Empirical Exercise

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CASH-ON-HAND AND COMPETING MODELS OF INTERTEMPORAL BEHAVIOR: NEW EVIDENCE FROM THE LABOR MARKET (Card et.al. 2007)

1 Institutional Context

The labor market in Austria is characterized as an optimal blend of institutional regulation and flexibility. Their dynamics of job creation and job destruction are well-balanced, akin to the situation in the United States. Severance pay, a critical component of firing regulations in Austria, was first introduced in 1921 solely for white-collar workers. This provision was subsequently extended to all the categories of workers in 1979. Severance payments are disbursed within one month of job termination and are not subject to social security taxes.

Eligibility for severance pay in Austria is strictly confined to individuals with at least three years of employment tenure. According to this stipulation, employees with less than 36 months (about 3 years) of service are ineligible for this benefit. The amount of severance pay is calculated as two months of the employee's pre-tax salary, averaging 2,300 euros across observed cases. This regulation excludes construction workers, who are subject to alternate severance pay regulation, and therefore, they are omitted from this analysis. Additional exclusions apply to employees in public sectors like schools and hospitals, owing to their fixed-term employment contracts.

The laid-off workforce is eligible for unemployment benefits if they can present evidence of sufficient work history. However, unlike severance pay, unemployment insurance can be claimed by the individuals who have worked for twelve months or more in the two years preceding their job loss. Workers who are laid off by their employers are immediately eligible for benefits, while those who voluntarily leave or are fired for a reasonable cause undergo a four-week waiting period. Furthermore, there are different unemployment insurance slabs applicable depending on the duration of job tenure in the past five years to the current job loss. Individuals with less than 36 months of employment in the past five years receive twenty weeks of benefits, while those who have worked for at least 36 months of employment in the last five years receive thirty weeks of benefit. Unemployment insurance is also referred to as extended benefits. At the end, if unemployed individuals exhaust their extended benefits, they can also claim means-tested secondary benefit, known as "unemployment assistance" UA which amounts euros equivalent of an average family income until they find the next job. The receipt of severance pay does not affect any of the extended employment benefits.

2 Internal Validity

This investigation is based on data obtained from the Austrian Social Security Registry 1980-2001. The dataset provides comprehensive daily records on employment status, unemployment and non-employment duration, annual earnings of the employees, as well as demographic characteristics of the firms and the workers. It is integrated with additional information regarding education and marital status obtained from the Austrian unemployment registers, which are available from 1987 to 1998. The authors leverage a quasi-experimental design induced by Austria's institutional arrangements to rigorously examine the discontinuities in severance pay and unemployment benefits, enabling a sharp regression discontinuity (RD) analytic framework. From this rich dataset, the analysis excludes any job terminations followed by an unemployment claim that did not result in retirement within the same calendar year, alongside roles in the public sector, services industry, and construction sector due to their distinct regulatory frameworks.

The refined sample consists of 650,922 job losses, selectively filtering out individuals under 20 or over 49 years of age, those employed less than a year or over five years, voluntary quitters, and any instances of rehiring by the same employer. This strategic sample refinement helps ensure that the empirical findings are representative of the broader population of individuals experiencing job loss. The sample included individuals who lost job more least once. The dataset shares 84% of single job loss, two job losses for 13%, and 3 or more job losses for the remaining 3% of individuals. The final analysis sample is slightly younger, more likely to be female, and a little less likely to hold Austrian citizenship than the overall workforce. Job losers also earn lower wages than workers as a whole. However, overall characteristics of the job losers in the paper's analysis are fairly similar to those of the broader set of job losers (see Table 1). This will be suggestive of that fact that the authors' empirical results are likely to be representative of the population of job losers.

The overlapping discontinuity of the kind of benefits- severance pay and unemployment insurance creates a "double discontinuity." The authors identify each of these to be a discontinuous function of different running variables and decompose it into a extended model:

$$y = \alpha + S\beta_{\text{sp}} + E\beta_{\text{eb}} + \varepsilon,$$

$$E[\varepsilon | JT, MW] = g(JT, MW).$$

Where g(JT, MW) is defined as the control function that can be approximated by a lower order polynomial of JT and MW. The authors also suggest an alternative way to deal with it is to pick such a sub sample for analysis on which the threshold never coincides.

The key identifying assumption here is that workers laid off just before and after the 36 months cut-off for severance pay are as good as randomly assigned. A potential concern of self-selection around the validity of the identification assumption is that firms may fire workers prior to 36-months threshold in order to evade from severance pays or do relatively less beyond the threshold. Compliance with the severance pay law is believed to be universal in Austria due to rigorous monitoring by works councils and the imposition of legal penalties for non-compliance. The fact that that layoffs at firm with

more than five workers is first approved by the Works Council suggests an existence of fair system of checks and balances in case of violations, tarnishing also firm's reputation. The authors have tried to test the practice of selective firing mechanism by

1. Investigating whether there is spike in layoffs at 35 months, or a relative shortfall in the number of people who have been fired just above the threshold of 36 months. (see Appendix Figure II)

2. Checking whether there is potential differences in sample composition by investigating the variation in observable characteristics such as average work histories of those around the 36 month threshold, and mean wages of those laid-off at different job tenures (see Appendix Figure IIIa & IIIb).

3. Evaluating average predicted hazard ratios by tenure-month category using a Cox Proportional Hazard Model (see Appendix Figure IV).

Another assumption is to implement RD is that people with MW just near the 36 months cut-off would be similar in observable and expected unobservable characteristics. Similar validity checks are conducted for extended benefits status against the number of months worked (MW) in the last five years before job termination. The authors find no discontinuity in the relative number of layoffs, no significant jump in mean wages, and in the predicted hazard rates. Therefore, EB status is also 'as good as randomly assigned' on either side of the cut-off of 36 months.

Card et al., 2007 have excellently exploited Graphical Analysis to map the relationship between the running variable and the factors that may impact our outcomes of interest. Lee and Lemieux, 2010 have recommended such visual inspection of the discontinuity at the cut-off point. From my understanding after referring Lee and Lemieux, 2010, following tests could be performed to test the validity of the RD design

1. Inspecting the histogram of the running variable (here job tenure). The local random assignment in RD rests on the assumption that individuals have an imprecise control over the assignment variable. Even though we cannot test this directly, we can detect whether its aggregate distribution is discontinuous. McCrary, 2008 has devised a method to execute this forward in two step procedure. In the first step, the running variable is partitioned into equally spaced bins and frequencies are computed within those bins. The second step treats the frequency count as a dependent variable in a local linear regression. However, McCrary, 2008 points this to be not a conclusive test of the RD identification condition.[1]

2. It is also suggested to inspect Covariate Balance around the cutoff i.e. observations just above or below the cutoff should be similar in terms of observed characteristics to serve as a good counterfactual to each other.

3. Employing Placebo Tests or Falsification Tests: By implementing the RD design in the running variable other than the actual cutoff can be helpful to pin down the causal impact of a program at the cut-off.

[1]The test may fail to detect violation of RD identification condition if for some individuals there is a "jump" up in the density, offset by jumps "down" for others, making the aggregate density continuous at the threshold. McCrary (2008) also argues the possibility that the RD estimate could remain unbiased, even when there is important manipulation of the assignment variable causing a jump in the density.

4. Lee and Lemieux, 2010 also suggest exploring the sensitivity of results to a range of bandwidths, and a range of orders to polynomials. A useful graphical device used by Card et al., 2009 for illustrating the sensitivity of the results to bandwidths is to plot the local linear discontinuity estimate against a continuum of bandwidths.

3 Key Results and Findings

Figure V (see Appendix) suggests that the nonemployment duration increases by 10 days (about one and a half weeks) at the threshold for severance pay eligibility. This observed increase, however, cannot be solely attributed to severance pay due to potential confounding effects from extended unemployment benefits. Subsequent analyses (see Appendix Figure VI) adjusting for these dual influences reveal a decrease in the reemployment likelihood at the severance pay eligibility threshold, quantified as a 10% reduction in the hazard rate of finding new employment. Therefore, the jump in Figure V can be attributed to the effect of severance pay. These insights are critical for understanding the multifaceted impact of severance pay and unemployment benefits on labor market outcomes.

$$
\begin{aligned}
h_d = \alpha_d \exp\Big(&\theta_{13} \cdot I(JT = 13) + \cdots + \theta_{34} \cdot I(JT = 34) \\
&+ \theta_{36} \cdot I(JT = 36) + \cdots + \theta_{58} \cdot I(JT = 58) \\
&+ \theta \times E + \theta_1 MW + \theta_2 MW^2 + \theta_3 MW^3 \\
&+ \theta_1^E \times (MW - 36) + (\theta_2^E \times (MW - 36)^2) \\
&+ (\theta_3^E \times (MW - 36)^3)\Big)
\end{aligned} \tag{1}
$$

Similar analysis is replicated for Extended Benefits (EB). Figure VIIIa (see Appendix) suggest that the average nonemployment duration drops by seven days around the EB discontinuity. To deal with the double discontinuity, I find that there is a slight fall in the the average hazard rate (see Appendix Figure VIIIb). However, the authors find that there is a sudden fall of approximately 7% in the average hazard rate at the cutoff for EB eligibility. Table II presents the estimated effect of SP and EB on nonemployment duration.

TABLE II
EFFECTS OF SEVERANCE PAY AND EB ON NONEMPLOYMENT DURATIONS: HAZARD MODEL ESTIMATES

	(1) No controls	(2) Basic controls	(3) Full controls	(4) >=4 layoffs by firm
Severance Pay	-0.146***	-0.128***	-0.0888***	-0.163***
	(0.0174)	(0.0186)	(0.0254)	(0.0602)
Extended benefits	-0.0994***	-0.0697***	-0.0924***	-0.0955
	(0.0163)	(0.0174)	(0.0236)	(0.0616)
Sample Size	650,922	565,835	292,165	48,390

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Hazard Ratios: Provide an intuitive measure of risk. However, coefficients (Beta) here indicate the effect on the log hazard rate; a one-unit increase in the variable increases the log hazard by the coefficient value. Negative values indicate a protective effect.

The authors have attempted to explore further how the duration of job search affects the quality of the next job matches. Figure Xa (see Appendix) suggests that increased job search duration due to severance pay did not improve wage levels in the next job, and job leaving hazards are smooth around cut-off (see Appendix Figure Xb). Table III presented further estimations to double RD specifications.

TABLE III
EFFECTS OF SEVERANCE PAY AND EXTENDED BENEFITS ON MATCH QUALITY

	Dep. Variable: change in log wage		Dep. Variable: duration of next job	
	No controls (1)	Full controls (2)	No controls (3)	Full controls (4)
Severance Pay	-0.00944	0.00540	-0.0236*	-0.00913
	(0.00654)	(0.00764)	(0.0123)	(0.0184)
Extended benefits	-0.00183	-0.0160**	0.0114	0.0186
	(0.00637)	(0.00713)	(0.0117)	(0.0172)
Sample Size	553,607	260,024	601,152	275,904

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

4 Discussion

Proportional hazard model is a statistical tool to conduct survival analysis and evaluate not only if an event happens like using the logistic regression but also when it happens. In the context of Card et al., 2007, employing Cox proportional hazards model, the study assessed the timing and likelihood of reemployment subsequent to job loss, accounting for the duration of unemployment benefits received. This is extremely useful tool in public finance as it can assist in deciding for how long similar policy benefits should be financed and given to the beneficiaries to smooth consumption and improve their welfare. Cox

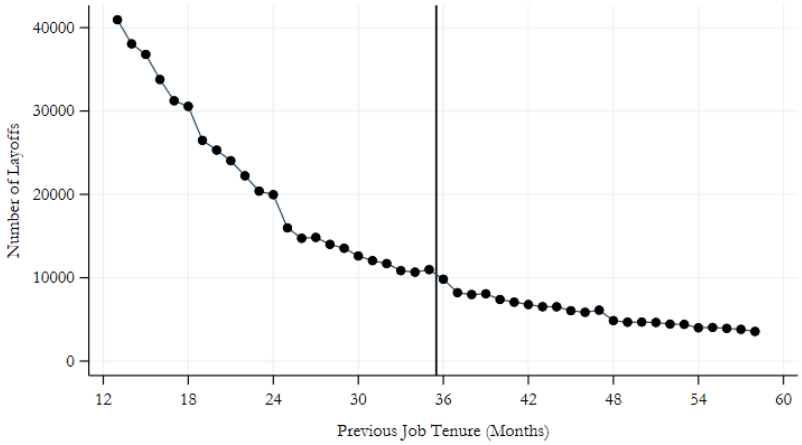
models also helped analyse the dynamic process of job searching over time by handling the time dependent covariates, which often causes issues in time series analysis due to complex dependency structures. This model is particularly advantageous for analyzing complex, time-dependent data structures typical of longitudinal employment studies such as this. While inspecting the validity of RD design and evaluating main results, Proportional hazard model also allowed to censor time dependent factors and study the required model specifications such as the effect of EB on nonemployment duration in the first twenty weeks. This model can be further utilized to check the robustness of findings in more refine censors.

Let us now discuss the negative sides of using the Proportional hazard model. Starting from a fundamental assumption on which the Proportional hazard model firmly stands, that the effects of the covariates are constant over time. It necessitates careful consideration to avoid bias in interpreting the results. The authors have excellently attempted to mitigate this issue by constructing rich models comprising of a comprehensive set of covariates and polynomial functions. Notwithstanding, such an approach may not always be appropriate given the assumptions.

Selective censoring in the proportional hazard models may sometime bias our estimates. Card et al., 2007 censor spells at 140 days to isolate the policy variables' effects, which might lead to information loss or bias if the censoring is not random. Another rising issue is associated with complexity in interpretation of interactions terms: When interaction terms are included (such as interactions with eligibility indicators and job tenure), interpreting the model can become complex, especially when trying to understand the effects of policy changes on job search behavior. If the likelihood of a job-finding event being censored is related to unobserved characteristics that also affect the hazard rate, this can lead to biased estimates. The potential for selective censoring and the intricate interplay of various model variables may further complicate the analysis, underscoring the need for meticulous model specification and robustness checks.

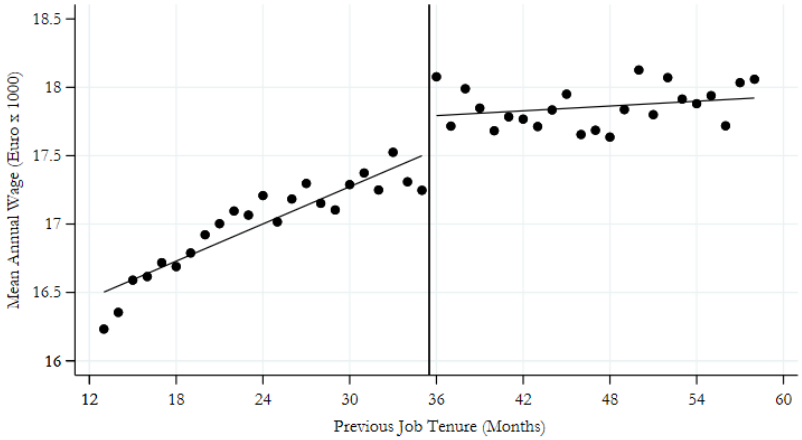
5 Appendix

Figure II
Frequency of Layoffs by Job Tenure



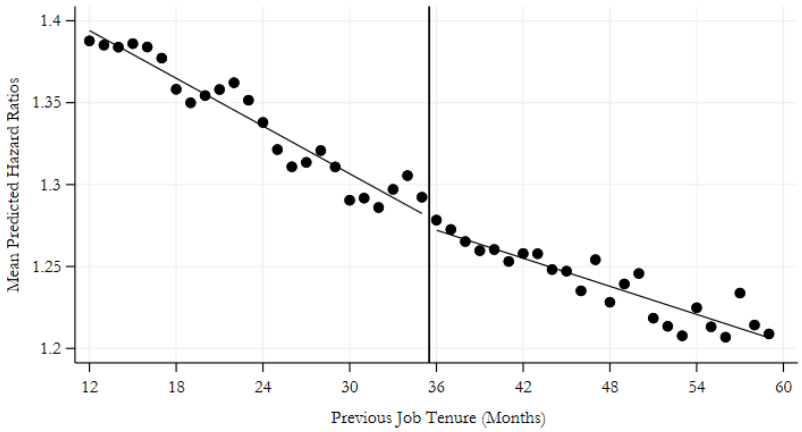
Note: The graph neither witness a jump in the layoffs around the 35-month threshold of job tenure, nor a shortfall in the number of people laid off immediately after the threshold. This is suggestive ofthe claim that firms do not engage in selective firing in order to evade severance payments

Figure III b
Wage by Tenure



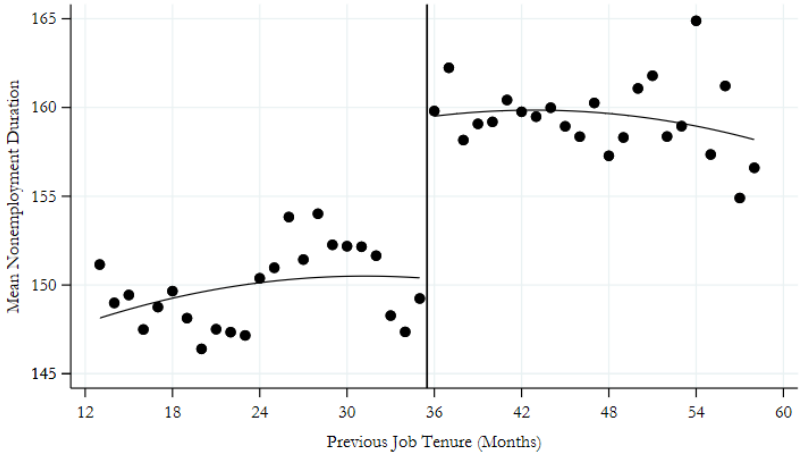
This figure plots the average annual wage in the final year of the job from which the individual was laid off. While there is a statistically significant jump observed in this graph, the authors emphasize the distinction between economic and statistical significance in a dataset of this size. They argue that unless there is a large correlation between wages and nonemployment duration, such a small jump in wages or any other observable characteristics do not have potential to cause bias in the estimates of severance pay on the search durations

Figure IV
Selection on Observables



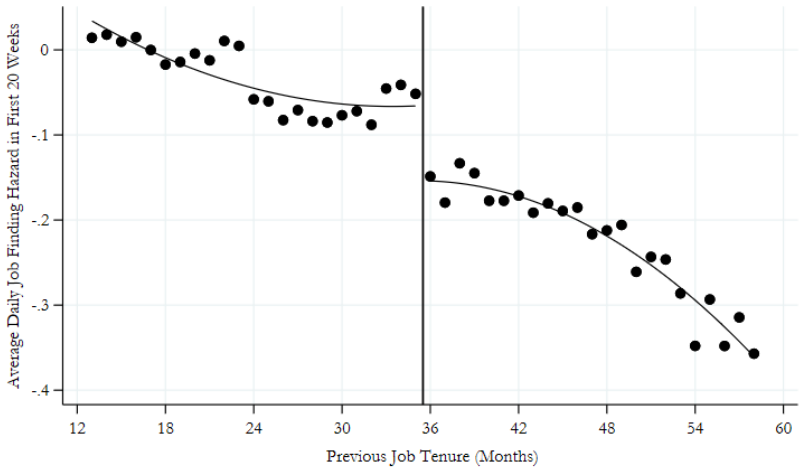
Note: This figure analysis how endogenous outcomes, such as number of previous jobs, the duration of the most recent spell, and wages are affected by the unobserved attributes. This would in turn affect the duration of job search which is likely to be correlated with these observed variables. However, there is no jump in the predicted hazard rates at the threshold of 36 months of job tenure. This concluded that individuals are nearly randomized around the cut-off, implying that any discontinuity in the search behavior at the cut-off can be reasoned as the causal effect of severance pay of other extended benfits

Figure V
Effect of Severance Pay on Nonemployment Durations



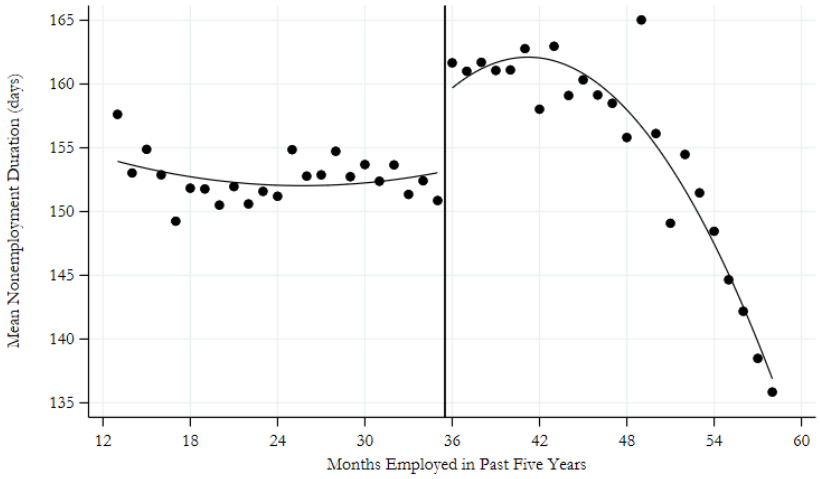
Note: This figure plots average nonemployment duration in each tenure-month category. Observations with more than two years of noneemployment duration are excluded. The smooth graph away from the JT = 36 threshold, implies that the average search duration are similar for people with similar job tenures in the absence of discontinuous severance pay rule

Figure VI
Effect of Severance Pay on Job Finding Hazards



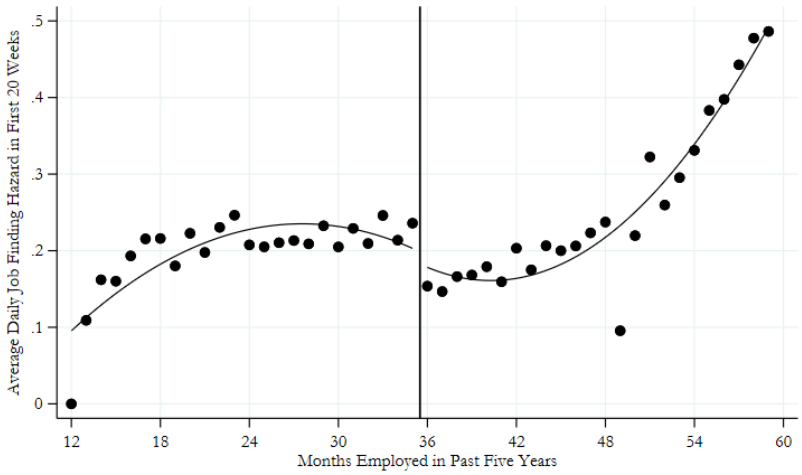
Note: The values in this plot can be interpreted as the percentage difference in the average job-finding hazard during the first twenty weeks after job loss between each tenure-month group and the group with 35 months of job tenure

Figure VIIIa
Effect of Benefit Extension on Nonemployment Durations



Note: While analyzing the effect of EB, the plot exclude the observations with a nonemployment duration of more than two years.

Figure VIIIb
Effect of Extended Benefits on Job-Finding Hazards



Note: This figure plots coefficients from the Cox model examining how the average hazard rate over the first twenty weeks of the spell vary around the EB discontinuity

Figure Xa
Effect of Severance Pay on Subsequent Wages

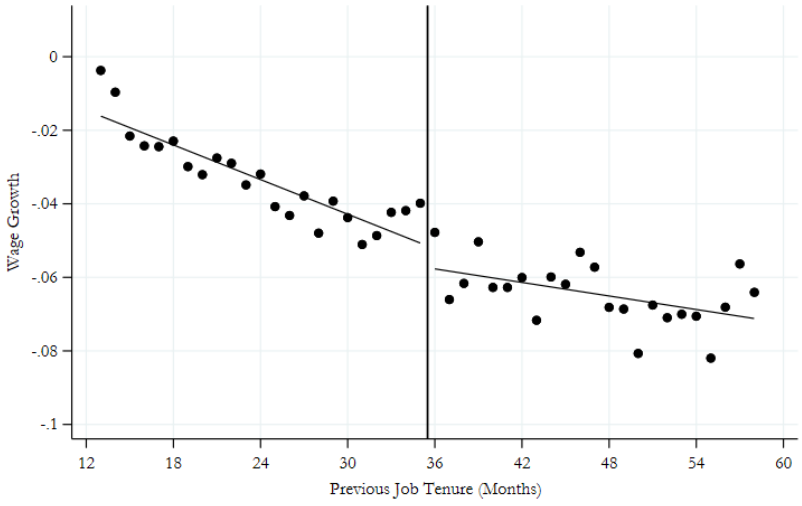


Figure Xb
Effect of Severance Pay on Subsequent Job Duration