some theoretical and empirical evidence (Gleeson, 1979; Pozdena, 2002; Phillips and Goodstein, 2000). However, the alternative hypothesis of growth management increasing affordability has not been sufficiently addressed in academic literature (Downs, 2004).

While it is certainly possible that growth management could increase housing prices and therefore reduce affordability, it is not a definitive outcome. Simply put, this is because most analyses fail to look at the impacts of growth management on *individual* segments of the housing market. The following theoretical description is borrowed from Voith and Crawford (2004) and Nelson, Pendall, Dawkins, and Knaap (2004), and shows that the effects of growth management on housing affordability are ultimately ambiguous.

Some works, such as Pozdena (2002), conclude that all else being equal, growth management raises housing prices through restriction of land supply. While this is absolutely the case in an *all else being equal*, static framework, it does not account for the influence of other policies that violate these assumptions. This is because the true determinants of housing prices are affected by the relative changes in supply and demand of particular units. While land prices are certainly correlated with housing prices, and increases in infrastructure costs for developers are passed to homebuyers, they need not cause all housing prices to increase. When a dynamic framework of analysis is introduced, whereby the supply of particular units is allowed to increase when land is restricted, housing prices could actually decrease. This is especially the case when land and housing markets are heavily regulated, and housing supply is restricted below equilibrium levels.

Pozedna's case is shown below in Figure 1. Here, the supply of land is restricted to from Q* to Q', which causes an increase in price from P* to P'. If the allowable building densities of new homes remains unchanged, then the future supply of homes will be less than without the restriction, and home prices will rise. Clearly in a free market, this must be the case. However, because local land use regulation is quite extensive across the U.S., the free market assumption is likely to be inaccurate. Many empirical papers (Glaeser and Gyourko, 2003; Saks, 2004; Glaeser, Gyourko and Saks (2005a and 2005b) find that local land use zoning often restricts the supply of housing units below equilibrium levels.

As such, many state and regional growth management regimes act to "regulate regulations," in an effort to reduce or remove restrictive zoning codes. Though growth management can reduce the amount of developable land by preserving of open space, it can also increase the number of housing units by eliminating these restrictive zoning codes. When the restrictions are reduced or eliminated, the supply of certain units may decrease, such as land-intensive single-family homes, while the supply of other units can increase, such as non land-intensive multifamily units. Thus, the impact of growth management is theoretically ambiguous.

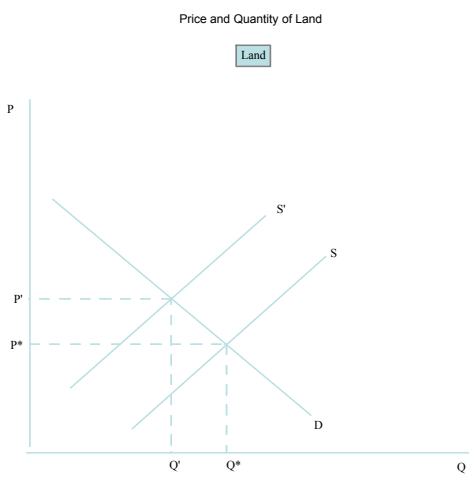

Figure 1a: Impacts of Land Supply Restriction

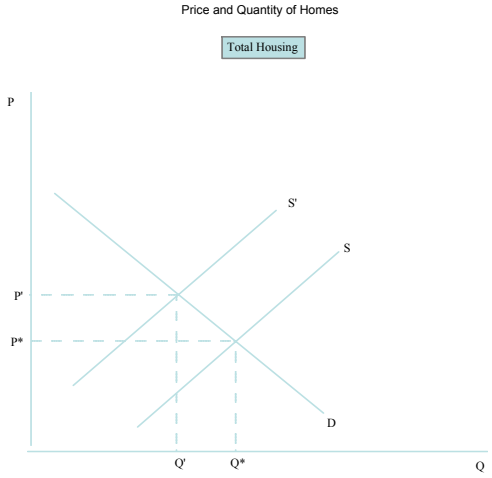

Figure 1b: Housing without Density Change

For instance, Figure 1a and 1b shows the case of Pozedna (2002), where growth management restricts land below equilibrium levels without increasing developable densities. The relative changes in the supply and demand of land and housing are identical. The price of land and housing increases, while the quantity of land and housing consumption decreases. However, Figure 2a and 2b show a growth management scenario where land use density restrictions are relaxed for single family and multifamily units, respectively. Though the price and quantity of land remains identical to Figure 1a because of open-space preservation, homebuilders are more likely to build multifamily units when density restrictions are relaxed. Thus, the supply of new single-family units is likely to be smaller relative to new multifamily units after growth management is implemented. For a descriptive example, see Voith and Crawford (2004).

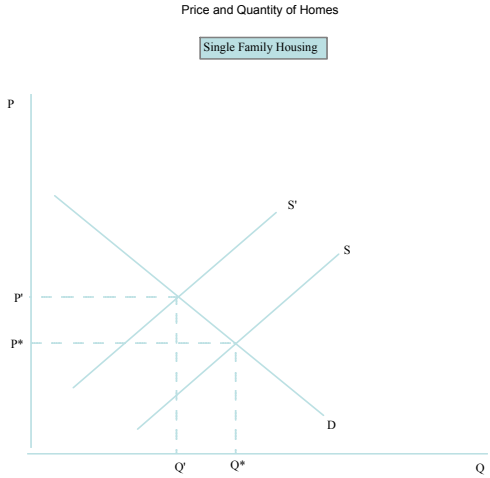

Figure 2a: Supply of Single-Family housing

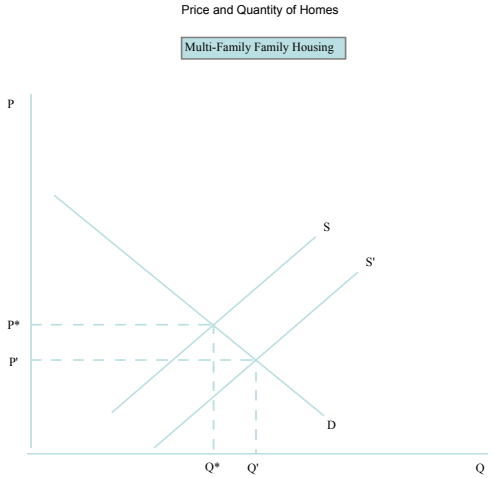

Figure 2b: Supply of Multi-Family housing

The Priority Funding Areas Act of 1997 is expected to exert this kind of impact. This is for several reasons. First, the PFA Act identifies specific areas of for urban and rural growth. This likely encourages local governments to restrict residential growth in rural areas, thus reducing the overall supply of developable land. Second, the PFA Act allots subsidies to local governments and redevelopment agencies for the approval of projects that meet the goals of the "Smart Growth." These goals are numerous, and are listed in the previous section. Of these goals, two might encourage the construction of multifamily units relative to single-family units: Smart growth principle 2) "take[s] advantage of compact building design," and 3) "create[s] housing opportunities and choices." These smart growth guidelines, when used as criteria for state subsidies, would likely have the effects similar to those demonstrated in Figures 2a and 2b.

As mentioned at the end of section II, both of these principles encourage an increase in the number of residential units. However, "compact building design" and "housing opportunities and choices" probably refers to increasing the number of multifamily units. This is likely because the overwhelming majority of residential units constructed in Maryland are single-family homes. Thus, it is assumed that "creating housing opportunities and choices" entails increasing multifamily units. While "tak[ing] advantage of compact building design" likely refers to multifamily housing, it may simply refer to building less land-intensive structures. Regardless, both principles likely act as "regulation of regulation," that encourages increases in unit densities and types.

Hence, an important policy question is clear. Have these two Smart Growth principles affected the supply of housing? More specifically, does PFA designation increase the balance of housing choices over time? This study takes a quasi-experimental approach by using the 1997 PFA Act as a natural experiment to determine if the balance of housing choices improved after its enactment. The following subsection presents the empirical approach to addressing this question.

IV. *Data Set and The Empirical Model*

In 1997, the PFA Act and its associated pieces of "Smart Growth" were passed. By 1998, priority-funding areas had been designated through collaborations among state, county, and local governments. This provides researchers with a unique opportunity to analyze the efficacy of the PFA Act by looking at changes in housing conditions before and after 1998. This type of "natural experiment" can be extremely useful to policy researchers because it allows the use of data over time. This is advantageous because time-series models can help control for the effects of omitted variables, as well as individual and year-by-year effects of each observation. The empirical approach in this paper builds borrows elements from Boarnet and Bogart (1996) and Burge and Ihlanfeldt's (2006).

As mentioned in the literature review, many studies of growth management programs have been conducted in an interstate framework. This type of comparative approach traditionally measures the performance of a growth management state against other similar states, usually with respect to proximity and/or initial conditions. While this approach can yield informative results, it can be problematic because of possible omitted variables. If data measured over time (panel data) is available, special statistical techniques can be applied to help purge the effect of these confounding variables. Even

if panel data is used, however, any effects attributed to the growth management program can only be induced from either a state indicator or age-of-policy variable. While these variables can provide some evidence of growth management efficacy, it does not provide specific information on the growth management policies themselves. Thus, an additional *intrastate* model is estimated that analyzes housing choice exclusively in Maryland.

Using panel data, the empirical approach this paper consists of two models. First, an interstate model is used to test the hypothesis that the housing balance in Maryland diverged from its interstate neighbors growth management was implemented in 1997. In this model, growth management is simply measured by an interaction variable of the 1998-2004 time period with the neighboring state dummies. The Maryland State dummy is omitted both as a state indicator and interaction variable so that all estimates are compared to Maryland. Neighboring states include Delaware, New Jersey, Pennsylvania, Virginia, and West Virginia.

Second, an intrastate model of PFAs in Maryland is used to test the hypothesis that the housing balance inside PFAs diverged from non-PFAs after the growth management program was implemented. Here, growth management is measured in a more specific manner. This is done using a unique variable that captures the percent of residential development that occurred in PFAs from 1990-2004. While PFAs were not actually designated until 1998, the Maryland State Data Center has data on development activity in these areas before Smart Growth was implemented. This data allows for a unique variable that captures residential growth in PFAs before and after they were established. This variable is described in more detail in the following section.

Both models use the fixed-effects specification, which appears as,

$$y_{i,t} = \alpha_i + \gamma_t + \beta_0 X_{i,t} + \beta_1 Z_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where $y_{i,t}$ is the dependent variable observed in area *i* at time *t*; α_i and γ_t are dummy variables that capture the effects of area and time, respectively; $X_{i,t}$ is the policy variable of interest in area *i* at time *t*; $Z_{i,t}$ is a vector of other exogenous variables in area *i* at time *t*; and $\varepsilon_{i,t}$ is an error term that varies among observations over time and space. Area based fixed-effects are included to capture the effects of unobservable characteristics across space, and time based fixed-effects are included to capture the effects of conditions that affect all areas over time.

While this specification is essential for controlling the area and time based intercepts, it does not allow for the coefficients of a variable to change over space and/or time. However, this can be achieved by interacting the area and time dummy variables with any other variable of interest. This technique is especially useful if a natural experiment at one point in time is being analyzed, such as the adoption of policy, the occurrence of a physical disaster, or a change in political structure. In this paper a "post-policy" 1998-2004 dummy variable is used as in the interaction because it captures the first six years of growth management in Maryland. As such, the interstate model appears as

$$HB_{i,t} = \alpha_i + \gamma_t + \varsigma_i + \gamma_{9804} + \beta_0 \varsigma_i \gamma_{9804} + \beta_1 Z_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where $HB_{i,t}$ is the ratio of multifamily to single-family permits issued in county *i* at time *t*; α_i and γ_t are dummy variables that capture the effects of area and time, respectively; ς_i is a state-dummy variable for county *i*; γ_{9804} is the 1998-2004 time period dummy; $\varsigma_i\gamma_{9804}$ is an interaction term of the state and 1998-2004 dummies; $Z_{i,t}$ is a vector of other exogenous variables in area *i* at time *t*; and $\varepsilon_{i,t}$ is an error term that varies among observations over time and space. Note the policy variable is operationalized through the $\varsigma_i\gamma_{9804}$ interaction term. The Maryland state dummy variable is omitted so that it becomes the benchmark of all other states. Thus, a significant interaction term indicates that a state grew different from Maryland over the growth management time period, and provides evidence that the program may have had some impact.

Because an *inter*state model such as (2) may oversimplify the measurement of growth management, a second *intra*state model is used in this paper. As mentioned above, this model takes advantage of unique data on PFAs. This unique data measures development PFAs before and after PFA designation. A new variable, labeled PFA_i, is calculated from this data: PFA_i measures the percent of county residential development that occurs in PFAs. For the 1990-1997 years, this variable measures percent development in areas that would eventually become PFAs after 1997. For the 1998-2004 period, it measures percent development in fully functioning PFAs. Because this data is unique to Maryland, the data in the model must be restricted to counties in Maryland. The intrastate model is written as,

$$HB_{i,t} = \alpha_i + \gamma_t + \gamma_{9804} + PFA_i + \beta_0 PFA_i\gamma_{9804} + \beta_1 Z_{i,t} + \varepsilon_{i,t} \quad (3)$$

where $HB_{i,t}, \alpha_{i,}, \gamma_t, \gamma_{9804}, Z_{i,t}, \varepsilon_{i,t}$ are identical as used in (2) except restricted to Maryland counties, PFA_i is the percent of new residential units built in PFA zones (before and after PFA designation) from 1990-2004, and $PFA_i\gamma_{9804}$ is an interaction term that identifies PFA_i in the 1998-2004 growth management period. A significant and positive coefficient on $PFA_i\gamma_{9804}$ would indicate that housing choice in to-be PFAs grew significantly different after growth management was implemented. This would provide evidence that PFAs may be effective at achieving at least some of its stated goals and principles.

Equations (2) and (3) are estimated using Stata's *xtreg*, *fe* command, which calculates a deviation from means models and eliminates the county fixed effect. The program transforms equations (2) and (3) into

$$HB_{i,t} = \gamma_t + \varsigma_i + \gamma_{9804} + \beta_0\varsigma_i\gamma_{9804} + \beta_1 Z_{i,t} + \varepsilon_{i,t} \quad (4)$$

and

$$HB_{i,t} = \gamma_t + \gamma_{9804} + \beta_0 PFA_i + \beta_1 PFA_i\gamma_{9804} + \beta_2 Z_{i,t} + \varepsilon_{i,t}, \quad (5)$$

respectively, and estimates the remaining variables using ordinary least squares (OLS).

Data and Variables

The dependent variable, $HB_{i,t}$, is the measure of housing choice in both models. It is simply the proportion of total building permits in county *i* at time *t* that are multifamily units. The raw data is available from both the US Census and US Department of Housing and Urban Development. A positive coefficient on an independent variable indicates that it may increase the balance of housing choices through an increase in the share of new multifamily units, and vice versa.

The PFA_i variable is constructed from data gathered by the Maryland State Data Center. This data charts residential development inside and outside PFAs before and after boundary designation. As mentioned above, the variable before 1998 measures the percent of residential development that occurred in these areas before they PFAs were implemented. This type of variable is especially useful, because it allows for a quasi-experimental analysis of the impact of growth in these areas on housing choice pre and post policy. Thus if PFAs are effective at increasing housing choice, we would expect to see a positive coefficient on the interaction term for the 1998-2004 time period.

The vector Z is included to capture other time-varying factors that are hypothesized to effect $HB_{i,t}$. Population, annual percent population change, median income, annual percent change in median income, and a metropolitan county identifier comprise this vector. Total population and percent population increase are both expected to exert upward pressure on the housing market, which should lead to more multifamily housing and a positive coefficient in the models. Median income and increases in median income both expected to put downward pressure on demand for multifamily units. This is because, *ceteris paribus*, higher and increasing median incomes are more likely to create demand for larger homes, typically in the form of single-family housing. For a detailed urban economic comparison of these four variables, see the comparative statics of Fujita (1988). A metropolitan county identifies is included to control for two time-varying characteristics of metropolitan areas. First, metro areas are more likely to consist of multifamily housing units than non-metro areas. And second, it is hypothesized that metro areas are more likely to have been designated as a PFA than their non-metro counterparts. For non-census years, this data is gathered from US Census Bureau's intercensus estimates of county population and income. All of the data above is also available from the Maryland State Data Center upon request.

V. Results

Interstate Estimates

Column (1) in Table 1 shows estimates of the interstate model of housing choice, with county and time fixed effects suppressed. The effects of county population and population growth on housing choice are not significant. This is not as expected, since larger and faster growing counties are hypothesized to have greater housing choice since they are more likely to represent areas with tighter housing markets. However, the effects of income may trump the effects of population and population growth. Both income levels and income growth are strongly significant at or below the one percent confidence level. The positive coefficient on income level suggests that counties with higher median incomes, on average, have greater housing choices. This is as expected

because counties with higher incomes usually have more developed urban areas, which often add a greater percentage of new multifamily units annually. The negative coefficient on income growth suggests that areas with faster growing incomes are adding a lower yearly percentage of multifamily units to the housing stock. This is expected for two reasons. First, increases in income usually lead to increases in demand for larger more spacious housing units. This type of housing is typically single-family homes. Second, areas with faster growing incomes are likely to be developing or newly developed areas on the periphery of urban areas, where land is relatively cheap. In these areas, housing markets are less likely to support the construction of multifamily units.

The coefficients on the interaction variables suggest that Maryland's housing choice did not grow differently over the growth management period. None of these variables are statistically significant below the ten percent confidence level. While this is evidence that Maryland's growth management program did not cause the state to increase housing choice relative to its neighbors, it certainly does not imply that counties within Maryland did not experience changes in housing balance. For instance, other states in the model, such as New Jersey, also have detailed growth management programs that could potentially influence the balance of housing choices. Thus, an intrastate model is employed that restricts observations to Maryland counties.

Intrastate Model

Column (2) of Table 1 shows the estimates of the intrastate model, with county and time fixed effects once again suppressed. The overall explanatory power of the model is superior to the interstate model, with an R^2 of .24. Like the interstate model, both population level and population growth are not significant. However, income level and income growth are also not significant, which suggests that the housing choice in Maryland is determined by a variety of other factors omitted from the model. These omitted variables do not pose a threat to model validity if they do not vary over time, as these effects are captured in the county fixed effect, or vary between counties, which are captured in the time period dummies.

The PFA variable and 1998-2004 time period dummies are both not significant. This suggests that all else equal, percent development inside PFAs do not have an effect on the overall housing choice of a county. This is expected because the PFA variable includes the 1990-1997 pre-growth management time period, before these areas were established by the state. The insignificant coefficient on the 1998-2004 time period dummy suggests that housing choice for Maryland counties were not statistically different from the pre-growth management time period.

As mentioned above, the interaction variable, PrcPFA*9804, tests the hypothesis that percent of housing units built in PFAs during growth management time period (1998-2004) effects the overall balance of housing choice within Maryland counties. The coefficient on this variable is positive and strongly significant at below the 1% confidence level. This evidence strongly suggests that increases in housing growth inside PFAs increased the overall balance of multifamily units during the growth management period.

Table 1:
Results of Interstate and Intrastate Models

Variable	(1) Interstate	(2) Intrastate
Population	6.45E-08 (0.28)	4.62E-07 (1.16)
Population Change	0.0734812 (0.41)	-0.2122922 (-0.22)
Median Income	9.44E-06 (4.81)***	3.90E-07 (0.06)
Income Change	-0.2942449 (-2.56)**	0.4636186 (1.12)
1998-2004 (9804)	0.0289168 (0.51)	-0.0338497 (-0.54)
Percent Units in PFA (PrcPFA)	-	0.0972026 (0.81)
PrcPFA*9804	-	0.1761992 (3.03)***
9804*DE	-0.0427212 (-0.94)	-
9804*NJ	0.0240222 (1.1)	-
9804*PA	-0.0155882 (-0.88)	-
9804*VA	-0.0268843 (-1.64)	-
9804*WV	-0.0228504 (-1.24)	-
R^2	0.07	0.239
Observations	4530	360

Note: T statistics are in parentheses; ***, **, and * represent significance levels of <.01, <.05, and <.10, respectively.

VI. Discussion and Policy Implications

This paper has analyzed the efficacy of Maryland's 1997 Priority Funding Areas. One objective of this Act, as stated in the four goals and ten principles of the Smart Growth Legislation, is to increase housing choices and densities within Maryland's communities. The Act seeks to achieve this objective by directing growth into designated Priority Funding Areas, where cities, counties, and private developers are eligible for state infrastructure subsidies if residential and commercial developments meet the goals and principles of Smart Growth.

To determine if the PFA Act actually increased housing choice in Maryland, two quasi-experimental models of building permit activity were utilized. Both models used data over a 15-year time period to analyze the annual ratio of multifamily building permits pre and post PFA Act. The first, an interstate model, used differences in differences approach that compared Maryland to 5 neighbors before and after the growth management program took effect. If the PFA Act did have an effect, we would expect to greater differences between Maryland and its neighbors during the 1998-2004 time period. The second model used an intrastate framework that analyzed the ratio of multifamily building permits within Maryland counties only. This model looks at the effects of development inside PFAs on the annual multifamily housing ratio. If the PFA act did affect housing within Maryland, we would expect a higher proportion of development within PFAs to have a larger effect in the 1998-2004 time period.

The results from the interstate model indicate that housing choice in Maryland did not grow significantly different from neighboring states during the growth management time period. If the smart growth legislation did have an impact, it was not discernable from housing permit activity in the surrounding region. This could be for several reasons. First, this could imply that counties in the study area comprise a closely linked housing market. If so, the effects of growth management regime could spillover into neighboring states causing housing growth to be similar to Maryland. Second, PFA investment may have effects that lag beyond the 1998-2004 time period. Future research may need to extend the period to later years to account for this. And third, Maryland's regime may not be discernable from its neighbors because of homogenous housing policies in adjacent states. If in fact the region was experiencing shortages of certain housing types, many states in the region may have passed similar legislation to address the problem.

The results from the intrastate model tell a different story. All evidence points towards an effective PFA act that increased the balance of housing in Maryland counties during the growth management time period. The finding suggests that counties with a higher percentage of development inside PFAs experienced a larger ratio of new multifamily units. This is strong evidence that statewide infrastructure subsidies encourage cities, counties, and private developers to build and rezone land for multifamily housing. Despite this finding, there are many aspects of the PFA Act that need to be evaluated. Specifically, a detailed evaluation of state funding and its effects on the built environment is needed. For instance, how much/which type of funding is most effective in achieving desired outcomes? Does PFA designation significantly affect land values and housing prices? What types of multifamily units are most encouraged by PFA funding?

While generalization of these findings outside of Maryland is not perfectly straightforward, there are implications for both the formation of growth management housing policy and research methods. First, growth management programs that seek to address housing issues may increase their effectiveness by designating specific problem areas and using state funding as incentives for cites, counties, and developers to meet desired goals. This may direct growth into desired areas while encouraging specific types of development. Second, research findings may be highly dependent upon the scale of analysis. Using neighboring states as benchmarks could be misleading, especially if there is no specific measurement of a growth management policy. A "race-with-yourself" approach that utilizes accurate measurements of a specific policy could yield more meaningful results.

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