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The Effect of Subsidized Employment on Women's Labor: Evidence from Chile

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Abstract

This thesis delves into the behavioral response of Chilean female workers to BTM (women's labor subsidy) payment scheme, in terms of weekly hours worked. The limited research encompassing the impact of this subsidy, essentially a conditional cash transfer, leaves a critical knowledge gap. While existing studies on this topic evolve around program evaluation, this thesis uniquely investigates beneficiaries' response to their positioning on the BTM payment scheme. Employing a regression kink design (RKD), the kinks in the benefit function are exploited to study the behavioral response among program beneficiaries' labor supply. Using a publicly available dataset, this study reveals that the impact of the workers positioning around the kinks in the payment scheme and their weekly hours worked is minimal, lacking statistical significance.

Keywords: CCT, female labor supply, bono al trabajo de la mujer (BTM)

Table of Contents

1 Introduction **4**
2 BTM: Bono al Trabajo de la Mujer **7**
2.1 Background 7
2.2 Eligibility criteria and payment scheme 7
3 Literature Review **10**
4 Research Design **14**
5 Data and Descriptive Statistics **16**
5.1 Data source and sample 16
5.2 Descriptive statistics 17
6 RDK assumptions **19**
6.1 Density smoothness 19
6.2 Smoothness of pre-determined observables 22
6.3 Bandwidths choice 26
7 Results **26**
8 Sensitivity analysis **29**
6.1 Ineligibles 29
6.2 Sensitivity to observations near the kink 30
9 Conclusion **32**
References **34**

1 Introduction

Female labor force participation in Chile is of important concern for policymakers given that despite the creation of policies intended to promote and maintain women in the formal labor market, these rates are still low in comparison to other OECD countries.

According to the World Bank development indicators database, in 2021 female labor market participation in Chile was 41% of the total labor force. When comparing the same statistic 20 years earlier, in year 2001, only 34% of the total labor market was composed of female participants. This increase might be attributed to social, economic, and cultural factors. It could also be associated to the increase of women enrolment in tertiary education, Chile's steady economic growth, or the shift of attitudes and perceptions on women entering the workforce.

Regardless of Chilean females being one of the most educated group of women in Latin America, their participation in the labor market is lower than other Latin American countries like in neighboring countries Bolivia and Peru, or other countries close in proximity such as Uruguay (Serrano et al., 2019). It is surprising that one of the most affluent countries in Latin American presents one of the lowest rates of females in the workforce when compared to other less affluent nations in the region. Women labor force participation rates are especially low among the poorest of the Chilean population, where less than one-third of women sells their labor (Dellacasa, 2023). The disadvantaged and most vulnerable part of the Chilean population is the target of multiple public policies aimed at breaking the poverty cycle. An example of a governmental policy designed to improve market outcomes for women is Bono al Trabajo de la Mujer (BTM).

Bono al Trabajo de la Mujer (BTM), in English: women's labor subsidy, is fundamentally a CCT program created as a mechanism to fight the low employment rates present in the Chilean female labor market. This Chilean CCT differs from other CCTs as it is not conditioned at children's wellbeing, but was created to promote the insertion, and retention, of women in formal employment. In Chile, formal employment requirements are having a signed work contract with an employer, which must be registered in the Chilean internal revenue system, and to pay a portion of the income to ensure social security benefits. Rather than BTM just being a welfare policy, it is presented as a tool for social promotion as the program is intended to serve as an incentive for women to develop skills to remain (or become) employable in the labor market.

Given the requirements and conditions to receive the benefit revolve around the labor market, it is of interest of this paper to examine their relationship. While the natural question would be to analyze the intended outcome of the subsidy, this is not possible due to data limitations. However, the dataset studied in this research does contain information about the number of hours worked by subsidy recipients. Thus, this thesis investigates the correlation between being a subsidy recipient and the weekly number of hours worked. Particularly, the number of hours worked depending on where in the subsidy scheme recipients placed.

The BTM payment scheme is composed of three phases and two kinks. When exiting one phase and entering the next, the benefit level presents a change in slope, or a kink. The first kink is located in-between the end of the phase-in segment and the beginning of the plateau phase of the program, and the second kink is present in-between the end of the plateau phase and the beginning of the phase-out portion of the benefit. Given that the benefit scheme presents two kinks, these changes in slope can be used to assess the effect of being on each side of the kink, considering that women to the left and to the right of the kink are similar except for their

positioning on the payment scheme. By implementing a regression kink design (RKD) this thesis exploits these two kinks to evaluate the effect of being on the proximity of each side of the kink and the number of hours worked by the subsidy beneficiaries. As a result, differences in outcome would be attributable to the beneficiary's location on the BTM payment structure.

The results show that when being on the right side of the first kink (entering the plateau phase) BTM explains 1.4% of the variation in the number of hours worked when using a first order polynomial, while 3.5% when using a second-degree polynomial. Surrounding the second kink (entering the phase-out segment), the effect size was 1.8% with a polynomial order one and 0.0776% with a second order polynomial. Confidence intervals suggest that an effect size larger than 10.5% near the first kink and 2.4% near the second kink can be discarded. However, the estimates were not statically significant at any significance level.

While a little more than 10 years have passed since the creation of this employment subsidy, not a lot of literature, other than governmental entities, has studied the effects of the benefit on the insertion of Chilean women in the formal labor market. Furthermore, the effect of the number of hours worked and its relation to being a subsidy beneficiary has not been exploited. Thus, this thesis serves as an innovative piece to the limited BTM literature currently available.

2 BTM: Bono al Trabajo de la Mujer

2.1 Background

The BTM program started in Chile in year 2012 following Congress' enactment of Law No. 20.595. It consists of wage-bonuses for employees and employers. The subsidy in itself is a conditional cash transfer as its eligibility depends on, among other conditions, holding – and keeping- formal employment.

2.2 Eligibility criteria and payment scheme

To be eligible for the subsidy women must be between 25 and 59 years old, be formally employed on a non-governmental enterprise (paying health and retirement contributions), meet the wage requirements, and belong to the 40% most vulnerable segment of the population. If self-employed, up-to-date tax fillings are needed to apply. This subsidy is incompatible with other governmental subsidies, such as Ingreso Minimo Garantizado (in English: minimum income guaranteed) aimed at self-employed individuals.

The vulnerability index is constructed based on a registry of Chilean households. This entity splits Chilean households in 7 segments, where the lowest segment corresponds to the 40% most vulnerable households. Segments are constructed based upon household income, a necessity index (measuring number of people in the household, age, and disability factors), material goods (such as car ownership, real state), access to services (such as healthcare and education), and data from the National Socioeconomic Characterization Survey. According to their scores, Chilean households are ordered showing the most vulnerable part of the population at the bottom of the list.

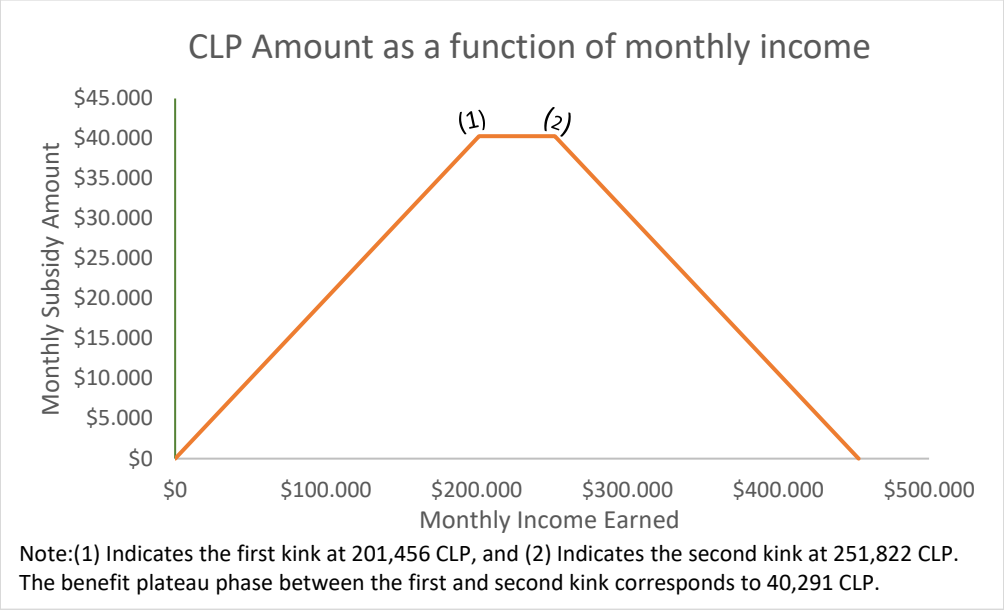
BTM programs has two components, one aimed at workers and the other aimed at employers. Employers and employees must apply individually for the subsidy through an online portal.

Unless the employee mentions to their employer that they are receiving the subsidy, the employer has no other mean of checking their eligibility given that their employee's position of the vulnerability scale, a component of eligibility, is private information. The data used in this thesis only provides information about the workers receiving the subsidy and not the employers; Therefore, this investigation only alludes to the worker component of the subsidy.

For the calendar year 2017, which is the year of interest for this thesis, the maximum monthly wage allowed to apply for the subsidy was 453,281 Chilean Pesos (CLP) per month (≈ 698 USD) (Currency conversions were made based on the average exchange rate for 2017: 1USD = 649 CPL).

Figure 1 shows the structure of the BTM as a function of monthly earnings. As in the figure, in 2017, upon earning monthly income greater than 0 but less than $201,456 CLP (≈ 310 USD) women receive 20 percent of their monthly income (phase-in region). After the first kink, women then enter the plateau phase, a region for those whose monthly income is no more than $201,456 CLP but less than $251,822 CLP (≈ 388 USD). Those in the plateau phase receive 20 percent of $201,456 CLP ($40,291 CLP (≈ 62 USD)), which is the maximum benefit amount granted in 2017. After the second kink, the payment scheme enters the phase-out region encompassing women whose monthly earnings fluctuate between $251,822 CLP and $453,281 CLP (≈ 698 USD). Women in the phase-out region receive 20 percent of $201,456 CLP (40,291 CLP) minus 20 percent of the difference between their monthly income and $251,822 CLP. Table 1 shows the payment scheme for workers depending on their monthly income and the benefit restrictions.

Figure 1: BTM payment scheme



Note:(1) Indicates the first kink at 201,456 CLP, and (2) Indicates the second kink at 251,822 CLP. The benefit plateau phase between the first and second kink corresponds to 40,291 CLP.

The payment of the subsidy to the worker, up to 20% of their salary, can be given monthly or annually. When applying, the website suggests selecting an annual payment scheme as women would not be subject to payback excess money given to them. When receiving monthly payments, the first payment is accrued four months after the application submission date. Annual payments are usually given out in the month of August, according to observed income from the previous year. In 2017, around half of the beneficiaries chose to receive the benefits monthly while the other half chose to receive it in a lumpsum. Sadly, there is no public information on the number of beneficiaries that chose to receive the payment annually and that then were subject to payback excess money given to them.

The benefit is paid out directly to the beneficiaries via bank transfer or a check, never through payroll. This benefit can be only granted once and has a duration of 4 consecutive years, 48 monthly payments.

Table 1: Payment scheme for workers

Subsidy amount for workers	**Restriction**
(1) 20% of Monthly Income (MI)	If MI $\leq$ 201,456
(2) 20% of $201,456	If 201,456.80 $\leq$ MI $\geq$ 251,822
(3) 20% of $201,456 - 20% (MI - $251,822)	If 251,822.33 $\leq$ MI $\geq$ 453,281

Note: (1) refers to the phase-in region, (2) to the plateau phase, and (3) to the phase-out region

3 Literature Review

There is vast literature that explores the impact of public spending in the form of support for wages, in terms of tax-credits, loans, or wage subsidies and its relation to labor market outcomes. While the main objective of the BTM policy is to increase employment rates for Chilean women, this thesis focuses on exploring the relationship between BTM and the weekly number of hours worked depending on where the beneficiaries fall in the subsidy payment scheme. Therefore, the literature review touches upon subsidies paid directly to individuals and their labor market outcomes, placing an emphasis on labor supply, when literature is available.

Sjögren & Vikström (2015) implement a difference-in-differences (DiD) model to assess how the Swedish "New Start Jobs" wage subsidy affects the re-employment rate for long term unemployment. The findings show that being eligible for the wage subsidy increases job-finding rates from 16 to 20 percent initially, then the effect declines but it is still persistent. At the same time, the authors report that the duration and the size of the subsidy also play an important role on the labor market outcomes reported. Overall, they conclude that extended subsidies allow workers to accumulate the skills needed to continue to motivate employment after the subsidy ends.

While policies regarding the establishment of a minimum wage are not considered wage subsidies, workers who benefit from the minimum wage policies effectively obtain a higher income than they did before the policy went into effect, such as the women who benefit from the

BTM effectively receive more money than they did before at all stages of the subsidy scheme. Connolly & Gregory (2003) use a difference-in-differences (DiD) model to investigate the implication of the National Minimum Wage policy in the UK on the number of hours worked of low-paid women. This minimum wage policy boosted the hourly pay of the low paid workers, and while possibly a potential disincentive from the income gains was a reduction in the working hours, no significant evidence was found that pointed out to a change in the hours worked as a result of to the new policy. Furthermore, the study found no significant changes in the hours worked by both part-time and full-time workers, pointing to no adverse effects from the policy. In the Latin American context, Alzúa et al. (2013) explores the causal effect of 3 CCT programs on labor market outcome, namely the number of hours worked in all occupations in a week, for adults in Nicaragua, Honduras and Mexico using a difference-in-differences (DiD) approach controlling for individual, and household characteristics. At the individual level, the number of hours worked as a result of the Honduran CCT program is an increase from 0.5 to 1.85 hours per week, however the results are not statistically significant. The results for Nicaraguan program are a statistically significant decrease on number of hours worked from -1.5 to about -5.7, reported to be higher for women (-3 to -5.6 hours per week), the results for the Mexican program presented no clear pattern at the individual level. At the household level, the results are similar to the pattern followed at the individual level showing an increase but non-significant effect on hours worked for Honduras's program. However, the Nicaraguan program presents a statistically significant pronounced decrease in weekly hours worked. It is reported that these results are driven by the large and strongly significant decrease in the number of hours worked by adults in female headed households. At the same time, the authors describe that these findings might be due to the size of the monetary transfer with respect to the individual's income, the Mexican and

the Nicaraguan CCT programs presented a relatively high benefit level, while the Honduran had low levels of monetary transfers. Overall, the authors conclude that the effect of these CCTs in the number of hours worked is small.

The Earned Income Tax Credit (EITC) is the biggest US federal cash transfer program intended to reduce poverty in low-income families with children by offsetting payroll tax. To obtain the benefit, applicants must meet certain requirements as well as being up to date on their tax filing and not owe any money in taxes. The EITC program benefits families by reducing the amount they are taxed, even some beneficiaries might be eligible for tax money to be paid back to them. Eissa & Hoynes (2005) study the labor supply response to the EITC program and hypothesize that the EITC eligible workers would unambiguously reduce the number of hours worked. The authors conclude that, for single taxpayers, there is little evidence consistent with their predictions; Meanwhile for married women, they observe a modest decrease between 1% to 4% on the annual number of hours worked. It is important to point out that the EITC program follows a similar payment schedule as BTM, both programs present two kinks. While the BTM kinks at the same income point for all, the EITC kinks at different income points depending on the number of children in the family. Jones (2013) uses a RKD method to investigate the EITC and the labor supply response of single mother's conditional on the number of children. The author reports that no effect was found at the first kink (when beneficiaries leave the phase-in phase to enter the plateau phase), and no effect was found for women with only one child. Although minimal, there is an effect on the second kink (leaving the plateau phase and entering phase-out) for single mothers with more than one child; When entering the phase-out portion of the payment scheme these women responded by reducing the number of hours worked by 0.5 of an hours per year.

Concerning the BTM, the only non-governmental research paper dedicated to the study of this subsidy is conducted by Larraín (2017), he studies the BTM and its impact on female labor market participation exploiting the change in the eligibility criteria across years. Using a difference-in-differences approach he reports an increase of 0.76 percentage points on female labor market participation for eligible women. However, these results are only statistically significant for the 20% most vulnerable part of the population. Furthermore, he reports that while the BTM has a positive effect on labor market participation, it negatively affects the average income of eligible women given that women who enter the labor market due to the subsidy do so to lower paying jobs than women that had already been employed when they received the subsidy. However, the study only focuses on labor market participation and does not touch upon the number of hours beneficiaries' work.

The Chilean National Service of Training and Employment (SENCE) last evaluation of the BTM was published in 2022 and reports that no non-governmental evaluation of the subsidy has been conducted (besides the abovementioned paper by Larraín, 2017) due to the difficult access to the data. SENCE (2022) studied the probability of gaining formal employment and monthly income received, both in the months after exiting the program. The results report that after the end of the subsidy, women who were benefited by it increase their chances of being formally employed by 4.6 percentage points compared to those who did not receive the subsidy. Additionally, it is reported that beneficiaries increase their income by 14% when compared to their income before the start of the benefit. These results are only applicable for women who started the benefit between 2012-2014 and received it for 48 consecutive periods (4 years of monthly benefits). Unfortunately, this report, or any other report published by this entity, does not touch upon the number of hours worked by subsidy beneficiaries.

While it seems that the BTM beneficiaries do present positive labor market outcomes in the sense of integrating themselves into the formal labor market. Little information is known about BTM and women's labor supply. Based on the literature presented in this section, it is hypothesized that being on either side of any of the kinks does not influence the number of hours worked by program beneficiaries.

4 Research Design

Given that the payment schedule for the subsidy relies on kinks, rather than jumps, the regression kink design (RKD) is an appropriate method for the analysis of the BTM.

The idea of this design is similar to a regression discontinuity design (RDD) but differs in that there is not a discontinuity in the level of the assignment rule, but in its slope. RKD exploits kinks in the relationship between the assignment variable (earned income) and a treatment variable (amount of BTM).

Taking Card et al. (2016) explanation of this method and applying it to the BTM program, it is observed that this strategy analyses the slope of the relationship between beneficiaries' number of weekly hours worked and their earned income at the exact location of the kinks in the BTM payment scheme. Given that program recipients on either side of the kink's threshold are alike in their pre-determined observables, any kink in the number of hours worked can be assigned to BTM's treatment effect. Therefore, if changes in the treatment variable (amount of BTM received) have a causal effect on given outcome (hours worked), a corresponding kink should be observed in the relationship between the outcome variable (hours worked) and the assignment variable (earned income), and this kinks should occur at the same points in the benefit level assignment scheme.

This method relies on a regressor that is a deterministic function of a "behaviorally endogenous variable" that cannot be replaced by a plausible instrument (Card et al., 2009). The subsidy amount is determined by a worker's earned income, and thus income and the subsidy amount are related behaviorally to hours worked.

The key assumption for the RDK according to Card et al. (2016) requires that the density of the assignment variable is smooth conditional on observable characteristics around the kink points of the assignment rule. This assumption implies that the conditional expectation function of any pre-determined characteristics is smooth around the kink points. Therefore, I provide evidence on the smoothness of pre-determined observables such as age, highest educational level attained, number of children, and age at the birth of their first child, around both kink points. At the same time, I provide evidence on whether the density of the assignment variable (earned income) is smooth around the kink points.

As explained by Card et al. (2015) the RKD relies on the change in the slope of the conditional expectation function of the outcome given the assignment variable at the kink. Econometrically, it can be expressed as follows,

$$Y_i = \alpha_0 + \sum_{p=1}^{p} \left[\alpha_p (v_i - k)^p + \beta_p (v_i - k)^p D_i\right] + \varepsilon_i$$

Where $|v - k| \leq h$, and h is the size of the bandwidth selected. In the equation, Y is the outcome variable; v is the assignment variable; k is the kink point; D is a dummy variable that takes value 1 to indicate one is on the right side of the kink and 0 otherwise; β_p captures the change in slope in the outcome at the kink point in the treatment variable. When implementing this empirical strategy, we assume $E[\varepsilon_i] = 0$ and $Var[\varepsilon_i] = \sigma^2$.

Note that because we only use data form women that receive the subsidy, the RKD estimates should be interpreted as a treatment effect on the treated and not as an intention to treat effect.

5 Data and Descriptive Statistics

5.1 Data source and sample

The data used for this thesis originates from Chile's CASEN survey — an abbreviation for Encuesta de Caracterización Socioeconómica Nacional, translating to the National Socioeconomic Characterization Survey in English, which is a national survey conducted by the Chilean Ministry of Social Development. In the year 2017, which is the year of interest for this research, the survey encompassed a sample of 69,816 households, providing 219,439 individual observations. The main objective of the CASEN survey is to carefully assess the attributes and characteristics of the Chilean population, with particular emphasis on the most vulnerable population living in conditions of vulnerability. Across its iterations, this national survey comprehensively examines a wide range of aspects that make the Chilean population unique, these questions touch upon demographic characteristics, health profiles, educational attainments, living circumstances, employment, and income.

The CASEN survey is carried out biennially, alternating between intervals of two and three years, since its inaugural implementation in 1987. Since its origins, CASEN has been executed anonymously in the participants' residences. It is important to mention that this survey is of notable significance given that the CASEN survey stands as the official tool employed to quantify the extent of the poverty prevailing in Chile.

Conditional on the relevance and importance of the CASEN survey in Chile, the data is readily available online via the Ministry of Social Development's website. While numerous years of the

survey are available to the public, the dataset of interest for this study is the one corresponding to the 2017 iteration of the CASEN survey. It is noteworthy to mention that while the BTM subsidy initiated in 2012, the 2013 survey neglected to incorporate questions regarding the benefit, and while the 2015 survey did inquire about the subsidy, the publicly dataset regrettably did not encode the responses. Therefore, the 2017 CASEN dataset emerges as the first publicly available survey year granting access to information about the BTM subsidy.

The dependent variable of interest is the number of weekly hours worked per week. In the CASEN survey, respondents are asked about how many hours a week they usually work at their job or occupation. Also vital for this analysis are questions related to earned income, BTM recipient status, amount received, and other questions regarding women's demographics.

The dataset is cleaned in the following manner: to start, all males were dropped form the survey data, and I further limit the analysis to women that receive the subsidy, leaving around 929 observations.

5.2 Descriptive Statistics

Table 2 provides statistics regarding the BTM beneficiaries across selected years. Colum (1) shows the take-up rate corresponding to the percentage of women who receive the subsidy over the eligible population (women that meet all the requirements). Colum (2) reports the actual number of women who are benefited each year from the subsidy (source). While the actual number of beneficiaries increased from 2016 to 2017 by approximately 45,700 women, the take-up rate decreased. Whilst this decrease could plausibly be explained by an increase in the number of women who meet the criteria for being BTM subsidy recipient, there is no governmental information that explains or analyses the changes in this rate.

Table 2: BTM Statistics across selected years

Year	Take-up rate[1] (1)	Number of beneficiaries[2] (2)
2016	81.49%	337,589
2017	69.81%	383,298

[1] (Actual beneficiaries at year t / criteria meeting population)*100

[2]A beneficiary is considered as someone who received at least one payment during the stated year

Table 3 report descriptive statistics of the data relevant to the RKD for the first and the second kink. The statistics presented in these tables correspond to women that fall within one bandwidth to the left and to the right of each kink point. The bandwidth of choice for these descriptive statistics for both kinks is $47,000 CLP (≈ 72 USD), this bandwidth ensures that enough observations around the kink points are considered for observation while not overlapping with the other kink point. More on bandwidth chosen for analysis is presented in the following section.

Table 3: Summary statistics at first and second kink

	First Kink		Second Kink	
Variable	Mean	SD	Mean	SD
Age	41.507	9.857	41.132	9.166
Monthly Income (CLP)	$210,850	$24,130	$267,651	$22,231
Weekly worked hours	35.665	11.991	43.22	7.633
Number of people in the house	3.674	1.550	3.798	1.488
Number of children	2.233	1.103	2.267	1.12
Age at first childbirth	20.946	4.37	21.46	4.802
Attained primary education	.285	.452	.216	.412
Attained secondary education	.566	.497	.644	.479
Attained higher education	.145	.353	.136	.344

Around the first kink, women are on average 41 years old, with a monthly income of $210,850 CLP (≈ 324 USD). The average number of hours worked is reported to be 36 hours per week. These women on average live in a household composed of 3.67 people (including themselves), have 2.23 children and gave birth at around the age of 21 years old. From this subsample, 28.5% of women reported to have primary education as their highest educational level attained; 56.5% reported to have completed secondary education (high school) and that being their highest educational level attained; 14.5% reported their highest educational level is any post-secondary education (technical college, bachelor's or any other higher educational degree).

Around the second kink, women are 41 years old on average, report an average monthly income of $267,651 CLP (≈ 412 USD). In this subsample, women report to work 43 hours per week, and report the number of people living in their household (including themselves) to be 3.8, on average. Women around the second kink give birth to their first child at around 21 years old and have on average 2.23 children. From this subsample, 21.6% of women reported to have primary education as their highest educational level attained; 64.4% reported to have completed secondary education (high school) and that being their highest educational level attained; 13.6% reported their highest educational level is any post-secondary education (technical college, bachelor's, or any other higher educational degree).

6 RKD Assumptions

6.1 Density smoothness

Best practices for RDD, and RKD as well, summarized by Lee and Lemieux (2010) require the examination of the density of the assignment variable to ensure that assignment to one side of the

kink or the other is as good as random. Figure 2 and 3 show histograms of income earned at the two kink points.

From visual inspection of figure 2, the density function around the first kink seems to present bunching before and after the change in slope, marked as vertical line.

Figure 2: Density smoothness test – first kink

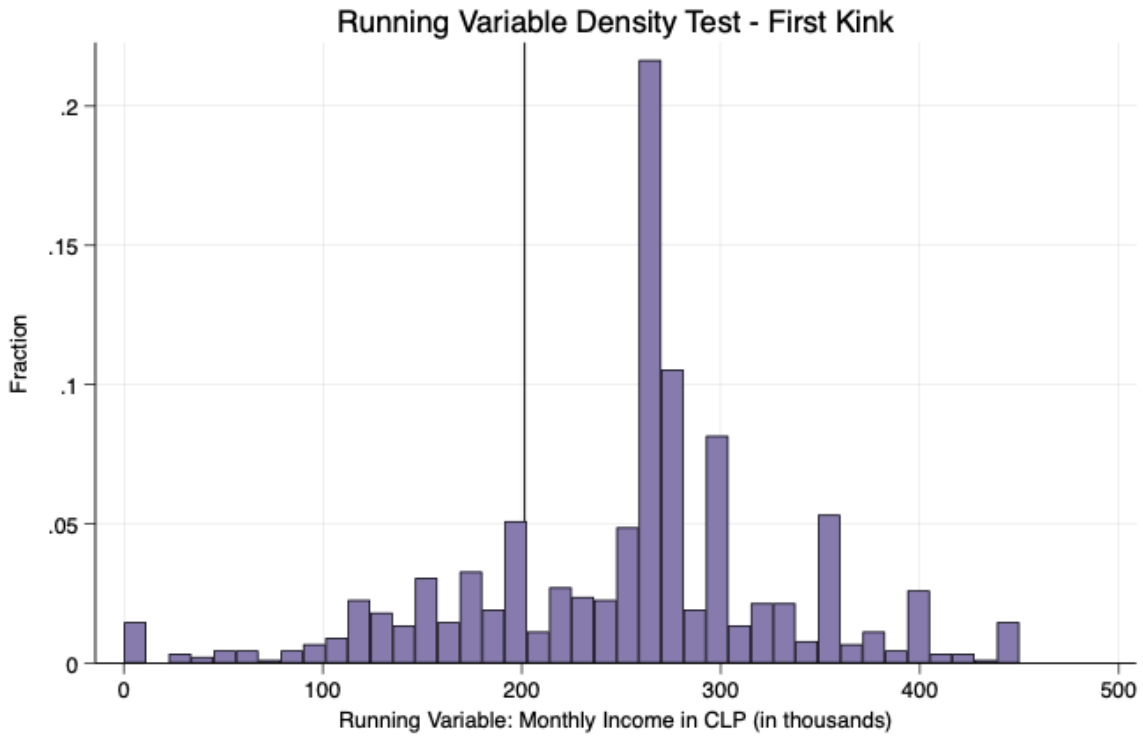
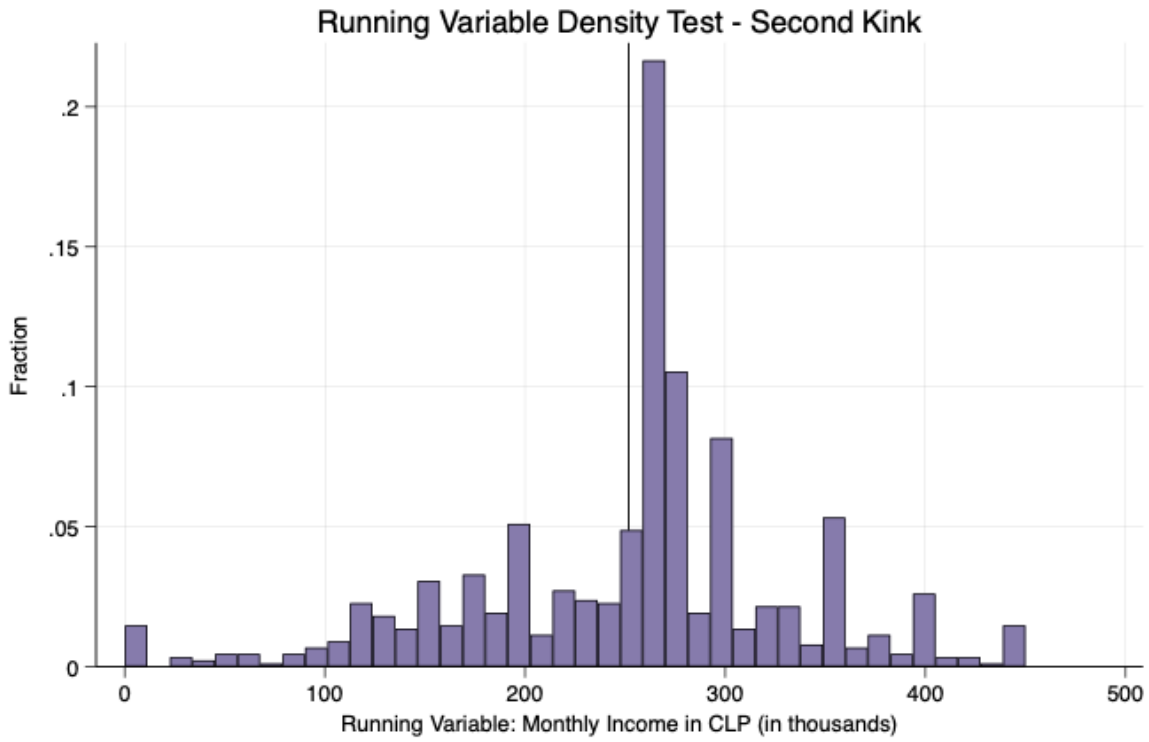


Figure 3 presents the density function around the second kink. An increase of frequency before the kink is observed along with a pronounced decrease in frequency after the kink. Attention is drawn to the drastic frequency increase at $267,000 CLP (≈ 411 USD). This dramatic increase can be explained as $267,000 CLP was the minimum monthly wage in Chile for the year 2017. Women earning less than the legal minimum can be explained as being hourly or part time workers.

Figure 3: Density smoothness test – second kink



The bunching around the kink points might point out to self-selection into the treatment. However, these points occur either before or after the kinks which indicates that women are not particularly self-selecting into the highest paying portion of the subsidy scheme. Furthermore, it is almost impossible to know the exact benefit structure of the subsidy given that the scheme gets adjusted previous to the start of every calendar year. The adjustments to the payment scheme and kink points are adjusted using the Consumer Price Index to adjust for inflation. Moreover, bunching might be attributable to rounding and reporting bias given that all the values reported on the CASEN survey are self-reported by the interviewees. Additionally, payments made in year *t* are based on the perceived income of year *t-1*. Regardless of women participation in the program in previous years, as long as they cannot precisely place themselves in their preferred

position of the benefit function, namely the highest paying phase, their behavior, according to Lee and Lemieux (2010), does not invalidate the validity assumption for RKD.

A visual inspection of the running variable indicates that at both kinks bunching is observed. However, none of these agglomerations lead one to think that women are self-selecting into the highest paying phase of the program. Nonetheless, the smoothness test possibly indicates that the assignment variable does not meet the continuity requirements of the RKD.

6.2 Smoothness of pre-determined observables

For the RDK to be valid, covariates should not display kinks that corresponds to the kinks in the BTM benefit function. This can be tested visually as well as parametrically. Visually by looking at the distribution of covariates around the kink points, and parametrically by regressing the pre-determined observables against a dummy variable that takes value 1 if one is on the right side of the kink, and value 0 otherwise. Figure 4 show visually represent the smoothness of pre-determined observables for the first kink, while figure 5 show smoothness for those observations around the second kink. These figures present the variables age, highest educational level attained, number of people in their households, number of children, and age at the birth of their first child around each kink point. The confidence intervals showed in the graph correspond to the 90%. After visual inspection of the pre-determined observables at both kinks, covariates appear to be smooth indicating that the women before and after the kink are similar in characteristics, meeting the smoothness of pre-determined characteristics requirements for RKD.

Figure 4: Pre-determined observables at the first kink

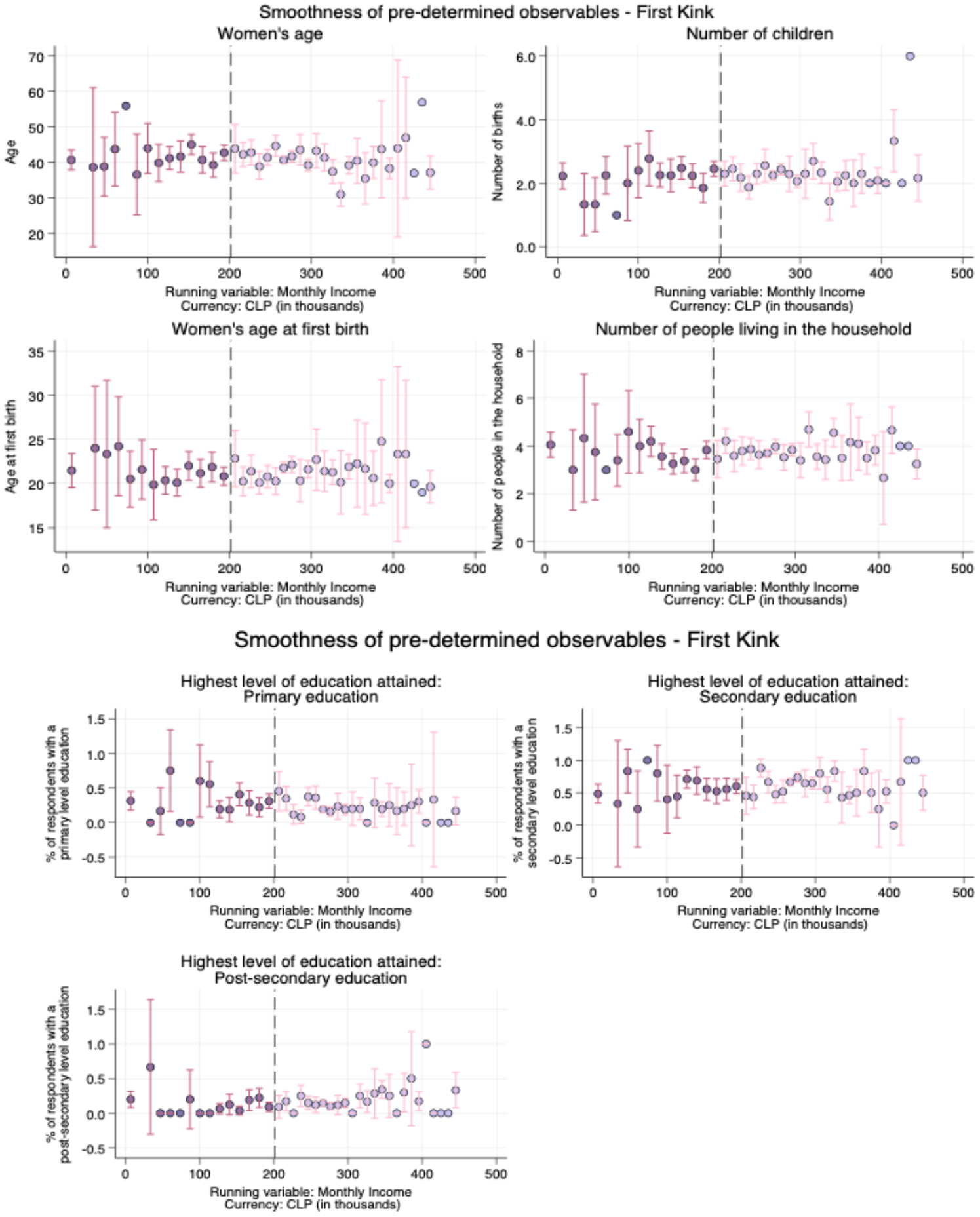
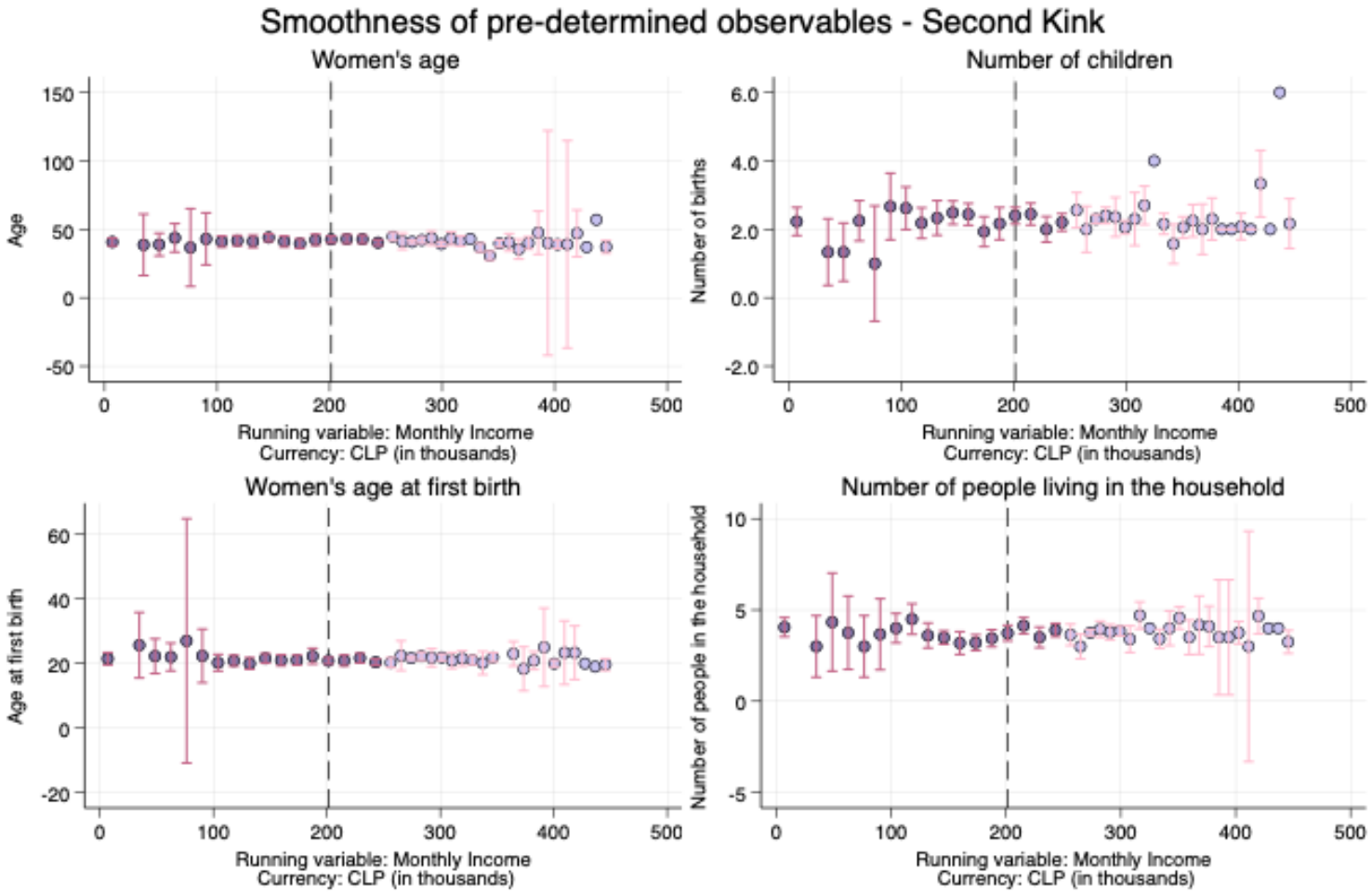
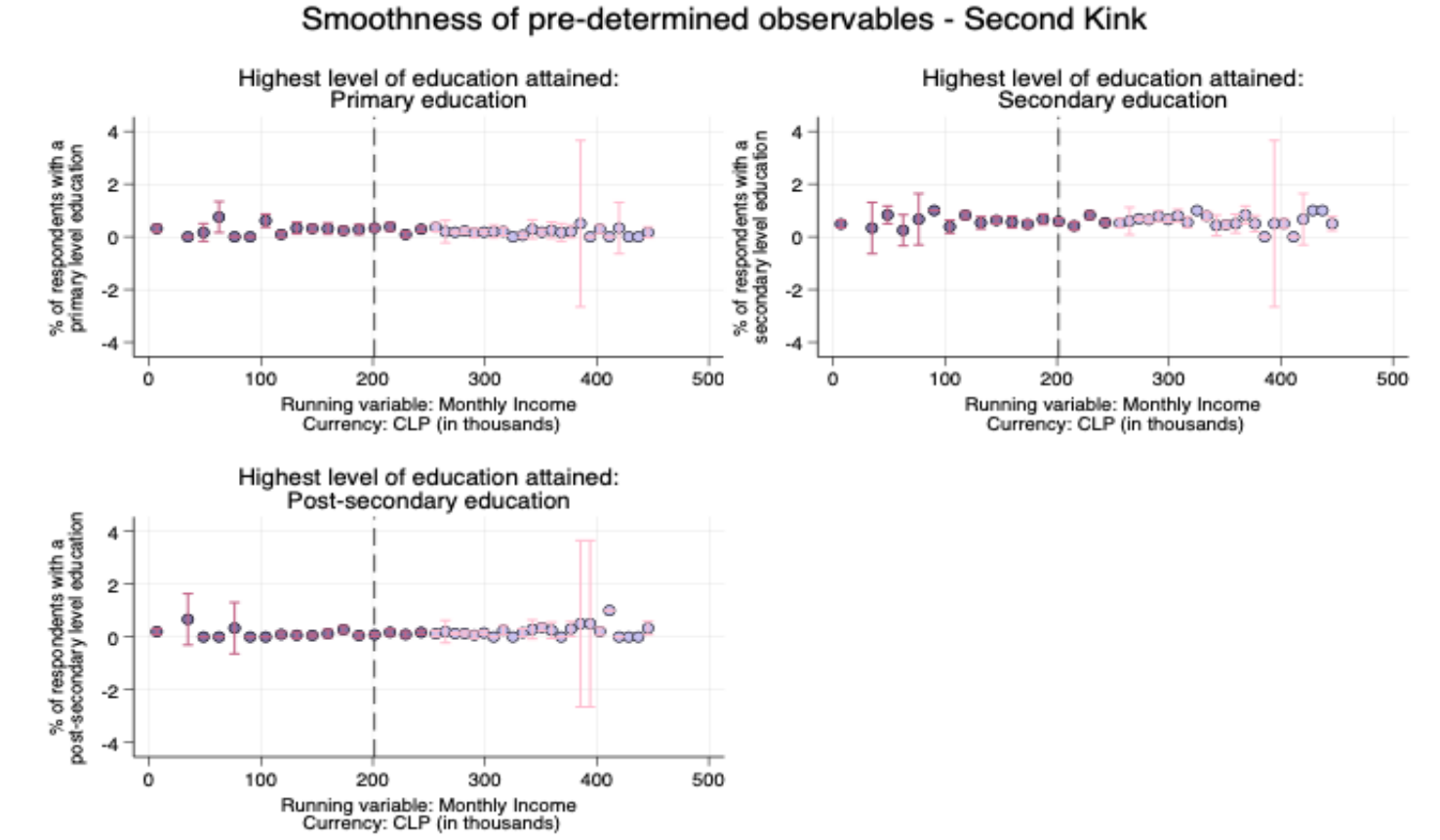


Figure 5: Pre-determined observables at the second kink





Furthermore, the smoothness of these variables can be tested parametrically. Table 4 show the regression results for the first kink, while table 5 does so for the second kink. Each pre-determined observable is regressed against a dummy that indicates if the observations are in the right or left side of each of the kinks. None of the observables, with the exception of having attained primary education as the highest educational level around the second kink, are statistically significant meaning these characteristics are not different for women on each side of each kink.

Table 4: Regression between first- kink dummy and pre-determined observables

Variable	Coefficient	Std. err.	*p*-value	90% Coef. Interval
Age	.0025	.0013	0.057	[.001, .005]
Number of children	.0025	.0107	0.819	[-.015, .020]
Age at first childbirth	-.0015	.0026	0.574	[-.006, .003]
# of people in house	-.0071	.0077	0.355	[-.020, .006]
Primary Edu	.0905	.0296	0.002	[.042, .139]
Secondary Edu	-.0219	.0253	0.386	[-.063, .020]
Post-secondary Edu	-.0744	.0328	0.024	[-.128, -.020]

Table 5: Regression between second-kink dummy and pre-determined observables

Variable	Coefficient	Std. err.	*p*-value	90% Coef. Interval
Age	.0036	.0015	0.017	[.001, .006]
Number of children	.0012	.0121	0.922	[-.019, .021]
Age at first childbirth	-.0040	.00030	0.183	[-.009, .001]
# of people in house	-.0051	.0087	0.555	[-.020, .009]
Primary Edu	.1238	.0334	0.000	[.069, .179]
Secondary Edu	-.038	.0253	0.179	[-.085, .009]
Post-secondary Edu	-.091	.0370	0.014	[-.152, -.030]

6.3 Bandwidths choice

This thesis exploits two kinks. The first kink, where earners leave the area of increasing benefit and enter the plateau phase; and the second kink, where earners leave the plateau phase and enter the area of decreasing benefit. To select the appropriate bandwidths rdbwselect, part of the regression discontinuity package created by Calonico et al. (2014) was consulted. The MSE-optimal bandwidth was selected using the default options: first order (linear) polynomial specification, a triangular kernel, and the same bandwidth on each side of the cutoff. Specifying the aforementioned characteristics, it suggested to use a bandwidth of $40,867 CLP (≈ 63 USD) or the first kink, and a bandwidth of $38,860 CLP (≈ 60 USD) for the second kink. When asked for the optimal bandwidth for the kinks considering a second order polynomial, the results suggested a bandwidth of $59,730 CLP (≈ 92 USD) for the first kink, and a bandwidth of $60,570 CLP (≈ 93 USD) for the second kink. However, these bandwidth choices suggestions for each kink, considering a second order polynomial, were constrained by the rules of the benefit function, since the suggested bandwidth would include observations too close (or at) the non-relevant kink, which would induce bias. To avoid this bias, the bandwidth used for the first and second kink when specificizing a second order polynomial was $47,000 CLP (≈ 72 USD).

7 Results

Table 6 presents the regression results of estimating the change in hours worked at the first kink and second kink. One can see that none of the regressions have statistical significance meaning that coefficients for both regressions are not statistically significant different from zero. However, they present different signs. At the first kink, the coefficient has a negative sign which indicates that weekly hours decrease when one is on the right side of the first kink (entering the

plateau phase). For the second kink, the coefficient is positive meaning that being on the right side of the second kink (entering phase-out region) increases the hours worked per week. Different bandwidths and polynomial orders are attempted to search for a better fit on the model. Initially, the regression was run on a polynomial order of 1 following Pei et al. (2020) advice on selection of local polynomial order for regression discontinuity. The paper suggests using the asymptotic mean squared error of the local regression RD estimator as the criterion to guide polynomial order selection. Using rdmse by Pei et al. (2020) the lowest mean squared error term was obtained by selecting a polynomial order of one for both kinks. Furthermore, Gelman and Imbens (2014) recommend staying away from high-order polynomials in regression discontinuity and sticking to linear or quadratic polynomials. Therefore, only a polynomial order of 2 was attempted when searching for a better fit. Whilst the change in polynomial order does not provide significant results, the coefficient signs follow the same pattern as the previous estimations, negative for the first kink and positive for the second kink.

The effect size of the kinks in the payment schedule on weekly hours worked is the following: For the immediate vicinity of the first kink, when specifying a polynomial order one, BTM explains 1.4% of the variation in hours worked, relative to standard deviation of this variable. The effect size increases to 3.5% when using a second polynomial order in the regression. Meanwhile, the effect size in the vicinity of the second kink when using a polynomial order one is 1.8% of the variation in the weekly hours worked thar be explained by the BTM kink in the payment schedule relative to the standard deviation of the variable weekly hours worked. A similar pattern is appreciated when specifying a degree two polynomial presenting an effect size of 7.8% of the variation in the weekly number of hours worked relative to the standard deviation of said variable.

Overall, when referring to the confidence intervals, we can rule out an effect size larger than 10.5% of the standard deviation on the weekly numbers of hours worked around the first kink of the payment scheme. For observations around the second kink, we can rule out an effect size larger than 2.4% of the standard deviation of the variable.

These findings for the first and the second kink in the BTM benefit schedule are trivial and statistically insignificant, meaning that being on either side of either of the kinks in the payment scheme do not significantly influence the beneficiary's behavior around the number of hours worked per week, as previously hypothesized. These findings align with EITC studies by Eissa & Hoynes (2005) and Jones (2013) which find no to little effect on the number of hours worked conditional on the benefit amount. Additionally, the findings presented in this sections follow Connolly & Gregory (2003) findings on boosting hourly pay and the no subsequent change in hourly work. However, it is interesting to notice that while Jones (2013) finds a minimal effect of a decrease on the hours worked by 0.5 of an hour per year at the second kink, the results presented in this study suggest that in the second kink for BTM women would insignificantly increase their weekly hours worked.

Table 6: Regression kink design estimates of change in hours worked at both kinks

	First Kink		Second Kink	
	Poly order One	Poly order Two	Poly order One	Poly order Two
Bandwidth	$40,867	$47,000	$38,860	$47,000
RD Estimator	-.16178	-.41333	.13368	.59267
p-value	0.381	0.336	0.447	0.353
Conf. Int.	[-.524,.201]	[-1.255,.428]	[-.211,.478]	[-.659,1.844]
Obs.	929	929	929	929

8 Sensitivity analysis

While results were not robust at any of the kinks, regardless of the polynomial order selected and the bandwidth, a sensitivity analysis was still conducted.

8.1 Ineligibles

Following the work of Jones (2013) I perform a test on ineligible population. This test hypothesizes that a population similar to the one being considered for this study, should not present a change in behavior at the kink point when they are not eligible for the benefit. In other words, individuals that do not receive the subsidy, but are similar in age and monthly income to those women who do receive the benefit, are tested for statistically significance. The group tested for this ineligible sensitivity analysis are women aged 24 to 60 years old, and their monthly earnings are under, or at, the subsidy qualification threshold. These results are reported in table 7. The RKD results, presented in column 4, show that for these group of women the effect on the numbers of hours worked weekly depending on being on each side of either kink is not statistically significant different than zero. The estimates also follow the same pattern as the original results, a negative coefficient for the first kink and a second coefficient for the second kink.

Table 7: Sensitivity analysis: Ineligibles

Kink	Bandwidth	Polynomial Order	RD Estimator	*p*- value	Conf. Int.	Number of Observations
(1)	(2)	(3)	(4)	(5)	(6)	(7)
First	$25,493	First	-.2725	0.049	[-.543,-.002]	24,542
First	$47,000	Second	-.21863	0.331	[-.660,.222]	24,542
Second	$27,024	First	.00251	0.968	[-.119,.124]	24,542
Second	$47,000	Second	.01674	0.888	[-.217,.251]	24,542

8.2 Sensitivity to observations near the kink

Cattaneo et al. (2019) propose that when bunching occurs on the running variable, it is natural to assume that the individuals closest to the kink are the ones most likely to have engaged in self-selection. Therefore, they suggest the "donut hole" approach to exclude those who might have engaged in manipulation. This approach consists of excluding units too close to the kink point and repeat the estimation and analysis using the remaining sample.

Table 8 and table 9 illustrates the results of the analysis excluding different number of observations each time for the first and second kink, respectively. Figure 6 and figure 7 depict the results graphically. It is seen that the RKD estimates for the first kink change signs as the donut-hole radius excludes more observations around the kink. The confidence interval also grows bigger as more observations are dropped from the analysis. Regarding the second kink, the exclusion of observations around the kink seems to barely affect the RKD coefficients, as well as the confidence intervals that remain mostly unchanged. In all cases considered, the conclusions remain unchanged pointing that the effect of being on each side of both kinks is not statistically significantly different than zero. At the same time, it is also argued that the coefficients, and the confidence intervals, are small enough when compared to the mean of the variable, rendering the relationship between the positioning in relationship with the kink and the number of hours worked to be unimportant. Nonetheless, by excluding observations too close to the second kink, the regression estimates are positive when the original estimates presented negative coefficients.

Table 8: Sensitivity analysis – Donut hole: first kink

Donut-Hole Radius (1)	Bandwidth (2)	RD Estimator (3)	*p*- value (4)	Conf. Int. (5)	Number of Observations (6)	Excluded Obs. Left (7)	Excluded Obs. Right (7)
$0	$40,867	-.16178	0.381	[-.524,.201]	929	0	0
$2,043	$40,867	.05274	0.874	[-.599,.704]	885	41	2
$5,600	$40,867	.13998	0.684	[-.535,.815]	883	41	4

Table 9: Sensitivity analysis – Donut hole: second kink

Donut-Hole Radius (1)	Bandwidth (2)	RD Estimator (3)	*p*- value (4)	Conf. Int. (5)	Number of Observations (6)	Excluded Obs. Left (7)	Excluded Obs. Right (7)
$0	$38,860	.13368	0.447	[-.211,.478]	929	0	0
$1,943	$38,860	.12768	0.483	[-.229,.484]	891	38	0
$5,500	$38,860	.10555	0.493	[-.196,.407]	886	39	4

Figure 6: Sensitivity analysis – Donut hole: first kink

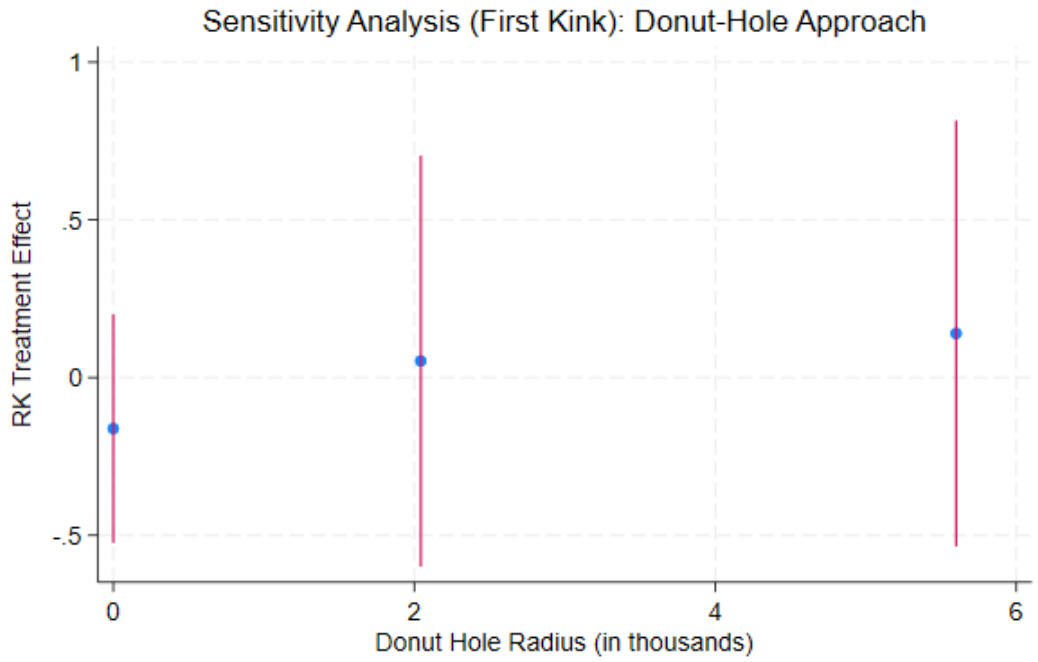
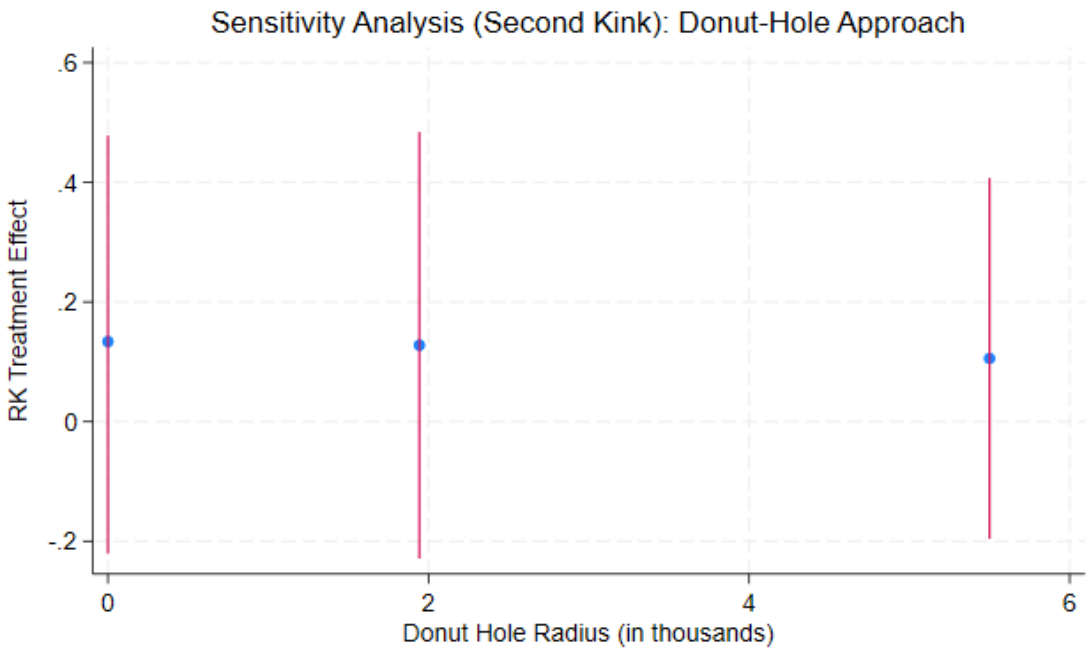


Figure 7: Sensitivity analysis – Donut hole: second kink



9 Conclusion

The analysis presented in this thesis investigated the change in hours worked as a response of the positioning in the benefit function of the BTM subsidy using a regression kink design. The preferred specification suggested that women just beyond the first kink in the benefit function (where the benefits changes from the phase-in region to the plateau phase) responded by increasing their weekly work hours. Regarding the second kink, women responded by decreasing their weekly work hours. However, none of these findings were significantly different from zero meaning women's position in relation to the benefit kink present no statistical significance on the number of hours worked. The findings, while they are not strong enough to indicate causality, align with the literature pointing that the subsidy amount does not change the beneficiary's behavior in the number of hours worked.

This analysis contributes to the limited literature that exists on this specific subsidy by showing that, while not statistically significant, the effect size on the hours worked around the kink points is deemed very small.

Information from CASEN 2017 reports childcare and household constrains as limiting factors for women's participation in the labor market. Moreover, arguments alluding to low earners not having a say on the number of hours they work and relying on stablished labor market expectations, such as the stablished number of hours for part-time and full-time workers, might hold true for the women surveyed. An opportunity to tackle childcare constrains and therefore increase the number of hours worked by them might be to provide desirable childcare subsidies. Guner et al. (2014) work suggests that fully subsidized childcare available to families leads to an increase in the labor market participation and in the total amount of hours worked, in the long run. Particularly, these subsidies impact is substantial for females considered low-skilled. Therefore, a policy as such should be of interest as it potentially could increase the number of hours worked by women with children in the most vulnerable segments of the population.

The results to this study must be interpreted with caution given several important limitations. First, the data used for this study might be subject to reporting and rounding bias presented that the data is self-reported. Second, the density of the running variable is not smooth and presents bunching, before or after, the points of interest for this study, making this the most important caveat. As stated by SENCE, little to no studies have approached this subsidy given that the data to thoroughly assess this subsidy is not publicly available and at most times hard to request. Further research using a RKD approach on better data might reveal more insights about the subsidy. At the same time, another method for statistical analysis such as bunching or propensity score matching might serve as a more appropriate fit given the data characteristics.

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