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Essays on the Effectiveness and Competitiveness of State Government Expenditures

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Essays on the Effectiveness and Competitiveness of State Government Expenditures

J. Sebastian Leguizamon

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

Doctor of Philosophy
in
Economics

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Human Capital, Work Participation,
Government Competition, Political Structures

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Abstract

Essays on the Effectiveness and Competitiveness of State Government Expenditures

J. Sebastian Leguizamón

This dissertation addresses issues related to the effectiveness and consequences of state and local spending in the United States. Chapter two examines how merit-based aid tuition assistance contributes to the retention of graduates in a state. An analysis of restricted-use administrative data for West Virginia graduates suggests that in-state college graduates that received merit-based aid to attend college are no more likely to work in the state after graduation, compared to those who did not receive the assistance. These graduates are between 1.9 and 5.2 percentage points less likely to remain in the state, decreasing the overall effect of merit-based assistance on the retention of human capital. In chapter three I calculate the implicit marginal tax rates for individuals that participate in multiple welfare programs and use them to examine the extent to which it may affect labor force participation of welfare recipients after the reform of 1996. The analysis supports the hypothesis that high implicit marginal tax rates discourages workers from looking for work and becoming self-sufficient. On average, a standard-deviation increase in these rates lowers the work participation rates of TANF recipients by 0.208 standard deviations, or 8.5 percent. Chapter four looks at the consequences of state welfare spending across the border. In it, I use data from 1987 to 2007 and find that the interaction of state governments does depend on the political environment of each state. Single party majority governments do not react to neighboring states' welfare spending while divided governments do. Also, fiscal policy reactions among states appear to depend on what political party holds the majority. Finally, the analysis suggests that the welfare reform of 1996 did change the way in which these governments reacted to one another, which can be mainly attributed to the change from a matching-grant to a block-grant system. An initial examination of the data suggests that the surge in Republican elected officials after the reform may have also played a role in the way state governments interact.

Dedication

A mis padres, a quienes les debo absolutamente TODO. A mi madre quien me enseñó la importancia del trabajo, la perseverancia, y la ética. A mi padre por su apoyo incondicional. A mis hermanos por acompañarme desde lejos, con sus chistes y maricadas que le suben el animo a cualquiera. I also want to specially dedicate this dissertation to a very important couple in the mountains of West Virginia: *My Aunt and Uncle*. For they always believed in me, bragged about me, and loved me as another son. For all that, I owe them this dissertation and a lot more. Last but not least, I want to thank Susane for all she is and all she does. This document would have not been the same without having her by my side.

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Contents

Abstract	ii
Acknowledgements	iv
1 Purpose and Agenda	1
2 The Effect Of Merit-Based Tuition Assistance On State Human Capital Retention	8
1 Introduction	8
2 Literature Review	11
3 PROMISE Scholarship Program	13
4 Data and Methodology	15
4.1 <i>Data Description</i>	15
4.2 <i>Methodology</i>	19
5 Empirical Results	22
6 Conclusions and Policy Implications	28
3 The Work Disincentives Created by Government Safety Nets Continue: Analysis of TANF	33
1 Introduction	33
2 Literature Review	36
3 Methodology and Data	38
3.1 Program Description	38
3.2 Calculating Implicit Marginal Tax Rates	40
3.3 Additional Data	46
4 Results	47
4.1 Implicit Marginal Tax Rates	47
4.2 Empirical Results	61
4.3 ‘Effective’ Tax Rates	69
4.4 Robustness Checks	72
5 Conclusion	75
4 Yardstick Competition, Politics, and The 1996 U.S. Welfare Reform	78
1 Introduction	78
2 Background	83

3	Data and Methodology	86
3.1	Empirical Methodology	86
3.2	Data Description	93
4	Analysis and Results	97
4.1	<i>One vs. Two Regimes</i>	97
4.2	<i>Alternative Estimations and the Welfare Reform of 1996</i>	101
5	Summary and Conclusions	106
5	Conclusion	109
A	Appendix: Spatial Regimes	119

List of Figures

3.1	Correlation Between The Work Participation of Temporary Aid for Needy Families (TANF) Recipients and the Implicit Marginal Tax Rate Incurred by Moving from Not Working to Part-Time Work	62
3.2	Correlation Between The Work Participation of Temporary Aid for Needy Families (TANF) Recipients and the ‘Effective’ Implicit Marginal Tax Rate Incurred by Moving from Not Working to Some Work (10 Hours) . . .	63

List of Tables

2.1	W.Va. Public Higher Education Graduates And W.Va. Employment In 2007 and 2008	17
2.2	Probit Estimation of the Impact of Graduate Characteristics on W.Va. Work Participation in 2008	23
2.3	Probit Estimation of the Impact of Graduate Characteristics on W.Va. Work Participation in 2008: Alternative Models	26
2.4	Illustration of PROMISE Impacts	30
3.1	Calculation of Housing Subsidies and Food Stamps (SNAP) for COLORADO	44
3.2	Implicit Marginal Tax Rates (IMTR) Under Multiple Welfare Program Participation	48
3.3	Summary of Implicit Marginal Tax Rates (IMTR) Under Multiple Welfare Program Participation	58
3.4	OLS Results for the Impact of Implicit Marginal Tax Rates on Work Participation of TANF Families	67
3.5	OLS Results for the Impact of Implicit Marginal Tax Rates on the Percent of TANF Families Working	71
3.6	OLS Results for the Impact of Implicit Marginal Tax Rates on the Percent of TANF Families Working	74
4.1	Descriptive Statistics: Political Yardstick Competition in U.S. Welfare Spending .	95
4.2	OLS and One-regime Results for Public Welfare spending in the United States (1987-2006)	98
4.3	Two-regime model of Public Welfare spending in the United States (1987-2006): Unified Vs. Divided Government	100
4.4	Public Welfare Spending Competition among U.S. States: Before and After Welfare Reform	104

Chapter 1

Purpose and Agenda

Throughout history economists have emphasized the importance of efficiency. Resources are scarce and economists have spent years studying the many ways in which economic agents allocate the resources available to them. Microeconomic theory has shown that competitive markets tend to allocate resources more efficiently, yet theory has justified government interventions for instances in which market outcomes fail to provide full economic efficiency. In such cases, policy interventions are thought of as the tool that can potentially solve market imperfections and improve the social well-being of individuals.

However, not all public policies achieve efficiency either. Many government policies result in outcomes that are far less efficient than those provided by imperfect but unregulated markets. Often, these policies, both at the federal and state and local levels, are justified on equity basis rather than efficiency. Indeed, an increase in equity is a goal held by many policy makers and government intervention. Based on this criterion, it is widely accepted and very popular. However, this popularity tends to interfere with our understanding what equity and fairness really mean.

Many economists agree that education is one of the key elements in the creation of human capital and therefore the development of a region. Hence, it is in the best interest of a region to increase the levels of education of its population. However, not everyone can afford sending

his/her children to college. Capable children in poor families may be unable to obtain a higher education due to the family's financial constraints, and consequently remain poor. This phenomenon then can perpetuate for many generations, contributing to the persistence of poverty and falling into what has been known as the 'poverty trap' (Bowles, Durlauf and Hoff, 2006; Sachs, 2006; Aariadis and Stachurski, 2004; Barham, Boadway, Marchand and Pestieau, 1995).

At first sight, this may seem not only unfortunate but also unfair, and thus the government should reallocate resources from the rich to the poor so that these people can be lifted out of poverty. However, if analyzed from a purely equitable perspective, can we say that such policy is one-hundred percent fair? Is it fair to families without children to have to pay taxes so that other children can be educated? The answers to this type of question are clearly bound to different interpretations, making equity a very difficult criterion to use when analyzing the role of public policy. This does not mean that equity and fairness are not important topics in the study of public policy and public economics; however, they are rather ambiguous and many economists try instead to focus on efficiency.

Efficient economic systems are those in which everyone is as well off as possible (Brown-ing and Browning, 1994). An economy is operating efficiently if, and only if, the reallocation of resources cannot make any person better off without harming somebody else. If there is room to improve the well-being of an individual without hurting the well-being of anybody else, the economy (or market) is such in which resources are not being allocated efficiently. In that case, a government economic policy that improves the level of efficiency may be justified. This, however, needs to be undertaken with caution. While most people care about raising the well being of all individuals, some societies make different value judgements on whose well-being is most important. Some groups, for instance, do not have a problem with increasing the well-being of poor children at the expense of criminals' well-being. Incorporating these preferences can prove problematic when defining efficiency due to the lack of perfect measures of social welfare. As a result, although efficiency of public policy is an im-

portant tool for evaluation, it presents some complexities as the private interests of certain groups vary across societies (Browning and Browning, 1994).

If the purpose of government intervention is to correct inefficient markets, improve upon efficiency, and reach maximum levels of social welfare, it is especially difficult to assess public policy outcomes when there is no properly defined measure or amount of optimal welfare. Although not a perfect method, economists often focus on the use of cost-benefit analysis to evaluate the efficiency of expenditure programs. This method is widely used in both the private and public sectors. Based on principles of welfare economics, cost-benefit analysis attempts to provide information on the normative issue of whether certain investments should be undertaken. This is not an easy task as it is sometimes very difficult to identify all benefits and all costs, as well as who benefits and who bears the cost. This is, of course, not to mention the difficulties in determining the future value of certain benefits, and compare them with the present costs (Cullis and Jones, 1998; Browning and Browning, 1994).

According to Browning and Browning (1994), expenditure analysis (the main element of this dissertation) focuses on two basic categories: (1) allocative effects and (2) distributive effects. Allocative effects deal with the way in which “expenditure program[s] affect the pattern of goods and services produced,” and distributive effects examine the question of who is the one bearing the costs and who is the beneficiary. Cost-benefit analysis tries to deal with efficiency, and thus the first category. The second category is more closely related to the issue of equity mentioned above. In this context, this dissertation is concerned with the former, leaving the latter for future analysis.

Yet, while a comprehensive analysis of government expenditure programs includes a complete cost-benefit analysis, this dissertation focuses on the first step toward evaluating the economic effects of public policy programs. Specifically, I primarily investigate the efficacy of particular state and local government spending toward achieving the intended outcomes. Before even undertaking a cost-benefit analysis, I take a step back and examine

whether certain public expenditure programs are justifiable on the ground of accomplishing their initial goals. In addition, I analyze the political effects of these programs. By looking at government expenditures in different jurisdictions, I examine the political process to which these governmental programs are subject, and how the type of political environment affects the level and nature of expenditures associated with them.

In chapter two and chapter three I examine state and local expenditures on higher education and public welfare assistance, focusing on the issue of how effective these are toward achieving the intended outcomes. In chapter 2 I particularly examine the effect of merit-based scholarships on the probability of retaining college graduates in their home state after graduation. This chapter uses a unique data set containing information on wages from employment for graduates from West Virginia public colleges and universities in 2008. While other research has focused on the effects of such aid on outcomes such as in-state enrollment, private versus public enrollment, and college enrollment by income, in this chapter I examine the effect of the West Virginia merit-based aid (i.e. the ‘PROMISE’ scholarship) on the participation of graduates in the state’s workforce. As in many other states, this merit-based assistance was implemented in West Virginia with the intent of keeping the best and the brightest in the state for, and hopefully after, college.

Some merit-based scholarship programs have been justified as investments that can raise the level of education in the state’s labor force, which will eventually contribute to its economic growth. Using data on employment earnings, the results of the analysis show that after controlling for aptitude, residency status, and other demographics, ‘PROMISE’ scholarship recipients are *no* more likely to work in West Virginia after graduation. This is partly explained by the fact that high aptitude students (measured by ACT scores) are more likely to leave the state and seek employment somewhere else. Consequently, even though the program may increase the stock of graduates through in-state enrollment, it has no effect on retaining graduates after college, and thus no significant impact on the creation of better

state human capital.¹

In chapter 3 I examine the effect of implicit taxation on the decisions of welfare recipients to participate in the labor force. In particular, I study the short-run variation of work participation decisions of working Americans living in poverty across the U.S. states. Families with income below the federal poverty line often qualify for several assistance programs. The eligibility criteria varies by state and by the level of income. Studies have found that, given the nature of the benefit reduction scheme for each program, families that participated in more than one program prior to the U.S. Welfare Reform of 1996 usually faced very high implicit tax rates. Under federal control, a typical welfare recipient's additional disposable income gained from additional hours worked could have been as little as 20 or even 10 percent of the additional earnings. Facing such disincentives, families would reasonably choose to remain in welfare and out of the labor force. The results of this chapter suggest that these disincentives have not disappeared from the welfare recipients' lives.

The reform granted states the authority to make their own decisions regarding the benefit structure of their own welfare programs. Although some states do appear to have systems in which welfare recipients find it more encouraging to find work, there are some states in which the phasing out of welfare benefits continue to translate into high implicit taxation. Results suggest that aggregated implicit marginal tax rates resulting from these programs have influenced the overall work participation of welfare recipients across U.S. states. The cross-sectional analysis reveals that implicit marginal tax rates emerging from increasing working hours at the state's minimum wage, decreases the work participation of welfare family recipients. In other words, the results not only suggest that welfare recipients encounter huge implicit marginal tax rates in some states, but they also point at a negative correlation between these rates and the work participation rates of welfare recipients.

In the fourth chapter I use spatial maximum likelihood estimation adapted to a panel data set and find that the degree of spatial dependency among state governments varies

¹This chapter is primarily based on a co-authored paper with George W. Hammond.

according to the political structure of each government. Previous work has found that state governments “compete” or interact through changes in spending levels. States’ spending policies appear to be influenced by the spending policies of their neighboring states (Baicker, 2005b; Case, Rosen and Hines Jr., 1993). This occurs as state governments react to their neighboring states based on two assumptions. First, policy makers believe that voters would relocate according to the provision of public goods. A neighboring state offering high welfare benefits will be more attractive to families that depend on welfare, inducing them to leave their current state. This outflow of families translates into a loss of votes for the current policy maker during the next election (Tiebout, 1956). On the other hand, even if voters do not migrate, policy makers may just be simply judged based on what voters observe in other states. Incumbents that do not keep up with their neighboring state’s policies may lose potential votes as voters start feeling misrepresented (Besley and Case, 1995).

In 1996, the United States passed the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) which, among other things, gave states freedom to regulate public welfare spending individually under a new set of federal guidelines. The increased state autonomy in setting welfare expenditure levels could certainly result in states exhibiting a greater degree of spatial dependence. However, spending policy outcomes are subject to political processes and the consensus of policymakers. Consequently, the political structure of each state may influence the type and strength of spatial dependence among states.

In this chapter I use expenditure data for the pre-and-post-welfare reform period (1987-2006) and find that the degree of spatial interrelatedness depends on whether the government is politically unified or politically divided. Here, states in which one single party holds a majority of each of the two houses of the legislature and the governorship office are considered to be unified. When a party controls only two of the three bodies of government (upper chamber, lower chamber, and Governorship), that state is considered to have a divided government. Using a two-regime model developed by Elhorst and Fréret (2009), I find that politically unified governments do not tend to compete with neighboring states, while divided

governments do. I also find evidence that this is partly due to the political party controlling office majority and the type of expenditure used to determine the competition. However, the results show that the effect of the political structure is different for the pre and the post reform periods.

In an attempt to isolate the sources of government competition, I use data for public welfare benefits only. As part of the reform, states were given more flexibility and independence in terms of managing these programs, which reduces the degree of dependency on federal regulations. Looking at the typical welfare recipient, we can infer that Democrats may be more susceptible to issues that may affect this type of voter. These results support the idea of government interaction through political yardstick competition and welfare migration among states. Finally, I find that migration patterns fail to consistently explain any of the spatial dependence among states under different political structures, casting some doubt on the hypothesis that policy makers' decisions are influenced by the migration of welfare recipients only. This does not mean, however, that potential migration can be discarded entirely as the motivation of politicians to respond to neighboring policies.

Chapter 5 concludes the dissertation. In this chapter I summarize and discuss the major findings of each chapter and review the importance of each finding as it pertains to public policy. Finally, future research ideas are discussed.

Chapter 2

The Effect Of Merit-Based Tuition Assistance On State Human Capital Retention

1 Introduction

Federal and state governments place an enormous emphasis on the importance of providing higher education to their citizens as means to improve the quality of the labor force, increase productivity, and boost economic growth. Recently, several states have begun to invest in merit-based aid programs. While not being the very first, Georgia began the trend in 1993 with the Helping Outstanding Pupils Educationally (HOPE) scholarship. There are now 16 states with some form of merit-based aid program underway.¹ Although the nature of each state's merit-aid program varies considerably, they all aim to provide in-state tuition assistance to the best local students. These programs, however, have not accomplished the original financial aid goals proposed in the Higher Education Act of 1965, which intended to increase access to higher education for low-income students (Dynarski, 2002; Heller, 2002;

¹They are: Alaska, Arkansas, Florida, Georgia, Kentucky, Louisiana, Massachusetts, Michigan, Mississippi, Missouri, Nevada, New Mexico, South Carolina, South Dakota, Tennessee, and West Virginia.

DeFrank-Cole, Noland and Green, 2007). In fact, it has been found that merit-based aid has primarily affected the college location decisions of students of middle and high income families, who would attend college even in the absence of the scholarship, but has little effect on college enrollment of low-income students (Dynarski, 2000, 2002). Based on these results, Cornwell and Mustard (2007) investigate the extent to which merit-based disbursements simply represent rent payments to those high-income families that would have sent their children to college, regardless of the award. They find that, for the case of Georgia, car registrations increased in the counties above the 75th percentile in per-capita income the year in which income caps were removed from the scholarship requirements, suggesting that the award may have freed up some education funds to be spent on other assets.

In 2001, West Virginia implemented the PROMISE (Providing Real Opportunities for Maximizing In-State Student Excellence) scholarship program with the idea of promoting college education among West Virginia residents. In addition to the common objectives of merit-aid policies identified by Heller (2002), political leaders believed that by keeping more students in West Virginia for college would increase the probability that they would stay in the state to work after graduation (DeFrank-Cole, Noland and Green, 2007).²

Previous research on the labor market impacts of college attendance suggests that it has a small positive impact on the graduates' decision to work in that state after graduation (Groen, 2004). The author takes this as evidence that merit-based aid should not be adopted because of labor market impacts alone. Bound, Groen, Kezdi and Turner (2004) find that the production of college graduates in a given state has a modest positive impact on the share of college graduates living in that state. This is taken as evidence that states have a limited ability to influence human capital accumulation through the financing of higher education (which would include the impact of merit-aid scholarships). In addition, Dynarski (2008) presents evidence that merit-based scholarships may increase the college completion rates of state residents, using secondary data for Arkansas and Georgia. In contrast to

²Common objectives included: promote college access; keep the best and brightest students in their home state for college; and reward students who work hard (See also DeFrank-Cole, Noland and Green (2007).

previous research, Dynarski (2008) argues that merit-aid scholarships in these states are socially efficient at rates of return to higher education as low as 5%.

This chapter contributes to the merit-based aid literature by exploiting a new data set to estimate the impact of such program on employment in a state which has not been the subject of previous analysis. Using restricted-use matched individual-level data on graduates from public higher education institutions in West Virginia and employment in the state, I estimate the likelihood of PROMISE graduates to work in the state, after controlling for other factors such as academic achievement, gender, residency, race, age, enrollment, experience, degree, and area of concentration. This is no easy task given the potential for selection bias due to the academic and marketable characteristics of high-achieving PROMISE recipients. To my knowledge, this is the first research to use direct individual-level observations on the work experience of graduates receiving merit-aid.

After attempting to reduce the selection bias as much as possible and given students' decision to attend college in the state, I find that PROMISE graduates are between 1.9 and 5.2 percentage points less likely than graduates that did not receive the scholarship to work at establishments in West Virginia. These results suggest that states which are considering adopting merit-based scholarship programs should be wary of unqualified claims that keeping students in a state for college means that they will be more likely to work in the state after graduation.

This chapter is divided into 6 subsections. The following section provides a brief look on the previous literature on the effects of merit-based aid on college decisions and human capital retention. Section 3 discusses the PROMISE scholarship program in detail. Section 4 discusses the data and the empirical methodology used in the analysis. Section 5 provides the results of the analysis, and section 6 concludes the chapter.

2 Literature Review

Much of the research on the impact of merit-based aid has focused on its ability to influence the accessibility of college attainment and the possible distortionary incentives generated by such a scholarship. For instance, both Dynarski (2000) and Cornwell, Mustard and Sridhar (2006) found that Georgia's HOPE scholarship (a merit-based scholarship) increased enrollment at state higher-education institutions and Cornwell, Mustard and Sridhar (2006) found that four-year institutions accounted for most of the increase. They also found that only a small part of the increase is driven by an increase of recent-graduate freshmen entering college, which seems surprising since they make up the vast majority of merit-based aid recipients. Further, Cornwell, Lee and Mustard (2005) found that the HOPE scholarship, through its grade-based retention rules, decreased full-load enrollment of freshmen, affected course-taking choices, and increased summer school credits. Along the same lines, Scott-Clayton (2008) found that completion rates of 4-year degrees are positively affected by course load requirements mandated for the renewal of the West Virginia PROMISE scholarship. Similarly, Pallais (2009) found that even though the merit-aid scholarship in Tennessee did not induce students to stay in the state for college, it did create significant increases in academic achievement, measured by ACT scores.

A separate strand of the research on merit-based aid has focused on the influence it may have on local human capital accumulation. The role of human capital in local economic development has attracted a great deal of attention from researchers in recent years. In part, this attention is derived from a desire to understand the relative importance of basic growth determinants at the local level, including human capital, public infrastructure investment, and private capital investment. One result of this strand of research was evidence suggesting that human capital accumulation plays a large role in generating long-run local income growth (see for example Hammond and Thompson (2008), Higgins, Levy and Young (2006), Shapiro (2006), Moretti (2004), and Glaeser, Scheinkman and Shleifer (1995)).

The importance of human capital in long-run growth has stimulated the interest of pol-

icymakers looking to improve local and regional economic performance. One avenue that has been proposed to increase local human capital accumulation has been the provision of merit-based aid to residents wishing to pursue higher education. Indeed, the legislation authorizing the PROMISE scholarship in West Virginia specifically cites (along with other issues) the fact that West Virginia ranks low among states in the share of the population with a Bachelor's degree or better.

Implicit in the arguments for the use of merit-based aid to increase human capital accumulation is the idea that residents are more likely to remain in the state after graduation if they attend college in the state. However, there is evidence that this link is not especially strong. Groen (2004) uses individual-level data from two separate longitudinal samples of students that attended college in the 1970s, which also tracks the students' state of residence 10-15 years after college. He finds a modest link between college attendance in a state and remaining in that state to work after graduation. Indeed, the results suggest that the impact of attending college in-state raises the probability of remaining in state by about 9 or 10 percentage points. Groen (2004) argues that labor market impacts alone are unlikely to justify the adoption of merit-based scholarships.

Bound, Groen, Kezdi and Turner (2004) use state data on Bachelor's and Medical Doctor degree production and Census data on the stock of degree holders residing in each state to measure the relationship between state degree production and state human capital accumulation. They find that the supply of college graduates in a state is modestly positively correlated with the stock of college graduates, with a positive and significant elasticity of 0.3 in the long run for Bachelor's degree holders. They find a much smaller positive correlation for medical degree recipients. Bound, Groen, Kezdi and Turner (2004) suggest that states can only modestly influence local human capital accumulation through policies designed to affect higher-education financing.

In addition, Dynarski (2008) presents evidence that merit-based scholarships increase college completion rates, using Census 2000 data for Arkansas and Georgia. For these two

states, Dynarski (2008) finds evidence suggesting that the merit-aid scholarships in these two states increased the share of college graduates by 3 percentage points. Using cost-benefit analysis, Dynarski (2008) argues that the merit-aid scholarships in these states are socially efficient (at rates of return to higher education as low as 5%).

It is important to note that none of the research to date examines the individual work experience of merit-aid recipients. Groen (2004) examines individual-level data, but does not have information on merit-based scholarships. Bound et. al. (2004) use secondary data, which again provides no direct information on merit-based scholarship programs. Dynarski (2008) analyzes secondary data for two states which adopted merit-based scholarships, but even this study lacks direct information on the work experience of graduates receiving merit aid. This chapter examines a novel data set, which contains information on the work experience of recent graduates, including those receiving merit-based aid.

3 PROMISE Scholarship Program

In 1999, based on Georgia’s HOPE (Help Outstanding Students Educationally) scholarship, the West Virginia legislature authorized the PROMISE scholarship program. Funding, however, did not become available until 2001, when it was determined that revenues to fund the program would come from taxation and regulation of the West Virginia video lottery machines. West Virginia created the program with the objectives of improving the state’s workforce, promoting college access, keeping the “best and brightest” students in their home state for college, and rewarding students who work hard while encouraging younger students to achieve academic excellence during their high-school years (DeFrank-Cole, Noland and Green, 2007).

According to the legislation’s requirements, students must earn a minimum 3.0 GPA in the overall coursework, and a minimum score of 21 in the composite ACT in order to be eligible to receive the scholarship. However, more students than expected qualified for

the scholarship and initial cost estimates turned out to underestimate true program costs. Indeed, initial estimates suggested that funding for the first four classes of PROMISE scholars would be \$27 million; however, actual funding requirements turned out to be about \$40 million. In 2007 the state decided to raise the minimum ACT composite score to 22 with a minimum sub-score of 22 for each of the subject areas. Alternatively, students may obtain a combined SAT score of 1,020 with a minimum score of 420 in critical reading and 480 in mathematics.³

In contrast to most state merit-aid programs, PROMISE grantees are provided with a scholarship that covers full tuition in any of the state institutions, or an equivalent amount for in-state private institutions. In order to keep the scholarship, college students must earn a 2.75 grade point average on a 4.0 scale the first year and a 3.0 cumulative grade point average during all following years. Additionally, students must successfully complete 30 credit-hours per year (DeFrank-Cole, Noland and Green, 2007).

A common argument used to support merit-aid programs is the claim that keeping more students in the state for college will increase their likelihood of staying in the state for work. Part of the motivation of the PROMISE scholarship in West Virginia is thus founded on human capital theory, which states that investment in education and training enhances human capital, resulting in economic growth with greater returns within the labor market (Becker, 1964; Shultz, 1963). Legislators believed that West Virginia needed an educated workforce in order to attract and retain the high wage, high skill jobs (DeFrank-Cole, Noland and Green, 2007). In other words, legislators assumed that educating the West Virginia residents would increase the state's workforce competitiveness, raise wages in the state, and incentivize more new graduates to seek full-time employment in the state.

Moreover, as DeFrank-Cole, Noland and Green (2007) posit, West Virginia “was hypothesizing that an investment in college tuition for its young people would produce an economic return from its citizens who later worked and paid taxes in the state.” Thus, such investment

³For a detailed description of the eligibility requirements see www.wvhepcnew.wvnet.edu

would not only generate private returns, but also social returns where everyone in the state would benefit.⁴

As mentioned before, in this chapter I use a unique data set for graduates from West Virginia public higher education institutions in order to determine whether or not the PROMISE scholarship has had an impact on the decisions of recent public higher education graduates to work at establishments in West Virginia. This information is critical to policymakers (both in West Virginia and around the country) who are investing huge sums of money in merit-based aid programs, partly in the hope of increasing local human capital concentrations.

4 Data and Methodology

4.1 *Data Description*

The data used here were provided by the West Virginia Higher Education Policy Commission (HEPC). The WVHEPC compiled demographic information on graduates from West Virginia public higher education institutions, including graduates' PROMISE scholarship status, gender, race, residency for fee purposes, age, ACT score, graduation year, highest degree earned, current enrollment status, and area of concentration.⁵ Data on graduates during the 2003-2004 to 2006-2007 period is then matched with wage and salary employment records for 2008 maintained by Workforce West Virginia. All graduates reflect the highest degree earned at the time of measurement.

Employment is measured by place of work, and covers jobs and wages reported by firms

⁴See Bevia and Iturbe-Ormaetxe (2002) for details on how low-income families benefit from higher education subsidies to middle- and high-income families. According to their theory, low-income voters favor middle- and high-income education subsidies (such as merit-based aid) because they assume that those that are being subsidized will earn higher incomes and pay higher taxes, which will in turn convert into higher and more adequate redistribution in the future. This could be applied to the U.S. states under the assumption that graduates will stay working in the state.

⁵Area of concentration and degree are identified by Classification of Instructional Programs (CIP) codes. These are eight-digit codes that identify the degree (Associate's, Bachelor's, etc), area of concentration (Business, Education, Engineering, etc), and major (accounting, kindergarten teaching, chemical engineering, etc) of graduates. An area of concentration is an umbrella classification that includes one or more majors.

that participate in the West Virginia Unemployment Compensation system. Firms employing one or more workers for some part of a day in at least 20 different weeks of a calendar year are required to contribute to the state’s unemployment insurance system. However, there are certain exceptions such as railroad companies and the federal government, which contribute to different systems. Additionally, this data set does not cover the self-employed, student workers, most church workers, and unpaid family workers. A graduate is counted as employed in the state in 2008 if he/she is employed for at least one quarter during the year.

As Table 2.1 shows, I count with 22,101 observations in the data set. That is the total number of graduates from West Virginia public higher education institutions during the 2003-2004 to 2006-2007 period for which I have complete information. I initially focus on this period since it includes all PROMISE graduates to date. Of the 22,101 graduates during the period, 3,206 were PROMISE recipients for at least one semester, which translates into a share of 14.5%. Note that most graduates in the sample were female (59.7%), in-state for fee purposes (92.4%), white (94.8%), earned a Bachelor’s degree (67.4%), and majored in Business, Education, General Studies, or Health Professions (55.3%). This sample can be decomposed further by distinguishing between PROMISE and non-PROMISE scholarship recipients.

PROMISE graduates have similar general characteristics, with 64.0% female, all graduates in-state (as required), 96.2% white, 80.2% earned a Bachelor’s degree, and 47.9% majored in Business, Education, General Studies, or Health Professions. Of the non-PROMISE graduates 59.0% are female, 91.1% in-state residents, 94.5% white, and 65.2% Bachelor’s degree holders. Note as well that most PROMISE graduates (95.0%) graduated in the last two years. This reflects the relatively recent implementation of the PROMISE scholarship in the state. In addition, PROMISE graduates are on average a bit younger than the average graduate (23.7 years versus 27.0), have higher mean ACT scores (24.3 versus 21.2), and less experience since graduation (1.5 years versus 2.9 years).

Table 2.1 also presents West Virginia work participation rates for graduates, defined as

Table 2.1: W.Va. Public Higher Education Graduates And W.Va. Employment In 2007 and 2008

	Graduates During 2002-2003 To 2006-2007				Area of concentration	Graduates During 2002-2003 To 2006-2007			
	Percent All Graduates	Percent Working In West Virginia In 2008	Promise Recipients	Percent Working In West Virginia In 2008		Percent All Graduates	Percent Working In West Virginia In 2008	Promise Recipients	Percent Working In West Virginia In 2008
Total	22,101	62.77	3,206	62.94					
Gender									
Female	13,200	64.48	2,053	64.20	Agriculture	263	48.29	65	44.62
Male	8,901	60.23	1,153	60.71	Natural Resource	230	69.57	32	68.75
Residency for fee purposes					Architecture	38	26.32	n/d	n/d
In-state	20,418	66.14	3,206	62.94	Communication	941	52.71	175	56.57
Out-of-state and other	1,683	21.93			Comm. Technologies	76	68.42	8	62.50
Race, age, ACT score Enrollment					Computer & Info Sci.	299	59.87	46	67.39
White	20,944	63.16	3,083	63.38	Culinary	39	66.67	n/d	n/d
Non-white	1,157	55.66	123	52.03	Education	3,301	70.34	305	71.48
Mean Age	26.63		23.742		Engineer	786	49.11	160	46.25
Mean ACT Scores	21.25		24.289		Engineer Tech.	493	67.95	59	64.41
Enrolled	2,160	68.52	652	61.35	Foreign Languages	94	56.38	20	55.00
Mean Experience	2.35		1.450		Family Science	303	50.17	25	56.00
Graduation Year					Legal Professions	266	68.80	6	50.00
2003-2004	4,530	56.89	44	84.09	English & Literature	366	58.47	78	55.13
2004-2005	5,256	61.38	115	69.57	General Studies	1,594	64.37	133	70.68
2005-2006	5,929	63.60	1,081	60.31	Bio Sciences	832	44.71	260	41.54
2006-2007	6,386	67.32	1,966	63.53	Math and Stats	75	50.67	16	50.00
Degree and Institution					Multidisciplinary Studies	380	61.84	80	61.25
Undergraduate Cert.	290	80.34	47	89.36	Recreation	263	53.61	27	59.26
Associate	3,773	75.06	531	80.04	Philosophy	18	33.33	n/d	n/d
Bachelor	14,890	59.31	2,571	58.97	Physical Sciences	265	45.28	61	34.43
First Professional	653	60.64			Science Technology	116	82.76	11	81.82
Masters	2,455	63.75	57	61.40	Psychology	849	59.60	165	65.45
Mast Certificate	16	37.50			Security	866	65.24	71	63.38
Doctoral	24	37.50			Public Administration	337	67.66	25	60.00
Two Year Institution	2,712	75.15	385	78.96	Social Sciences	818	59.90	135	60.74
					Mechanic & Repair Tech	51	80.39	n/d	n/d
					Precision Design	55	85.45	n/d	n/d
					Visual & Perf. Arts	478	51.88	74	64.86
					Health Professions	3,367	71.01	514	78.60
					Business	3,956	62.11	585	64.44
					History	285	60.00	54	72.22

n/d: not disclosed due to confidentiality requirements

the number of graduates working at establishments in the state divided by the total number of graduates. Out of the total number of graduates during the past four years, 13,873 worked at establishments located in West Virginia for at least one quarter in 2008. This is the same percentage (62.8%) of non-PROMISE graduates in the sample working in West Virginia in 2008. Work participation rates tend to be higher for women, for in-state graduates, and for white graduates. Work participation rates also tend to be higher for those earning Undergraduate Certificates and Associate's degrees.

I also find that West Virginia work participation rates tend to be highest for the most recent graduates. Indeed, for graduates during the 2006-2007 academic year, the work participation rate in 2008 is 67.3%. In contrast, for graduates during the 2003-2004 academic year, 56.9% worked in the state in 2008. This pattern may be observed for a variety of reasons. For instance, graduates with more experience may be more likely to engage in self-employment (and those will not be covered by this data set). In addition, graduates with more experience may be more marketable, and thus leave the state to pursue opportunities elsewhere, or graduates may elect to leave the labor force altogether (and perhaps become a stay-at-home spouse).

For all PROMISE graduates to date, the work participation rate in 2008 is 62.9% (or 2,108 out of 3,206 graduates). Again, work participation rates are higher for PROMISE graduates that are female, white, and those that earned an Undergraduate Certificate or Associate's degree.

PROMISE graduates have a different pattern for work participation rates by experience. The rate drops from 63.5% to 60.3% then rises to 84.1% for graduates during the 2003-2004 academic year. However, this pattern is driven by the fact that PROMISE graduates during the first two years of our data set were heavily influenced by Associate's degree graduates. These graduates tend to have much higher work participation rates than Bachelor's degree graduates, who dominate the results for the last two years of the sample.

Note from Table 2.1 that the work participation rate in 2008 for PROMISE graduates is

just above the rate for all graduates during the same period (at 62.9%). However, the work participation rate for PROMISE graduates is well below the rate for all in-state graduates (66.1%). This is the crucial comparison, since all PROMISE recipients must be in-state residents for fee purposes. It suggests that the PROMISE scholarship may not help retain graduates to work in the state.

In order to more carefully disentangle the influences in work participation in West Virginia, I now turn to an econometric analysis. This will allow me to estimate the impact of the PROMISE scholarship on work participation, while controlling for other important characteristics of graduates.

4.2 *Methodology*

To estimate the impact of the PROMISE scholarship on work participation in West Virginia, I use a non-linear probabilistic model that estimates the likelihood of earning wages from establishments in West Virginia, holding constant the demographic and academic characteristics available in the data set.

Since I can only observe whether or not a graduate earned wages in the state in 2008, I create a dummy variable y_i , which is defined by $y_i = 1$ if the graduate worked in West Virginia at least one quarter during 2008, and $y_i = 0$ otherwise. Hence, our latent variable y_i^* is defined as the “propensity to work at an establishment located in West Virginia in 2008.”

Similarly, I create dummy variables for gender, race, residency status, PROMISE recipient, enrollment, degree, area of concentration, and type of institution that serve as explanatory variables. For gender, race, and residency status, the excluded categories are male, white, and out-of-state graduates. Thus, our dummy variables compare the difference in the propensity to participate in West Virginia’s workforce between female graduates and male graduates, non-white versus white, and in-state versus out-of-state graduates.

The enrollment variable indicates whether a recent graduate was enrolled in any other

higher education program in 2008. Degree, on the other hand, is divided into seven different categories. I create a dummy variable for each one of these categories (i.e. Undergraduate Certificate, Associate, Masters, etc.), and do the same for areas of concentration. I exclude Bachelor' degree graduates and the Liberal Arts/General Studies area of concentration from the regression in order to avoid issues of collinearity.

Assuming that the variance of the errors is equal to 1, and that the cumulative distribution function of the errors (F) is symmetric (e.g. standard normal and standard logistic) such that $1 - F(-Z) = F(Z)$, the scale of y_i^* can be fixed as follows

$$P_i = Prob(y_i = 1) = F[\beta_0 + \sum_{j=1}^k \beta_j x_{ij}] \quad (2.1)$$

where x_{ij} is a matrix of explanatory variables. From equation (2.1), I estimate the propensity of graduates to work in West Virginia by maximizing the likelihood function. Thus, the log-likelihood function is defined as

$$l_i(\beta) = \ln F(y_i|x_i, \beta) = y_i * \ln F(x_i'\beta) + (1 - y_i) * \ln [1 - F(x_i'\beta)], \quad y_i = 1, 0 \quad (2.2)$$

and that likelihood function, $L(\beta) = \sum_{i=1}^n l_i(\beta)$, is maximized by $\hat{\beta}_{mle}$ when $\frac{\partial L(\beta)}{\partial \beta} = 0$. The marginal effects for continuous explanatory variables are given by $\frac{\partial P(y=1|x)}{\partial x_h} = f(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k) * \beta_h$ where $f(z) \frac{dF}{dz}$ represents the probability density function. Similarly, $\frac{\partial P(y=1|x)}{\partial x_h} = F(X'\beta + \delta) - F(X'\beta)$ yields the computed marginal effects for dichotomous variables when δ is the coefficient in front of the dummy. These marginal effects can be calculated either at the mean or at specific values of x . Assuming that the errors are distributed standard normal, I estimate a *probit* model with the variables mentioned above.

The model is given by

$$\begin{aligned}
workparticipation = & F(\beta_0 + \beta_1 PROMISE + \beta_2 ACTscore + \beta_3 Female + \beta_4 InState \\
& + \beta_5 NonWhite + \beta_6 Age + \beta_7 Enrolled + \beta_8 Experience \\
& + \beta_9 TwoYrCol + \theta Degree + \gamma AreaStudy) + \varepsilon
\end{aligned}
\tag{2.3}$$

where *workparticipation* equals 1 if the graduate worked in West Virginia during any quarter of 2008 and 0 otherwise. *PROMISE* identifies graduates recipients of the PROMISE scholarship, while *ACTscore* proxies for the level of academic achievement. Through the inclusion of ACT scores I attempt to reduce the selection bias arising from the fact that the scholarship is awarded to high achieving students, which also tend to be more mobile, in terms of employment opportunities. Thus, I expect a negative correlation between ACT scores and the propensity to work in the state.

InState identifies graduates that were classified as in-state for fee purposes. In-state graduates may be more likely to remain in the state after graduation due to family ties. Hence, I expect a positive association between in-state residents and work participation. Following the variable description above, *Degree* and *AreaStudy* are vectors of dummy variables describing the academic characteristics of each graduate. This helps to control for the effect of employment opportunities in West Virginia, as graduates with higher degrees may be more limited to find suitable employment in the state, choosing to move to other states, or even other countries. Additionally, due to the industry composition of the state, I expect that graduates with majors that match with West Virginia's industry mix will be more likely to work in the state.

TwoYrCol is a dummy variable that takes the value of 1 if the individual graduated from a community college or other two-year institution and 0 otherwise. *NonWhite* identifies the race of the graduate (0 for white, 1 otherwise) and *Enrolled* tracks those graduates continuing their education. While there is no prior on the sign of the coefficient for *NonWhite*, I expect

that those that are currently enrolled in the state will be more likely to be employed in West Virginia. This, however, may not hold if the majority of these enrolled graduates attend schools in border counties, but are employed in the neighboring state. I do not expect this to be very likely. *Experience* controls for the number of years since graduation. Given that experience may reflect the acquisition of additional marketable skills, more experienced graduates may be more mobile, and thus less likely to work in West Virginia, compared to more recent graduates.

5 Empirical Results

Table 2.2 contains the marginal effects from the probit estimation. These effects are evaluated at values in which the representative graduate is a white male resident of West Virginia with an Bachelor’s degree in Business, and a non-PROMISE recipient. This assumption facilitates the interpretation of the results. Model 1 shows the results including the full set of control variables specified above. After controlling for ACT scores, gender, race, residency, age, current enrollment status, experience, degree, type of institution, and area of concentration, I find that PROMISE graduates to date are 3.2 percentage points less likely to work in West Virginia than graduates that did not receive the scholarship. This estimate is significant at the 1% level. Moreover, the results provide evidence that, all other things equal, graduates characterized by high levels of academic achievement are already inclined to work elsewhere. On average, a one point increase in the ACT score of graduates reduces the likelihood of earning wages in the state by 0.8 percentage points (also significant at the 1% level).

As noted before, PROMISE scholarship recipients score higher on the ACT. Hence, it is not surprising to observe a negative correlation between the PROMISE scholarship and the likelihood of working in the state upon graduation. Furthermore, it appears that the desire of some PROMISE scholarship recipients to stay in West Virginia after work may be driven by other personal factors (e.g. family ties). According to the rules, the scholarship

Table 2.2: Probit Estimation of the Impact of Graduate Characteristics on W.Va. Work Participation in 2008

Variable	All Graduates			
	During 2002-2003 to 2006-2007			
	Model 1		Model 2	
	Marginal Effects ^a	Standard Errors	Marginal Effects ^a	Standard Errors
Promise	-0.032*** ^b	0.010	-0.019*	0.011
ACT_Score	-0.008***	0.001		
Personal Characteristics				
Female	0.012*	0.007	0.045***	0.007
In-State Graduate	0.453***	0.012		
Non-white	-0.060***	0.015	-0.089***	0.015
Age	0.005***	0.001	0.012***	0.001
Enrolled	0.056***	0.010	0.064***	0.011
Experience	-0.042***	0.003	-0.046***	0.003
Degree and Institution				
Undergraduate Cert.	0.092***	0.027		
Associate	0.107***	0.015		
First Professional	-0.089***	0.025		
Masters	-0.024**	0.011		
Mast Certificate	-0.305**	0.127		
Doctoral	-0.214**	0.108		
Two Year Institution	-0.018	0.017		
Area of Concentration				
Agriculture	-0.089***	0.033		
Architecture	-0.300***	0.087		
Bio Sciences	-0.102***	0.022		
Business	0.030**	0.014		
Comm. Technologies	0.043	0.048		
Communication	-0.028	0.019		
Computer & Info Sci.	-0.007	0.028		
Culinary	0.022	0.070		
Education	0.109***	0.011		
Engineer	-0.055**	0.022		
Engineer Tech.	0.026	0.022		
English & Literature	0.031	0.024		
Family Science	-0.076**	0.031		
Foreign Languages	-0.028	0.049		
Health Professions	0.086***	0.013		
History	0.034	0.027		
Legal Professions	0.122***	0.026		
Math and Stats	0.001	0.051		
Mechanic & Repair Tech	0.098*	0.056		
Multidisciplinary Studies	0.022	0.025		
Natural Resource	0.073***	0.028		
Philosophy	-0.180	0.127		
Physical Sciences	-0.091***	0.033		
Precision Design	0.131**	0.051		
Psychology	0.021	0.019		
Public Administration	0.068***	0.024		
Recreation	-0.014	0.030		
Science Technology	0.127***	0.036		
Security	0.043**	0.018		
Social Sciences	0.035*	0.018		
Visual & Perf. Arts	-0.038	0.025		
No. of Observations	22,101		22,101	
Pseudo R^2	0.0831		0.0116	

^a Marginal effects calculated at values for which the representative agent/graduate is a white male resident of West Virginia with an Associate's degree in Business and PROMISE scholarship holder.

^b Note: ***Significant at the 1% level. **Significant at the 5% level, *Significant at the 10% level.

can only be awarded to those students who have resided in the state at least one year prior to college enrollment. In that context, I find that in-state graduates are approximately 45.3 percentage points more likely to work in the state than out-of-state graduates. This result suggests that many of those scholarship recipients that decide to stay in the state may do so because of their desire to remain close to their families or other attachments.

However, there are other factors that influence the likelihood of graduates to work in the state. For example, those who remain in the state to pursue another degree have a higher propensity to work in the state. This is accentuated for the case of PROMISE graduates as they are more likely to pursue higher levels of education. In general, about 20.2 percent of total PROMISE graduates in the sample appear to be enrolled at some point in 2008. This is twice as much as the total percentage of enrolled graduates when looking at the entire sample. Even after controlling for enrollment, PROMISE scholarship recipients are less likely to remain in the state for work. Racial minorities, on the other hand, are also less likely to work in West Virginia after they graduate from college. Similarly, the propensity of West Virginia graduates to work in the state decreases with years of experience.

Additionally, controlling for degree and area of concentration brings us back to the fact that graduates' location decisions are heavily influenced by the opportunity for work. I find that, on average, graduates with Associate's degrees are 10.7 percentage points more likely to work in West Virginia than a Bachelor's degree recipient. However, graduates with higher levels of attainment (Master's degrees and above) tend to be less likely to work in the state.

Graduates from certain areas of concentration seem to find better opportunities for work in West Virginia. Education graduates, for instance, are approximately 10.9 percentage points more likely to work in West Virginia. Engineers, on the other hand, are 5.5 percentage points less likely to remain in the state for work. Health professions, Security, Mechanic and Repair Technologies, and Legal professions all show positive and significant effects. On the other end, graduates with degrees in Biological Science, Physical Science, Architecture, and Agriculture show negative propensities to work in West Virginia.

This suggests that the industry mix in West Virginia is not well suited to retaining large numbers of highly educated residents. The state's employment mix reflects the importance of the mining and logging sector, which accounted for 4.0% of state employment in 2008, compared to just 0.6% for the nation. In contrast, West Virginia has a relatively small share of jobs in financial activities, information, and professional and business services. Thus, the state tends to have small shares in sectors that tend to require high levels of educational attainment.

These initial results suggest that PROMISE scholars are less likely to remain in the state to work. However, the results may continue to be subject to a selection bias problem. As stated before, the PROMISE scholarship is awarded to individuals with high abilities and therefore particularly mobile. This can be more problematic given that the indicator of academic achievement and individual ability (ACT score) is part of the evaluation criteria and may be influenced by the availability of the scholarship. In other words, after the adoption of the scholarship, high-school students had an incentive to work harder to obtain higher scores and be eligible to receive the award. In order to check the robustness of the initial results, I include four additional model specifications.

Model 2 in Table 2.2 includes only those demographic variables which are most likely to be unaffected by the availability of the scholarship. Controlling for age, sex, race, enrollment after graduation, and experience, I find that PROMISE graduates are 1.9 percentage points less likely than non-PROMISE graduates to work in the state in 2008. I exclude ACT score, degree, institution type, and area of concentration from this regression since these may be influenced by the PROMISE and therefore determined endogenously. The results are similar to that in Model 1 with the PROMISE coefficient being statistically significant at the 10% level.

The selection bias issue has not been solved, however. In an attempt to reduce the problem as much as possible, I include three additional model specifications. Table 2.3 contains results for these models. Model 3 includes all the control variables included in the full specification

Table 2.3: Probit Estimation of the Impact of Graduate Characteristics on W.Va. Work Participation in 2008: Alternative Models

Variable ^a	All In-State Graduates 2003-2004 to 2006-2007		All Graduates Eligible For for PROMISE 2003-2004 To 2006-2007		PROMISE: 2003-2004 To 2006-2007 All Eligible for PROMISE 1995-1996 To 2000-2001	
	Model 3		Model 4		Model 5	
	Marginal Effects ^b	Standard Errors	Marginal Effects ^b	Standard Errors	Marginal Effects ^b	Standard Errors
Promise	-0.037*** ^c	0.013	-0.034**	0.016	-0.052**	0.022
ACT_Score	-0.008***	0.001	-0.010***	0.002	-0.008***	0.001
College GPA	-0.026***	0.008	-0.037***	0.011	-0.048***	0.011
Personal Characteristics						
Female	0.022***	0.009	0.020*	0.012	0.003	0.010
Non-white	-0.073***	0.018	-0.083***	0.030	-0.147***	0.022
Age	0.007***	0.002	0.007**	0.003	0.002	0.002
Enrolled	0.064***	0.013	0.042**	0.017	0.129***	0.018
Experience	-0.049***	0.004	-0.045***	0.006	-0.037***	0.004
Degree and Institution						
Undergraduate Cert.	0.001	0.059	-0.008	0.137	0.146**	0.061
Associate	0.116***	0.020	0.172***	0.030	0.156***	0.016
First Professional	-0.119***	0.029	-0.133***	0.034	-0.013	0.045
Masters	-0.019	0.014	0.005	0.018	-0.004	0.020
Mast Certificate	-0.151	0.152	0.013	0.293		
Doctoral	-0.167	0.112	-0.170	0.120		
Two Year Institution	-0.014	0.025	-0.007	0.043	-0.049**	0.021
Area of Concentration						
Agriculture	-0.099***	0.037	-0.100*	0.052	0.062	0.041
Architecture	-0.325**	0.080	-0.381***	0.124	-0.174	0.116
Bio Sciences	-0.119***	0.027	-0.104***	0.038	-0.035	0.031
Business	0.048**	0.020	0.065*	0.034	0.105***	0.023
Comm. Technologies	0.048	0.069	0.049	0.127	-0.008	0.063
Communication	-0.015	0.025	0.025	0.038	0.027	0.031
Computer & Info Sci.	0.002	0.038	-0.023	0.055	0.097**	0.040
Culinary	-0.110	0.102	-0.232	0.233	0.003	0.113
Education	0.153***	0.017	0.161***	0.029	0.160***	0.024
Engineer	-0.042	0.027	-0.029	0.039	0.008	0.032
Engineer Tech.	0.035	0.032	0.029	0.054	0.148***	0.032
English & Literature	0.055*	0.033	0.088**	0.044	0.081**	0.040
Family Science	-0.082**	0.038	-0.096	0.065	-0.025	0.041
Foreign Languages	-0.065	0.068	-0.065	0.095	0.016	0.084
Health Professions	0.105***	0.019	0.113***	0.031	0.173***	0.023
History	0.055	0.036	0.110**	0.050	0.098**	0.046
Legal Professions	0.167***	0.035	0.210***	0.042	0.220***	0.050
Math and Stats	-0.030	0.073	0.013	0.085	-0.144*	0.083
Mechanic & Repair Tech	0.127	0.089	0.037	0.190	0.256***	0.092
Multidisciplinary Studies	0.002	0.036	0.081	0.053	0.029	0.050
Natural Resource	0.091**	0.036	0.094*	0.056	0.118**	0.044
Philosophy	-0.203	0.152	-0.301*	0.166	-0.057	0.220
Physical Sciences	-0.109***	0.039	-0.111**	0.050	-0.044	0.043
Precision Design	0.147*	0.082	-0.334	0.244	0.176**	0.071
Psychology	0.034	0.025	0.060	0.038	0.087***	0.030
Public Administration	0.084***	0.032	0.082	0.053	0.138***	0.039
Recreation	0.003	0.039	-0.006	0.062	0.023	0.045
Science Technology	0.142*	0.082	0.165	0.245	0.116	0.129
Security	0.060**	0.025	0.054	0.045	0.105***	0.029
Social Sciences	0.055**	0.025	0.078**	0.039	0.059**	0.030
Visual & Perf. Arts	-0.054*	0.032	-0.029	0.048	0.047	0.038
No. of Observations	17,710		9,141		14,399	
Pseudo R^2	0.0437		0.0423		0.0419	

^a Missing variables have been dropped due to perfect predictability and/or multicollinearity issues.

^b Marginal effects calculated at values for which the representative agent/graduate is a white male resident of West Virginia with an Associate's degree in Business and PROMISE scholarship holder.

^c Note: ***Significant at the 1% level. **Significant at the 5% level, *Significant at the 10% level.

(Model 1), including those that may be affected by the scholarship, but restricts the sample to in-state graduates only, and controls for college GPA. Since the scholarship is only available to in-state students, it is reasonable to restrict the sample to those directly affected. Also, as mentioned above, ACT attempts to control for individual ability. Yet it is not a perfect measure. A somewhat weaker measure is the high-school GPA. However, I use college GPA for two reasons. First, the high-school GPA may be influenced by the implementation of the scholarship. Second, employers are more likely to look at college GPAs when determining who to hire, making it more relevant when analyzing labor market outcomes. As the table shows, the results on PROMISE do not change significantly (-3.7 percentage points).

Model 4 restricts the sample even further. This model attempts to reduce the bias by comparing similar graduates. Thus, the model uses the highly mobile graduates only. In other words, only those who are eligible to receive the scholarship. That is, in-state graduates with minimum high-school GPAs of 3.0 and ACT scores of 21 or better. Again, the results suggest that PROMISE graduates are 3.4 percentage points less likely to work in the state, and the coefficient estimate is statistically significant at the 5% level.

Finally, in Model 5, I combine data on graduates that were not subject to the implementation of the PROMISE scholarship (i.e. graduates from 1995 to 2001) but would have been eligible under the program's requirements with that on graduates that received the PROMISE scholarship after it was implemented. This model excludes the non-PROMISE graduates that might have been influenced by the implementation of the scholarship. This is done in an attempt to improve the performance of the ACT score as an indicator of ability while attempting to compare groups that are qualitatively similar. Again, the results (shown in table 2.3) suggest that PROMISE graduates are less likely to work in the state. This result is also statistically significant at the 5% level.

6 Conclusions and Policy Implications

The results presented in this paper suggest that merit-based scholarship programs may not have the intended impact on local human capital retention at the margin. After controlling for academic achievement, age, race, type of institution, degree, enrollment, and area of concentration, the results suggest that PROMISE scholarship recipients that have graduated so far are approximately 1.9 to 5.2 percentage points less likely to work in West Virginia than graduates that did not receive the scholarship. These results suggest that states which are considering adopting merit-based scholarship programs should be wary of unqualified claims that keeping students in a state for college means that they will be more likely to work in the state after graduation.

It is important to keep in mind as well that the estimated impacts operate at the margin. I show that 62.8% of PROMISE graduates remain in the state to work after graduation. To the extent that the scholarship can increase enrollment in state, this likely results in more graduates remaining in the state to work. Our results point out that the impact is smaller than one would expect from an examination of the behavior of in-state graduates alone. Indeed, the scholarship may provide incentives on the first margin (remaining in state for college), but not on the last one when they face labor market decisions. This is illustrated in Table 2.4, in which I estimate the contribution of the first two classes to receive the PROMISE scholarship to human capital accumulation in the state. This simulation assumes that all PROMISE recipients during the 2002-2003 and 2003-2004 years were incoming freshmen that would have left the state for college if not for PROMISE.⁶

I use four-year and five-year graduation rates (and PROMISE impacts) reported in West Virginia Higher Education Policy Commission (2008) and Scott-Clayton (2008). These estimates suggest a positive marginal impact for the PROMISE scholarship on graduation rates, raising the five-year rate by 4.0 percentage points (from 51%) and the four-year rate by 6.7 percentage points (from 26%). I apply the five-year graduation rate to the class of 2002-2003

⁶I do not have formal estimates of the enrollment impact of the scholarship in West Virginia.

and the four-year rate to the class of 2003-2004.

Under the assumption that all PROMISE recipients would have left the state, if not for the scholarship, we have a total of 2,919 graduates by 2006-2007 (of which PROMISE adds 338). Next, I apply the work participation rate for all graduates in 2006-2007 (67.3%) and adjust for our (negative) estimate of the impact of the scholarship on work participation in 2008.⁷ These estimates suggest that the full impact of the scholarship on the first two classes results in 1,865 graduates working in the state in 2008 (with the PROMISE impact at -93 graduates, using the mid-range estimate of -3.2 percentage points). The marginal impact of the scholarship is large for enrollment (by assumption), positive on the graduation rate, and negative on the work participation rate. Note that I have assumed that all PROMISE recipients would have left the state for college if not for PROMISE. If, however, the data showed that some percent of these high-achieving students would have enrolled in higher education institutions in the state even in the absence of the scholarship, the overall impact of the program would decline. After all, it is important to remember that such programs may not affect enrollment in some states (See Pallais (2009)).

As a long-term investment, the cost of the program may not justify the small marginal benefits that it may provide. Even though a decent amount of PROMISE graduates remain in the state to work after graduation, it must be noted that 32.7% of those graduates in the sample does not appear to be working in the state in 2008. As I have mentioned before, this group of graduates tend to be more mobile, which may lead them to seek employment somewhere else regardless of the scholarship.

For instance, out of the 6,415 non-PROMISE in-state graduates with ACT scores of 22 or higher during the academic years 2003-2004 to 2006-2007, 60.9% worked at establishments located in West Virginia in 2008. This is just 1.9 percentage points below the in-state work participation rate of the PROMISE graduates. This suggests that this costly program may not have much of an overall effect in changing the work decisions of this group of highly

⁷For simplicity, I abstract from the fact that work participation rates decline with experience. This tends to increase the total impact slightly

Table 2.4: Illustration of PROMISE Impacts

	2002-2003	2003-2004	Total
(1) New Promise Recipients^a	3,555	2,920	6,475
Graduation Rates^{a,b}			
(2) Five-Year Graduation Rate	51.0%	—	—
(3) PROMISE Marginal Impact	4.0%	—	—
(4) Four-Year Graduation Rate	—	26.0%	—
(5) PROMISE Marginal Impact	—	6.7%	—
Graduates By 2006-2007			
(6) Graduates Class 2002-2003 (1) * (2)	1,813	—	1,813
(7) PROMISE Marginal Impact Class 2002-2003(1) * (3)	142	—	142
(8) Graduates Class 2003-2004 (1) * (4)	—	759	759
(9) PROMISE Marginal Impact Class 2003-2004 (1) * (5)	—	196	196
(10) Total Graduates	1,955	955	2,910
Work Participation Rate 2008			
(11) All Graduates Rate 2006-2007	67.3%	67.3%	—
(12) PROMISE Marginal Impact	-3.2%	-3.2%	—
Working In 2008			
(13) All Graduates (10) * (11)	1,316	643	1,958
(14) PROMISE Marginal Impact (10) * (12)	-63	-31	-93
(15) Total Working In 2008	1,253	612	1,865

^a West Virginia Higher Education Policy Commission (2008)^b Scott-Clayton (2008)

marketable graduates. Thus, the marginal overall impact seems not to be enough to justify the increasing costs of this program.

This analysis also highlights the importance of the demand for labor in the state as a determinant of the extent to which graduates remain in West Virginia to work. As shown, Engineers, Biology Scientists, and Physical Scientists are all less likely to work in West Virginia. These results suggest that policy makers need to account for employment opportunities in the state, when judging the likely impact of programs to attract and retain educated residents and workers. Hence, it is important that policy makers not only focus on policies that aim at educating the state's labor force, but also on policies that promote investment and the creation opportunities for higher-education graduates. Additionally, while this analysis may be criticized with allegations of selection bias problems, one must not forget that policy makers are the ones selecting these highly mobile individuals who even after staying in the state for college may be tempted to leave in search of better opportunities.

This study also posits additional questions. Assuming that the scholarship does have a great impact on in-state enrollment in West Virginia, policy makers must take into account what this means in terms of the quality of education obtained by the students that end up staying in the state for work. The scholarship may change the enrollment behavior of high achieving students such that the suboptimal outcome of students not attending more prestigious schools may result. If, due to strong family ties, some of these students decided to seek employment in the state after graduation regardless of school choice, the state would be forgoing the opportunity to have employees with perhaps better connections and higher quality training. One avenue for additional research would be to explore different classifications of employment. For instance, one important characteristic of the data used in this study is that it includes only graduates working at establishments in the state. Like most states in the northeastern U.S., some West Virginia residents commute to jobs outside of the state. Implementing matches of higher education data with information on employment by place of residence across all states would also provide useful information. In particular,

it would allow researchers to distinguish between policies that encourage work in the state versus residence in the state.

Chapter 3

The Work Disincentives Created by Government Safety Nets Continue: Analysis of TANF

1 Introduction

Government-provided aid to low-and-moderate income families constitutes a significant share of the national budget. In 2006, public welfare expenditures accounted for approximately 24% of the U.S. states' total budgets.¹ Programs available to eligible families include, but are not limited to, Temporary Aid to Needy Families (TANF), Supplemental Nutrition Assistance Program (SNAP), housing subsidies and the Earned Income Tax Credit (EITC). These programs provide financial assistance to households with incomes below certain income thresholds and have been constructed to phase-out benefits as household income increases.

Unintended employment disincentives are created by the combination of the programs' benefit reduction designs with the cumulative effect of tax schedules (Holt and Romich, 2007). Increasing working hours, and consequently earned income, results in the slow phasing out of

¹Source: State Government Finances U.S. Census Bureau.

benefits received, which in turn may translate into high ‘implicit’ marginal tax rates (IMTR). These depend, among other things, on the families’ choice of program participation. IMTR’s will also vary by family composition (i.e. married versus single, or number of children), the number of programs in which the family participates, the amount of earnings (or number of hours worked), the state of residence, and the cost of living associated with each geographic location. When the phase-out of the various programs are considered, the result may be an increase in disposable income significantly less than the marginal increase of earned income for eligible households, in many occasions off-setting the positive effects of the EITC documented by Meyer and Rosenbaum (2000). This may create the undesirable outcome of an individual being better off in terms of wealth by earning \$25,000 a year compared to earning \$35,000 year.²

Aligning the incentives of assisting households in need without discouraging work participation is an important policy debate. The literature to date has focused on the impact of the implicit marginal tax rates faced by representative eligible households on labor supply for different time periods, geographical areas, or benefit use packages. However, while variation among states already existed for some programs, the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) reformed the welfare system so that each state now had more freedom to modify cash benefit packages that were previously controlled by stricter federal rules, which would increase the level of state variation. As a result, the employment decision faced by eligible households is now subject to the welfare rules and program interaction in each state of residency.

Following previous literature, here I calculate the implicit marginal tax rate faced by a representative eligible household at various earning levels for all 50 states. I aggregate the benefits for which a representative low-income household is eligible under their respective state guidelines for different earning levels. Incorporating assumptions regarding cost of living and earning potential, I am able to construct IMTR tables for each state. I then

²http://content.ksg.harvard.edu/blog/jeff_frankels_weblog/2008/02/08/8/

consider the differences in states' labor supply rates of households receiving benefits and I use the variation in states' IMTRs to explain the states' difference in welfare recipients' workforce participation rates.

To my knowledge, this is the first attempt to calculate the potential IMTRs faced by the representative welfare recipient for all 50 states under rules adopted after the 1996 reform, and use them to explain inter-state variation in the overall labor supply rates of households receiving benefits. Using state aggregated data for labor supply of welfare recipients allows me to investigate the impact of the incentive structures- represented by these IMTRs- created by the difference in program rules on state efforts to decrease overall dependence on welfare and promote employment rates.

Garfinkel and Orr (1974) found a negative correlation between welfare tax rates and state employment rates for AFDC (Aid to Families with Dependent Children) recipients. However, they use tax rates derived from participating in the cash-benefit program only. On the other hand, Meyer and Rosenbaum (2000) provide results confirming the positive effects of the EITC rules on employment.³ However, instead of analyzing the effect of each program in isolation but all of them combined represented by one single implicit tax rate, I find that high IMTRs stemming from multiple program participation across U.S. states after the 1996 welfare reform do have negative effects on these families' workforce participation rates. The negative impact persists even under different model specifications, and control for potential labor market spillovers.

The statistical results are based on the definition of work participation provided by the Department of Health and Human Services (DHHS), and the simulated implicit tax rates described above. While not all welfare recipients may participate in all available programs (Holt and Romich, 2007), data from the DHHS shows that a vast majority of recipients participate in at least two (Food Stamps or SNAP and TANF) and claim the tax benefits given by the Earned Income Tax Credits. After only considering these widely used programs,

³See also Meyer and Rosenbaum (2001), Meyer (2009), and Eissa and Liebman (1996)

and controlling for state characteristics, the inverse relationship between these marginal tax rates and work participation of welfare recipients persists.

Coupled with the potential high “tax” rates that these low-income individuals can face in the event of participating in more assistance programs, this paper addresses an important policy issue as the structure of some welfare benefits may increase the disincentives to start working and abandon the welfare rolls. This will raise the overall costs of uncoordinated welfare programs to some states as a higher percent of recipients prefer to lower the work effort and depend instead on government assistance. Additionally, it sheds light on the importance of monitoring and enforcing work requirements as the disincentives are more severe when households are given exemptions, while slowly transitioning into full-time employment.

The remainder of the paper is organized as follows: Section 2 discusses the literature, Section 3 describes the methodology and data, Section 4 presents the results and Section 5 concludes.

2 Literature Review

Marginal tax rates have historically been, and continue to be, an important issue in the welfare literature. In economics, as much as in the public policy literature, researchers have been concerned with the effect of welfare programs on the effective tax rates faced by low-and-middle income families that participate in those programs. More importantly, economists have been particularly concerned with the impact of those tax rates on the labor-supply decisions of these individuals. Previous studies have already focused on the labor supply outcomes of welfare recipients that participate in one, two, or more programs at the same time. This, however, has become even more interesting as states started adopting the new rules and regulations implemented after the 1996 welfare reform and comparisons were made possible.

Most studies analyzing the pre-reform cash-assistance program (Aid to Families with

Dependent Children AFDC) found negative impacts on labor supply. Garfinkel and Orr (1974) and Williams (1975) find negative elasticities of employment rate of female heads of household with respect to the take-up (tax) rate imbedded in the phase-out mechanism of the program. Moffitt (1983) and Hausman (1981) use individual data to estimate the labor supply response of female heads of households to different welfare-program parameters given the kink in the budget constraints created by AFDC, when accounting for federal and state income taxes and participation in other programs. Their results with respect to the AFDC tax rate differ both economically and statistically. Keane and Moffitt (1998) use a structural model of labor supply and welfare stigma under multiple-program participation. They find that combined tax rates have modest impacts on labor supply given that reduced rates increase the probability of program entry.⁴

In 1996, however, the PRWORA provided that earnings from work should actually raise disposable income of welfare recipients. The reform aimed at reducing the work disincentives found in the AFDC system in previous research. It included a series of stipulations that supported mothers with children by promoting work through child-care subsidies (Haskins, 2002; Sawhill and Haskins, 2002). However, it has been found that a combination of benefit schedules may result in implicit taxation that may not remove those disincentives found under the previous system. Recent work has focused on specific states⁵ (e.g. Wolf (2002)).

Holt and Romich (2007) discuss some of the most recent studies regarding IMTRs faced by the representative family using post-reform rules. Using different points in time, as well as specific geographic areas, they highlight the IMTR calculations found by Wilson and Cline (1994); Shaviro (1999); Sammartino, Toder and Maag (2002); Wolf (2002). According to Holt and Romich (2007), these studies are informative but limited given the nature of the calculations. Not all individuals participate in the same programs, creating a wide variation

⁴See Levy (1979) for similar conclusions. Also, Danziger, Haveman and Plotnick (1981) provide a comprehensive review on income transfers prior to the reform.

⁵This has been defined as a single mother of two children. This has become the icon of much of the welfare analysis as it has been used by federal government publications such as the Green Book (U.S. House of Representatives). Data also show that a great percentage of TANF recipients are single mothers, and that the average family has 1.8 to 2 children.

of IMTRs among individuals/families even if they are subject to the same rules. They use individual data for the state of Wisconsin to look at the distribution of IMTRs across the state population. Additionally, Moffitt (2002) studies the rules under TANF and reviews the research on both TANF and AFDC. Blank (2002) evaluates the welfare reform and also provides a thorough review of much of the recent research on reform impacts.

More recently, Meyer and Sullivan (2004) analyze consumption patterns to evaluate the effect of the reform on the well-being of single and less educated mothers. While some advocate the use of individual level data, the literature also acknowledges the downfalls of the sources as much of it is drawn from surveys and are subject to decreased accuracy.⁶ Hence, I analyze state aggregated data which allows me to (1) focus on more accurate administrative data and (2) look at the overall effects on the states' efforts to increase employment rates of low-income individuals with the implementation of the reform rules.

3 Methodology and Data

3.1 Program Description

To calculate the IMTRs for all 50 states, I consider the following benefit programs: TANF, food stamps (currently known as SNAP), WIC (Women and Infant Care), child care subsidies, housing subsidies and Medicaid/SCHIP. Temporary Aid to Needy Families (TANF) is a cash transfer which was implemented in 1996, replacing the AFDC (Aid to Families with Dependent Children). Under the program, recipients must get a job as soon as possible with a maximum unemployment time of two years. Initially, only 25% of recipients had to participate in “work related activities” but by the fiscal year 2000, the requirement was a minimum of 30 hours per month in most states. However, these are general outlines and specific requirements vary by state. For example, some states define work activity as schooling,

⁶Meyer and Rosenbaum (2000) state additional difficulties with the use of structural models to analyze labor-supply decisions of each individuals.

training or skill development. Work hours required range from 20 in some states to 40 in others. Eligibility depends on income, assets, and the presence of dependent children under the age of 18 (Lugaila, 2005).

Food stamps (now SNAP) are provided by the U.S. Department of Agriculture and eligibility guidelines are such that individuals eligible for TANF are generally eligible for food stamps. While some argue that this is an in-kind benefit rather than a cash transfer, others argue that it frees up money that households would otherwise allocate for food to be used elsewhere (Lugaila, 2005). As such, it may be treated as a cash transfer. Women and Infant Care is a supplemental nutrition program for women, infants and children under the age of 5 with income less than 185% of the poverty line, according to the U.S. Poverty Income Guidelines, and be nutritionally at risk. Benefits are paid in the form of vouchers or checks to buy groceries specified by a professional doctor or clinic associated with the program. The program includes non-tangible benefits such as education and counseling for participating mothers.

Medicaid is a form of health care designed to service those whose income falls below 133% of the poverty line, although some states opt to cover individuals up to 185% of the poverty line. Since this benefit cannot be captured quantitatively (except for a case-by-case basis), its eligibility is reported but not counted when calculating the IMTRs. Housing subsidies may take the form of availability of public housing or a supplement to cover rent in low-income areas. Guidelines are set at the federal level and are dependent on income and location. However, public housing is subject to supply constraints and many eligible individuals do not have access to the benefit. Child care subsidies are closely tied to TANF and as such, vary across states. Typically there is a subsidy provided which is dependent on the number of children, type of child care, and income. This program is often considered part of TANF because the goal is to provide resources to parents as they gain work skills and/or experience.

3.2 Calculating Implicit Marginal Tax Rates

The implicit marginal tax faced by welfare eligible individuals is given by the marginal loss in disposable income resulting from an increase in earned income when all tax implications and benefit reductions are taken into consideration. In order to calculate the IMTRs, I use a hypothetical representative welfare recipient participating in all programs for which she is eligible. In accordance with previous examinations, this study uses a single parent with two children who is within the 60 month limit to receive TANF. Holt and Romich (2007) argue that the examination of this representative household is useful given its frequent reference in anti-poverty policy debates. Indeed, TANF reports cite that the average family recipient has 1.8 children, providing great support for the single parent, two children assumption.⁷

The tax implication calculation is comprised of the state and federal tax liability caused by additional earned income as well as the Earned Income Tax Credit (EITC). I use the tax and transfer rules in place for the year 2005. Federal tax liability follows guidelines established on the Federal 1040 form and state tax liability is computed using TurboTax 2005 software. Families are assumed to take all tax credits and deductions for which they are entitled, including the assumption that all children are claimed as dependents. Furthermore, it is assumed that adults do not make contributions to tax-exempt vehicles such as a 401-K or Individual Retirement Accounts. No local taxes are included in the calculation. In some cases tax liabilities prior to EITC benefits may be negative, in which case income would increase due to the entitlement of a refundable credit that exceeds the tax liability. This illustrates the nature of the EITC implicit tax rates as it is positive at low levels of income (the group described here) and negative at higher earning levels. The EITC is calculated according to federal guidelines for 2005. This positive effect can be magnified by the state's EITC.

The benefit reduction calculation incorporates TANF, Medicaid eligibility, food stamps,

⁷ U.S. Department of Health and Human Services: Administration for Children and Families <http://www.acf.hhs.gov/programs/ofa/data-reports/annualreport8/chapter10/chap10.htm>

WIC, subsidized housing and child care subsidies. Information on TANF recipient guidelines follow the rules obtained from the Welfare Rules Database (WRD) for 2005.⁸ Medicaid benefits are difficult to quantify and are thus relegated to noting if the family is eligible to receive benefits. Federally established rules regarding food stamps refer to the rules outlined on the Food and Nutritious Service (FNS) website and are used to account for food stamp benefit levels. Women and Infant Care (WIC) benefits are taken to be the average value per person per month by type of recipient and are the same for all states. Subsidized housing benefits are calculated using the average rent payments by food stamps recipients in 2006 obtained from the American Community Survey (ACS), information on fair market rents (FMR) for the lowest quintiles of the largest county in each state obtained from the Housing and Urban Development website, and the federal guidelines and co-payment rules. Child care subsidy eligibility and benefit amount are taken from the Child Care and Development Fund (CCDF) State Plans, while the child care costs for 2006 are obtained from the National Association of Child Care Resource & Referral Agencies (NACCRRA). If a plan differs within the state, the guidelines in the most populous region are used.

It is important to note that the phase-outs of benefits with respect to each program are interdependent. As such, the analysis is not one of simply calculating the benefits of all programs independently and aggregating them, but rather requires simultaneous consideration of all benefits. For example, Table 3.1 shows computation results of monthly food stamp benefits (SNAP) and house subsidies for the case of Colorado at different levels of earnings. Panel A illustrates the typical monthly amounts for which a single mother with two children under the age of five is eligible. At an hourly wage rate of \$7.28, a mother with two kids would have to work an average of 45.6 hours per week in order to reach the federal poverty threshold for the year 2006 (\$16,600 for a family of three). Given this wage rate, available tax credits and other benefit programs, it is easy to observe how the net income of this

⁸Developed by the Urban Institute and funded by the Department of Health and Human Services and the Administration for Children and Families (<http://anfidata.urban.org/wrd>).

mother may be affected as she works longer shifts.⁹

However, contrary to what one may believe, some benefits do not phase-out steadily. TANF benefits, for instance, decrease as the individual goes from unremunerated employment to working for pay to increasing the number of hours worked per week at the same wage rate. Yet, before reaching 20-hour work weeks, her monthly benefits increase rather than decrease. Although this may seem counterintuitive not all states follow strict benefit reduction rules. In West Virginia, for instance, benefits are usually reduced at a rate of 40%, after accounting for program interactions. However, as the interaction of several programs in Colorado causes this reduction rate to vary. As the table shows, TANF benefits are reduced initially by 3.1%, then by 13.1%, and then by 15.0% before they climb back up.

Food Stamps (SNAP) and housing subsidies exhibit similar patterns. This results from the fact that benefits are often determined by the availability of other benefits. Panel B illustrates how these housing subsidies are calculated for the case specified above. Note that personal income is composed of both earnings and TANF benefits. After independently calculating the child care subsidies, the program takes the amount of final child care expenses as given and subtracts it from the personal income. Additionally, a standard deduction (\$40 per dependent) is subtracted from it, arriving to the net income calculation shown in the second row of Panel B.

The program then calculates an income-based rent that selects the maximum amount between 10% of the gross personal income or 30% of the net income. Finally it subtracts this amount from the assumed rent (\$742 in this case) to calculate the final house subsidy. However, as child care subsidies phase-out and the mother has to front a larger percent of the bill, it affects the amount of deductions allowed to calculate the income-based rent, impacting the amount of housing subsidies allowed. Thus when child care expenses go from \$96 to \$170

⁹My calculations mimic those of the Net Income Calculator (NIC) following the rules and assumptions put forth by the Urban Institute through its Low Income Working Families Project. My calculations are compared to simulations conducted using the beta version of the NIC. While my results are similar to those found for the simulations, all errors are mine. The comparison of the results for the two methods act as a robustness check of the consistency of the two methods.

per month, for example, income net of deductions decreases, driving the income-based rent down and rising the subsidy.

Food Stamps (SNAP) benefits for the same case are calculated on Panel C. Like house subsidies, some deductions are taken when calculating the benefit amount. First, 20% of the earned income is deducted from the personal income, as defined above. Second, child care expenses are also deducted up to a maximum of \$175 per child, where families with younger kids enjoy higher deductions. Third, a standard deduction is taken into consideration (\$134 in this case), yielding what is referred on the table as ‘Remaining Income.’ The shelter expense is given by the income-based rent and is added to a telephone allowance of \$26 a month. Additionally, the calculation allows for a deduction of excess shelter expense and covers up to \$391 a month for this specific case. According to the rules there is an excess shelter expense if the difference between the shelter expense plus the telephone allowance and half of the ‘Remaining Income’ is greater than zero.

The final net income is then calculated by subtracting the excess shelter deduction from the calculated remaining income. Given the maximum allowance of \$395 per month for a family of three in Colorado, the benefit is calculated by subtracting 30% of the calculated net income from the maximum allowance. Note that it uses the part of the rent that is not covered by the housing subsidy to calculate the shelter and telephone allowance used in the final benefit calculation. This has a significant influence in explaining the variation of IMTR among states.

The remainder of the implicit marginal tax rate calculation relies on incorporating the changes in cost of living associated with changes in work hours and geographic location. Naturally, the calculation is sensitive to assumptions regarding the representative recipient with respect to child care costs, wages and rent. For my analysis I assume that the single parent with two children pays child care at an hourly rate using an average rate for the state. For simplicity, I assume that child care is not needed until the mother works part-time (20 hours per week). Before that she uses other resources such as friends and relatives. This

Table 3.1: Calculation of Housing Subsidies and Food Stamps (SNAP) for COLORADO

Welfare Monthly Benefits									
Panel A: Monthly Benefits in Colorado									
Hours Worked (Week)	0	5	10	15	20	25	30	35	40
Monthly Earnings (\$7.28 /Hr)	0	157	315	473	630	788	946	1,104	1,261
Total Tax Credits ^a	0	51	102	153	204	255	298	310	308
TANF	357	346	301	256	290	0	0	0	0
SNAP	328	293	268	244	225	304	284	269	237
Housing Subsidy	659	615	581	547	519	581	553	528	548
Child Care Expenses	0	0	0	0	96	170	235	310	533
Panel B: Housing Subsidies									
Cash (Earnings + TANF)	357	503	616	729	920	788	944	1,104	1,261
Income Net of Deductions ^b	277	423	536	649	744	538	631	714	648
Income-based Rent (IBR) ^c	83	127	161	195	223	161	214	194	205
Subsidy ^d	659	615	581	547	519	581	553	528	548
Panel C: SNAP Benefits									
Earnings Deduction (20%)	0	31.4	63	94.6	126	158	189	221	252
Child Care Deduction ^e	0	0	0	0	96	170	235	310	350
Remaining Income ^f	223	338	419	500	564	326	388	439	525
IBR + Phone Allowance	109	153	187	221	249	187	215	240	220
Excess Shelter Deduction ^g	0	0	0	0	0	24.2	21.4	20.6	0
Final Net Income ^h	223	338	419	500	564	302	366	419	419
Maximum Allowance (3 Persons)	395	395	395	395	395	395	395	395	395
SNAP Benefit ⁱ	328	294	269	245	226	304	285	269	238

^a Includes Federal and state taxes and all other credits from the EITC (Earned Income Tax Credit).

^b Net income after taking the child care expenses and dependent deduction (\$40 per dependent) into account.

^c Rent/Shelter Expense calculated as the maximum of 10% of the gross and 30% of the net income.

^d Based on average rent (\$742) minus the rent/shelter expense.

^e Deduction of child care expenses up to \$175 per kid.

^f Total cash income minus earned income deduction, child care deduction, and standard deduction (\$134)

^g Takes the maximum value between 0 and the difference between IBR plus phone allowance and half of the remaining income without exceeding \$391.

^h Remaining income minus the excess shelter deduction.

ⁱ Maximum allowance minus 30% of the final net income.

potentially affects the calculated implicit tax rate as it could change if the mother used child care the minute she starts working.¹⁰

For scenarios where employment is undertaken, she is eligible for work which commands the levels equivalent to the current minimum wage for the respective state. Although benefits are determined by the total earnings, I assume that low skilled individuals do not start working at higher wages until they reach full-employment. In any case, keeping the minimum wage constant raises total earnings when hours worked increase. I assume that housing costs represent the average monthly rent paid by low-income individuals in 2006, found in the American Community Survey (ACS). These rent averages vary by geographic location and not by earning levels. For all scenarios, the adult is assumed to own one car valued no more than \$2,000 and the sum of all other assets do not exceed \$1,000. Additionally, I assume that the family does not receive child care support from the absent parent.

Taking the tax liability, benefit reduction and lifestyle considerations into account, the implicit marginal tax rate schedule can be calculated for any change in hours worked ranging from zero hours to forty hours (and any range in between) for all states. For any case, the IMTR is calculated by subtracting the ratio of the change in disposable income resulting from a change in hours worked from 1. In other words, the formula is given by $IMTR = 1 - \frac{\Delta DisposableIncome}{\Delta EarnedIncome}$. Table 3.2 shows the different implicit marginal tax rates for all states for three different scenarios.

The first scenario calculates the IMTR when working hours for the representative mother of two increases by ten hours from zero, ten, twenty and thirty hours per week. The second scenario considers increments of twenty hours from zero hours and twenty hours. This represents going from not working to part-time status and from part-time to full-time status with respect to hours worked. The third scenario calculates the IMTR for the case of going from not working (zero hours) to full-time work (forty hours). All scenarios are calculated for each state assuming the state's minimum wage for 2006. The only benefit program which

¹⁰Previous literature such as Meyer and Rosenbaum (2000) asserts that the use of informal child care is very realistic for this group of individuals.

does not influence the implicit marginal tax rate is WIC since it is an in-kind benefit and the value is reported as a constant average. A discussion of the variation in IMTR of the states can be found in Section 4.

3.3 Additional Data

In addition to the marginal change in disposable income, workforce participation rates are assumed to be dependent on gender, race, location (rural or urban), age and the unemployment rate. All variables are measured at the state level. Gender is the percent of the population that is female. The racial component is captured by including percent of the population that is black, while age is controlled for using the percent of the population that is over 65. Location is the percent of the population that live in rural conditions. Information for all control variables except the unemployment rate is from the Census for the year 2006 and the unemployment rate is obtained from the Bureau of Labor Statistics.

The choice of control variables follows analyses of the welfare participation and poverty. Since I am considering the labor participation of welfare recipients, I follow Kasper (1968) with respect to the choice of control variables. He analyzed the influence of state characteristics on poverty and welfare participation for urban and rural areas. Presumably, the determinants of welfare participation will also be determinants of labor force participation of welfare recipients with the opposite influence (since one is closely analogous to the opposite of the other). Additionally, the analysis includes the simulated implicit marginal tax rates found for the various scenarios described above. The dependent variable, work participation of TANF recipients, is obtained from the U.S. Department of Health and Human Services in their Eighth Annual Report to Congress.

Following Garfinkel and Orr (1974), I check the robustness of the results by including some of the control variables they used when determining AFDC employment rates. These include the percent of TANF recipients with levels of education no higher than the 9th grade, the maximum amount of TANF guarantee for each state, the percent of families with children

under 6 years of age, and the population density. The last one is obtained from the Census Bureau, while the former ones are obtained from the appendix of the Eighth Annual Report to Congress.

4 Results

4.1 Implicit Marginal Tax Rates

Table 3.2 summarizes the calculation of implicit marginal tax rates (IMTR) for all 50 states under three different scenarios. For all cases, the simulations assume a single mother of two children under 5 that participates in the most widely known available programs. Table 3.2 displays the IMTRs to which these families are subject when the mother increases the working hours. In the first case, it calculates the IMTRs by increasing working time by 10 hours per week. The second column group displays the IMTRs under the assumption that the mother goes from not working to working 20 hours a week (part-time) and from 20 hours to 40 hours a week (full-time). Finally, the last column shows the IMTRs that stem from being fully dependent on welfare programs to working full time at the state's minimum wage.

For simplicity and ease of reference, table 3.2 is then summarized by the table 3.3 below.

The table shows that in many cases these implicit marginal tax rates do not follow any specific pattern. For instance, South Carolina is among the top 5 states with highest IMTRs created when going from working 0 hours a week to working full time (63.00%). Yet they are amongst the states with the lowest IMTRs corresponding to a switch from full-welfare dependency to part-time employment (23.54%). Arkansas, on the other hand, experiences a complete different result. The simulated marginal tax rate for Arkansas for the 0 to 40-hour scenario is among the lowest (31.61%), while the one for the 0 to 20-hour scenario ranks third at 95.51%.

The distributions of the implicit marginal tax rates described in these two scenarios also differ substantially. While the difference between the average IMTRs for both cases is within

Table 3.2: Implicit Marginal Tax Rates (IMTR) Under Multiple Welfare Program Participation

Weekly Hours	Monthly Earnings	Taxes		Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Enrl.)	Disposable Income Per Mth	IMTR		
		Federal Income	Payroll		State Income	Federal EITC	TANF	Food Stamps					WIC	House Subsidy	IMTR1 [§]
At Minimum Wage															
ALABAMA															
0 Hours	0	0	0	0	0	215	382	39	388	0	3	1024			
10 Hours	283	0	17	0	89	0	386	39	375	0	3	925	52.01%		
20 Hours	446	0	34	1	178	0	355	39	332	43	2	1273	37.21%	44.61%	
30 Hours	669	0	51	8	267	0	294	39	265	43	2	1434	27.08%		
40 Hours	892	0	68	17	357	0	273	39	230	152	2	1556	45.29%	36.54%	40.58%
ALASKA															
0 Hours	0	0	0	0	0	923	259	39	200	0	3	1421			
10 Hours	309	0	23	0	123	847	208	39	129	0	3	1346	31.72%		
20 Hours	619	0	47	0	247	694	179	39	82	0	3	1241	41.61%	36.67%	
30 Hours	929	-1	71	0	366	542	150	39	35	0	3	1132	42.58%		
40 Hours	1239	-48	94	0	357	449	128	39	0	82	3	973	70.00%	46.49%	56.29%
ARIZONA															
0 Hours	0	0	0	0	0	347	333	39	526	0	3	1245			
10 Hours	223	0	17	0	89	253	306	39	487	0	3	1383	39.01%		
20 Hours	446	0	34	0	178	97	302	39	467	0	3	1083	48.43%	43.72%	
30 Hours	669	0	51	0	267	0	289	39	439	32	2	1034	44.39%		
40 Hours	892	0	68	0	357	0	250	39	390	92	2	1036	33.63%	39.01%	41.36%
ARKANSAS															
0 Hours	0	0	0	0	0	204	382	39	434	0	3	1059			
10 Hours	223	0	17	0	89	0	395	39	429	0	3	952	55.60%		
20 Hours	446	0	34	0	178	0	395	39	427	373	3	1039	135.42%	95.51%	
30 Hours	669	0	51	0	267	0	395	39	402	559	2	1106	61.43%		
40 Hours	892	0	68	0	892	0	220	39	228	0	2	844	-126.00%	-32.28%	31.61%
CALIFORNIA															
0 Hours	0	0	0	0	0	704	224	39	705	0	3	1672			
10 Hours	292	0	22	0	117	670	163	39	628	0	3	1617	26.02%		
20 Hours	584	0	44	0	234	524	137	39	584	0	3	1518	41.14%	33.73%	
30 Hours	877	0	67	0	351	377	111	39	540	0	3	1418	41.97%		
40 Hours	1169	-38	89	0	366	231	84	39	496	0	3	1216	63.01%	52.47%	43.11%

[§] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

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Table 3.2 – Continued

Weekly Hours	Monthly Earnings	Taxes		Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Enrl.)	Disposable Income Per Mth	IMTR		
		Federal Income	Payroll		State Income	Federal EITC	TANF	Food Stamps					WIC	House Subsidy	IMTR1 [§]
At Minimum Wage															
COLORADO															
0 Hours	0	0	0	0	0	357	328	39	658	1382	0	3	1382		
10 Hours	223	0	17	0	17	89	327	283	39	600	0	3	1547	26.45%	
20 Hours	446	0	34	0	34	178	338	253	39	557	90	3	1690	35.87%	31.16%
30 Hours	669	0	51	0	51	267	357	239	39	530	241	3	1811	45.73%	
40 Hours	892	0	68	0	68	357	0	328	39	644	486	2	1707	146.63%	63.67%
CONNECTICUT															
0 Hours	0	0	0	0	0	543	272	39	690	1544	0	3	1544		
10 Hours	320	0	24	0	24	128	543	195	39	593	0	3	1796	21.56%	
20 Hours	641	0	49	0	49	256	543	118	39	497	0	3	2047	21.80%	21.68%
30 Hours	961	-6	73	0	67	366	543	41	39	401	0	3	2287	25.00%	
40 Hours	1282	-54	98	0	54	348	543	0	39	305	0	3	2476	41.11%	27.37%
DELAWARE															
0 Hours	0	0	0	0	0	338	333	39	526	1236	0	3	1236		
10 Hours	266	0	20	0	20	106	338	259	39	446	0	3	1447	21.42%	
20 Hours	532	0	40	0	40	213	326	227	39	396	87	3	1616	36.46%	28.94%
30 Hours	799	0	61	0	61	319	238	213	39	369	177	3	1753	48.68%	
40 Hours	1065	-22	81	0	59	366	133	228	39	376	361	3	1806	80.07%	46.67%
D. OF COLUMBIA															
0 Hours	0	0	0	0	0	379	321	39	458	1197	0	3	1197		
10 Hours	303	0	23	-42	-19	121	330	263	39	381	0	3	1459	13.86%	
20 Hours	606	0	46	-84	-38	242	244	221	39	321	17	3	1698	21.12%	17.49%
30 Hours	909	0	69	-113	-44	364	172	179	39	261	48	3	1922	26.07%	
40 Hours	1213	-44	92	-97	-49	363	153	137	39	201	132	3	2026	65.78%	31.73%
FLORIDA															
0 Hours	0	0	0	0	0	303	344	39	642	1328	0	3	1328		
10 Hours	277	0	21	0	21	110	264	289	39	570	0	3	1531	27.07%	
20 Hours	554	0	42	0	42	221	205	264	39	528	80	3	1693	41.51%	34.29%
30 Hours	831	0	63	0	63	332	122	239	39	487	135	3	1854	41.87%	
40 Hours	1109	-28	84	0	56	366	81	230	39	461	286	3	1947	66.54%	44.27%

[§] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

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Table 3.2 – Continued

Weekly Hours At Minimum Wage	Monthly Earnings	Taxes		Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Enrl.)	Disposable Income Per Mth	IMTR		
		Federal Income	Payroll		State Income	Federal EITC	TANF	Food Stamps					WIC	House Subsidy	IMTR [§]
GEORGIA															
0 Hours	0	0	0	-6	0	280	355	39	516	0	3	1196			
10 Hours	223	0	17	-6	11	89	280	297	39	449	0	3	1368	23.31%	
20 Hours	446	0	34	-5	29	178	280	355	39	503	473	3	1303	129.14%	76.23%
30 Hours	669	0	51	-3	48	267	20	304	39	423	102	3	1575	-21.97%	
40 Hours	892	0	68	-2	66	357	0	329	39	427	317	2	1662	60.98%	19.50%
HAWAII															
0 Hours	0	0	0	-8	0	570	474	39	643	0	0	1734			
10 Hours	314	0	24	-8	16	125	570	399	39	548	0	0	1979	21.97%	
20 Hours	628	0	48	-5	43	251	527	339	39	469	8	0	1625	28.98%	25.48%
30 Hours	942	-3	72	7	76	366	424	312	39	423	66	0	2364	48.41%	
40 Hours	1256	-51	96	28	73	354	427	284	39	377	230	0	2434	77.71%	44.27%
IDAHO															
0 Hours	0	0	0	0	0	309	351	39	510	0	3	1209			
10 Hours	223	0	17	0	17	89	255	310	39	459	0	3	1360	33.18%	
20 Hours	446	0	34	0	34	178	121	309	39	441	29	3	1473	49.32%	41.25%
30 Hours	669	0	51	0	51	267	0	306	39	423	68	2	1587	48.87%	
40 Hours	892	0	68	-5	63	357	0	254	39	362	91	2	1752	26.09%	37.44%
ILLINOIS															
0 Hours	0	0	0	0	0	396	316	39	593	0	3	1344			
10 Hours	281	0	21	-5	16	112	302	276	39	536	0	3	1534	32.74%	
20 Hours	563	0	43	-9	36	225	208	247	39	490	32	3	1708	38.29%	35.52%
30 Hours	844	0	64	-6	58	338	114	229	39	455	104	3	1859	46.26%	
40 Hours	1126	-31	86	0	55	366	20	258	39	462	316	3	1903	84.39%	65.36%
INDIANA															
0 Hours	0	0	0	0	0	288	352	39	494	0	3	1173			
10 Hours	223	0	17	-5	12	89	232	312	39	444	0	3	1329	30.94%	
20 Hours	446	0	34	-4	30	178	176	275	39	394	0	3	1480	32.28%	31.61%
30 Hours	669	0	51	-1	50	267	120	238	39	343	0	3	1630	32.73%	
40 Hours	892	0	68	0	68	357	64	201	39	293	0	3	1781	32.28%	32.51%

[§] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

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Table 3.2 – Continued

Weekly Hours	Monthly Earnings	Taxes		Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Enrl.)	Disposable Income Per Mth	IMTR		
		Federal Income	Payroll		State Income	Federal EITC	TANF	Food Stamps					WIC	House Subsidy	IMTR1 [§]
At Minimum Wage															
IOWA															
0 Hours	0	0	0	0	0	426	307	39	416	0	3	1188	37.66%	1188	
10 Hours	223	0	17	0	17	89	336	280	39	376	0	3	1328	154.70%	1328
20 Hours	446	0	34	0	34	178	247	372	39	450	495	3	1206	-79.82%	1206
30 Hours	669	0	51	0	51	267	158	227	39	295	0	3	1607	52.01%	1607
40 Hours	892	0	68	0	68	357	68	224	39	279	80	3	1714	-13.90%	1714
KANSAS															
0 Hours	0	0	0	-24	-24	0	429	306	39	430	0	3	1228	29.59%	1228
10 Hours	223	0	17	-37	-20	89	349	276	39	387	0	3	1386	39.91%	1386
20 Hours	446	0	34	-50	-16	178	262	263	39	360	47	3	1520	39.46%	1520
30 Hours	669	0	51	-64	-13	267	200	250	39	333	119	3	1655	39.46%	1655
40 Hours	892	0	68	-77	-9	357	138	236	39	306	191	3	1790	39.46%	1790
KENTUCKY															
0 Hours	0	0	0	0	0	262	363	39	315	0	3	979	29.14%	979	
10 Hours	223	0	17	0	17	89	232	313	39	257	0	3	1138	47.98%	1138
20 Hours	446	0	34	0	34	178	148	308	39	236	70	3	1254	49.75%	1254
30 Hours	669	0	51	2	53	267	67	304	39	216	146	3	1366	64.57%	1366
40 Hours	892	0	68	15	83	357	0	325	39	217	303	3	1445	57.17%	1445
LOUISIANA															
0 Hours	0	0	0	0	0	240	368	39	393	0	3	1040	23.76%	1040	
10 Hours	223	0	17	0	17	89	240	309	39	326	0	3	1211	92.82%	1211
20 Hours	446	0	34	3	37	178	240	371	39	372	384	3	1227	-18.38%	1227
30 Hours	669	0	51	8	59	267	240	247	39	237	151	3	1491	52.01%	1491
40 Hours	892	0	68	12	80	357	240	241	39	218	310	3	1598	16.81%	1598
MAINE															
0 Hours	0	0	0	0	0	485	289	39	342	0	3	1155	21.52%	1155	
10 Hours	223	0	17	0	17	89	485	236	39	275	0	3	1332	31.39%	1332
20 Hours	446	0	34	0	34	178	485	198	39	224	52	3	1485	39.46%	1485
30 Hours	669	0	51	0	51	267	430	175	39	187	98	3	1620	41.70%	1620
40 Hours	892	0	68	0	68	357	328	155	39	154	109	3	1750	40.58%	1750

[§] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

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Table 3.2 – Continued

Weekly Hours	Monthly Earnings	Taxes		Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Enrl.)	Disposable Income Per Mth	IMTR	
		Federal Income	Payroll		State Income	Federal EITC	TANF	Food Stamps					WIC	House Subsidy
At Minimum Wage														
MARYLAND														
0 Hours	0	0	0	0	0	482	290	39	636	1447	0	3	1447	
10 Hours	266	0	20	-21	106	322	274	39	604	1345	0	3	1615	37.21%
20 Hours	532	0	40	-42	213	235	258	39	572	1317	73	3	1781	37.59% 37.40%
30 Hours	799	0	61	-61	319	213	228	39	526	1325	164	3	1965	31.08%
40 Hours	1065	-22	81	-81	366	109	254	39	537	1305	364	3	2024	77.81% 54.40% 45.91%
MASSACHUSETTS														
0 Hours	0	0	0	0	0	618	249	39	644	1550	0	3	1550	
10 Hours	292	0	22	-17	117	531	200	39	582	1474	0	3	1764	27.39%
20 Hours	584	0	44	-35	234	404	169	39	538	1394	18	3	1952	35.61% 31.50%
30 Hours	877	0	67	-39	351	355	138	39	494	1391	116	3	2127	40.27%
40 Hours	1169	-38	87	-26	366	0	207	39	595	1263	389	3	2021	136.30% 88.20% 59.88%
MICHIGAN														
0 Hours	0	0	0	0	0	459	297	39	539	1334	0	3	1334	
10 Hours	301	0	23	0	120	378	249	39	473	1259	0	3	1539	32.22%
20 Hours	602	0	46	0	240	234	249	39	455	1217	97	3	1678	53.82% 43.02%
30 Hours	903	0	69	0	361	129	239	39	426	1194	199	3	1831	59.16%
40 Hours	1204	-43	92	11	365	0	257	39	423	1084	360	3	1869	87.73% 68.27% 55.64%
MINNESOTA														
0 Hours	0	0	0	0	0	577	299	39	492	1407	0	3	1407	
10 Hours	266	0	20	-26	106	406	299	39	464	1314	0	3	1588	32.33%
20 Hours	532	0	40	-53	213	235	299	39	435	1221	0	3	1768	35.88% 32.33%
30 Hours	799	0	61	-79	319	65	299	39	406	1128	0	3	1948	32.58%
40 Hours	1065	-22	81	-91	366	0	193	39	347	945	5	3	2041	65.03% 48.78% 40.56%
MISSISSIPPI														
0 Hours	0	0	0	0	0	170	394	39	360	963	0	3	964	
10 Hours	223	0	17	0	89	140	344	39	301	913	0	3	1122	29.14%
20 Hours	446	0	34	0	178	147	383	39	317	1064	282	3	1296	66.81% 47.98%
30 Hours	669	0	51	0	267	0	281	39	216	803	20	2	1403	7.17%
40 Hours	892	0	68	0	357	0	227	39	150	773	23	2	1576	22.42% 14.79% 31.39%

[§] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

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Table 3.2 – Continued

Weekly Hours	Monthly Earnings	Taxes		Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Enrl.)	Disposable Income Per Mth	IMTR		
		Federal Income	Payroll		State Income	Federal EITC	TANF	Food Stamps					WIC	House Subsidy	IMTR [§]
At Minimum Wage															
MISSOURI															
0 Hours	0	0	0	0	0	292	350	39	447	0	3	1128	23.31%		
10 Hours	223	0	17	0	17	89	292	294	39	380	0	3	1301	31.83%	27.57%
20 Hours	446	0	34	0	34	178	247	258	39	331	14	3	1453	34.97%	
30 Hours	669	0	51	0	51	267	225	227	39	286	67	3	1598	43.04%	33.29%
40 Hours	892	0	68	0	68	357	281	208	39	255	240	3	1725		
MONTANA															
0 Hours	0	0	0	0	0	375	322	39	368	0	3	1104	24.66%		
10 Hours	223	0	17	0	17	89	357	274	39	306	0	3	1274	52.01%	38.34%
20 Hours	446	0	34	0	34	178	209	271	39	290	19	3	1381	51.12%	
30 Hours	669	0	51	0	51	267	72	269	39	273	51	3	1490	60.05%	47.08%
40 Hours	892	0	68	1	69	357	0	292	39	276	210	3	1578		
NEBRASKA															
0 Hours	0	0	0	0	0	364	328	39	474	0	3	1205	22.86%		
10 Hours	223	0	17	0	17	89	364	272	39	407	0	3	1379	35.42%	29.14%
20 Hours	446	0	34	0	34	178	285	242	39	364	0	3	1523	53.81%	
30 Hours	669	0	51	0	51	267	156	242	39	350	48	3	1626	52.91%	41.25%
40 Hours	892	0	68	0	68	357	145	243	39	337	217	3	1731		
NEVADA															
0 Hours	0	0	0	0	0	348	330	39	646	0	3	1363	41.70%		
10 Hours	223	0	17	0	22	89	236	310	39	613	0	3	1495	41.70%	41.70%
20 Hours	446	0	34	0	34	178	152	290	39	579	27	3	1625	41.25%	39.68%
30 Hours	669	0	51	0	51	267	55	270	39	546	41	3	1756	34.08%	
40 Hours	892	0	68	0	68	357	0	237	39	499	55	2	1903		
NEW HAMPSHIRE															
0 Hours	0	0	0	0	0	625	247	39	540	0	3	1451	41.70%		
10 Hours	223	0	17	0	24	89	513	227	39	507	0	3	1583	41.70%	41.70%
20 Hours	446	0	34	0	48	178	612	207	39	473	210	3	1713	65.02%	89.68%
30 Hours	669	0	51	0	69	267	523	222	39	477	358	3	1791	114.34%	
40 Hours	892	0	68	0	45	357	412	202	39	513	589	3	1759		

[§] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

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Table 3.2 – Continued

Weekly Hours	Monthly Earnings	Taxes		Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Emr.)	Disposable Income Per Mth	IMTR		
		Federal Income	Payroll		State Income	Federal EITC	TANF	Food Stamps					WIC	House Subsidy	IMTR1 ^s
NEW JERSEY															
0 Hours	0	0	0	0	0	424	308	39	730	0	3	1501			
10 Hours	266	0	20	-24	106	290	284	39	690	0	3	1409			
20 Hours	532	0	40	-39	213	390	295	39	740	665	3	1677			
30 Hours	799	0	61	-57	319	101	236	39	610	77	3	1305			
40 Hours	1065	-22	81	-63	366	124	225	39	584	278	3	1338			
NEW MEXICO															
0 Hours	0	0	0	-16	0	389	318	39	315	0	3	1061			
10 Hours	223	0	17	-20	89	339	279	39	263	0	3	1009			
20 Hours	446	0	34	-19	178	241	259	39	229	13	3	946			
30 Hours	669	0	51	-11	267	143	242	39	198	36	3	889			
40 Hours	829	0	68	-8	357	165	226	39	169	184	3	956			
NEW YORK															
0 Hours	0	0	0	0	0	691	227	39	567	0	3	1524			
10 Hours	292	0	22	-35	117	575	192	39	514	0	3	1437			
20 Hours	584	0	44	-70	234	408	172	39	476	0	3	1329			
30 Hours	877	0	67	-105	351	242	151	39	439	0	3	1222			
40 Hours	1169	-38	89	-110	366	75	187	39	457	186	3	1124			
NORTH CAROLINA															
0 Hours	0	0	0	0	0	272	356	39	409	0	3	1076			
10 Hours	223	0	17	0	89	191	325	39	366	0	3	1010			
20 Hours	446	0	34	0	178	110	395	39	411	563	3	1133			
30 Hours	669	0	51	0	267	29	287	39	301	66	3	923			
40 Hours	892	0	68	1	357	0	247	39	249	89	3	892			
NORTH DAKOTA															
0 Hours	0	0	0	0	0	477	292	39	176	0	3	984			
10 Hours	223	0	17	0	89	477	238	39	109	0	3	952			
20 Hours	446	0	34	0	178	433	197	39	55	0	3	902			
30 Hours	669	0	51	0	267	323	177	39	22	0	3	828			
40 Hours	892	0	68	0	357	362	139	39	0	90	3	897			

[§] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

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Table 3.2 – Continued

Weekly Hours	Monthly Earnings	Taxes			Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Enrl.)	Disposable Income Per Mth	IMTR		
		Federal Income	Payroll	State Income		Federal EITC	TANF	Food Stamps	WIC					House Subsidy	IMTR ¹	IMTR ²
At Minimum Wage																
OHIO																
0 Hours	0	0	0	0	0	0	373	323	39	442	0	3	1177			
10 Hours	223	0	17	0	17	89	373	269	39	375	0	3	1353	21.52%		
20 Hours	446	0	34	0	34	178	350	245	39	337	89	3	1488	39.46%	30.49%	
30 Hours	669	0	51	0	51	267	252	225	39	304	101	3	1616	41.25%		
40 Hours	892	0	68	0	68	357	140	209	39	274	127	3	1744	43.94%	42.60%	36.54%
OKLAHOMA																
0 Hours	0	0	0	0	0	0	292	351	39	443	0	3	1125			
10 Hours	223	0	17	-4	13	89	240	309	39	391	0	3	1281	30.49%		
20 Hours	446	0	34	-8	26	178	216	289	39	358	87	3	1416	39.46%	34.97%	
30 Hours	669	0	51	-11	40	267	184	269	39	324	167	3	1548	40.80%		
40 Hours	892	0	68	-12	56	357	222	257	39	298	338	3	1673	43.94%	42.37%	38.67%
OREGON																
0 Hours	0	0	0	0	0	0	460	297	39	551	0	3	1347			
10 Hours	324	0	24	0	24	130	297	267	39	502	0	3	1538	41.58%		
20 Hours	649	0	49	0	49	260	0	303	39	511	58	3	1657	63.38%	52.38%	
30 Hours	974	-8	74	0	66	366	0	248	39	441	149	3	1856	38.76%		
40 Hours	1299	-57	99	-9	33	345	0	211	39	386	291	3	1940	74.15%	56.46%	54.42%
PENNSYLVANIA																
0 Hours	0	0	0	0	0	0	403	314	39	430	0	3	1186			
10 Hours	223	0	17	0	17	89	291	294	39	396	0	3	1317	41.70%		
20 Hours	446	0	34	0	34	178	179	280	39	369	21	3	1439	45.29%	43.49%	
30 Hours	669	0	51	0	51	267	68	260	39	236	21	3	1569	41.70%		
40 Hours	892	0	68	0	68	357	0	229	39	291	28	3	1714	34.97%	38.34%	40.91%
RHODE ISLAND																
0 Hours	0	0	0	0	0	0	554	269	39	432	0	3	1294			
10 Hours	307	0	23	0	23	123	485	215	39	361	0	3	1509	30.29%		
20 Hours	615	0	47	0	47	246	331	188	39	315	0	3	1688	41.88%	36.09%	
30 Hours	922	0	70	0	70	366	177	160	39	268	0	3	1866	42.02%		
40 Hours	1230	-47	94	0	47	359	110	136	39	226	100	3	1957	70.64%	56.26%	46.17%

[§] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

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Table 3.2 – Continued

Weekly Hours At Minimum Wage	Monthly Earnings	Taxes		Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Enrl.)	Disposable Income Per Mth	IMTR		
		Federal Income	Payroll		State Income	Federal EITC	TANF	Food Stamps					WIC	House Subsidy	IMTR1 [§]
SOUTH CAROLINA															
0 Hours	0	0	0	0	0	240	369	39	436	1084	0	3	1084		
10 Hours	223	0	17	0	89	240	309	39	369	1046	0	3	1254	24.21%	
20 Hours	446	0	34	0	178	240	257	39	303	1017	5	3	1426	22.87%	23.54%
30 Hours	669	0	51	0	267	82	265	39	298	951	53	3	1519	58.29%	
40 Hours	892	0	68	0	357	0	305	39	315	1016	251	3	1591	67.77%	43.27%
SOUTH DAKOTA															
0 Hours	0	0	0	0	0	508	282	39	340	1169	0	3	1169		
10 Hours	223	0	17	0	89	401	261	39	305	1095	0	3	1303	40.80%	
20 Hours	446	0	34	0	178	222	277	39	308	1024	54	3	1385	63.22%	52.01%
30 Hours	669	0	51	0	267	44	307	39	317	974	127	3	1467	63.22%	
40 Hours	892	0	68	0	357	0	290	39	218	971	201	2	1595	42.60%	52.46%
TENNESSEE															
0 Hours	0	0	0	0	0	185	389	39	461	1074	0	3	1074		
10 Hours	223	0	17	0	89	185	328	39	394	1035	0	3	1243	24.66%	
20 Hours	446	0	34	0	178	185	395	39	429	1226	453	3	1187	125.11%	74.88%
30 Hours	669	0	51	0	267	185	324	39	407	1222	679	3	1163	110.76%	
40 Hours	892	0	68	0	357	185	203	39	231	1015	126	3	1715	-147.53%	28.25%
TEXAS															
0 Hours	0	0	0	0	0	223	374	39	470	1106	0	3	1106		
10 Hours	223	0	17	0	89	119	351	39	434	1032	0	3	1240	40.35%	
20 Hours	446	0	34	0	178	130	395	39	455	1197	483	3	1128	150.22%	95.29%
30 Hours	669	0	51	0	267	0	306	39	363	975	91	2	1504	-68.60%	
40 Hours	892	0	68	0	357	0	306	39	347	1049	259	2	1615	50.22%	43.04%
UTAH															
0 Hours	0	0	0	0	0	474	293	39	302	1108	0	3	1108		
10 Hours	223	0	17	0	89	412	257	39	254	1051	0	3	1259	32.73%	
20 Hours	446	0	34	0	178	300	237	39	220	974	0	3	1390	41.25%	36.99%
30 Hours	669	0	51	0	267	189	217	39	187	899	0	3	1520	41.70%	
40 Hours	892	0	68	0	357	77	197	39	153	823	0	3	1650	41.70%	39.34%

[§] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

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Table 3.2 – Continued

Weekly Hours At Minimum Wage	Monthly Earnings	Taxes		Total Taxes	Benefits				Total Benefits	Child Care Expenses	Medicaid/ SCHIP (# Enrl.)	Disposable Income Per Mth	IMTR	
		Federal Income	Payroll		State Income	Federal EITC	TANF	Food Stamps					WIC	House Subsidy
VERMONT														
0 Hours	0	0	0	0	0	640	243	39	288	0	3	1210		
10 Hours	314	0	24	-40	125	516	204	39	230	0	3	1448	24.52%	
20 Hours	628	0	48	-80	251	305	200	39	207	24	3	1640	38.85%	31.68%
30 Hours	942	0	72	-117	366	138	195	39	183	92	3	1822	42.03%	
40 Hours	1259	-51	96	-113	354	43	226	39	192	341	3	1839	94.58%	50.00%
VIRGINIA														
0 Hours	0	0	0	0	0	320	347	39	407	0	3	1113		
10 Hours	223	0	17	0	89	320	286	39	340	0	3	1282	24.66%	
20 Hours	446	0	34	0	178	320	242	39	283	34	3	1442	28.25%	26.45%
30 Hours	669	0	51	0	267	320	211	39	238	108	3	1587	34.97%	
40 Hours	892	0	68	0	357	320	213	39	227	294	3	1687	55.15%	35.76%
WASHINGTON														
0 Hours	0	0	0	0	0	546	271	39	548	0	3	1404		
10 Hours	330	0	25	0	132	380	241	39	498	0	3	1598	41.51%	
20 Hours	661	0	50	0	264	282	211	39	449	67	3	1791	41.69%	41.60%
30 Hours	991	-11	75	0	366	210	192	39	409	195	3	1951	51.51%	
40 Hours	1322	-60	101	0	340	118	187	39	407	425	3	1949	100.60%	58.85%
WEST VIRGINIA														
0 Hours	0	0	0	0	0	340	333	39	309	0	3	1021		
10 Hours	223	0	17	0	89	206	319	39	282	0	3	1143	45.73%	
20 Hours	446	0	34	0	178	104	306	39	255	32	3	1264	45.73%	45.73%
30 Hours	669	0	51	0	267	0	284	39	219	32	3	1397	40.35%	
40 Hours	892	0	68	11	357	0	240	39	162	64	2	1547	32.73%	41.14%
WISCONSIN														
0 Hours	0	0	0	0	0	628	246	39	455	0	3	1368		
10 Hours	281	0	21	-15	112	0	379	39	558	0	3	1366	101.06%	
20 Hours	563	0	43	-31	225	0	314	39	483	30	3	1584	22.69%	61.81%
30 Hours	844	0	64	-47	338	0	241	39	399	30	3	1815	17.79%	
40 Hours	1126	-31	86	-43	366	0	208	39	348	144	3	1935	57.44%	49.73%
WYOMING														
0 Hours	0	0	0	0	0	340	335	39	440	0	3	1154		
10 Hours	223	0	17	0	89	316	286	39	380	0	3	1319	26.90%	
20 Hours	446	0	34	0	178	93	307	39	383	10	3	1405	61.43%	44.17%
30 Hours	669	0	51	0	267	0	291	39	353	39	3	1531	43.49%	
40 Hours	892	0	68	0	357	0	287	39	333	195	2	1646	48.43%	45.06%

[‡] Implicit Marginal Tax Rate calculated from working 10 additional hours (compared to the amount of hours immediately above).

[†] Implicit Marginal Tax Rate between 0 and 20 hours, and 20 to 40 hours.

[‡] Implicit Marginal Tax Rate between 0 and 40 hours.

Table 3.3: Summary of Implicit Marginal Tax Rates (IMTR) Under Multiple Welfare Program Participation

	10-Hour Increments				20-Hour Increments		40-Hour Increment	Effective IMTR
	0 to 10	10 to 20	20 to 30	30 to 40	0 to 20	20 to 40	0 to 40 [†]	0 to 10
ALABAMA	52.02%	37.22%	27.80%	45.29%	44.62%	36.55%	40.58%	47.98%
ARIZONA	39.01%	48.43%	44.39%	33.63%	43.72%	39.01%	41.37%	9.42%
ARKANSAS	55.61%	135.43%	61.43%	-126.01%	95.52%	-32.29%	31.61%	59.19%
CALIFORNIA	26.03%	41.44%	41.98%	63.01%	33.73%	52.48%	43.11%	-0.34%
COLORADO	26.46%	35.87%	45.74%	146.64%	31.17%	96.19%	63.68%	-19.28%
CONNECTICUT	21.56%	21.81%	25.00%	41.12%	21.68%	33.07%	27.38%	-8.75%
DELAWARE	21.43%	36.47%	48.69%	80.08%	28.95%	64.35%	46.67%	-29.32%
FLORIDA	27.08%	41.52%	41.88%	66.55%	34.30%	54.23%	44.27%	-18.41%
GEORGIA	23.32%	129.15%	-21.97%	60.99%	76.23%	19.51%	47.87%	-32.29%
IDAHO	33.18%	49.33%	48.88%	26.01%	41.26%	37.44%	39.35%	-8.07%
ILLINOIS	32.74%	38.30%	46.26%	84.40%	35.52%	65.36%	50.44%	-0.71%
INDIANA	30.94%	32.29%	32.74%	32.29%	31.61%	32.51%	32.06%	-9.42%
IOWA	37.67%	154.71%	-79.82%	52.02%	96.19%	-13.90%	41.14%	9.87%
KANSAS	29.60%	39.91%	39.46%	39.46%	34.75%	39.46%	37.11%	0.90%
KENTUCKY	29.15%	47.98%	49.78%	64.57%	38.57%	57.17%	47.87%	-17.04%
LOUISIANA	23.77%	92.83%	-18.39%	52.02%	58.30%	16.82%	37.56%	-32.29%
MAINE	21.52%	31.39%	39.46%	41.70%	26.46%	40.58%	33.52%	3.56%
MARYLAND	37.22%	37.59%	31.09%	77.82%	37.41%	54.41%	45.92%	20.68%
MASSACHUSETTS	27.40%	35.62%	40.27%	136.30%	31.51%	88.21%	59.88%	6.16%
MICHIGAN	32.23%	53.82%	49.17%	87.38%	43.02%	68.27%	55.65%	3.99%
MINNESOTA	32.33%	32.33%	32.58%	65.04%	32.33%	48.78%	40.56%	21.80%
MISSISSIPPI	29.15%	66.82%	7.17%	22.42%	47.98%	14.80%	31.39%	-19.28%
MISSOURI	23.32%	31.84%	34.98%	43.05%	27.58%	39.01%	33.30%	-32.29%
MONTANA	24.66%	52.02%	51.12%	60.54%	38.34%	55.83%	47.09%	-8.97%
NEBRASKA	22.87%	35.43%	53.81%	52.91%	29.15%	53.36%	41.26%	-30.04%
NEVADA	41.70%	41.70%	41.26%	34.08%	41.70%	37.67%	39.69%	17.94%
NEW HAMPSHIRE	41.70%	41.70%	65.02%	114.35%	41.70%	89.69%	65.70%	26.91%
NEW JERSEY	33.46%	150.00%	-79.78%	60.15%	91.73%	-9.94%	40.85%	9.77%
NEW MEXICO	28.70%	42.15%	46.64%	45.74%	35.43%	46.19%	40.81%	6.28%
NEW YORK	25.34%	32.19%	32.76%	89.73%	28.77%	61.20%	45.00%	7.19%
NORTH CAROLINA	36.77%	204.93%	-121.08%	32.29%	120.85%	-44.39%	38.23%	4.04%
NORTH DAKOTA	21.52%	29.15%	41.70%	17.49%	25.34%	29.60%	27.47%	3.59%
OHIO	21.52%	39.46%	41.26%	43.95%	30.49%	42.60%	36.55%	-23.32%
OKLAHOMA	30.49%	39.46%	40.81%	43.95%	34.98%	42.38%	38.68%	-11.21%
OREGON	41.36%	63.38%	38.77%	74.15%	52.39%	56.46%	54.43%	20.68%
PENNSYLVANIA	41.70%	45.29%	41.70%	34.98%	43.50%	38.34%	40.92%	17.94%
RHODE ISLAND	30.29%	41.88%	42.02%	70.45%	36.10%	56.26%	46.18%	15.96%
SOUTH CAROLINA	24.22%	22.87%	58.30%	67.71%	23.54%	67.71%	63.00%	-32.29%
SOUTH DAKOTA	40.81%	63.23%	63.23%	42.60%	52.02%	52.91%	52.47%	29.60%
TENNESSEE	24.66%	125.11%	110.76%	-147.53%	74.89%	-18.39%	28.25%	-32.29%
TEXAS	40.36%	150.22%	-68.61%	50.22%	95.29%	-9.19%	43.05%	13.90%
UTAH	32.74%	41.26%	41.70%	41.70%	37.00%	41.70%	39.35%	18.83%
VERMONT	24.52%	38.85%	42.04%	94.59%	31.69%	68.31%	50.00%	12.42%
VIRGINIA	24.66%	28.25%	34.98%	55.16%	26.46%	45.07%	35.76%	-29.60%
WASHINGTON	41.52%	41.69%	51.52%	100.60%	41.60%	76.10%	58.85%	26.36%
WEST VIRGINIA	45.74%	45.74%	40.36%	32.74%	45.74%	36.55%	41.14%	27.80%
WISCONSIN	101.07%	22.70%	17.79%	57.45%	61.81%	37.66%	49.73%	174.38%
WYOMING	26.91%	61.43%	43.50%	48.43%	44.17%	45.96%	45.07%	-21.97%

[†] Implicit Marginal Tax Rates ($IMTR = 1 - \frac{\Delta Disp. Income}{\Delta Earned Income}$) are calculated at each state's minimum wage and show the percentage of the the additional earned income that is implicitly taxed when increasing the weekly working hours according to the scenarios presented.

two percentage points only, IMTRs for the 0 to 20-hour case range from 120.85% (North Carolina) to 21.68% (Connecticut), and 65.69% (New Hampshire) to 27.37% (Connecticut) for the other case. The average IMTR is 45.36% for the first scenario and 43.37% for the latter one, with standard deviations of 22.26 and 9.29 percentage points, respectively. North Carolina (120.85%), Iowa (95.18%), Arkansas (95.51%), Texas (95.29%), and New Jersey (91.72%) rank among the states with the highest IMTRs for the 0 to 20-hour work shift. On the other hand, low-income welfare-receiving individuals in Connecticut (21.68%), South Carolina (23.54%), North Dakota (25.33%), Maine (26.45%), and Virginia (26.45%) are subject to the lowest IMTRs when going from full-welfare dependency to part-time work and participating in all the programs listed.

In many cases, these single mothers may be waiting for the opportunity to find employment, and may well go from being fully dependent on welfare to working full time. Under both federal and state welfare rules, welfare recipients in New Hampshire (65.69%), Colorado (63.67%), South Carolina (63.00%), Massachusetts (59.88%), and Washington (58.85%) will be subject to the highest marginal tax rates as they lose much of the government aid. Connecticut (27.37%), North Dakota (27.46%), Tennessee (28.25%), Mississippi (31.39%), and Arkansas (31.69%) show the lowest marginal tax rates under the same conditions.

Since low-income parents may actually slowly transition toward full-employment, Table 3.2 displays other important scenarios of labor conditions for low-income heads of households. These households may start by finding part-time jobs first. As they try to move to full-time employment, they are also subject to similar implicit marginal tax rates. These, however, appear to be a lot more diverse across states, according to the simulations. For instance, the simulations for North Carolina show that low-income single mothers trying to transition from part-time to full-time employment will actually face incentives to do so as they would be subject to an implicit tax rate of -44.39%. On the other hand, similar individuals in Colorado would face IMTRs as high as 96.18%. Initial suspicion of the work disincentives stems from employment data released by the Department of Health and Human Services

and the Administration for Children and Families.

Table 3.2 also displays the IMTRs that such individuals will face if this transition were even slower. Instead, mothers that need time adapt to a new working life while being able to find proper day care for their children at a reasonable rate may increase their working hours only marginally. This is a likely scenario given the individuals' lack of experience and/or training. For simplicity, I chose to increase weekly work hours by 10. By doing this, one may analyze how labor-supply may be influenced by both earnings and choice of welfare participation, as parents seek to slowly become self-sufficient.

Finally, going back to Holt and Romich (2007), one can think of studies that involve all programs very informative but also limited. They find that not all low-income welfare recipients participate in the same programs. In fact, not many participate in all programs available to them. They note that “not all eligible households use the [all] available means-tested benefits, so assuming full take up of means-tested programs will overstate the MTRs facing LMI [low-and-middle-income] households.”

Data for 2006 TANF recipients suggest that, on average, approximately 80% also receives food-stamps, and most of them participate in some kind of medical assistance program. My dataset does not provide information on the EITC take-up rates, but Holt and Romich (2007) find a significant percent of EITC claimants in Wisconsin being single heads of households with two dependants. Using these statistics I recalculate the implicit marginal tax rates assuming that TANF recipients will also claim EITC and participate in one additional program only (SNAP). As with my previous analysis, I do not include benefit amounts for Medicaid expenses since they are more difficult to estimate. I call these the “Effective Marginal Tax Rates.” Given that in many cases individuals transition slowly into the workforce, Table 3.2 displays the rate that represents the first hurdle (from 0 to 10 hours).

Indeed, one can observe an inverse relationship when comparing the work participation rates of TANF participants against the calculated IMTRs. Figures 3.1 and 3.2 show graphical evidence of this relationship between two types of marginal tax rates and work participation

of TANF families.

The figures show that on average, in 2006, states with the highest IMTRs experienced lower work participation rates from individuals receiving TANF benefits. The trends observed correspond to the plotting of scenarios in which individuals switch from no work to part-time work, as well as when they barely start working (10 hours a week). These relations are further explored in more detail in the results' section.

4.2 Empirical Results

I use a simple Ordinary Least Squares (OLS) approach to examine the effect of the simulated marginal tax rates on the employment of TANF recipients. While more complicated methods have been acknowledged when analyzing labor-supply decisions, this analysis is concerned with determining whether these simulated rates help explain the variation of employment rates across states under a reformed welfare system, and not with the specific individual's behavior. After the 1996 reform, all states have implemented work requirements within their welfare systems. However, not all welfare recipients comply with these 'working' rules. This is in part due to the lack of monitoring, the disincentives created by the system, and also because of some of the exceptions granted throughout as these programs become more complex. As a result, it can be observed that no state reports a 100% work participation rate for these welfare recipients.

Many factors influence individuals' work choice. However, when aggregating data, one can think of certain factors that can influence the employment rates of certain groups. As mentioned in the section describing the data, I start the analysis with a simple model that includes some basic controls. Since the dependent variable is work participation of welfare recipients and it is closely related to the employment conditions and opportunities of those who receive welfare benefits (TANF), the models are specified by control variables that possibly affect employment of these individuals in particular.

In addition to the implicit marginal tax rates, I include the percent of female population

Figure 3.1: Correlation Between The Work Participation of Temporary Aid for Needy Families (TANF) Recipients and the Implicit Marginal Tax Rate Incurred by Moving from **Not Working to Part-Time Work**

Figure 3.2: Correlation Between The Work Participation of Temporary Aid for Needy Families (TANF) Recipients and the ‘Effective’ Implicit Marginal Tax Rate Incurred by Moving from **Not Working** to **Some Work (10 Hours)**

in the state. Women are generally the ones in charge of child care, especially if they do not share residence with the father of those children. Hence, it is reasonable to think that states with higher shares of female population may experience lower work participation rates. If most of the TANF recipients are single mothers, or children of single mothers, then one may argue that this group of individuals could also be affected. Ideally, controlling for the share of females that receive welfare may serve as a better control. However, according to the data, the share of female welfare recipients in 2006 oscillated around 90%, with a standard deviation as small as 6.63 percentage points. That leaves us with a vast majority of women in the TANF rolls, with very small variation across states.

The percentage of the population living in rural areas attempts to control for many of the differences among states. Not only do rural and urban states differ culturally, but they also present differences that can clearly affect the labor markets. For the case of low-income welfare-receiving individuals, it is not clear in which way this factor may affect their opportunities for employment. While metropolitan areas do have bigger and more developed labor markets that provide more opportunities, these markets may also experience a higher supply of low-income workers, potentially leaving many unemployed. Higher labor supply may actually reduce wages, and if total welfare benefits provide a higher income than what individuals may earn through employment in those cities, the disincentive to seek employment grows.

On the other hand, rural labor markets have limited opportunities. This, however, depends on the type of skills needed to perform the jobs that are actually available. In any case, even though I have no clear prior on the direction of its coefficient, Garfinkel and Orr (1974) found that higher concentration of urban populations was associated with lower employment rates of AFDC recipients. If this is true, and assuming that labor market opportunities have not changed substantially for these individuals, I expect a positive effect of rural concentrations on the employment rates of welfare recipients.

Similarly, the effect of minorities on employment participation rates is not obvious. Yet,

as Garfinkel and Orr (1974) noted, there has been an increase in the labor force participation of married black women. Hence a positive coefficient for the percent of black individuals receiving welfare may not seem surprising.

The effect of aging populations on labor force participation rates is more complicated to predict. One could hardly think of reasons why an increase in the share of the population of ages 65 and older would affect the labor markets for younger women. If any, one could hypothesize that populations with older individuals could increase the availability of jobs due to increased retirement. However, Börsch-Supan (2003) argues that an increase in the share of older people can affect future tax rates and contribution schemes. Thus, it is possible that younger forward thinking individuals may be discouraged by a growing gap between gross and net earnings, reducing the willingness to participate in the labor force. To a certain extent, this additional factor may further discourage young welfare recipients from seeking remunerated employment.

Finally, the state unemployment rate should be a good proxy for the employment opportunities for these individuals. In order to avoid endogeneity I include the lag of the unemployment rate and expect to find a negative effect on the labor outcomes for the group analyzed in this study. In summary, the OLS equation to be estimated is given by

$$TANF_{WP} = \alpha + IMTR_{0-to-40hours} + \beta_1 PctFemale + \beta_2 PctRural + \beta_3 PctBlack + \beta_4 PctElderly + \beta_5 UnplRate_{t-1} + \epsilon \quad (3.1)$$

where $TANF_{WP}$ is the work participation of TANF recipients as defined by the Department of Health and Human Services. The estimated results from equation 3.1 are reported on Table 3.4. The estimation uses robust standard errors in order to take care of possible bias created by the presence of outliers. Table 3.4 shows results for three different models. The first column uses the simulated marginal tax rates when welfare recipients jump from complete welfare dependency to full-time employment. While the coefficients of the control

variables have the expected signs, not all are statistically significant.

On the other hand, the implicit marginal tax rate does not reflect the negative correlation displayed above. In fact, the results suggest that after controlling for other demographics, the implicit marginal tax rate does not explain any of the variation among states' work participation rates of welfare recipients. Indeed, it shows a positive and statistically not significant effect, contradicting the disincentive hypothesis. An important fact to highlight here is that in many cases, unless forced by strict rules, the likelihood of welfare recipients switching to full-time employment at once is very slim. Given the widely defined working requirements in each state, the importance of child care, and the availability of employment it is more likely that these welfare beneficiaries seek for part-time employment first.

Column 2 of Table 3.4 shows results when using simulated IMTRs for the 0 to 20 hours per week scenario instead. The signs, magnitudes, and statistical significance for the other control variables are comparable to those found in the first column. With the exception of the coefficient on the share of female population, the parameter coefficients remain statistically significant. Yet, the coefficient on the implicit marginal tax rate still shows no statistical significance. Note that it *does* have the expected sign. In other words, on average and after controlling for other demographics, one could expect lower work participation in states where jumping from welfare dependency to part-time work yields high implicit marginal tax rates.

But work requirements for these welfare recipients differ by state and not always refer to working for earned wages. In many cases individuals may combine participation in job training programs with some kind of remunerated work. If there is an opportunity to work less, comply with the state's rules and receive benefits, it makes sense that mothers choose the least amount of paid hours. Moreover, this is reasonable when benefits depend on the family's earned income and not the hours worked, and also if the implicit marginal tax rate from working 20 hours (part-time) is higher than the rate incurred when working only 10 or 15 hours a week. Indeed, the average marginal tax rate for the 0 to 10 hour scenario is 32.95%, compared to 45.35% for the 0 to 20 hour case. Additionally, such scenario may be of

Table 3.4: OLS Results for the Impact of Implicit Marginal Tax Rates on Work Participation of TANF Families

Variable	Model 1 (0 to 40 Hrs.)	Model 2 (0 to 20 Hrs.)	Model 3 (0 to 10 Hrs.)
IMTR (0 to 40 Hours)	0.022 (0.212) [†]		
IMTR (0 to 20 Hours)		-0.067 (0.085)	
IMTR (0 to 10 Hours)			-0.250* (0.139)
Percent Female	-4.522 (2.729)	-4.829 (2.894)	-5.370* (2.815)
Percent Rural	0.331** (0.139)	0.340** (0.140)	0.327** (0.136)
Percent Black	0.217*** (0.079)	0.233*** (0.080)	0.230*** (0.079)
Percent Elderly	-0.844*** (0.240)	-0.909*** (0.236)	-0.922*** (0.212)
Lag of Unemployment Rate	-0.400* (2.234)	-3.762* (2.190)	-0.372* (2.176)
R^2	0.3180	0.3256	0.3587
No. of Observations	48		

[§] Statistical significance is reported at the 1% (***), 5% (**), and 10% (*) levels.

[†] All models show results with robust standard errors in parenthesis

special interest since individuals with low skills may have to accept short work shifts before they can prove employers of their true capabilities.

Thus, the third column of Table 3.4 displays the OLS results using the IMTRs for the 0 to 10 hour per week switch. Note that the coefficient on the IMTRs is inversely related to the work participation rates and it is statistically significant at the 10% level. Compared to the results obtained for the other two scenarios, this result may reaffirm the importance of this marginal tax rates and the work requirements set by each state. Strict work requirements may prove important to the extent that pushing individuals to work at least 20 or 30 hours a week could avoid the disincentives observed in the 0-to-10 hour transition case. Yet, if these requirements are not heavily enforced, and welfare recipients are constrained to a certain amount of hours a week due to their lack of connections and job training, the disincentives may remain, as it is shown by the results.

Also note that the coefficient on female percentage becomes statistically significant. Additionally, this model does a better job in explaining the variation in TANF employment

rates as evidenced by the increase in the R^2 . Given the wide variation among states' implicit marginal tax rates, compared to other variables such as unemployment rate, percent female, and percent of the population over the age of 65, this results are better interpreted in terms of changes in standard deviations. For the case of the implicit marginal tax rate for the 0 to 10-hour change in work behavior one standard deviation equals approximately 13 percentage points.

The results show that the implicit marginal tax rates created from multiple program participation do have a negative impact on the working choices of welfare participants. In order to compare and standardize the results on Table 3.4, one can multiply the parameter estimates by their standard deviations. Holding all other variables constant, a standard-deviation increase in these marginal tax rates lowers the work participation rates of TANF recipients by 0.208 standard deviations. This is no small effect if compared with the effect of the other variables. For instance, a standard-deviation increase in unemployment rates (often a measure of work opportunities) only lowers the work participation rates by 0.022 standard deviations. On the other hand, a standard-deviation increase in the percent of female lowers the work participation just slightly more than the implicit marginal tax rate (0.273 standard deviations).

To keep things in perspective, the decrease of the work participation rates can be interpreted in terms of percents. On average, a 0.208 standard deviation decrease translates into a decrease of 3.253 percentage points. Such decrease amounts to a nearly 8.50% drop from the work participation mean (38.72%). This is especially important when these individuals take an initial step to become productive by increasing their working hours slowly. As noted above, small changes in one program could change the resulting marginal tax rate dramatically, sometimes by even more than 13 percentage points.

For simplicity, let us look at the case of South Carolina and Maryland. Their 0-to-10 IMTR differs by exactly 13 percentage points. While program guarantees among states vary, among other things, depending on the costs of living, changes in the benefit structures

will cause the dramatic change in IMTR. Assuming that welfare recipients participate in all of the programs included in Table 3.2, South Carolina does not reduce TANF benefits when individuals transition from no work to 10 hour work weeks. On the other hand, Food Stamps (SNAP) benefits are reduced by 16.26%. Maryland reduces TANF benefits by as much as 33.19% and SNAP benefits by as little as 5.52%. These differences, added to changes occurring in other programs create an IMTR of 37.21% for Maryland and 24.21% for South Carolina. As a result, one observes that the work participation rate in Maryland is in fact 10% higher than that of South Carolina (close to the estimated 8.50%).

Hence, even when welfare recipients do not have complete knowledge on how tax rates and benefit reductions interact, on average they perceive the decrease of disposable income, altering their working behavior. Yet, one must be careful when looking at labor supply outcomes. The implicit marginal tax rates used thus far have been simulated under a set of assumptions that may not necessarily apply to everyone. Moreover, it is widely argued that the choice of work participation, especially for this group, may depend on more factors than those included in the model above. Consequently, a more detailed analysis is presented as a robustness check in the following section.

4.3 ‘Effective’ Tax Rates

Rightfully, policy makers could question the validity of these initial results by arguing that the assumption that most, if not all, TANF families also participate in every other welfare program at the same time is optimistic at best. To test the validity of the result, I use the “effective” marginal tax rates described above, including only the programs that are most widely used. This adds on evidence that the negative effects of the most popular programs may still offset the positive effects of programs such as the EITC in the provision of work incentives to LMI households.

The first column of Table 3.5 displays the OLS results when the effective marginal tax rate is used. Although the magnitude of the coefficient is smaller, the negative relation

persists and is statistically significant. These initial results would suggest that an overestimation of IMTRs, as discussed previously, could lead to overestimating their impact on work participation. However, when interpreting the results in terms of a one-standard-deviation change, I find that a standard deviation increase in these rates also translates into a decrease in work participation rates by 0.209 standard deviations. In other words, these results are comparable even when the distribution of the two sets of IMTRs is different.

Yet, a potential problem arises when each state defines work participation. Temporary Aid for Needy Families establishes rules and regulations with regards to working requirements. However, these rules are implemented independently by each state. In each state, some recipients can be exempt, disregarded, deemed engaged, or required to work. Those required to work can be classified by the type of work activity performed. Some participate in work preparation programs, some in job search and job training programs, unsubsidized employment, and other work activities. Some may even try to meet the hour requirement by combining those activities.

To the best of my knowledge, these administrative data is compiled by the DHHS to reflect the true work participation rates and allow comparisons across states. Yet, in order to provide confidence on the results, I use a similar measure of work participation rates based on the percent of households with earnings. Column 2 on Table 3.5 reports the results obtained when the percent of TANF families with earnings during 2006 is used as the dependent variable. Again, the effective IMTRs have a negative and statistically significant impact on the dependent variable. These results ought to be interpreted carefully. The data do not specify whether these are taxable earnings from employment or from other sources, in which case the IMTRs simulated here should have no effect. Nonetheless, it is important to show that the relationship seems to hold, partly due to the fact that for some of the individuals these earnings come from work.

Table 3.5: OLS Results for the Impact of Implicit Marginal Tax Rates on the Percent of TANF Families Working

Variable	On TANF Work Participation	On Percent of TANF Families with Earnings [†]
‘Effective’ IMTR (0 to 10 Hours)	-0.105* (0.058) [‡]	-0.058* (0.030)
Percent Female	-4.869* (2.719)	2.391 (1.914)
Percent Rural	0.321** (0.130)	0.003 (0.075)
Percent Black	0.203** (0.075)	0.013 (0.065)
Percent Elderly	-0.945*** (0.201)	-0.362** (0.144)
Lag of Unemployment Rate	-3.839* (2.135)	-1.121 (1.962)
R^2	0.3669	0.1169
No. of Observations	48	

[§] Statistical significance is reported at the 1% (***), 5% (**), and 10% (*) levels. Column heading is the dependent variable.

[†] Account for some kind of earnings received by the family at some point in 2006. Data limitations does not permit to identify earnings from single or married parents.

[‡] Both models show results with robust standard errors in parenthesis

4.4 Robustness Checks

Labor choices are determined by a variety of factors. Like individual work decisions, the employment rates in regions depend on more factors than only those specified in the model. Thus, I compare the results obtained for the IMTRs above with those from a more complete model that uses some of the same variables used by Garfinkel and Orr (1974). Even though the work requirements changed when TANF was implemented, the characteristics of a state continue to explain a big part of the labor outcomes observed in each state. For this reason, this study attempts to capture program rules and philosophies through the IMTRs, and uses demographic variables to account for the other sources of variation of work participation rates. Consequently, it is reasonable to use control variables that were used for studies prior to the welfare reform, given that reform changes will be captured by the marginal tax rates.

Adding to the variables above, I include the percent of TANF recipients with 9 years of education or less. For TANF parents, like for any other person, lower levels of education should yield less opportunities for work and monetary reward, expecting a negative sign on its coefficient.

The model also includes a logarithmic transformation of the maximum level of TANF benefits for each state, the population density, the percent of TANF families with kids under the age of 6, and the employment opportunities in the surrounding areas. Presumably, higher TANF benefits will discourage employment. On the other hand, dense states may also have tighter labor markets, frustrating the desires of TANF recipients to look for remunerated work. Children under 6 years of age can be seen as an impediment to leave the house and work. This age group requires more intense and specialized child care that can be very expensive. Thus, I would expect a negative sign for all three coefficients.

Finally, when analyzing labor opportunities and labor markets it is important to account for the fact that these markets often cross state borders. It is well known that many Metropolitan Statistical Areas (MSAs) in the United States include counties from different states. Hence, some of the work participation decisions may not only depend on the job

opportunities but also on those opportunities across the state borders. As such, I draw from the spatial econometrics literature and construct a weight (W) matrix that accounts for neighboring characteristics by looking at each state's immediate neighbors. This is a 48×48 matrix of zeros and ones. A value of one is given to the element w_{ij} if state i is a neighbor of state j and zero otherwise. Since a state cannot be a neighbor of itself, zeros are assigned to the main diagonal.

This matrix is row-normalized and multiplied by the lag of the unemployment rates. This returns a vector with states' neighbors' average unemployment rate. If unemployment rates are spatially correlated, a state's unemployment rate may increase if its neighbors' rates increase. Hence, I expect to observe a negative correlation between neighbors' unemployment rates and work participation.

Table 3.6 shows the results for the two different model specifications (IMTR vs. Effective IMTR). Both columns follow the original model using the best measure of work participation available in the dataset. In both specifications, even when including the additional controls, the coefficients of the initial marginal tax rate (from 0 to 10 hours per week) have the same sign and have similar magnitudes. Although the IMTR is not statistically significant under the traditional standards, the difference is minimal. In fact, it has a p-value of 0.110 making it almost significant at the 10% level. The original variable coefficients conserve the signs although some lose statistic significance. Interestingly, only coefficients on population density and neighbors' unemployment rate have the expected sign.

The signs on low-educated parents and TANF guarantees show positive and significant effects. These puzzling results are counterintuitive and hard to explain. In one hand, it may be possible that states with higher TANF benefits have stricter rules on work requirements and compliance. Yet, there is no sufficient evidence to support this hypothesis since the data has no information on monitoring.¹¹ On the other hand, states with higher percent of the welfare recipients with low levels of education may have more low-skilled jobs available, being

¹¹See Moffitt (2006) for the importance of screening and monitoring for the implementation of work requirements.

Table 3.6: OLS Results for the Impact of Implicit Marginal Tax Rates on the Percent of TANF Families Working

Variable	On Work Participation of TANF Recipients	
IMTR (0 to 10 Hours)	-0.223 (0.136)	
‘Effective’ IMTR (0 to 10 Hours)		-0.101* (0.059)
Percent Female	-3.282 (3.053)	-3.094 (2.971)
Percent Rural	0.206 (0.158)	0.208 (0.152)
Percent Black	0.338*** (0.096)	0.318*** (0.094)
Percent of Elderly	-0.774*** (0.254)	-0.817*** (0.258)
Lag of Unemployment Rate	-1.886 (2.299)	-1.853 (2.295)
Percent With Low Education [‡]	1.114** (0.510)	1.104** (0.511)
TANF Guarantee	8.654* (4.276)	9.147** (4.150)
Population Density	-0.016* (0.008)	-0.014 (0.009)
Percent With Kids under 6	0.750 (0.488)	0.786 (0.487)
Neighbors’ Unemployment Rates	-7.555 (4.816)	-7.750 (4.689)
R^2	0.4729	0.4859
No. of Observations	48	

[§] Statistical significance is reported at the 1% (***), 5% (**), and 10% (*) levels.

[‡] Percent of adult TANF recipients with 9 years of education or less.

able to accommodate these individuals more easily. Again, these hypotheses are hard to prove given the nature of this analysis, leaving some room for future research.¹² The labor market conditions in neighboring states show the expected sign but are not statistically significant.¹³

The models using percent of families with earnings including all additional control variables show very similar results but suffer from the same caveats mentioned in the previous section.¹⁴

5 Conclusion

Marginal tax rates, like any other tax rate, act as mechanisms that can potentially discourage individuals to work additional time in order to earn some additional income. However, marginal taxes are not limited to those stipulated by the tax codes, especially for low-and-middle income families who are subject to some exemptions and may believe that none of their income is being taxed. In fact, when these families participate in welfare and some other government social programs they may be subject to very high tax rates- depending on which and how many programs they participate in- as their earnings from work increase and their benefits decrease.

Since they are not stipulated in any tax code or schedule, these tax rates are “implicitly” imposed on low-income individuals. As individuals start earning wages, their benefits start being phased out and a great part of what was disposable income before gets taxed away. In other words, the spendable income decreases, affecting the real purchasing power of welfare recipients.

Consequently, more and more welfare recipients may be discouraged from looking to add

¹²One argument may be that the model also needs to control for the impact of work requirements set by TANF. This vary across states and are not captured by the IMTR. However, this variation is small in the sense that the work hour requirement is usually 20, 30, or 35 hours per week. I run the model including a dummy variable describing strict requirements if states require more than 30 hours per week after accounting for education allowance, and lose if less. The results do not change and the p-value for IMTRs remains just slightly above 0.10. These results are available from the author upon request.

¹³An additional check was pursued correcting for possible spatial dependence in the error term and results suggest that there is no statistical evidence of such dependence.

¹⁴Again, these results are available from the author upon request.

more working hours to their week, decreasing their overall labor force participation rate. This situation worsens as individuals participate in more benefit programs. Current data suggests that individuals participate in 2 or 3 of the programs available (TANF, SNAP, and Medicaid). In many states this does not only generate high implicit marginal tax rates but also creates a disincentive to work. This problem can be exacerbated if individuals participate in other programs as well. If the welfare participation of these families does not change, not all states will experience huge implicit tax rates. Figure 3.2 showed that in some states some of the implicit marginal tax rates are negative. Nonetheless, participating in more programs will give a totally different picture.

This, of course, is without counting the implications of losing the benefits of Medicaid, which is not counted for this calculation, but it is highly regarded by this group of individuals. Future analysis and research can include the implementation of the health care reform recently signed in to law in 2010.

At the state level, the results have important implications given the effect of this implicit taxation on the labor force participation rates of welfare beneficiaries. I have shown that even after the welfare reform, some states continue providing these individuals with disincentives to find work. Moreover, the results show that under weak monitoring systems, as welfare recipients start their transition into the labor market, the most influential IMTRs are the ones that result from increasing the working hours from 0 to 10 per week. However, according to the data stricter work requirements may serve as a mechanism to avoid such disincentives.

On average, states with higher implicit marginal tax rates have lower work participation rates from welfare recipients, even when accounting for labor opportunities in neighboring jurisdictions. Furthermore, these disincentives, on average, appear to change work participation rates by as much as 8.50%, which is no small effect. The disincentives can drive welfare recipients away from self-sufficiency and instead make them depend on welfare for as long as they are allowed. As a consequence, states may be losing potential workers while also having to keep supporting them financially.

The results presented here use simulated marginal tax rates and aggregated data in order to show the effect of state program rules on the states' effort to motivate more LMI individuals to work. A more detailed analysis of labor supply decisions of welfare recipients require individual-level data including program participation, benefit amounts, family living expenses such as rent, transportation, and net child care expenditures, as well as time under welfare since this may constitute an important determinant of labor supply. This provides an avenue for future research that can give a better understanding on how the individual welfare recipients- not just an aggregated group- behave when facing such disincentives. This includes the understanding of how structural models are not perfect in establishing how some variable influence others.

Chapter 4

Yardstick Competition, Politics, and The 1996 U.S. Welfare Reform

1 Introduction

In 1996, the United States passed the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) which, among other things, gave states freedom to regulate public welfare spending individually under a new set of federal guidelines. This act allowed states to set benefit levels and time limits at their own discretion. It has been found that even before the 1996's reform, when state benefit levels were strictly determined by federal regulations with relatively little influence from state governments, states' spending policies appeared to be influenced by the spending policies of their neighboring states (Baicker, 2005b; Case, Rosen and Hines Jr., 1993).¹ These results are often interpreted as measuring government competition. Accordingly, increased state autonomy in setting welfare expenditure levels should result in states exhibiting a greater degree of spatial dependence. However, spending policy outcomes are subject to political processes and the consensus of policymakers. Consequently, the political structure of each state may influence the type and strength of spatial

¹See Case, Rosen and Hines Jr. (1993) for a brief analysis on how different types of expenditures may lead to different results for the spatial correlation coefficient.

dependence among states.

This chapter uses a two-regime spatial econometric model to test for the strength of spatial dependence between states' welfare expenditures under several political structures. I find that spatial dependence among state governments differs between states under politically unified governments and those under coalition governments. In particular, I find that unified governments do not engage in welfare spending competition while divided governments do. Moreover, I find that the degree of spatial dependence, given the political structure of the state, is different when analyzing the pre-and-post reform periods. Contrary to what may be expected from increased decentralization, after the welfare reform there is less evidence of spatial dependence (or government competition) among states. This evidence suggests that the welfare reform not only brought administrative changes, but also fiscal changes, especially in the way state governments interact when more of their own resources are at stake.

In this chapter I also calculate the correct marginal effects for the control variables used in most panel-data analyses of fiscal policy competition. These effects differ from the standard regression interpretation of coefficient estimates. Models that contain spatial lags of the dependent variable must account for the fact that changes to an explanatory variable in a given region can potentially affect the dependent variable in all regions through changes to its own dependent variable. This marginal effects account for interactions among higher order neighbors.

Strategic interaction among governments can be explained by different theories, depending on the interaction channel assumed (preferences, constraints and expectations) (Revelli, 2005b). In the case of fiscal and yardstick competition, two different reasons may be defined. An "exit" argument suggests that individuals will leave or migrate to states where their preference for public goods is better met. A "voice" argument says that citizens will voice their opinions through their votes, and these depend on what they observe in other jurisdictions. Either way, politicians value those votes, leading them react to what their

counterparts are doing in neighboring jurisdictions. Tiebout (1956), for instance, suggested that spatial spillovers emerge as governments compete for resources by trying to attract citizens based on preferences for public goods provision. Others find that re-election concerns result in political ‘yardstick competition’ (Case, 1993; Besley and Case, 1995). If states’ spending is closely related to population mobility, this provides evidence that government competition fits the model of sorting based on public good provision. If true, this has economic and political implications as states may set welfare benefits based on the benefit levels in other states, to an extent that they may end up in what is commonly called a “race to the bottom.”²

In any case, state interdependence can be affected by the political structure of the legislative and executive bodies. Under the conjecture that political leaders are often judged by what has been done in other jurisdictions, either by the threat of re-election or migration, different politicians may respond to neighboring states’ policies differently. State governors that seek reelection adopt different fiscal spending strategies than those who do not, and these strategies appear to be influenced by policies adopted in surrounding states (Besley and Case, 1995). For the case of welfare spending, fiscal interaction and political structure may help us understand the source of such interdependence. Democrat leaders, for instance, may be more worried about migration since many welfare recipients tend to adopt liberal redistributive philosophies. Having those votes becomes crucial for these leaders. On the other hand, the voice argument can be better supported when there is no established control of the government, and politicians will care about capturing as many votes as possible. That could be the case when governments are divided.

Out of the fifteen states with legislative term limits, only eight have lifetime bans. The other nine have limits on the consecutive number of years in which a legislator can serve in a particular chamber. This does not limit an incumbent from running for election to

²See Albert and Catlin (2002) for a comprehensive analysis of state benefit levels under the hypothesis that state competition puts downward pressure on state benefits in fear that these levels may seem relatively generous compared to other states. They find that strategic interaction in benefit-setting does exist, but has not intensified under the welfare reform.

the other chamber, where the clock resets (NCSL, 2009). Loose limits in the legislature makes it harder to determine whether running or not running for reelection matters for fiscal policy setting, given that the majority of the political leaders who influence fiscal policy have the a continuous chance to run for reelection. This does not mean that reelection opportunities do not matter for fiscal policy competition, however, but it does prompt a search for other political instances in which reelection may matter more. Similarly, under what conditions migration can be more influential. Previous empirical work using U.S. data on state and local government for pre-1996 reform periods has found support for both the Tiebout and the yardstick competition hypotheses. Yet these results are worth examining for the period marked by the reform, given that significant changes were implemented, including the increased autonomy and responsibilities of each state government, which would lead us to think that a race to the bottom based on migration could have gained importance.

The autonomy gained through a federal block-grant system created by the 1996 reform is contingent on certain federal regulations. First, an individual cannot receive means-tested cash benefits for more than 60 months during their lifetime. Further, states must (1) impose strict work requirements for the majority of recipients, (2) increase regulation on child care provision and (3) engage in better monitoring of child support payments. The reform also imposes restrictions on welfare participation of illegal immigrants. Finally, no more than fifteen percent of the grants may be used for administrative expenses. States are allowed to set up their own benefit structures, but are subject to a lump-sum grant scheme in which states are required to contribute most of the funds in order to receive the corresponding grants from the federal government. Shorter time limits, maximum benefit levels, and benefit reduction rates are all states' responsibilities.

I combine pre-and-post-reform data on state and local public welfare expenditures with measures of political government structures based on partisan majorities in order to determine the effect of political control on the degree of spatial dependence and state competition before and after the welfare reform bill. Previous results use pre-reform data and may not

fully capture the process of state competition given the federal-entitlement system of the time. Furthermore, while some analysis has focused on the impact of political structures on government competition for certain European countries, the channels through which local fiscal policies interact in the United States are often different from those in Europe, as many of the European nations have parliamentary systems. This, coupled with the enactment of a major welfare spending reform, presents an excellent opportunity to measure the effects of political settings before and after the reform in the United States, which to my knowledge has not been done before.

This chapter contributes to the literature by examining alternative political determinants of fiscal policy competition in the United States using a two-regime spatial econometric analysis.³ I use panel data on per capita state welfare spending from 1987 to 2006, and calculate the degree of spatial interactions among states with different political structures, as well as the true marginal effects of the explanatory variables used in both the one-and-two regime spatial autoregressive models of government competition. With the exception of Case, Rosen and Hines Jr. (1993), these effects have been largely ignored by the recent literature on political competition and have not been fully developed for models with two regimes. The time period for this data set captures the changes created by the 1996 reform, providing a unique opportunity to study the behavior of state governments under increased decentralization. The two-regime model in this chapter, which differentiates between unified and divided governments, provides evidence of political yardstick competition based on the partisan structure of state governments. I find that unified governments do not engage in welfare spending competition while divided governments do. These results are less evident for after the enactment of the welfare reform bill. I also find that the degree of welfare spending competition between states is not only sensitive to government structure, but also

³Identification of yardstick competition presents a challenge to the empirical implementation of reaction functions. According to Revelli (2005b), reduced-form models may not be able to determine whether spatial auto-correlation is simply due to spillovers from commonly experienced shocks, or the existence of strategic interactions among incumbent governments. He suggests that some of the identification may be achieved if additional constraints are imposed on these local governments- including local party competition and ideological complexion.

to the party that holds the majority of seats. When using migration flow matrices, the results on the degree of spatial autocorrelation for states' welfare spending are inconclusive, providing little support for the "exit" argument based on migration patterns.

The remainder of the chapter is organized in 4 sections. Section 2 reviews the literature, section 3 describes the methodology and data, and section 4 discusses the results. Section 5 concludes.

2 Background

Several studies have pointed out the importance of accounting for spatial dependence when examining local fiscal policies.⁴ Tiebout (1956) and Wildasin (1988) argued that in the long-run individuals will sort themselves out based on local provision of public goods and tax policies. As a result, one may predict that jurisdictions will engage in fiscal competition to attract resources. Besley and Case (1995), however, developed a model in which elected officials compete with officials from other locales based on the assumption that voters judge their political leaders by comparing them to the leaders from other jurisdictions. If this were true, fiscal decisions would exhibit spatial dependence in the sense that they are partly influenced by fiscal decisions elsewhere. Brown and Oats (1987); Borjas and Hilton (1996); and Baicker (2005a) find that states tend to determine welfare benefit levels strategically based on potential for interstate migration and federal grants. Political yardstick competition then suggests that fiscal policy dependence is closely related to political processes rather than the sorting of individuals as a result of public goods provision.

Besley and Case (1995) tested the political competition hypothesis and found that fiscal interaction between states during 1960 to 1988 was strongly determined by the incumbent's opportunity of reelection. In 1993, Case, Rosen, and Hines further explored the political yardstick competition hypothesis and found that after controlling for state and year fixed

⁴Federico Revelli has paid particular attention to the subject. See Revelli (2001, 2002a,b, 2003, 2005a) for a comprehensive review of several issues in testing spatial interaction.

effects, per capita expenditures in the U.S. states are not only positively influenced by per capita spending in neighboring states but also tightly related to political processes. Additionally, they found that the degree of spatial dependence is greater when neighborliness is defined by demographic characteristics (e.g. the percent of black population or states with similar income levels). Baicker (2005b) found stronger support for fiscal competition motivated by migration between states rather than political processes. Baicker (2005b) used instrumental variables with a migration-based weight matrix to elaborate on the work of Case, Rosen and Hines Jr. (1993) and finds that fiscal government competition is more sensitive to measures of in-migration. Vermeir and Heyndels (2006) find evidence of political yardstick competition among Flemish municipal tax rates. They find that incumbents tend to be punished for raising tax rates.

State competition based on welfare benefits has been extensively studied. Previous work finds evidence supporting the idea that states' welfare spending is positively related to neighbors' spending. Saavedra (2000) and Wheaton (2000) found that spillovers from welfare competitions are positive and significant. Figlio, Kolpin and Reid (1999) estimate migration-based spatial spillovers using welfare benefits data for the U.S. states and find larger responses to neighbors' decreases than neighbors' increases. Brueckner (2003) reviews some of the literature on government interaction. He points out that positive spatial autocorrelations are not enough to determine whether state interdependence describes the sorting of resources, or are the result of yardstick competition. He also discusses the econometric issues involved with these types of models.⁵ More recently, Revelli (2008) links part of the competition and incumbency literature to the performance of local governments. He analyzes the role of media networks in spreading information, a key player in models of yardstick competition, about local taxation and public service provision practice.

Elhorst and Fréret (2009) introduce a political sensitivity model to distinguish between political-based and migration-based spillovers. They use a two-regime Spatial Durbin model

⁵See Brueckner (2000) and Brueckner (2003) for more in depth discussions of welfare spatial spillover literature.

and find that French departmental governments exhibit larger degrees of sensitiveness to fiscal policy changes in neighboring departments when council presidents have low political support (measured as the percentage of supporting seats). Their findings suggest that spillovers found for public welfare expenditures in French departments are due to political yardstick competition rather than migration flows. Solé-Ollé (2003) examines yardstick competition under single party majority and coalition governments using tax data for Spain. Other studies highlighting the importance of political yardstick competition in other European countries include Schaltegger and Kttel (2002), and Revelli (2006).

I use the methodology in Elhorst and Fréret (2009) to analyze the nature of spatial spatial dependence for public welfare expenditures in United States. Instead of using data on opportunity for reelection, I study political yardstick competition by conditioning states' welfare spending on political party controls. While state spending depends on a wide variety of factors, there is an increasing concern among researchers about issues associated with legislative outcomes under divided and unified governments. For quite some time, both economists and political scientists have studied the impact of political constraints policy outcomes, including fiscal policy. Kernell (1991) argues that under a divided government legislation becomes a product of a bargaining process that can easily delay processes of policy change and result in political gridlock.

Niskanen (2006) argues that divided governments are not necessarily bad, given that such gridlock will act as a constraint on government growth, as legislatures struggle to agree on fiscal and budgetary issues. Others, however, do not find sufficient evidence of gridlock under divided governments (Meyhew, 1991; Jones, 1995). Yet, it has been found that divided governments do affect the legislative process (Edwards, Barrett and Peake, 1997), so that it should be included in models of political competition. The two-regime model helps in differentiating between the degrees of spatial autocorrelation for unified and divided governments.

Fiscal outcomes are also affected by party controls. Alt and Lowry (1994) found that

combinations of party and institutional controls help explain the persistence of state-level budget deficits and other fiscal problems. Additionally, it has been found that left-wing majority parties spend a little more than their counterparts, especially when the composition of the ruling party remains unchanged over a long time period (Blais, Blake and Dion, 1993). Finally, Geys and Vermeir (2008) relate partisan importance to models of yardstick competition by creating a theoretical model in which politicians' response to policies in neighboring jurisdiction are subject to the political party affiliation of each jurisdiction's leader. Consequently, it is reasonable to assume that political parties also influence the level or degree of state spending competition.

3 Data and Methodology

3.1 Empirical Methodology

This analysis uses spatial econometric techniques to measure how state governments respond to changes in neighboring states' spending. The dependent variable is taken to be linearly correlated to its spatial lag and other controls. Through maximum likelihood estimation, I analyze the political competition among states' total welfare spending in the United States.⁶ Among other programs, total welfare spending includes several assistance programs such as housing, foodstamps, Women and Infant Care (WIC), and Temporary Aid for Needy Families (TANF). This study differs from previous work in that it uses data for the years before and after the 1996 Welfare Reform. Even though states are still constrained by some federal regulations, the welfare reform of 1996 gave states the flexibility to manage their programs independently. This allows me to examine government spending behavior across state governments in the absence of strict federal influence.

In addition to using data to compare the pre-and-post-reform periods, I extend the

⁶see Baicker (2001, 2005b) for an instrumental variable approach also used to solve possible endogeneity. ML is an alternative method to solve it.

traditional spatial regression used by others to a two-regime model in which the degree of interaction among states depends on the political structure of the state government. Similar to the study by Elhorst and Fréret (2009) for political yardstick competition in France, I use a conditional spatial autocorrelation model to test whether political competition in the United States depends on the political organization of state governments at any given year. Following LeSage and Pace (2009), I also calculate the true marginal effects estimates for the set of controls specified in the model. LeSage and Pace (2009) point out that in the presence of spatial dependence, the coefficients of the independent variables are not the true marginal effects. These must be calculated separately. This analysis begins with the original one-regime spatial autocorrelation model as a benchmark, which I then compare to the two-regime specification. Finally, I compare the marginal effect estimates for the two models.

One-regime Specification

The estimation follows the methodology used in some of the previous literature, estimating the usual spatial autocorrelation model with a geographical weight matrix of the 48 lower states that accounts for the influence of contiguous neighboring states only. Controlling for space and time fixed effects, the model can be written as

$$y_{it} = \rho \sum_{j=1}^N w_{ij} y_{jt} + \sum_{r=1}^k x_{itr} \beta_r + \sum_{r=1}^k \sum_{j=1}^N w_{ij} x_{jtr} \theta_r + \alpha + u_i + \gamma_t + \varepsilon_{it} \quad (4.1)$$

where $i = 1 \dots N$ ($N = 48$), t is a time index where $t = 1 \dots T$, x_{itr} is one of k independent variables, and ε represents the idiosyncratic term ($\varepsilon \sim \text{MVN}(0, \sigma^2 I_n)$). The term $\sum_{j=1}^N w_{ij} y_{jt}$ is the spatial lag of the dependent variable, and it is a linear combination of the values of y that correspond to the neighbors of region i . For our purpose, W has been constructed as an $N \times N$ row-normalized spatial weight matrix in which only a region's immediate neighbors carry a weight and each neighbor is equally weighted. Finally, note that equation

(4.1) above describes a Spatial Durbin Model (SDM) that includes spatially-lagged control variables and spatial (u_i) and time (γ_t) fixed effects.⁷ LeSage and Pace (2009) justify the use of SDM models, with spatially lagged control variables, by arguing that omitted variables in a spatial autoregressive process may be spatially correlated, as well as with the covariates in the model. If this is true, results from the autoregressive process will be biased.⁸

Additionally, as mentioned by Elhorst and Fréret (2009), the inclusion of these spatially weighted control variables that account for the omission of variables, space fixed effects that control for unobserved group characteristics, and time-fixed effects that can be seen as a replacement for spatial error correlation, we can make sure that the model does not suffer from the identification problem pointed by Manski (1993). Likelihood ratio tests favor the use of the SDM model over the Spatial Autoregressive Model (SAR) for these data.⁹ Spatial and time-period fixed effects control for place-and-time-specific variations resulting from additional variable omission not captured in traditional cross-sectional work. Ignoring these effects in panel-data analysis may also lead to biased estimates (Baltagi, 2005; Elhorst and Fréret, 2009).¹⁰ Likelihood ratio tests for this specific data set support the use of the SDM model and the inclusion of two-way fixed effects. An LR test with a value of 101.18 (p-value<0.001) reject the use of the SAR model in favor of the SDM model, while an LR of 875.86 (p-value<0.001) rejects the use of SDM model without the fixed effects. Given the ongoing discussion about the pros and cons of including spatial fixed effects, I follow Elhorst and Fréret (2009) and test for the alternative of a random effects model using both Hausman and LR tests. Both tests suggest the use of the fixed effects model.¹¹

⁷See Elhorst (2003) for an explanation of spatial panel-data estimations and the treatment of the intercepts under Maximum Likelihood estimation

⁸See LeSage and Pace (2009) pages 29 and 30, and 157-163. *Introduction to Spatial Econometrics*.

⁹SAR does not include the spatial lags of the control variables. Only the spatially-lagged dependent variable.

¹⁰Previous literature, including Baicker (2005b), Case, Rosen and Hines Jr. (1993), and Elhorst and Fréret (2009), provide justification for time and space fixed effects.

¹¹The LR test has a value of 622.93 with 1 degree of freedom and p-value<0.001. The Hausman test yields a value of -158.19, 19 degrees of freedom, and p-value<0.001. Partridge (2005) points out that Hausman test results should be interpreted with caution, then in this case it is used to reinforce the results of the LR test.

Using the SDM model as the true model, we can use matrix notation to re-write equation (4.1) in such a way that we account for all T cross-sections of N observations as follows

$$Y = W_T Y \rho + X\beta + W_T X\theta + U + \Gamma + \varepsilon \quad (4.2)$$

where $Y = (y'_1, \dots, y'_T)'$, $y_t = (y_{1t}, \dots, y_{Nt})'$ is the $N \times 1$ vector of observations for the t^{th} time period, $X = (x'_1, \dots, x'_T)'$ so that x_t denotes the $N \times k$ matrix of non-stochastic regressors at time t , and $W_T = I_T \otimes W$. U and Γ are vectors of space and time fixed effects respectively. As noted, W is a $N \times N$ contiguity matrix that is constant over time. Hence, we can write the data generating process as

$$Y = (I_{NT} - \rho W_T)^{-1}(X\beta + W_T X\theta + U + \Gamma + \varepsilon) \quad (4.3)$$

where ρ measures the degree of spatial dependence in the dependent variable (state's welfare expenditure) and $\varepsilon \sim MVN(0, \sigma^2 I_N)$. We can further simplify the DGP in (4.3) such that

$$Y = P^{-1}[\alpha + X\beta + W_T X\theta + U + \Gamma + \varepsilon] \quad (4.4)$$

where P is an $NT \times NT$ matrix with $(I_N - \rho W)$ in the main diagonal. Assuming that there is no intertemporal dependence, the matrix of marginal effects for changes in the X_r variable at time t is given by $(I_N - \rho W)^{-1}(I_N \beta_r + W \theta_r)$.¹² The diagonal elements of this matrix are the effects on region i from changing X_r on that same region at time t (and these are the same for all t 's). In the presence of spatial dependence, these “own-partial derivatives” account for higher-order neighbor effects (LeSage and Pace, 2009). This follows from the fact that $(I_N - \rho W)^{-1} = (I_N + \rho W + \rho^2 W^2 + \rho^3 W^3 + \rho^4 W^4 + \dots + \rho^\infty W^\infty)$, which tells us that in the model above the expected value of each y_{it} will depend on the mean values of the right hand side variables plus a linear combination of values of neighboring regions scaled by ρ .

¹²See Appendix for full derivation.

The infinite series expansion shows the cumulative effects. In other words, how if a region is influenced by its neighbors, and those neighbors are also influenced by their neighbors, then every region is also influenced by higher-order neighbors. Similarly, the off-diagonals of this matrix represent cross-partial derivatives of y_i with respect to changes in the x_r variable in region j at time t .

While this matrix is very informative for specific analysis, it complicates the task of interpreting the parameter estimates. I follow LeSage and Pace (2009) and calculate comprehensive measures of these effects by averaging them to provide scalar measures. The ‘direct’ effects are defined as the average of the diagonal elements of $(I_N - \rho W)^{-1}(I_N \beta_r + W \theta_r)$.¹³ The ‘total’ effects are obtained by averaging the sum of the rows, and the ‘indirect’ effects are given by the difference between the ‘total’ and ‘direct’ effects. The parameters $\hat{\rho}$, $\hat{\beta}$, and $\hat{\theta}$ for this panel analysis are estimated via maximum likelihood as described by Elhorst (2003).

Two-regime Specification

The two-regime estimation divides the spatial correlation coefficients into two components. One for states that have unified governments and one for states with divided governments. As mentioned previously, this extends the single-regime model above by using the model described by Elhorst and Fréret (2009) and is applied to the political state government structure in the United States. The model in matrix notation is

$$Y_t = \rho_1 D_t W Y_t + \rho_2 (I_N - D_t) W Y_t + X_t \beta + W X_t \theta + U + \Gamma + \varepsilon \quad (4.5)$$

for the SDM specification, and

$$Y_t = \rho_1 D_t W Y_t + \rho_2 (I_N - D_t) W Y_t + X_t \beta + U + \Gamma + \varepsilon \quad (4.6)$$

¹³Although not reported, the spatial and time fixed effects are also influenced by the degree of spatial autocorrelation ρ .

for the SAR specification. In this case D_t represents the $N \times N$ matrix with diagonal elements equal to the values corresponding to each state's regime status. For instance, if at a given year (t) Alabama has a unified government, the element that corresponds to the first row and first column of D_t will take the value of 1 and the value 0 if its government is divided. I define divided and unified governments in the following section. Thus, ρ_1 measures the impact of neighbors for those states that have a unified government, while ρ_2 does it for those with a divided government for a given time period. Note that D_t varies over time as a state government may be unified one year but divided in the next, depending on the political cycle. Likelihood ratio tests results of 78.96 (9 degrees of freedom and p-value < 0.001) suggest that for the two-regime specification the SDM model is also preferred to the SAR model, after controlling for all the explanatory variables commonly used in the most of the previous literature. Further LR tests (1,062.67 with 68 dof and p-value < 0.001) reject the use of the SDM model with out controls for space and time-specific effects.

Let $W_1^t = D_t W$ and $W_2^t = (I_N - D_t)W$ so that the data generating process (DGP) of the double-regime model in equation (4.5) can be written as

$$\begin{aligned} Y_t &= \rho_1 W_1^t Y_t + \rho_2 W_2^t Y_t + X_t \beta + W X_t \theta + U + \Gamma + \varepsilon \\ &= (I_N - \rho_1 W_1^t - \rho_2 W_2^t)^{-1} (X_t \beta + W X_t \theta + U + \Gamma + \varepsilon) \end{aligned} \quad (4.7)$$

Again, X is an $NT \times R$ matrix of control variables, U and Γ are matrices of spatial and time fixed effects, and ε is the vector of idiosyncratic components. Similar to the model with one spatial correlation coefficient, this model is also estimated through maximum likelihood using spatial and time-period fixed effects. Assuming that the errors are normally distributed

($\varepsilon \sim MVN(0, \sigma^2)$), the concentrated log-likelihood function of the two-regime model is

$$\begin{aligned} \ln L = & -\frac{NT}{2} \ln 2\pi\sigma^2 + \sum_{t=1}^T \ln |I_N - \rho_1 D_t W - \rho_2 (I_N - D_t W)| - \frac{1}{2\sigma^2} \sum_{i=1}^N \sum_{t=1}^T \left[y_{it}^* \right. \\ & \left. - \rho_1 d_{it} \sum_{j=1}^N w_{ij} y_{jt}^* - \rho_2 (1 - d_{it}) \sum_{j=1}^N w_{ij} y_{jt}^* - x_{it}^* \beta - \sum_{j=1}^N w_{ij} x_{jt}^* \theta \right]^2 \end{aligned} \quad (4.8)$$

in which $\sum_{t=1}^T \ln |I_N - \rho_1 D_t W - \rho_2 (I_N - D_t W)|$ represents the Jacobian matrix of the transformation from ε to y , and the terms accompanied with a star denote the demeaned transformation of those variables (Baltagi, 2005). Using the first-order conditions from the untransformed likelihood function allows us to solve for α , u_i , and γ_t , and use these solutions back into the log-likelihood function to then find the concentrated log-likelihood function above to estimate β , ρ_1 , ρ_2 , θ , and σ_2 .¹⁴ The total, direct, and indirect effects for this model are found by taking the partial derivatives of the reduced model in equation (4.7). This time, however, because we have two regimes and both W_1^t and W_2^t vary with respect to the specific regime at time t , the elements of the main diagonal of P will differ from time to time.¹⁵ This implies that, contrary to the one-regime case, partial derivatives are not identical for each time period even if the assumption of constant parameters is kept.

Let $S_r^t(W) = (I_N - \rho_1 W_1^t - \rho_2 W_2^t)^{-1} (I_N \beta_r + W \theta_r)$ be the matrix of marginal effects from changes in variable X_r at time t derived from the two-regime model specification.¹⁶ Just as before, I calculate comprehensive measures of the marginal-effect estimates (direct, indirect, total) by using estimated parameters of β , θ , ρ_1 , and ρ_2 from the maximum likelihood estimation. Once again, these parameters are assumed to be constant through time. Since the averages for the total, direct, and indirect effects are scalar measures computed for each point in time, I find a more comprehensive measure by averaging those scalars over all time

¹⁴See Elhorst (2003) and Elhorst and Fréret (2009) for a complete mathematical solution of the concentrated maximum likelihood estimation.

¹⁵See Appendix for full derivation.

¹⁶An alternative model could further develop a more elaborate SDM model in which the spatial lags of the independent variables also depend on the two different regimes. I am not concerned with the estimation of such model but it may be an avenue for future research.

periods.

Using the calculation of marginal effects above, we get $\widehat{S}_r^t(W) = (I_N - \hat{\rho}_1 W_1^t - \hat{\rho}_2 W_2^t)^{-1} (I_N \hat{\beta}_r + W \hat{\theta}_r)$ where the parameter estimates are obtained from the estimation of the concentrated log-likelihood. Additionally, let $\widehat{S}_r^t(W)_{direct}$ be a scalar obtained from averaging the diagonal elements of the $N \times N$ matrix $\widehat{S}_r^t(W)$, $\widehat{S}_r^t(W)_{total}$ be the sum of the rows in $\widehat{S}_r^t(W)$ averaged over the number of regions in each cross-section, and $\widehat{S}_r^t(W)_{indirect}$ be a scalar defined by the difference between the total and direct effect estimates for changes in variable X_r in time t . Then, the average ‘direct’ estimate derived from changes in X_r is given by $\frac{1}{T} \sum_{t=1}^T \widehat{S}_r^t(W)_{direct}$.

$$S(W)_{direct} = \begin{pmatrix} \widehat{S}_1^1(W)_{direct} & \widehat{S}_2^1(W)_{direct} & \dots & \widehat{S}_R^1(W)_{direct} \\ \widehat{S}_1^2(W)_{direct} & \widehat{S}_2^2(W)_{direct} & \dots & \widehat{S}_R^2(W)_{direct} \\ \vdots & \vdots & \ddots & \vdots \\ \widehat{S}_1^T(W)_{direct} & \widehat{S}_2^T(W)_{direct} & \dots & \widehat{S}_R^T(W)_{direct} \end{pmatrix} \quad (4.9)$$

I compute the comprehensive measures of the total and indirect effects using the same methodology. It is important to note that the reported estimates for such effects are produced after simulating the parameters through the maximum likelihood multivariate normal parameter distribution and the analytical Hessian approach described by LeSage and Pace (2009) using the information matrix. Means (averages), standard deviations, and t-statistics are constructed from 1,000 simulated draws.

3.2 Data Description

In my analysis I use longitudinal data from the Survey of Government Finances (SGF) for total public welfare spending during the 1987 through 2006 period. These data are collected for all of the lower 48 states in the United States and do not include the District of Columbia. The SGF defines public welfare spending as,

“[The] support of and assistance to needy persons contingent upon their need. Excludes pensions to former employees and other benefits not contingent on need. Expenditures under this heading include: Cash assistance paid directly to needy persons under the categorical programs (Old Age Assistance, Temporary Assistance for Needy Families (TANF)) and under any other welfare programs; Vendor payments made directly to private purveyors for medical care, burials, and other commodities and services provided under welfare programs; and provision and operation by the government of welfare institutions. Other public welfare includes payments to other governments for welfare purposes, amounts for administration, support of private welfare agencies, and other public welfare services. Health and hospital services provided directly by the government through its own hospitals and health agencies, and any payments to other governments for such purposes are classed under those functional headings rather than here” (SGF, 2009).

Following the previous literature, the control variables include federal grants, tax revenues, population density, percent female population, percent of population that is at least 65 years of age, percent black, per capita income, unemployment rate, and a political dummy variable that takes the value of 1 if the governor is Democrat and 0 otherwise.¹⁷

Federal grants and tax revenues are also obtained from the Survey of Government Finances. Data on income come from the Bureau of Economic Analysis (BEA) and represents the income per capita net of all transfer payments in an attempt to get rid of potential endogeneity problems. Other demographic variables come from the United States Census estimates. Unemployment rates are annual lags in order to correct for endogeneity and simultaneity, and represent seasonally adjusted average rates obtained from the Bureau of Labor Statistics (BLS). Data on the governors’ party come from Dubin (2007). All monetary variables are expressed in natural logs of real (2006=100) per capita dollars.

To classify whether a state government is unified or divided, I use data on legislators’ party affiliation from Dubin (2007). State governments are composed of two branches, the executive and the legislative. States in which one single party holds a majority of each of

¹⁷In order to avoid multicollinearity, percent of female only includes the number of women between the ages of 20 and 64. Poor women outside this range are less likely to receive TANF, and may substitute it for other types of welfare. While this does not take care of the problem entirely, given that within that group there may be African-Americans counted as a separate control, or the fact that unemployment rates may be higher in areas with great concentrations of minority groups, tests suggest that the pair-wise correlation between this variables is not very strong. Alternative model specifications dropping some of these variables do not change the quality of the results.

Table 4.1: Descriptive Statistics: Political Yardstick Competition in U.S. Welfare Spending

Variable	Mean	Std. Dev.	Minimum	Maximum
Public Welfare	\$803.20	308.43	235	2,018
Federal Grants	\$1,077.30	389.17	414	3,816
Tax Revenues	\$1,998.90	456.13	828	4,137
State Per Capita Income	\$26,643.50	5,053.70	15,934	46,898
Population Density	178.79	244.45	4.67	1,165
Percent Female (age 20-64)	29.59	1.07	25.72	31.69
Percent Black	10.53	9.85	0	40.90
Percent age 65 and over	12.92	3.01	8.19	43.01
Percent Unemployed (Lagged)	5.30	1.54	2.24	12.43
Percent Democrat Governor	45.3			
POLITICAL CHARACTERISTICS				
Percent Unified Government	42.2	Percent Divided Government	57.8	
Unified Republican (%)	49.1	Divided Republican Majority (%)	17.1	
Unified Democrat (%)	50.9	Divided Democrat Majority (%)	82.9	
Percent Unified Legislature	74.9	Percent Divided Legislature	25.1	
With Republican Majority (%)	41.0	With Republican Majority (%)	41.5	
With Democrat Majority (%)	59.0	With Democrat Majority (%)	58.5	
Percent Simple Republican Majority	43.8	Percent Simple Democrat Majority	56.2	

Number of years: 20 (1987-2006)

Number of observations: 960

All monetary values are adjusted for inflation (2006=100), in per capita terms.

the two houses of the legislature and the governorship office are considered to be unified. When a party controls only two of the three bodies of government (upper chamber, lower chamber, and Governorship), that state is considered to have a divided government.¹⁸ Under a different specification of political regimes, I relax the conditions on the governorship, and look at the effects of unified versus divided legislatures. Presumably, this provides an idea about the strength and power of the governors. Table 4.1 describes the data. The first part of the table displays the summary statistics for all independent variables before any logarithmic transformations. The first three rows are the per capita averages in real terms, and population density is obtained by averaging the number of persons per square mile in each state.

The lower part of the table provides information about the composition of the political variables analyzed. The sample period (1987-2006) includes data covering more than four political cycles, allowing for a political structure analysis, while also capturing the states' independence obtained after the welfare reform (1996 onwards). State governments are

¹⁸Nebraska has a nonpartisan and unicameral state government. Hence, it is assumed to be unified throughout the entire sample period. I check the robustness of the results by dropping it from the estimation of the models. The results do not change significantly.

classified as divided almost 60 percent of the time. However, of the 555 times in which state governments were divided, the Democratic party controlled two of the three bodies of government 460 times (82.8 percent). The Republican party held control of the government 49.1 percent of the time in which states were governed by a single unified party majority. These percentages are more balanced, although still tilted toward the democrat side, when I relax the governor's restriction and look at the political structure of the legislative branch only. For both cases -unified or divided legislature- Republicans held majority nearly 41 percent of the times, while Democrats did it almost 59 percent of the time.

Looking at simple majorities, in which a party holds majority control of any two of the three bodies examined, Democrats appear to have had control over 56.2 percent of the times whereas Republicans had it 43.8 percent of the times. When splitting the sample by looking at pre-and-post reform, the percentages look similar to those on Table (4.1). During both periods state governments were unified 41.0 to 43.0 percent of the times. However, some differences are noteworthy. The post-reform period (1997-2006) experienced a surge of Republican representation.¹⁹ Governments with two out of the three bodies with Republican majority grew from 33.1 percent during the first period to 50.4 percent after the reform was implemented. In terms of unified versus divided governments, this is important since unified governments with Republican control went from 31.1 percent to 63.7 percent after 1996. Divided governments had the same distribution observed in Table (4.1) during the two periods. Alternatively, divided legislatures also experienced a decline in Democrat control (64.6 percent to 45.4 percent) and a rise of Republican representation (35.4 percent to 54.6 percent).

If leaders associated with the Democrat party cater to the type of voter that receives public welfare, as it is often believed, I suspect that regimes in which there is strong presence of this party would exhibit higher degree of spatial responsiveness since these are votes they

¹⁹The year in which the reform was implemented has been left out of the two-period analysis. This is due to the fact that not all states implemented the changes at the same time. Some started earlier than others, going through a transition process. Hence, in an attempt to fully capture the full effect of the bill, I start the post-reform period with the year 1997.

would like to either preserve or attract.

4 Analysis and Results

4.1 *One vs. Two Regimes*

Table 4.2 shows results obtained for both ordinary least squares (OLS) and spatial regression estimation using the whole sample period.²⁰ The table shows the spatial dependence coefficient and the marginal-effect estimates of state public welfare expenditures when political structure of state governments is not taken into consideration. I find that the degree of spatial dependence (ρ) among states is much smaller than those found by Baicker (2005b) and Case, Rosen and Hines Jr. (1993) in previous studies of the United States. Although the results show some level of political yardstick competition, the coefficient reflecting the reaction to neighbors' spending is very small and not statistically significant.²¹ The results in Table 4.2 also show that once we account for spatial spillovers, the most important determinants of state spending on public welfare are the amount of federal government grants, the number of women with the highest probability to have children, and the unemployment rate from the previous period. The table also shows that the effect of having a Democrat governor becomes positive and statistically irrelevant, suggesting a potential bias in the OLS estimates due to the presence of spatial interrelatedness in political variables. If taxes and migration are associated, it is possible that increases in neighbors' tax revenues may influence own tax revenues, therefore a decline in transfer payments.

²⁰Lagrange Multiplier (LM) tests reveal robust presence of spatial dependency (15.987 and p-value<0.001).

²¹Previous studies for the United States have used levels of real per capita spending rather than the logs. Accordingly, they have used a dollar-for-dollar interpretation of the spatial autocorrelation coefficient. I refrain from such interpretation for two reasons. First, according to LeSage and Pace (2009), maximum likelihood estimation requires that $Z = (I_N - \rho W)$ is non-singular so that its determinant is non-zero. Given that W is symmetric and row-normalized, the compact open interval for $\rho \in (\lambda_{min}^{-1}, \lambda_{max}^{-1})$ will lead to a symmetric positive definite Z . When these symmetric matrices are similar to row-stochastic (e.i. $\lambda_{max} = 1$) the upper bound for ρ becomes 1. Second, I use a log-transformation of real per capita expenditure which would translate into elasticities in a least square estimation. Still, when using expenditure levels in maximum likelihood, a dollar-for-dollar interpretation would imply that a \$1 increase in neighbors' spending cannot affect own spending by more than \$1, when it could feasibly occur.

Table 4.2: OLS and One-regime Results for Public Welfare spending in the United States (1987-2006)

Variable	OLS Results ^a	Spatial Durbin Model with Spatial and Time Fixed Effects ^b		
		Direct	Indirect	Total
PC Federal Grant	0.791*** (32.612)	0.751*** (17.557)	0.051 (0.629)	0.802*** (8.613)
PC Tax Revenue	0.187*** (4.478)	0.045 (0.808)	-0.521*** (-5.813)	-0.476*** (-4.598)
PC Income (NOT) ^c	0.026 (0.424)	0.196 (1.185)	0.432 (1.539)	0.629** (2.244)
Population Density	0.000*** (3.391)	-0.000** (-2.084)	0.005*** (7.203)	0.005*** (6.790)
Percent Female (20-64 y/o)	0.097*** (10.297)	0.066*** (4.296)	0.009*** (3.551)	0.164*** (5.773)
Percent Black	-0.002** (-2.532)	-0.002 (-1.552)	-0.003 (-1.380)	-0.005* (-1.914)
Percent Elderly	0.016*** (6.689)	0.001 (0.492)	-0.001 (-0.330)	-0.000 (-0.116)
Lagged Unemployment Rate	-0.009* (-1.742)	0.013** (2.275)	0.002 (0.243)	0.015** (2.246)
Democrat Governor	-0.039*** (-2.589)	0.009 (1.132)	0.009 (0.565)	0.019 (1.021)
Adjusted R^2	0.683	Log Likelihood		
		ρ		
			829.334	
			0.049	
			(1.104)	
No. of Observations	960		960	
No. of Years	20		20	

^a t-values are in parenthesis

^b Statistical significance: ***1%, **5%, and *10%. For the effects estimates these are calculated from the simulated values obtained using the information matrix

^c NOT: Net of Transfers. All PC (per capita) values are real values in 2006 chained dollars.

The signs on the marginal effects of the other covariates show no particular surprises. States with higher taxes per capita and higher percentages of individuals over 65 years of age tend to spend more on public assistance. These direct effects, however, are very small and not statistically significant. Contrary to previous findings for other expenditures (e.g. total expenditures, highway and education expenditures, etc.), I do not find significant evidence of a correlation between public assistance expenditures and income per capita (see Baicker (2005b); Case, Rosen and Hines Jr. (1993)). Yet the direct effect is positive which would suggest that public welfare assistance in the United States, like in France (Elhorst and Fréret, 2009), may be becoming a normal good. Another plausible explanation is that higher per-capita income allows states to increase their tax base, which can translate into higher public welfare expenditures, consistent with the positive sign of the direct effect of tax revenues.

The effect estimates for the two-regime model are similar to those found under the one-regime specification model with one notable exception. The percent of black becomes statistically significant. While small, the negative coefficient is not consistent with previous results or popular beliefs. I also find that the political composition of the state government *does* affect the degree of spatial dependence among neighboring states. Results for the two-regime model of state welfare spending are in Table 4.3. These data show evidence that divided governments engage in political yardstick competition while unified governments do not. Contrary to the case of unified state governments, the degree of spatial autocorrelation between states with divided governments and their neighbors is positive and statistically significant. These results may seem puzzling if we believe that divided governments often lead to political gridlock and legislation delays. If voters do judge the actions of their political leaders by comparing them to policy outcomes observed from neighboring states, and elected politicians respond by engaging in competition, it should be relatively easier for unified governments, not divided, to engage in competition. Hence, it may be possible that other factors outweigh the potential for gridlock.

Fiscal accountability is more stringent on unified governments than divided governments.

Table 4.3: Two-regime model of Public Welfare spending in the United States (1987-2006): Unified Vs. Divided Government

Spatial Durbin Model with Spatial with 2-way FE ^a			
Variable	Direct ^b	Indirect	Total
PC Federal Grant	0.738*** (17.714)	0.012 (0.150)	0.750*** (8.174)
PC Tax Revenue	0.047 (0.844)	-0.504*** (-5.727)	-0.457*** (-4.605)
PC Income (NOT) ^c	0.194 (1.202)	0.446 (1.625)	0.640** (2.343)
Population Density	-0.001* (-1.859)	0.006*** (7.794)	0.005*** (7.384)
Percent Female (20-64 y/o)	0.069*** (4.477)	0.086*** (3.321)	0.156*** (6.108)
Percent Black	-0.009*** (-3.339)	-0.005 (-1.111)	-0.015*** (-2.798)
Percent Elderly	0.001 (0.711)	-0.001 (-0.336)	-0.000 (-0.037)
Lagged Unemployment Rate	0.014** (2.418)	0.000 (0.011)	0.014** (2.059)
Democrat Governor	0.009 (1.200)	0.008 (0.527)	0.018 (1.036)
Log-Likelihood		832.693	
Unified Government (ρ_1)		-0.065 (-0.873)	
Divided Government (ρ_2)		0.118** (1.996)	

^a t-values are in parenthesis

^b Statistical significance: ***1%, **5%, and *10%. For the effects estimates these are calculated from the simulated values obtained using the information matrix

^c NOT: Net of Transfers. All PC (per capita) values are real values in 2006 chained dollars.

In other words, potential fiscal disasters are attributable to only one party when there is a unified government. Governments under a unified structure may act more fiscally responsible, which may lead them to ignore neighboring actions and focus inward. In divided governments, when there is more than one party to blame for fiscal mismanagement, political leaders may easily deflect responsibility to the other party. Furthermore, politicians in divided governments can have a greater incentive to engage in pork barrel and logrolling activities, as these activities are used to persuade those with different priorities to vote on a favored piece of legislature.²² If true, then the notion of gridlock may not occur to a large extent under divided governments, freeing them to engage in yardstick competition. This effect may be added to the fact that politicians are usually influenced by interest groups that may shape the way they conduct fiscal policy. A final, and plausible, explanation can be attributed to what ?? call the ‘Curly Effect,’ referring to the strategies of James Curley, a mayor of Boston, to stay in office several periods by driving out certain type of voters.

On the other hand, in the cases where incumbency matters for reelection, unified governments may behave in a monopolistic way and not worry about competition. Divided governments are more representative of a diverse constituency, leading them to care more about the next election and the complacency of their swinging voters. If voters then *do* judge their politicians based on what their counterparts in neighboring states do, divided governments are more likely to respond with similar policies and engage in some kind of yardstick competition.

4.2 *Alternative Estimations and the Welfare Reform of 1996*

The results described above indicate that the structural composition of the state government matters when measuring the spatial spillover effects of public welfare spending. However, political yardstick competition may depend on factors other than the political organization of the state’s government. Case, Rosen and Hines Jr. (1993) and Baicker (2005b) suggest

²²See Tullock (1981); Shepsle and Weingast (1981); and Shepsle and Weingast (1994) for a review on logrolling and pure majority rule.

that different types of expenditure may exhibit different levels of spatial dependency, or even the opposite sign. Additionally, if fiscal activity is primarily determined by the legislature, the degree of political competition may be affected by the partisan majority of the legislative branch instead of the whole government. Also, depending on the type of expenditure, it is possible that the nature of the political party (left or right) that holds majority may impact the extent to which states react to their neighbors' fiscal decisions.²³

To explore these alternatives, I estimate the two-regime model using two other regime indices. I elaborate on the findings for unified versus divided governments by looking at the composition and strength of the legislative branch. If ultimate approval of welfare spending policies is largely determined by the state legislature, it is reasonable to isolate the effect of partisan majorities in the legislature on welfare spending. If one party holds the majority of seats in both houses, the state legislature is assumed to be unified and the diagonal element of D_t that corresponds to that state takes the value of 1. Consequently, the state legislature is assumed to be divided if each house is “controlled” by a different political party. This second specification helps us to understand the restrictive power of state governors. If the spatial autocorrelation under divided legislature is larger than under divided government, it is possible to infer that governors play an important role in each state's spending decision, affecting the degree of fiscal reaction. Second, based on the belief that left-wing parties may care more about the type of voter that receives welfare benefits, I test the degree of spatial dependence by comparing Democrat versus Republican majority only. In this case, either party is assumed to hold majority if it controls at least two of the three bodies of government mentioned before. Therefore, a state government is considered Republican if (1) it has a Republican governor and holds majority of one of the two houses, (2) it holds majority in the two houses of congress but not the governorship, and (3) if it controls all three.²⁴

²³Left-wing parties may be more reactive to fiscal policies that affect their particular constituency directly (e.g. welfare assistance and higher redistribution), while right-wing parties may be more concerned with tax policies in neighboring states.

²⁴Nebraska is assumed to be ruled by the governor's party.

Additionally, the welfare reform of 1996 implemented significant changes to the way in which states distributed their benefits. As consequence, I test whether the reform also changed the way politicians respond to fiscal decisions made in neighboring states. I do this by splitting the sample and looking at the spatial correlation coefficients for the pre and post reform periods. Given that the transition to the new system did not occur simultaneously in every state, I drop the year 1996 in order to capture the full implementation of the bill. Consequently, the pre-reform period in my sample goes from 1987 through 1995, and the post-reform one from 1997 through 2006.

Table 4.4 summarizes the results for the two-regime spatial coefficients for all four alternative specifications of political structures analyzed. Although greater, the coefficient of divided legislature is not statistically significant for the whole sample period, partially highlighting the importance of the governor's influence in the degree of spatial dependence or competition. Indeed, the results show that, when looking at the whole sample period, Democrat governors do exhibit positive and significant degrees of spatial dependence in public welfare spending. This is also true when analyzing party majority only. Republicans, on the other hand, do not appear to respond to neighboring welfare expenditure policies.

The welfare reform of 1996, however, does appear to have changed the way in which politicians respond to neighboring welfare policies. The effect of both divided government and divided legislatures loses statistical significance after the bill was implemented. Contrary to what one would expect, the decentralization of the welfare system decreased the level of competition among states. A plausible explanation is that even under the pressure of reelection, policy makers in divided governments are now required to use more of their own resources to fund this type of expenditure. Prior to 1996, the AFDC program was an entitlement program in which state governments received all or most funds from the federal government. Public welfare then was a grant-matching system in which the federal government would contribute through grants, although it would not fund the totality of the program. The reform bill mandated that states should be more responsible for the funding,

changing from a matching to a blocking grant system. This may have influenced the way in which policy makers make use of their own resources. Additionally, these results may suggest that great part of the spatial dependence observed prior to the reform could be explained by states competing to capture rents from the federal government, rather than providing the goods demanded by their constituents.

Table 4.4: Public Welfare Spending Competition among U.S. States: Before and After Welfare Reform

Spatial Durbin Model 2-way FE ^a				
Political Structure	Regime	(1987-2006) Entire Sample	(1987-1995) Pre Reform	(1997-2006) Post Reform
State Government ^b				
	<i>Unified</i> (ρ_1)	-0.0648 (-0.873)	-0.1502 (-1.358)	0.0558 (0.528)
	<i>Divided</i> (ρ_2)	0.1185** (1.996)	0.1839** (2.117)	0.0981 (1.135)
Legislature Composition ^c				
	<i>Unified</i> (ρ_1)	0.0263 (0.500)	0.0189 (0.245)	0.0222 (0.291)
	<i>Divided</i> (ρ_2)	0.1282 (1.375)	0.2338*** (1.894)	0.2363 (1.600)
Party Majority ^d				
	<i>Democrat</i> (ρ_1)	0.1052** (1.779)	0.0843 (1.069)	0.1472 (1.544)
	<i>Republican</i> (ρ_2)	-0.0350 (-0.483)	0.0495 (0.425)	-0.0061 (-0.062)
Governor's Party ^e				
	<i>Democrat</i> (ρ_1)	0.1334** (1.962)	0.0094 (0.100)	0.2714** (2.509)
	<i>Republican</i> (ρ_2)	0.0046 (0.075)	0.1189 (1.264)	-0.0257 (-0.295)

^a t-values are in parenthesis. Statistical significance: ***1%, **5%, and *10%.

^b Considers party majority in all upper house, lower house, and governorship of each state government.

^c Only considers the party majority in the two legislative houses.

^d A party holds majority if it controls two of the three bodies considered in the first specification.

^e Only looks at the power of the governor and its party of affiliation.

Alternatively, table (4.1) showed that after 1996 there has been a surge of Republican representation in both unified and divided governments. Indeed, if Republican politicians care less about votes of welfare recipients, it is reasonable that post-reform political regimes exhibit less significant degrees of welfare spending spatial dependence. Referring back to the exit argument, Republican policy makers may actually benefit in the next election if,

due to the lack of responsiveness, welfare-recipient voters that are more likely to vote for Democrats leave the state (see Peltzman (1984, 1985) for voting preferences of welfare recipients). Democrat governors, on the other hand, do exhibit positive and significant degrees of state competition during the period after the bill was implemented. State governments in which Democrats control at least two of the three government bodies are more influenced by neighbors' spending on welfare assistance.²⁵

It is reasonable to believe that when politicians are being judged according to what is observed in neighboring states, Democratic leaders may feel stronger pressure from low-income voters who are more likely to vote Democrat. For instance, if one state raises its maximum benefit level, surrounding states may lose residents as welfare recipients consider migrating into that state. To compete for these citizens, neighboring states may raise benefits as well (see Rom, Peterson and Scheve Jr. (1998)). The results then support the idea of this being true for Democratic controlled states but not Republican ones. As mentioned above, the Democrat party would be more likely to compete to keep low-income votes. Republicans, on the other hand, may actually gain vote share by not competing with neighboring states and allowing these Democratic voters to move out of state. Thus, a non-response might be optimal for Republicans who may be indifferent to voting decisions of public welfare recipients. This result may not hold true for other kinds of government spending. Following Baicker (2005b) and Case, Rosen and Hines Jr. (1993), I also estimated the degree of spatial dependence under the two-regime model using weight matrices with in-and-out migration flows obtained from the PUMS CPS data. The results for this sample period using such matrix are mixed and inconclusive. I believe that the interpretation of those results requires further investigation on the degree of mobility among welfare recipients.²⁶

Finally, I use an omitted-variable approach to look at the robustness of the results when one or more control variables are dropped. None of the spatial coefficients vary significantly

²⁵These results are almost significant at the 10 percent level.

²⁶see Baicker (2005b) on how to construct more appropriate weight matrices capturing migration flows within a model of fiscal competition.

under different model specifications.²⁷ The biggest change caused by the omission of one single variable is given by the exclusion of the state's share of women from the full model specification. There is an increase in the level of spatial dependence when the control for the population share of women is omitted, reflecting an upward bias in the coefficient. In other words, when the percent of women is kept constant for all states the influence of neighboring states' spending on own spending decreases. This change is consistent across all categories of political composition as well as all three sample periods.

The spatial correlation coefficient is also affected greatly by the inclusion or exclusion of the unemployment rate in the model. Furthermore, the degree of neighboring influence experiences its largest increase when both unemployment and percent female are omitted from the full specification. Thus, we observe lower degrees of political yardstick competition under divided governments when both unemployment and percent of females are held constant across all sample units. This reflects some of the importance of both unemployment benefits and temporary aid for needy families -mostly claimed by single mothers. On the other hand, controlling for the percentage of the population older than 64 years of age does not change the degree of spatial dependence. In other words, although Medicare is one of the largest components of welfare spending and very important to many politicians, the variation of the percentage of Medicare recipients does not provide any observable bias to the degree of political competition. Further investigation and detailed information on specific welfare benefits seem plausible for future research topics.

5 Summary and Conclusions

The degree of government competition in the United States depends on the political structure of the state governments. Using data on state and local public welfare expenditures, I find evidence that unified governments are less likely to be influenced by neighboring governments' spending. Divided governments, on the other hand, do tend to mimic neighboring

²⁷Results are available from the author upon request.

spending decisions. Intuitively, potential for pork barrel and logrolling activities in divided governments may possibly influence the levels of government spending, allowing some politicians to be able to react to their neighbors' spending decision. Moreover, it could be argued that in the absence of complete party accountability, politicians have an incentive to abandon fiscal responsibility, as there is another party to blame. Divided governments may also be subject to a more indecisive group of voters. Hence, politicians may be willing to respond to policies in neighboring states in order to keep their position. I find here that the degree of political yardstick competition for both divided and unified governments appears to be influenced by the inclusion of the state governor as part of the fiscal decision making process.

Furthermore, the results suggest that political parties also influence the level of interstate competition. In the case of public welfare assistance, governments with a Democratic majority exhibit positive and significant spatial dependence with neighbor states' welfare expenditures. One explanation is that given the average political inclinations of low-income welfare recipients, Democrats feel more pressured to keep up with their neighbors' welfare spending decisions. Thus, if divided governments are heavily populated by Democratic politicians it is reasonable to observe high degrees of expenditure spatial spillovers. This results are not always the same. The implementation of the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) in 1996 became a switching point in the way politicians behaved with respect to the welfare spending decisions adopted in neighboring states. An increase in the percent of Republican representatives in state governments around the United States and the fact that states became responsible for part of the funding for welfare expenditures has decreased the level of spatial competition in welfare spending.

Overall, the results support both "exit" and "voice" arguments for political yardstick competition mentioned in the introduction. The pre-reform time period exhibits a greater degree of state interaction with respect to welfare spending in the absence of a government coalition. This result supports the idea that politicians who are concerned about the next election respond to what other states since they may be judged by what constituents observe

elsewhere, the so-called “voice” argument. On the other hand, the results for the post-reform period provide stronger support for the “exit” argument. If politicians are worried about fleeing constituents, and welfare-recipient voters are more likely to support the Democrats, it is reasonable to observe a higher degree of spatial interaction when states have strong representation from the Democrat party, which is the case for that period.

I also calculate the total, direct, and indirect marginal effects being used in some of the new cross-sectional studies with spatial analysis. I find that after controlling for spatial autocorrelation, space and time fixed effects, and the political structure of the state government, grants from the federal government are the main direct determinants of a state’s welfare spending. Tax revenues, on the other hand, affect welfare spending mostly through neighbors. Interestingly, welfare may have become a normal good in the United States. This is similar to the results found by Elhorst and Fréret (2009) for the case of France. This is surprising, given some of the known differences between household preferences for public good provision in the United States and France.

These results suggest that government conditions play an important role when studying interstate government competition. The extent to which political regimes affect other aspects of political yardstick competition is an important topic for future investigation. Although this analysis is limited to studying states’ welfare assistance, this methodology may be applied to other types of government spending, tax competition among states and/or counties, as well as many other applications of government influence on economic development.

Chapter 5

Conclusion

This dissertation addresses the efficacy of government expenditures on higher education and public welfare. In 2006, U.S. state governments allocated nearly 44% of their budgets toward these two areas, making them the largest and most important components of the state expenditures. Both economists and policymakers are often concerned with the efficiency and fairness of such allocation. This has generated controversial debates since some times efficiency is sacrificed in the name of equity and vice versa. As these expenditures continuously appear in each year's states' budgets without evidence of being reduced, this dissertation takes a step back to look at whether these programs are justified on the grounds of achieving their intended outcomes while examining some of their most visible consequences.

In Chapter 2 I examine how merit-based tuition assistance contributes to the retention of graduates in a state. I analyze a restricted-use administrative data set that allows me to determine the impact of merit-based aid in West Virginia (known as the PROMISE Scholarship) on work participation in the state. The results suggest that, after controlling for other factors such as age, sex, degree, and area of concentration, PROMISE graduates to date are not more likely to work in the West Virginia after graduation. After attempting to correct for the selection bias as much as possible, I find that these scholarship recipients are between 1.9 and 5.0 percentage points less likely to work at establishments in the state

than graduates that did not receive the scholarship.

These results reflect the fact that policymakers may induce high-school graduates to remain in the state for college by reducing their tuition costs, but may not retain them as in-state workers given the lack of incentives. Once these graduates have graduated from college, there is no additional incentives that would persuade them to remain in the state. In fact, policymakers should be wary that through this merit-based program they are selecting a group of individuals that is already more mobile given that their aptitudes provide them with a wide variety of work opportunities nationwide.

In chapter 3 I find that, in most states, women that participate in more than one program will be subject to potentially high marginal tax rates creating a disincentive to pursue economic independence. Statistically, I find that states with higher implicit marginal tax rates tend to experience lower work participation rates of households that receive cash benefits from the TANF (Temporary Aid For Needy Families) program.

It is important to note, however, that the Welfare Reform of 1996 has imposed time limits of no more than 60 months of welfare collection over a person's lifetime. This implies that any estimation of the probability of work participation of welfare recipients requires a longitudinal analysis, as people may move in and out of welfare based on the time limit and the tax rates mentioned above. Yet, the results suggest that despite the huge efforts to reform the welfare system in the United States, the adopted reforms have done little to address the problem of providing low-income individuals with the economic incentives to become self-sufficient, rather than simply mandating it through rules.

In chapter 4 I studied some of the consequences associated with the Welfare Reform. Using state spending data from 1987 to 2006, I find that while there exists some degree of spatial interaction among state governments (found in previous studies), the political organization of a state affects the degree of such spatial dependence with regards to fiscal policies. In particular, I find evidence that single party majority governments do not react to neighboring states' welfare spending while divided governments do. Furthermore, on

average, fiscal policy reactions among states appear to depend on what political party holds the majority of the government. Results, however, differ when the sample is partitioned into the pre-and-post reform period. Despite the reform's induced decentralization of the welfare system, the post-reform sample shows lower degrees of fiscal interaction (or competition).

These findings highlight the importance of looking at the effects and consequences of some of the government spending policies, before we even get to the efficiency and equity issues. Policymakers need to understand whether or not their policies and expenditures actually achieve the intended outcomes. In cases in which the outcomes as expected, policymakers should also be aware of the consequences they may inflict upon others.

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Appendix A

Appendix: Spatial Regimes

Single-Regime Model

According to the data generating process described in the methodology section, after re-defining the space and time fixed effects, the marginal effects for the one-regime model can be derived starting from the following reduced form

$$Y = P^{-1}[X\beta + W_T X\theta + U + \Gamma + \varepsilon] \quad (\text{A.1})$$

where

$$P_{NT \times NT} = \begin{pmatrix} (I_N - \rho W) & 0_N & \dots & 0_N \\ 0_N & (I_N - \rho W) & \dots & 0_N \\ \vdots & \vdots & \ddots & \vdots \\ 0_N & 0_N & \dots & (I_N - \rho W) \end{pmatrix} \quad (\text{A.2})$$

In order to facilitate the understanding of the marginal-effect estimates, I use (A.1) and (A.6) and define the model as

$$Y = \sum_{r=1}^R S_r(W)X_r + P^{-1}[U + \Gamma + \varepsilon] \quad (\text{A.3})$$

$$S_r(W) = P^{-1}(I_{NT}\beta_r + W_T\theta_r) \quad (\text{A.4})$$

where X_r represents the r^{th} column of the $NT \times R$ matrix of control variables. Note that P^{-1} is a block matrix of $N \times N$ matrices with inverses of $(I_N - \rho W)$ in the diagonals. This allows for the calculation of the marginal effects in any time period t , as shown by equation (A.5). Assuming that W , β_r , ρ , and θ_r are constant over time, the marginal effects of X_r on Y are identical for all t . Note that this yields an $N \times N$ matrix with changes in each region's welfare spending as a result of changes in the own- region and all other- region's changes of the explanatory variables.

$$\frac{\partial y_t}{\partial x_t^r} = S_r^t(W) = (I_N - \rho W)^{-1}(I_N\beta_r + W\theta_r), \quad t = 1, \dots, T \quad (\text{A.5})$$

In other words, $S_r(W)$ is also a block matrix of $N \times N$ matrices with partial derivatives for each time period in the diagonal and zeros everywhere else. These diagonals are the partial derivatives described in (A.5), which contain the changes caused by changes from the explanatory variable X_r in every region at time t . Hence, $S_r^t(W)$ is an $N \times N$ matrix with partial derivatives obtained from changing the r^{th} explanatory variable in each of the regions at time t . Thus, the elements of $S_r^t(W)$ are given by

$$S_r^t(W)_{N \times N} = \begin{pmatrix} \frac{\partial y_{1t}}{\partial x_{1t}^r} & \frac{\partial y_{1t}}{\partial x_{2t}^r} & \cdots & \frac{\partial y_{1t}}{\partial x_{Nt}^r} \\ \frac{\partial y_{2t}}{\partial x_{1t}^r} & \frac{\partial y_{2t}}{\partial x_{2t}^r} & \cdots & \frac{\partial y_{2t}}{\partial x_{Nt}^r} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{\partial y_{Nt}}{\partial x_{1t}^r} & \cdots & \cdots & \frac{\partial y_{Nt}}{\partial x_{Nt}^r} \end{pmatrix} \quad (\text{A.6})$$

where the change in the dependent variable of region i given a change in variable X_r in region i at time t is given by $S_r^t(W)_{ii} \equiv \frac{\partial y_{it}}{\partial x_{it}^r}$. The set of these “own-partial” derivatives are then aggregated to provide a comprehensive measure of what has been defined by the literature as the ‘direct’ effect. Similarly, $S_r^t(W)_{ij} \equiv \frac{\partial y_{it}}{\partial x_{jt}^r}$, and they are also aggregated to calculate comprehensive measures of ‘indirect’ effects. Assuming that the parameter estimates do not change over time, these effects estimates should stay constant for all time periods as well.

Two-Regime Model

For the case of the two regime model, the analysis is very similar. However, as each regime varies with respect to time, that affects the composition of the P matrix, as well as the calculation of the marginal effects. Using the same procedure, the DGP for the two-regime model can be re-written as

$$Y = P^{-1}[X\beta + W_T X\theta + U + \Gamma + \varepsilon] \quad (\text{A.7})$$

$$P = \begin{pmatrix} (I_N - \rho_1 W_1^1 - \rho_2 W_2^1) & 0_N & \dots & 0_N \\ 0_N & (I_N - \rho_1 W_1^2 - \rho_2 W_2^2) & \dots & 0_N \\ \vdots & \vdots & \ddots & \vdots \\ 0_N & 0_N & \dots & (I_N - \rho_1 W_1^T - \rho_2 W_2^T) \end{pmatrix} \quad (\text{A.8})$$

where W_1^t and W_2^t are defined by the two regimes examined. The inverse of each of the elements of P can be expanded in the same fashion such that the marginal effects include the higher order effects, returning all the cumulative effects. Given that the two regimes are mutually exclusive, we can assume that the two W matrices are additive such that $(I_N - \rho_1 W_1^t - \rho_2 W_2^t) = (I_N - [\rho_1 W_1^t + \rho_2 W_2^t])$. Furthermore, let $[\rho_1 W_1^t + \rho_2 W_2^t] = A$ such that $(I_N - \rho_1 W_1^t - \rho_2 W_2^t)^{-1} = (I_N - A)^{-1}$. Expanding this matrix we obtain $(I_N - A)^{-1} = (I_N + A + A^2 + A^3 \dots A^\infty)$. Thus, the marginal effects for each specific time period are now

given by

$$\frac{\partial y_t}{\partial x_r^t} = S_r^t(W), \quad t = 1, \dots, T \quad (\text{A.9})$$

$$S_r^t(W) = (I_N - A)^{-1}(I_N \beta_r + W \theta_r) \quad (\text{A.10})$$

where all higher order effects and interaction effects are accounted for. Note that the spatial organization of each cross-section (W) is still constant through time. Given the results from (A.8) and (A.10), I define $S_r(W)$ as the block matrix that contains $N \times N$ matrices of partial derivatives in the diagonal. Just as before, these diagonals contain the partial derivatives of the dependent variable (welfare spending) in each region with respect to changes in the X_r variable in each region. As mentioned before, I use maximum likelihood estimation to find the parameter estimates, and use these estimates to calculate effect estimates (direct, indirect, total) for each point in time the same way I did for the one-regime case.