MINIMUM WAGE INCREASES AND CHILD SUPPORT PAYMENTS:
A Secondhand Anti-Poverty Regime

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Abstract

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Background and Purpose: By 2010 in the United States, approximately 11.3 million cases owed over $110 billion in back child support. The accumulated debt from unpaid child support may be due, at least in part, to non-custodial parents' inability to afford it. The setting of order amounts relies on a set of assumptions which may not reflect the reality of low-income, non-custodial parents, like uncertainty in wages and intermittent workforce participation. Even attempts to improve economic conditions for the lowest-wage workers, like a local minimum wage increase, may have uncertain effects on non-custodial parents' earnings and thereby, their ability to pay child support. Could a local minimum wage increase be followed by an alteration in the number of hours worked, earnings, and the amount of child support paid by low-income,

non-custodial parents? Analyzing data from a cohort of low-income, non-custodial parents (NCPs) from 2010 through 2016, comparing those working in jurisdictions with local minimum wage increases (Seattle, Tacoma, and SeaTac) to those working in other areas of Washington state, findings from this study could inform policies to improve the economic outcomes for families that depend on financial support from non-resident parents.

Methods: With Washington State administrative data from 2010 to 2016, I examine over 70,000 low-income NCPs, all of whom have active child support orders around the time of an increase in local minimum wages. As a longitudinal cohort study, I take a difference-in-difference approach to compare parents who worked in jurisdictions subject to local minimum wage increases to those who did not. Using interrupted time-series models with propensity score weighting, I examine outcomes involving hours worked, earnings, and child support payments before and after an increase in a local minimum wage.

Results: NCPs exposed to a local minimum wage increase results in a 5% decline in the chance of having any job in a quarter. They also see a 14-hour reduction in the expected mean number of hours worked per quarter. a drop averaging about 1 hour per week. Even with a small increase in expected mean hourly earnings of $0.05 per hour, NCPs subject to a minimum wage increase experience a decrease in overall expected earnings of $260 per quarter, about a $20 per week decline. Finally, there is a change in predicted percent of child support paid after a minimum wage increase, depending on NCPs' earnings. Those earning less than $2,700 per quarter show as much as a 1% increase in child support paid, while those earning more have up to a 1% decrease.

Conclusions and Implications: While many factors influence consistent and full child support payments, results in this study suggest that local minimum wage increases can lead to a decrease in hours worked, earnings, and child support payments among non-custodial parents, at least in the short-term. A decline in child support payments is only evident among those with higher earnings, and the change is small, approaching 1% of the order amount. Rather than statistical significance, my conclusions, therefore, rest on questions of practical significance. Will the magnitudes of these shifts in work hours, earnings, or child support payments tangibly change the level of resources available to children whose families are dependent on child support? This prompts a discussion of what constitutes substantive material support for children.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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DEDICATION

I dedicate this work to three people who have passed away. First, I dedicate this to Mária Luisa Castillo Rocha, my aunt, who succumbed due to COVID-19 during the process of researching this. Her keen insight, sense of humor, and practicality are my legacy, and I gratefully applied them, as best I could, in the process of completing this project. Second, I dedicate this to Mabel (Dee) Turner Willard, my mother, who secretly embedded a small economist in me. She was the first to teach me to question, examine, and analyze, arousing my researcher spirit, demonstratively embodied in her every day. Finally, I dedicate this to Rafael Castillo Rocha, my father, who taught me to be curious and that surfacing inequities and injustices were worthy of both personal and professional pursuit.

Chapter 1. INTRODUCTION

Child support, a monthly payment intended to offset the cost of raising a child and to help provide a safe, stable, and enriching household in which to grow, can be required by law from the non-custodial (NCP) parent. Yet by the end of 2010, it was estimated that approximately 11.3 million individuals owed over $110 billion in back child support in the United States. Among those, 313,463 NCPs in Washington State, the focus of this study, owed over $1.8 billion (Office of Child Support Enforcement, U.S. Department of Health & Human Services, 2010). Plainly, there can be obstacles for the NCP in consistently paying the full amount of child support. There are several reasons why an NCP cannot meet their child support obligation for any given month. Meager or inconsistent wages may amplify hurdles to making payments. As a consequence, defaults on child support payments are not unusual. In this study, I focus on several economic reasons for failing to make full child support payments. In particular, I look closely at hours worked and earnings, particularly in the presence of a local minimum wage increase.

The idea behind child support is simple: an NCP earns a wage, and from those earnings directs funds, or has funds directed on their behalf, toward a child support payment. Unfortunately, wages and available work hours may be insufficient to provide for oneself as well as a child support payment. For example, the federal minimum wage rate, $7.25 per hour, has not increased since 2009. Wage rates, particularly for the low-wage worker, have largely remained flat or even declined in real dollars across the entire country. Cooper, Mishel, and Zipperer (2018) wrote that working at the federal minimum wage of $7.25 per hour is equivalent to making 25 percent less than in 1968, the height of the national minimum wage rate (adjusted for inflation), despite a doubling in national productivity.

There have been notable inroads in increasing the minimum wage. At least 30 states have increased their minimum wage above the federal level. A 2020 decision in the national spotlight, Florida voters passed Amendment 2 that incrementally raises the state minimum wage to $15 per hour, the first state to raise its minimum wage to $15 through a ballot measure. Additionally, some states, like Washington, have indexed their minimum wage to the inflation rate, thereby increasing it each year to help offset the increasing cost of living.

Besides state mandates for a higher minimum wage, numerous local jurisdictions now have minimum wage rates above both federal and state minimums. As many as 44 localities have increased their minimum wage rates. Important for the study here, Seattle's Minimum Wage Ordinance took effect in 2015 and it gradually raises the minimum to $15 per hour, which is above the state minimum, and thereafter adjusts the rate to account for inflation. Two other smaller Washington cities also implemented minimum wage increases around the same time. This patchwork of jurisdiction-level minimum wage increases lends itself to a natural experiment, a comparison of those whose employers are located in a jurisdiction subject to a minimum wage increase to those whose employers are not, over the same timeframe. Washington state represents just such a condition.

1.1 Relevance to Social Work

Minimum wage rates, employment measures and child support payments represent legitimate concerns for social workers. For instance, increasing the minimum wage to a level that ensures the dignity of the individual and the family they support is consistent with social workers' professional goals. Besides the potential for material benefit, wage reform aimed at improving earnings for low-income families may help reduce their reliance on public assistance.

Social Work has long since established ethical principles that promote social justice, and in particular, wage justice. The National Association of Social Work's (NASW's) Code of Ethics encourages social workers to promote social change, particularly involving vulnerable, disadvantaged, oppressed, and exploited people and groups (Reamer 1998). Apropos to wage reform, the Code of Ethics' principle 6.01 encourages social workers to "advocate for living conditions conducive to the fulfillment of basic human needs and should promote social, economic, political, and cultural values and institutions that are compatible with the realization of social justice" (NASW 2019). In addition, principle 6.04 (a) describes the obligation for social workers to engage in social and political action that promotes equal access to resources, employment, and opportunities (Weiss-Gal and Gal 2009).

The Statement of Ethical Principles promoted by the International Federation of Social Workers (IFSW), the umbrella organization that represents national social work organizations including the NASW, also contains principles relevant to wage justice. IFSW's principle 2.3 states that social workers are to advocate for the equitable distribution of resources and wealth (IFSW 2019). In the absence of personal safety concerns, social workers "must challenge employers, policy makers, politicians and civil society, situations where policies and practices are socially unjust" (IFSW 2019, 2.4). If these principles are taken as a guide, social workers stand squarely against precariously low wage levels. One such reform that addresses social work values, principles, and ethics is increasing the minimum wage.

Using data from the State of Washington, this study tests the hypothesis that a minimum wage increase can trigger a change in hours worked and earnings among low-wage NCPs, and in turn, it can prompt a change in their child support payments. While wage levels represent just one factor that could influence consistent and full child support payments, it may be among the

leading factors. An increase in wage rates for low-income NCPs might result in a change in earnings. Higher earnings, on the one hand, could help NCPs make child support payments and avoid debt associated with defaulting on such payments. This, in turn, could benefit the recipient families, depending on their child support arrangements. Lower earnings for NCPs, on the other hand, could intensify challenges in making child support payments leading to debt accumulation. To quantify potential changes for NCPs in their hours worked, earnings, and child support payments after a minimum wage increase could richly inform both the setting of minimum wage rates and child support obligations. Thus, this study advances the scientific understanding of two of Social Work's areas of concern: wage justice and provisions to children.

1.2 Research Aims

This study focuses on the number of hours worked and earnings of low-income non-custodial parents (NCPs) before and after a minimum wage increase, as well as their payment compliance with their established child support orders. I begin by identifying a cohort of low-income NCPs with both active child support orders and one or more record of earnings around the time of the implementation of the Seattle Minimum Wage Ordinance. First, does the number of hours worked among these NCPs change after a minimum wage increase? Second, do earnings change for these NCPs after a minimum wage increase? Third, does a minimum wage increase lead to changes in child support payments among these low-wage NCPs?

The current study represents a unique contribution to the extant literature that examines hours worked, earnings and child support in at least two ways. First, few studies have been able to longitudinally link hours worked and earnings to non-custodial parents with active orders. The results presented here are based on quarter-over-quarter information contained in the Washington Merged Longitudinal Administrative Data (WMLAD), providing a large-scale, state-wide

matching of employment information with child support payments. The longitudinal aspect enables precision in estimating the potential changes over time in important employment and child support outcomes. Second, the timeframe over which the data was recorded includes the implementation of three local minimum wage increases in the State of Washington, with particular emphasis on the Seattle Minimum Wage Ordinance, a sizeable increase potentially affecting the earnings of a substantial number of employees. The within-state variation enables the investigation of a natural experiment among low-wage NCPs with active child support orders, comparing those subject to a minimum wage increase to those who are not. This offers a rarely encountered opportunity to investigate the impact of local minimum wage increases on important outcomes for both the remitting and recipient families involved in the child support system. The comparison of minimum wage policy implementations across regions and over time allow for stronger causal statements than can be made by cross-sectional study designs.

We begin by describing the background of several important components of this study, including child support, orders and payments, as well as the minimum wage rates, both state and local. I do not describe the federal minimum wage here since both state and local minimum wage rates in this study exceed the federal level, and therefore take precedence.

1.3 CHILD SUPPORT

The intent of a child support order is to financially support one or more children when their parents are no longer co-residing, thus obligating the non-custodial parent (NCP) to make regular payments to offset the costs related to raising the children incurred by the custodial parent. Established in 1974, Child Force enforcement or Title IV-D of the Social Security Act, often referred to as just IV-D, at first collected child support on behalf of children receiving public assistance. At the outset, its primary goal was cost recovery (Cancian et al., 2011). With a

custodial parent already receiving welfare, the NCP's payments toward child support went directly to the public agency to offset its outlay in direct assistance.

Sometimes child support orders were established for couples outside the welfare system. Before 1980, such orders were only established by request and then only temporarily. By 1980, however, enforcement of child support was broadened to serve more families outside the welfare system (Cancian et al., 2011). Today, any custodial parent may request assistance from a child support office if the informal child support arrangement is unsatisfactory (Cancian & Meyer, 2007).

However, vestiges of cost recovery remain. For example, disadvantaged custodial parents are required to help locate NCPs and to establish orders as a condition of receiving public assistance like Temporary Assistance for Needy Families (TANF). Although not all states have precisely the same policies, it frequently occurs that disadvantaged custodial parents assign their right to the assistance over to the state, thus offsetting the cost of the public benefit (Cancian et al., 2011). Thus, the NCP's monthly child support payment goes into a system that then supports their children, but only through offsetting the cost of a benefit the recipient family already receives.

1.3.1 *Establishing Child Support Orders*

The amount of the child support order is dependent on three primary characteristics, although accommodations can occur at the court's discretion. The first major aspect of establishing the level of child support obligation is the non-custodial and custodial parents' earnings. By federal rules, all NCPs' earnings must be taken into account when referring to state guidelines. Washington State applies an "Income Shares Model" which considers both parents' incomes (Washington Courts, 2020). Since earnings from wages often make-up a significant

portion of individual incomes, there is a foundational legal and administrative link between wages and child support payments. Thus, a NCP's and custodial parent's point-in-time earnings through wages is a major factor in establishing the level of the child support obligation.

The second major characteristic that influences the level of child support obligations are statewide guidelines. Federal reforms to the child support system in 1984 required that each state establish guidelines for setting the amount of the NCP's monthly payment. By 1988, those guidelines became presumptive, that is a default level of obligation whenever relevant factors may be unknown. In Washington state, a single, state-wide child support obligation table, the Washington State Child Support Schedule (Washington Courts, 2020), guides each county and court. Although consistency is encouraged, there may be regional differences due to court discretion. Variations in how courts apply the guidelines may not be detectable, let alone quantifiable. For instance, there are known regional differences across the State of Washington in cost of living expenses, with those living in major cities often paying more for housing, food, and transportation. Therefore, statewide implementation of guidelines used to establish child support obligations may vary due to regional differences in cost of living.

The third major feature that influences the level of child support obligations is the point-in-time establishment of the order. The level of the child support order, due to legal and bureaucratic hurdles, is often set just once. Factors that could mitigate the level of the order may be unknown at the time it is established or be emergent after the obligation is set. The point-in-time establishment of the order, at least in practice, binds the NCP to a level of obligation regardless of, say, instabilities surrounding workforce participation or modified wage rates (Cancian & Meyer, 2007). In Washington State, either parent may request a child support modification by applying for a Division of Child Support (DCS) review, but that represents an

administrative barrier requiring a set of actions on the part of the parent. Although rules say that a child support order can be modified every two years in Washington State, unless there is evidence of change in financial circumstances earlier than two years, frequent modifications are unlikely. Thus, the NCP's ability to make child support payments may differ over time, either declining or increasing, while the level of the order is relatively fixed (Cancian & Meyer, 2007).

So earnings, statewide guidelines, and point-in-time establishment of orders all likely have influence on the rate of success NCPs have in meeting their child support obligations. Deviations from the obligation level as specified in the child support guidelines, however, do occur. The level of obligation could be set lower or higher than found in the guideline's pay schedule. Setting the level of child support payments accounts for both the needs of the child and the ability of the NCP to pay. While some states have implemented lower bounds on the amount of the obligation, there can be other adjustments to the standard range. These low-income adjustments or percentage of earnings limits are intended to account for the ability of the NCP to afford the obligation. Still, courts can exercise discretion. For example, a court can disregard an adjustment intended to lower the obligation in order to protect the financial well-being of custodial parents and the children (Brustin, 2012). A Washington statute, for example, requires that neither the non-custodial nor the custodial parent's obligation exceed 45% of his or her net earnings (Brustin, 2012). Before applying the 45% rule, however, Washington courts must consider whether this leaves insufficient funds in the custodial parent's household to meet the basic needs of the child. In addition, they consider the level of hardship across the affected households, assets or liabilities, and involuntary limits on earnings such as incarceration, disabilities, or incapacity (Brustin, 2012).

1.3.2 *Making Child Support Payments*

After an order is set, the non-custodial parent is expected to make regular child support payments. In Washington State, payments occur monthly and are remitted to the Division of Child Support (DCS) within the Department of Social and Health Services (DSHS). If NCPs work in the formal sector, such that they have employers who provide regular wages and reserve funds from payroll for taxes or other benefits to remit to agencies or providers, employers are required withhold child support payments from NCPs' paychecks and send payments directly to DCS whenever an order is active. Most of the payments in Washington State are made through such withholding (Washington State Department of Social and Health Services, 2018). On the other hand, NCPs who are either not working or working in the informal sector, such as those working as contractors or in the gig economy, can make their payments to DCS themselves. Washington State takes payments by mail, through a payment portal (Secure Access Washington), by voluntary deductions from bank accounts, or in person. In 2018, the State partnered with LexisNexis to enable electronic child support payments using credit or debit cards (Washington State Department of Social and Health Services, 2018). Though outside the study period and scope here, this system of credit card remittances opens the possibility of new forms of debt accumulation and attendant consequences.

DCS processes the child support payment, either retaining it for the State if the custodial parent receives public assistance, or forwarding it to the custodial parent. In the latter case, a processing fee may be withheld. Since October 1, 2019, Washington State retains an annual fee of $35, taken out of the custodial parents' receipt of child support payments, but only after the first $550 of child support is received within the federal fiscal year (between October 1 and September 30) (Washington State Department of Social and Health Services, 2019) .

1.4 State Minimum Wage and Local Minimum Wages

This study is based in Washington State which has had a minimum wage rate higher than most other state minimum wage rates (National Conference of State Legislatures). In fact by the end of this study, Washington State's minimum wage rate was increased again: its minimum wage ranked among the highest in the nation (Conroy, 2020). This study relies on in-state variations to help discern the effects of a series of local minimum wage increases within three cities, Seattle, Tacoma, and SeaTac. By comparison, the minimum wage rate for the rest of the State of Washington is lower, although higher than in many other states.

Figure 1.1 contain maps of the state of Washington and King County (*Map of Seattle in King County*, 2006). Washington state appears green in the lower map on the right, with King County in darker green. The map on the left is King County expanded, showing the Seattle in red. The city of Tacoma is in Pierce County, just south of King County, and SeaTac is a small city south of Seattle. Seattle is prominent because it is the largest of the three cities, and the ordinance implemented within its city limits influenced the wages of far more workers than the other two cities combined. The three cities that implemented a minimum wage increase above the state minimum rates are densely populated, with numerous employers, relative to most other regions in the state. Geographically, however, the maps suggest that Seattle, Tacoma, and SeaTac are relatively small areas compared to the rest of the state.

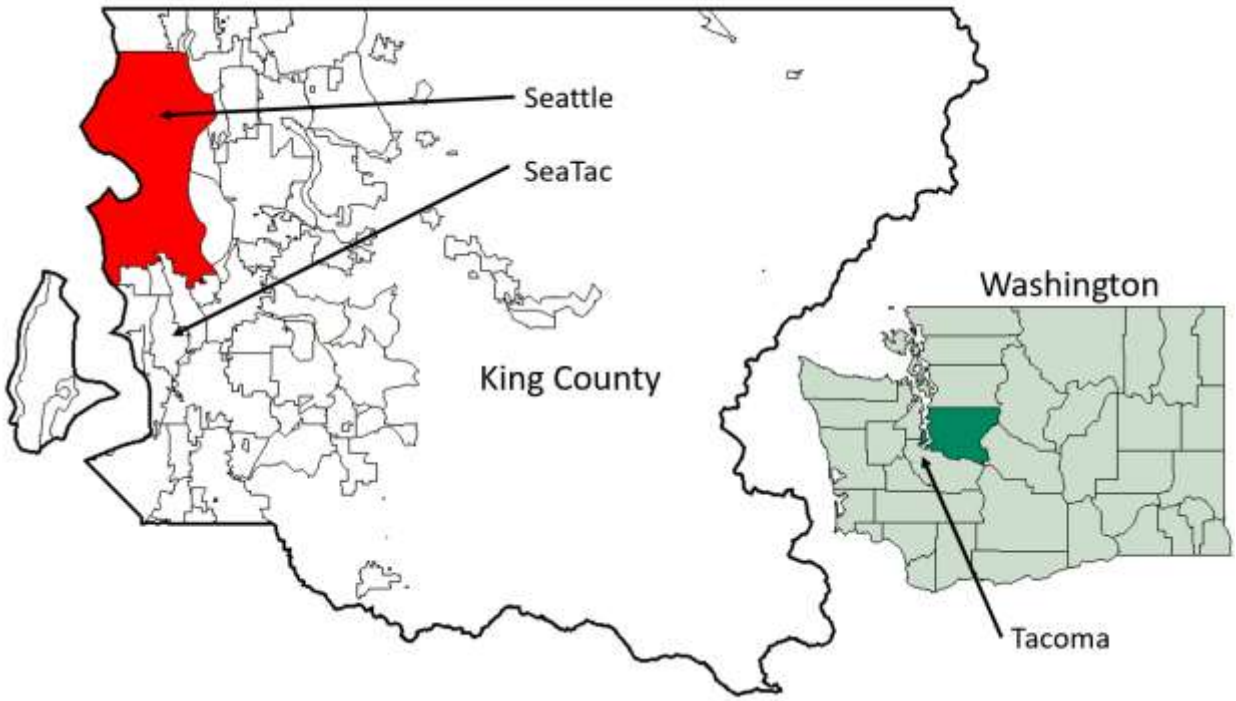

Figure 1.1 Map of Washington state, identifying King County, Seattle, Tacoma and SeaTac
King County in dark green and Seattle in red

1.4.1 *Washington State Minimum Wage*

In 1998, Washington State voters approved Initiative 688. This law required that the Department of Labor & Industries make a cost-of-living adjustment to the State's minimum wage each year beginning in 2001. This continued until a new law would take effect in 2017. During this interval, the annual adjustment was based on the federal Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) (Washington State Department of Labor and Industry, 2021). In 2001, the State minimum wage was $6.72 per hour, and by 2016 it had reached $9.47 per hour, as shown in Table 1.1. With growing concern that working full-time at the state minimum wage rate could not reasonably support a family, even with a cost of living adjustment, in 2016 Washington State voters approved Initiative 1433. This required an increase in the minimum wage to better reflect actual costs. Playing catch-up over several years, the statewide minimum was set at $11.00 in 2017, $11.50 in 2018, $12.00 in 2019, and $13.50 in

2020. Beginning in 2021, and each year thereafter, the Washington State Department of Labor & Industries (L&I) will be required to make a cost-of-living adjustment to the minimum wage, again based on the CPI-W (Washington State Department of Labor and Industry, 2021). For instance, the minimum wage in 2021 is set at $13.69 per hour.

The primary reason the study here stops short of 2017 is due to sizeable jump in minimum wage across the state. This changes the comparison group dramatically, thus reducing the differences across minimum wage floors throughout Washington. The Washington State minimum wage rates most important for these analyses are between the years of 2010 to 2016, set each year on January 1st. The year 2017 is included in this table only for comparison purposes, but will not be included in the analyses going forward.

Table 1.1 Washington state minimum wage rates, 2010 to 2017

Implementation date	Hourly wage ($/hr)
January 1, 2010	$8.55
January 1, 2011	$8.67
January 1, 2012	$9.04
January 1, 2013	$9.19
January 1, 2014	$9.32
January 1, 2015	$9.47
January 1, 2016	$9.47
January 1, 2017	$11.00

1.4.2 *SeaTac Minimum Wage*

SeaTac is a city located just south of Seattle and is home to the area's international airport. Along with Seattle, SeaTac is within King County. SeaTac's ordinance titled Setting Minimum Employment Standards for Hospitality and Transportation Industry Employers, went into effect January 1, 2014 (City of SeaTac, 2021). SeaTac's law sets the hourly minimum wage rate to the highest level relative to all other local minimums. However, SeaTac's minimum wage

law only applies to those working in the transportation or restaurant and hotel industries, intended to cover SeaTac Airport employees and others across the city in similar job classes.

Compared to Seattle's Minimum Wage Ordinance, described in more detail below, this law applies to a very small number of employees. To identify jobs classes subject to the increased minimum wage, SeaTac created a list of North American Industry Classification System (NAICS) codes, a system to identify jobs within classes and commonly used by Employment Security Departments (City of SeaTac, 2021). Although cautioned this was not an exhaustive list of NAICS codes identifying employees that could qualify for an increase in minimum wage, in this study I use precisely this list, acknowledging it as an approximation, to identify the majority of workers subject to the higher minimum wage within SeaTac. Table 1.2 shows the minimum wage rates applicable to transportation, restaurant, and hotel workers during this study period (City of SeaTac, 2021).

Table 1.2 SeaTac minimum wage, years 2014 to 2016

Implementation date	Hourly wage ($/hr)	Difference from WA State
January 1, 2014	$15.00	+$5.68
January 1, 2015	$15.24	+$5.77
January 1, 2016	$15.24	+$5.77

Although an estimated 4,700 airport workers would be affected (Bradbury, 2015), some employers were slow to comply with the new wage schedule and later, faced filings for back pay with the Washington Department of Labor and Industries (L&I). By July 2017, the City of SeaTac had investigated 61 alleged violations which led to 42 settlements worth $781,000 (Wilson, 2017). This represents a study limitation: while certain SeaTac employees were eligible for a pay raise based on local policy, some employers were unwilling to comply.

1.4.3 *Seattle Minimum Wage*

Seattle is the largest city in Washington, more than three times larger, by population, than the next largest city, Spokane. A strong economic center for the state, a number of large employers have headquarters and branches located in Seattle, as well as hosting a vibrant medium and small business community. Seattle's Minimum Wage Ordinance took effect on April 1, 2015, gradually raising the minimum to $15 per hour by January 1, 2019, and adjusting to the rate of inflation thereafter (Seattle Office of Labor Standards, 2021).

The new Seattle minimum wage applies to all wage-earners working within the city limits, regardless of immigration status or where their employers are located. To explain the latter, if an employer has a corporate office, say, in Spokane, but had employees working regularly in Seattle, then those employees working in Seattle would be subject to Seattle's minimum wage ordinance. For this study, the Seattle Minimum Wage Ordinance increase applies to two years shown in Table 1.3.

Table 1.3 Seattle minimum wage, April 1, 2015 through 2016

Implementation date	Hourly wage ($/hr)	Difference from WA State
April 1, 2015	$11.00	+$1.53
January 1, 2016	$12.00	+$2.53

1.4.4 *Tacoma Minimum Wage*

Tacoma, the third largest city by population in Washington State and located in Pierce County, approved and implemented an increase in minimum wage during this study period. In November 2015, Tacoma voters approved a $12 per hour minimum wage. The minimum wage, phased in over two years, would reach $12 beginning January 1, 2018. On the same ballot, Tacoma voters rejected a separate initiative setting a higher minimum at $15. The approved

minimum wage applies to almost all employees who work 80 or more hours per year within the City of Tacoma limits from February 1, 2016 to December 31, 2019. Beginning on January 1, 2020, the Washington State minimum wage overtook the Tacoma minimum, and employers in Tacoma were required to use Washington State's higher minimum wage of $13.50. Tacoma's increased minimum wage applies to the better part of a year within this study period. Shown in Table 1.4, the magnitudes above the Washington minimum wage levels are modest compared to other jurisdictional minimum wage rates.

Table 1.4 Tacoma minimum wage, February 1, 2016

Implementation date	Hourly wage ($/hr)	Difference in WA State
February 1, 2016	$10.34	+$0.87

Taken together, Table 1.5 displays all the minimum wage increases over the course of this study's observation period. Alongside one another, the concentration of local increases in the last three years of the study becomes apparent.

Table 1.5 Minimum wage rates in Washington state, 2010 through 2016

	WA	SeaTac[a]		Seattle		Tacoma	
Implementation Date	$/hr	$/hr	diff from WA	$/hr	diff from WA	$/hr	diff from WA
January 1, 2010	$8.55						
January 1, 2011	$8.67						
January 1, 2012	$9.04						
January 1, 2013	$9.19						
January 1, 2014	$9.32	$15.00	+$5.68				
January 1, 2015	$9.47	$15.24	+$5.77	$11.00[b]	+$1.53		
January 1, 2016	$9.47	$15.24	+$5.77	$12.00	+$2.53	$10.34[c]	+$0.87

[a] Applied to occupations in transportation or restaurant and hotel industries
[b] Seattle's ordinance began on April 1, 2015
[c] Tacoma's ordinance began on February 1, 2016

1.5 Contents of this Study

This study seeks to answer the following questions. 1) Among low-wage, non-custodial parents with active child support orders, does an increase in the minimum wage impact their employment, either having a job or, if they are employed, the number of hours they work? 2) In this subpopulation, does an increase in the minimum wage effect their earnings, either as hourly earnings or overall earnings? Finally, 3) does an increase in the minimum wage result in a change in child support payments?

Subsequent to this first chapter, this work is divided into chapters two through seven. The second chapter explores the literature regarding the association between hours and earnings with child support payments as well as the policies that govern the practice of paying and collecting child support. The third chapter describes the data for this study and offers descriptive statistics for key measures. In the fourth chapter, I analyze whether a minimum wage increase has a bearing on two employment measures, any hours worked and total hours worked, for the lowest paid NCPs. The fifth chapter addresses the question of whether earnings change, both hourly and total, among low-wage NCPs in the presence of a minimum wage hike. In the sixth chapter I investigate whether child support payments are influenced by minimum wage increases while adjusting for earnings. Finally, the seventh chapter concludes with a discussion of findings from this study, questions for further study, and potential policy implications.

Chapter 2. LITERATURE AND POLICY REVIEW

Some non-custodial parents (NCPs) face harsh economic realities, such as low wages and unstable employment (Waller & Plotnick, 2001). Sorensen & Zibman (2001) estimated there were 2.5 million nonresident fathers in the United States who were poor and had a limited ability, if any, to provide financial support to their children. It is unlikely that the number of impoverished fathers has declined in the last 20 years. To begin the study of the effect of local minimum wage increases on child support payments, I turn to the research on child support, formal and informal, with special attention to Temporary Assistance for Needy Families (TANF) recipients. I explore NCPs' barriers to paying child support, with a concentration on employment factors. Failing to pay child support can be met by steep consequences, so here I highlight what is known about the accumulation of debt and common punitive measures. I take a brief look at the research on poverty experienced by both custodial and non-custodial parents with child support arrangements. Finally, I describe previous research concerning the effects of the minimum wage on child support payments.

2.1 CHILD SUPPORT

The process of paying child support begins with an order. A child support order is set by establishing paternity (if the couple is unmarried), creating a legal order, and determining the amount based on common procedures across a state (Cancian et al., 2011). The amount of the child support fixes the NCP's monthly payment based on a state guideline. Washington State ascribes to an "Income Shares Model" for assigning the amount of the child support order. The idea behind this model is that a child should receive the same proportion of parental income that they would have received if the parents lived together. In an intact household, the income of both

parents is pooled for the benefit of all household members. Thus, all income and resources of each parent is assessed to determine the child support obligation of the NCP (Washington Courts, 2020). In addition, the guideline includes a self-support reserve, a minimum amount that an NCP retains in order to support themselves before making a child support payment.

While the guidelines are intended to ensure that the level of the NCP's income informs the amount set for the monthly child support order, in reality the order amount may exceed the guideline's level (Cancian et al., 2011). A study by Stirling and Aldrich (2008) in Washington State found a significant difference in the child support obligations across non-custodial fathers' incomes. Low-income and middle-income fathers faced greater child support obligations than high-income fathers. When including child care expenses, low-income fathers were ordered to pay a median of 25% of their earnings towards child support, while middle-income fathers were ordered at 24%, and high-income fathers were ordered at 20% (Stirling & Aldrich, 2008). This suggests that while income is intended to inform the amount of the support order, there can be inequities in practice.

2.1.1 *Changing the Amount of Orders*

Once the child support order is set, frequent modification may be prohibitive. By law, a child support order is reviewed automatically every 35 months in Washington state. However, either party to the order can request to modify the amount after 24 months. Prior to that, orders can only be reviewed if there is justification that there had been a major change in circumstances for either the custodial or non-custodial parent. Parents, however, may face administrative hurdles to modify the amount more frequently than its stipulated review schedule (Cancian et al., 2011). Sometimes orders are not modified because of the expense and time involved in going through a court proceeding (Sorensen & Lerman, 1998). Yet for NCPs with unstable

employment and earnings, varying payment amounts may help them avoid punitive measures when defaulting. In interviews, non-custodial fathers said they needed more flexibility in paying child support when they were out of work, when their earnings decreased, and when they were incarcerated (Waller & Plotnick, 2001). Thus, viewed as a cumbersome and sluggish administration, the relatively stagnant child support order amount contrasts with the potential volatility of NCPs' work and earnings, particularly among those employed at the lowest wage rates.

2.1.2 *Child Support and TANF*

When a custodial parent qualifies for TANF assistance, the state must open a TANF child support case. Washington's Division of Child Support (DCS), on behalf of the Department of Social and Health Services (DSHS), opens the case through its child support enforcement program. Sometimes called IVD cases, as it is authorized by Title IV-D of the Social Security Act, as well as chapters 74.20 and 74.20A of the Revised Code of Washington (RCW), there are special rules with regard to child support. First, TANF recipients must cooperate with the state to locate the non-custodial parent and establish a child support order. Thus, there is strong incentive to establish a child support order for the benefit of a TANF recipient, even though the NCP may have been formerly estranged or intentionally avoided. Second, the custodial parent who receives TANF must assign all rights to child support to the state up to the amount of aid received. Until recently, the Division of Child Support (DCS) could direct the entire amount remitted by the NCP to reimburse the state for the assistance provided to the custodial parent. That has since changed.

In Washington state starting February 1, 2021, a custodial parent who receives TANF for one or more children may also receive a portion of child support paid on their case, called a pass-

through payment. A pass-through payment occurs even if the amount of the TANF assistance exceeds the amount of the child support payment. This is only paid to the custodial parent if the NCP makes a child support payment, thus incenting the custodial parent to encourage payment of child support from the NCP. Also an incentive, the NCP may see direct benefit from their payment for their children. Although moderate, the pass-through amount could make a difference to impoverished families: up to $50 each month for households that include one child, and up to $100 for households with two or more children (Department of Social and Health Services, 2021). This pass-through payment is not relevant to the study here because it was implemented after the observation period for this study.

Also beginning February 1, 2021, Washington state's DCS implemented a new law to abate or reduce child support orders for NCPs who are incarcerated or sentenced to at least six months. Those eligible can temporarily reduce their child support order to $10 per month per child support order. Post-confinement, the child support amount could increase gradually over the first year until it resumes the full order amount. This new policy could help NCPs avoid or reduce the accumulation of arrears that can occur while the non-custodial parent is incarcerated. Again, this regulatory change occurs after the observation period for the study here.

2.1.3 *Informal Support*

NCPs may provide for their children through informal support, either direct cash payments to the family or in-kind support such as providing school supplies or diapers. There is no obligation attached to informal support, nor does it enter into the calculus of a state agency or court when it sets the amount of a formal child support order. In other words, no credit is given for in-kind support (Waller & Plotnick, 2001). Research suggests that low-income fathers tend to prefer informal payments over formal payments, possibly strengthening the father's bargaining

position with his child's mother or his ability to monitor the mother's behavior (Nepomnyaschy & Garfinkel, 2010). Especially for NCPs with irregular employment, informal support may be preferred. Moreover, Nepomnyaschy & Garfinkel (2010) found that informal cash and in-kind support can play an important role in providing for low-income custodial parents and the children they raise. Thus, informal support could be an important resource for recipient families. It was also shown, however, that NCPs subject to a formal child support order will tend to decrease their informal support: formal support thereby substitutes for the informal support (Nepomnyaschy & Garfinkel, 2010).

2.2 Barriers to Paying Child Support

In this section I examine research on barriers to making child support payments that could commonly be faced by NCPs. First, I juxtapose the assumptions about work that are embedded in child support policies with research on the employment realities of low-income NCPs. Second, I review several barriers to work faced by NCPs that could, in turn, inhibit child support payments. Last, I briefly note other, non-employment, barriers to paying regular child support.

2.2.1 *Assumptions About Work*

One basic assumption behind child support is that non-custodial parents are steadily employed. When child support legislation was first developed, it assumed non-custodial parents were primarily divorced fathers working full-time (Sorensen & Lerman, 1998; Waller & Plotnick, 2001). There are two problems with this assumption. First, working full-time at low wages may result in net earnings below or close to the poverty level, challenging NCPs to both support themselves and to make child support payments. For instance, anyone working forty

hours a week at $7.25 per hour, the federal minimum wage level, earns an annual earnings significantly below the federal poverty guidelines for a family of three (Brustin, 2012).

Even if the state sets a higher minimum wage than the federal government, earnings can be modest. Washington's minimum wage in 2010 was $8.55 per hour, $1.50 per hour higher than the federal level. Still, working 40 hours per week for 52 weeks at this wage results in annual earnings below $18,310, the poverty threshold for a family of three in 2010. That same year, it would have required $8.81 per hour to have met the earnings set as the poverty line for a family of three, even though many have argued that the federal poverty threshold is insufficient to sustain a family in most regions in the United States, let alone the additional child support payments. Approximately 25% of non-resident parents with child support orders have reported earnings below the federal poverty level (Brustin, 2012). Lifting the wage floor, as an increase in the minimum wage, is intended to relieve the financial shortfall experienced by low-income workers and their families.

The second problem with assuming that non-custodial parents work full-time is the irregularity of employment which often accompanies low-wage jobs. Qualitative studies suggest that fathers have problems paying regular child support when they have irregular employment (Waller & Plotnick, 2001). As mentioned, incarceration can also occur, where NCPs are outside the formal workforce and have no comparable means to make full child support payments (Cancian et al., 2011). Overall, poor NCPs do not pay child support at the same frequency and amount as those with higher and more consistent earnings. In one study using the National Survey of America's Families (NSAF), Sorensen and Zibman (2001) estimated that only 3 percent of fathers who were poor paid child support, while among fathers who appeared to have the financial means to cover the expense, 58 percent paid child support. Low-income NCPs will

not be able to take full responsibility for supporting their children, Stacy Brustin (2012) contends, “until they earn enough or receive financial supports to meet both individual and family subsistence needs.”

2.2.2 *Barriers to Work*

While there may be many barriers to work for non-institutionalized, poor NCPs, they roughly fall into two categories: 1) barriers to work that any low-income worker might face, and 2) barriers to work related to having a child support order itself. An example of a commonly reported barrier of the first type is lack of education. In the study conducted by Sorensen and Zibman (2001), approximately 43% of poor, non-custodial fathers had a lack of education, either no high school diploma or GED (passing a General Education Development test, an equivalency exam for a high school education). Another common employment barrier was related to poor health, reported among 39% of the fathers in the same study. To a smaller extent, fathers reported lack of English skills, limited transportation, and shelter instability as employment barriers (Sorensen & Zibman, 2001). In general, such obstacles and others may be relevant to many low-income, working-age adults.

The second type of employment barrier among low-income NCPs is related to having a child support order. Some evidence indicates that requiring fathers to make cash payments reduces their motivation to work in the formal sector (Waller & Plotnick, 2001). Most employers are required to deduct child support payments from their employees’ earnings, referred to as wage garnishment. Under Title III, wage garnishment may be ordered whenever an individual who owes money receives personal earnings from an employer including wages, commissions, and earnings from a pension or retirement program (U.S. Department of Labor, 2022). Employer transfers on behalf of NCPs in their employ are the most common form of child support

payments: Washington employers remit approximately 70% of all child support payments (Washington State Department of Social and Health Services, 2022). NCPs who are self-employed or work as independent contractors, outside of an employers' regular payroll processing, might avoid wage garnishment. The growing number of work opportunities in the informal sector may make this option even more attractive. Non-custodial fathers might even quit their job after learning how much of their wages are garnished (Waller, 1997; Waller & Plotnick, 2001).

Garnishment can also occur, however, outside of earnings from working in the formal sector. If a non-wage garnishment is enabled by court order, assets and property can be seized, usually as a lump sum. While NCPs may avoid wage garnishment by working in the informal sector, they leave themselves open to the possibility of non-wage garnishment that carries an addition risk. A non-wage garnishment order may not protect the NCP from an excessive withdrawal, side-stepping the federal and state legal safeguards intended to ensure sustainable wages for the NCP that accompany child support and wage garnishment orders (GarnishmentLaws.org, 2022).

The accumulation of debt related to unpaid child support may discourage both child support payments as well as working for wages. Research suggests that low-income NCPs are less likely to pay support when they began to accrue arrears for previously unpaid child support (Nepomnyaschy & Garfinkel, 2010). Interviews indicate that fathers who fell behind in payments with no hope of paying off their arrears felt they were in an impossible bind (Waller & Plotnick, 2001). The financial demands on poor NCPs, particularly when they build up large arrearages, could add additional strain to their relationships with the custodial parents (Waller & Plotnick, 2001). This could create a vicious cycle, yet further compounding the barriers to child support

payments. One study in Wisconsin examined labor force attachment of non-custodial fathers and their accumulated arrears (Cancian et al., 2013). Researchers found a negative interaction between birth cost charges, partly assumed by the non-custodial father, and recent labor market attachment. In other words, the swift accumulation of arrears could negatively affect NCP employment, as well as payments of child support, into the future. Thus, a high accumulation of arrears could further dampen fathers motivation to work in the formal labor market (Cancian et al., 2011).

2.2.3 *Other Barriers to Paying Child Support*

There are other barriers besides low-earnings, inconsistent employment, and debt accumulation that contribute to an NCP's failure to make child support payments. Though not an exhaustive list, here I point out several additional barriers. For example, one barrier to making full and consistent child support payments involves the level of connection NCPs have to their children's families. Researchers found that fathers who had not lived with the mother and child at some point were less willing to pay child support than those who had (Johnson, 2001). Moreover, child support payments tend to decline over time, particularly as family structures become more complex. Parents may go on to cohabitate with or marry new partners, and have more children. Research suggests that the greater complexity in family structure, the less likely the NCP will pay child support (Cancian et al., 2011).

Some NCPs were less likely to pay child support when they saw that their support went towards reimbursement of government expenses for families receiving assistance, instead of going directly to the family to support their children (Brustin, 2012; Nepomnyaschy & Garfinkel, 2010). These findings may have been instrumental in Washington state's policy (as well as that of other states) to adopt pass-through payments. As mentioned earlier, a pass-through is the

amount the TANF recipient receives as a cash payment drawn directly from the child support received. This contrasts with the practice of the state retaining the entire amount of the child support payment as reimbursement for the public assistance provided to the recipient family.

2.3 Failing to Pay

Whenever an NCP fails to pay the full amount of the child support order, the custodial parent has a number of ways to collect unpaid child support. Commonly, the first step is the custodial parent goes to court and asks the judge to issue a judgement for the amount of the arrears, the unpaid debt owed. If a judgment for child support is granted, common collection methods become available like letters, phone calls, and seizure of property. Moreover, interest can be charged on the balance due for child support. Thirty-four states, plus Guam and Puerto Rico, authorize interest charges for child support arrears. Under Washington state's revised statute 4.56.110, judgments for unpaid child support bear interest at the rate of 12% per annum. Washington state's interest rate on arrears is among the highest, tying only with Colorado and Kentucky (National Conference of State Legislatures, 2021).

Strong enforcement may be effective among some NCPs. Research suggests that robust child support enforcement is associated with increases in the amount of formal support received by children from their non-resident fathers (Nepomnyaschy & Garfinkel, 2010). Enforcement can go beyond state borders. Washington's Division of Child Support (DCS) works with other state agencies to help collect child support if NCPs move out of the state. Even the U.S. State Department can help collect payments from NCPs who live outside of the country.

The penalties for failure to pay child support can be severe (Waller & Plotnick, 2001). Non-custodial parents could face liens on their property or the interception of their federal or state income tax refunds. Besides wages, the state could attach unemployment benefits or

workman's compensation. Driver's or occupational licenses could be suspended. As indicated previously, the state could seize property, report debt to a collections agency or refer the case to judicial enforcement (Chapter 26.18 RCW). Failure to pay child support could result in non-custodial parents being held in contempt and fined, or sent to jail, with possible criminal charges if nonpayment continues for a long period of time. Still, not all NCPs will respond to enforcement policies. For instance, fathers who never cohabited with the mother of their child have a lower ability to pay child support in general, and are more likely to be unmoved by strong child support enforcement (Nepomnyaschy & Garfinkel, 2010).

2.4 Impact on Poverty Levels

2.4.1 *Poverty of Families with a Child Support Order*

A sizeable percentage of children with a non-resident parents live in impoverished households. Yet, most families with children do not receive child support (Cancian et al., 2011). In one study, only 34 percent of children who had a non-resident father reportedly received formal child support (Sorensen & Zibman, 2001). Even when a child support order is established and payments are made, the amount may be insufficient to lift the custodial parent's household out of poverty. Research suggests that disadvantaged men tend to father children with disadvantaged women (Sinkewicz & Garfinkel, 2009). A double bind, disadvantaged NCPs may face greater obstacles to making child support payments than those with more resources. In turn, a low-income recipient family may rely more heavily on the portion of their incomes derived from child support. For families facing poverty with established child support orders, payments from NCPs can make up as much as 58% of their household earnings when all assistance is received (Miller et al., 2020). While a substantial portion of non-custodial parents are poor, as many as 26 percent in one study (Sorensen & Zibman, 2001), an even larger segment of their

children tend to be poor. In the same study, 40 percent of children lived in disadvantaged households (Sorensen & Zibman, 2001). Thus, a low-income non-custodial parent with a child support order often corresponds with a recipient custodial parent whose household is also low-income.

Still, receiving child support has the potential to lift a household out of poverty. A non-custodial parent's contributions through child support lowers the risk that a child resides in a poor household. Research suggests that child support can reduce the poverty of custodial parent-lead households by approximately 6 to 10 percentage points (Cancian et al., 2011). The poverty gap, the percent difference in the poverty threshold and a family's income, in custodial parent households decreased between 13 and 23 percent due to child support payments (Cancian et al., 2011).

Consistency in child support payments is important but not always possible. Payments are often irregular. For example, researchers Yansook Ha, Maria Cancian and Daniel R. Meyer (2011) examined three earnings outcomes using data from Wisconsin: pre-tax/transfer incomes, post-tax/transfer incomes, and post-child support incomes. The latter accounts for parental income after the child support transfer has been made. They then compared non-custodial fathers' incomes with custodial mothers' incomes. In the first year of the establishment of a child support order, this study showed that only 40 percent of the custodial mothers received a regular amount of support for at least 10 months out of the year (Ha et al., 2011). Yet, child support can smooth the irregularity of incomes for mothers who, without the additional support, live below the poverty threshold. Even as an irregular source, child support payments can sometimes diminish the volatility of a family's overall income (Ha et al., 2011).

2.4.2 *Poverty of Non-Custodial Parent Paying Child Support*

There are many reasons non-custodial parents pay less than the full order, one of which is the non-custodial parent's level of poverty. Policymakers have begun to differentiate between non-custodial fathers who have the means to support their children but choose not to do so, commonly referred to as "deadbeat dads," from those who do not have the financial means to support their children, or "deadbroke dads" (Brustin, 2012). Moreover, poor fathers who pay child support tend to become poorer (Cancian et al., 2011).

To help make ends meet, many non-custodial parents participate in the informal economy. This has already been mentioned as a way for NCPs to avoid wage garnishment that can occur through regular withholding from wages earned in traditional employment. Informal work arrangements, however, can also be an important source of extra earnings. One study found that 28% of unmarried fathers had unreported earnings from self-employment, under-the-table work for cash, or "hustling" (Maldonado, 2006). This research also showed that such work could increase fathers' earnings by an average of 23% (Maldonado, 2006). For the study here, however, measures from the informal economy are not available. Earnings not reported to the Employment Security Department (EDS) as wages from an employer are not included in the measures here. Instead, data for this study are comprised of hours and earnings reported for the purpose, among others, of tracking unemployment insurance. The lack of information on participation in the informal economy poses a limitation of this study.

2.5 Minimum Wage Increases

Could a minimum wage increase materially benefit children? In this section, I discuss the several ways children could benefit from a minimum wage increase. In particular, I describe the potential benefit for children residing in families with active child support orders. I conclude

with findings from two studies that examine the association between minimum wage increases and child support payments.

2.5.1 *Children's Economic Circumstances*

Children, those under 18 years of age, could benefit from a minimum wage increase in at least two ways, directly and indirectly (Hill & Romich, 2018). Directly, teenagers could work for employers who pay a minimum wage. A law that increases the minimum hourly wage could benefit the youngest workers directly if their net earnings increase as a result (Hill & Romich, 2018). Another possible benefit might be fewer hours of work for young workers. For instance, if a minimum wage increase induces employers to reduce the number of hours of work (without reducing overall earnings), working teens could benefit by having more time for other tasks, including school work and extra-curricular activities.

Indirectly, children could benefit if the household in which they reside sees a growth in earnings after a minimum wage increase. First, a child's household could see an increase if there are greater contributions from its adult members in the form of increased earnings as a result of a minimum wage hike (Hill & Romich, 2018). At an even further remove, if a child has a non-resident parent obligated to pay child support, her household may see an increase in income. This improvement depends on whether prior to the minimum wage increase, the child support payments tended to be less than the order amount or paid inconsistently. In addition, this is contingent upon the child support arrangement, whether the full payment or a portion of the payment is directed to the custodial parent's household. Thus, should a minimum wage hike be followed by the child's household receiving a greater or more consistent child support payment, it could materially benefit that household and possibly allow for improved financial stability (Ha et al., 2011).

2.5.2 *Earnings*

Numerous studies have looked at an increase in minimum wage and its effects on earnings. Here I focus on the findings particularly relevant to study here. Seattle's local minimum wage ordinance was implemented in 2015, gradually raising the minimum to $15 per hour. In the Seattle setting, a study by Jardim and her colleagues (2018) found evidence of negative effects: some workers subject to the minimum wage increase also experienced a decrease in work hours that resulted in an overall decline in pay. They also found, however, that it depended on job experience. More experienced low-wage workers were less likely to feel negative effects of Seattle's minimum wage ordinance than less experienced workers.

2.5.3 *Child Support Payments*

To my knowledge, only two previous studies examined child support payments in the presence of minimum wage increases. One study by Daniel Miller and his colleagues (2020) used pooled data from the 1994-2016 waves of the Current Population Survey Child Support Supplement. A national study, these data concentrated on custodial mothers with low SES as identified by educational attainment, as well as the non-custodial father's state of residence. Comparing state-wide minimum wage policies and the timing of their implementation, this study found that each $1 increase in a state's minimum wage was significantly associated with an annual $170 increase in formal cash support among custodial mothers due assistance (Miller et al., 2020). They conclude that policies that buttress father's economic security could increase his ability to make child support payments. These data contained child support information and other forms of assistance to custodial parents, but to my knowledge no wage data was directly examined.

A second study of a minimum wage increase and child support payments again used data from Seattle. As mentioned, a local minimum wage ordinance was implemented in Seattle in 2015. In this setting, a study by Robert Plotnick (2019) had access to both child support measures and wage data. I assisted Plotnick with analytics for his study. He examined child support payments among low-wage NCPs, defined as those earning $19 per hour or less, after the minimum wage increase. The change in child support payments was not statistically significant. Plotnick concluded that "the lack of impact suggests that [Division of Child Support's] challenges of enforcing child support orders are neither helped nor hindered by Seattle's minimum wage" (Plotnick, 2019). This non-significant finding does little to quantify the impact of a minimum wage increase on child support payments, nor is it strong enough to counter Miller and colleagues' (2020) conclusion that a minimum wage increase could help families receive more child support. I re-examine the Seattle data in the study here, with a focus on a cohort of low-income, non-custodial parents with active child support orders.

2.6 Chapter Summary

This literature and policy review offered context for the current study on local minimum wage increases and child support payments. Briefly, child support orders are relatively fixed, particularly in light of the potential inconsistency in employment and variability of earnings among low-wage NCPs. Policies for TANF recipients require them to help establish child support arrangements, regardless of the circumstances of their separations from NCPs. I describe a number of barriers to NCPs making regular, full child support payments, with inconsistent employment and low earnings having outsized impacts. Penalties for unpaid child support can be severe, and strong enforcement seems to translate into more child support being paid, although not in all cases. Not all eligible low-income families receive child support, but those who do

could see stabilization of their incomes, bringing some family incomes above the poverty thresholds. A minimum wage increase could improve the economic outlook for children in several ways, one of which is increasing earnings among low-wage NCPs who can then make fuller, more consistent child support payments.

Although many questions remain, one is particularly relevant for this study. Why do findings from the Miller et al. (2020) and Plotnick (2019) studies differ? Both examine the effect of minimum wage increases on child support payments. Miller and colleagues (2020) suggest a positive effect while Plotnick (2019) concludes with a non-significant finding. To add more to our understanding, the study here involves a re-examination of the Washington Merged Longitudinal Administrative Data (WMLAD), with more data available since the Plotnick study and analyzed differently. With careful investigation, I hope to add to the understanding of the how a minimum wage increase could help modify resources to children.

Chapter 3. DESCRIPTIVE DATA

To examination the association between minimum wage increases and the amount of child support payments made by low-income, non-custodial parents (NCPs), I begin by describing the data I use. The data is primarily comprised of information from the Washington Merged Longitudinal Administrative Data (WMLAD) (Romich, et al., 2018). WMLAD contains millions of de-identified, administrative records associated with Washington State residents between the years 2007 through 2017. Relevant for these analyses, it contains overlapping child support and wage data in the years 2010 through 2016, spanning the implementation of the Seattle Minimum Wage Ordinance on April 1, 2015 but before the statewide increase in minimum wage implemented on January 1, 2017. For these 7 years of data, my analyses will focus on low-income NCPs whose earnings and child support records appear in WMLAD.

In this chapter, first I describe WMLAD and its construction from component data sets from different Washington government departments. Next, I outline the methodology I employ to examine these data including a definition of earnings and data limitations. Finally, I summarize several descriptive statistics among low-wage NCPs including hours worked and earnings, child support payments, and earnings fluctuations in the presence of a minimum wage increase.

3.1 DATA SOURCES

Constructed over three years, WMLAD is a joint effort between researchers affiliated with the Seattle Minimum Wage Study at the University of Washington and staff working within Washington state government agencies. In particular, members of the Research and Data

Analysis (RDA) Division of the Department of Social and Health Services (DSHS) performed a lion's share of the effort to gather and merge data from across several Washington State agencies such as the Department of Social and Health Services (DSHS), Employment Security Department (ESD), Economic Services Administration (ESA), Department of Health, Washington State Patrol, Voter Registration, and Department of Licensing. I acted as data manager on the University of Washington side, and helped by tracking and ingesting the resulting administrative data sets into an organized and secure repository, accessible only to approved University of Washington researchers. The biggest contributing factor in developing WMLAD as a remarkable and possibly unique data resource was the harmonizing of data such that individual adult Washington residents can be traced and matched across data from independent departments. This crosswalk between highly disparate data sources is an explicit strength of this data asset.

To help preserve individuals' confidentiality, the WMLAD contains no directs identifiers, yet enables researchers to analyze trends for numerous outcomes over time across individual workers in Washington. These data are described in greater detail in a paper published by Jennifer Romich, Mark Long, Scott Allard, and Anne Althauser (2018). The Washington State Institutional Review Board approved use of these data in July 2017. WMLAD offers a distinct contribution to research: it is a comprehensive, administrative, state-level, geo-coded, merged data asset across numerous government departments to enable close examination of individual employment and earnings outcomes along with other factors of interest. Most relevant to the study here, WMLAD provides information about NCPs by work location, earnings, hours, and child support orders and payments, along with demographic measures of this subpopulation.

3.1.1 *Merging Data*

The structure of WMLAD allows researchers to combine and merge nearly any portion of the available administrative records as needed. The segment of the WMLAD analyzed here is structured as a panel study. State Unemployment Insurance records (which include quarterly wages and hours worked) form the backbone of the analytic data in this study. In addition to wage records, these data allow me to locate employers geographically, link child support orders and payments, and assign demographic characteristics. The most relevant records are available in either monthly or quarterly increments. For instance, child support information is recorded in months, while employment information is recorded in quarters. For each NCP, child support payments and orders are added across cases within each month and then across months for a quarter total. Next, I merge this accumulated child support data to quarterly hours and earnings information. In addition, I include demographics across several WMLAD sources, Census tract information, a geographic cost-of-living measure, and information provided by minimum wage ordinances and laws themselves. While WMLAD represents a (near) census of the population of Washington State, the data for this study is a subset, restricted to low-income NCPs with overlapping child support orders and wage information within the study period between 2010 and 2016.

3.1.2 *Child Support Data*

Child support information originates at the Division of Child Support within the Economic Services Administration (ESA), part of the Washington State Department of Social and Health Services (DSHS). The original child support data contains nearly 33 million records (N=32,972,035) at the level of case-month, with nearly 29 million (N=28,863,996) of those having an NCP identified and occurring sometime between study observation years 2010 through

2016. This represents nearly a half-million NCPs (N= 489,639). In order to be retained in these data, an NCP must have at least one positive order in the observation window. In addition, NCPs can have no more than four positive orders in any given month over the study period. In other words, I assume NCPs with an excessive number of assigned cases of child support either different enough from other NCPs to warrant separate analysis, or they may be mistakenly matched within these data with duplicative identifiers. These two criteria, a positive order, and no more than 4 positive orders per month, reduces the number of case-months to 17 million (N=17,357,980), a reduction of nearly 40% of the monthly records, representing 154,537 thousand NCPs. Summing the monthly data to the quarter level produces 4,213,035 records of child support data at the NCP-quarter level. Thus, I retain the summation of quarterly child support orders and payments for each case with an identified NCP.

3.1.3 *Employment Data*

The second important data source comes from the Washington State Employment Security Department (ESD), a data set containing at the outset over 176 million records (N=176,765,710) at the individual-quarter level. I omit records missing either hours worked or earnings, as well as missing employer Census tracts, leaving N=166,909,952, a loss of just under 6 percent. I top-code hourly earnings outliers such that those earning over $300/hour (which is true for less than 1% percent of the earnings rates) are capped at that amount. Also, I remove those individuals with total hours worked in any quarter over 1,040 hours (the equivalent to 80 hours per week for all 13 weeks of the quarter). Excessive hours worked could signal a data integrity issue, or suggest an unusual individual.

Next, I only retain ESD records associated with NCPs identified by the earlier child support data. Furthermore, I retain only the records corresponding to the study observation years,

2010 through 2016. The result is N=9,619,384 remaining records. Like Jardim et. al. (Jardim et al., 2018), I omit franchise establishments from the analyses resulting in N=6,896,716 remaining records, a drop of 28 percent. (The incapability of employment information from franchise establishments will be discussed in greater detail in the Limitations section.)

Each individual may have more than one record per quarter. It is reasonable to imagine that an NCP could assume a new job mid-quarter in a different jurisdiction, or have multiple simultaneous employers across jurisdictions. So, I sum over employment information for each quarter, making sure to note the employer address for which the employee worked the most hours. About 13 percent of the records were accumulated to attain a single quarterly sum per NCP, resulting in N=6,011,179 observations.

Employer addresses are geocoded and linked to U.S. Census Bureau's Census Tracts to determine employer location which, in turn, determines the minimum wage policy active in that jurisdiction. Seattle is located within King County, and I assume, like Jardim and colleagues (Jardim et al., 2018), that King County tracts numbered less than 200 are within Seattle city limits, thus subject to a local minimum wage ordinance. Similarly, I identify individuals working in other cities with local minimum wage laws, SeaTac and Tacoma, through Census tracts within city boundaries.

Before separating into jurisdictions subject to local minimum wage policies that differ from the state minimum wage rate, I begin with broad regional comparisons. For the following descriptive statistics, NCPs are separated into three mutually exclusive categories: 1) those working for employers inside the City of Seattle, 2) others working for employers in greater King County, the county that contains Seattle, and 3) still others working for employers in greater Washington State. If all of an individual's employers for a quarter are within one of these

regions, say within the City of Seattle, then the designation is simple: the employee is working within a single region. However, if records for an individual indicate that two or more employers' addresses are in different regions, then the decision rule is as follows: the designated employer region for that individual is the one with the most number of reported hours worked. The second category, NCPs working for employers located in greater King County, is important due to the potential geographic proximity to Seattle with a higher minimum wage beginning in April 2015. For instance, businesses near Seattle but outside the city limit may have to compete for workers subject to Seattle's higher minimum wage.

3.1.4 *Definition of "Low-Income"*

In addition to the inclusion criteria already mentioned, primarily based on available data, I adopt a definition of "low-income" to help identify NCPs most likely to be influenced by a change to a local minimum wage. I define low-income as earnings no more than 200% of the Federal Poverty Threshold (FPT) for a family of three. I chose this threshold because the Poverty Reduction Work Group (PRWG) commissioned by the Office of the Governor in Washington State noted in their *10-Year Plan for the Future* that the "PRWG uses 200% FPL to provide a conservative estimate of the size and extent of economic hardship in Washington state" (Poverty Reduction Work Group, 2020). This captures a sizeable number of families. PRWG noted that in 2019, 1.75 million Washingtonians, including over 500,000 children, lived in households with earnings below 200% of the federal poverty level for a family of three (Poverty Reduction Work Group, 2020).

For this study, if an NCP has recorded earnings below the 200% FPT for a family of three in any quarter, I retain them in this analysis. For instance, the hourly income for a full-time worker in 2010, set at 200% of the FPT for a family of three, is $17.61/hour. This changes

incrementally each year through 2016 when it is $19.38/hour. If in any quarter, an NCP's hourly earnings dips below this definition of poverty, I include them in the definition of low-income. This accounts for those working at the lower wage range who may experience considerable earnings fluctuations, quarter to quarter. Thus, one advantage of the way I apply this definition of low-income is that NCPs demonstrating such fluctuations remain in the analysis here.

3.2 METHODOLOGY

To answer questions about hours worked, earnings, and child support payments, I plan to follow a cohort of NCPs over time. The analytic approach builds on an approach taken by Plotnick (2019) and begins with identifying a cohort of eligible parents within WMLAD. Second, I construct difference-in-difference models. The implementation of the Seattle Minimum Wage Ordinance, as well as other cities' laws to increase the minimum wage, depend on the location of employers. Geographic location of a NCPs' employer will be the basis for an "exposure" to a policy that increases the minimum wage.

3.2.1 *Definition of Earnings*

For this study, I will adopt Belman and Wolfson's (2014) definitions of earnings and hourly earnings. For these researchers, the term "wages" is too general and can include both pre-tax earnings and hourly pay, without an explicit measurement. To be more precise, Belman and Wolfson (2014) define "earnings" as the total pretax amount a worker receives in a paycheck, regardless of the interval of pay, be that weekly, every two-weeks, twice-monthly, or monthly. On the other hand, the "wage rate" is a salary amount per hour, straight-time, associated with the employment arrangement, such as "this job pays $17.50 per hour." In this study I adopt the measure "hourly earnings" as an employee's earnings divided by the number of hours worked in

the same period (Belman & Wolfson, 2014). It is the hourly pay in reality rather than by arrangement.

The hourly earnings may equal the wage rate if 1) records of earnings are accurate, 2) none of the hours worked qualified for time-and-a-half for overtime, or any other premium added to the wage rate (Belman & Wolfson, 2014), and 3) if the employer fulfills its wage dispersal obligation, without unlawful withholding or other oversight. Unfortunately, these three conditions are unmeasurable with the current data, and so I acknowledge these as potential points of deviation.

For the remainder of this study I will refer to "earnings" and "hourly earnings" as the measures available in WMLAD, and the term "wages" will retain its more general meaning. I can then compare hourly earnings (conceding the caveats above) to a lawfully set hourly minimum wage rate, state and local. When the analysis requires earnings in dollar amounts, I inflation-adjust (U.S. Bureau of Labor Statistics, 2021) earnings for comparability across years, adjusted to November 2016 dollars, the middle month of the final quarter of the study period.

3.2.2 *Limitations*

While the use of WMLAD offers a rare opportunity to analyze cross-departmental information collected for an entire state over a number of years, there are limitations to how well this administrative data is able to answer questions posed by this study. First, there is incomplete information. For instance, certain work statuses are exempt from unemployment insurance coverage, including a sizable group of workers categorized as independent contractors or self-employed. As a consequence, there is no earnings information for jobs in the gig economy or for salespersons whose earnings are based solely on commission. Low-income workers may be particularly dependent on contract or informal work arrangements for a portion of their earnings.

Notably, the federal CARES Act of 2020, to address the spike in unemployment brought about by the COVID-19 pandemic, expanded the number of occupations that could qualify for unemployment benefits, including freelancers, independent contractors and other self-employed workers (Employment Security Department, 2020). But at the time of WMLAD data collection, this expansion had not yet taken place. Thus, the earnings I examine in this study comprise those sources which are recorded by ESD, exclusively, leaving potential streams of earnings outside these analyses.

Other information that define certain circumstances of the earner is not available for this analysis. For instance, these data do not distinguish between student workers, salaried employees, or hourly workers. These are several of the subgroups highlighted as having different wage-earning profiles by Belman and Wolfson (2014). Another limitation is missing employment location information brought about by multiple franchise establishments. For instance, a corporate office could be located inside the City of Seattle while having two retail outlets, say, one in Seattle and one in a neighboring county. On payroll records collected by ESD, however, all the employees of such a business could have a single address, that of the corporate office. There would be no possibility of distinguishing the locations of the two retail outlets. Which employees, if any, are subject to a local minimum wage policy above the state minimum? Without access to employees' actual work locations, only the corporate office location, there is no accurate way to identify the minimum wage enacted in the jurisdiction of their employment. Unfortunately, the elimination of franchise employers is a study limitation, affecting 28% of the NCP workforce across the study's observation period.

Another important missing factor in these analyses is previous marital or cohabitation statuses between the NCP and the custodial parent. NCPs with support orders may decide not to

pay child support for any number of reasons, even if their earnings are high enough to afford the payment. Research suggests that NCP attachment to the recipient family has a bearing on their decision to make child support payments (Nepomnyaschy & Garfinkel, 2010). One proxy for the level of attachment is previous marital or co-habitation statuses. Such information could act as important control variables in models, or offer the possibility of informative subset analyses. Lack of marital or co-habitation statuses represent study limitations.

One study limitation is the limited length of follow-up. Data for the analyses here represent seven years, from 2010 through 2016. Only the latter portion of that time, April 1, 2015 through December 31, 2016, or the last seven quarters, occurs after the implementation of Seattle's Minimum Wage Ordinance. Therefore, I can only observe the outcomes of interest for a limited time to assess the impact of the wage interruption. While the follow-up period may be lengthy enough to observe immediate effects, it is likely insufficient for making inferences on medium- to long-term outcomes. So, one study limitation is that I am only able to infer the extent of the impact of a minimum wage increase in the short-term.

Finally, one important study limitation involves generalizability. WMLAD is exclusively data from Washington state. A study involving a set of representative states, or ideally all states, may more accurately predict the impact of a local minimum wage increase on NCPs who work in other regions across the United States. This single-state analysis represents a study limitation. In the Discussion section in Chapter 7, I offer several ideas how this study, despite this limitation, could help decision-makers across the country anticipate the effect of a local minimum wage increase.

3.3 Population Descriptive Statistics

As mentioned previously, the data for this study is primarily a combination of child support information from the Washington State Department of Social and Health Services (DSHS) and employment and earnings information from the Employment Security Department (ESD). These data were merged on unique individual identifiers as part of the larger WMLAD source. Table 3.1 displays the disposition of subjects, tracing the process steps from the original data sets to the creation of a single, analytic data set.

From 2010 through 2016, DSHS child support data has nearly 29 million monthly observations, as shown in Table 3.1. The ESD data source contains over 95 million quarterly observations during that timeframe. After cleaning faulty records in ESD data, I remove franchise and multi-site employer data (those with a single corporate office address rather than actual work locations). The drop from over 83 million quarters of data to over 60 million represents a 28% decline in the number of observations. After applying the inclusion criteria and combining the DSHS child support information, the primary analytic data set is the first shown under “Combined data” and has 2,130,866 observations representing 73,234 NCPs. Notably, these 2 million observations represent the union of the two data sources, thus an upper limit of the number of observations available to derive any particular model. For instance, of the 73,234 NCPs who met the inclusion criteria, they had 883,855 quarters with earnings greater than zero. For these same NCPs, a total of 1,887,993 quarters indicated at least one child support order greater than zero. The intersection, or the number of quarters among NCPs with both positive earnings and positive orders, was 727,012, representing about 39% of the quarters with positive orders.

Table 3.1 Disposition of subject

Number of observations and unique individuals in data at key stages in the development of the final analytic data set

Child support (DSHS)

Description	Unit	Number of observations	Unique individuals
2010-2016, all NCPs	NCP-order-month	28,863,996	489,639
Applied inclusion criteria[4]	NCP-order-month	17,357,980	154,537
Summed to quarter level	NCP-quarter	4,213,035	154,537

Employment (ESD)

Description	Unit	Number of observations	Unique individuals
2010-2016, all individuals	individual-quarter	95,487,853	5,804,353
Cleaned data[1]	individual-quarter	83,341,896	5,432,582
Removed franchises[2]	individual-quarter	60,307,198	4,627,724
Applied inclusion criteria[3]	NCP-quarter	2,118,144	78,995

Combined data

Description	Unit	Number of observations	Unique individuals
Overlap in data[5]	NCP-quarter	2,130,866	73,234
Demographics available[6]	NCP-quarter	2,129,483	73,183
Propensity score available[7]	NCP-quarter	2,041,916	70,168

[1]Removed records with key fields missing
[2]Removed franchise and multi-site employer data
[3]Retained individuals who also appear in child support data; plus, removed records with no Census tract, or records with earnings below WA state minimum wage; summed over the quarter among those reporting multiple jobs; must work at least one quarter with earnings below 200% FPT for a family of 3

[4]NCP must have a at least one positive order over the observation years; must have no more than 4 positive orders per month
[5]Must have at least one quarter overlap between one record of positive work hours and one positive child support order; note that the "Number of observations" reflects the union of data sources and thus is greater than the ESD component source
[6]At least some demographic information is available
[7]Full demographic information is available to develop propensity score weights for models

The bottom of Table 3.1 displays the proportion of remaining NCPs who have demographic information. Most of the 73 thousand NCPs have some demographic information available, with a large majority (nearly 96%) of the NCPs having enough demographic information to enable computation of propensity score weights, an important feature of the difference in difference approach adopted later.

Table 3.2 displays the demographics of NCPs in this study. It shows that the majority of the NCPs are male (87.4%). While nearly 70% of NCPs in this study identify as White only (with no other race recorded), 17.8% claim more than one race or other race, 9.4% identify Black only, and 2.7% identify Asian or Pacific Islander only. Those with Native Americans or Alaska Natives as their only race constitute one-half of a percent. Hispanics make up 20.9% of the NCPs. The median NCP age is 36, but age ranges widely from 15 to 82 years old. A small fraction of NCPs died (0.2%) prior to the end of the study.

Table 3.2 Demographics of non-custodial parent study population (N=73,234)

Characteristic (N=total available)	N or measure	Statistic
With demographic data	73,183	99.9%
With propensity score	70,168	95.8%
Sex percent male (N=73,182)	63,940	87.4%
Race (N=70,169)		
Asian/Pacific Islander only[2]	1,918	2.7%
Black only[2]	6,608	9.4%
Native American/Alaska Native only[2]	375	0.5%
White only[2]	48,808	69.6%
Multiple/Other	12,460	17.8%
Ethnicity Hispanic (N=70,169)	14,646	20.9%
Age (N=73,182)	mean:	37.3
years old in 2016	median:	36
	range:	15-82
Died (N=73,183)		
by 2016	181	0.2%

[1]Matching child support data with employment data, with inclusion criteria
[2]"Only" signifies only one race recorded

3.3.1 *Description of Earnings and Hours Worked*

To better understand regional differences, below I explore NCPs' earnings and hours worked, along with the potential effects of an increase in minimum wage on these measures. To begin, I divide Washington state into three regions: 1) Seattle, 2) King County (not including Seattle), and 3) Washington (not including King County). Seattle is the region where workers were subject to a minimum wage increase in 2015. Workers in the remainder of King County were only subject to a minimum wage increase if they worked in narrowly designated job classifications in the city of SeaTac. Thus, the majority of workers in the remainder of King County were not subject to a minimum wage increase, but potentially worked in close proximity to workers in a region that did feel an impact. Finally, workers in the remainder of Washington state were only subject to a minimum wage increase in the city of Tacoma, a small increase among a minority of workers relative to all those employed across the state. Among these three regions, therefore, workers in Seattle felt the most comprehensive impact of a minimum wage increase: it was a relatively large increase and broadly applied, potentially affecting all workers on the lower end of the wage scale. The other two regions allow for comparison: King County for those working in close proximity to a region broadly subject to an increase, and Washington for those mostly working relatively far from such a region.

Table 3.3 displays summary statistics for quarters with NCP earnings (inflation adjusted to 2016 dollars) from 2010 through 2016. This cohort of NCPs worked a total of 77,916 quarters (8.8%) in Seattle, 163,000 quarters (18.4%) in King County (not including Seattle), and 642,939 quarters (72.7%) in Washington State (not including King County). Overall, the mean earnings for quarters worked in Seattle ($7,763) exceeds King County's ($7,612) and Washington's ($6,525) by $151 and $1,238, respectively, although the median earnings for Seattle ($7,027) is

lower compared to King County's ($7,151). A similar trend can be seen in mean hourly earnings of $20.50 per hour, $19.58 per hour, and $17.07 per hour, respectively, with the comparison of median hourly earnings following the same trend. Total hours worked in each of the regions for these workers shows an uptick among King County NCPs with 393 hours per quarter on average compared to Seattle (380 hours) and Washington (378), with medians following that relative order. By way of comparison, a full-time employee working 40 hours per week for 13 weeks in a quarter would have worked 520 total hours.

Table 3.3 Earnings and hours for quarters NCPs worked, by jurisdiction

Quarters of earnings	Seattle[y] N = 77,916	King County[y] N = 163,000	Washington[y] N = 642,939
Earnings – total dollars*			
Mean (sd)	7,763 (6,432)	7,612 (5,732)	6,525 (4,875)
Median	7,027	7,151	5,939
Earnings – dollars* per hour			
Mean (sd)	20.50 (19.84)	19.58 (17.57)	17.07 (13.10)
Median	16.52	16.44	14.57
Hours worked			
Mean (sd)	380 (208)	393 (200)	378 (203)
Median	440	453	428
Exposure to high minimum			
N	56,011	28,704	60,965
(%)	(72%)	(18%)	(9%)

[y] Mutually exclusive jurisdictions: Seattle, King County excluding Seattle, and Washington excluding King County
* Inflation adjusted to 2016 dollars

In Table 3.3, exposure represents the number of quarters that a worker was exposed to a minimum wage rate higher than that set by Washington State. Exposure was treated generously: if at any time in a quarter a NCP worked for an employer located in a jurisdiction with a minimum wage set above the state minimum, the exposure variable was set to one, and otherwise it was set to zero. Thus, even part-time employment in a jurisdiction with a higher minimum wage was counted towards exposure. For the cohort working in Seattle, 72% of their quarters

were during a time when Seattle's minimum wage rate exceeded that of the state. Only 18% of the quarters worked in King County had a minimum wage rate above Washington's minimum, and just 9% in the remainder of Washington. As noted previously, a few jurisdictions outside of Seattle (the City of SeaTac) and King County (the City of Tacoma) phased-in minimum wage increases over this course of this study.

Table 3.4 summarizes hourly earnings by sector. This table answers the questions, what proportion of quarters with earnings fall within each sector and jurisdiction? On average how much do NCPs earn per hour? The sectors are displayed along with their 2-digit NAICS code. When a sector accounted for a small portion of the NCPs' work quarters such that no more than 4% of the quarters were represented across all jurisdictions, I combined that sector into an "Other" category. According to Table 3.4, the lowest earning NCPs are in sector "72 Accommodation and Food Services" in the jurisdiction of Washington with median earnings of $11.68 per hour. The second lowest earners are also in greater Washington but in the sector "11 Agriculture, Forestry, Fishing and Hunting" with median earnings of $12.65 per hour.

In Table 3.4, quarter percent and earnings in certain sectors suggest trends and others do not. For example, a progression from low (Seattle) to medium (King County) to high (Washington) is evident in sector "44-45 Retail Trade," with the proportion of quarters represented by 6%, 8%, and 12%, respectively. The median hourly earnings in retail trade, however, trend in the other direction, $16.36, $16.31, and $14.20. Focusing on the sector with some of the lowest earners, "72 Accommodation and Food Services," median hourly earnings follows the downward trend of $14.74 per hour in Seattle, $13.30 in King County, and $11.68 in Washington. Yet, there is no clear progression in the proportion of quarters: Seattle has the highest number of quarters with 17% in this sector, while King County has 7% and Washington

has 11%. Low-earning sectors may vary by jurisdiction. For instance, “11 Agriculture, Forestry, Fishing and Hunting” displays lower hourly earnings in King County ($13.64) and Washington ($12.65) compared to Seattle ($20.97). In Washington, where there is a sizeable agricultural industry, the portion of the quarters are represented at 9%, while much fewer are in Seattle at 1% and King County at <1%. Other sectors of note include those with lower earnings across all jurisdictions: “56 Administrative and Support and Waste Management and Remediation Services” (hourly earnings $14.23, $15.24, and $13.63, in Seattle, King County, and Washington, respectively) and “62 Care and Social Assistance” (hourly earnings $16.75, $16.34, and $13.23, respectively).

Table 3.4 NCPs' hourly earnings by sector and jurisdiction

Sector	Seattle[v]	King County[v]	Washington[v]
% of quarters within jurisdiction Earnings per hour*: Mean (sd) Median			
11 Agriculture, Forestry, Fishing and Hunting	1% 27.46 (20.96) 20.97	<1% 16.32 (8.93) 13.64	9% 14.19 (5.55) 12.65
23 Construction	11% 26.03 (11.38) 23.54	14% 24.44 (10.36) 21.61	13% 21.41 (8.77) 19.25
31-33 Manufacturing	13% 21.40 (11.60) 18.43	15% 18.53 (6.46) 17.36	17% 17.55 (7.04) 16.46
42 Wholesale Trade	7% 18.42 (8.16) 16.69	9% 19.56 (9.49) 17.88	6% 17.83 (8.78) 16.31
44-45 Retail Trade	6% 20.38 (13.73) 16.36	8% 19.22 (11.74) 16.31	12% 16.81 (10.18) 14.20
48-49 Transportation and Warehousing	7% 20.02 (8.02) 18.24	9% 17.68 (8.28) 16.48	5% 19.12 (7.25) 18.03
52 Finance and Insurance	1% 31.93 (28.24) 21.94	1% 26.57 (26.06) 19.77	1% 21.51 (14.70) 18.08
53 Real Estate Rental and Leasing	5% 19.02 (6.79) 17.92	3% 18.03 (6.53) 16.87	1% 16.25 (6.29) 14.99
56 Administrative and Support and Waste Management and Remediation Services	10% 16.19 (9.77) 14.23	15% 17.07 (8.02) 15.24	7% 15.81 (7.53) 13.63
62 Care and Social Assistance	7% 18.57 (8.64) 16.75	5% 17.46 (7.08) 16.34	6% 15.15 (6.55) 13.23
71 Arts, Entertainment, and Recreation	1% 18.34 (9.77) 16.32	5% 18.68 (8.36) 16.80	3% 16.00 (7.28) 13.73
72 Accommodation and Food Services	17% 16.52 (6.79) 14.74	7% 14.94 (5.80) 13.30	11% 13.30 (4.98) 11.68
Other[ɣ]	14% 24.19 (16.97) 19.58	11% 22.17 (15.33) 18.60	10% 19.24 (9.43) 17.41

ɣ Mutually exclusive jurisdictions: Seattle, King County excluding Seattle, and Washington excluding King County
* Inflation adjusted to 2016 dollars
ǂ Sectors with no more than 4% of the quarters across all jurisdictions: “21 Mining”, “22 Utilities”, “51 Information”, “54 Professional, Scientific, and Technical”, “55 Management of Companies and Enterprises”, “61 Educational Services”, “81 Other Services (except Public Administration)”, and “92 Public Administration”

3.3.2 *Description of Child Support Orders and Payments*

Table 3.5 displays summary child support information for NCPs. Among quarters where there is an active child support order or payment, 82 to 83% have positive (above $0) orders, and 74 to 76% have positive payments. I compute payment percent, also referred to as “compliance” by Cancian and Meyer (2007), as the total amount NCPs paid toward child support in a quarter, divided by the total amount owed (combining all child support orders in that quarter), multiplied by 100. Across mutually exclusive jurisdictions of Seattle, King County (excluding Seattle), and Washington (excluding King County), NCPs paid at least 50% of a child support in 63 to 65% of the quarters. The number of quarters when the order was paid 100% is between 34 and 36%, so in about one-third of the quarters NCPs paid child support payments in full.

Table 3.5 Quarters with child support orders and payments by jurisdiction

N (%)	Number of quarters		
Child support order	Seattleɣ	King Countyɣ	Washingtonɣ
Positive orders	64,931 (83%)	134,983 (83%)	527,098 (82%)
Child support payment			
Positive payments	58,679 (75%)	123,187 (76%)	474,638 (74%)
Payments at least 50% of order	49,758 (64%)	105,269 (65%)	402,062 (63%)
Payments 100% or more of order	27,918 (36%)	57,651 (35%)	219,503 (34%)

ɣ Mutually exclusive jurisdictions: Seattle, King County excluding Seattle, and Washington excluding King County

3.3.3 *Combined Description of Earnings and Child Support Payments*

Table 3.6 examines NCP hourly earnings relative to payments towards orders. I divide percent of child support paid into four discrete categories: no payment, paid some but less than 50%, paid between 50% but less than 100%, and paid in full or more. As has been noted previously, lower earnings are associated with less than full payments towards child support orders (Cancian & Meyer, 2007). The same appears true in these data from Washington State. NCP earnings appear lowest in quarters where an active order existed but no child support payment was made: median earnings were $13.26 per hour in Seattle, $13.48 per hour in King County, and $11.94 per hour in Washington. Those quarters with some payment but less than 50% of the order, median hourly earnings were about $0.40 higher. The upward trend continues for those quarters with a greater portion of the order paid, with a sizable jump when paying more than 50% with earning ranging between $15.19 to $21.54 per hour. The quarters with full payments had the highest NCP earnings. Based on these data, there appear to be jurisdictional differences: while Seattle and King County vie for the highest median earnings in each pay category, Washington has consistently lower earnings per hour.

Table 3.6 Hourly earnings by child support payment by jurisdiction

Mean (sd) Median	Earnings* per hour		
Child support payment relative to order amount	Seattle[y]	King County[y]	Washington[y]
Paid none	16.36 (14.90) 13.26	16.45 (14.91) 13.48	14.64 (12.83) 11.94
Paid >0% but less than 50%	17.42 (17.58) 13.70	17.36 (16.99) 13.94	15.12 (12.45) 12.30
Paid >=50% but less than 100%	21.54 (20.71) 17.44	20.37 (17.98) 17.15	17.52 (12.74) 15.19
Paid 100%	22.11 (20.09) 18.01	20.94 (18.36) 17.76	18.46 (13.44) 16.19

* Inflation adjusted to 2016 dollars

[v] Mutually exclusive jurisdictions: Seattle, King County excluding Seattle, and Washington excluding King County

3.3.4 *Description of Measures Before and After a Local Minimum Wage Increase*

To discern the possibility of a local minimum wage increase having an influence on our measures of employment, I factor into the next tables a time interval before implementation of the minimum wage hike and after implementation. To begin with, Table 3.7 displays NCPs' hours worked and hourly earnings in quarters before Seattle's Minimum Wage Ordinance took effect and after it took effect. Median hours worked tended to hover around the low- to mid-400s, compared to full-time employment totaling 520 hours per quarter (40 hours per week for 13 weeks). Those employed post-ordinance had median work hours increase by 29, 30, and 36 hours across jurisdictions, respectively.

In Table 3.7, the median hourly earnings pre-Seattle ordinance and within Seattle was $16.05 per hour. Comparing this to the post-Seattle ordinance hourly earnings of $17.97, there was a positive $1.92 difference. Across jurisdictions that temporal increase holds. While median differences tend to be greater in Seattle and King County ($1.88 per hour), Washington also showed an increase ($1.36 per hour).

Since this study follows a cohort of active NCP earners, and does not consider employment consequences following a minimum wage increase, these increases in work hours should be interpreted cautiously. For example, if any NCPs were laid off to accommodate their employer's increased cost of payroll after a minimum wage increase, they would have no work hours to factor into these statistics. At the same time, if the number of employees decreased as a result of a minimum wage increase, the remaining employees may see increased hours to cover

lost jobs. Examining the number of hours worked in this context does not allow for firm conclusions to be drawn about either employment effect.

Table 3.7 Hours worked and hourly earnings by pre- and post-implementation of Seattle's minimum wage increase

Mean (sd)	Hours worked in the quarter		
Median	Seattle[ɣ]	King County[ɣ]	Washington[ɣ]
	374 (208)	385 (201)	371 (202)
Pre-Seattle ordinance	431	443	417
	394 (205)	413 (197)	397 (202)
Post-Seattle ordinance	460	473	453
Difference in medians	29	30	36
	Hourly earnings*		
	19.72 (19.53)	18.89 (16.97)	16.60 (12.72)
Pre-Seattle ordinance	16.05	15.97	14.16
	22.43 (20.46)	21.41 (18.93)	18.31 (13.95)
Post-Seattle ordinance	17.97	17.85	15.52
Difference in medians	1.92	1.88	1.36

[ɣ] Mutually exclusive jurisdictions: Seattle, King County excluding Seattle, and Washington excluding King County

* Inflation adjusted to 2016 dollars

Table 3.8 displays hourly earnings in percentiles for quarters where NCPs worked. The first column under each jurisdiction represents hourly earnings for quarters pre-implementation of the Seattle ordinance, while the second column represents the post-implementation hourly earnings. The third column is the percent difference between the pre- and post-implementation hourly earnings. In this case, the percent differences are positive to represent the consistent gain in the rate of earnings. The biggest changes across jurisdictions in percent differences occurs at the lowest percentiles. In particular, at the 5th percentile, the percent difference in wages between pre-implementation and post-implementation in Seattle at 12.4%, compared to King County at 7.1% and Washington at 3.0%. At the 10th percentile, percent difference in hourly earnings is 13.1%, 10.9%, and 4.4%, respectively. By the 20th percentile, Seattle and King County begin to converge with 13.9%, 13.7%, and 8.1% differences. By the 30th percentile, the percent difference in hourly earnings in King County exceeds that of Seattle, with 13.8%, 14.0%,

and 10.3% respectively. But then Seattle's percent differences begin to exceed King County's by the 50th percentile (median) and beyond.

Based on this table alone, preliminarily I observe the strongest effects of Seattle's minimum wage increase is in a subset of quarters where NCPs earn the least (less than the 20th percentile) and, of course, work in Seattle. Preliminarily, there may be evidence of spillover effects as wages across a number of rates above the minimum adjust upward. Spillover effects occur when a minimum wage increase raises wages of those already earning above the new minimum wage. One reason for spillover effects is market-driven: employers may want to retain and attract workers just above entry level by increasing their wages, causing their equilibrium wage to rise (Belman & Wolfson, 2014).

Table 3.8 Percentile of hourly earnings pre- and post-implementation of Seattle's minimum wage increase

	Hourly earnings*								
	Seattle[ɣ]			King County[ɣ]			Washington[ɣ]		
Percentile	Pre	Post	% diff	Pre	Post	% diff	Pre	Post	% diff
5th	9.68	10.88	12.4	9.80	10.50	7.1	9.51	9.80	3.0
10th	10.31	11.66	13.1	10.41	11.54	10.9	9.80	10.23	4.4
20th	11.55	13.15	13.9	11.62	13.21	13.7	10.56	11.42	8.1
30th	12.99	14.78	13.8	13.03	14.86	14.0	11.46	12.64	10.3
40th	14.50	16.14	11.3	14.47	16.18	11.8	12.67	14.04	10.8
50th (median)	16.05	17.97	12.0	15.97	17.85	11.8	14.16	15.52	9.6
60th	17.76	20.08	13.1	17.54	19.63	11.9	15.80	17.37	9.9
70th	19.79	22.86	15.5	19.34	21.98	13.7	17.68	19.45	10.0
80th	22.97	27.15	18.2	21.99	25.57	16.3	19.98	22.20	11.1
90th	29.55	35.37	19.7	27.86	32.35	16.1	24.35	27.49	12.9

* Inflation adjusted to 2016 dollars

[ɣ] Mutually exclusive jurisdictions: Seattle, King County excluding Seattle, and Washington excluding King County

3.4 CHAPTER SUMMARY

In this chapter, I introduced the population of non-custodial parents who will serve as the cohort for these analyses. The unique merging of individual-level child support, wage and birth

records data makes WMLAD a highly valuable resource for this research. I begin by describing how the population was derived from the larger WMLAD source, with inclusion criteria and the results of merging employment data with child support information, resulting in over 70,000 low-earnings NCPs in the final analytic data.

Next, I offer a demographic overview of this population, with 87% of NCPs identifying as male. I then examine the descriptive statistics for the outcomes of interest for this study, namely earnings, hours worked, and child support measures. As a simple approach, I differentiate between measures prior to the implementation of a minimum wage increase in Seattle and after implementation. Preliminarily, I observe the strongest effects on of a minimum wage increase in hourly earnings among NCPs who earn the least (less than the 20th percentile). These are cautious indications of differences across regions and time intervals, suggesting the possibility that more robust modeling techniques may reveal that local minimum wage increases could influence hours worked and earnings, potentially leading to changes in child support payments.

Chapter 4. MINIMUM WAGE INCREASE AND EMPLOYMENT

Child support payments contribute to the well-being of children. This mechanism of support for children is dependent, however, on the non-custodial parent's (NCP's) ability to pay. After increasing a minimum wage, workers earning the lowest hourly rates ought to see their earnings increase, and potentially enable higher, more consistent child support payments. After all, more take-home pay for low-income workers is the primary reason for enacting such a measure in the first place. There may be unintended side-effects in implementing wage mandates, however, several of which could result in a negligible change, or even less pay, in the pockets of low-wage workers.

This chapter will attempt to answer two questions surrounding minimum wage increases and NCP employment. Do minimum wage increases affect the likelihood that NCPs work? Do increases in the minimum wage effect NCP work hours conditional on employment? The primary idea is that after an increase in a local minimum wage, employment and hours worked may change for low-wage NCPs, possibly altering earnings and, in turn, the amount of child support paid. A minimum wage adjustment can result in fewer assigned hours as employers re-adjust to accommodate greater payroll expense (Jardim et al., 2018). Simply put, I hypothesize that a local minimum wage increase may lead to a decline in hours worked among NCPs, at least in the short term. In later chapters, I explore whether such a relation, if it exists, could influence earnings that then leads to the amount of child support paid.

4.1 CONCEPTUAL MODEL

The conceptual model addresses the volatility of employment in the formal sector among low-earnings NCPs. Could a minimum wage increase destabilize lower earning NCP

employment? This gives rise to the following hypothesis and Figure 4.1 depicting the relation. Here, I predict a negative association between a minimum wage increase and employment, where an increase in the minimum wage results in a decrease in (employment or hours worked). This hypothesized association is depicted as a path diagram in Figure 4.1 where the negative sign (-) attached to "H1" symbolizes the hypothesized direction of the coefficient in the model.

H1: NCPs subject to a minimum wage increase will see a decline in employment

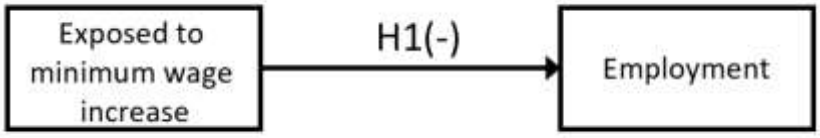

Figure 4.1 Conceptual model for hypothesis 1

4.2 Descriptive Measures

I employ both descriptive and stochastic methods to address the above question. In this section, I describe the unadjusted patterns of employment (any employment and number of hours among employed) for low-earning NCPs before and after the implementation of the Seattle Minimum Wage Ordinance (also referred to here as the "interruption" or simply the "implementation").

4.2.1 *Any Hours Worked*

Did NCPs lose or gain jobs after a local minimum wage increase? Employment will be measured as the number of hours worked including zero hours -- no hours reported for any job in the formal sector in the quarter. Here, I assume zero hours worked whenever an NCP has a record of employment in the quarter that contains less than 1 hour worked, or has no record of

employment at all. I begin by examining the number of low-income NCPs with any work hours in the quarters before and after the implementation. I define "low-income," as stated earlier, as those with at least one quarter in which they earn less than 200% of the FPT for a family of three over the course of the 7-year study. I define "working" NCPs as those with any positive (non-zero) work hours in a quarter. I begin descriptive statistics by separating working NCPs into three jurisdictions, Seattle, King County (not including Seattle), and Washington State (not including King County). I display regional differences in employment to offer context for the eventual implementation of the measures that will increase the minimum wage.

Figure 4.2 depicts the number of low-earning NCPs with any hours worked per quarter across this study. First, reflecting differences in total populations, the fewest NCPs worked in Seattle (approximately 4,500-6,200, or 8-9 percent) compared to King County excluding Seattle (9,500-12,700, or 18-19 percent), and then again compared to Washington State excluding King County (40,000-50,000, or 73-74 percent). The strong seasonal trends are apparent in the NCPs working in greater Washington in Figure 4.2. There may be some evidence of flattening in the trends after the interruption, particularly noticeable for Washington. These visual distinctions, however, may be due to differences in scale.

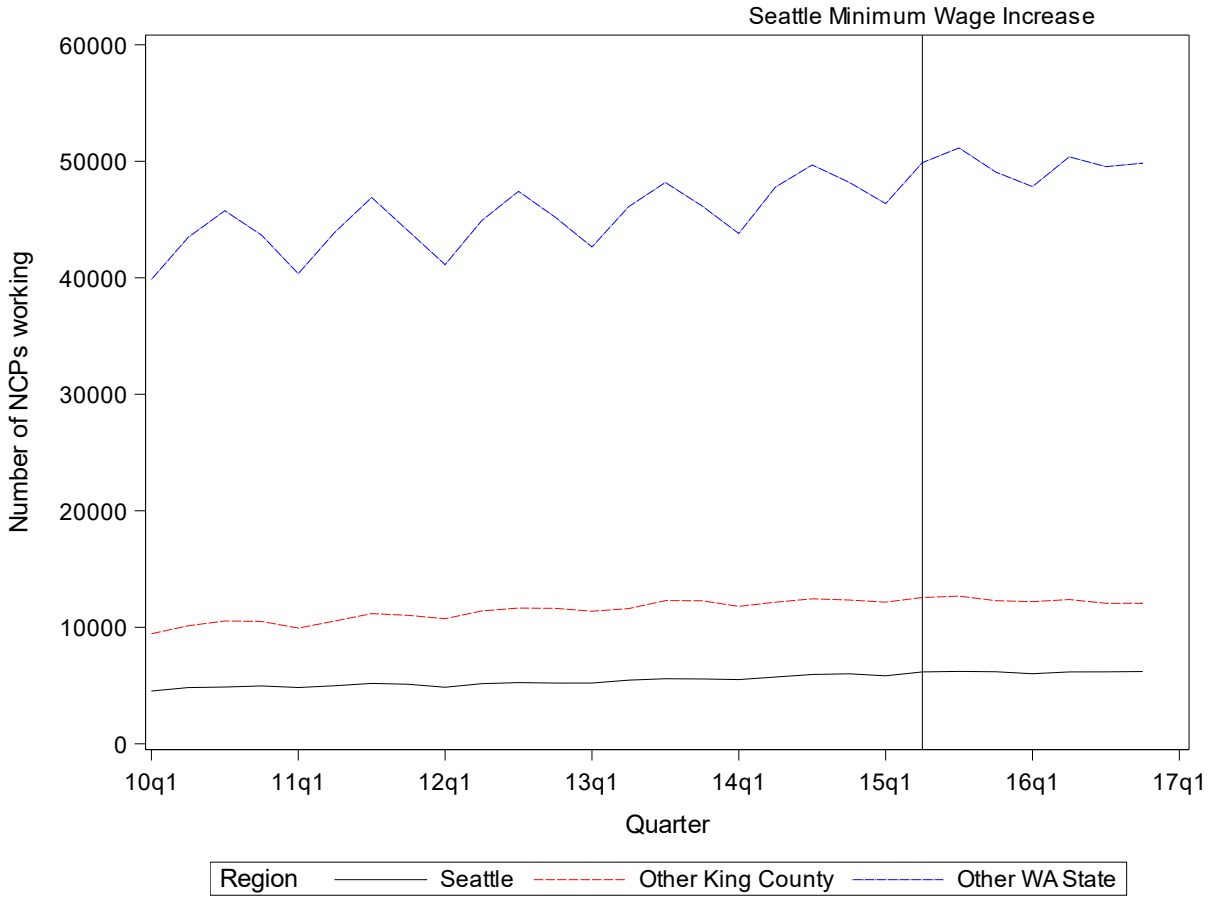

Figure 4.2 Number of NCPs with any hours worked per quarter by region.

Regions are mutually exclusive: "Other King County" does not include Seattle, and "Other WA State" does not include King County.

Another way to look at these data is by standardizing the number of NCPs working per quarter. In Figure 4.3, all counts have been standardized (by subtracting their mean and dividing by their standard deviation, within region) to account for differences in scale. Here, it is evident that the number of NCPs employed each quarter is increasing across all regions over this time period. Also, seasonal trends appear across all regions, although the seasonal trend for Washington State remains most prominent. Each year, the quarter with the least number of employees tends to be the first quarter (January-March), while the third quarter (July-September)

has the most. This pattern would square with the seasonal work observed in the agricultural sector with more employment in the growing and harvesting seasons, or in the construction sector with work best conducted in dry weather. Seasonal tourism, highest in summer, may also contribute to these employment differences. The trends in number of employees working per quarter approximately agree across regions, without any large departures prior to the implementation of the Seattle Minimum Wage Ordinance in April 2015. Moreover, King County appears to experience an employment dip in the last quarters of 2016 relative to other regions. A test for differences in employment between regions, however, was not statistically significant at the 0.01 level

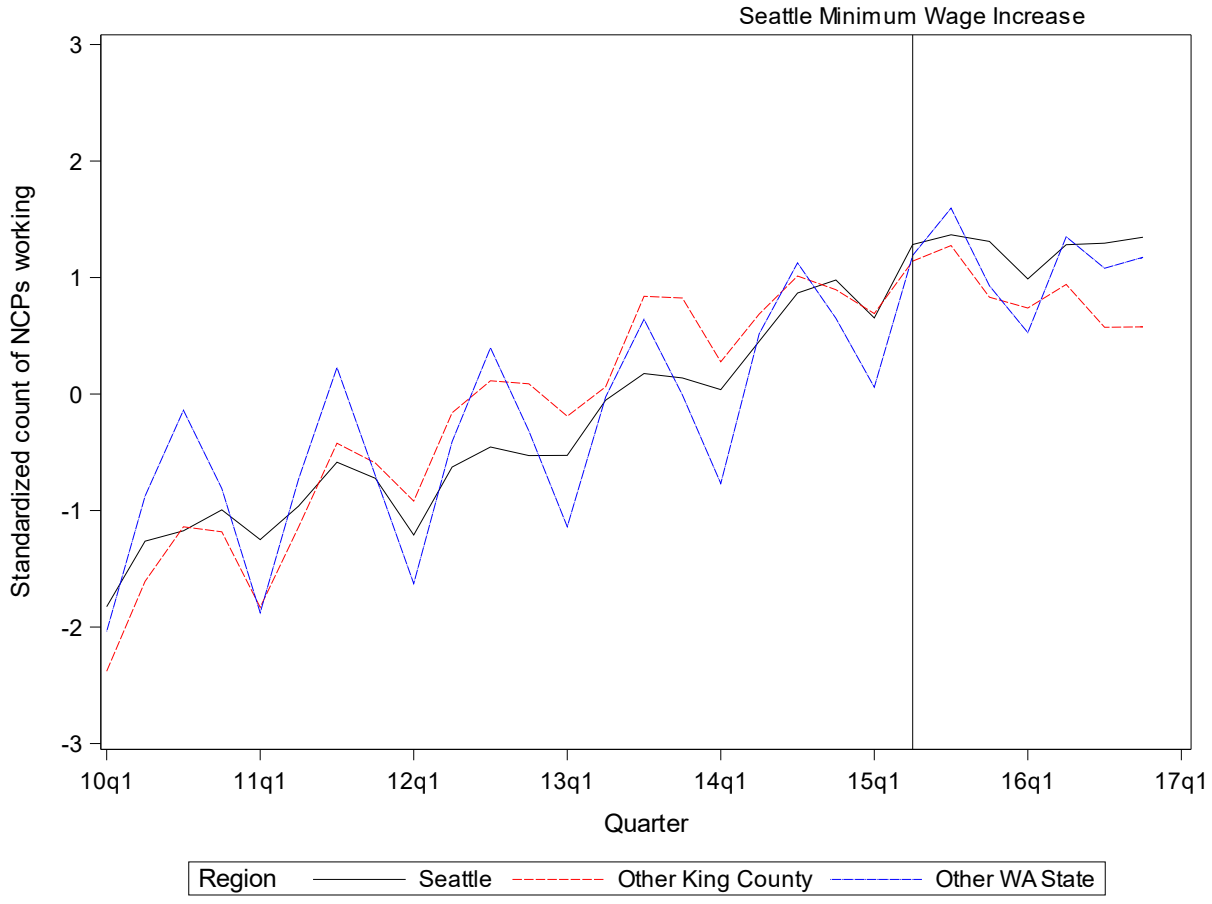

Figure 4.3 Standardized number of NCPs with any hours worked per quarter by region

Regions are mutually exclusive: "Other King County" does not include Seattle, and "Other WA State" does not include King County.

Figure 4.3 suggests a general upward trend in employment, with a possible disruption in employment post-ordinance, with flattening (or decline) and possibly a seasonal disturbance. To add context, the increasing number of NCPs working each quarter may reflect lower unemployment rates occurring in Washington State as a whole in the post-2008 recession recovery period. Table 4.1 displays the annual unemployment rates from 2008 to 2016 for both Washington state and the United States. Washington's unemployment rate stood at 10.0% in 2010, but by 2016 it had dropped to 5.3% (Washington State Office of Financial Management, 2021), so more Washingtonians were working in the latter years of this study. Moreover, the post-implementation "flattening" in the number of NCPs with any work displayed in Figure 4.3 could reflect the state approaching full employment. Figure 4.3, however, does not offer evidence of a relative decline in having a job among NCPs in the region of Seattle compared to King County or the rest of the state. This simple approach does not offer evidence to support my hypothesis that the implementation of a minimum wage increase is followed by a decline in employment as measured by the number of NCPs employed each quarter.

Table 4.1 Unemployment rates in Washington and the United States, 2010-2016[1]

Year	Washington (%)	United States (%)
2008	5.4	5.8
2009	9.2	9.3
2010	10.0	9.6
2011	9.3	8.9
2012	8.1	8.1
2013	7.0	7.4
2014	6.1	6.2
2015	5.6	5.3
2016	5.3	4.9

[1]Washington State Office of Financial Management (2021)

4.2.2 *Number of Hours Worked*

Among those who had jobs, is there any change in the number of hours worked post-increase in the local minimum wage? As previously described, Seattle's Minimum Wage Ordinance took effect in April 2015, gradually raising the minimum to $15 per hour and thereafter adjusting the rate to account for inflation. The cities of SeaTac and Tacoma each had laws that increased their local minimum wage rates above the state minimum, implemented at different times with different employee qualifications. The number of employees subject to a minimum wage increase differed by jurisdiction, with the lion's share working within Seattle rather than the smaller cities where such increases applied to many fewer workers. At a population level, Seattle's law likely had the greatest influence, if any, across the broadest number of employees and across the largest geographic area. Thus, I concentrate on the implementation of Seattle's Minimum Wage Ordinance as the point in time at which a major change occurs, justifying an especially close examination of its impact. While I account for all employees recorded as working in a jurisdiction subject to a minimum wage increase above the state minimum, here I assume a temporal "interruption" on April 1, 2015, the date of implementation of the Seattle Minimum Wage Ordinance.

Figure 4.4 displays the median number of hours NCPs worked per quarter, ranging from about 380 hours to 480 hours over the course of the study, by exposure status. By way of comparison, a full-time job at 40 hours per week × 13 weeks per quarter equals 520 hours. The "Exposed" group comprises NCPs who worked at least one quarter in a jurisdiction that saw a minimum wage increase above the state minimum over the 7-year observation period. The "Not Exposed" group represents those who, over the study, never worked under laws that increased the minimum wage above the state minimum. Exposure status as defined here can be considered

conservative, since the threshold is just one quarter of work in a jurisdiction with a local minimum wage increase above the state's minimum wage. This potentially underestimates the impact of a minimum wage increase for NCPs with changing employers that cross jurisdictions.

Figure 4.4 Median hours worked among low-earnings NCPs by exposure status Exposed=10,079, Not Exposed=63,155.

A few notable features of Figure 4.4 include the seasonal trends, with work hours peaking in the summer, and a general upward trajectory, possibly reflecting the simultaneous economic recovery mentioned previously. Relevant to the questions posed here, there appears to be similar paths between the exposed and unexposed groups early in the study. At the vertical line, representing the quarter in which Seattle's minimum wage ordinance is implemented, there is an

apparent widening gap in work hours between exposed and unexposed NCPs post-implementation. Among unexposed NCPs, the median hours worked seems to continue an upward trend post-implementation, while the median hours worked for exposed NCPs appears to flatten and possibly decline. Preliminarily at least, this supports my prediction that hours worked may decline among low-wage NCPs who are subject to a minimum wage increase. In the next section, I apply statistical modeling to formally test the possibility of a change in exposed and unexposed groups after a minimum wage increase.

4.3 METHODS

My methods for unearthing the relationship between minimum wage increases and hours worked center on justifications for a difference-in-difference approach. Within that context, I select and defend a modelling strategy, including the use of propensity score weighting. Finally, I consider and reject two alternative methods.

4.3.1 *Difference-in-Difference*

To model the effects of minimum wage on employment, I chose a difference-in-difference approach. The difference-in-difference method is a quasi-experimental design used to study longitudinal cohort data (Warton et al., 2016). This approach accounts for a point-in-time shift, an external shock or an interruption. In this case, the point-in-time implementation of a minimum wage increase in Seattle is the shift of interest. It involves comparison of an "exposed" group, here a segment of the population that worked within a jurisdiction subject to a minimum wage increase, to an "unexposed" group, the remaining segment of the population that worked outside this jurisdiction. In its simplest form, difference-in-difference measures pre-interruption

and post-interruption outcomes from both the exposed and unexposed groups, and then subtracts the one from the other, thus a "difference-in-difference" (Warton et al., 2016).

Figure 4.5 displays a difference-in-difference approach applied to an implementation of a local minimum wage based on a similar diagram published by Heatherington and colleagues (2021). "Difference 1" between the pre-implementation Control 2 and Control 3 groups can be contrasted, under reasonable assumptions, with "Difference 2" between the post-implementation Exposure and Control 1 groups. Finally, the difference-in-difference quantity is equal to Difference 2 minus Difference 1. This contrast permits a stronger causal argument. It can, given reasonable comparability of groups, account for unmeasured confounding.

Figure 4.5 Difference-in-difference approach: exposure group versus control groups
Based on Heatherington et al. (2021), estimated as (Difference 2 – Difference 1)

4.3.2 *Interrupted Time Series with Propensity Score Weighting*

The analytic model I select to measure the differences between groups is an interrupted time-series with propensity score weighting. First, I argue the appropriateness of this model by justifying the weighting scheme. A causal argument in these analyses requires making a claim that a minimum wage increase influences work hours among non-custodial parents. To justify a causal argument using difference-in-difference, the analytic model must sufficiently account for differences in the exposed and unexposed groups outside of the interruption itself. What differences between groups might directly, or indirectly, influence the outcomes of interest? The propensity score weights permit adjustment for known factors, so that the unexposed group

better represents the average outcomes of the exposed group, in the absence of the exposure (Warton et al., 2016). By employing propensity score weights, I attempt to account for characteristics at the outset of the study (measures based in year 2010) that might describe a population most likely to work in Seattle or other areas where an increase in the minimum wage occurs. Applying such weights helps balance the characteristics that might influence the selection of where to work in the State of Washington. What's more, propensity score weighting has been found to perform well when parallel trends, a primary assumption for difference in difference analyses, does not hold (Ryan et al., 2019). Demographics at the time of study initiation that make up propensity score weights in this analysis include NCP's age, gender (binary female or male), ethnicity (Hispanic or non-Hispanic), and race (Asian/Pacific Islander, Black, Native American, or White). I also include one measure as a proxy for each county's cost-of-living called the Self-Sufficiency Standard (Pierce, 2009). After applying weights and observing each group over the same period of time, the difference-in-difference approach assumes that one group differs from the other only in its exposure to a minimum wage increase. It is then reasonable to compare differences in post-interruption outcomes to differences in pre-interruption outcomes.

The second justification for the model centers around treatment of data as a time-series. An interrupted time-series with propensity score weighting accounts for the passage of time. The data for this analysis spans 28 quarters, from 2010 through 2016. Each NCP contributes one or more quarters of earnings and other information over the period of the study. A time-series model allows specification of a covariance structure that can help account for autocorrelation, when prior quarterly data is correlated to subsequent quarterly data. In this study, examples of measures that likely exhibit autocorrelation include participation in the formal work sector,

hourly earnings rates and child support payments. Thus, this model accounts for the tendency to have a continuity of circumstances and behavior over time.

To estimate model coefficients, I employ either a generalized estimated equation (GEE) or linear mixed model, depending on the outcome. The GEE model allows for a "Yes/No" binary response variable with a logit link, appropriate for the outcome 1=any hours of employment, 0=otherwise. On the other hand, the linear mixed model is suitable for a continuous variable, as is the case for the outcome number of hours employed. Both models account for fix and random effects. Specifically, I choose a random-intercepts model which allows intercepts for each individual NCP to vary around their group mean, drawn from a plausible distribution of intercepts. Random-intercepts models can help account for the lack of independence across observations from individual NCPs. By confining random effects to just intercepts, slopes representing outcome trajectories in these models are constrained (fixed) to match the slope of other group members (Warton, 2020). So in combination, I specify a random intercepts model to account for multiple contributions from each NCP, I included covariance structure to adjust for autocorrelation as autoregressive process of order 1 [AR(1)], and I apply propensity score weights to help balance NCP pre-study selection into the exposed and unexposed groups.

4.3.3 *Alternative Methods*

While a interrupted time-series with propensity score weighting is not the only way to analyze these data, there are some advantages to this approach. For instance, a study by Linden and Adams (2011) found that the results using propensity score weighting, in the context of interrupted time-series models, were similar to the synthetic control method. Yet, there were advantages of propensity score weighting over synthetic control: the former method was technically less complicated, and uses a regression technique familiar to many analysts.

Moreover, models employing propensity score weighting in interrupted time series can be developed using standard statistical software, can accommodate any number of exposed units, and allows for a broader choice of exposure effect estimators (Linden & Adams, 2011). Thus, an interrupted time-series with propensity score weighting has advantages for its flexibility and ease of interpretation, its ability to address deviations from the parallel trends assumption, and in its comparable performance to synthetic control.

Another method for estimating coefficients of interrupted time series employs segmented regression. For this approach, measures are aggregated at each time point prior to model estimation. However, as Bazo-Alvarez and colleagues noted (2020), aggregate-level segmented regression analyses can bias the interrupted time series estimates when individual-level data are missing at random (MAR). Data that is MAR is missing but not due to a cause related to its missingness. Missing values may occur in these data before, between, and following measures of wage information. For instance, a non-custodial parent may have a quarter without any recorded earnings, sandwiched between two quarters with recorded earnings. If earnings were MAR, I could assume that the reason for the missing quarter of data does not have anything to do with the earnings being measured in general. Unfortunately, that is not likely since intermittent formal workforce participation is endemic in low-wage workers (Stewart, 2007). According to Stewart (2007), higher wages are associated with lessening predictions of unemployment.

There may be additional reasons for not considering these data as MAR. Not all earnings will appear in these data, such as informal workforce participation, interstate mobility, and failure to report or reporting nonsensical values on the part of the employer. Possibly only the last reason for missing earnings (employers' failure to report or error in reporting) could justifiably be described as MAR. I concede that patterns of missingness are a potential limitation

of this study. However, assuming for the moment that these data are MAR, Bazo-Alverez and colleagues (2020) argue that issues can arise when taking averages of individual-level data before applying segmented regression. Even if data are assumed MAR at the individual level, data at the cluster level will be missing not at random. Analysts can avoid the averaging-step altogether by using linear mixed models (Bazo-Alvarez et al., 2020). So, I used random intercepts models to circumvent the compounding of issues with regard to missingness.

4.4 RESULTS

My models are estimated in two steps. First, I estimate propensity scores that are then converted to weights, and second, I apply these weights in the computation of an interrupted time-series model. Using this two-step approach, I derive two models with two different dependent variables: 1) any hours worked, and 2) number of hours worked given employment. I consider estimated coefficients statistically significant if their p-values are less than 0.01. Throughout my analyses, I interpret my statistical tests cautiously since I do not formally adjust my significance thresholds to account for multiple testing.

4.4.1 *Propensity Score Weights*

The first step is to develop propensity score weights. In the context of an interrupted time-series, a propensity score weight represents the probability of being in the exposure group, conditional on control variables for both groups prior to or at the start of the study. This weighting scheme helps address the possibility of biased selection into the exposed group. I use SAS/STAT(2020) software procedure PSMATCH to produce average treatment effect (ATE) weights for the following control variables for NCPs in this study: age in 2010, female (=1), ethnicity (=1 Hispanic), and the race indicators Asian/Pacific islander, Black/African American,

Native American, and White. In addition to the demographic measures, I include one regional control variable in the propensity score construction. To approximate the cost of living, I use the Self-Sufficiency Standard (Pierce, 2009) for a family of three (comprising one adult, one school-age child, and one preschool-age child) in each county in Washington State in 2009, the closest measure prior to the start of the study in 2010. The Self-Sufficiency Standard measures how much earnings (hourly wage) is needed to meet basic needs without public or private assistance.

The Self-Sufficiency Standard, in this context, in not intended to accurately reflect the make-up of each NCP's household, nor to precisely reflect the cost for financially sustaining a family without assistance. Rather, it is intended as a county-level measure to account for differences in cost-of-living across the state. Acknowledging it as an approximation as applied here, the Self-Sufficiency Standard likely deviates from an individual's actual cost of living for up to three reasons. First, cost of living can vary over a county (especially for counties with concentrations of dense population). Yet, I use the Self-Sufficiency Standard averaged at the county level. Second, I use employer addresses rather than individual addresses, so I approximate NCPs' cost of living based on where they work rather than where they live, which could be a different county. Third, cost of living will vary based on family composition, but this formulation assumes one standard (a three-member household with specific composition) for every NCP working in the county. Conceding these variations, I retain the Self-Sufficiency Standard hourly wage as a proxy for cost-of-living, acting as a regional factor that could influence NCPs' choice of work location.

So, using the demographic measures for individual NCPs and the Self-Sufficiency Standard, I compute average treatment effect (ATE) weights based on their propensity scores. For the population of NCPs, the ATE is the average effect of moving the entire population from

the unexposed to the exposed status (Austin, 2011). The result of weighting helps balance the two groups, justifying later comparison. Table 4.2 displays the assessment of covariate balance, before and after weighting.

Table 4.2 Covariate balance in propensity score weight analysis

	All				ATE weighted			
Characteristic	Mean exposed[1]	Mean unexposed[1]	Standardized diff	Variance Ratio	Mean exposed[1]	Mean unexposed[1]	Standardized diff	Variance Ratio
Age	38.19	37.91	0.03	1.07	37.67	37.95	-0.03	1.03
Female	0.11	0.15	-0.13	0.75	0.14	<0.01	<0.01	1.00
Ethnicity Hispanic	0.17	0.21	-0.11	0.84	0.21	0.21	<0.01	1.01
Race Asian/ Pacific Islander	0.06	0.06	0.13	1.54	0.07	0.06	<0.01	1.03
Black	0.28	0.12	0.40	1.85	0.15	0.15	0.02	1.04
Native American	0.06	0.06	<0.01	1.00	0.06	0.06	<0.01	1.00
White	0.69	0.83	-0.33	1.52	0.82	0.81	0.02	0.97
Self-sufficiency hourly wage	23.10	20.55	0.82	0.66	20.81	20.88	-0.02	1.07
Propensity score, Mean (SD)	0.19	0.12	0.83	1.12	0.13	0.13	<0.01	0.99
Logit Propensity score, Mean (SD)	-1.58	-2.28	0.87	0.75	-2.20	-2.19	-0.02	1.05

[1]Individual NCPs Exposed N= 9,709 and unexposed N= 65,939

As previously stated, the purpose of these weights is to help make the exposed and unexposed groups more similar, a means to better approximate random selection into the groups. The post-ATE weighted means in Table 4.2 display greater similarity between the exposed and unexposed groups compared to the unweighted means. Specifically, their variance ratios

approach one after applying weights, signally closer distributional spread for the two groups. For example, the standardized difference between the exposed and unexposed groups for Self-Sufficiency hourly wage was $0.82 pre-weighting, with a variance ratio of 1.52. Post-weighting the standardized difference becomes $0.02 (much closer to zero) with a variance ratio of 1.07 (much closer to one). Thus, the post-weighted statistics for exposed and unexposed NCPs appear more similar on Self-Sufficiency hourly wage. The same holds for all the measures included in Table 4.2. Together, the results suggest applying the propensity score weights in these analyses will help render the exposed and unexposed groups comparable.

4.4.2 *Outcome Any Hours Worked*

The second phase of the analysis is to apply the now computed propensity score weights to employment models. In this section, I derive a model for the first outcome of interest, having a job (yes/no) each quarter. As mentioned previously, I select a Generalized Estimating Equation (GEE) logistic regression model, appropriate for non-normal, binary data for this interrupted time-series, with random intercepts and an autoregressive covariance structure. Borrowing from a formulation by Warton (2020), the fixed effects portion of the model can be represented by Equation 4.1.

$$\begin{aligned}\ln\left(\frac{p_{it}}{1-p_{it}}\right) &= \beta_0 + \beta_1 Time + \beta_2 Interruption + \beta_3 Interruption \times Time \\ &+ \beta_4 Exposed + \beta_5 Exposed \times Time \\ &+ \beta_6 Exposed \times Interruption \\ &+ \beta_7 Exposed \times Interruption \times Time \\ &+ \beta_8 Quarter2 + \beta_9 Quarter3 + \beta_{10} Quarter4 + \varepsilon_{it}\end{aligned} \tag{4.1}$$

where

i: Non-custodial parent (NCP) *i.*

t: Time *t* representing quarters 1 to 28 (2010 quarter 1, 2010 quarter 2, …, 2016 quarter 4).

p_{it}: The expected probability of NCP *i* working any hours in quarter *t.*

β_0: The predicted mean outcome of the unexposed group at baseline.

β_1: The difference in outcomes from time *t* to *t+1* before the interruption. In other words, the slope of the outcome in the unexposed group pre-interruption.

β_2: The amount the outcome shifts at the interruption point among the unexposed group, measured as the first post-interruption outcome value minus the last-pre-interruption outcome value.

β_3: The difference in outcomes from time *t* to time *t+1* after the interruption, i.e. the slope of the outcome in the unexposed group in the post-interruption period.

β_4: The difference in outcome levels at baseline in the exposed group compared to the unexposed group.

β_5: The difference in slope in the exposed group compared to the unexposed group in the pre-interruption period.

β_6: The outcome shift difference at the interruption between exposed and unexposed groups.

β_7: The difference in slopes after the interruption between exposed and unexposed groups.

$\beta_8, \beta_9, \beta_{10}$: Coefficients for quarter 2, 3, and 4 indicators (values of 0 or 1) to control for seasonality. (The reference category is quarter 1.)

ε_{it}: The error term for the outcome measure of NCP *i* at time *t*.

In Equation 4.1, exposed is a binary variable: 1 = ever worked in a jurisdiction with a minimum wage above the state minimum, and 0 = otherwise. The interruption, also represented by binary, is the time at which the Seattle Minimum Wage was implemented, (1= April 1, 2015 and beyond, and 0=beforehand). To control for seasonality, dummy variables for Quarter 2, Quarter 3, and Quarter 4 (with Quarter 1 as the reference category) are included in the model. In particular, my interest is if a minimum wage increase puts downward pressure on employment in the form of having any job at all. The fixed effect results are shown in Table 4.2

Table 4.2 Model[1] coefficient estimates for outcome any hours worked (yes/no)

Variable	Estimate	StdErr	p-value
Intercept	-0.669	0.008	<.0001
Time (quarter number)	0.010	<0.001	<.0001
Interruption (Seattle law applied = 1)	0.377	0.041	<.0001
Exposed (higher minimum = 1)	-0.144	0.026	<.0001
Exposed × Time	0.035	0.002	<.0001
Interruption × Time	-0.019	0.002	<.0001
Exposed × Interruption	-1.136	0.166	<.0001
Exposed × Interruption × Time	0.060	0.007	<.0001
Seasonality: (ref. Quarter = 1)	0.107	0.005	<.0001

Quarter = 2			
Quarter = 3	0.160	0.006	<.0001
Quarter = 4	0.097	0.005	<.0001
Fit statistic: QIC[2]	5,656,551.9		

[1]N=2,118,144 NCP-quarters; GEE logistic regression model with ATE weights and covariance structure AR(1)
[2]Quasi-likelihood under the independence model criterion (QIC)

While all the estimated coefficients in Table 4.2 are statistically significant at the 0.0001 level, three parameters in particular offer evidence relevant to my hypothesis, that NCPs subject to a minimum wage increase will see a decline in employment. In combination, these estimates allow me to compute a difference-in-difference measure for a one-quarter change pre- versus post-interruption: 1. (Exposed × Time), 2. (Exposed × Interruption), and 3. (Exposed × Interruption × Time). I display a difference-in-difference estimate in the next step, after I compute the inverse of the logit function, providing predicted probabilities which may be easier to interpret.

Figure 4.6 shows the predicted probability of any hours over time. Employing the customary method, I calculate the linear predictor using model estimates, and then apply the inverse of the logit function. For ease of interpretation, I hold seasonality constant by assuming the estimates are set at the reference quarter (first quarter of each year), the quarter least likely to have strong employment.

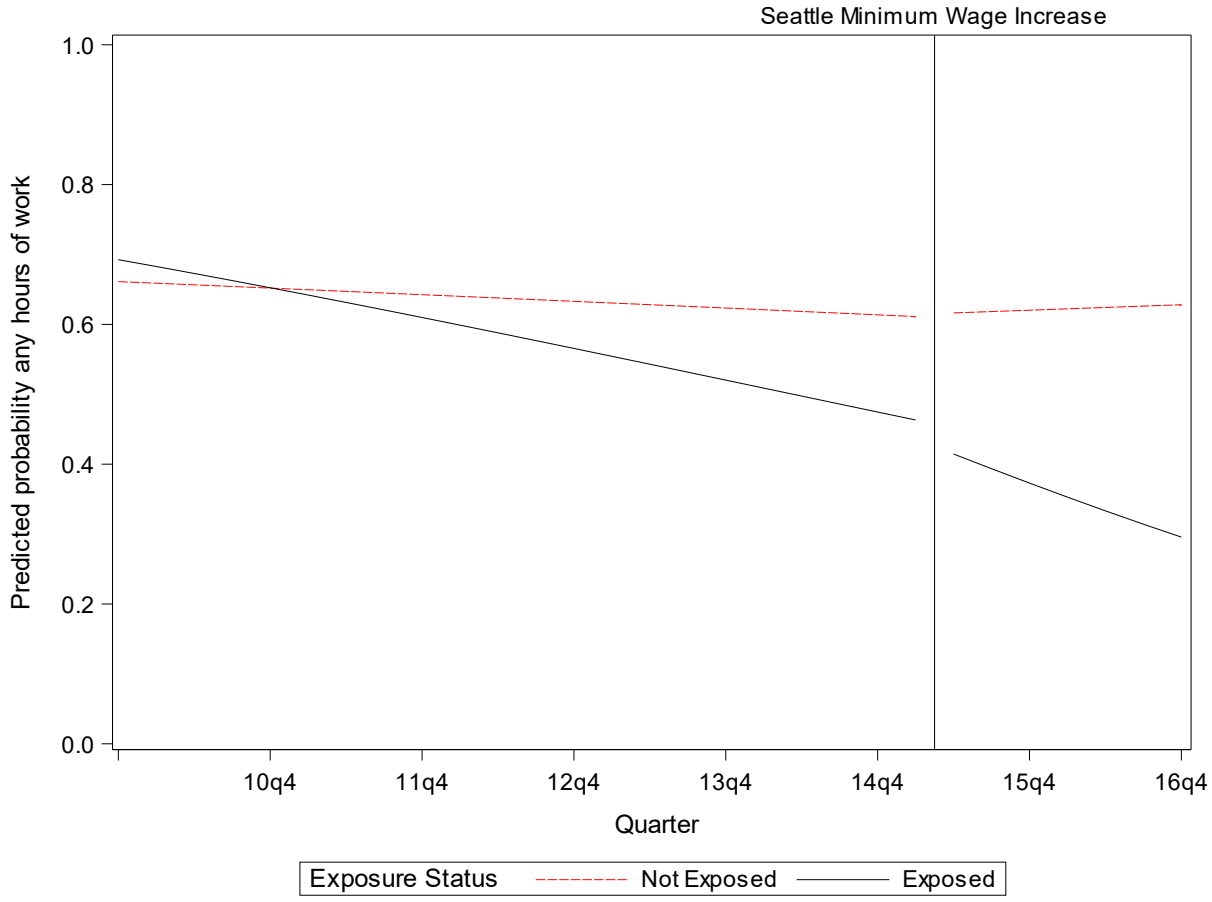

Figure 4.6 Predicted probability of any work among low-earnings NCPs by exposure status
Based on the estimated model coefficients from Table 4.2, seasonality held constant

Figure 4.6 shows that the predicted probability of any work varies between exposed and unexposed NCPs, and ranges from about 0.3 to 0.7. Based on model estimates, employment appears to stay somewhat stable over time for unexposed NCPs, with little discontinuity at the interruption when Seattle implements its minimum wage increase. The magnitude of employment for low-income NCPs is comparatively lower than would be suggested by Table 4.1, which displays Washington state unemployment levels falling during this same period, starting at 10.0 percent in 2010 and incrementally falling to 5.3 percent by 2016. Jobs for

exposed NCPs appears to gradually decline over time, even before the implementation of the ordinance. Exposed NCPs show a small negative employment discontinuity at the time of the interruption, and then a steeper decline for the seven quarters post-implementation.

Table 4.3 Select predicted probabilities with difference-in-difference estimates

	Predicted Probability of Any Work		
Quarter	Unexposed	Exposed	
2010 Q1	0.659	0.683	
2011 Q1	0.650	0.642	
2012 Q1	0.640	0.599	
2013 Q1	0.631	0.554	
2014 Q1	0.621	0.509	
2015 Q1	0.611	0.463	
2015 Q2	0.616	0.415	Interruption
2016 Q1	0.622	0.353	
2016 Q4	0.628	0.296	

Difference between 2015 Quarter 2 and 2015 Quarter 1		Difference in Difference
Unexposed	Exposed	Exposed – Unexposed
0.616 - 0.611 = 0.005	0.415-0.463 = -0.048	-0.048 – 0.005 = -0.053

Difference in Post-Interruption Slopes		Difference in Slopes
Unexposed	Exposed	Exposed – Unexposed
0.002	-0.017	-0.017-0.002 = -0.019

To display points from Figure 4.6 along with a computation of the difference-in-difference estimate, Table 4.3 shows select predicted probabilities for having a job in a given quarter. Here, Seattle implements its minimum wage increase just after the "interruption," at the start of 2015 quarter 2. For the quarter before the interruption, Table 4.3 displays the predicted probability of any work is 0.611 for the unexposed NCPs and 0.463 for the exposed NCPs. After the interruption, the predicted probability is 0.616 for the unexposed and 0.415 for the exposed. I compute the estimated difference-in-difference at the bottom of Table 4.3 for the one-quarter change, straddling Seattle's increase in the minimum wage. Based on this model and under these

constraints, the difference-in-difference quantity at the time of the interruption is negative 0.053. In other words, NCPs exposed to a minimum wage increase have an approximately 0.053 lower chance of having a job in a given quarter relative to those unexposed to a minimum wage increase. Although the magnitude may be small, this represents a disadvantage for NCPs exposed to a minimum wage increase and supports my hypothesis of downward pressure on employment post-implementation. Also informative is the comparison of slopes. The difference between post-interruption slopes (bottom of Table 4.3) indicates that the downward trajectory for exposed NCPs continues to lower on average by 0.019 per quarter relative to unexposed NCPs, at least for the five quarters remaining in this study.

4.4.3 *Outcome Number of Hours Worked*

Next, I examine a second measure of employment. Is a minimum wage increase accompanied by a decrease in the number of work hours among employed NCPs? Since the number of hours worked is continuous, I employ a linear mixed model. Like the previous model, I account for random intercepts, autocorrelation, and propensity score weights. Since the fixed effects portion of this second model is nearly identical to Equation 4.1, I do not repeat it here. Rather, I note that the model is slightly altered with a new dependent variable (without a logit link); I substitute μ_{it}, the expected mean value for NCP *i* at time *t* (an individual's expected quarterly number of hours worked). Table 4.4 displays the estimated coefficients for the fixed effects with the outcome of number of hours worked per quarter among those with a job.

The model results show that all but one of the estimated coefficients are significant at the 0.01 level. Regardless, I retain the non-statistically significant estimated coefficient [Exposed (p=0.0150)] in the final model because it is a lower-order term embedded in higher-order terms which are statistically significant. Explicitly, the parameters most useful in lending evidence to

my hypothesis as part of a difference-in-difference estimate are all statistically significant at the 0.0001 level: (Exposed × Time), (Exposed × Interruption), and (Exposed × Interruption × Time).

Table 4.4 Model coefficient estimates for outcome hours worked

Variable	Estimate[1]	StdErr	p-value
Intercept	291.100	1.257	<.0001
Time (quarter number)	1.784	0.090	<.0001
Interruption (Seattle law applied = 1)	-31.716	8.711	0.0003
Exposed (higher minimum = 1)	-4.199	1.726	0.0150
Exposed × Time	0.740	0.123	<.0001
Interruption × Time	1.678	0.371	<.0001
Exposed × Interruption	46.691	10.906	<.0001
Exposed × Interruption × Time	-2.797	0.467	<.0001
Seasonality: (ref. Quarter = 1)			
Quarter = 2	23.714	0.387	<.0001
Quarter = 3	35.894	0.420	<.0001
Quarter = 4	30.672	0.384	<.0001
Fit statistic: BIC[2]	11,214,565		

[1]N=860,964 NCP-quarters; linear mixed model with ATE weights and covariance structure AR(1)
[2]Bayesian Information Criteria

With a linear mixed model, expected values are more readily calculated directly from the estimated coefficients. Based on the model results in Table 4.4, the mean number of hours worked among those exposed to a minimum wage increase (Exposed) was 4.2 hours/quarter lower than among those unexposed. On the other hand, the exposed group sees a faster rate of increase in hours worked until the implementation of the Seattle ordinance: pre-interruption the exposed group [1.8 (Time) + 0.7 (Exposed × Time) = +2.5 hours/quarter) compared to the unexposed group (+1.8 hours/quarter). Post-interruption, the slopes continue to be positive, but with the unexposed group seeing a higher quarterly increase in hours worked (1.8 + 1.7 = +3.5 hours/quarter) compared to the exposed group (1.8 + 0.7+ 1.7 – 2.8 (Exposed × Interruption × Time)= +1.4 hours/quarter). Based on these estimates, the point-in-time implementation of the

Seattle Minimum Wage Ordinance had a negative impact on hours worked among the exposed group (-7.1 hours) compared to the unexposed group with a positive jump (+7.0 hours). The net effect, subtracting one from the other, is the difference-in-difference estimate equal to approximately negative 14-hours, a loss of just over one hour per week given a 13-week quarter. [This can be computed directly from estimated coefficients as $\hat{\beta}_5 + \hat{\beta}_6 + (\hat{\beta}_7 \times 22)$ = (1.678 + 46.691 + (-2.792 x 22).] This supports my hypothesis of a negative impact on hours worked after a minimum wage increase.

To help visualize the magnitude and direction of the model estimates from Table 4.4, I display expected mean hours worked in Figure 4.7. For comparison purposes, again I hold seasonality constant in the first quarter of each year (the reference category). In general, Figure 4.7 suggests that number of hours worked per quarter increases across the study, but differently among the exposed and unexposed group. There is an apparent drop in hours among the exposed at the point of interruption, with a slower rate of recovery than the unexposed group post-implementation of Seattle's increase in minimum wage. For the exposed group, the rate of increase in hours post-interruption brings the magnitude of the hours worked per quarter back to pre-interruption levels in 7 quarters, as seen by comparing 2016 quarter 4 relative to pre-interruption 2015 quarter 1. In the meantime, the number or hours worked for unexposed group continues to increase post-interruption.

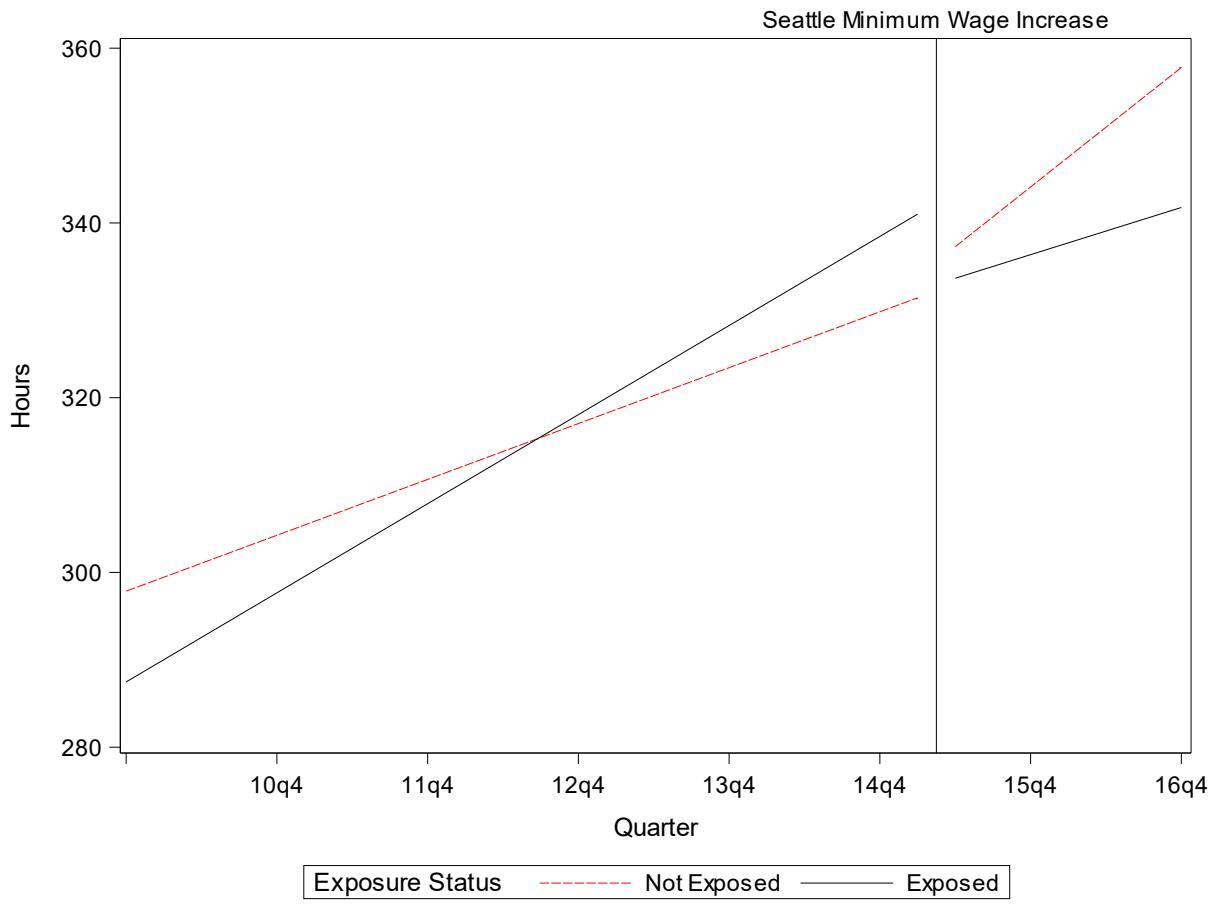

Figure 4.7 Expected number of hours worked among low-earnings NCPs by exposure status
Based on the estimated model coefficients from Table 4.4, seasonality held constant

Together, Figures 4.6 with Figure 4.7 suggest two possibilities for NCPs after a minimum wage increase: 1) there may be some evidence of job loss, and 2) there may be evidence of a decline in hours worked per quarter among those who have a job. With such a large number of NCPs included in these analyses, estimated coefficients tend to be statistically significant. The bigger question may revolve around whether the magnitude of the estimates is substantial enough to make a difference in the lives of NCPs and the children they support. This question will be taken up again in the next chapters.

4.1 Chapter Summary

In this chapter, I investigate the potential influence of a local minimum wage increase on two employment measures: any hours and number of hours worked. The premise rested on the idea that a minimum wage increase can be followed by an adjustment by employers, at least in the short-term, of eliminating jobs or ratcheting-down assigned work hours to compensate for increased payroll costs. I hypothesized just such a downward adjustment on hours among low-income NCPs.

Did the implementation of the Seattle Minimum Wage Ordinance result in a decline in hours worked for NCPs? My results suggest yes. The evidence from this analysis indicates low-income NCPs saw a loss of employment as measured by any hours worked (yes/no), with a reduced probability (-0.05) of having a job after implementation of a minimum wage increase. For the second measure, the exposed group who remained employed experienced a drop in the number of hours worked post-implementation, losing about 14 hours per quarter (about -1 hour per week). Assuming the model estimates are reasonable approximations, exposed NCPs appear to recover their average hours worked within 7 quarters post-implementation. Next, I investigate whether NCPs' decrease in number of hours worked has an impact on earnings and finally, child support payments.

Chapter 5. MINIMUM WAGE INCREASE AND EARNINGS

My study considers whether laws enacted to increase the minimum wage result in an increase in child support payments among low-wage workers, particularly in light of differing wage floors across jurisdictions. The payment of child support depends heavily on the level of the non-custodial parent's (NCP's) earnings. Here, I examine whether a minimum wage increase results in earnings changes for low-income NCPs. I focus on two outcomes: hourly earnings and total earnings, with special attention on the latter as the most relevant to child support payments. In this chapter, I outline my conceptual model, describe the data, define the methods I use to assess causal relations, show results from my analyses, and finally, summarize my findings.

5.1 Conceptual Model

Can a local minimum wage increase result in alterations in earnings among low-income NCPs? The two outcomes examined here may offer very different results. First, I investigate hourly earnings, computed as earnings divided by the number of hours worked, a proxy for hourly wage. Especially for NCPs working closer to the wage floor, I anticipate an upward shift in hourly earnings after a minimum wage increase.

On the other hand, the second outcome, earnings, may be more difficult to anticipate. As evidence suggests in chapter 4, a local minimum wage increase dampens the number of hours NCPs work, at least in the short-term. Given this potential decline in hours worked, earnings could decline, stay the same, or increase, depending on the change in hourly earnings relative to the number of work hours. Earnings increase whenever the hourly earnings over-compensates for a drop in hours worked. Earnings stays the same if the hourly earnings approximately compensates for the drop. Finally, earnings declines if hourly earnings falls short of full

compensation for the drop in hours. My hypothesized association proposes the latter: I anticipate that, at the point of implementation of the Seattle Minimum Wage Ordinance, employers adjust payroll costs by dropping hours in an overly conservative manner. In other words, I hypothesize that earnings declines for NCPs post-implementation of a minimum wage increase. This hypothesized association is depicted as a path diagram in Figure 5.1, and the negative sign (-) attached to "H2" symbolizes a negative association between the increase in minimum wage rates and earnings for working NCPs.

H2: A minimum wage increase results in a decline in earnings for low-wage, non-custodial parents.

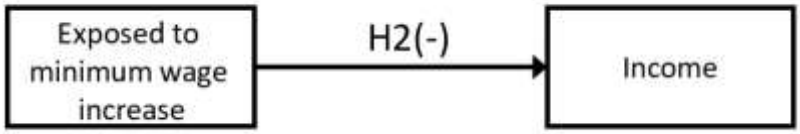

Figure 5.1 Conceptual model for hypothesis 2

5.2 Descriptive Measures

In this section, I provide descriptive statistics for the two outcomes of interest: hourly earnings and earnings. I begin by developing descriptive measures of the hourly earnings of NCPs in the exposed and unexposed groups. Does exposure to a minimum wage increase influence hourly earnings among low-wage NCPs? Figure 5.2 displays median hourly earnings over time among NCPs, ranging from just under $14 per hour to approximately $17.50 per hour.

Throughout these analyses, I use SAS (2020) software, Version 9.4[1]. As before, I define "exposed" NCPs as having worked at least one quarter during this 7-year study in a jurisdiction with a minimum wage set above the state minimum. The solid, dark line in Figure 5.2 represents median earnings among NCPs who were exposed. The broken, red line represents those who were unexposed to a minimum wage increase above the state's minimum for the entire course of the study. The single vertical line represents the quarter that the Seattle minimum wage increase was implemented.

Figure 5.2 Median hourly earnings among low-earnings NCPs by exposure status

NCP-quarters: exposed = 146,021 and unexposed = 761,110.

[1] Of the SAS System for Microsoft Windows Server 2019 Datacenter, copyright © 2020 SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

In Figure 5.2, the median hourly earnings appears to increase over time in both groups, with those exposed having greater hourly earnings throughout the study. Again, there is an apparent seasonality in hourly earnings, but inconsistent with the previous figures displaying work hours. Specifically, the median hourly earnings may be greatest in the autumn and winter quarters, possibly offset from the seasonally peaking work hours of summer where there may be a lot more workers but perhaps they are working at lower pay rates. After implementation of the Seattle Minimum Wage Ordinance in April of 2015, shown in the Figure 5.2 as a vertical line, hourly earnings for the two groups continue to rise. There may be rudimentary visual evidence of the median hourly earnings converging between the exposed and unexposed groups towards the end of the observation period.

Next, I examine descriptive measures for earnings, with both similarities and differences compared to the previous figure of median hourly earnings. Figure 5.3 displays the median earnings among low-income NCPs, with earnings ranging from approximately $5100 to $7700 per quarter. Given that there are 13 weeks in a quarter, this is between $392 and $592 per week, or $1,700 to $2,567 per month.

Figure 5.3 Median earnings among low-earnings NCPs by exposure status
NCP-quarters: exposed = 146,021 and unexposed = 761,110.

The first notable characteristic of Figure 5.3 is the increase in earnings over the course of 28 quarters (2010 through 2016) for both exposed and unexposed NCPs, even accounting for inflation adjustment to 2016 dollars. There are at least two possible reasons for this general increase. First, wages trend upwards with experience; the earnings of a cohort of workers over time could plausibly demonstrate an upward trend. Second, increasing earnings may reflect a recovery from the 2008 economic downturn. Seattle saw an increase in both jobs and population growth over the subsequent years (Brownstein, 2017), and such a recovery could be evident to some degree in other parts of the state.

Another notable characteristic of Figure 5.3 is the apparent convergence of median earnings of the exposed and unexposed groups after implementation of the Seattle Minimum Wage Ordinance. NCP quarterly earnings in the exposed group at the start of the observation period was around $5,700 compared to $5,100 in the unexposed group. Median earnings run somewhat parallel, with corresponding seasonal fluctuations, until implementation of the minimum wage increase in Seattle, when median earnings begin to draw together. By the end of the observation period, the median earnings of all NCPs converge to approximately $7700 per quarter.

Comparing Figure 5.3 with Figure 5.2, while quarterly earnings appears to converge between the exposed and unexposed NCPs, hourly earnings largely do not. The seasonality of earnings tends to follow the pattern of hours worked in that there is a decline in the winter months, differing from hourly earnings which tends to rise in the fall and winter. While only seven quarters are available in these data post-implementation, the pattern of convergence in earning may offer preliminary evidence of short-term reduction in earnings after exposure to an increase in the minimum wage, even in the presence of increasing hourly earnings. I test this formally in the next sections.

5.3 METHODS

In two separate models, I regress outcomes hourly earnings and earnings on predictor variables. To handle rare outliers, I top-code the hourly earnings at $300 per hour (above the 99th percentile), with a corresponding top-code for earnings. As before, I apply a difference-in-difference analysis with an interrupted time-series model with propensity score weighting. As detailed in Chapter 4, I employ a weighting scheme that accounts for NCPs' propensity of being

exposed to a minimum wage increase as an average treatment effect (ATE) based on age, sex, race, and ethnicity, as well as one measure of cost of living within counties called the Self-Sufficiency Standard. I account for autocorrelation in serial measures with an autoregressive (order=1) covariance structure. Finally, to account for the lack of independence among repeated measures from each NCP, I adopt a random intercepts model. (See Methods section 4.3 for more detail.) Again, borrowing from a formulation by Warton (2020), the fixed effects portion of the linear mixed model can be represented by Equation 5.1.

$$\begin{aligned}\mu_{it} = \beta_0 &+ \beta_1 Time + \beta_2 Interruption + \beta_3 Interruption \times Time \\ &+ \beta_4 Exposed + \beta_5 Exposed \times Time \\ &+ \beta_6 Exposed \times Interruption \\ &+ \beta_7 Exposed \times Interruption \times Time \\ &+ \beta_8 Quarter2 + \beta_9 Quarter3 + \beta_{10} Quarter4 + \varepsilon_{it}\end{aligned} \tag{5.1}$$

where

- i: Non-custodial parent (NCP) *i*.
- t: Time *t* representing quarters 1 to 28.
- μ_{it}: The expected mean value for NCP *i* at time *t* (e.g. an individual's expected quarterly value for hourly earnings or earnings)
- β_0: The predicted mean outcome of the unexposed group at baseline.
- β_1: The difference in outcomes from time *t* to *t+1* before the interruption. In other words, the slope of the outcome in the unexposed group pre-interruption.
- β_2: The amount the outcome shifts at the interruption point among the unexposed group, measured as the first post-interruption outcome value minus the last-pre-interruption outcome value.
- β_3: The difference in outcomes from time *t* to time *t+1* after the interruption, i.e. the slope of the outcome in the unexposed group in the post-interruption period.
- β_4: The difference in outcome levels at baseline in the exposed group compared to the unexposed group.
- β_5: The difference in slope in the exposed group compared to the unexposed group in the pre-interruption period.
- β_6: The outcome shift difference at the interruption between exposed and unexposed groups.
- β_7: The difference in slopes after the interruption between exposed and unexposed groups.
- $\beta_8, \beta_9, \beta_{10}$: Coefficients for quarter 2, 3, and 4 indicators (values of 0 or 1) to control for seasonality. (The reference category is quarter 1.)
- ε_{it}: The error term for the outcome measure of NCP *i* at time *t*.

In Equation 5.1, exposure is a binary variable: 1 = ever worked in a jurisdiction with a minimum wage above the state minimum, and 0 = otherwise. The interruption, also represented by an indicator, is the time at which the Seattle Minimum Wage was implemented, (1= 2015 quarter 2 and beyond, and 0=beforehand). To control for seasonality, dummy variables for quarter 2, quarter 3, and quarter 4 (with quarter 1 as the reference category) are included in the models. In particular, I highlight the coefficients β_5 (time × exposure), β_6 (exposure × interruption), and β_7 (time × exposure × interruption), together representing the magnitude of a one-quarter change (pre- and post-interruption) between exposed and unexposed NCPs. In the model for outcome hourly earnings, I employ step-wise backward elimination to achieve a parsimonious model when the t-test associated with an independent variable is not statistically significant at the 0.01 level. I explain more about model selection using backward elimination in the results section.

5.4 RESULTS

Results from two different models are presented here, the first for hourly earnings and the second for earnings, to answer the following questions. Does an increase in the minimum wage change hourly earnings among low-income NCPs? Given that a policy to increase the minimum wage is intended to put more money into the pockets of low-income workers, there should be gains in hourly earnings after a minimum wage increase. On the other hand, does an increase in the minimum wage dampen overall earnings? This could happen in this study, I hypothesized, when employers over-conservatively decrease hours while adjusting for rising labor costs.

5.4.1 *Outcome Hourly Earnings*

Beginning with hourly earnings, Table 5.1 presents fixed effects results from the model corresponding to Equation 5.1. Since earnings data is skewed right (not shown), I apply a log transformation to help satisfy the model assumption that errors are normally distributed. Estimated coefficients in Table 5.1 have t-tests statistically significant at the 0.01 level, except for two interactions terms: exposure × interruption (p=0.4974) and time × exposure × interruption (p=0.5928). To achieve greater parsimony, I use step-wise backward elimination by omitting the highest order term (one-at-a-time) which fails to meet the 0.01 level of statistical significance. I then recompute the smaller model and again apply the decision rule, until there are no more parameters that meet the criteria for elimination. As a result, I omit both of the parameters above in the parsimonious version of the model. The Bayesian Information Criteria (BIC), a measure of model fit, shows improvement (smaller is better) in favor of the reduced model.

Table 5.1 Model[1] coefficient estimates for outcome log hourly earnings

	Full parameterization			Parsimonious version		
Variable	Estimate	StdErr	p-value	Estimate	StdErr	p-value
intercept	2.660	0.003	<.0001	2.660	0.003	<.0001
time (quarter number)	0.002	<0.001	<.0001	0.002	<0.001	<.0001
interruption (Seattle law applied) = 1	-0.286	0.016	<.0001	-0.294	0.010	<.0001
exposure = 1	0.021	0.004	<.0001	0.022	0.003	<.0001
seasonality: (ref quarter = 1)			<.0001			
quarter = 2	-0.009	<0.001		-0.009	<0.001	<.0001
quarter = 3	0.005	<0.001	<.0001	0.005	<0.001	<.0001
quarter = 4	0.016	<0.001	<.0001	0.016	<0.001	<.0001
time × interruption = 1	0.014	<0.001	<.0001	0.014	<0.001	<.0001
time × exposure	0.002	<0.001	<.0001	0.002	<0.001	<.0001
exposure × interruption=1	-0.013	<0.001	0.4974	-	-	-
time × exposure × interruption=1	<0.001	<0.001	0.5928	-	-	-

Fit statistic: BIC	564,227.9	564,206.8

[1]N=860,964 NCP-quarters; linear mixed model, ATE weighted with covariance structure AR(1)

Confining model interpretation to just the parsimonious version of the model in Table 5.1, all estimated coefficients are statistically significant at the 0.0001 level. The coefficient that has a bearing on a difference-in-difference estimate for the one-quarter change (pre- and post-interruption) is given by (time × exposure) which is statistically significant and has a magnitude of 0.002. This small magnitude suggests, combined with the elimination of the last two interaction terms from the original model, that post-interruption slopes are running nearly parallel.

To help visualize the effects of the predictors on the outcome, Figure 5.4 displays the expected values of hourly earnings over time, by exposure status and with the seasonality held constant at the reference quarter. These are inverse-log values of the linear predictor based on the parsimonious version of the model in Table 5.1. Figure 5.4 suggests that expected mean hourly earnings increases over time, with the exposed rate of increase faster pre-implementation. A modest hourly earnings jump is evident at the interruption: on average unexposed NCPs saw a $0.22/hour increase while exposed NCPs saw a $0.27/hour increase. The difference-in-difference calculation at the point of interruption is $0.05/hour, a relatively negligible change yet notably postive. The slope for hourly earnings post-implementation appears much steeper for both groups, but again, mostly running parallel. This supports the idea that, on average, hourly earnings rise after a minimum wage increase for exposed NCPs, but so too for unexposed NCPs and at much the same rate.

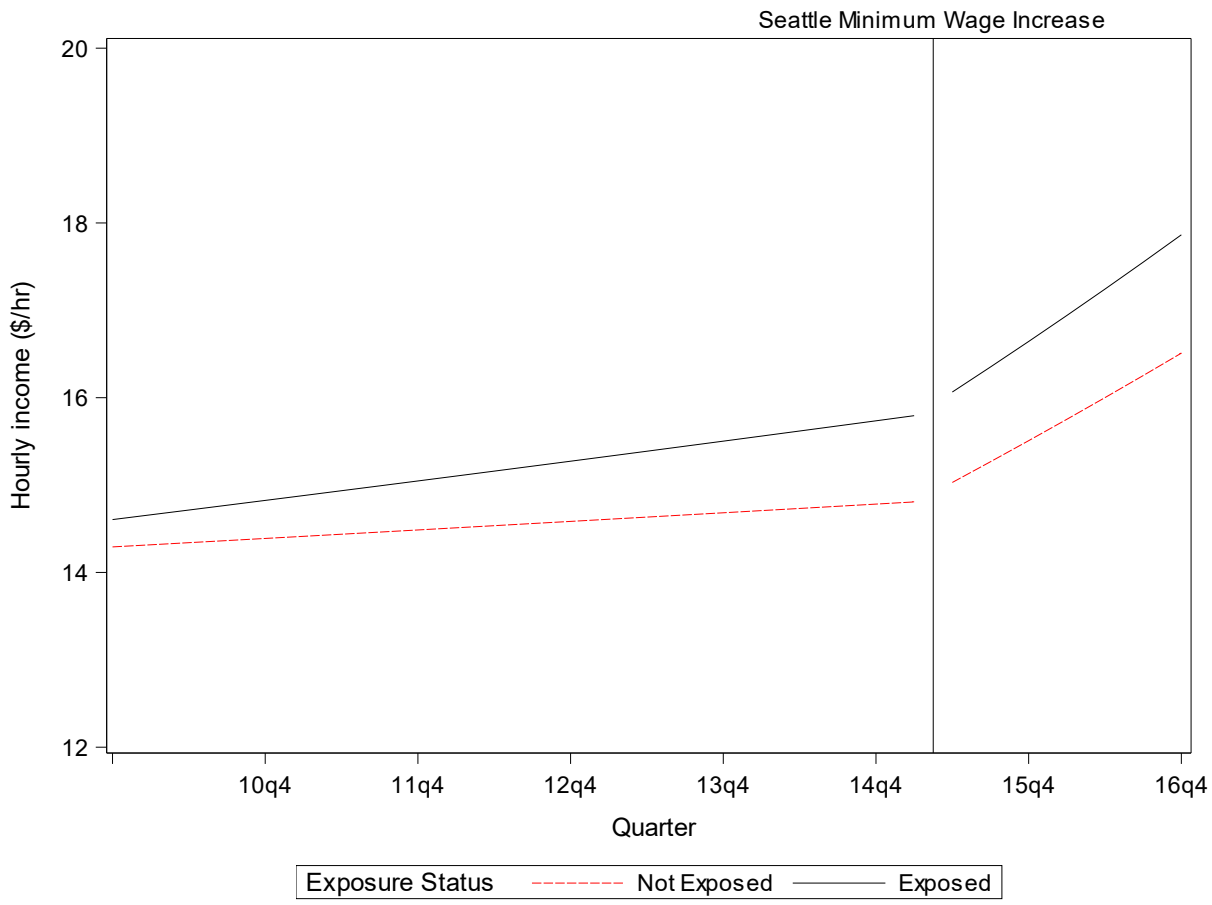

Figure 5.4 Expected mean hourly earnings by exposure status
Based on estimated coefficients in Table 5.1, holding seasonality constant

Findings for the outcome hourly earnings bring to light two ideas. First, the negligible magnitude for the difference-in-difference in hourly earnings at the time Seattle implements its minimum wage increase may mean that the local wage hike is mostly indistinguishable from the overall wage gains across the state in this time period. Second, this finding may highlight the difference between statistical significance and practical significance. Here, my model provides statistically significant parameter estimates. However, the magnitudes of the estimates are small and, in turn, the expected values for hourly earnings appear relatively similar for the exposed and unexposed groups. In the discussion, I comment further on the notion of practical significance.

5.4.2 *Outcome Earnings*

Next, is a minimum wage increase followed by a decline in earnings? Again, I employ a linear mixed model with Equation 5.1 representing the fixed effects portion. The only difference from the previous model is that the dependent variable is log earnings. Model results are shown in Table 5.2. Estimated coefficients are significantly different from zero at the 0.0001 level, except for estimated coefficient for "exposure" (p=0.4634). I retain this parameter estimate in the model since higher order terms involving exposure are statistically significant.

Table 5.2 Model[1] coefficient estimates for outcome log earnings

Variable	Estimate	StdErr	p-value
intercept	7.900	0.007	<.0001
time (quarter number)	0.011	<0.001	<.0001
interruption (Seattle law applied) = 1	-0.485	0.051	<.0001
exposure = 1	0.007	0.010	0.4634
seasonality: (ref quarter = 1)			
quarter = 2	0.075	0.002	<.0001
quarter = 3	0.125	0.002	<.0001
quarter = 4	0.119	0.002	<.0001
time × interruption = 1	0.023	0.002	<.0001
time × exposure	0.006	<0.001	<.0001
exposure × interruption=1	0.328	0.063	<.0001
time × exposure × interruption=1	-0.018	0.003	<.0001
Fit statistic: BIC	2,666,235		

[1]N=860,964 NCP-quarters; linear mixed model, ATE weighted with covariance structure AR(1)

In Table 5.2, the coefficients that offer possible evidence in support of my hypothesis are all statistically significant: (time × exposure), (exposure × interruption), and (time × exposure × interruption). Again, to help visualize the estimated changes in magnitude of earnings, based on the inverse-log of the linear predictor using these estimated coefficients, Figure 5.5 displays the expected value of earnings per quarter over time.

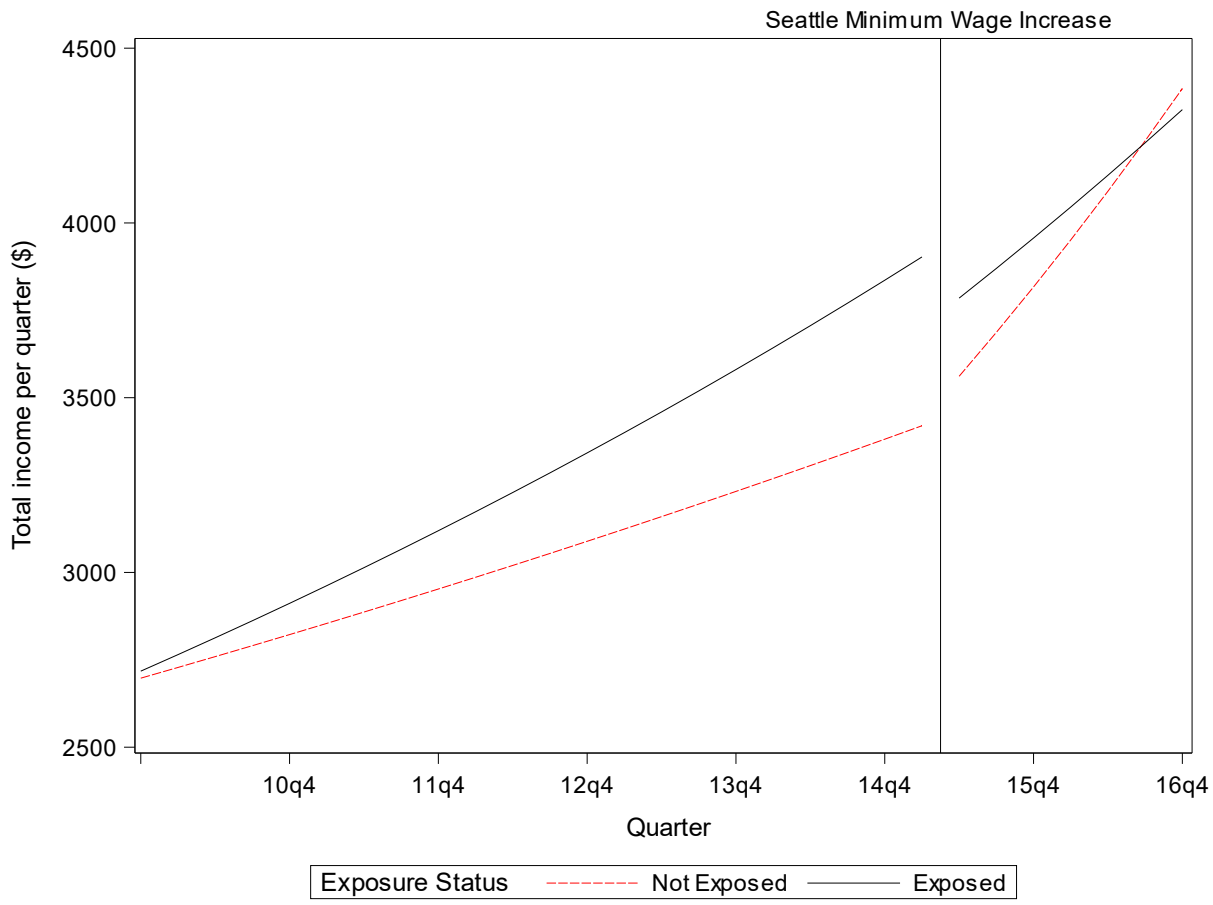

Figure 5.5 Expected mean earnings by exposure status
Based on estimated coefficients in Table 5.2, holding seasonality constant

In Figure 5.5, the expected value of earnings range from about $2700 to $4400 per quarter, equivalent to about $208 to $338 per week, or $900 to $1,467 per month. There are gains in earnings over time in both exposed and unexposed NCPs, with faster advances among the exposed group. This occurs until the interruption, after which the unexposed group makes faster gains, even converging to approximately the same level as the exposed group by the end of the observation period. Also at the interruption, there appears to be a drop in expected earnings for those exposed to a minimum wage increase, whereas the unexposed group may see a gain. Specifically. the expected mean earnings decreases in the exposed group (-$118 per quarter) but

increases in the unexposed group (+$142 per quarter). Thus, the difference-in-difference calculation at the implementation of the minimum wage ordinance amounts to -$118-$142 = -$260 per quarter, or about $20 per week loss for exposed NCPs relative to unexposed. This point-in-time deviation is not only statistically significant, but may have practical significance. Therefore, it lends support to my hypothesis that earnings decline for the exposed group relative to the unexposed group after a minimum wage increase.

5.5 Chapter Summary

In this chapter, I highlight the importance of NCPs' level of earnings as a basis for their ability to pay child support. Specifically, I investigate whether a minimum wage increase could alter earnings trajectories. Do hourly earnings change after a minimum wage increase? I found that on average, hourly earnings increase over time, and in particular, at the point of implementation of a minimum wage increase. This holds true for both exposed and unexposed NCPs, with a positive but negligible magnitude in the difference-in-difference estimate (+$0.05 per hour) for those exposed to a minimum wage increase. This small but positive earnings adjustment for exposed NCPs may mean that the local minimum wage hike is hard to discern against a backdrop of overall wage gains in the state.

Do overall earnings decline? NCPs exposed to a minimum wage increase show declines in earnings at both the point of implementation (estimated at -$260 per quarter) as well as in the slope in the post-implementation period, relative to unexposed NCPs. This lends evidence for my hypothesis that a minimum wage increase may be followed by a decline in earnings. Moreover, this latter result parallels findings in Chapter 4, that there was a loss in work hours among employed, exposed NCPs. Together, loss in hours worked as well as declines in earnings may reflect an overly conservative shift by employers to curb payroll costs. Thus, the reduced hours

of work fell below the level that would result in equivalent compensation accompanying a rising wage floor. Further, this loss in earnings could be relevant to child support payments. In the next chapter, I investigate the effects of a minimum wage increase on child support payments, adjusted for earnings.

Chapter 6. MINIMUM WAGE INCREASE AND CHILD SUPPORT PAYMENTS

This chapter explores whether implementation of laws to increase the minimum wage result in changes in child support payments among families who have established such obligations. While the intention of a minimum wage increase is to put more money in the pockets of low-income workers, results from previous chapters suggest that non-custodial parents (NCPs) may work fewer hours after a minimum wage increase, possibly to the extent that they see a decline in earnings. These effects may be short-term. Nevertheless, if NCPs experience a decrease in earnings, child support payments may suffer. While the level of earnings represents just one factor that could influence child support payments, it is among the most influential factors. For instance, one study showed that only three percent of fathers who are poor pay child support (Sorensen & Zibman, 2001).

Do child support payments decrease after a minimum wage increase? Specifically, I describe a conceptual model, key data elements, methods to assess relations, and results from my analysis. Finally, I summarize findings.

6.1 Conceptual Model

My conceptual model reflects the impact of earnings on child support payments in the presence of a minimum wage increase. First, I propose that earnings are positively correlated with child support payments. This idea suggests that when earnings increase so do child support payments. By the same token, when earnings decrease, child support payments decline. Second, I suggest that a minimum wage increase has a negative moderating effect on the relationship between earnings and child support. This hypothesis involves the uncertainty in earnings among

low-income workers, especially around the time of the minimum wage increase, and in light of evidence offered in previous chapters. The downward pressure on earnings, at least short term, among NCPs exposed to a minimum wage increase may dampen child support payments, and I argue this may be especially acute for low-income NCPs. Those with the highest relative earnings, however, may be making (or not making) child support payments unperturbed by a minimum wage increase. They are less likely to be influenced (either way) in paying child support by a wage shift that primarily impacts NCPs with earnings closer to the wage floor. I argue that the effect on child support, if any, ought to be among NCPs at lower earnings levels. The uncertainty in earnings could make keeping up with child support payments especially challenging. My hypothesis is stated as follows.

H3: A minimum wage increase has a negative moderating effect on the relationship between earnings and child support payments

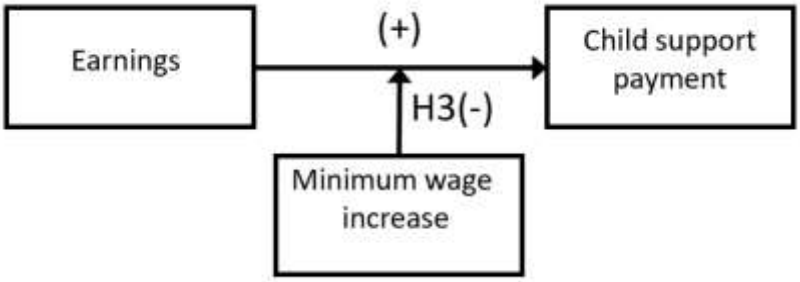

Figure 6.1 Conceptual model for hypothesis 3

Figure 6.1 depicts both the positive relationship between earnings and child support payments, as well as the negative moderating effect among NCPs exposed to a minimum wage increase. The novel idea introduced here, depicted as H3, is that a minimum wage exposure could put downward pressure on the positive relationship between earnings and child support payments.

6.2 Descriptive Measures

I begin by describing child support payments over the course of this study. Summing over monthly child support payments for each quarter, the merged analytic data set is comprised of child support and earnings information at the quarter level over the observation years 2010 through 2016. NCPs included in this analysis have at least one quarter overlap between positive earnings information and a child support order. Thus, each NCP is represented in these data between one and 28 quarters. Applying these inclusion criteria, this study comprises a total of 73,234 NCPs. (See Table 3.1 for more information on subject disposition, how many NCPs and their corresponding quarters of contributed data based on inclusion criteria.) Among these, 10,079 (13.8%) had a record of working at least one quarter in a jurisdiction subject to a minimum wage above the state minimum. As in previous chapters, NCPs in this category comprise the "exposure" group, those exposed to a minimum wage hike. In total, NCPs contributed as many as 910,508 quarters to these analyses.

The outcome of interest for this analysis is the percent or proportion of child support paid. I calculate percent child support paid as the amount of the child support paid divided by the amount of the order, times 100 (payment amount/order amount × 100), and top-coded to 100, since occasionally there are over-payments. Thus, percent child support paid ranges from zero to 100%. NCPs paying 100% are fully compliant with their child support orders, while those paying none are in full default. Figure 6.2 includes the trajectories of medians and first quartiles of percent of child support paid over time, separated by exposed and unexposed statuses.

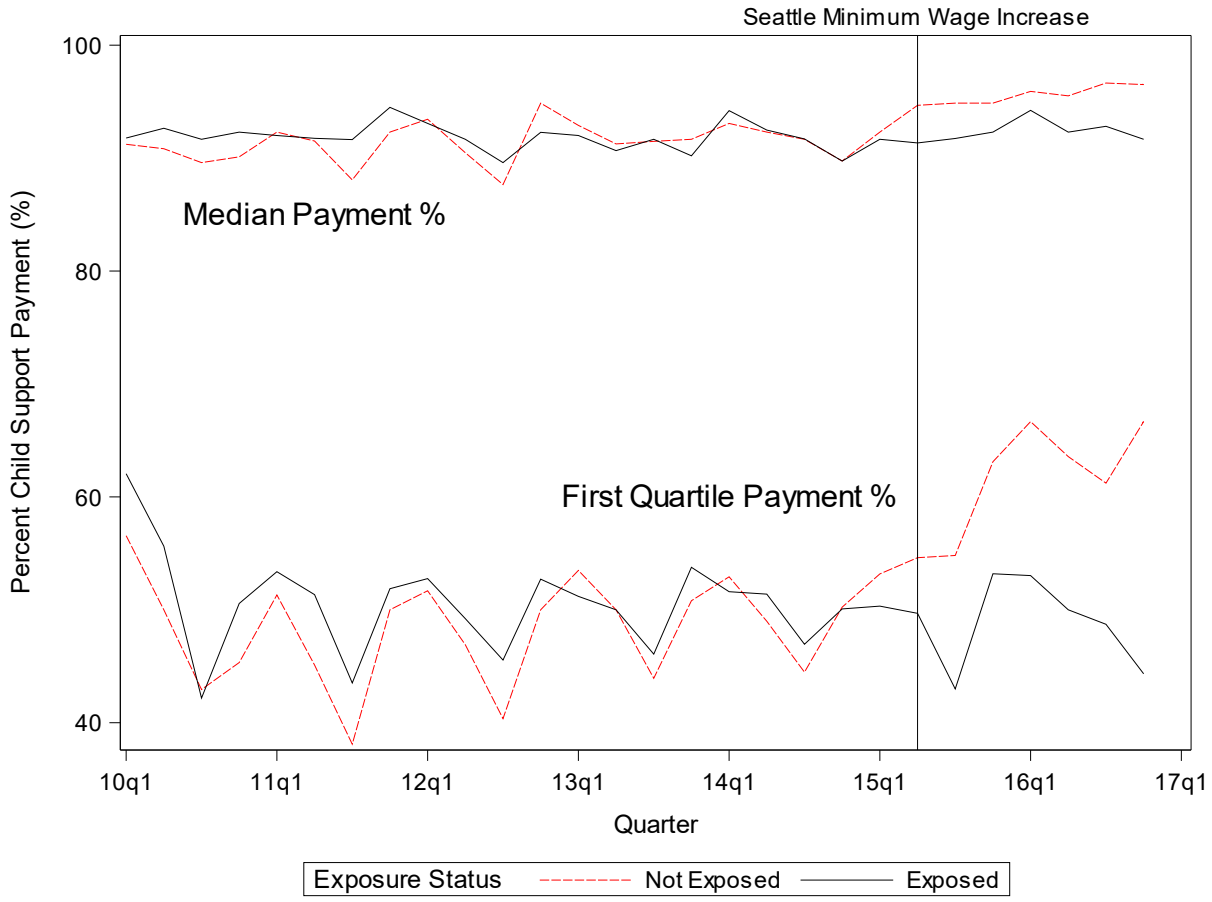

Figure 6.2 Median and first quartile percent child support paid among low-earnings NCPs by exposure status

Exposed=9,612, Not Exposed=60,556.

The first notable feature of Figure 6.2 is that median values are hovering at 90 percent of child support paid. That suggests that at least half of this cohort of low-income NCPs are paying nearly all of their child support orders. On the other hand, the first quartile of percent child support paid shows more variability, roughly centering around 50 percent. Thus, a sizeable number of NCPs are not fulfilling their child support obligations.

The second notable feature of Figure 6.2 is the seasonal trend, also apparent in earlier employment measures. However, here the peaks and troughs are different. In Figure 6.2, the percent child support paid tends to peak in winter and dip in summer, unlike work hours and

earnings that tend to peak in summer. The seasonal trend in child support payments is more reminiscent of the trend in hourly earnings. One conjecture for this seasonal difference between, say, earnings and child support payments is that some NCPs host children during summer vacation, leaving less motivation to pay child support in that season.

The third notable feature of Figure 6.2, in both the median and first quartile trajectories, is that percent child support paid appears similar between the exposed and unexposed groups prior to the interruption, possibly with the exposed group showing higher payments. Once the interruption occurs, however, there appears to be a separation, with the greatest deviation among child support payments in the first quartile. Post-interruption in the first quartile, the exposed group trajectory stays somewhat constant with expected seasonal variation, while the unexposed group trajectory slopes upward. In the next sections, I investigate whether this divergence in trajectories persist under formal modeling, adjusting for earnings and moderation introduced by a minimum wage increase.

6.3 METHODS

The outcome of interest is proportion of child support paid. Similar to the previous chapters, I take a difference-in-difference approach, apply an interrupted time-series model with propensity score weighting. As in Chapter 4, the computation of propensity score weights as average treatment effect (ATE) weights accounts for NCPs' age, sex, ethnicity, race, and the Self-sufficiency hourly wage in their county of work, a proxy for regional cost of living. I select a beta regression model with a logic link, random residuals, and an autoregressive (order=1) covariance structure using the GLIMMIX procedure in SAS[2] (2020). Beta regression is

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appropriate for continuous proportions, as the case of percent child support paid. Using the logit link, this model produces a bounded predicted outcome between 0 and 1, exclusive. In addition, beta regression dispenses with the assumption that errors are normally distributed as required by linear models.

Different from previous models, here I include earnings as an explanatory variable, log-transformed. Earnings has been shown to be a strong predictor of child support and is central to my hypothesized association. Log transformation may help improve model fit for earnings with is a highly skewed measure.

The fixed effects portion of the beta regression model with random residuals appears in Equation 6.1.

$$\begin{aligned}\ln\left(\frac{p_{it}}{1-p_{it}}\right) = {} & \beta_0 + \beta_1 Time + \beta_2 Interruption + \beta_3 Interruption \times Time \\ & + \beta_4 Exposed + \beta_5 Exposed \times Time \\ & + \beta_6 Exposed \times Interruption \\ & + \beta_7 Exposed \times Interruption \times Time \\ & + \beta_8 Quarter2 + \beta_9 Quarter3 + \beta_{10} Quarter4 \\ & + \beta_{11}\log(Earnings) + \beta_{12}\log(Earnings) \times Time \\ & + \beta_{13}\log(Earnings) \times Exposed \\ & + \beta_{14}\log(Earnings) \times Interruption \\ & + \beta_{15}\log(Earnings) \times Exposed \times Time \\ & + \beta_{16}\log(Earnings) \times Interruption \times Time \\ & + \beta_{17}\log(Earnings) \times Exposed \times Interruption \\ & + \beta_{18}\log(Earnings) \times Exposed \times Interruption \times Time + \varepsilon_{it}\end{aligned} \tag{6.1}$$

where all parameters are the same as Equation 5.1, except for and in addition to,

- p_{it}: The expected probability for NCP *i* at time *t* (an individual's expected proportion of quarterly child support paid).
- β_{11}: The increase in percent child support payment by log-earnings.
- β_{12}: The difference in slope by log-earnings in the pre-interruption period.
- β_{13}: The difference in log-earnings for the exposed group compared to the unexposed group in the pre-interruption period.
- β_{14}: The difference in log-earnings in the pre-interruption period compared to the post-interruption period.
- β_{15}: The difference in slope by log-earnings for the exposed group compared to the unexposed group in the pre-interruption period.

β_{16}: The difference in slope by log-earnings in the pre-interruption period compared to the post-interruption period.
β_{17}: The difference in log-earnings for the exposed group in the post-interruption period compared to other conditions.
β_{18}: The difference in slope by log-earnings for the exposed group in the post-interruption period compared to other conditions.

In Equation 6.1, the p_{it} represents the predicted proportion of child support paid for NCP *i* at time *t*. As in previous models, exposed and interruption statuses are represented as main effects and interactions, both together and with time. In addition, log-earnings appears both as a main effect and interacted with time, exposed, and interruption. The log-earnings interactions with exposed and interruption, combined with other parameter estimates, could provide evidence in support of my hypothesis, that the minimum wage increase acts as a negative moderator for the relation between earnings and child support payments.

6.4 RESULTS

In this section, I offer two sets of results. The first are findings from the formal modeling procedures proposed in this chapter for the outcome proportion of child support paid, with the fixed effects portion of the model described in Equation 6.1. The second set of results offers a summary of study findings, taken together, to answer the primary question of this study: does a local minimum wage increase alter child support payments?

6.4.1 *Outcome Proportion of Child Support Paid*

The fixed effects results from the beta regression are shown in Table 6.1. All but one estimated coefficient is statistically significant at the 0.01 level. I retain that one parameter [log(Earnings) × Exposed, p=0.2220] because higher order terms [such as log(Earnings) × Exposed × Time, p<.0001] are statistically significant and contain the lower order interaction. Many of the estimated coefficients are relevant to my hypothesis. For instance, the negative

coefficients for [log(Earnings) × Exposed × Time], [log(Earnings) × Interruption × Time], and [log(Earnings) × Exposed × Interruption] suggest downward moderation of the relationship between earnings and child support payments. Due to the complexity of the interactions, I provide a visual interpretation in Figures 6.3, 6.4, and 6.5.

Table 6.1 Model[1] coefficient estimates for outcome proportion child support paid

Variable	Estimate	StdErr	p-value
intercept	-3.149	0.024	<.0001
time (quarter number)	-0.0853	0.002	<.0001
interruption (Seattle law applied) = 1	-4.850	0.252	<.0001
exposure = 1	-0.147	0.034	<.0001
seasonality: (ref quarter = 1)			
quarter = 2	-0.072	0.002	<.0001
quarter = 3	-0.118	0.002	<.0001
quarter = 4	-0.082	0.002	<.0001
time × interruption = 1	0.207	0.010	<.0001
time × exposure	0.014	0.003	<.0001
exposure × interruption=1	1.556	0.310	<.0001
time × exposure × interruption=1	-0.053	0.013	<.0001
log(Earnings)	0.329	0.003	<.0001
log(Earnings) × Time	0.016	<.001	<.0001
log(Earnings) × Exposed	0.005	0.004	0.2220
log(Earnings) × Interruption	0.900	0.030	<.0001
log(Earnings) × Exposed × Time	-0.002	<.001	<.0001
log(Earnings) × Interruption × Time	-0.039	0.001	<.0001
log(Earnings) × Exposed × Interruption	-0.183	0.030	<.0001
log(Earnings) × Exposed × Interruption × Time	0.006	0.001	<.0001
Fit statistic:			
-2 Res Log Pseudo-Likelihood	5,916,197		

[1]N=910,508 NCP-quarters; beta regression with random residuals, ATE weighted with covariance structure AR(1)

Using the estimated coefficients from Table 6.1, Figure 6.3 shows the predicted proportion of child support paid by earnings, assuming constant seasonality. The figure differentiates between exposure statuses and a one-quarter change, from just prior to implementation of the Seattle law (2015 quarter 1) to just afterward (2015 quarter 2).

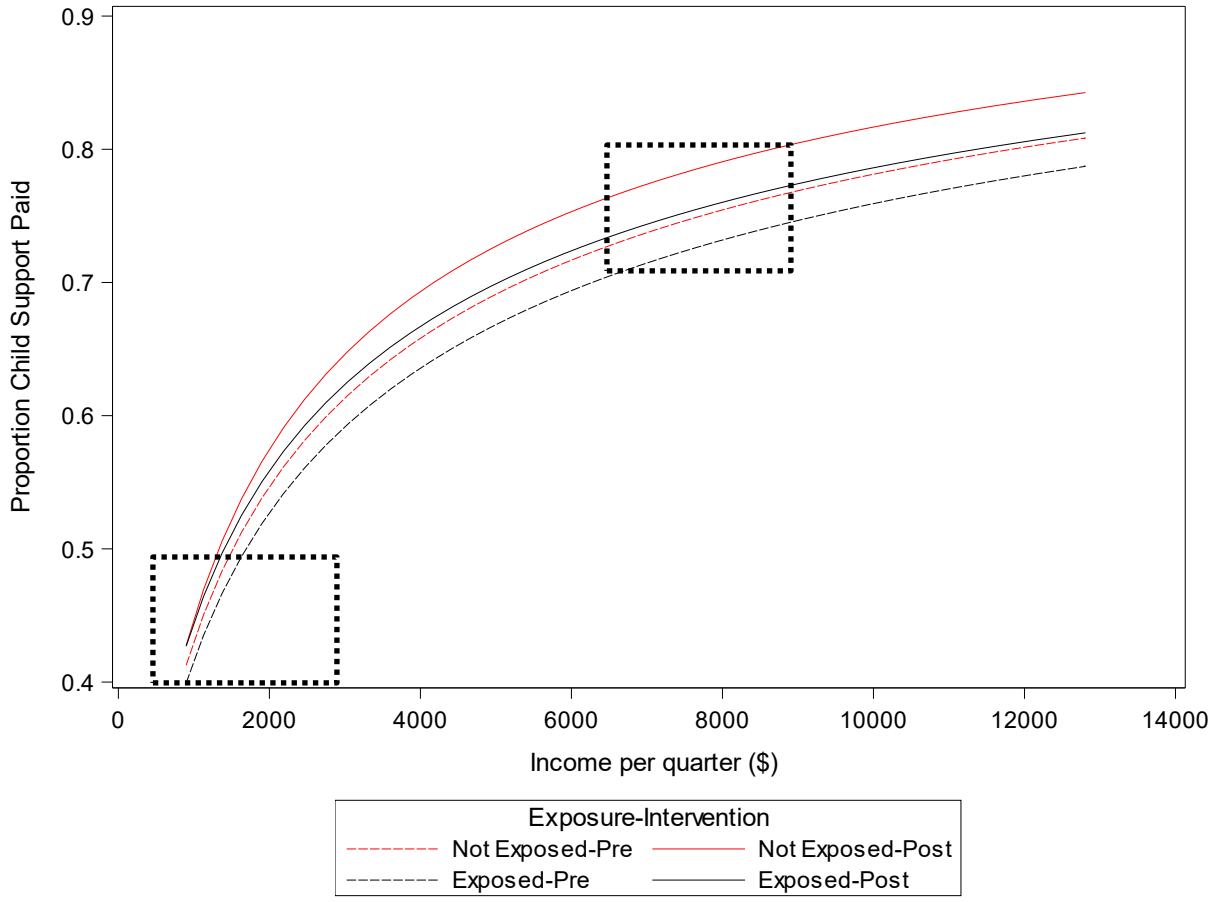

Figure 6.3 Expected proportion child support paid by earnings, by exposure status and one-quarter change

Pre-implementation of the Seattle Minimum Wage Ordinance (2015Q1) versus post-implementation (2015Q2); based on results in Table 6.1 with seasonality held constant; boxed areas represent insets expanded in Figures 6.4 and 6.5

First, Figure 6.3 displays support for the notion that child support payments increase with earnings. Here, the proportion of child support paid ranges from about 0.4 to above 0.8, growing as earnings increases from about $800 to over $13,000 per quarter. In addition, among both exposed and unexposed NCPs, there is a positive jump in child support payments (from dashed to solid lines) when there is a one-quarter change from pre-implementation, the first quarter of 2015, to post-implementation, the second quarter of the same year. From this vantage, a minimum wage increase appears to help NCPs, both exposed and unexposed, to make child

support payments. However, the difference-in-difference interpretation, along with the statistically significant interaction terms, complicate this picture.

To explicitly answer the question of whether the minimum wage increase acts as a moderator and depresses the relation between earnings and child support payments, I begin by including two insets, shown in Figure 6.3 as dotted rectangles. Figure 6.4 displays a subplot at the lower earnings range of $600 to $3,000, while Figure 6.5 shows an upper earnings range of $6,300 to $8,700.

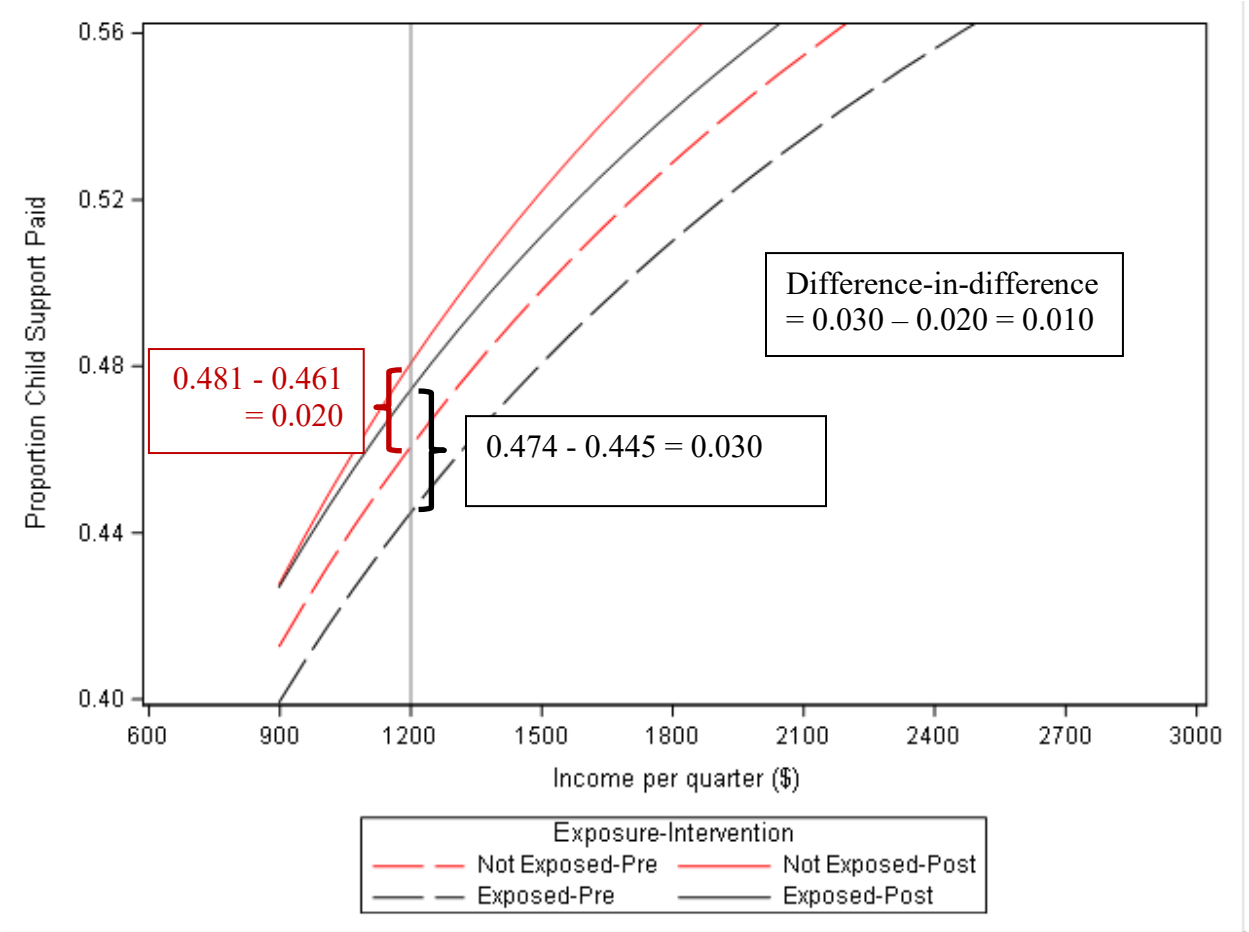

Figure 6.4 Predicted proportion child support paid by earnings ranging from $600 to $3000, by exposure status and one-quarter change

Pre-implementation of the Seattle Minimum Wage Ordinance (2015Q1) versus post-implementation (2015Q2); based on results in Table 6.1 with seasonality held constant;

vertical reference line highlights an example earnings of $1,200 per quarter ($400 per month).

Figure 6.4 shows the predicted proportion of child support paid in the lower range of the earnings distribution. As an illustration, I closely examine the quarterly earnings of $1,200, or $400 per month. For NCPs exposed to a minimum wage increase and at this earnings level, post-implementation proportion paid exceeds pre-implementation by (0.474 – 0.445 =) 0.030, or 3 percent. For unexposed NCPs, post-implementation proportion paid exceeds pre-implementation by (0.481 – 0.461 =) 0.020, or 2 percent. Thus, the difference-in-difference measure is (0.030 – 0.020 =) 0.010, or 1 percent. Assuming that the experience of the exposed group would be similar to that of the unexposed under similar circumstances, the implementation of Seattle's minimum wage law appears to help exposed NCP's increase payments at an earnings level of $1200, although the magnitude is small at 1 percent. For comparison, I now examine the effects at the upper earnings levels.

Figure 6.5 shows the second inset from Figure 6.3, a segment of the figure at higher earnings levels. Here, I highlight an example quarterly earnings of $7,500 per quarter, or $2,500 per month. For NCPs exposed to a minimum wage increase and at this earnings level, post-implementation proportion paid exceeds pre-implementation by (0.752 – 0.724 =) 0.029, or 2.9 percent. For unexposed NCPs, post-implementation proportion paid also exceeds pre-implementation by (0.783 – 0.746 =) 0.036, or 3.6 percent. The difference-in-difference measure is (0.029 – 0.036 =) -0.007, or -0.7 percent, again a relatively small departure. Taking the last two figures together, with a positive change in the lower earnings levels and a negative change at the higher earnings levels, it appears that being exposed to minimum wage increase does moderate the relationship between earnings and the proportion of child support payments. To

help make this finding more obvious, next I look at the difference-in-difference results across a range of earnings levels.

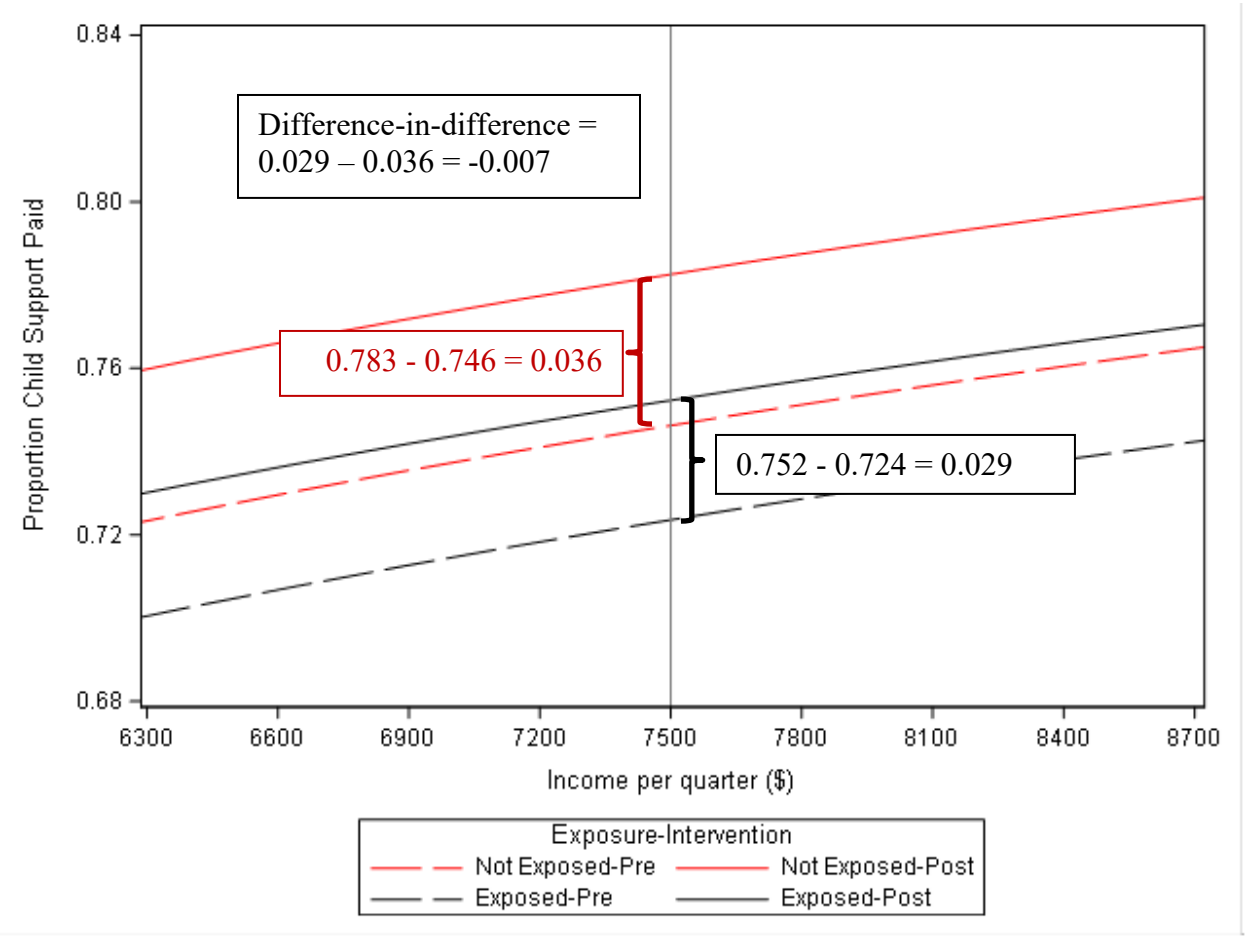

Figure 6.5 Predicted proportion child support paid by earnings ranging from $6,300 to $8.700, by exposure status and one-quarter change

Pre-implementation of the Seattle Minimum Wage Ordinance (2015Q1) versus post-implementation (2015Q2); based on results in Table 6.1 with seasonality held constant; vertical reference line highlights an example earnings of $7,500 per quarter ($2500 per month)

Figure 6.6 displays the difference-in-difference results by quarterly earnings. As suggested in the previous figures, the predicted measure exceeds zero and approaches 0.010, or one percent positive shift, for the lowest quarterly earnings. At the lowest earnings, exposure to a

minimum wage increase may correspond to making greater child support payments, above what would be dictated by earnings levels alone. In other words, child support payments on average may get a small boost among NCPs at lower earnings levels.

On the other hand, Figure 6.6 suggests that as earnings exceeds about $2,700, NCPs' exposure to a minimum wage may represent a disadvantage, approaching a negative one percent in payments. Thus, the story changes at higher earnings levels where being exposed to a minimum wage has little bearing, and may even suppress child support payments, but only to a small extent. Regardless, the magnitudes of this measure appear small in either direction and likely do not represent sizeable departures from typical child support payments. As in previous results, these findings may highlight statistically significant results that do not attain practical significance.

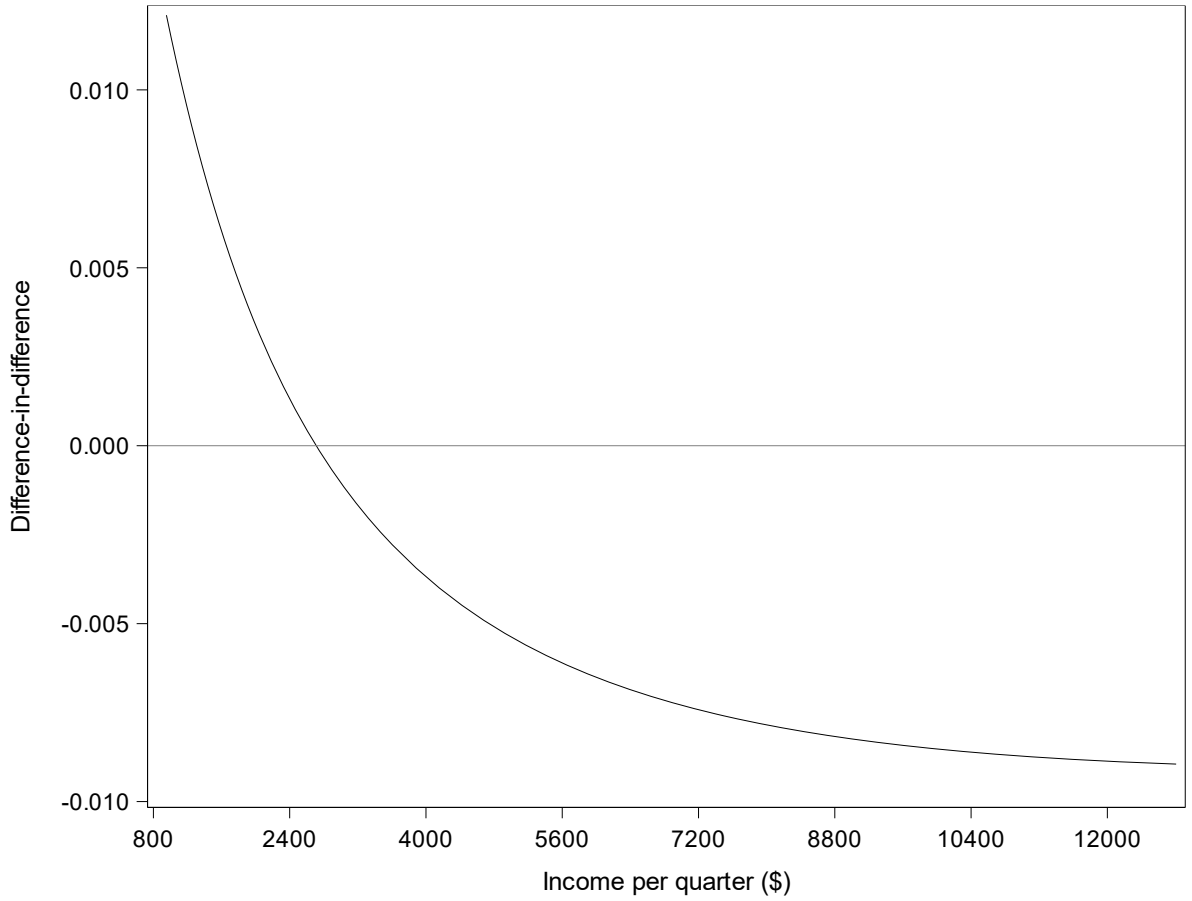

Figure 6.6 Expected difference-in-difference measure for one quarter change
Based on results in Table 6.1

As for my hypothesis, that a minimum wage increase might negatively moderate the relation between earnings and the proportion of child support paid, yes, that does occur but not consistently. Figure 6.6 displays difference-in-difference estimates of child support payments that change over the range of earnings, decreasing only as earnings exceed $2,700 per quarter. Again, the magnitude of these differences suggests the moderation effect may not be large. Taken together, these findings do not lend strong evidence in support of my hypothesis.

6.4.2 *Does a Minimum Wage Increase Have an Effect on Child Support Payments?*

Ultimately, I hope this study lends new insight on the question of whether a local minimum wage increase can influence NCPs to change the amount or consistency of their child support payments. To help summarize this study, Table 6.2 displays a compilation of my findings across outcomes.

In Chapter 4, evidence suggests that the predicted probability of working any hours in a quarter (a proxy for having a job) declines after a minimum wage increase by about 0.053. In other words, post-implementation there is about 5 percent drop in the chance of having a job for these low-income NCPs. Also, among NCPs who have jobs, I expect to see on average about a 14 hour decrease in hours worked per quarter post-implementation.

Table 6.2 shows that in Chapter 5, I examine hourly earnings and earnings among NCPs with jobs. My findings suggest that the expected value for hourly earnings increases by about $0.05 per hour after the Seattle minimum wage is implemented, a small impact on average. The expected value for overall earnings, however, declines by about -$260 per quarter, amounting to about $20 per week drop in earnings.

Here in Chapter 6, Table 6.2 displays that I find that the predicted proportion of child support paid does not change much after a minimum wage increase, accounting for earnings. The difference-in-difference estimates for percent child support paid range from approximately -0.010 to +0.010. In other words, NCPs showed a 1% change, plus or minus, in the percent child support paid across the range of earnings levels after a minimum wage increase, with those earning the least corresponding to a small positive impact of a minimum wage increase on child support paid.

Table 6.2 Summary of the association between a minimum wage increase and outcomes

Chapter	Outcome	Measure	Model Estimates	Difference-in-Difference Estimate
4	Hours worked	Any (yes/no)	Predicted probability of any hours	-0.053
		Number per quarter	Expected value of number of hours per quarter	-14 hours
5	Earnings	Hourly	Expected value of hourly earnings	+$0.05 per hour
		Total	Expected value of earnings	-$260 per quarter
6	Child support	Proportion paid	Predicted proportion of child support paid by earnings	Approximate range (-0.010, +0.010)

The final question is whether, taken together, these results suggest changes in child support payments after a minimum wage increase. While results from Chapter 5 imply the existence of a modest moderating effect of the minimum wage on the relationship between earnings and child support paid, it does not directly answer the ultimate question.

Here, I take a more heuristic approach to answer the question of whether a minimum wage increase influences child support payments. Specifically, I want to know how much the expected decline in earnings of $260 post minimum wage increase change child support payments. In other words, assuming that there is an earnings decline of this magnitude, what are the expected values of child support payments among exposed NCPs based on the child support

model already developed in Chapter 6?

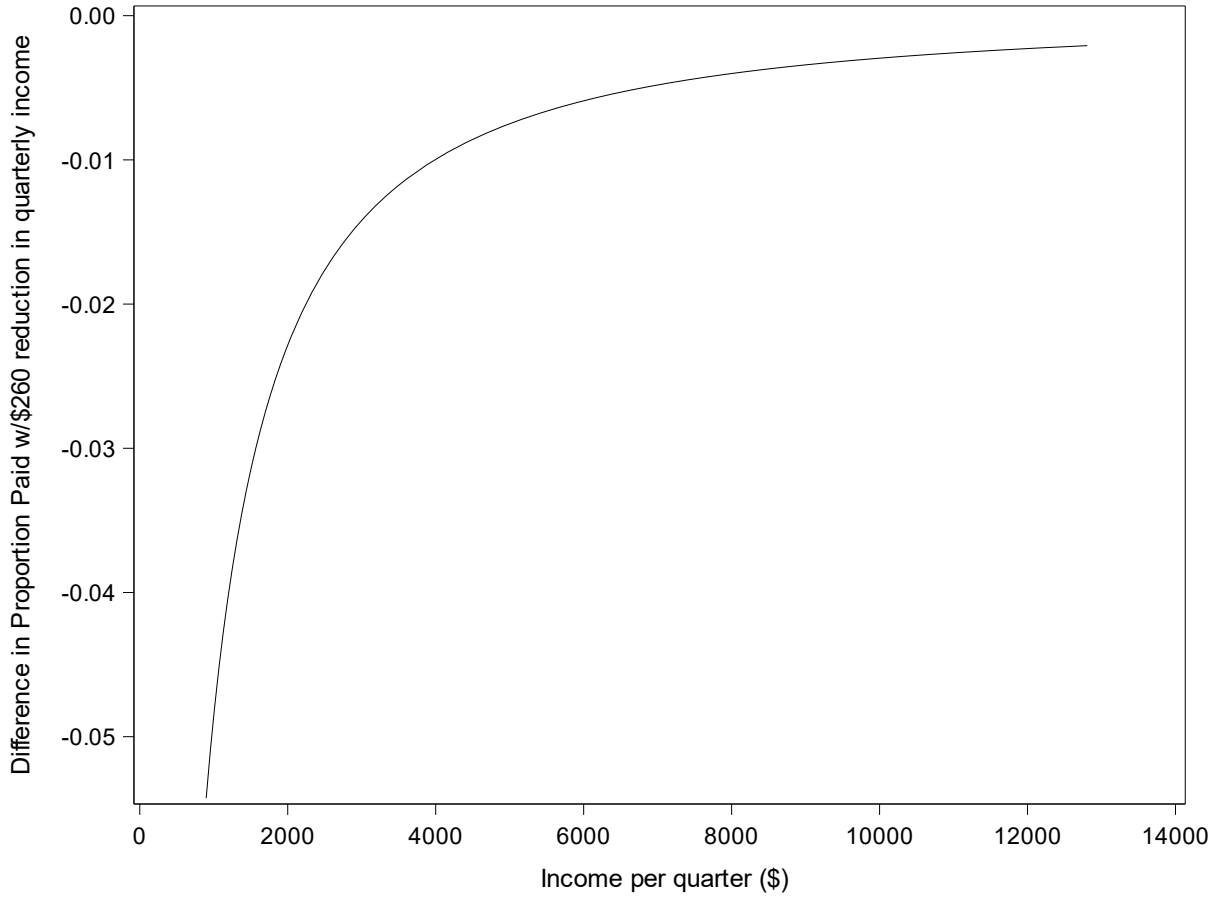

Figure 6.7 Expected difference in proportion child support paid given a $260 reduction in total quarterly earnings

Based on Table 6.1 results among exposed NCP after the minimum wage increase, seasonality held constant.

To help answer that question, I use coefficient estimates from Table 6.1 to compute additional predicted probabilities, under the assumption that NCPs are exposed to a minimum wage increase. Figure 6.7 displays the difference in the proportion of child support payments after reducing earnings by $260 per quarter. This answers the question: what if all NCPs had a drop in earnings of $260 per quarter immediately after the increase in the minimum wage? For instance, if an NCP's earnings are about $7,914 per quarter, a reduction of $260 would result in

earnings of $7,654. Using the estimated coefficients from the model, the predicted proportion change in child support payments comparing the old wage to the new wage would be -0.004, a small decline that reflects the small impact that the reduction in earnings would have on payments.

A $260 change, however, has more impact on child support at lower earnings levels. For example, for an NCP with a earnings of $1,187 per quarter, a $260 reduction leaves $927 in earnings, and the corresponding expected proportion of the child support paid changes by -0.041, a 4% decline. Assuming these model estimates are reasonable approximations, I conclude reductions in earnings at the magnitude reported in Chapter 5 do produce changes in child support payments, approaching an estimated 5 percent decline at the lower earnings ranges as displayed in Figure 6.7. The question remains whether the magnitude of change in the proportion of child support paid constitutes a meaningful change.

6.1 Chapter Summary

In this chapter, I investigate a moderation effect of a local minimum wage increase on the association between earnings and the proportion of child support paid. Child support payments are greatly influenced by NCP earnings levels. Findings here confirm this: as quarterly earnings increase, so do child support payments. However, as shown earlier, a minimum wage increase can be followed by an adjustment among employers, at least in the short-term, that lowers earnings for NCPs. This, by itself, may reduce child support payments. However, I hypothesize something more: that the minimum wage increase might destabilize the relation between earnings and child support, acting as a negative moderator, anticipating further erosion of child support payments after a minimum wage increase. Evidence suggests that while there is moderation effect, it is more complicated than I anticipated. Those at lower earnings level show

a modest increase (up to +1 percent) in child support payments, while those at the higher earnings level show a modest decrease (down to -1 percent) in child support payments. Ultimately, I conclude that the small magnitudes of change in child support payments render this finding negligible.

Finally, I attempt to answer the main question of this study, whether a minimum wage increase impacts child support payments. I use the model estimates from Chapter 6 to compute the effect of an earnings reduction of $260, the expected value from Chapter 5, on child support payments. I conclude that the predicted proportional change to child support payments ranges from about 0 and -5 percent, with the greater impact among NCPs in the lower earnings ranges. The answer is yes, evidence here suggests that a minimum wage increase can influence child support payments, but again, calls into question the practical significance of these findings.

Chapter 7. DISCUSSION AND CONCLUSION

In the end, I conducted this study in the hopes of tying local increases in minimum wage to changes in hours, earnings, and child support payments among low-income NCPs. While the findings varied across outcomes, the final goal was to unearth the potential impacts to children who live in families which are dependent on child support payments. The findings were mixed: while there were statistically significant differences, they were of negligible in magnitude that varied across earnings. In this chapter, I discuss the study findings, how they compare to previous work, and several open questions. I offer ideas for further work, with particular interest in the WMLAD data resource that is already available for research. I conclude with summarizing remarks and remaining challenges.

7.1 DISCUSSION

Several open questions and topics surfaced in the conduct of this study. First, I compare the findings from the current study with those of previous studies. Then I consider significance: this study exposed at nearly every turn the difference between statistical significance and practical significance, the latter being particularly challenging to define. Next, I ask what is a "large" minimum wage increase, and position the wage changes in this study to other magnitudes of increase in minimum wages. I then consider the generalizability of this study's results. Finally, I consider what constitutes substantive benefits to children in low-income families and how those might be achieved.

7.1.1 *Comparing Current Study with Previous Studies*

Does a minimum wage increase result in a decline in hours worked, especially to the extent that it leads to a decrease in earnings? I compare my study results with the study by

Jardim et. al. (2018), an examination of the same data only for a larger segment of Washington state population. Both of these studies examined implementation of Seattle's Minimum Wage Ordinance with the same Washington State administrative data. The Jardim (2018) study examined all low-income workers with wages below $19 per hour. In the current study, I examine a subset comprising a cohort of non-custodial parents with active child support orders anytime over a 7-year observation period, with at least one quarter in which their earnings fell below 200 percent of the federal poverty threshold for a family of three. The current study involves a smaller portion of Washington state workers over a shorter timeframe.

Comparing the two treatments, Jardim and her colleagues (2018) found evidence of negative effects such that some workers experienced a decrease in hours worked and decline in earnings after the minimum wage increase, but with less impact among more experienced workers. My study somewhat parallels these findings. In the smaller cohort comprised of low-income NCPs that I examine, there are negative effects of a minimum wage increase on hours worked and earnings after a minimum wage increase, although I do not include work experience as a factor here. In general, the results of this study approximately correspond to the larger study, analyzed with different statistical methods.

Next, I compare the results from this study with the two known studies of child support payments in the presence of a minimum wage increase. The first is a national study. Miller, Thomas, Emory, Nepomnyaschy, and Waller (2020) used pooled data from the 1994-2016 waves of the Current Population Survey Child Support Supplement, concentrating on custodial mothers with low SES as identified by educational attainment and non-custodial father's state of residence. This study found that each $1 increase in a state's minimum wage was significantly associated with an annual $170 increase in formal cash support among custodial mothers due

assistance (Miller et al., 2020). This differs from the study here, primarily since I compare one region to another within a single state. In my study among a cohort of low-income NCPs, a minimum wage increase is associated with an average change in child support payments of between negative and positive one percent, depending on earnings levels. Thus, Miller and colleagues (2020) find a positive association between a minimum wage increase and child support payments, about a $14 per month increase. My study, on the other hand, finds a percent child support payment difference that depends on earnings. These findings could agree in one specific instance: if the child support order is, say, $1,400 per month, my findings would suggest somewhere between -$14 to +$14 change in child support after a minimum wage increase.

The second study combining a minimum wage increase and child support payments used data from Seattle, the same WMLAD source used in the current study. Robert Plotnick (2019) examined child support payments after the minimum wage increased among low-wage employees earning $19 per hour or less. The change in child support payments was not statistically significant. This differs from the findings in the current study, where I found statistically significant differences in child support payments, but of small magnitude. I attribute differing results from these two treatments to three possible reasons: more data has become available for inclusion since Plotnick's (2019) original study, each study had a different definition of low-income workers, and each study applied different statistical approaches. First, additional demographic data has become available that I use to balance those exposed to a minimum wage increase to those who are not exposed. Second, the study here followed a cohort of low-income NCPs for the entire seven-year observation period, as long as they met the criteria that, for at least one quarter, their earnings were less than 200 percent of the federal poverty threshold for a family of three. That differed from the Plotnick study that used a wage cut-off of

$19 per hour. Third, my analysis involved a longitudinal approach, accounting for autocorrelation of trajectories across a minimum wage increase, weighting to adjust for selection into regions, and model selection that may help account for outcome distributions. In addition, I accounted for a minimum wage increase as a moderator between earnings and child support payments in my final model.

7.1.2 *Question of Significance*

From the outset, this study challenges interpretations of significance. It calls attention to the difference between statistical significance and practical significance. Statistical significance involves p-values, a measure of how probable the estimated value is under the conditions of a null hypothesis. A small p-value suggests that an estimate is unlikely, and thus, lends evidence in favor of the alternative hypothesis. On the other hand, practical significance necessitates examining effect sizes. Is the magnitude of the change in outcome, after accounting for the effect, large enough to matter? Ideally, to conclude that a change in circumstance could make a real difference in the lives of NCPs and the children they support requires both statistical and practical significance. In this study, with its large number of NCPs and choice of suitable models, coefficients tend to be statistically significant at the 0.01 level. Once satisfying the criteria for statistical significance, the main task falls to the question of practical significance. Ultimately, the findings here suggest that a minimum wage increase may not change, in any material way, the conditions under which low-income NCPs make child support payments.

7.1.3 *What is a Large Change in Minimum Wage?*

The magnitudes of the minimum wage increases could be relevant in understanding the findings for any hours or number of hours worked that I observe in this study. As shown in Table

1.5, Seattle's minimum wage takes a sizeable jump on April 1, 2015, increasing by $1.53 per hour, a 16% increase over state's minimum wage of $9.47 per hour. That's rapidly followed on January 1, 2016 by an increase of $2.53 above the state's, nearly a 27% shift. The City of SeaTac had even larger increases starting in 2014, over $5 per hour more than the state's minimum, although the number of employees it applied to was far fewer than that of the Seattle. (SeaTac's law was implemented only for employees working in transportation, restaurant, and hotel industries within the smaller city.)

This brings into relief Belman and Wolfson's (2014) idea of the potential differences between moderate versus large minimum wage increases. While they highlight the accumulation of evidence that a moderate minimum wage increase has little or no disemployment effects (Belman & Wolfson, 2014), they admittedly know of no studies that examine effects after a large minimum wage increase, and further, do not define "large." More boldly, Cooper, Mishel, and Zipperer (2018) suggest that since modest minimum wage increases in the 1990s and 2000s were not followed by sizeable employment losses, "we could have pursued larger increases with few negative consequences for low-wage workers" (Cooper et al., 2018, 1). Again, the authors do not define "larger increases."

What does not appear to be discussed is the economic vitality of the region in which a minimum wage is introduced. Possibly, the magnitude of Seattle's increase, along with a few other cities in the region, was most easily absorbed without job loss because of the economic upturn at this time in the region. If Seattle's minimum wage increase can be deemed "large" relative to other instances, then it would serve to compare economic factors that contribute to few job loses but possibly a drop in hours among the employed. There is more work to be done on the notion of "large" increases in minimum wage and their effect on employment measures.

7.1.4 *Generalizability*

I hope this study in Washington State from 2010 through 2016 informs leaders who implement local minimum wage increases in other regions across the United States. In other words, I assume this study is generalizable. One challenge, however, of a close examination of a policy implementation is the unique regional characteristics, combined with temporal circumstances, which may make such a study less applicable to other local implementations. The unique setting, local economic trends, or other jurisdictional factors could influence results. Can the outcomes from a local minimum wage increase in Seattle, SeaTac, and Tacoma the make a functional comparison to other regions across the United States that implement a local minimum wage increase?

One way such generalizability could be argued is that similarities might exist for regions that are poised to implement a local minimum wage increase. In other words, while perhaps not generalizable to all regions in the United States, these findings may be useful to regions that are able to receive enough public and government support for a local minimum wage increase, such that the momentum towards raising the wage floor may overcome the objections of the business community. The very nature of the policy implementation may render such regions somewhat comparable. The political will, the strength of the local economy, and the popular sentiment may offer enough similarity to the circumstances in Seattle prior to the 2015 minimum wage increase that this study is generalizable to other regions.

On the other hand, Seattle's economic upswing during this interval, its position in the state's economy, and the way the primary law was implemented (Seattle's Minimum Wage Ordinance was approved though a city council process) may stretch the assumption of generalizability beyond utility. While I hope that this study proves useful to municipalities

considering minimum wage increases, I acknowledge the potential limitation of generalizing the findings here.

7.1.5 *What Could Make a Difference to Children?*

Providing adequate resources for children to thrive in low-income families with a non-resident parent is the ultimate goal. How can we assure that children have the resources they need? One improvement would be to place more emphasis on supporting children rather than reducing public expenditure (Cancian et al., 2011). Among TANF recipients under the current policies and practices, cost recovery appears to be a primary goal. In these cases, the majority of NCPs' child support payments offset the cost of government assistance to the custodial parent's family. Cancian, Meyer, and Han (2011) offer several variations to the proposals made in the Responsible Fatherhood and Healthy Families Act, first introduced in 2009 by Senator Evan Bayh and cosponsored by then-Senator Barack Obama. For instance, new legislation could allow TANF families to keep all child support paid on their behalf. Such a 100% pass-through policy could encourage NCPs to pay more, as they may see more direct impact of their payments on their child's wellbeing. These researchers fully recognize this change will likely eliminate an important source of revenue for child support enforcement agencies (Cancian et al., 2011). While such a policy would require public expenditure to cover the full cost of the TANF program, there could be real gains for children in low-income families.

If one goal is enable NCPs to fulfill their financial obligations to their children, then we need policies to wholly support NCP employment and earnings (Brustin, 2012). A minimum wage increases could be just one policy that increases NCP earnings, in the long run if not in the short-term. Policies to improve earnings among low-income NCPs could also include funding for employment programs, assistance that enables better workforce participation, and tax incentives

(Brustin, 2012). In the case of TANF recipients, policies could be broadened to impact custodial parents and NCPs in parallel. For instance, like custodial parents who are TANF recipients, NCPs with child support orders for a TANF family could be required to work. Also like TANF recipients, NCPs could be offered supports to improve their employment outcomes such as training in occupational skills and transitional jobs (Cancian et al., 2011). Then NCPs could benefit from other resources associated with work like the Earned Earnings Tax Credit (EITC). NCPs with child support orders to TANF families could be eligible for supplemental health insurance (Medicaid) and SNAP benefits (food stamps) (Sorensen & Zibman, 2001). Together, these policies and programs could enable low-income NCPs to earn more and, thereby, pay more child support.

7.2 FURTHER WORK

7.2.1 *Employment Consistency*

Other questions might remain about the consistency of NCPs' hourly work. While this study has confirmed that earnings is a major driver of child support payments, more could be explored about the consistency of employment. These data allow for the possibility of assessing the steadiness of hours worked among low-income NCPs. For instance, adding model covariates representing quarter-over-quarter full-time, half-time or less than half-time hours, controlling for earnings, could begin such an examination. If NCPs experience considerable variability in the expected number of hours worked, payments towards child support could be weighed differently against other expenses compared to NCPs who can more confidently count on a set number of hours of employment.

One possible extension of this work is a developing sectoral study centering on NCP employment. The consistency of hours worked and stability of wages can differ across sectors

(Belman & Wolfson, 2014). For example, employment in the agricultural sector could be compared to employment in service industries like restaurant or accommodations. The very sectors which, under usual circumstances, are subject to more employment churn or volatility in work hours may be those most impacted by a minimum wage increase. Some suggest, however, that this very volatility may help individuals find other readily available employment opportunities should there be a downshift in hours after a minimum wage increase (Cooper et al., 2018). Is that sort of recovery in fact taking place? Are those with reduced hours simply finding another opportunity, and if so, does this differ by employment sector? These data may be able to address these questions because here a change in employer and sector are traceable. Thus, the comparison of NCPs across a change in employer, while subject to a minimum wage increase, might surface sectoral differences in employment outcomes, leading to potential differentiation in patterns of child support payments.

7.2.2 *Earnings Comparison Between Parents*

The data for this study allows for further exploration of questions regarding earnings. For example, the available data for child support cases identify a custodial parent and, if recorded, a non-custodial parent. So, for a subset of child support cases there are matched pairs of parents. This allows for a comparison of earnings between the two, as well as factoring in the child support payment itself. There is limited research that simultaneously considers the effect of child support on the earnings of the two families, that of the non-custodial parent and the custodial parent (Cancian et al., 2011; Ha et al., 2018). By examining earnings of the NCP compared to the custodial parent, the next step would be to assess the effect of the child support transfer from one to the other, as does Ha and colleagues (2018) in their Wisconsin study. What are the estimated earnings that remains for the NCP but adds to the earnings of the non-custodial parent? This

assumes full-pass through, that all of the child support paid is received by the non-custodial parent, which may not be the case for TANF recipients. Unfortunately, these data do not indicate pass-through amounts. Projections on post-transfer poverty levels, however, could anticipate the effects of a full pass-through policy.

7.2.3 *Child Support, Further Demographics, and Subset Analysis*

Several questions remain about child support and demographics. To maximize the number of NCPs included in the study here, demographic information on NCPs was limited to what was available for most NCPs across data sources. However, a richer set of demographic information exists in these data for a subset of matched parents if a new birth was recorded in Washington State during the study inclusion period. For instance, birth records have information on each parent's highest education level attained at the time of the birth, an important predictor of wages. Another influential factor on child support payments is marital status (Nepomnyaschy & Garfinkel, 2010), again available for a limited number of NCPs and custodial parents on birth records. By matching both parents to their child's birth record and child support order, a follow-up study could access more demographic information to help inform both employment outcomes and child support payments. In addition, this presents an opportunity to examine the initiation of the child support order, including a comparison of the order amount to the amount of NCP and custodial parent earnings at the start of the case. The legitimacy of such a sub-analysis would rest on arguments of generalizability.

Finally, it would be ideal to examine those NCPs that had showed a decrease in hours worked after the minimum wage increase. Isolating these NCPs and examining them for consistency of child support payments before and after the minimum wage increase could elucidate the trajectories of those most likely impacted by rising wage floor. One consideration is

to incorporate the addition child support information available for 2017 to help strengthen the analysis with longer follow-up data, even if overall state minimum wage increases at the start of that year.

7.3 Conclusion

Getting more resources to children whose families depend on child support is imperative. Perhaps the most relevant finding in this study is that, on average, child support payments were not strongly impacted by an upward adjustment to the wage floor. Social work advocates and many others favor increasing the minimum wage because higher pay rates could offset the cost of basic needs for financially vulnerable families, and possibly decrease reliance on public assistance. Positive findings from this study could have strongly supported such drives. The modest negative results, however, do not strongly detract from supporting such a policy

Fortunately, NCPs who worked in a jurisdiction subject to a minimum wage increase for the most part kept paying at their customary levels, regardless of potential downshifts in hours worked or earnings. Moreover, the small decline in payments appeared to return to before-implementation levels over the remainder of the observation period. Thus, child support payments provided directly to families, or that offset program costs for TANF benefits, changed little. Families with child support orders may rely heavily on this income stream, so maintaining this as a steady source is vital.

If increasing the minimum wage can be shown to have long-run benefits to the lowest wage earners, then here I offer little evidence of a strong negative consequence with regard to child support payments. In other words, this study lends practically no support for detractors who may claim sizeable and long-term declines in child support payments as a hindrance to passing laws that raise the minimum wage. Yet, this finding did little to relieve tension among several

opposing conditions. Held in balance, we need minimum wage increases, to develop policies that improve the economic conditions of the lowest paid workers, to respect the economic realities among low-income non-custodial parents, to acknowledge the advantage to our public interests from effective child support enforcement, and all the while, to provide truly substantive benefits to children in low-income families.

REFERENCES

Austin, P. C. (2011). An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behavioral Research*, *46*, 399–424. https://doi.org/10.1080/00273171.2011.568786

Bazo-Alvarez, J. C., Morris, T. P., Pham, T. M., Carpenter, J. R., & Petersen, I. (2020). Handling missing values in interrupted time series analysis of longitudinal individual-level data. *Clinical Epidemiology*, *12*, 1045–1057.

Belman, D., & Wolfson, P. J. (2014). *What does the minimum wage do?* W.E. Upjohn Insittute for Employment Research.

Brownstein, R. (2017, November 16). Can Seattle handle it's own growth? *The Atlantic*. https://www.theatlantic.com/politics/archive/2017/11/can-seattle-handle-its-success/546053/

Brustin, S. (2012). Child support: Shifting the financial burden in low-income families. *Georgetown Journal on Poverty Law and Policy*, 49.

Cancian, M., Heinrich, C. J., & Chung, Y. (2013). Discouraging disadvantaged fathers' employment: An unintended consequence of policies designed to support families: discouraging disadvantaged fathers' employment. *Journal of Policy Analysis and Management*, *32*(4), 758–784. https://doi.org/10.1002/pam.21707

Cancian, M., & Meyer, D. R. (2007). Child support and the economy. In *Working and poor: How economic and policy changes are affecting low-wage workers* (pp. 338–365). Russell Sage Foundation.

Cancian, M., Meyer, D. R., & Han, E. (2011). Child support: Responsible fatherhood and the quid pro quo. *The Annals of the American Academy of Political and Social Science*, *635*(Young disadvantaged men: fathers, families, poverty, and policy), 140–162.

Conroy, B. (2020, January 7). Washington and Seattle lead the nation with the highest minimum-wage rates. *Seattle Business Magazine*. https://www.seattlebusinessmag.com/workplace/washington-and-seattle-lead-nation-highest-minimum-wage-rates

Cooper, D., Mishel, L., & Zipperer, B. (2018). Bold increases in the minimum wage should be evaluated for the benefits of raising low-wage workers' total earnings: Critics who cite claims of job loss are using a distorted frame. *Economic Policy Institute*. https://www.epi.org/publication/bold-increases-in-the-minimum-wage-should-be-evaluated-for-the-benefits-of-raising-low-wage-workers-total-earnings-critics-who-cite-claims-of-job-loss-are-using-a-distorted-frame/

Department of Social and Health Services. (2021). *Child support pass-through payment: What is it?* Washington State. https://www.dshs.wa.gov/esa/eligibility-z-manual-ea-z/child-support

Employment Security Department. (2020). *Self-employed or independent contractor? Benefits available for self-employed workers*. Washington State. https://esd.wa.gov/unemployment/self-employed

GarnishmentLaws.org. (2022). *Wage garnishment for the self employed*. https://www.garnishmentlaws.org/wage-garnishment-for-the-self-employed/

Ha, Y., Cancian, M., & Meyer, D. R. (2011). The regularity of child support and its contribution to the regularity of income. *Social Service Review*, *85*(3), 401–419. https://doi.org/10.1086/661923

Ha, Y., Cancian, M., & Meyer, D. R. (2018). Child support and income inequality. *Poverty & Public Policy*, *10*(2), 147–158. https://doi.org/10.1002/pop4.215

Heatherington, E., Adhikari, K., Tomfohr-Madsen, L., Patten, S., & Metcalfe, A. (2021). Birth outcomes, pregnancy complications, and postpartum mental health after the 2013 Calgary flood: A difference in difference analysis. *PLoS ONE*, *16*(2), e0246670.

Hill, H. D., & Romich, J. (2018). How will higher minimum wages affect family life and children's well-being? *Child Development Perspectives*, *12*(2), 109–114. https://doi.org/0.1111/cdep.12270

Jardim, E., Long, M. C., Plotnick, R., van Inwegen, E., Vigdor, J., & Wething, H. (2018). *Minimum wage increases, wages, and low-wage employment: Evidence from Seattle* (Working Paper No. 23532; p. 75). National Bureau of Economic Research. http://www.nber.org/papers/w23532

Johnson, W. E. (2001). Paternal involvement among unwed fathers. *Children and Youth Services Review*, *23*(6), 512–536.

Maldonado, S. (2006). Deadbeat or deadbroke: Redefining child support for poor fathers. *U.C. Davis Law Review*, *39*(3), 991–1002.

Map of Seattle in King County. (2006). [Map]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Seattle_in_King_County.png

Miller, D., Thomas, M. M., Emory, A. D., Nepomnyaschy, L., & Waller, M. (2020, January 16). *The minimum wage and fathers' provision of child support. Findings from national data*.

Society for Social Work and Research, Washington, DC. https://sswr.confex.com/sswr/2020/webprogram/Paper39415.html

National Conference of State Legislatures. (2021, October 15). *Interest on child support arrears*. NCSL. https://www.ncsl.org/research/human-services/interest-on-child-support-arrears.aspx

Nepomnyaschy, L., & Garfinkel, I. (2010). Child support enforcement and fathers' contributions to their nonmarital children. *Social Service Review*, *84*(3), 341–380. https://doi.org/10.1086/655392

Pierce, D. (2009). *The self-sufficiency standard for Washington State 2009: Prepared for the Workforce Development Council of Seattle-King County*. Center for Women's Welfare. http://ydn.dtd.mybluehost.me/SELC/wp-content/uploads/2021/11/WA2009.pdf

Plotnick, R. D. (2019). *How did Seattle's minimum wage policy affect compliance with child support orders?* (DSHS Agreement Number 1665-70363). Prepared for Washington State Division of Child Support, Department of Social and Health Services.

Poverty Reduction Work Group. (2020). *Reducing Poverty & Inequality in Washington State: 10-Year Plan for the Future*. The Office of the Governor, State of Washington. https://dismantlepovertyinwa.com/wp-content/uploads/2020/02/2020_Jan_21_PRWG_10_year_plan_COORDINATING_DRAFT.pdf

Romich, J., Long, M., Allard, S., & Althauser, A. (2018). The Washington State Merged Longitudinal Administrative Database. *International Journal of Population Data Science*, *3*(5).

Ryan, A. M., Kontopantelis, E., Linden, A., & Burgess, J. F. (2019). Now trending: Coping with non-parallel trends in difference-in-differences analysis. *Statistical Methods in Medical Research*, *28*(12), 3697–3711. https://doi.org/10.1177/0962280218814570

SAS 9.4. (2020). [Windows]. SAS Institute Inc.

Sinkewicz, M., & Garfinkel, I. (2009). Unwed fathers' ability to pay child support: New estimates accounting for multipartner fertility. *Demography*, *46*(2), 247–263.

Sorensen, E., & Lerman, R. (1998). Welfare reform and low-income noncustodial fathers. *Challenge*, *41*(4), 101–116.

Sorensen, E., & Zibman, C. (2001). Getting to know poor fathers who do not pay child support. *Social Service Review*, *75*(3), 420–434. https://doi.org/10.1086/322221

Stewart, M. B. (2007). The interrelated dynamics of unemployment and low-wage wmployment. *Journal of Applied Econometrics*, *22*, 511–531. https://doi.org/10.1002/jae.922

Stirling, K., & Aldrich, T. (2008). Child support: Who bears the burden? *Family Relations*, *57*, 376–389.

U.S. Bureau of Labor Statistics. (2021). *CPI Inflation Calculator*. United States Department of Labor. https://www.bls.gov/data/inflation_calculator.htm

U.S. Department of Labor. (2022). *Garnishment*. https://www.dol.gov/general/topic/wages/garnishments

Waller, M. R. (1997). *Redefining fatherhood: Paternal involvement, masculinity, and responsibility in the "other America"* (11th ed., Vol. 57).

Waller, M. R., & Plotnick, R. (2001). Effective child support policy for low-income families: Evidence from street level research. *Journal of Policy Analysis and Management*, *20*(1), 89–110.

Warton, M. E. (2020). Time After Time: Difference-in-Differences and Interrupted Time Series Models in SAS®. *Proceedings of the SAS Global Forum 2020*. https://www.sas.com/content/dam/SAS/support/en/sas-global-forum-proceedings/2020/4674-2020.pdf

Warton, M. E., Parker, M. M., & Karter, A. J. (2016). How D-I-D you do that? Basic Difference-in-Differences Models in SAS. *Proceedings of the SAS Global Forum 2016*. https://www.researchgate.net/publication/309231873_How_D-I-D_you_do_that_Basic_Difference-in-Differences_Models_in_SAS_R

Washington Courts. (2020). *Washington State Child Support Schedule*. The State of Washington. https://www.courts.wa.gov/forms/documents/WSCSS_Schedule_2020%2006.pdf

Washington State Department of Social and Health Services. (2018). *Media release: DSHS partnership adds another option for making child support payments*. https://www.dshs.wa.gov/sesa/office-communications/media-release/dshs-partnership-adds-another-option-making-child-support-payments

Washington State Department of Social and Health Services. (2019). *18-686A: Notice of Increased Annual Fee for Support Enforcement Services*. https://www.dshs.wa.gov/sites/default/files/ESA/dcs/documents/18-686A%20Notice%20of%20Increased%20Annual%20Fee.pdf

Washington State Department of Social and Health Services. (2022). *Supporting child support: The basics of child support for employers* (DSHS 22-1190 (Rev. 1/22)). https://www.dshs.wa.gov/sites/default/files/publications/documents/22-1190.pdf

Washington State Office of Financial Management. (2021). *Unemployment rates: Washington and U.S.* https://ofm.wa.gov/washington-data-research/statewide-data/washington-trends/economic-trends/unemployment-rates

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Teaching
Secondary teaching credential, multiple courses taught at the undergraduate and graduate level, curriculum development for undergraduate courses; subjects: poverty, inequality, human rights, laws and policies pertaining to social justice, intergroup dialogue, statistics

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Study design, power analysis, multiple imputation, regression, structural equation modeling, two-stage least squares, survival analysis, Bayesian methods, and more

Technical
Statistical packages such as SAS, R, Stata, SPSS, MPlus, and HLM; Programming languages like SQL, C

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RESEARCH INTERESTS & EXPERIENCE

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Root causes of poverty, especially disparities among people who identify as Black, American Indian, and People of Color; low-wage work and workers, such as earning minimum wage, paying child support, and accumulating debt; human rights, including relevant theory, international law and real-world, local exercise and consequences.

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Seattle Minimum Wage Study, School of Social Work, University of Washington, Data Manager and Research Analyst	07/2017-02/2019
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Experience

Poverty & Inequality, Sole Instructor — 2017-2018 (taught 3 times)
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Data Management for Demographers, Co-Instructor — 2008-2015 (taught 5+ times)
Geared towards graduate students earning certificates in Demography, an introduction to the best data management practices that support empirical scholarship and reproducibility.

Introduction to Statistics, Sole Instructor — 1987-1990 (taught 6 times)
Undergraduate course covering fundamental statistical concepts, building skills and knowledge

PUBLICATIONS & PRESENTATIONS

Peer-Reviewed Publications

Mozer, Lauren, Johnson, Donna B, Podrabsky, Mary, & **Rocha, Anita**. (2019). School Lunch Entrées Before and After Implementation of the Healthy, Hunger-Free Kids Act of 2010. Journal of the Academy of Nutrition and Dietetics, 119(3), 490-499.

Bradford, Victoria A, Quinn, Emilee L, Walkinshaw, Lina P, **Rocha, Anita**, Chan, Nadine L, Saelens, Brian E, & Johnson, Donna B. (2019). Fruit and vegetable access programs and consumption in low-earnings communities. Journal of Hunger & Environmental Nutrition, 14(6), 780-795.

Prince, Dana M, **Rocha, Anita**, & Nurius, Paula S. (2018). Multiple Disadvantage and Discrimination: Implications for Adolescent Health and Education. Social Work Research, 42(3), 169-179.

Walkinshaw, Lina Pinero, Quinn, Emilee L, **Rocha, Anita**, & Johnson, Donna B. (2018). An Evaluation of Washington State SNAP-Ed Farmers' Market Initiatives and SNAP Participant Behaviors. Journal of Nutrition Education and Behavior, 50(6), 536-546.

Johnson, Donna B, Podrabsky, Mary, **Rocha, Anita**, & Otten, Jennifer J. (2016). Effect of the Healthy Hunger-Free Kids Act on the Nutritional Quality of Meals Selected by Students and School Lunch Participation Rates. JAMA Pediatrics, 170(1), E153918.

Nurius, Paula S, Prince, Dana M, & **Rocha, Anita**. (2015). Cumulative Disadvantage and Youth Well-Being: A Multi-domain Examination with Life Course Implications. Child & Adolescent Social Work Journal, 32(6), 567-576.

Sabin, Janice A, Stuber, Jennifer, **Rocha, Anita**, & Greenwald, Anthony. (2015). Providers' Implicit and Explicit Stereotypes About Mental Illnesses and Clinical Competencies in Recovery. Social Work in Mental Health, 13(5), 495-513.

Stuber, Jennifer, **Rocha, Anita**, Christian, Ann, & Johnson, David. (2014). Predictors of Recovery-Oriented Competencies Among Mental Health Professionals in One Community Mental Health System. Community Mental Health Journal, 50(8), 909-914.

Stuber, Jennifer P, **Rocha, Anita**, Christian, Ann, & Link, Bruce G. (2014). Conceptions of Mental Illness: Attitudes of Mental Health Professionals and the General Public. Psychiatric Services (Washington, D.C.), 65(4), 490-497.

Fujita, Masako, Brindle, Eleanor, **Rocha, Anita**, Shell-Duncan, Bettina, Ndemwa, Philip, & O'Connor, Kathleen A. (2009). Assessment of the relative dose-response test based on serum retinol-binding protein instead of serum retinol in determining low hepatic vitamin A stores. The American Journal of Clinical Nutrition, 90(1), 217-224.

Brown, B.Greg, Zambon, Alberto, Poulin, Drew, **Rocha, Anita**, Maher, Vincent M.G, Davis, Joseph W, Albers, John J, Brunzell, John D. (1998). Use of Niacin, Statins, and Resins in Patients With Combined Hyperlipidemia. The American Journal of Cardiology, 81(4), 52B-59B.

Book

Becker, Samantha, Crandall, Michael D, Fisher, Karen E, Kinney, Bo, Landry, Carol, **Rocha, Anita**. (2010). Opportunity for all : How the American public benefits from internet access at U.S. libraries. Washington, D.C.: Institute of Museum and Library Services.

Presentations

Rocha, Anita. From International Legal Instruments to Local Outcomes: Closing the Gap on Universal Primary Education. American Sociological Association Conference 2016, August.

Rocha, Anita. Subsampling with a Survey Sampling Design? DOMAIN Idea is to get an Appropriate Variance Estimate, Western Users of SAS Software 2013 Conference, November.

Rocha, Anita. I've got the beef, so where's the lettuce? Finding information using Dictionary Tables, Pacific Northwest SAS User Group 2011 Conference Proceedings, September.

Rocha, Anita. I want it my waaaay … Setting the reference category in a CLASS statement, Pacific Northwest SAS User Group 2011 Conference Proceedings, September.

Rocha, Anita. Navigating between a SASHELP View and the Real World:
A Macro Application in Data Management**,** Pacific Northwest SAS User Group 2008 Conference Proceedings, September.

Rocha, Anita. Missing Data? A Look at Two Imputation Methods, Pacific Northwest SAS User Group 2007 Conference Proceedings, September.

Rocha, Anita. Adventures in RTF: ODS with a little PROC TEMPLATE, Western Users of SAS Software 2001 Proceedings, September.

Rocha, Anita and Hamilton, Paul. Creating Case Report Tabulations (CRTs) for an NDA Electronic Submission to the FDA, SUGI 25 Proceedings, April 2000.

ADDITIONAL PROFESSIONAL EXPERIENCE

King County Housing Authority, Data Manager	2019-present
Harborview Medical Center, Biostatistician	2003-2005
Microsoft contract through Excell Data, Inc., Business Systems Analyst	2002-2003
Cell Therapeutics, Inc., Senior Clinical Programmer/Analyst	2000-2002

PROFESSIONAL AND COMMUNITY SERVICE

Professional Staff Organization, President, Director 2008-2012
An organization representing and offering resources to over 6000 University of Washington's profession staff employees.

PROFESSIONAL AFFILIATIONS & LICENSE

Society for Social Work and Research, member April/2019-present
SSWR advances, disseminates, and translates research that addresses issues of social work practice and policy and promotes a diverse, just, and equitable society.

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