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Evaluating the effect of Estonian unemployment benefits on the duration of unemployment using the Regression Kink Design

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Tartu 2024

I have written this master's thesis independently. All viewpoints of other authors, literary sources, and data from elsewhere used for writing this paper have been referenced. Code provided at https://github.com/GreysonCulbert/RKD_Thesis_Estonia.git

Abstract

The relationship between the size of unemployment benefits and unemployment duration is analyzed in Estonia for the years 2017 to 2022. Previous research done in Estonia doesn't adequately factor in worker heterogeneity, biasing their results. Using the regression kink design method, which only compares similar workers around a kink in the equation for unemployment benefits, an endogeneity free estimation may be found. Four kinks are calculated, a ceiling and floor kink in benefits, for two periods before and after a reform in 2020. Except for the floor kink in 2021, it is found that there is no significant change in unemployment duration at the location of kinks in the schedule of unemployment benefits, showing that at these local estimations, moral hazard from benefits are minimal.

Keywords: unemployment benefits, unemployment duration, moral hazard, Estonia

JEL Classification: J65, J68

CERCS Classification: S180, S215

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Introduction

The optimal generosity of unemployment insurance programs is an uncertainty. It is good to equalize living standards of people across time, and more generous unemployment insurance programs allows people to find more suitable jobs, but these societal benefits are restricted by the moral hazard effects which can increase the duration of unemployment. For this reason, an attempt to establish the level of moral hazard effects can help to decide what the best unemployment insurance program is. The results of papers regarding other countries are not necessarily relevant, because as Tatsiramos (2009) show, the relative generosity of countries' unemployment benefits programs influences the size of moral hazard which arises from changes to the programs. Few papers have attempted to find the relationship between unemployment benefits and unemployment duration specifically for Estonia. Lauringson (2011), the most notable study, estimates hazard models divided by benefit sizes, and finds that larger benefits prolong unemployment duration. The problem with these results is that worker heterogeneity present in wage differences, which determines the size of benefits, may also impact the length of unemployment. To find unbiased results, this type of endogeneity should not be included.

The objective of this paper is to estimate an endogenous-free estimate of the impact unemployment benefits have on unemployment duration. Endogeneity-free methods usually require instrumental variables, however in the context of unemployment benefits, it is probably not possible to find a variable that does not have some form of a relationship with the past income of the worker, meaning that the independence condition required for instrumental variables is not met. Instead, we may use the regression kink design.

The data comes from the Eesti Töötukassa, containing information about every worker who was enrolled in the unemployment insurance (UI) program from the years 2017 to 2022. As there was a reform in the calculation of benefits in 2020, the data is divided into prereform and postreform data, which is further divided into bottom kink and top kink data samples. These kinks come from the benefit schedule for the Estonian UI program, which has floor and ceiling limits for daily payments. The daily benefits an unemployed worker receives is generally set as a replacement rate of their past wages, but they are guaranteed to receive at least 50% of the past year's minimum wage, and can not receive more than 60% of three times the mean wage of the past year. This means that on either side of the kink, similar workers will have slightly different replacement rates in their benefits. By using the kink in the rule for unemployment benefits, we can see if there is also a kink in unemployment duration.

The regression kink design method has certain conditions regarding smoothness of variables around the kink. If the distribution of wages people earned is not smooth, then this could mean that people were knowingly manipulating their past wage to get on a favorable side of the kink, which would make the results invalid. Covariates, such as age and gender, should also be smooth around the kink, otherwise the worker characteristics would not be constant, introducing endogeneity. These conditions are first tested for. Then, the slope changes at the kink are estimated. While robust results were found for unemployment benefits around the kink, which is a necessary condition, none were found for unemployment duration. Outside of the year 2021, we conclude that there are no significant elasticities of unemployment duration from UI benefits at local estimates where the kinks take place at. For workers around the floor kink in 2021, a statistically significant elasticity is recorded, which is interpreted as being caused by the later recession in 2022. Without the influence of recessions, it doesn't appear that Estonian workers at the kinks are being incentivized to remain unemployed longer due to more generous benefits. As Tatsiramos (2009) demonstrates, this could be due to the Estonian UI program being relatively strict and ungenerous, which would hamper any effect an increase in unemployment benefits may have. At the kinks, there is no significant moral hazard, and an increase in the floor and ceiling payments would help to smooth the income of temporarily unemployed workers without impacting unemployment duration.

The rest of the paper is structured as follows: a literature review explains the search theory unemployment duration analysis is based off of, the relative generosity of Estonian UI payments, and various estimation methods that deal with endogeneity. Next, the structure of Estonian UI payments are explained. The regression kink design method is then given. The data is presented along with how new variables are created. The results are then reported along with various robustness tests, with a conclusion giving policy analysis.

Literature Review

Search Theory

Some of the seminal studies regarding the relationship between UI policies and the duration of unemployment are from Mortensen (1977) and Moffitt (1985). To explain the results from Ehrenberg and Oaxaca (1976) that unemployment duration was positively affected by benefit size, Mortensen utilized the search theory, which outlines the incentives unemployed workers face when searching for a job. The search model developed by Mortensen has the rate at which workers exit unemployment depend on how hard the worker decides to search for jobs. Only job offers above a certain reservation wage are accepted, which declines over the course of unemployment. Searching is understood to come at the cost of leisure and potential earned wages, which is minimized by unemployment benefits, helping workers find more suitable jobs. However, moral hazard and distortionary market effects are introduced by workers delaying reentry into employment so as to continue receiving UI benefits, resulting in concern over efficient UI policies.

Moffitt was among the first to use the Kaplan-meier hazard model to test this relationship. Contrary to many other studies at the time including Ehrenberg and Oaxaca (1976), he found a significant impact of UI duration on unemployment duration. Another phenomenon observed was that spikes in the hazard rate are seen right before UI exhaustion. This was explained before by Mortensen (1977) showing that this common observation is due to the worker's reservation wage falling until the benefit period is expired. The literature generally interprets this as workers choosing to be picky for jobs so as to retain as much UI benefits as possible, which would be a source of moral hazard contributing to distortionary markets effects from UI. However, Card, Chetty, and Weber (2007) add an important caveat to this. This spike in the hazard rate is from people leaving unemployment, which is not necessarily the same as people reentering employment. Using Austrian reemployment data, the authors detect a barely noticeable spike at the end of UI benefits. They interpret this finding as showing that the distortionary effects from UI are consistently exaggerated by looking at unemployment hazard rates, as many unemployed workers seamlessly transition out of the labor force after their UI benefits are used up.

Estonia and UI Generosity

Most of the literature only focuses on the disincentives and moral hazards UI benefits cause, without giving due consideration to the beneficial aspects. Post-unemployment job stability is a theoretically plausible result from more generous UI systems, as workers would be able to put more effort in searching more thoroughly, seen in Mortensen (1977). Tatsiramos (2009) uses a hazard model to investigate how the endogeneity of benefits affects later employment stability. The paper finds that European countries that already have generous UI systems in place, such as Spain and Germany, see a large increase in unemployment duration following UI increases, but also increased post-unemployment job stability. Countries with relatively restrictive UI policies, such as Ireland and Italy, see instead a much smaller disincentive effect from UI increases, but also less post-unemployment job stability. These countries would potentially benefit from increased generosity of UI, as there would be increased job stability and matching of skills, with minimal moral hazard. This study is qualified by Schmieder et al. (2016), which finds that each additional month in unemployment decreases future wages by 0.8%, however Lalive (2007) did not find that UI extensions affected later wages. Estonia was not part of Tatsiramos (2009)'s study, but the finding that the relative generosity of UI systems affects the relationship between UI benefits and unemployment duration is still relevant.

Studies that have compared the strictness and generosity of the Estonian UI system, such as Venn (2012) and Esser et al. (2013), find that Estonia is much more strict and less generous than the average. Venn created a score of strictness that takes into account various aspects such as entitlement conditions, proof of job searching, and sanctions for rejecting viable job offers. Out of 36 countries, Estonia was the 7th most strict country, having a higher past employment requirement than most countries, and a more thorough reporting system of job search that UI recipients have to participate in. Esser et al. look at the unemployment benefits of EU member states, and find that Estonia's net replacement rate for UI is below 50%, making it among the lowest in the Eurozone. Unemployment assistance is also among the lowest in the EU. As Estonia is very close to Ireland and Italy with regards to strictness and generosity, the results from Tatsiramos (2009) suggest that Estonia would see minimal moral hazard from UI policies.

The only studies as far as the author knows that measures the relationship between unemployment benefits and unemployment duration for Estonia only use the hazard model. One such study is from Rõõm (2003). Using a hazard model to determine the factors for the reservation wage, Rõõm finds that while receiving UI benefits did not influence the reservation wage, it did extend unemployment duration. A more recent study comes from Lauringson (2011), where the impact of the size and duration of UI benefits on unemployment duration was investigated. In line with Mortensen (1977)'s search theory, it was seen that both of these factors decreased the hazard rate of exiting unemployment, and that the hazard rate increased as the UI duration reached its end. The analysis done by Lauringson to estimate the effect from UI benefits came from creating specific hazard estimates for groupings of UI benefits, from below 100 EEK to between 300 and 400 EEK. As there is worker heterogeneity regarding characteristics such as age, education, and experience as workers are placed in higher UI size categories, it is probable that endogeneity is biasing the results. This threat of endogeneity is something most papers on this subject try to account for.

Difference-in-Difference

The way to analyze the effect UI policies have on unemployment that recent studies have gravitated towards is to exploit policy driven changes. Quasi-experimental designs that arbitrarily give one group more or less benefits than another allows for the estimation of the causal effects from the benefits on unemployment duration. One commonly used method, oftentimes used in conjunction with hazard models, are difference-in-difference models. This method allows for the treatment and control group to be fundamentally different, but are assumed to have constant differences regarding the outcome in question in the absence of treatment. An example of this is from Card and Levine (2000), where they investigate a temporary policy change in New Jersey that extended UI by 13 weeks. This is an attractive change to use for a study because it was not based off of economic conditions, but rather legislative infighting, minimizing potential sources of endogeneity. The exhaustion rate of UI before and after the UI increase was the control group, and the exhaustion rate during the UI increase was the treatment group. Their result was that the extension resulted in a 7% increase in the exhaustion rate of UI, or an extra week of unemployment.

Regression Discontinuity Design

Similar to difference-in-difference, the regression discontinuity design (RDD) measures the impact of some treatment by comparing a treatment and a control group. However, these groups are assumed to be identical before the treatment. A discontinuity in an aspect of UI policy with respect to specific worker characteristics is exploited, for example a boost in the replacement rate of past wages after a certain age. The discontinuity designs are divided into the sharp and fuzzy categories. This distinction was developed by Hahn et al. (2001), where in the sharp design, the treatment variable is deterministically dependent on other observable variables. The fuzzy design instead has unobserved variables that partially determine assignment to the treatment in question. Hahn et al. (2001) use Imbens and Angrist (1994) to show that the nonparametric estimation in RDD finds the local average treatment effect. An example of this method is in Lalive (2008). In the late 1980s in Austria, steel industry factories began to rapidly shut down. Regions affected extended the duration of unemployment benefits from 30 weeks to 209 weeks for workers over 50 years old. This sharp cut off allows for a sharp RDD to be used, comparing workers just below 50, and workers just above 50. To try to hold worker characteristics and economic conditions constant, workers living along the border of eligible regions were used as controls. Lalive found that each additional week of max UI duration increased unemployment duration by 0.09 weeks.

Regression Kink Design

An offshoot of the RDD is the regression kink design (RKD). Instead of utilizing some discontinuity in a given assignment function, kinks in the assignment function are used. One of the first usages of a specifically regression kink design was in Guryan (2001), which utilized a kinked function in school aid from State governments to counties. The function which determined if a county would receive extra aid has arbitrary kinks, allowing for similar counties with only some receiving aid to be compared, thus estimating the effect State aid has on student test scores. The term "Regression Kink Design" was coined by Nielsen et al. (2010). Similar to Guryan (2001), Danish college aid for students, which is a kinked function of parental income, was used to measure the effect on college enrollment. When running regression kink designs, optimal methods for the estimation of various parameters have to be taken into consideration. The three main parameters are the bandwidth, which chooses how many observations to keep on either side of the kink, the kernel, which weights observations based on their distance from the kink, and the polynomial order for regression analysis.

Regression discontinuity and regression kink designs are typically estimated with local linear or potentially local polynomial estimators, ever since the seminal research from Fan and Gijbels (1992) pointed to local linear estimators being superior to global polynomial estimators. While there have been new estimation methods developed since then, their rule of thumb bandwidth selection procedure, known as FG, is still widely used. The basis for Fan and Gijbels (1992) bandwidth method was to minimize the mean integrated squared error criterion. However, Imbens and Kalyanaraman (2012) argue that since the regression discontinuity estimand depends on the difference between two values, which are both boundary values, the minimization of the mean squared error is more appropriate. Due to global criteria inherent in a normal mean squared error estimate not being relevant when the identification for regression discontinuity is local, a first-order approximation is calculated, known as the asymptotic mean squared error (AMSE). For their own bandwidth selection procedure known as IK, they are concerned about overly large bandwidths. To deal with this, a regularization term is added, which reduces the instability of the bandwidth. Building from this problem, Calonico et al. (2014) develop a new method, known as CCT, which creates robust confidence intervals when bandwidths that are potentially too wide are used.

A more modern study from Calonico et al. (2022) updates their bandwidth selection procedures with Edgeworth expansions, achieving a higher rate of coverage with confidence intervals. Simulations ran prove that their robust bias corrected methodology is optimal, and allows for the usage of the uniform kernel. Previously, Cheng et al. (1997) compared various kernel estimators for local polynomial fitting, and found that triangular kernels are oftentimes preferable, but most modern studies keep the uniform kernel, such as Imbens and Lemieux (2008). For the polynomial order, previous understanding was that bias reduction is the aim, which would always argue for using the highest order possible. Gelman and Imbens (2019) instead argue that high-order polynomial estimation is faulty with regards to regression discontinuity, because the higher orders create too extreme values leading to noisy estimates, and confidence intervals that are misleadingly narrow. They recommend for only local linear or local quadratic orders to be used, and for specifically regression kink designs, the local quadratic order is recommended. Pei et al. (2022) run Monte Carlo experiments, and instead finds that the local linear order was always preferable for small sample sizes in both sharp and fuzzy designs.

Most of the past research on the effect of UI benefits on unemployment duration using the RKD has been led by David Card. His papers used the regions of Washington, Missouri, and Austria, with multiple paper extensions for his original paper on Austria, Card et al. (2012). The first paper on the subject is Card et al. (2009), where data from the state of Washington in 1988 is used. In Washington, the size of benefits was a function of past earnings, as is the maximum duration of benefits. Both functions have kinks in them, and because the max duration kink is due to the size of benefits, a reduced-form estimation can find the effect from UI benefits holding changes in max duration constant. Using a uniform kernel, various bandwidths and polynomial orders are selected for by the Aikake Information Criterion (AIC). They estimate that a $1 increase in UI benefits leads to an increase in unemployment duration by 0.04 weeks. Using data on Austria from 2001 to 2012, Card et al. (2015a) investigate the ceiling and floor kinks in UI benefits. A uniform kernel is used and compared with the triangular, along with FG, IK, and CCT bandwidth selectors. Due to the possibility of unobserved factors in the assignment formula, fuzzy bandwidth selectors for the IK and CCT methods are also used. The local linear FG method found an elasticity of 2 between time to next job and UI benefits at the ceiling kink, and an elasticity of 1 for the floor kink. Using instead Missouri data from 2003 to 2013, Card et al. (2015b) uses the same estimation methods. They find a pre-Great Recession elasticity of 0.3 between UI benefits and unemployment duration, and an elasticity between 0.65 and 0.9 during the recession. The pre-Great Recession elasticity is similar to the one found in Landais (2013), which uses the RKD method for Missouri along with 4 other US states. Card et al. (2016) operates as an extension of the Austrian paper Card et al. (2015a), and finds that the theoretically optimal IK and CCT methods are not always best for every application, using Monte Carlo simulations instead of theory to select a method and result.

Background Information

To be eligible for Estonian unemployment insurance, there are multiple conditions that have to be met. The main requirement for eligibility is that the worker had to have been either laid off or unwillingly had their employment contract expire without renewal. If they willingly quit their job, they can only be eligible for unemployment allowance, which is significantly less. The worker also had to have been employed and contributing to the unemployment insurance for at least 12 months in the past 36 months prior to applying for unemployment. Before a reform in 2023, if the past employment of the worker is less than 5 years, then they are eligible for 180 days of unemployment benefits. If the past employment is between 5 and 10 years, they are eligible for 270 days of unemployment benefits. If the past employment is more than 10 years, they are then eligible for 360 days.

On August 1st 2020, there was a reform in the Estonian calculation of benefits. Before this change, recipients received 50% of their past daily earnings for the first 100 days, then 40% afterwards. After the reform, workers instead received 60% for the first 100 days, then 40%. Workers who began to receive UI benefits on April 24th 2020 or later received a mix of the two replacement rates for the first 100 days, while those who started their UI benefits on August 1st or later received 60% for the entire first 100 days.

Workers are guaranteed UI benefits equal to at least 50% of the minimum wage of the previous calendar year for both periods, resulting in a floor kink. For example, in 2019, the Estonian minimum wage was 18 euros per day. If a worker's average daily wage was calculated as less than 15 euros, then a replacement rate of 60% would be less than 9 euros. As this would then be less than 50% of the minimum wage, their UI benefits are instead set at 9 euros per day, resulting in these workers receiving more than 60% of their past wage.

There is also a maximum amount of benefits a worker may receive. This is calculated as three times the mean payment from work in the previous year in Estonia. Prior to the 2020 reform, the ceiling of UI payments was set at 50% of this level for the first 100 days, which was 53.43 euros in 2020. After the reform, workers in 2020 were able to receive up to 64.12 euros for the first 100 days. After the first 100 days, the ceiling is set to 40% of three times the mean wage.

To calculate the average UI payment a worker receives, the mean value of the potentially changing UI payments over their course of receiving UI is taken. The length of unemployment is calculated as the length of time between the unemployment start date and unemployment exit date, conditional on the fact that the reason for exiting unemployment was due to reentering employment. The past daily wage of the worker is calculated from wages earned during a set period prior to their unemployment. As this may be affected by sickness or other absences, the recorded daily wage may not fully reflect their full-time wage. This is an important detail, as the prereform bottom kink is set at the minimum wage point, which otherwise would imply that 100% of the workers to the left of this point are part-time workers.

Figures 1 and 2 map the average UI payments received by workers based on the location of past wages with respect to the policy kink. For the bottom kink, linear lines are shown to the left as every worker is receiving a constant UI payment equal to 50% of the previous year's minimum wage. To the right, there is variability as the average UI payment, increasing with the worker's past wage, is subject to the additional replacement rate change after the first 100 days. For the top kink, as the ceiling payments are subject to a change to 40% after the first 100 days, clear lines are not seen after the kink, but there is still a noticeable change in average UI payments at the kink.

Figure 1: Daily UI Benefits Bottom Kink

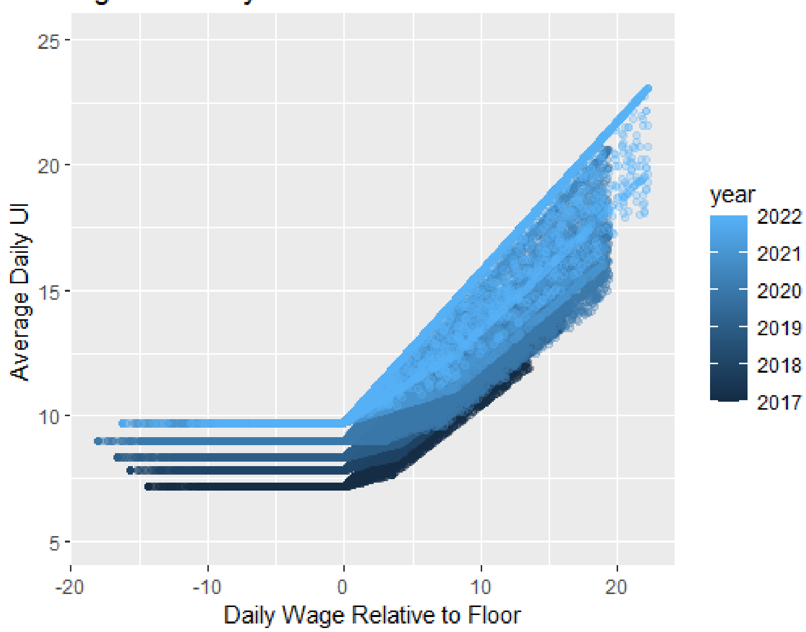
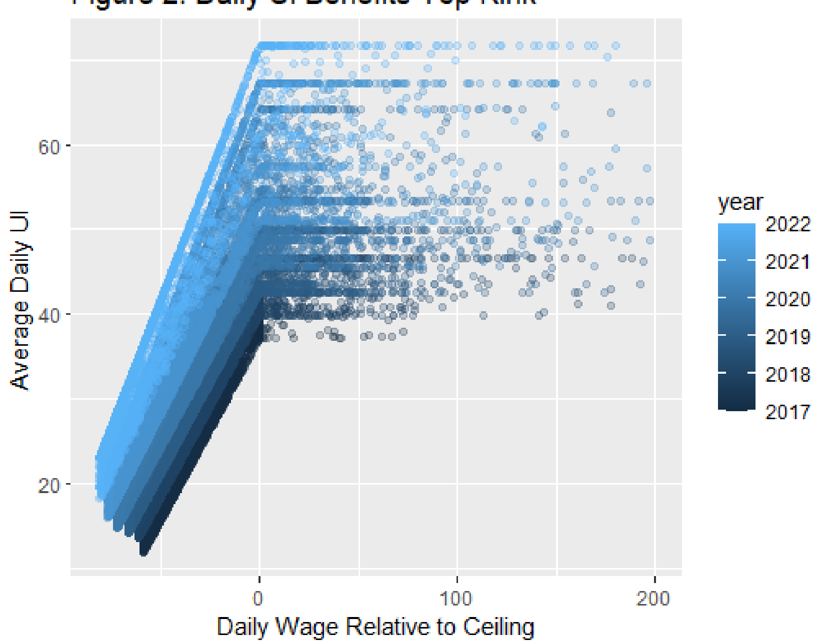


Figure 2: Daily UI Benefits Top Kink



Note: Observations censored at 200 so as to only show relevant results close to the kink.

Methodology

Following the common notation for regression discontinuity, B stands for the treatment variable, which is the size of unemployment benefit payments, V stands for the assignment variable, which is the past earnings of the worker being used to calculate the size of UI payments, U is the error term, and Y is the outcome, which is the duration of the current unemployment spell.

$$\mathrm{Y} = \mathrm{y}(\mathrm{B,V,U}) \tag{1}$$

The objective is to find the partial derivative of unemployment duration with respect to the size of UI payments. Florens et al. (2008) identify this as the treatment-on-the-treated parameter, and proposes the usage of instrumental variables. However, in the context of unemployment benefits, it is unlikely that any instrumental variables will not have a relationship with past wages, rendering the variable invalid. By instead using the kink in the rule for UI benefits, we will still be able to determine the causal effect of B on Y. Since there will also exist a kink between the level of UI benefits B and the past wages V, we can also identify a kink between Y and V. Nielsen et al. (2010) develop the RKD estimand, which shows the treatment effect for the sharp RKD (SRKD).

$$\tau = \frac{\lim_{v_0 \to 0^+} \frac{dE[Y|V=v]}{dv}|_{v=v_0} - \lim_{v_0 \to 0^-} \frac{dE[Y|V=v]}{dv}|_{v=v_0}}{\lim_{v_0 \to 0^+} b\prime(v_0) - \lim_{v_0 \to 0^-} b\prime(v_0)} \tag{2}$$

The RKD estimand, (2), has the numerator as the slope change for unemployment duration, our outcome variable, with the denominator being the slope change for the replacement rate of wages. This finds the treatment-on-the-treatment, the weighted average of UI benefits on unemployment duration. The required assumptions for RKD analysis to be valid is that the density of the assignment variable, past wages, has to be smooth around the kink point, and the treatment rule has to be continuous. The condition for smooth density of earnings around the kink points allows us to rule out possible endogeneity from wages being planned around these kink points. The distribution of predetermined covariates such as age should also be smooth, and can be tested for in a similar fashion.

If the benefit schedule is followed precisely without any errors or unknown variables, then the SRKD estimator is valid, defined as equation (3), with k^+ and k^- being the known slopes of the average replacement rates around the kink. $\hat{\beta}_1^+$ and $\hat{\beta}_1^-$ are the slope estimators for unemployment duration.

$$\hat{\tau}_{SRKD} = \frac{\widehat{\beta}_1^+ - \widehat{\beta}_1^-}{k_1^+ - k_1^-} \quad (3)$$

However, it is possible that there remains unobserved factors which influence the policy rule under investigation. It can also be incorrectly implemented, or the past earnings and benefits level may be recorded incorrectly. If this happens, the sharp RKD is no longer valid. Instead, a fuzzy generalization of the sharp RKD may instead be carried out. Here, the slope change for the UI benefits at the kink is replaced with an estimation derived from the data being used. $\hat{k}^+$ and $\hat{k}^-$ are instead the estimated slope of the first stage.

$$\hat{\tau}_{FRKD} = \frac{\widehat{\beta}_1^+ - \widehat{\beta}_1^-}{\hat{k}_1^+ - \hat{k}_1^-} \quad (4)$$

While there is variability in average benefits due to the UI schedule which itself is discontinuous, there appears to be complete compliance based on Figures 1 and 2 with the location of workers around the kink based on their past wages. This isn't generally the case for studies using RKD methods for unemployment data. Card et al. (2012), for example, looks at Austrian data, which has the number of dependents a worker has influencing their replacement rate. This makes the point where they are subject to a kink be varied, requiring a fuzzy regression kink design to be used to estimate the kink point. In our case, it appears that the sharp regression kink design may be used for Estonian data. After the sharp design is chosen, the RKD estimation requires further specification to be made for which observations to be used. Bandwidth selection procedures choose a distance from the kink to act as a filter for relevant observations based on limiting the asymptotic mean squared error. Here, the CCT and the IK bandwidth selection procedures are both used, as using a variety of procedures is important in insuring robust results. A kernel which weights observations also has to be chosen. Based on Imbens and Lemieux (2008) and Calonico et al. (2022), a uniform kernel is used. Polynomial orders for estimating slopes have to be selected, and while the quadratic polynomial order is viewed as theoretically optimal for sharp designs, linear order results are also reported, as Pei et al. (2022) show that they are optimal for small sample sizes. Due to this, final elasticity estimates utilize the linear order. The bandwidth for the elasticity estimations uses the chosen unemployment duration kink bandwidth, as is common practice for RKD papers.

Data

The data used comes from the Eesti Töötukaasa, and contains information regarding recipients of unemployment insurance. The initial dataset contains 103,458 observations from 2017 to 2022. The data is trimmed down to only include when the spell end dates are known, and if the worker is reentering employment once they exit unemployment. This is an important detail, as Card, Chetty, and Weber (2007) show, it is not relevant to our study on how unemployment benefits influence the duration a worker takes to get another job if they decide to exit the workforce once their UI period ends. 8 observations that exited unemployment before they started to receive UI benefits are also removed, reducing the data to 84,245 observations. Due to the change in UI calculations in 2020, the data has to be divided into 2. For a hundred days in 2020, starting on April 24th, there are workers who experience both replacement rates. These observations, 8,726, are not included for analysis. As most observations for the top kink from 2017 until June of 2018 are censored at the ceiling kink, as shown in Figure A3, this data has to be dropped. This ultimately results in 66,909 observations divided into prereform and postreform data. This is further divided into bottom kink and top kink samples by the median wage of each year.

Table 1: Unemployment Insurance Summary Statistics

	Bottom Kink data		Top Kink data	
	Prereform	Postreform	Prereform	Postreform
Wage	19.65(6.88)	23.05(7.48)	61.18(33.51)	64.21(33.65)
Avg. Distance from Kink	3.62(6.78)	7.23(7.49)	-38.93(33.81)	-47.51(33.55)
Avg. UI Benefit	10.12(2.33)	13.27(3.32)	26.95(9.89)	32.92(12.65)
Avg. Unemp. Duration	184(177) days	182(137) days	218(179) days	196(138) days
Avg. UI Duration	131(94) days	141(92) days	163(107) days	158(101) days
Exhausted Benefits	27.25%	27.75%	32.09%	26.21%
Assigned UI Duration				
180 Days	54.71%	51.99%	33.40%	30.85%
270 Days	24.15%	25.58%	28.05%	28.45%
360 Days	21.14%	22.42%	38.54%	40.69%
Observations	22,996	14,755	14,400	14,758

Note: standard deviations reported in parentheses

Table 1 shows statistics relevant to UI payments for the 4 samples. An increase in average wages by 4 euros for both the bottom and top kinks can be seen by the postreform data occurring in later years. The top kink samples exhibit much larger variation in average UI benefits, along with increased unemployment durations, an expected result if the size of unemployment benefits influence unemployment duration. The prereform top kink sample has a higher chance to completely exhaust benefits, while the postreform sample is less likely than the bottom kink data. This can be explained by observations from 2022 being censored if their reemployment date is not known. The bottom kink has a much higher percentage of workers with maximum UI durations of 180 days, meaning that they have much less work experience.

Table 2 reports worker characteristics which may be relevant for unemployment duration. These covariates will be the ones tested for smoothness around the kinks. The bottom kink data is mostly female, which is expected due to wage differences between men and women. The bottom kink data also has a higher proportion of workers between the age 15 to 30, and are less educated. The top kink is represented more by those in the business field, and less by those in the personal service and retail fields.

Table 2: Unemployed Worker Summary Statistics

	Bottom Kink data		Top Kink data	
	Prereform	Postreform	Prereform	Postreform
Male	35.36%	36.52%	54.45%	52.50%
Age group				
[15-30)	26.13%	29.72%	17.73%	17.54%
[30-50)	47.24%	45.47%	60.07%	60%
[50-65]	26.63%	24.81%	22.20%	22.45%
Education				
Primary	16.65%	17.92%	7.62%	8.45%
Secondary	53.96%	54.38%	37.83%	40.28%
Tertiary	28.57%	26.62%	52.76%	49.33%
Unknown	0.82%	1.08%	1.78%	1.93%
Past Employment				
Agriculture	2.40%	2.67%	1.38%	1.65%
Business Service	18.45%	17.47%	37.34%	36.93%
Construction	9.47%	9.51%	9.90%	10.28%
EduHealthSocPub	7.91%	7.56%	8.03%	9.16%
Industry	18.25%	14.05%	20.28%	14.92%
Personal Service	19.87%	25.79%	8.89%	11.76%
Retail	15.72%	14.80%	6.38%	7.54%
Transport	4.08%	4.08%	5.09%	4.92%
Other	3.83%	4.08%	2.70%	2.81%
Observations	22,996	14,755	14,400	14,758

Results

Validity Tests

To determine the validity of the regression kink design, the smoothness assumptions should first be tested. As suggested by Imbens and Lemieux (2008), graphical analysis of both covariates and the forcing variable, wages in this case, should be used. The most important test will be for wages, as the density needs to be smooth for regression discontinuity tests to be valid. Here, we can use the McCrary test, presented in McCrary (2008). If workers are able to manipulate their wages to be on one side of the UI kink, then continuity assumptions won't be true. The McCrary test uses the density of wages to test for this continuity.

Using Cattaneo et al. (2018)'s rddensity software, McCrary tests are ran, with graphical results shown in Appendix Figures 1-5. Statistical results are shown in Table 3. A very significant spike in the frequency of wages relative to the floor is seen for prereform bottom kink data in Figure A1. The most obvious explanation for this comes from the location of the bottom kink being located exactly at the minimum wage. This is supported by the density of wages for the postreform bottom kink in Figure A2. Another spike is seen here, but this time about 3.75 euros to the right of the kink, where the postreform minimum wage is located. This lends credible proof that workers are not manipulating their wages, but are naturally earning high frequencies of the minimum wage. The null hypothesis of smoothness for the bottom kink is not rejected for both prereform and postreform data at the 5% level, but is rejected for the prereform kink at the 10% level.

More troublesome is the spike located at the wages for the prereform top kink in Figure A3. An analysis shows that many of the data points for 2017 and 2018 up until June have their wage equal to the ceiling kink, with virtually none greater. As it is not plausible for so many observations to have the same past wage, this phenomenon is interpreted as past wages being censored at the ceiling kink via faulty record keeping. As this would have a severe impact for bandwidth analysis, the entire year of 2017 and 2018 up until June is dropped for the top kink. Another McCrary test is ran on prereform top kink data starting from June of 2018, and no spikes are seen. For this data, the smoothness hypothesis is kept. The postreform top kink data is also exceptionally smooth. In the absence of minimum wage spikes and the censoring of top kink wage observations, the McCrary tests demonstrate that there doesn't appear to be systematic manipulation of wages around the kink.

Table 3: McCrary Distribution test Results

	Bandwidth	P-value
Prereform		
Bottom Kink	6,159	0.072
Top Kink (2017-2020)	1,609	0
Top Kink (June 2018-2020)	2,295	0.9291
Postreform		
Bottom Kink	1,980	0.211
Top Kink	1,325	0.8439

Notes: Null hypothesis is that there is no manipulation of the running variable (Wages around the kink). Bandwidths are the number of observations included for optimal results.

As the underlying worker characteristics are assumed to be similar on either side of the kink, which allows us to credit any change in unemployment duration solely to the kink in unemployment benefits, such covariates actually being smooth around the kink is an important finding for the robustness of our results. It can be seen from Figures A6 to A9 mapping the distribution of gender that workers at the bottom kink making relatively less money are mostly women, while the more affluent workers are male. The bottom data is quite smooth at the kink, even with the high variability to the left of the graph. The top kink also has a lot of variability in some places. However, in terms of wages, the variability occurs around 100 euros above the kink, so such variation won't be included in any bandwidths. Overall, the top kink also evolves quite smoothly around the kink.

Those working in the agriculture, construction, and industry fields are considered here to be bluecollar. In Figures A10 to A13, the bottom kink prior to the reform is very smooth, while there appears to be a small spike right before the kink postreform. However, this spike is not that large. The top kink prereform also has a spike before the kink, but the evolution of the distribution is still fairly smooth. Postreform, there does appear to be a concerning change in the slope right after the kink, but there is high variability throughout.

For the education covariate, primary education is assumed to take 9 years, secondary education 3 years, and tertiary education 2 years. Observations with unknown educational attainment are dropped for these figures, A14 to A17. For the bottom kink both before and after the reform, the average years of education are quite smooth around the kink. The top kink also evolves fairly smoothly, but with increased variation after the kink due to the small number of observations in some of the bins.

Observations from age come in three general groups, between 15 and 30, 30 and 50, and 50 and 65. Each observation is assumed to be in the middle of their respective group, so possible ages are 22.5, 40, and 56.5. This way, the average of age in bins should be fairly accurate even though the precise ages of workers are not known. The top kink data is very smooth both times. The bottom kink data, however, shows very clear kinks. For the prereform data, this kink is itself located at the UI kink. After the reform, this kink in age is about 4 euros above the UI kink, where the minimum wage is located. To have your past wage calculated as below minimum wage, one most likely has to be working part time, so the Figures A18 to A21 demonstrate the relationship between part time work and age. Part time work creates the possibility of a confounding effect, particularly for the prereform bottom kink, which may be quite important for this study.

Another important covariate to examine which is connected to age is maximum UI duration. What determines maximum UI duration is the length of past years the worker was employed for, which has an obvious correlation with age. Part time work and length of past employment are variables not directly included in our study or in the main studies of this topic, but we are at least able to see the variable which employment history affects, the maximum UI length workers are assigned. This is particularly relevant for Estonia, as Estonia is unique in having UI duration be dependent on past employment length. The wider literature generally finds that maximum UI duration has a significant effect on overall unemployment length, so any kinks found around the wage kinks will be especially problematic. Figures A22 to A25 investigate this.

For the top kink, maximum UI length evolves fairly smoothly around the kink, albeit with a drop in the intercept for the prereform data. For the bottom kink, however, a very significant slope kink is seen in the prereform data. For the postreform data, it is more smooth around the kink, with a change in the slope occurring about 4 euros to the right. As discussed with the analysis on the distribution of age, these kinks in the slope are due to the location of the minimum wage. As maximum duration of unemployment benefits typically affects unemployment duration, this drastic change in the slope of maximum UI days will be a sure cause of endogeneity that will greatly bias the results for the bottom kink prereform data, so any result pertaining to this sample has to be heavily scrutinized.

Kink Estimates

The graphs mapping the average UI benefits for the bottom kink, Figures 3 and 4, exhibit a very clear kink in benefits at the location of the wage kink. Though there is variation on either ends, the kink location itself is quite stable. For the top kink, Figures 5 and 6 demonstrate a lot of variation once the kink point is crossed due to the bins on the right side having fewer observations, but the estimated regression is still roughly horizontal, as it theoretically should be. These graphs show that the kink point as prescribed by the UI program is effective at changing the replacement rate of benefits for workers.

For the log of duration at the bottom kink for Figures 7 and 8, a fairly continuous and horizontal slope is seen on both sides of the kink. The top kink data for Figures 9 and 10 show more variation, with the slope appearing to be increasing up until the kink point with the prereform data, but the postreform data instead has the estimated regression plummet right before the kink. Overall, this data does not graphically show a significant impact from UI payments on log unemployment duration.

For these graphs to show that the size of UI payments as a replacement rate of past wages is a significant determinant of unemployment duration, then Figures 7 and 8 for the bottom kinks would need a clear downward slope on the left side of the kink. This would mean that workers getting a higher replacement rate have longer duration. For the top kink in Figures 9 and 10, there would need to be an upward slope on the left of the kink. While the replacement rate is being held constant, the nominal size of UI payments increasing should also increase unemployment duration. Then, the slope would need to sharply become neutral if not negative to the right side of the kink, as workers here now receive a smaller replacement rate. This almost appears to be the case for the prereform data, but it is not that sharp of a change.

Figure 3: Daily UIB Benefits Prereform Bottom Kink

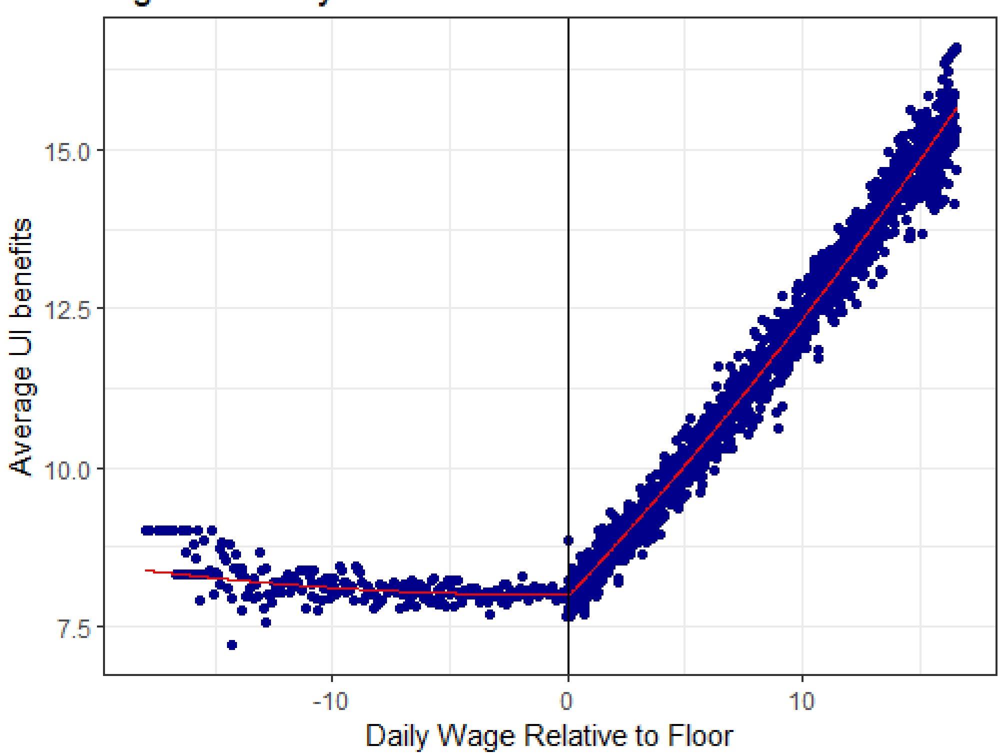


Figure 4: Daily UIB Benefits Postreform Bottom Kink

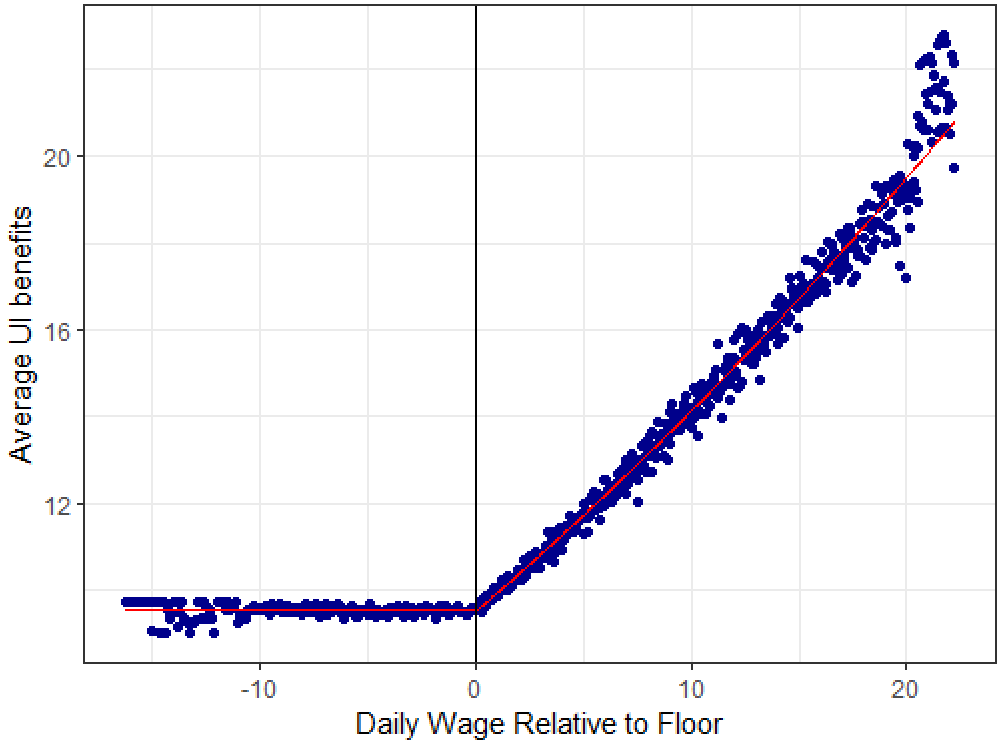


Figure 5: Daily UIB Benefits Prereform Top Kink

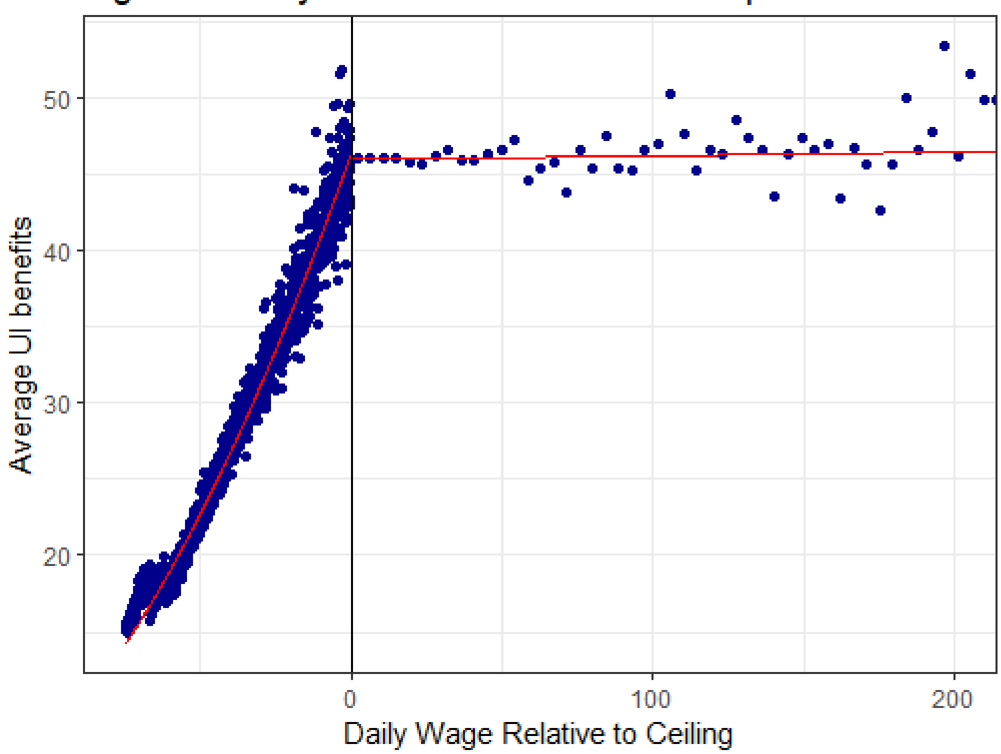


Figure 6: Daily UIB Benefits Postreform Top Kink

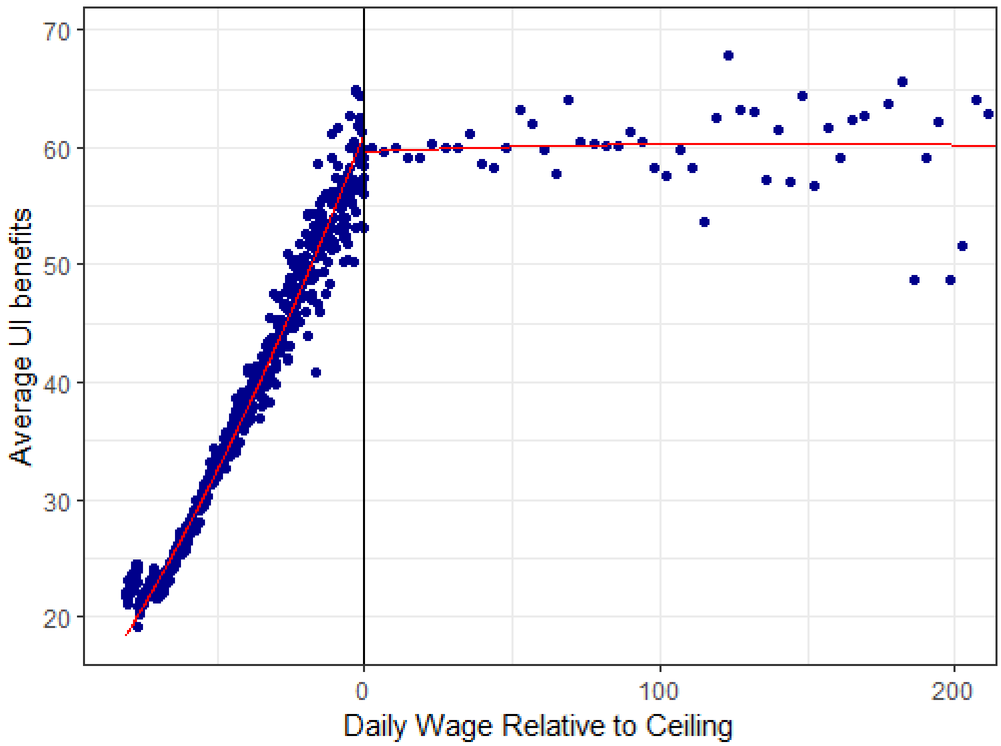


Figure 7: Length of Unemployment Prereform Bottom Kink

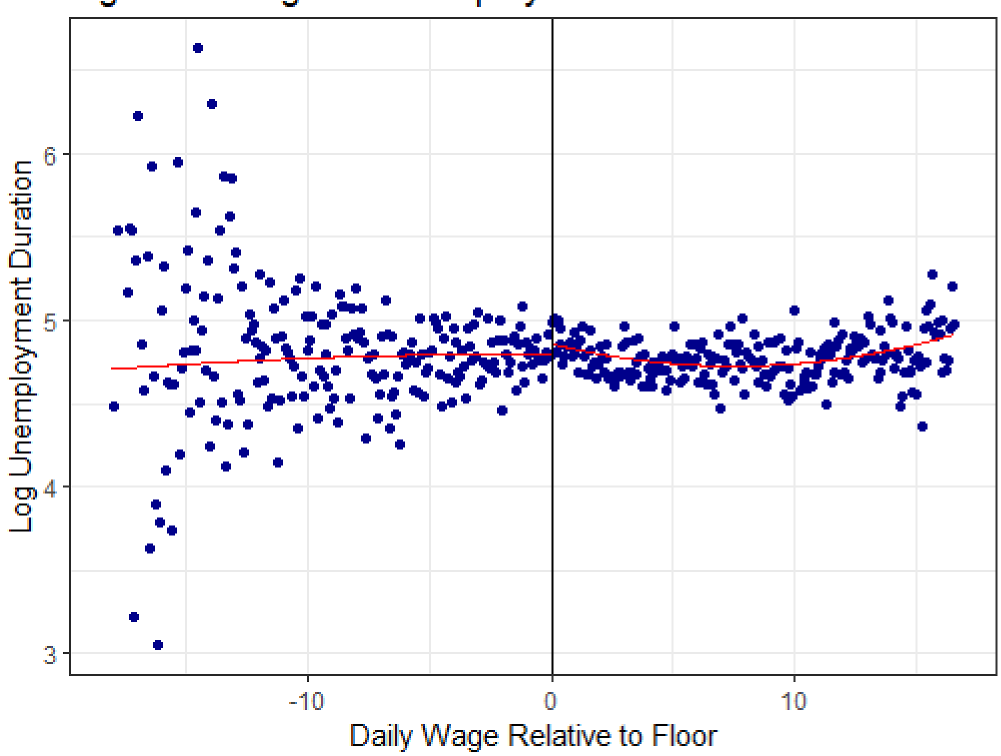


Figure 8: Length of Unemployment Postreform Bottom Kink

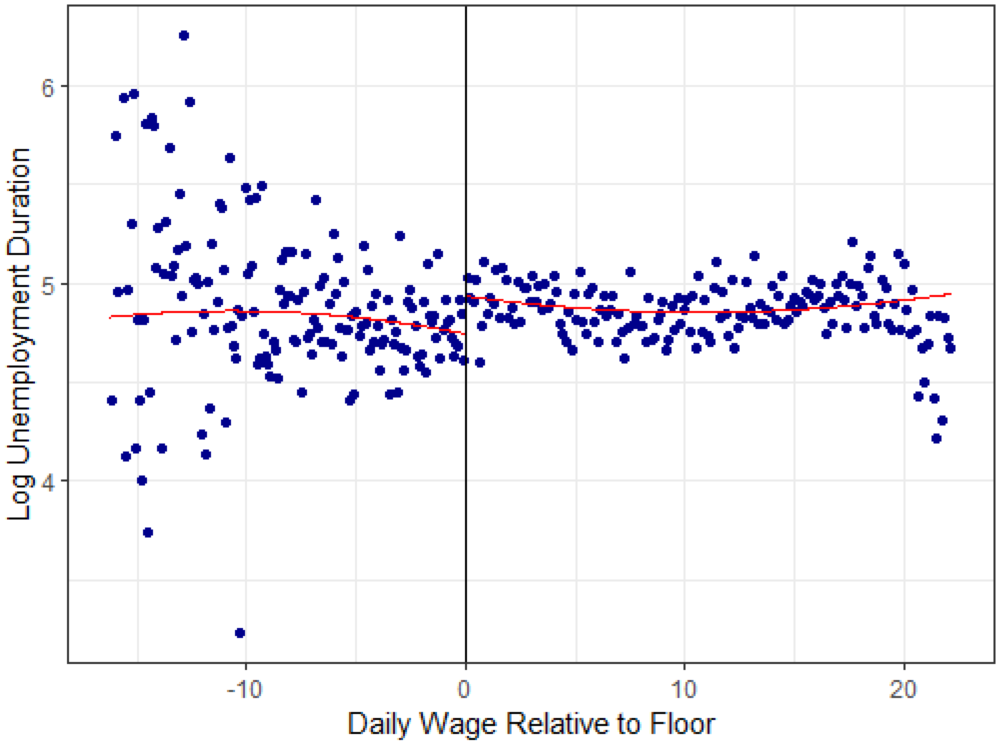
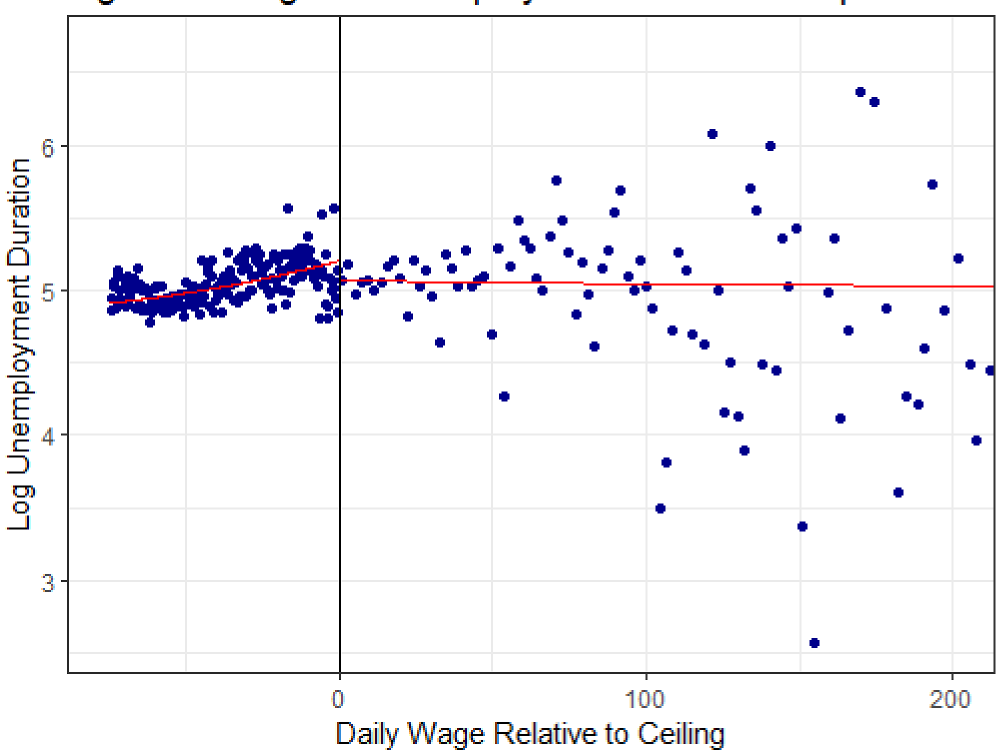
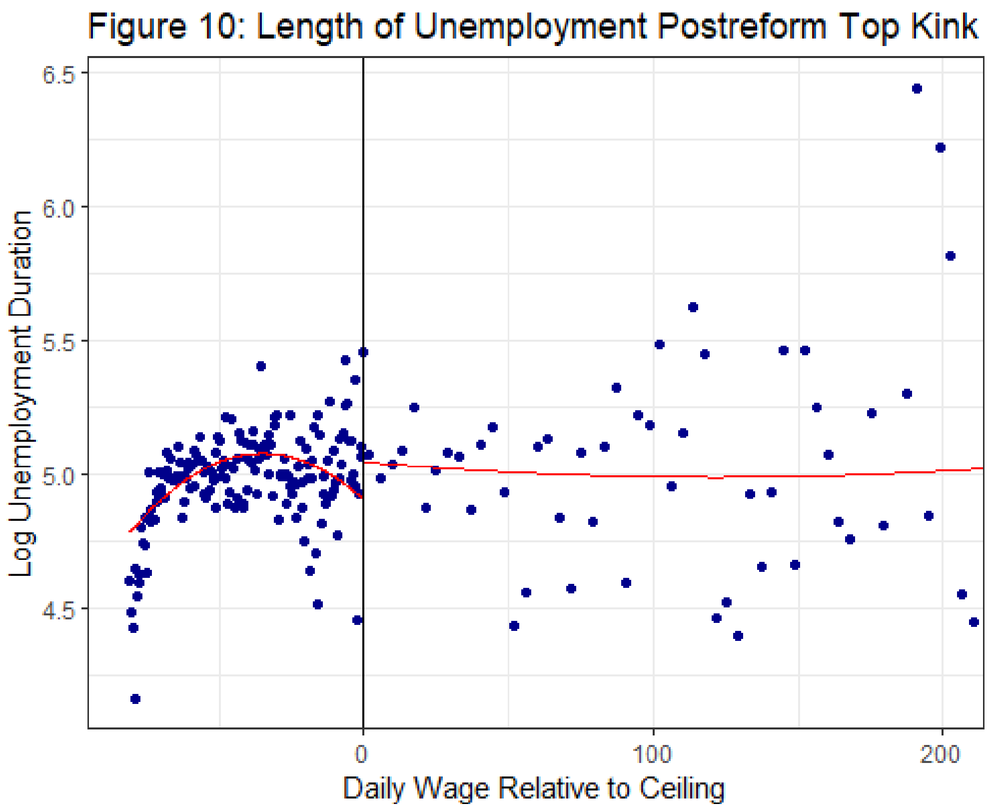


Figure 9: Length of Unemployment Prereform Top Kink





To get estimates of the slope changes at the kink, CCT's rdrobust software is used. The kernel is held constant as a uniform estimate, but local linear and quadratic polynomials are reported, along with CCT's optimal asymptotic mean squared error bandwidth and the IK bandwidth. The standard estimates are reported along with a robust estimate. The prereform results are found in Table 4, and the postreform results in Table 5. For the first stage estimate, where the daily UI benefits are analyzed, the CCT method is significant at the 1% level. The IK method is similar, however the local quadratic estimations are less significant. The estimates are similar to the results of Landais (2015) and Card (2012), as is expected from the graphical analysis.

The reduced form model results tell a much different story. Here, only the prereform bottom kink has remotely significant results. This data sample is also the one where the kink is located right on the minimum wage point, resulting in endogeneity from most workers to the left of the kink being part time workers. Looking at the distribution of covariates, we can see that the age and maximum potential

UI duration profiles are different for the two sides of the kink. As a result, any estimates from this sample should not be trusted. In comparison to Landais (2015) and Card (2012), the kink estimates are the opposite sign of what is to be expected, and are also much larger. For the prereform top kink and both postreform kinks, none of the estimates are remotely significant, as can be guessed from Figures 8 to 10.

To find τ, the RKD estimand which represents elasticity, a two-stage least squares regression is ran as described in Card et al. (2012), instrumenting the treatment variable of UI benefits with an interaction term between past wages and what side of the kink a worker is on. The results are reported in Table 6. As can be inferred from the statistical insignificance of the kink for the duration of unemployment, all of the elasticities except for the prereform bottom kink are statistically insignificant. As endogeneity arising from the proportion of part-time workers on the left side of the kink is most likely responsible for this specific kink's results, we can conclude that there are no significant elasticities reported.

Table 4: Prereform Kink Estimates

	Bottom Kink		Top Kink	
	Local Linear	Local Quadratic	Local Linear	Local Quadratic
First Stage(Dependent variable = Log Daily UI Benefit)				
CCT MSE opt. bandwidth	5032	7,362	893	2,118
Estimated Kink	0.048(0.0045)***	0.057(0.0085)***	-0.0132(0.002)***	-0.0135(0.002)***
Robust estimate	0.052(0.0063)***	0.0618(0.01)***	-0.0139(0.003)***	-0.0137(0.003)***
IK bandwidth	3,577	3715	1,741	2,975
Estimated Kink	0.0477(0.0081)***	0.054(0.011)***	-0.013(0.001)***	-0.012(0.0016)***
Robust Estimate	0.036(0.0138)***	0.001(0.0256)**	-0.013(0.002)***	-0.0125 (0.0027)***
Reduced Form Model(Dependent variable = Log Duration)				
CCT MSE opt. bandwidth	5,776	11,321	1,423	2,821
Estimated Kink	-0.108(0.0414)***	-0.129(0.046)***	0.0069(0.012)	0.009(0.02)
Robust Estimate	-0.1425(0.0538)***	-0.14((0.058)**	0.012(0.018)	0.013(0.026)
IK bandwidth	5,963	9,193	2,683	5,216
Estimated Kink	-0.0948(0.039)**	-0.137(0.068)**	-0.001(0.0052)	0.0056(0.0107)
Robust Estimate	-0.206(0.085)**	-0.187(0.13)	0.0045(0.0137)	0.015(0.024)

Notes: standard error reported in parentheses. P-value significance at 1%/5%/10% represented by ***/**/* respectively.

Table 5: Postreform Kink Estimates

	Bottom Kink		Top Kink	
	Local Linear	Local Quadratic	Local Linear	Local Quadratic
First Stage(Dependent variable = Log Daily UI Benefit)				
CCT MSE opt. bandwidth	1,887	3,068	681	1,119
Estimated Kink	0.038(0.003)***	0.041(0.007)***	-0.012(0.003)***	-0.018(0.007)***
Robust estimate	0.039(0.005)***	0.039(0.009)***	-0.015(0.005)***	-0.023(0.008)***
IK bandwidth	2,149	2,587	1,316	1,767
Estimated Kink	0.0416(0.0028)***	0.0327(0.0088)***	-0.0102(0.0013)***	-0.0128(0.0036)***
Robust Estimate	0.0438(0.0059)***	0.0174(0.0282)	-0.0094(0.0027)***	-0.021(0.0095)**
Reduced Form Model(Dependent variable = Log Duration)				
CCT MSE opt. bandwidth	2,183	3,811	992	1,322
Estimated Kink	0.0126(0.061)	0.091(0.124)	-0.0037(0.014)	0.007(0.037)
Robust	0.04(0.091)	0.157(0.159)	-0.0015(0.021)	0.03(0.047)
IK bandwidth	5,580	5,605	2,824	3,031
Estimated Kink	-0.0185(0.0181)	0.0519(0.0684)	0.0009(0.0038)	-0.0043(0.014)
Robust Estimate	-0.0359(0.0540)	0.5371(0.6039)	-0.0033(0.0123)	0.0817(0.0956)

Notes: standard error reported in parentheses. P-value significance at 1%/5%/10% represented by ***/**/* respectively.

Table 6: Linear Elasticity Estimate

	Bottom Kink	Top Kink
Prereform CCT	-1.65(0.78)***	-0.61(0.89)
Bandwidth	5,776	1,423
Postreform CCT	0.165(1.47)	0.34(1.42)
Bandwidth	2,183	992

Notes: standard error reported in parentheses. P-value significance at 1%/5%/10% represented by ***/**/* respectively. The estimates represent τ from Equations 2 and 3. To obtain elasticity estimates with robust standard errors, instrumental 2sls regressions are ran as described in Card et al. (2012).

Robustness Tests

As a robustness test, the value of redundancy payments are added to the average UI payment for workers. Redundancy payments are one time payments given to workers, sometimes before they become unemployed, sometimes after. Adding these payments to the UI calculation may be problematic, as this is technically outside the domain of UI payments, and is more similar to discontinuities in UI payments instead of replacement rate kinks at certain wages. There is also inherent heteroskedasticity, as some redundancy payments are under 100 euros, while others are over 35,000 euros. New elasticity tests are ran, as reported in Table A1. The absolute values of the estimates and p-values increase for the prereform top kink and postreform estimates, but are still not statistically significant.

It is possible that there is some heterogeneity regarding the max duration of UI that workers face. The prereform and postreform datasets are further divided by if a worker faced 180 days, 270 days, or 360 days, with new elasticity estimates reported in Table A2. There is heterogeneity in that workers facing 180 days had much more negative elasticity results than workers with more work experience who faced longer durations, however none of the estimates are statistically significant.

The fact that the replacement rate of UI benefits are dynamic and shifts after the first 100 days is unique to Estonia, and presents a potential source of bias when considering the calculation of average UI payments each worker faces. While the existing kink estimate for UI payments around the kink is statistically significant and graphically visible, meaning that this doesn't appear to be that big of a problem, a new method for calculating UI benefits is conducted. The elasticity estimates for Table A3 instead use the potential average UI benefits workers face if they received UI benefits for as long as possible, instead of the actual average they received. This time, not even the prereform bottom kink is statistically significant.

Elasticity estimates by year are then reported. Here, there is an actual statistically significant result that we can trust. The postreform bottom kink data for the year 2021, reported in Table A4, is significant at the 5% level, with an elasticity of 5.9. Graphs showing the UI and unemployment kinks, along with covariate distributions, are shown in Figures A26 to A32. As only 1004 observations were included in the bandwidth for that specific calculation, which is smaller than many bandwidths used in the wider literature, we can't be that confident regarding the magnitude of the estimate. Regardless, it is interesting that this specific year has a statistically significant result, while none of the other years come close. This can probably be attributed to the COVID related recessions. While 2020 saw much higher unemployment than 2021, it makes sense that workers in 2020 were not affected with regards to their own unemployment duration. There was an economic contraction for that year, but 2021 saw significant GDP growth, at around 8%. This would mean that the many workers unemployed in 2020 quickly had access to a booming labor market. 2022, however, had a much worse economic contraction than the one in 2020. This means that those who became unemployed in the seemingly strong economy of 2021, then had to deal with worse economic prospects later in 2022.

Finally, there is the possibility that currency differences from each year may be biasing results. As the 6 year time frame is already divided into prereform and postreform datasets, this can't be that significant of an issue, and is already partly dealt with by dividing the datasets by year. However, UI payments and wage distance from the kinks are deflated by CPI changes using 2017 as a base year. The results are reported in Table A5. The postreform top kink estimate changes to about -2, but is merely significant at the 10% level.

Conclusion

In almost every other related study, the magnitude of unemployment benefits significantly affects the duration of unemployment, including the Estonian study Lauringson (2011). A potential issue with Lauringson (2011) is that worker characteristics are not adequately being controlled for, leading to endogeneity. With the regression kink design method, we can exploit kinks in the replacement rate of UI benefits to find its causal effect on unemployment duration. As this compares similar groups of workers around the kinks, the inherent endogeneity problem past studies commonly have is avoided. The required conditions for valid RKD results are tested for, mainly the smoothness of variables around the kink. Additional robustness tests factoring in different aspects of the data, such as max UI duration, are included.

While robust estimates are found for the kinks in UI benefits, the only robust estimate for the kinks in unemployment duration was for the prereform bottom kink data. As this particular sample does not satisfy the smoothness condition for the age and max UI duration covariates, these estimates can not be trusted. The other estimates for unemployment duration using the prereform and postreform datasets are completely insignificant, regardless of the bandwidth method, estimate type, and polynomial order used. What this means is that subject to the kink in unemployment benefits, no change in the duration of unemployment is detected. While these are only local estimates, so they do not necessarily apply to the entire data, this is still a significant result which goes against past research.

An important qualification for this result is found in the robustness test for year, where a statistically significant result is found for the bottom kink data in 2021. As these workers were probably affected by the severe recession which hit 2022, our result that increased UI for workers at the kink does not impact their unemployment duration only holds in the absence of recessions. This is reinforced by Card et al. (2015b), which saw an increased elasticity from the Great Recession. However, we can still say that there is normally no change in unemployment duration at the kinks. In the absence of significant moral hazard, the unemployment insurance program could be changed by increasing the floor and ceiling payments without impacting unemployment duration. While this only necessarily holds for observations near the kink which were included in the chosen bandwidth, this result of increased UI benefits not affecting unemployment duration could also easily hold for the rest of the data, as the cost of living in Estonia relative to wages is much higher than most of the EU. This means that regardless of slight increases in UI benefits, Estonian workers are still incentivized to find a new job as quickly as possible due to the sheer inadequacy of any fraction of past earnings.

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Appendix

Figure A1: Wage Density for Bottom Kink Prereform

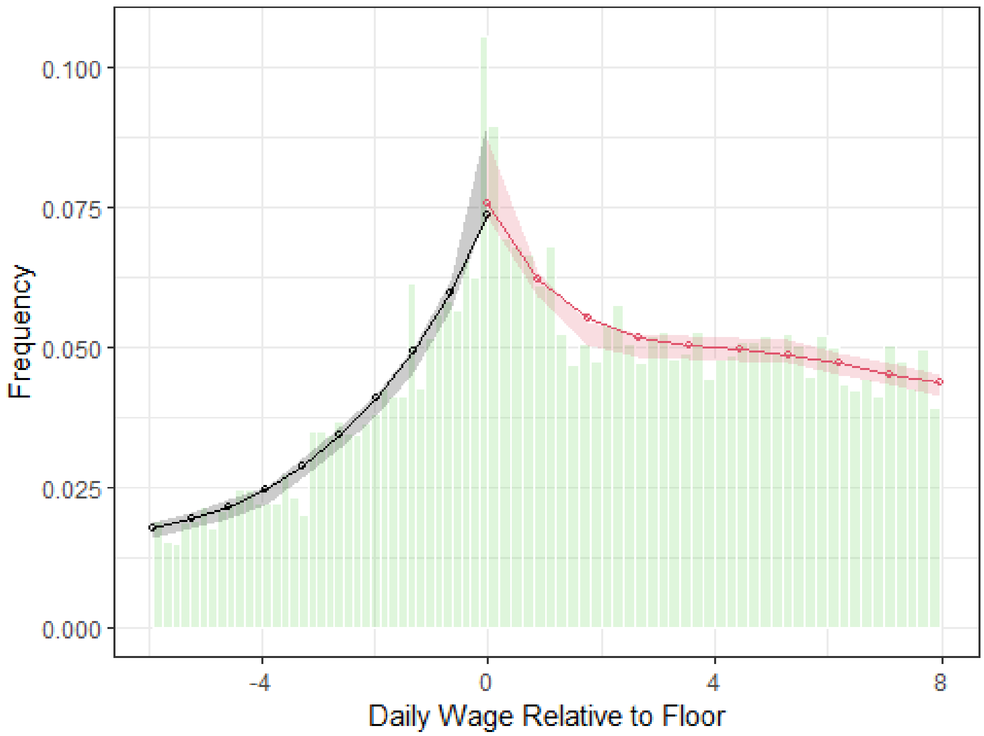


Figure A2: Wage Density for Bottom Kink Postreform

Figure A3: Wage Density for Top Kink Prereform (2017-2020)

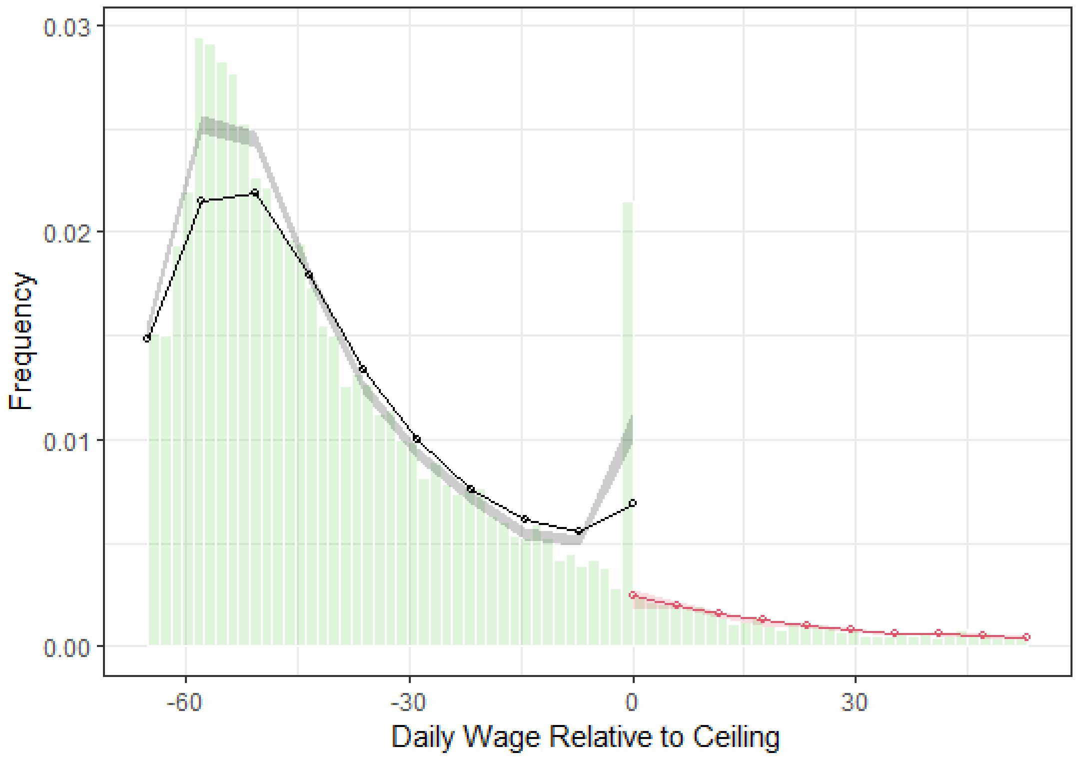


Figure A4: Wage Density for TK Prereform (June 2018-2020)

Figure A5: Wage Density for Top Kink Postreform

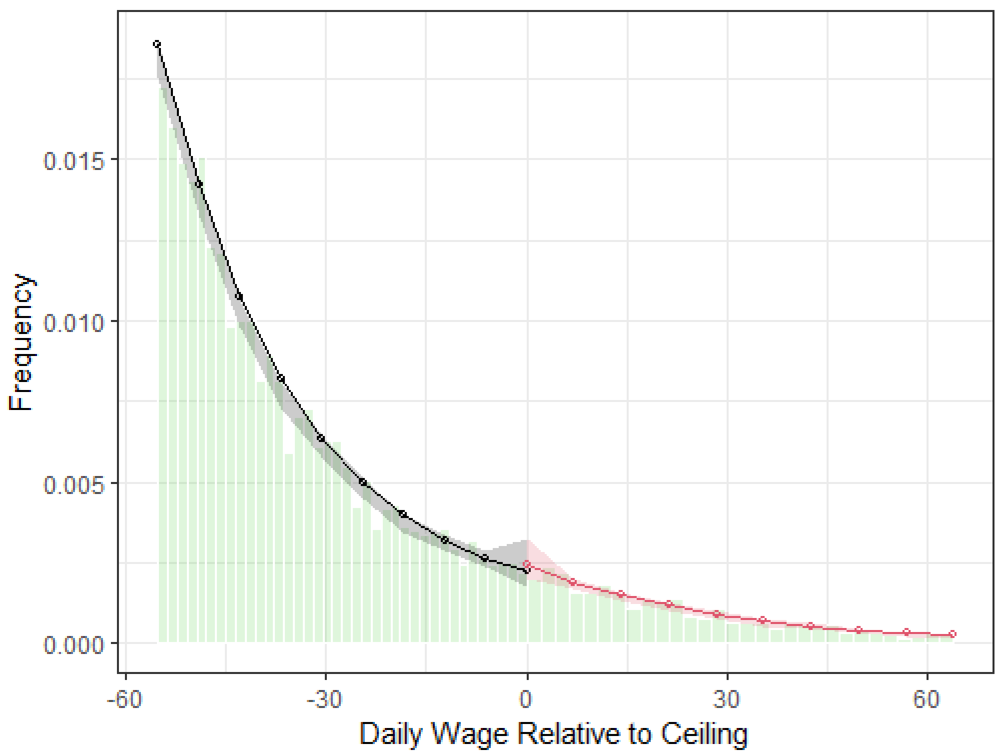
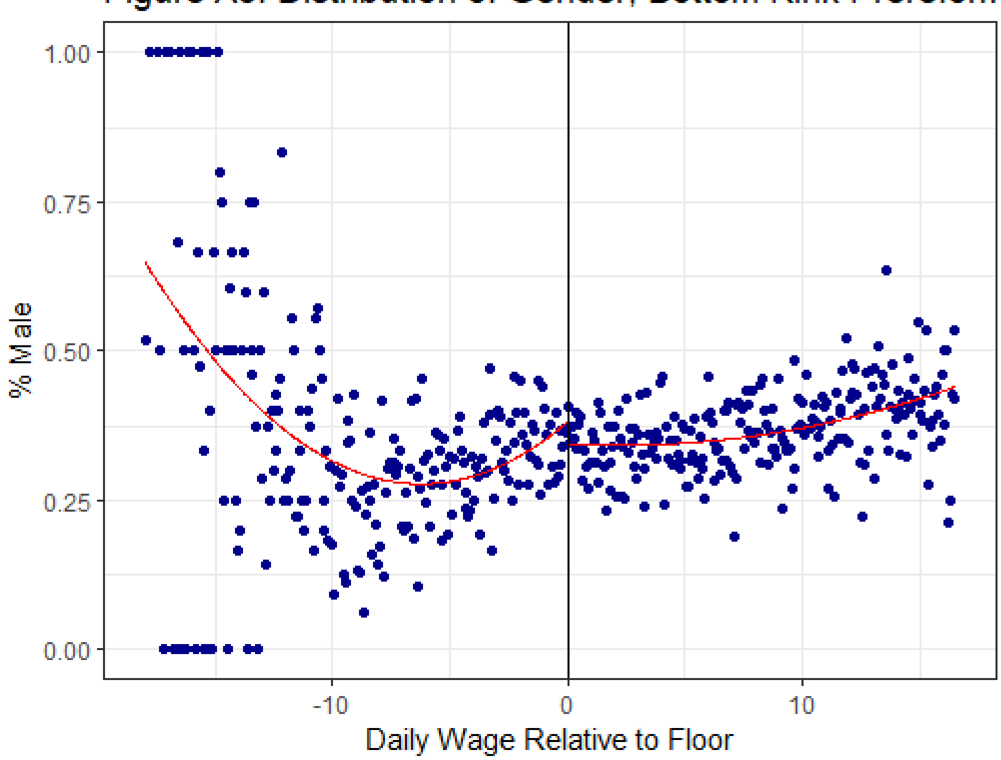


Figure A6: Distribution of Gender, Bottom Kink Prereform



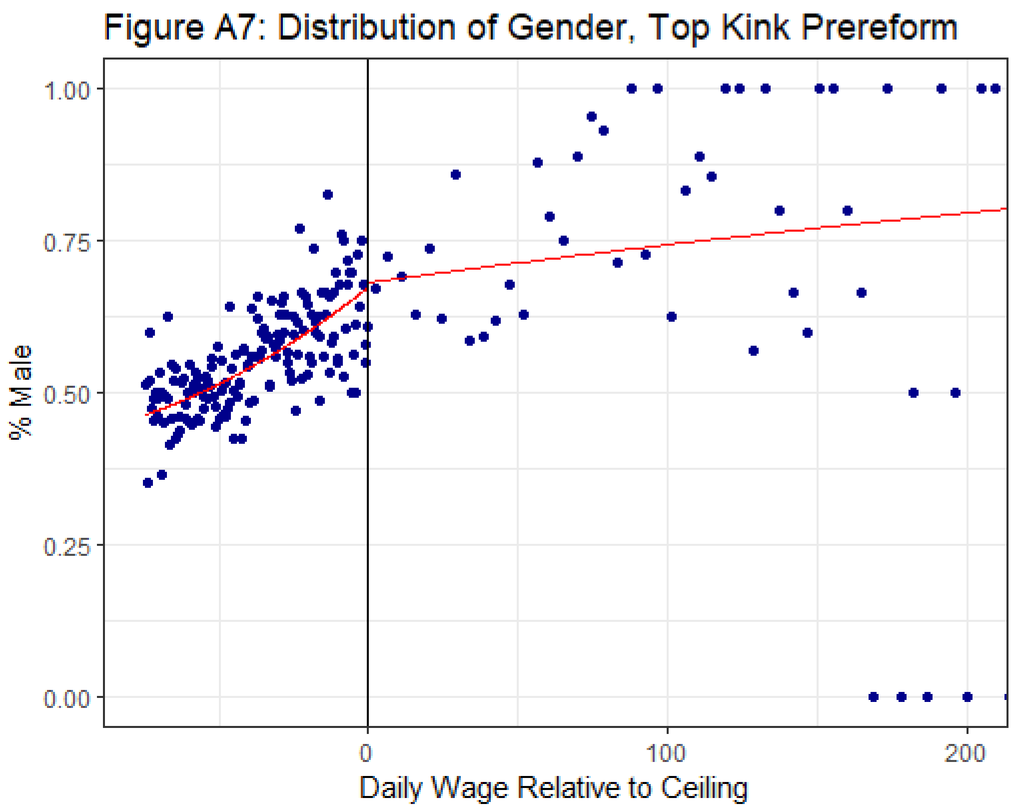


Figure A7: Distribution of Gender, Top Kink Prereform
% Male
1.00
0.75
0.50
0.25
0.00
0
100
200
Daily Wage Relative to Ceiling

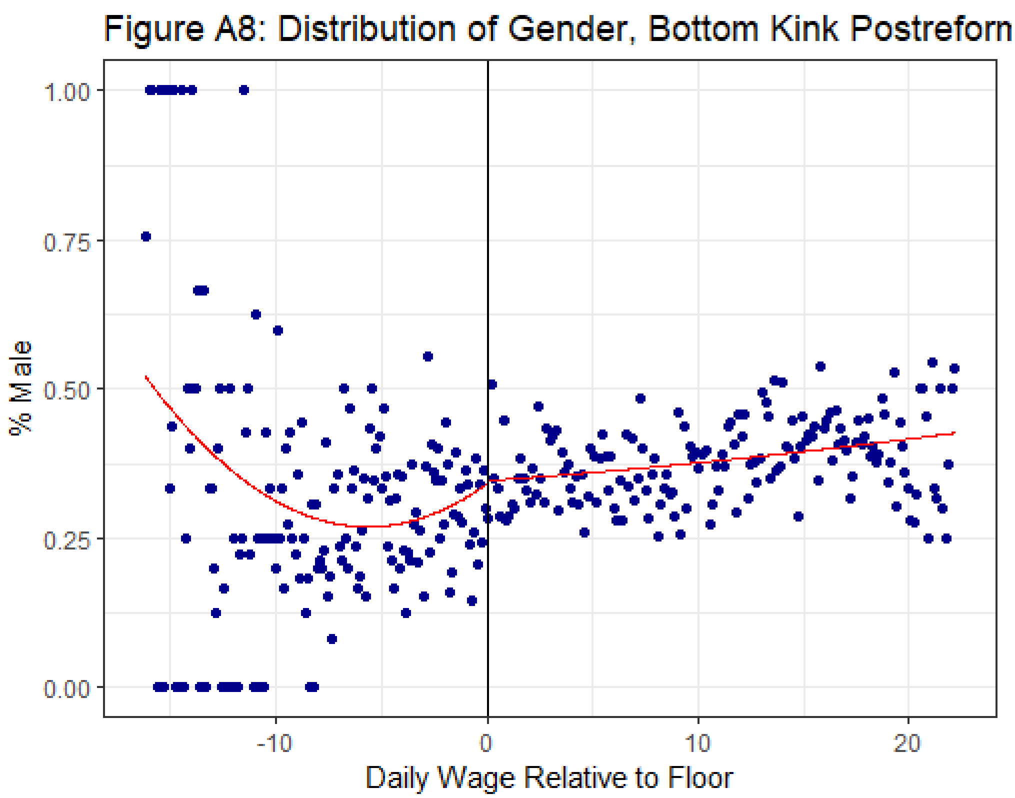


Figure A8: Distribution of Gender, Bottom Kink Postreform
% Male
1.00
0.75
0.50
0.25
0.00
-10
0
10
20
Daily Wage Relative to Floor

Figure A9: Distribution of Gender, Top Kink Postreform

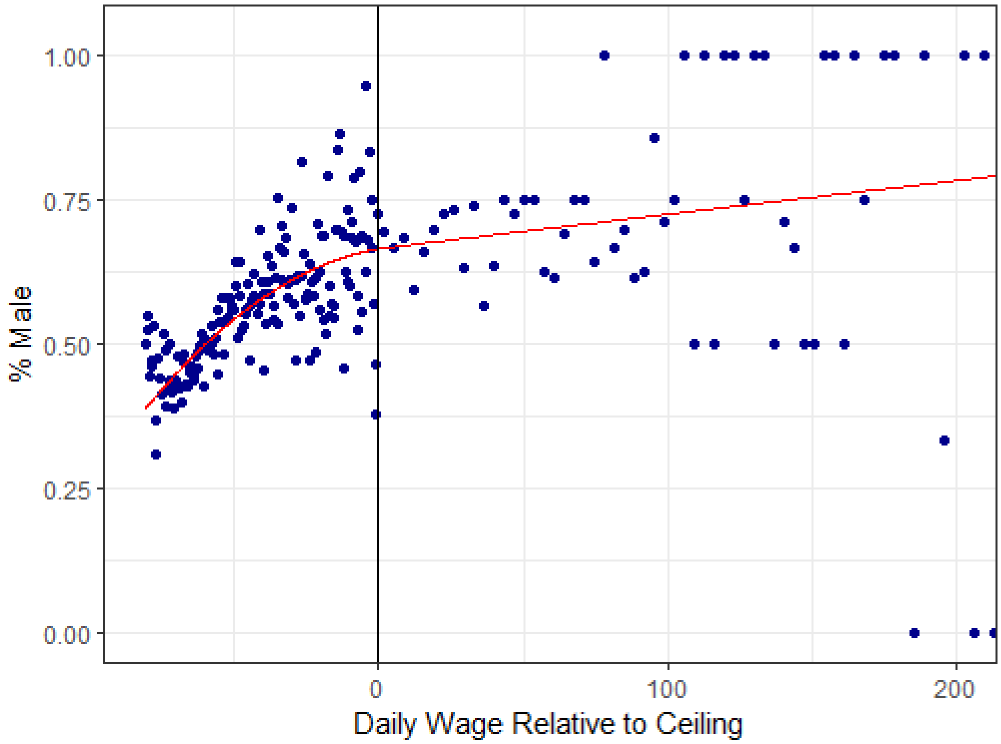


Figure A10: % of Bluecollar, Bottom Kink Prereform

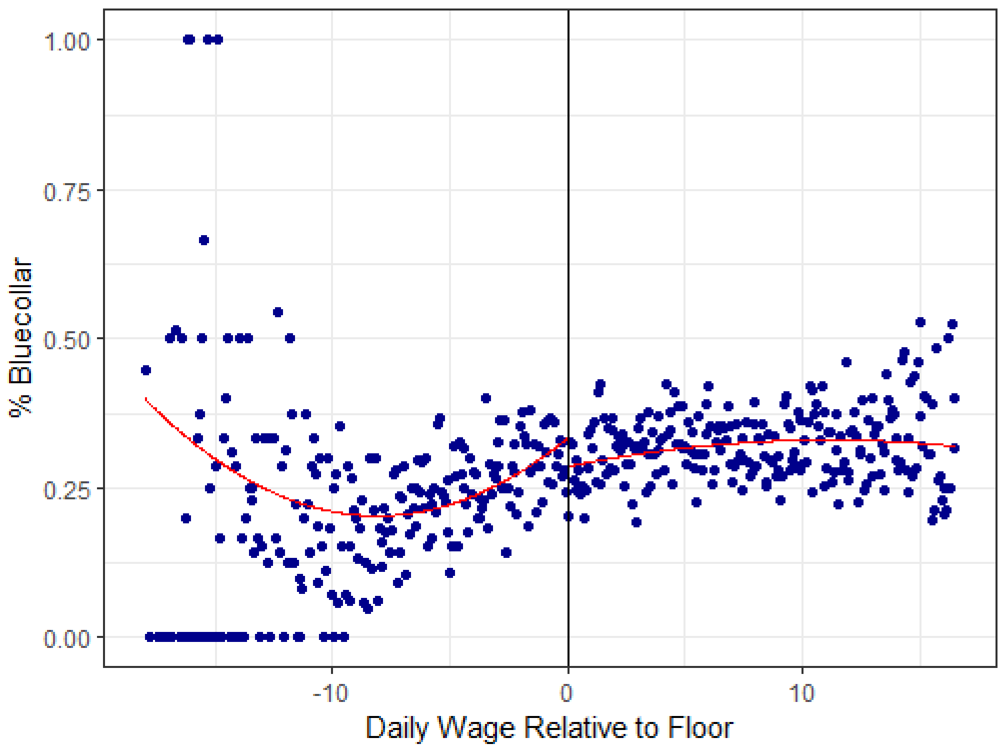


Figure A11: % of Bluecollar, Top Kink Prereform

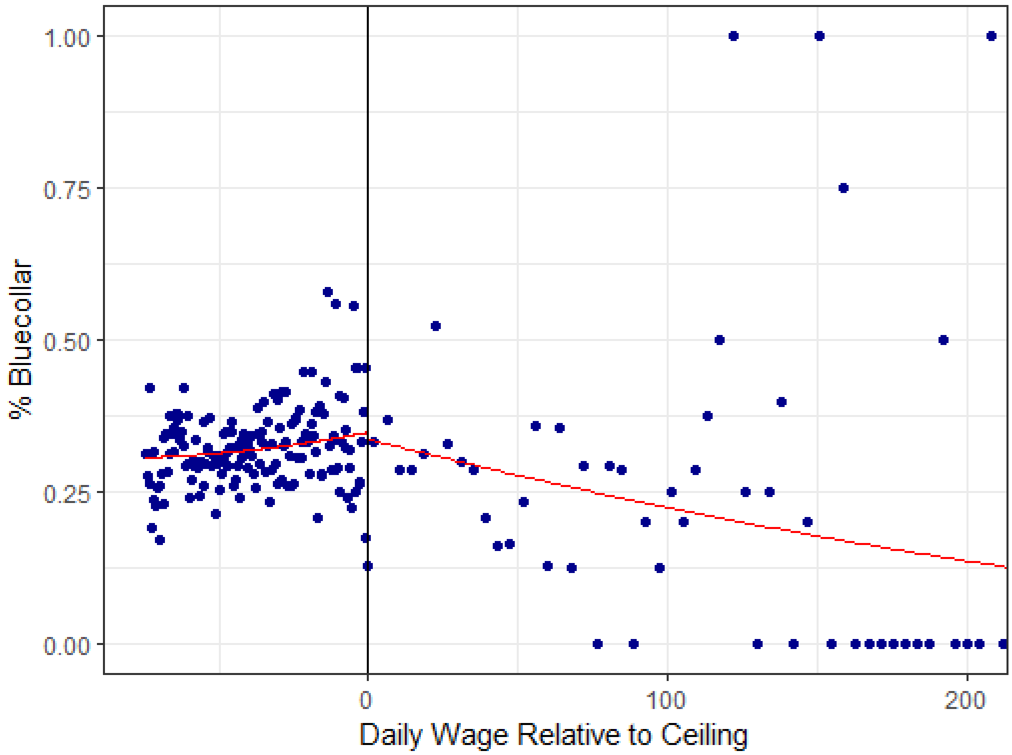


Figure A12: % of Bluecollar, Bottom Kink Postreform

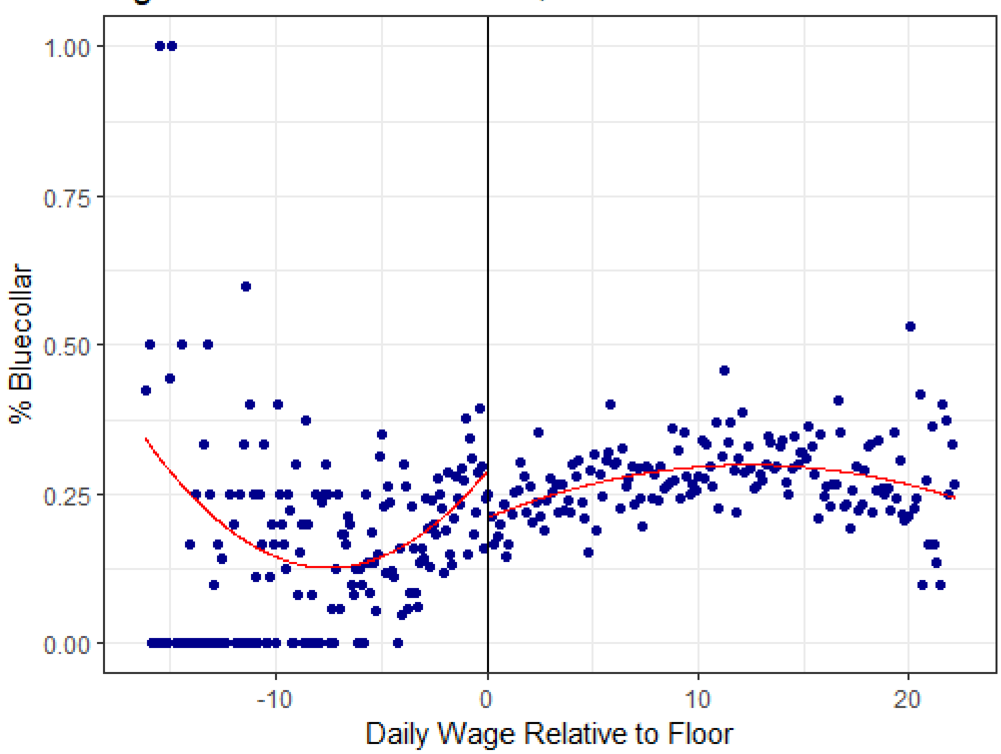


Figure A13: % of Bluecollar, Top Kink Postreform

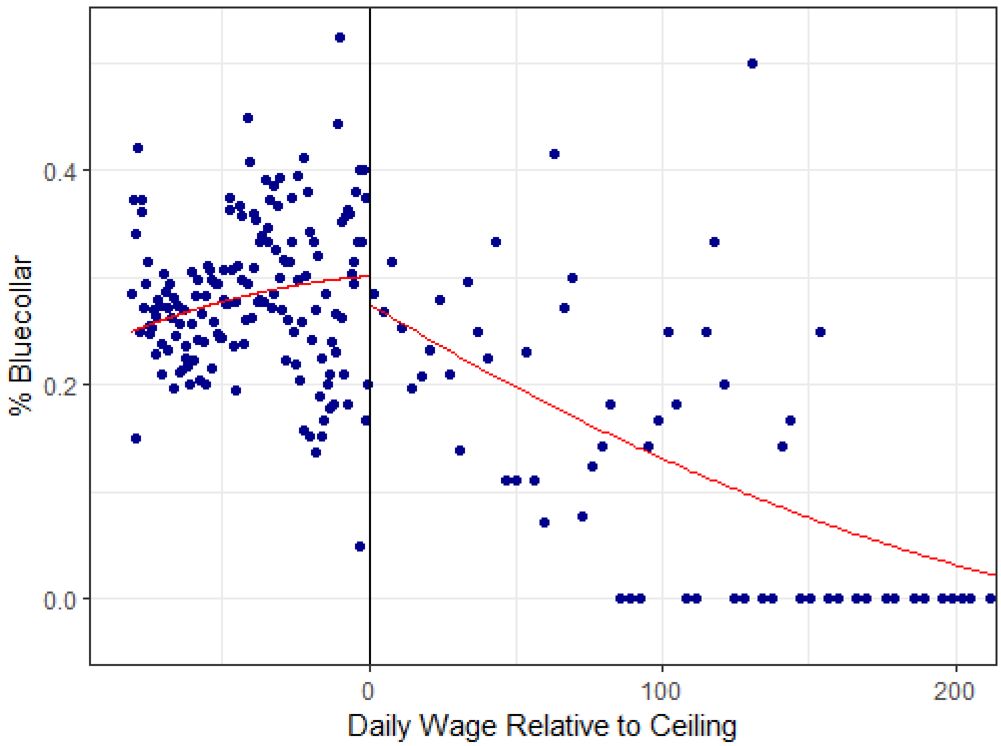


Figure A14: Avg Education Length, Bottom Kink Prereform

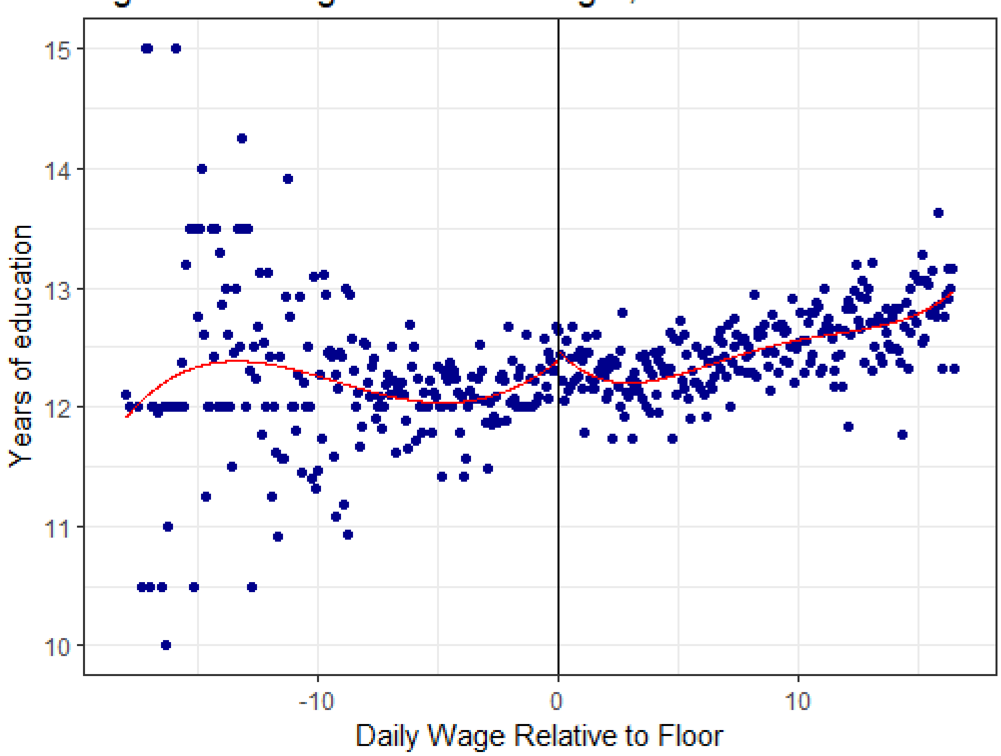


Figure A15: Avg Education Length, Top Kink Prereform

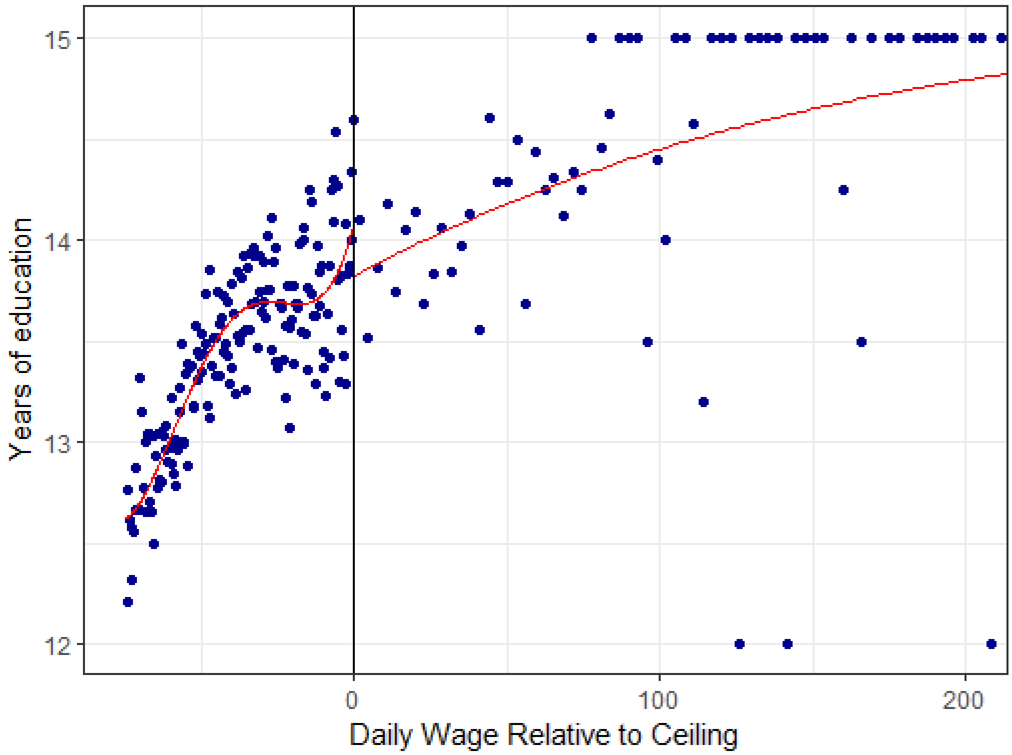


Figure A16: Avg Education Length, Bottom Kink Postreforn

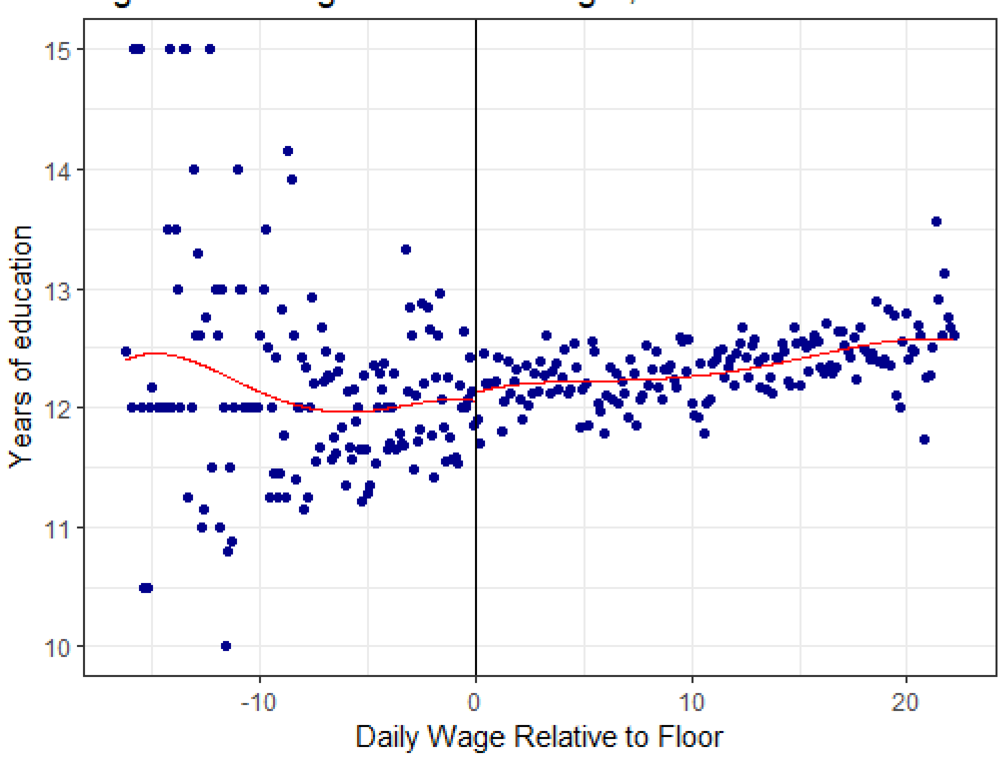


Figure A17: Avg Education Length, Top Kink Postreform

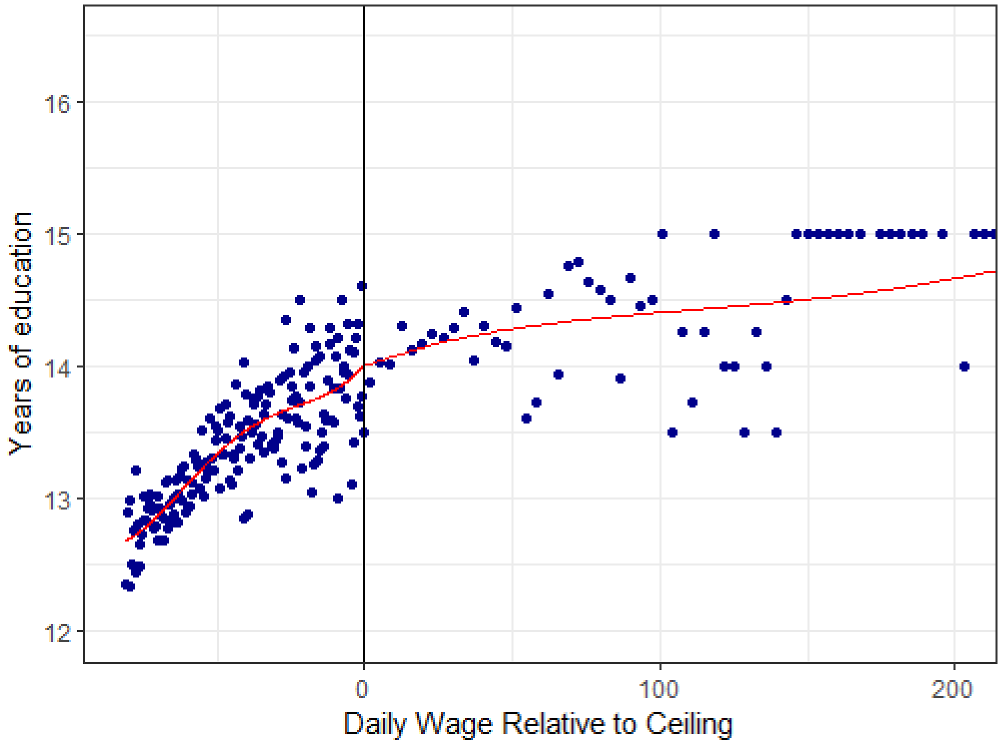


Figure A18: Avg Age, Prereform Bottom Kink

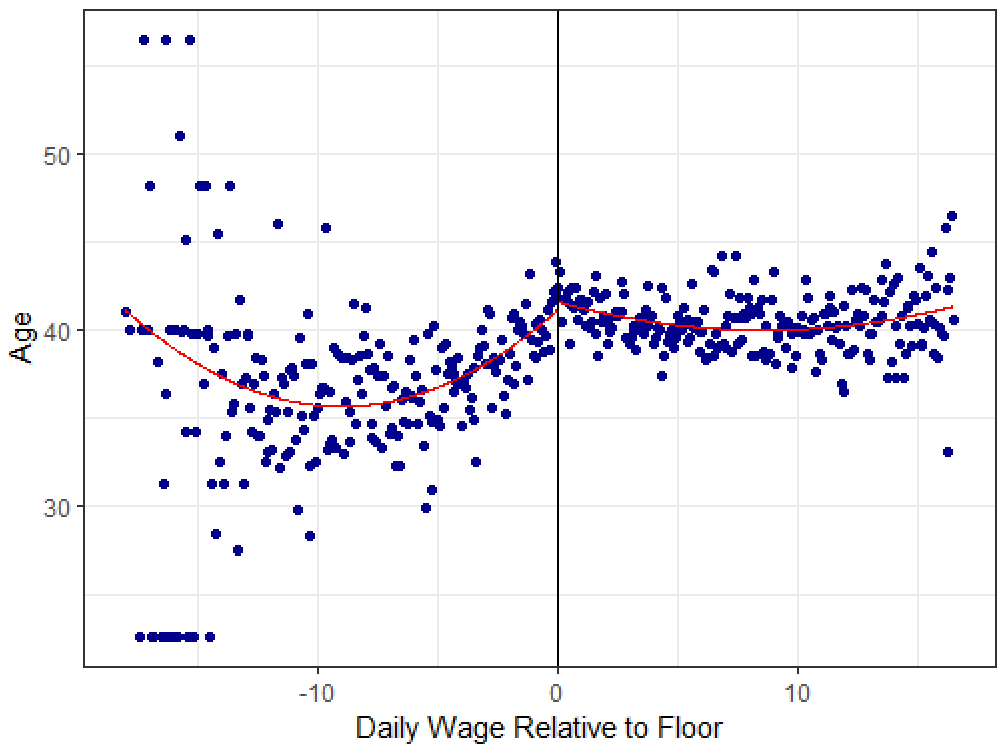


Figure A19: Avg Age, Prereform Top Kink

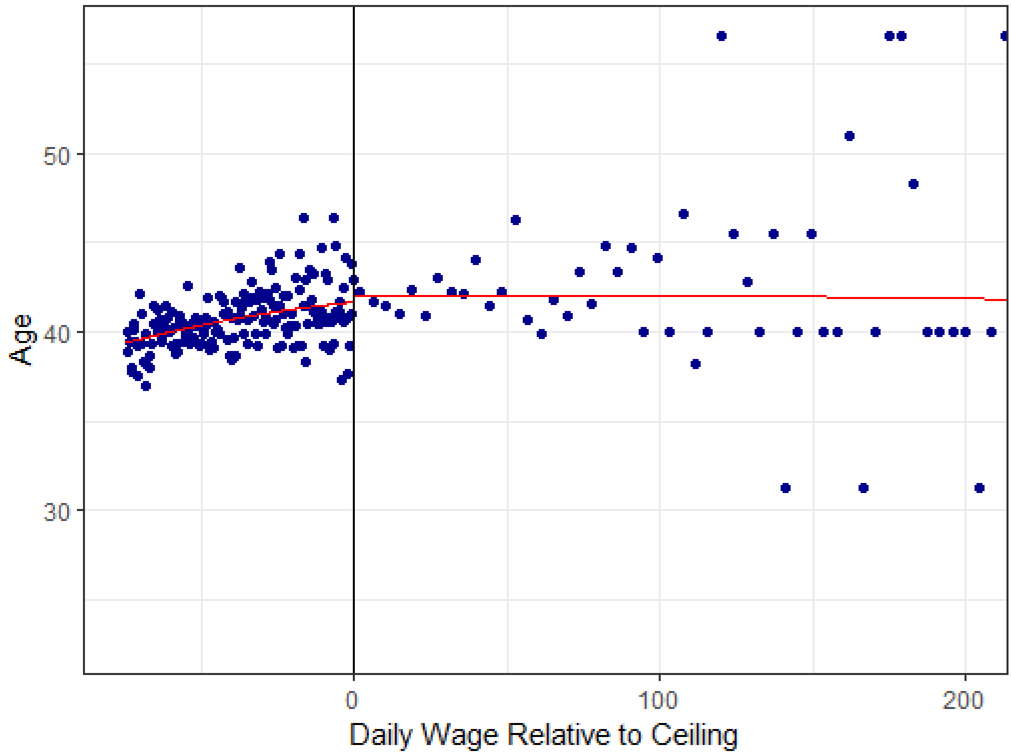


Figure A20: Avg Age, Postreform Bottom Kink

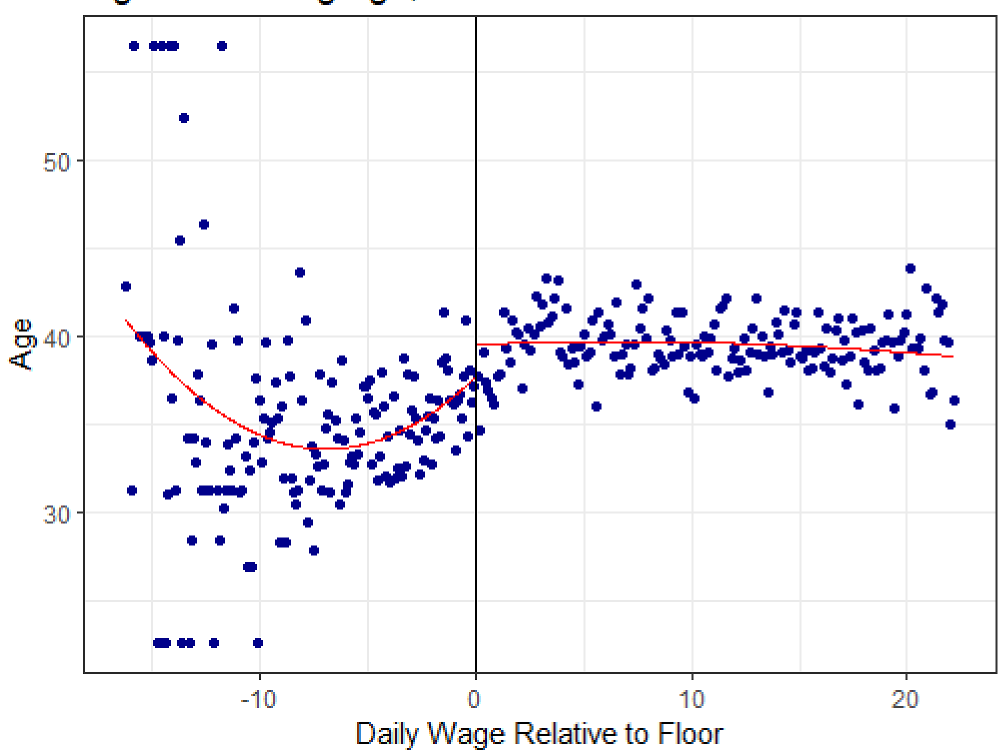


Figure A21: Avg Age, Postreform Top Kink

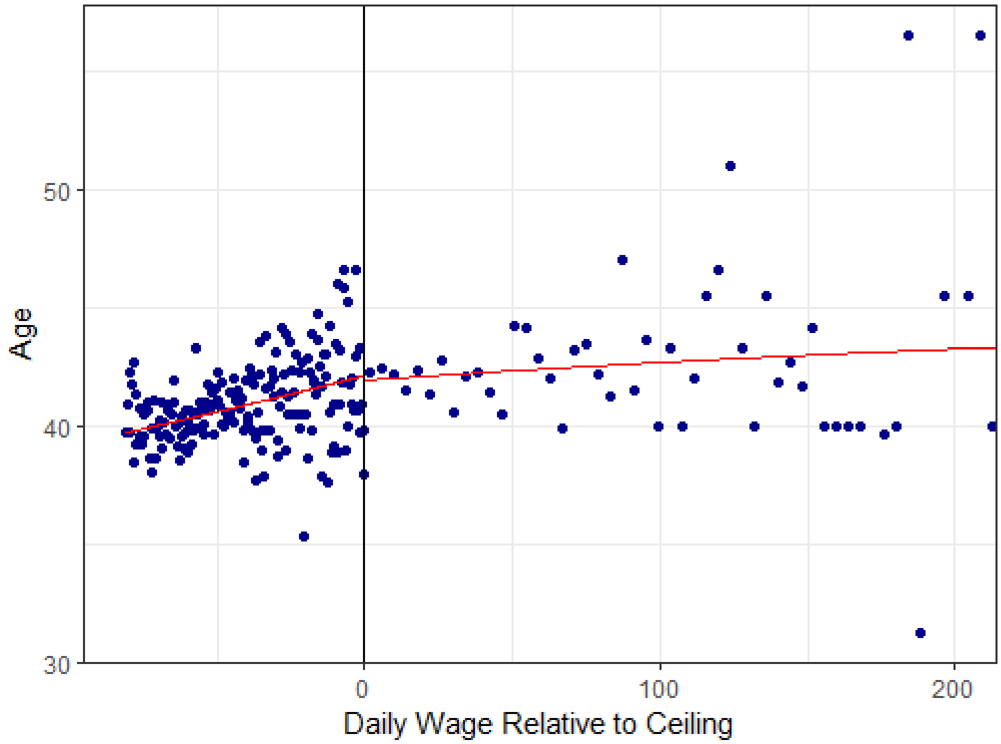


Figure A22: Maximum UI Days Prereform Bottom Kink

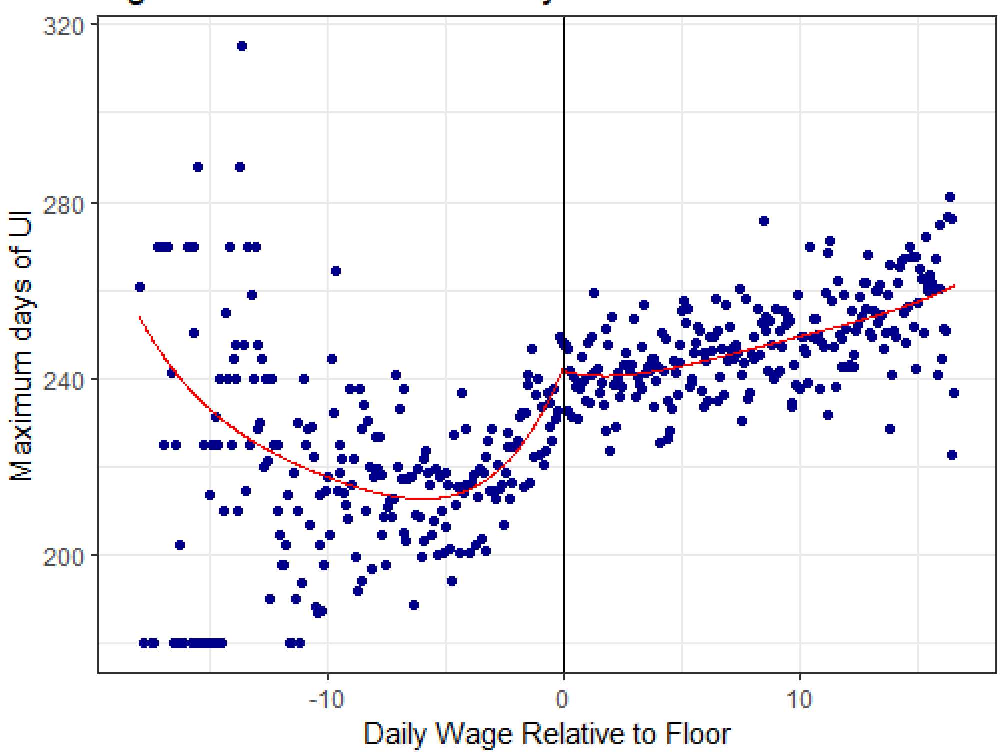


Figure A23: Maximum UI Days Prereform Top Kink

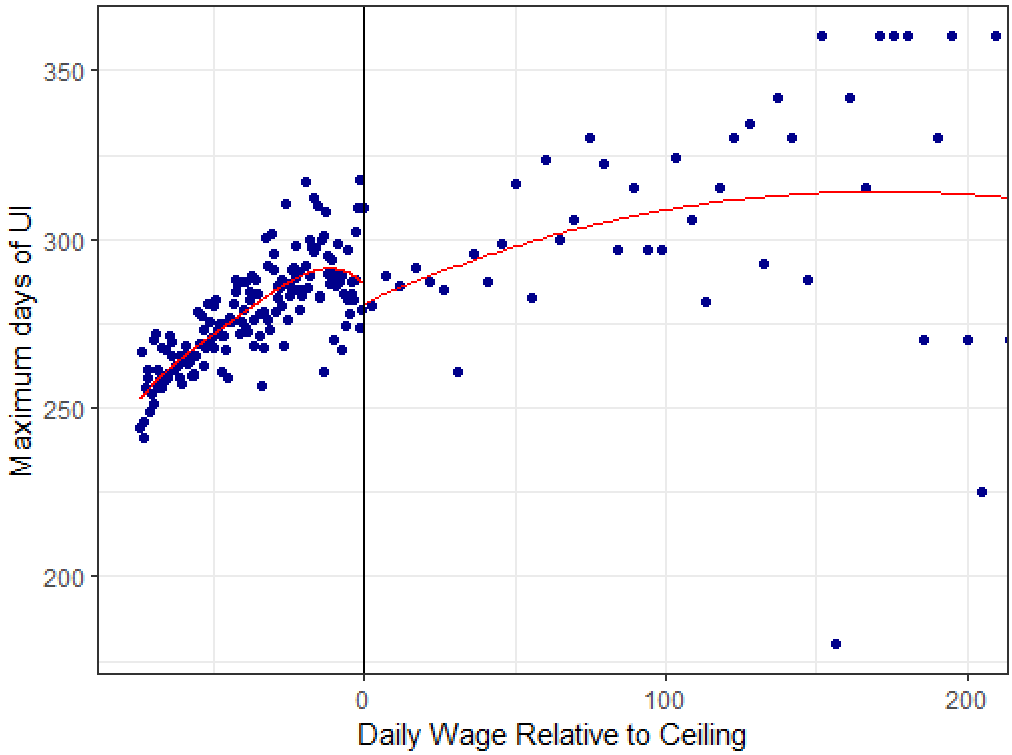


Figure A24: Maximum UI Days Postreform Bottom Kink

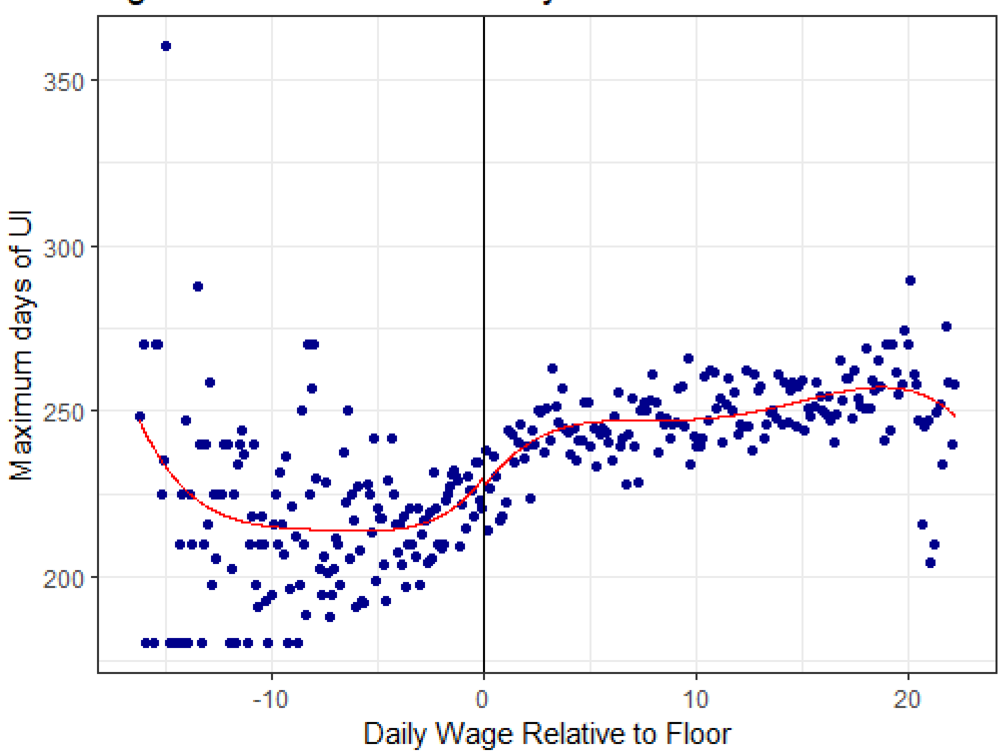


Figure A25: Maximum UI Days Postreform Top Kink

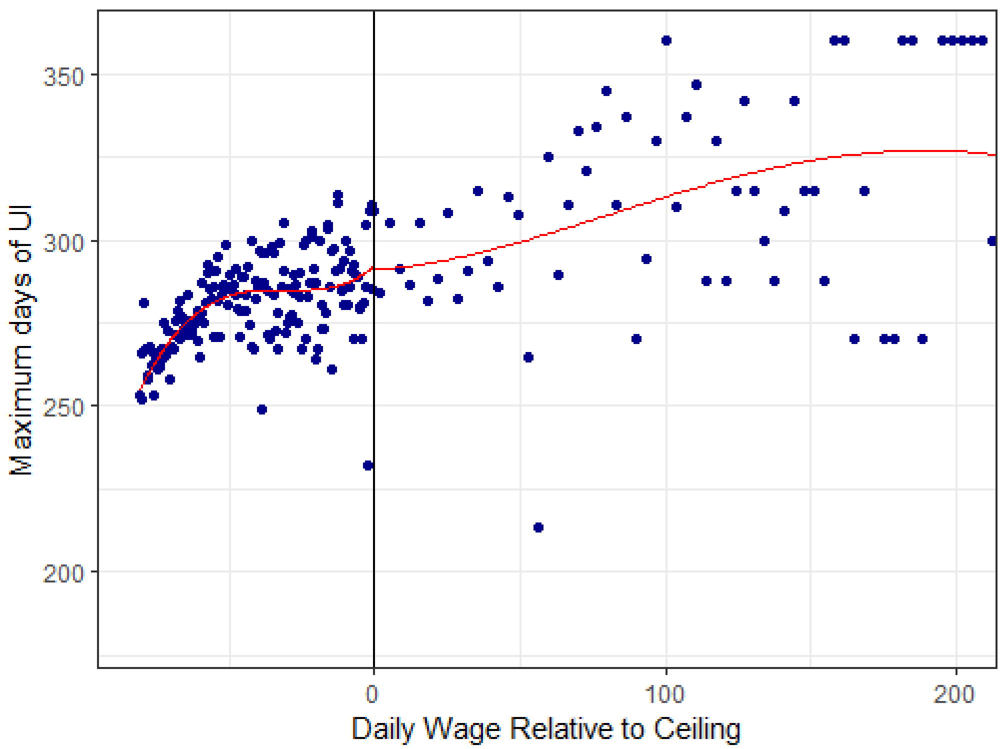


Figure A26: Daily UIB Benefits 2021 Bottom Kink

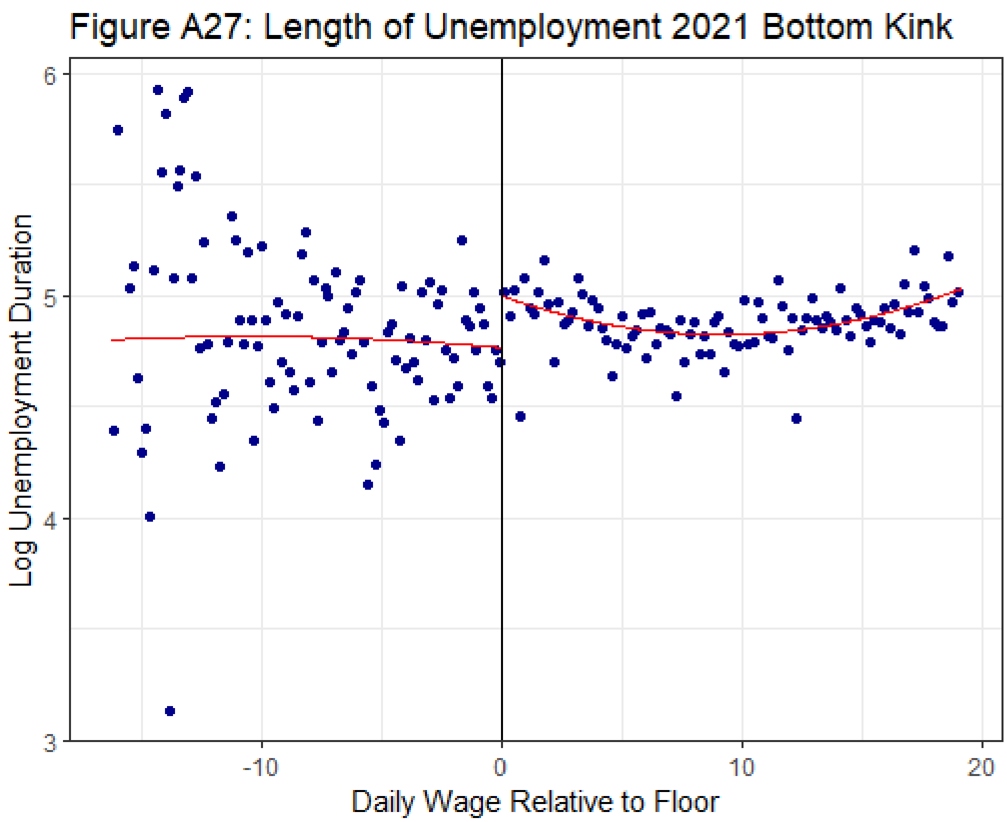


Figure A27: Length of Unemployment 2021 Bottom Kink
Log Unemployment Duration
6
5
4
3
-10
0
10
20
Daily Wage Relative to Floor

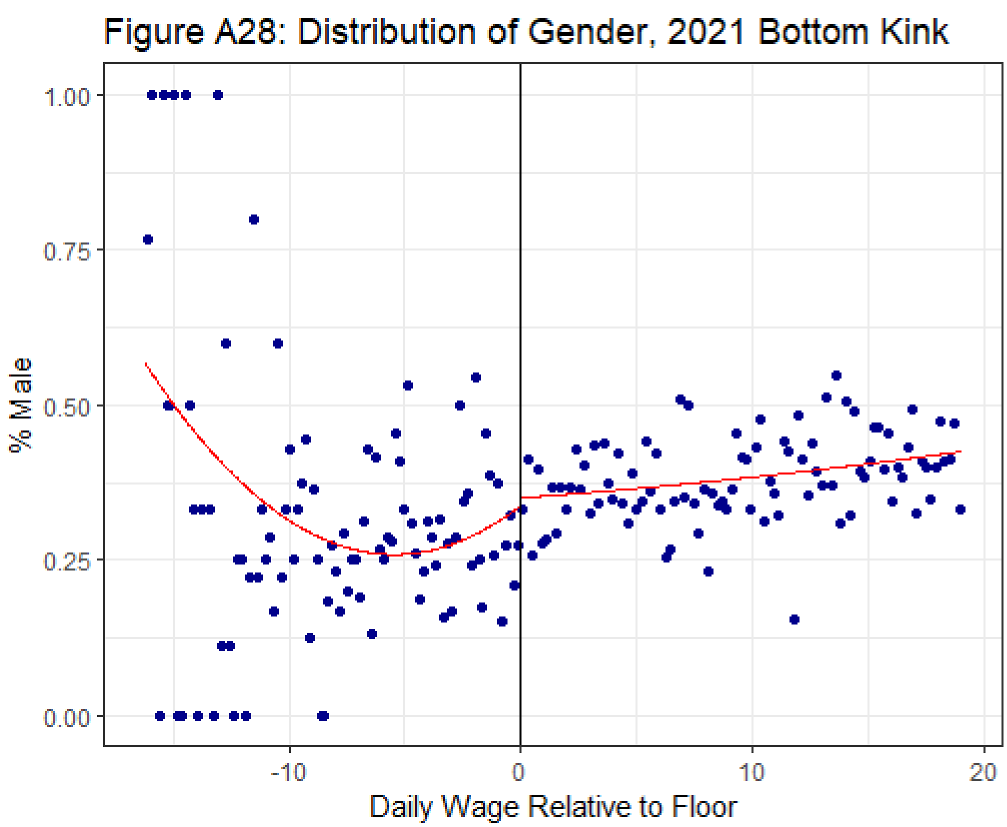


Figure A28: Distribution of Gender, 2021 Bottom Kink
% Male
1.00
0.75
0.50
0.25
0.00
-10
0
10
20
Daily Wage Relative to Floor

Figure A29: % of Bluecollar, 2021 Bottom Kink

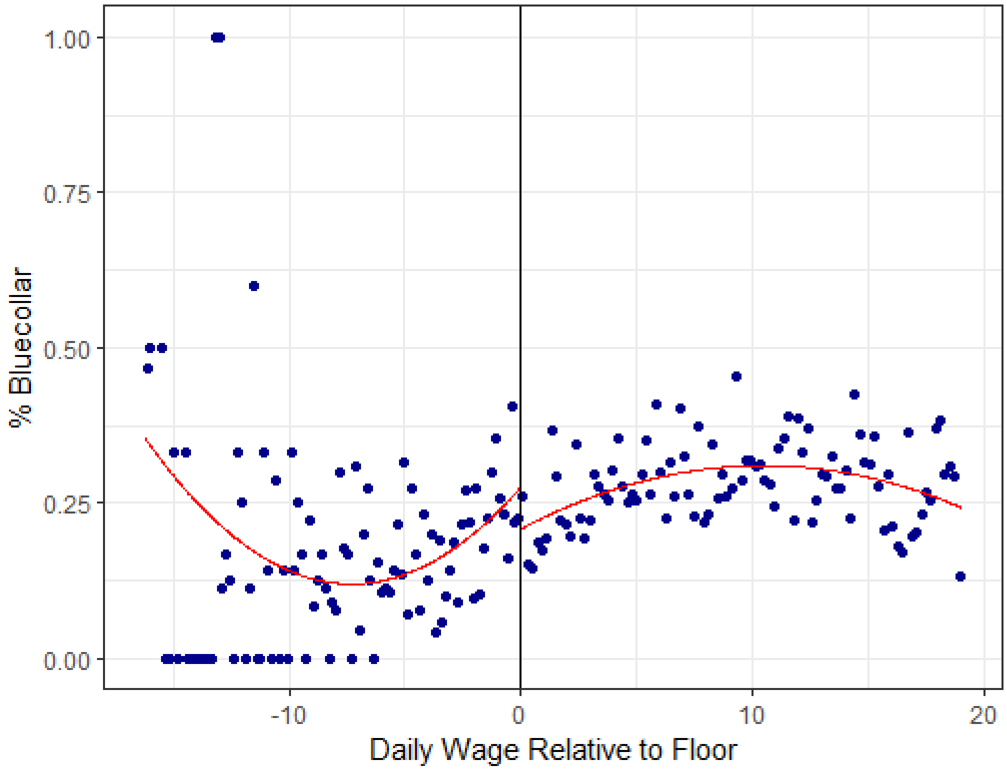


Figure A30: Avg Education Length, 2021 BK

Figure A31: Avg Age, 2021 Bottom Kink

Figure A32: Maximum UI Days 2021 Bottom Kink

Table A1: Linear Elasticity Estimate with Redundancy payment

	Bottom Kink	Top Kink
Prereform CCT	-0.148(0.985)	-0.647(0.906)
Bandwidth	5,776	1,423
Postreform CCT	-1.659(1.976)	0.099(0.784)
Bandwidth	2,183	992

Notes: standard error reported in parentheses. P-value significance at 1%/5%/10% represented by ***/**/* respectively. The estimates represent τ from Equations 2 and 3. To obtain elasticity estimates with robust standard errors, instrumental 2sls regressions are ran as described in Card et al. (2012). Redundancy payments included in calculation of average UI payments.

Table A2: Linear Elasticity Estimate by Max Duration

Prereform	Bottom Kink	Top Kink
180	-1.499(0.883)*	-2.082(1.366)
270	-1.074(1.136)	-0.508(1.787)
360	-0.556(1.465)	-0.543(0.877)
Postreform		
180	-0.221(1.164)	-1.432(1.991)
270	2.103(3.888)	1.95(4.699)
360	2.278(3.827)	-0.004(1.549)

Notes: standard error reported in parentheses. P-value significance at 1%/5%/10% represented by ***/**/* respectively. The estimates represent τ from Equations 2 and 3. To obtain elasticity estimates with robust standard errors, instrumental 2sls regressions are ran as described in Card et al. (2012).

Table A3: Linear Elasticity Estimate with Potential UI

	Bottom Kink	Top Kink
Prereform	-1.944(1.197)	-1.228(0.763)
Postreform	0.272(2.519)	0.5391.249)

Notes: standard error reported in parentheses. P-value significance at 1%/5%/10% represented by ***/**/* respectively. The estimates represent τ from Equations 2 and 3. To obtain elasticity estimates with robust standard errors, instrumental 2sls regressions are ran as described in Card et al. (2012). Potential UI is the average of UI payments if the worker receives them for as long as possible.

Table A4: Linear Elasticity Estimate by Year

Prereform	Bottom Kink	Top Kink
2017	-4.165(1.886)**	
2018	-2.552(1.376)*	0.954(2.246)
2019	-1.512(1.826)	-1.316(1.563)
2020	-0.338(1.919)	-0.708(1.013)
Postreform		
2020	-0.55(2.568)	1.356(2.904)
2021	5.912(2.729)**	0.979(1.614)
2022	-1.429(2.032)	-2.482(1.46)

Notes: standard error reported in parentheses. P-value significance at 1%/5%/10% represented by ***/**/* respectively. The estimates represent τ from Equations 2 and 3. To obtain elasticity estimates with robust standard errors, instrumental 2sls regressions are ran as described in Card et al. (2012).

Table A5: Linear Elasticity Estimate with CPI deflation

	Bottom Kink	Top Kink
Prereform	-2.248(0.915)**	-1.064(0.715)
Postreform	1.124(1.179)	-1.927(1.117)*

Notes: standard error reported in parentheses. P-value significance at 1%/5%/10% represented by ***/**/* respectively. The estimates represent τ from Equations 2 and 3. To obtain elasticity estimates with robust standard errors, instrumental 2sls regressions are ran as described in Card et al. (2012). 2017 used as a base year.

Resümee

Eesti töötushüvitiste mõju töötuse kestusele hindamine regressioonitõusu murdumise meetodiga

Käesoleva magistritöö eesmärk on analüüsida töötuskindlustushüvitiste suuruse ja töötuse kestuse vahelist seost Eestis. Töös kasutatud analüüsimeetod on regressioonitõusu murdumise meetod (Regression Kink Design - RKD), mis võimaldab leida lokaalse endogeensusest vaba hinnangu töötuskindlustushüvitise suuruse mõju kohta töötuse kestusele. Analüüs põhineb mittelineaarsustel, mis tekivad töötuskindlustushüvitiste ja töötaja varasemate palkade vahel, sest on kehtestatud miinimum- ja maksimumväärtused hüvitistele. RKD meetod kasutab neid mittelineaarsusi sarnaste töötajate omavaheliseks võrdlemiseks, kuid kellel on veidi erinevad asendusmäärad töötuskindlustushüvitistes. See lähenemisviis võimaldab uurida töötuse kestuse muutusi nendes punktides, pakkudes sisendi töötuskindlustushüvitisega kaasnevate käitumuslike riskide hindamiseks.

Uuring kasutab mikroandmeid Eesti Töötukassast, hõlmates töötuskindlustushüvitise saajaid aastatel 2017-2022. Uuringu meetod kontrollib esmalt murdepunktide ümbruses olevate palgajaotuste ja teiste tunnuste pidevuse, et valideerida RKD meetodit. Seejärel analüüsitakse murdepunktides nii töötuskindlustushüvitiste kui ka kestuse tõusunurkade muutusi.

Erinevalt varasematest uuringutest, näitab käesolev töö, et enamikul juhtudel ei ole töötuskindlustushüvitiste suurusel olulist mõju töötuse kestusele murdepunktides. Ainus erand on statistiliselt oluline elastsus, mis leiti 2021. aastal alumises murdepunktis olevate töötajate jaoks, mida võib seostada 2022. aasta majanduslangusega. Töö tulemused näitavad seega, et tavalistes majanduslikkudes tingimustes on töötuskindlustushüvitistega seotud moraalirisk Eestis minimaalne. Seetõttu soovitab töö, et töötuskindlustuseprogrammi võiks muuta, suurendades hüvitiste põranda ja lae suuruseid, kartmata, et see mõjutab töötuse kestust.

Märksõnad: töötukindlustus, töötukestus, moraalse ohtu, Eesti

JEL Klassifikatsioon: J65, J68

CERCS Klassifikatsioon: S180, S215

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