Cash-on-Hand and Competing Models of Intertemporal Behavior: New Evidence from the Labor Market

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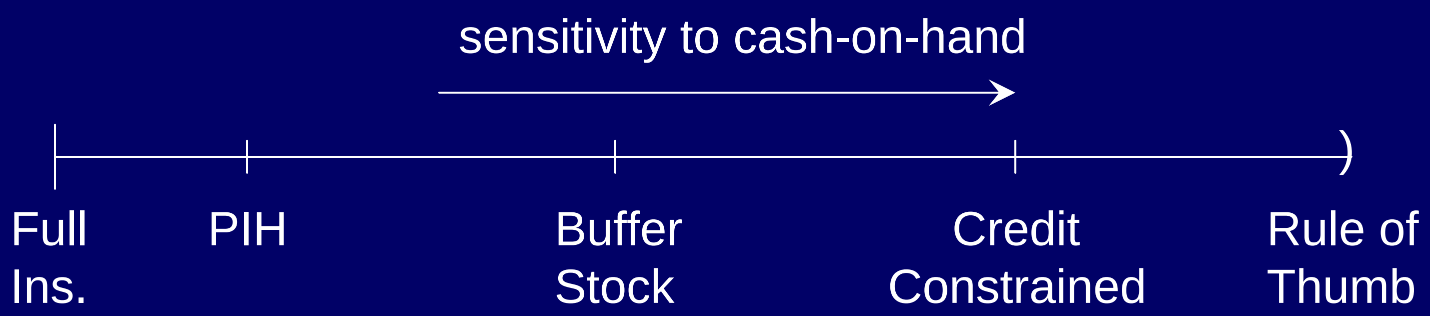
MOTIVATION

- Does disposable income ("cash-on-hand") affect household behavior?

- In macro, answer distinguishes between commonly used models:



- In public finance, answer matters for analysis of government policies

  – Tax cuts as consumption stimulus
  – Value of transitory insurance, welfare programs (Chetty 2006)

- Large existing literature tests for excess sensitivity using consumption data (Parker 1999, Souleles 1999, Hsieh 2003, Johnson et. al. 2006,…)
    - Does cash-on-hand (tax rebate) affect non-durable consumption?

- We test for “excess sensitivity” using data from the labor market instead
    - Does cash-on-hand (severance pay) affect job search behavior?
    - Excess sensitivity of labor/leisure to cash-on-hand violates PIH as does excess sensitivity of consumption

ADVANTAGES OF LABOR MARKET APPROACH

1. Large dataset + sharp research design → precise estimates.

   Consumption: small samples + noise → imprecision

   Parker et. al. (AER 2006): $1 tax rebate raises non-durable consumption by 5-65 cents.

2. Large lump-sum severance payments ($3000 on average)

   Consumption: Variation in grants often small ($300 rebate)

   Browning and Crossley (2001): low welfare costs from failure to smooth over small amounts

3. Policy variation + rich panel data → identification of long run consequences of cash grant

OVERVIEW

• Use discontinuities in the Austrian UI system to estimate effects of:

1. severance pay (cash-on-hand) on unemployment duration
2. UI benefit extension (incentives) on unemployment duration
3. both of these policies on subsequent job match quality

• Using empirical estimates, compute a moment *m* that identifies the "location" of representative household in data relative to models:

• The moment *m* identifies a plane within the space of preferences and financial technologies but rules out some benchmark models

OUTLINE

I) Job search model and testable predictions

II) Institutional background and estimation strategy

III) Empirical results

IV) Calibration: Testing between models

V) Conclusions

SEARCH MODEL

- Analyze a simple search model that nests a range of intertemporal models, from the PIH to CM.

- Use model for two purposes:

1. Derive tests of full insurance and rule-of-thumb models.

2. Derive a sample moment that can be estimated empirically and used to calibrate and test between models

SETUP

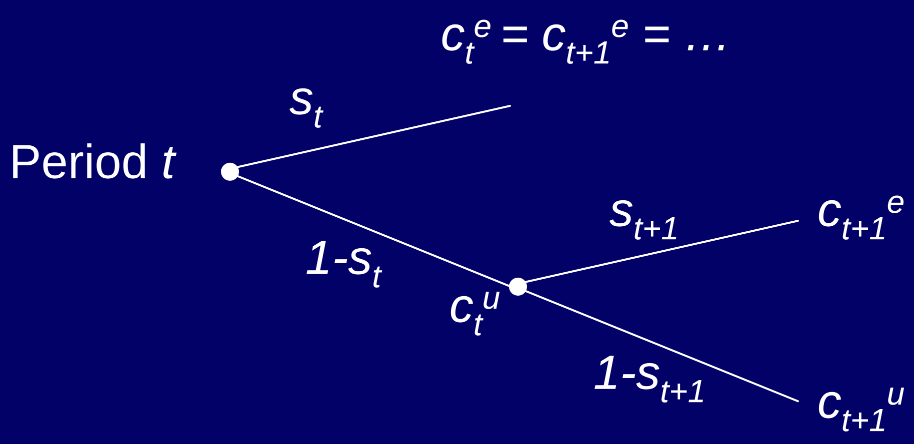
- Discrete time model with finite planning horizon *T*
- Interest rate *r*, discount rate δ
- Individual loses job in period $t = 0$
- Let $u(c_t)$ denote utility over consumption
- Dynamic budget constraint:

$$A_{t+1} = (1+r)(A_t + y_t - c_t)$$

- Asset limit: $A_t \geq L$

JOB SEARCH

- If unemployed in period t, worker first chooses search intensity s_t
- Finds a job that begins in period t with probability s_t



- If job found: permanent, fixed wage w → consumption c_t^e
- If no job: enters period $t+1$ unemployed → consumption c_t^u
- Cost of job search: $\psi(s_t)$

- Value function for agent who finds a job in period *t*:

$$V_t(A_t) = \max_{A_{t+1} \geq L} u(A_t - A_{t+1}/(1+r) + w) + \frac{1}{1+\delta} V_{t+1}(A_{t+1})$$

- Value function for agent who does not find a job in period *t*:

$$U_t(A_t) = \max_{A_{t+1} \geq L} u(A_t - A_{t+1}/(1+r) + b_t) + \frac{1}{1+\delta} J_{t+1}(A_{t+1})$$

where $J(A_{t+1})$ is value of entering next period unemployed.

- Agent chooses s_t to maximize expected utility:

$$J(A_t) = \max_{s_t} s_t V_t(A_t) + (1 - s_t) U_t(A_t) - \psi(s_t)$$

- First order condition for optimal search intensity:

$$\psi'(s_t^*) = V_t(A_t) - U_t(A_t)$$

TESTABLE COMPARATIVE STATICS

1. Effect of cash grant (severance pay) :

$$\partial s_t^* / \partial A_t = \{u'(c_t^e) - u'(c_t^u)\} / \psi''(s_t^*) \leq 0$$

- provides a test of perfect cons smoothing, where $c_t^e = c_t^u$

2. Effect of future benefit increase (benefit extension):

$$\partial s_t^* / \partial b_{t+j} = -\frac{1}{(1+\delta)^j}[p_{j,t}^* \frac{u'(c_{t+j}^u)}{\psi''(s_t^*)}] \leq 0$$

- provides a test of complete myopia, where $\delta = \infty$

3. Effects of sev pay and EB on job match quality

- some reservation-wage models (e.g. Mortensen 1979) predict improvements in match quality from longer search duration

- Ratio of sev. pay. to EB effect identifies “location” of representative agent in data relative to models:

$$m_j \equiv \frac{\partial s_0^*/\partial A_0}{\frac{1}{p_j^*}\partial s_0^*/\partial b_j} = \frac{u'(c_0^u) - u'(c_0^e)}{u'(c_0^u)} \times \frac{u'(c_0^u)}{u'(c_j^u)} \times (1+\delta)^j$$

  - In our empirical setting, we can estimate m_2
  - Since ψ cancels out, moment m_2 can be predicted purely from simulated consumption path.

- Value of m_j also of interest for analysis of optimal UI (Chetty 2006)
  - Effect of benefits on durations has two components when agents cannot smooth perfectly:

$$\partial s_t^* / \partial b_t = \partial s_t^* / \partial A_t - \partial s_t^* / \partial w_t$$

Liquidity — Moral Hazard

  - Ratio of liquidity to MH effect can be used to calculate marginal welfare gain from raising benefit level

    → New test for optimal benefits based purely on duration data

  - Empirical counterpart of Hansen-Imrohoglu (JPE 1992) and related analyses of calibrated models.

TABLE 1
Testable Predictions

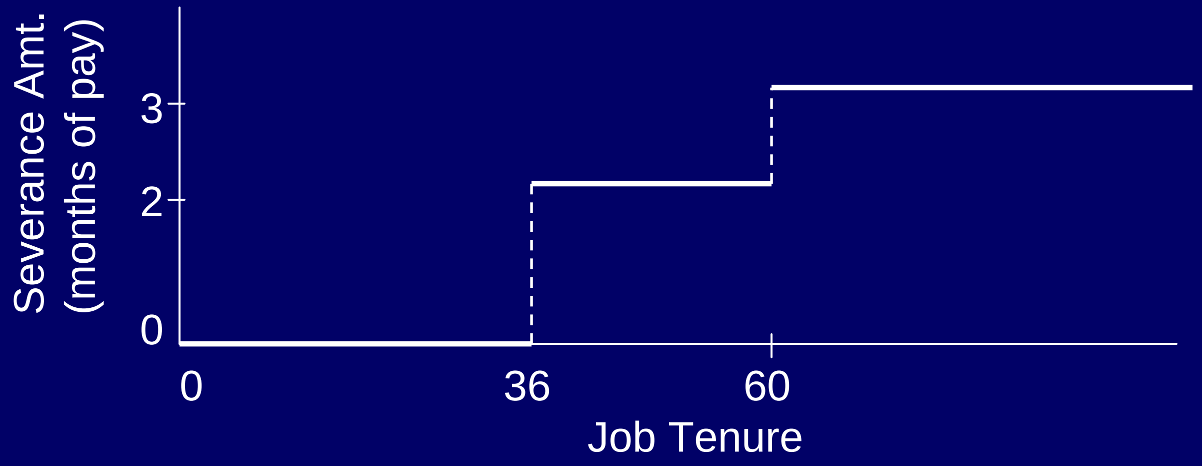
Prediction	Model: Perfect cons. smoothing	Model: Buffer stock w/match quality	Model: Buffer stock w/search intensity	Model: Complete Myopia “Rule of Thumb"
1. Sev Pay affects duration?	N	Y	Y	Y
2. Benefit extension affects *initial* hazards?	Y	Y	Y	N
3. Sev Pay, EB affects search outcomes?	U	Y	N	U

EMPIRICAL ANALYSIS

- Identification based on discontinuities in two components of Austria's unemployment benefit system: severance pay and weekly UI benefits

- Severance payment is made by firms out of their own funds

- Formula for sev. pay amount for all non-construction workers:



- All individuals who worked 52 or more weeks in last 2 years also receive weekly UI benefits

    - Avg. UI benefit rate: 55% of prior wage

- Maximum duration is a discontinuous function of months worked in past five years:

    - 20 weeks if < 36 months of work

    - 30 weeks if 36 or more months of work

- Overlapping discontinuities at 36 months creates a “double discontinuity” complication in empirical analysis

Figure 2a

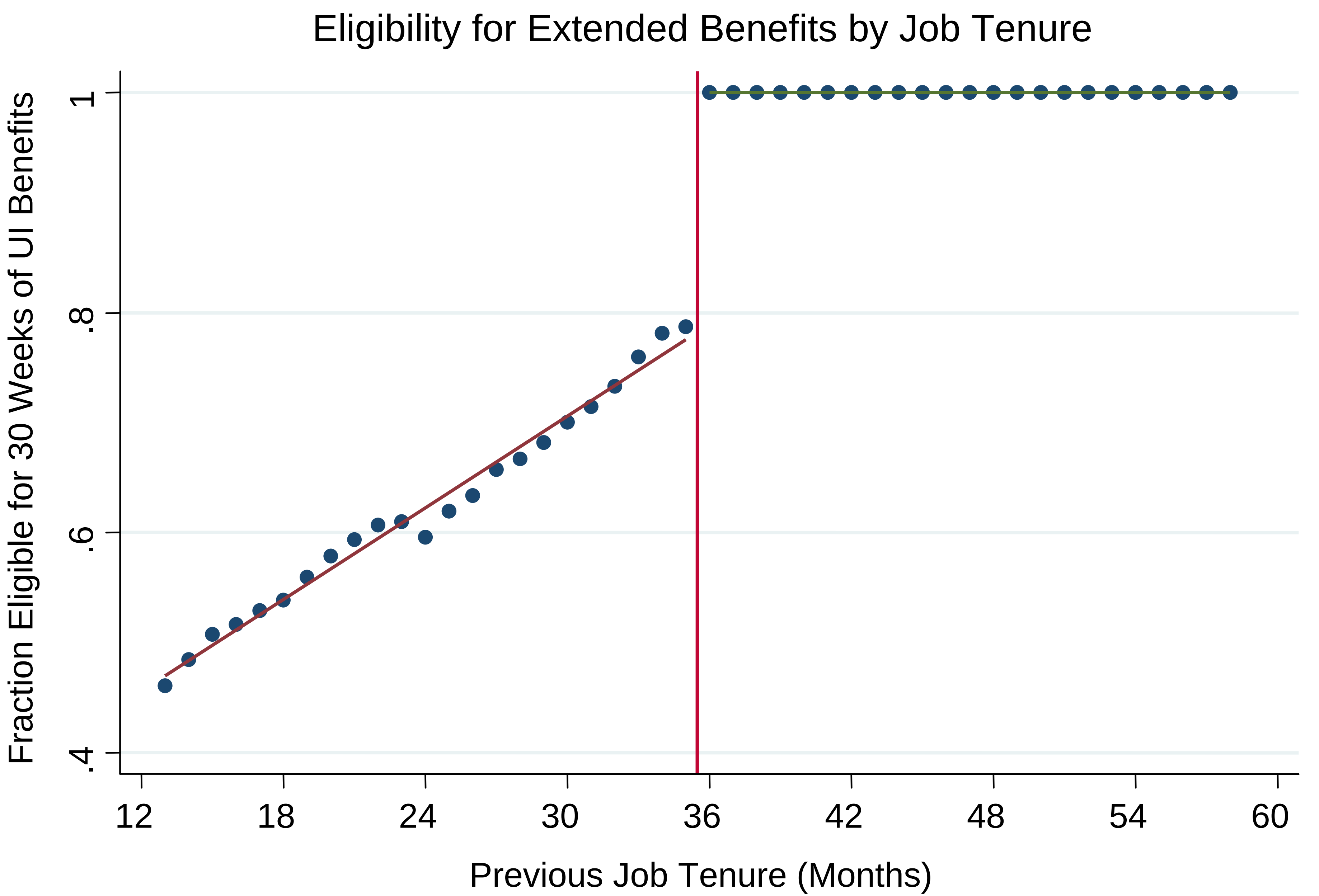
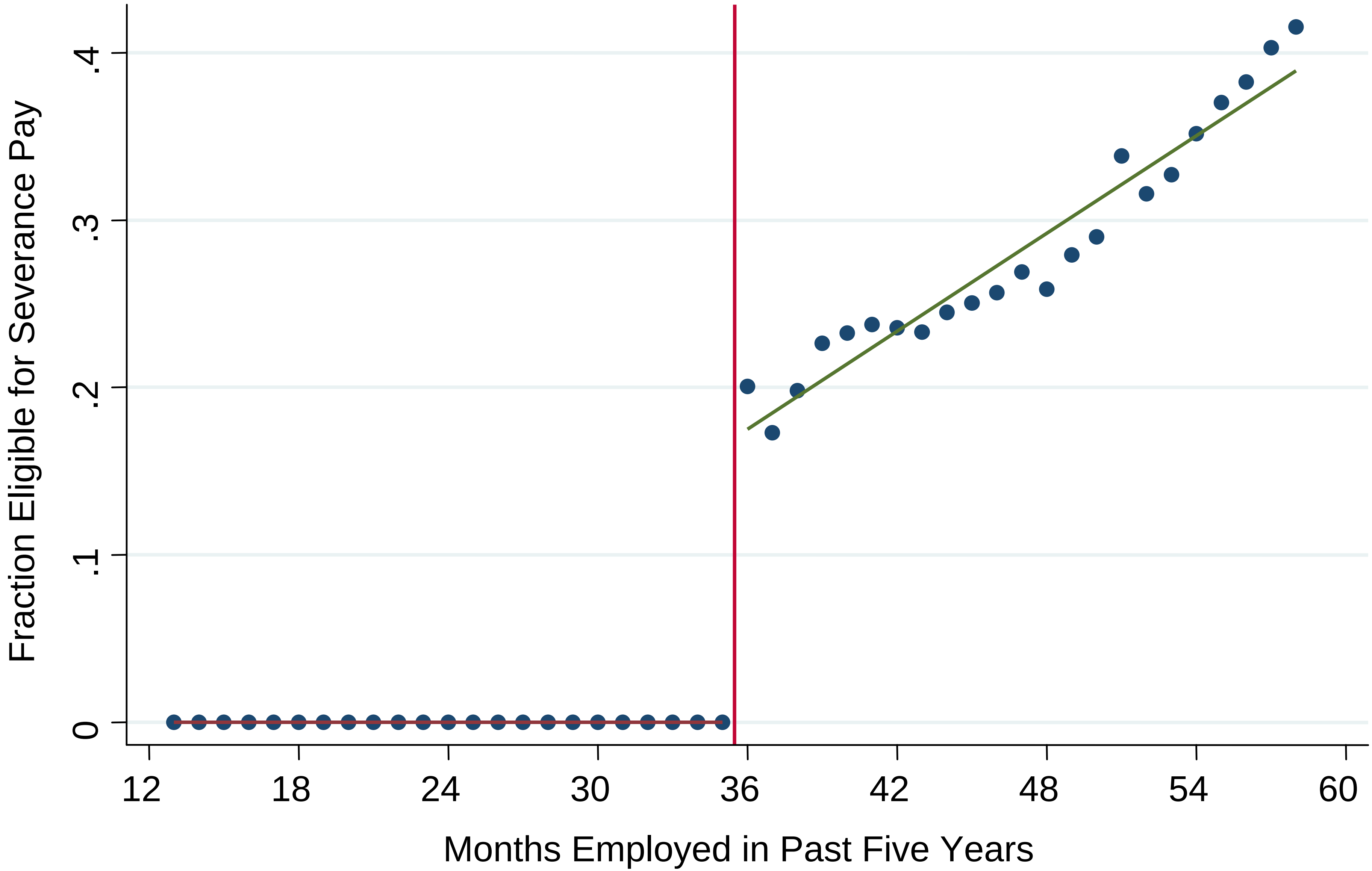

Eligibility for Extended Benefits by Job Tenure
Fraction Eligible for 30 Weeks of UI Benefits
1
.8
.6
.4
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

Figure 2b

Eligibility for Severance Pay by Past Employment



DATA

- Austrian social security registry 1980-2001

  - daily records on employment status
  - unemployment and *nonemployment* duration
  - annual earnings by employer
  - some demographic information on worker and firms

- Sample restrictions:

  1. non-construction workers between age of 20 and 50
  2. took up UI within 28 days after job loss (eliminating quits)
  3. previous job tenure between 1 and 5 years
  4. between 1 and 5 years of employment in past 5 years
  5. not recalled to prior firm (no temporary layoffs)

- Sample size: 650,922

TABLE 2

Sample Characteristics: Austrian Job Losers, 1980-2001

	Mean	**Median**	**Std. Dev.**
Unemployment duration	4.75	**2.93**	8.37
Nonemployment duration (months to next job)	16.93	4.29	38.19
Previous wage (Euros/Yr)	17,034	16,950	7,588
Change in Log Wage	-0.03	-0.01	**0.51**
Number of Employees at Firm	299.4	**31**	1271.82

ESTIMATION STRATEGY

- Regression discontinuity design: examine change in durations around 3 year cutoff for severance pay eligibility

- Key identifying assumption: randomization around discontinuity

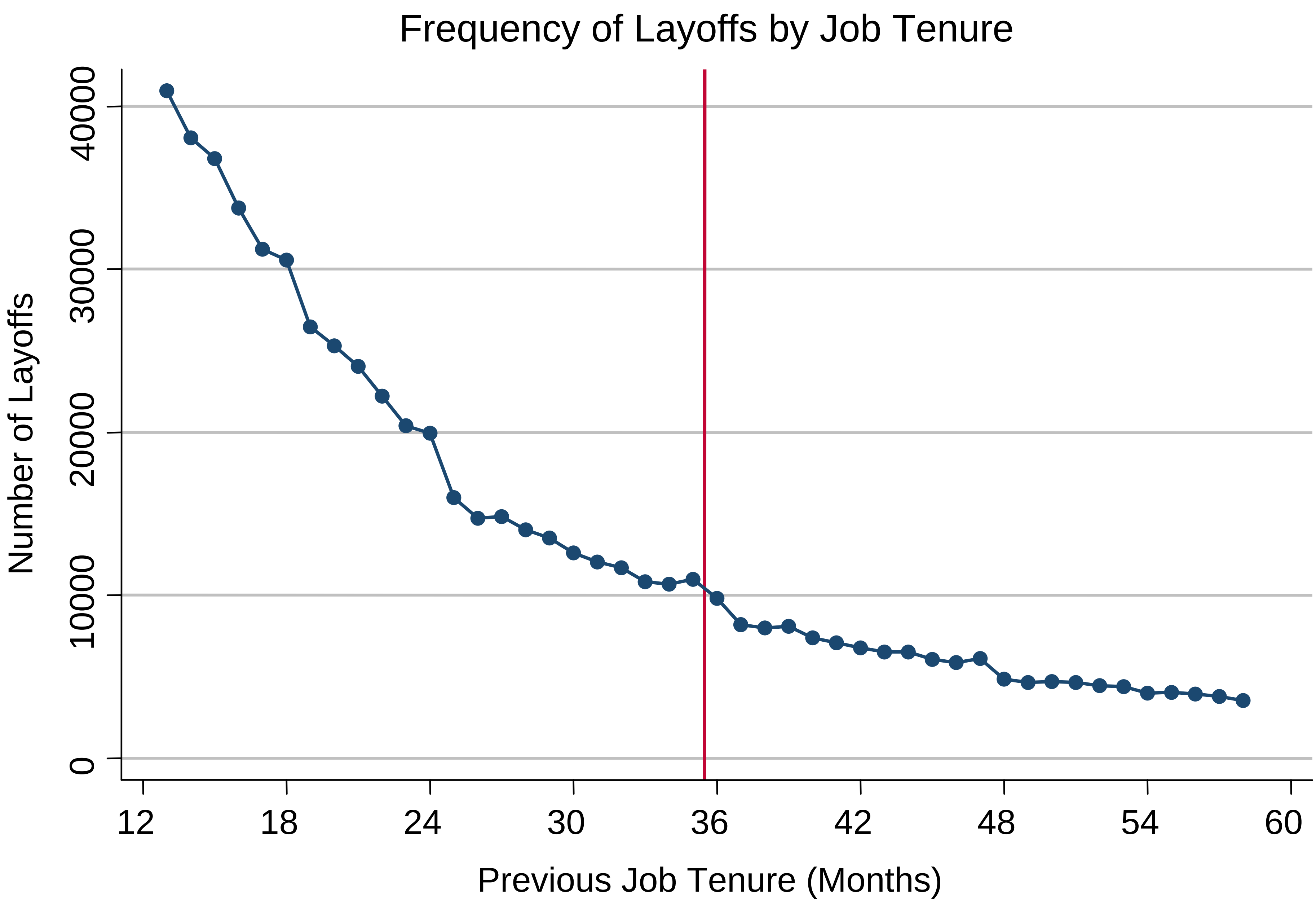
  - Workers laid off just before 3 years must be comparable to those laid off just after 3 years

  - Potential concern: Firms have an incentive to lay off workers before 3 years, creating selection around the break

- We begin by evaluating this identification assumption

  - Check for jumps in observables around eligibility cutoffs

Figure 3



Frequency of Layoffs by Job Tenure
Number of Layoffs
0
10000
20000
30000
40000
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

WHY NO SPIKE IN FIRING?

1. Every layoff must be vetted and approved by firm's works council.

2. Strict enforcement of severance pay law (lawsuits, reputation).

3. Little scope for selective firing in many firms because of small size

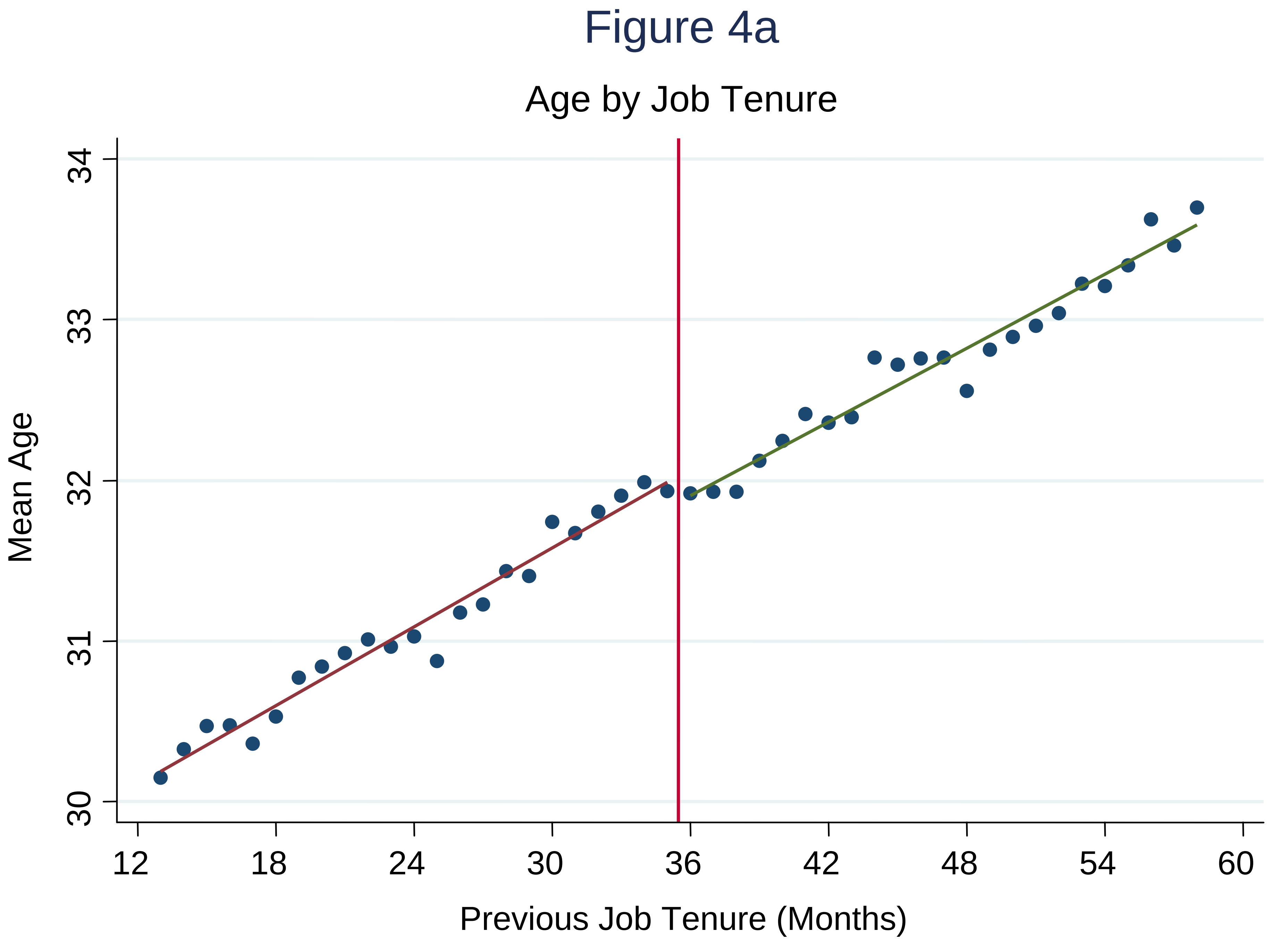


Figure 4a
Age by Job Tenure
Mean Age
34
33
32
31
30
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

Figure 4b


Wage by Job Tenure
Mean Annual Wage (Euro x 1000)
16
16.5
17
17.5
18
18.5
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

SELECTION ON OBSERVABLES

• We evaluate magnitude of selection on observables by examining how predicted job finding hazards vary around the discontinuity

• Set of observable covariates used in prediction:

A. gender, age, education, marital status, nationality

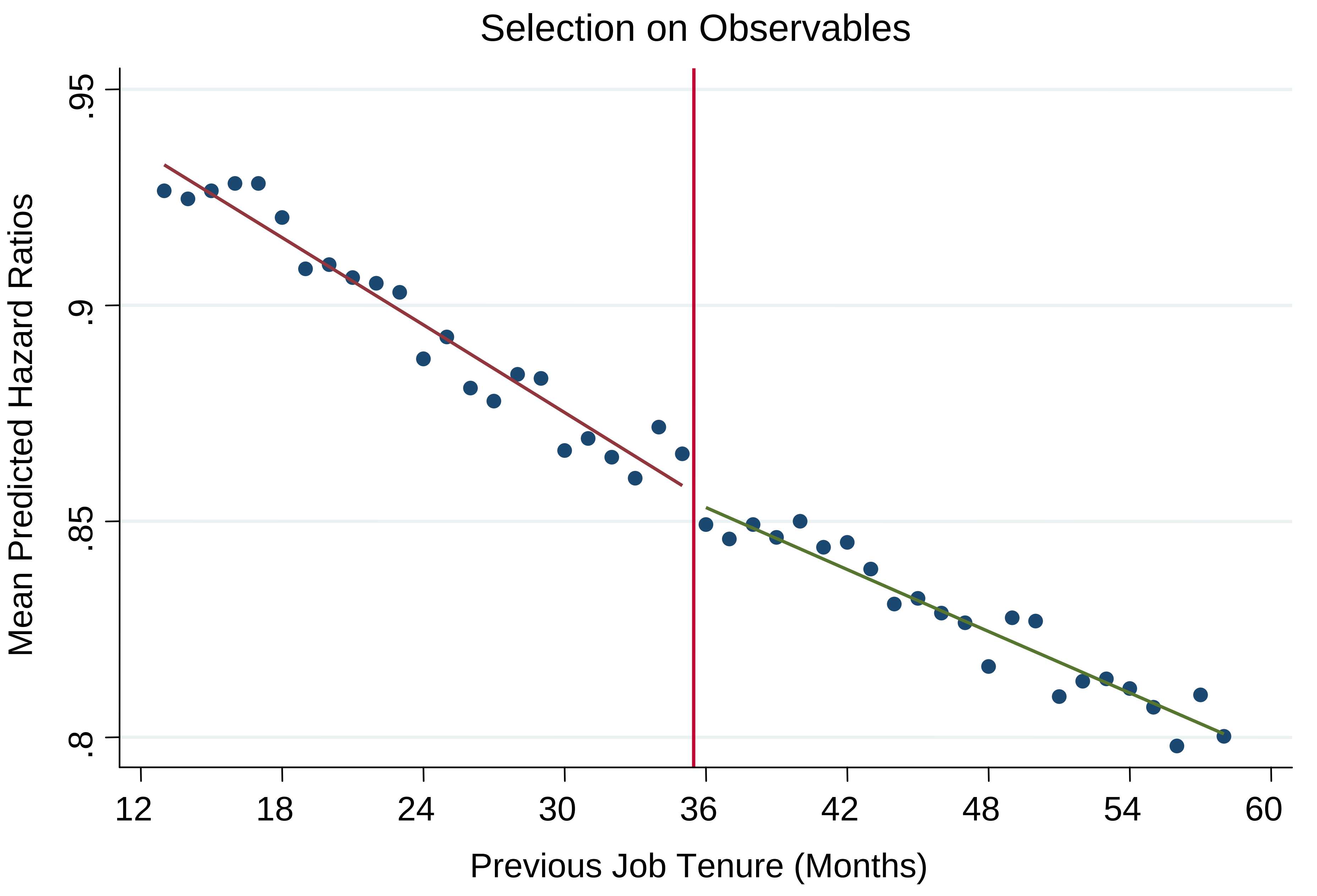
B. wage, firm size, blue collar status

C. duration of job before the one lost, recalled to that job, blue collar at that job

D. last nonemployment duration, total breaks in career, total work experience

E. year, month, industry, and region dummies

Figure 4c



Selection on Observables
Mean Predicted Hazard Ratios
.95
.9
.85
.8
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

ADDITIONAL CHECKS FOR SELECTION

1. Focus on subsamples where selection is ex-ante less plausible and wage discontinuities are not observed

   - layoffs of a group of individuals
   - small firms

2. Placebo test

Figure 5a

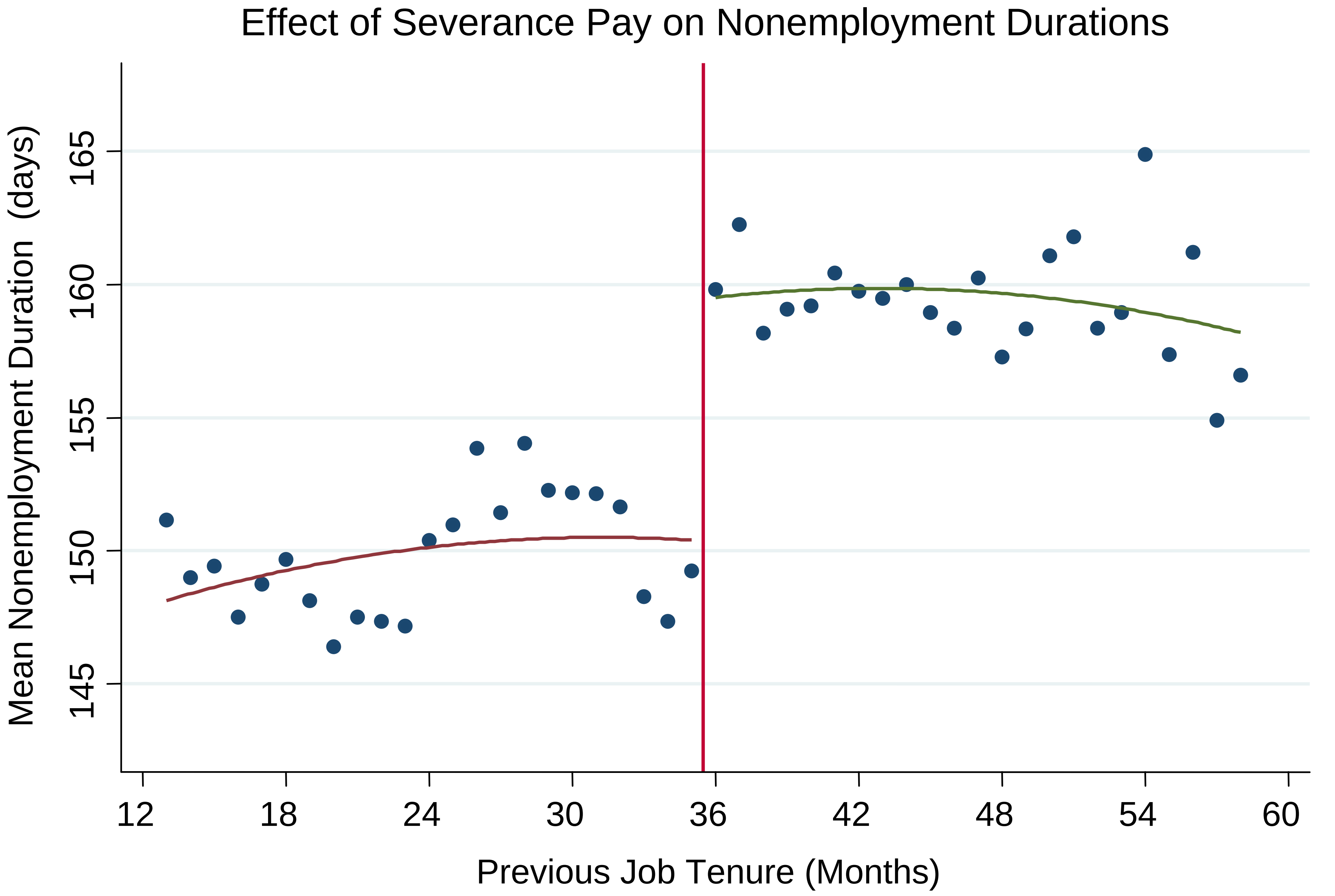

Effect of Severance Pay on Nonemployment Durations
Mean Nonemployment Duration (days)
165
160
155
150
145
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

Figure 5b

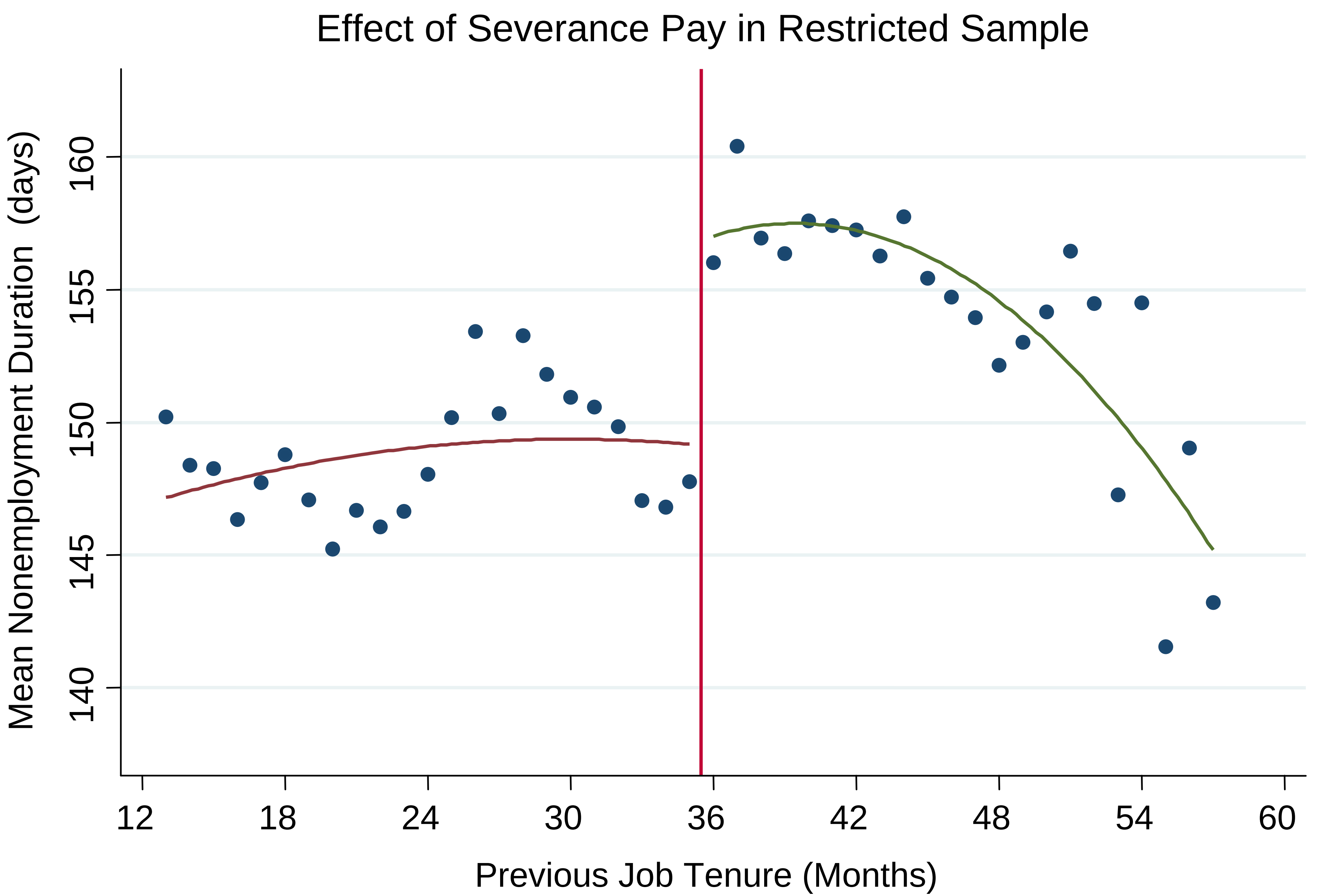
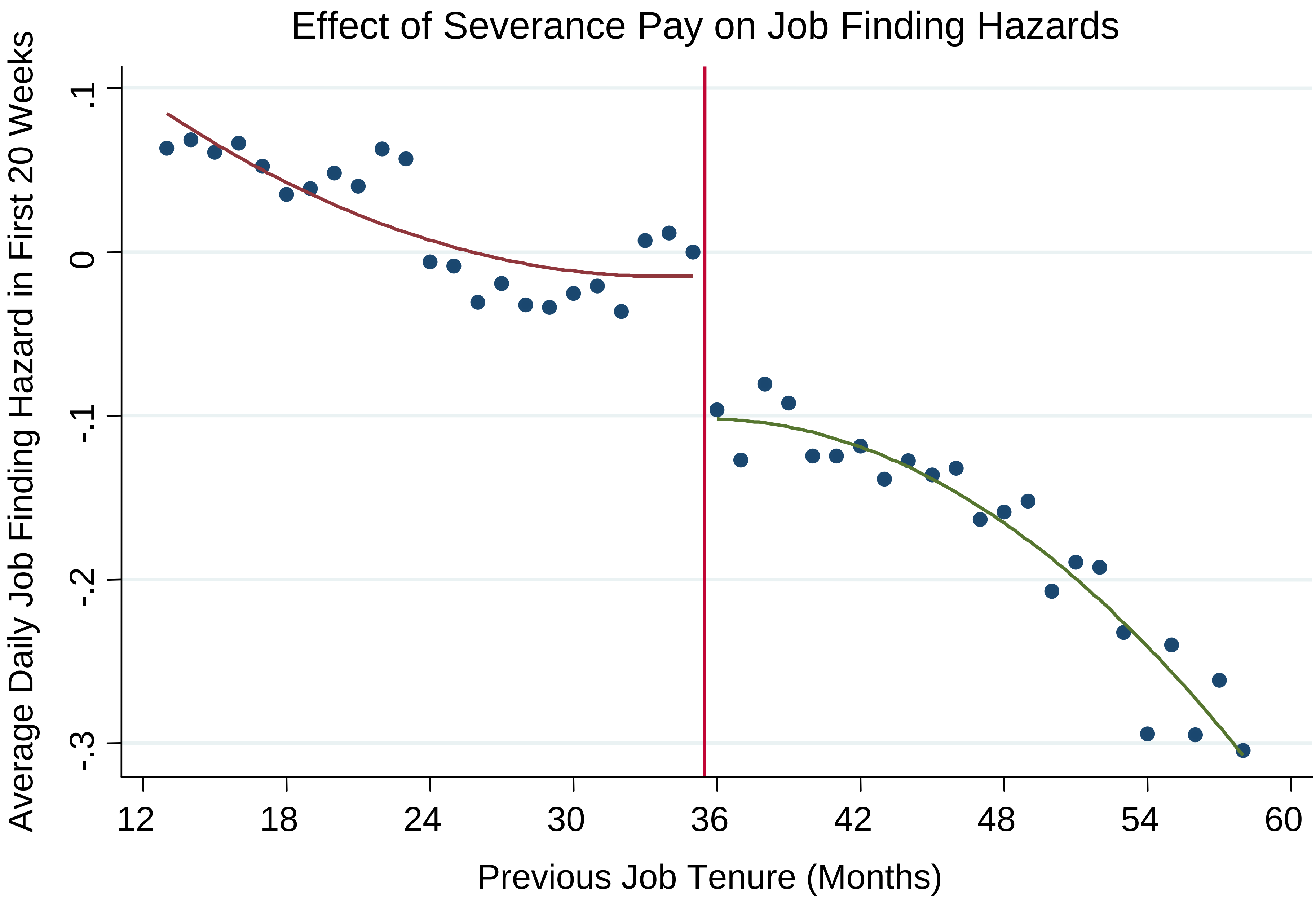

Effect of Severance Pay in Restricted Sample
Mean Nonemployment Duration (days)
140
145
150
155
160
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

Figure 6a



Effect of Severance Pay on Job Finding Hazards
Average Daily Job Finding Hazard in First 20 Weeks
.1
0
-.1
-.2
-.3
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

Figure 6b

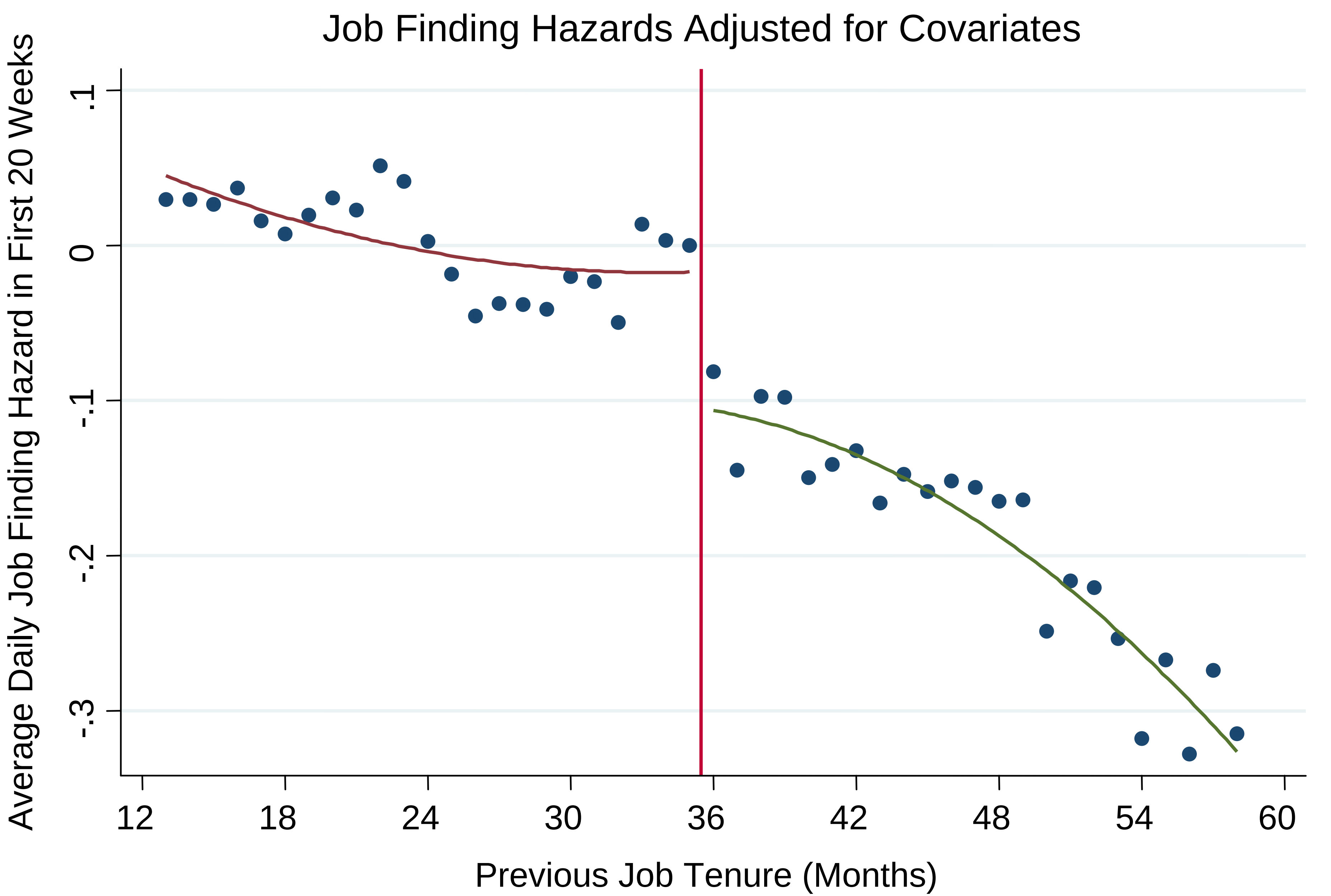

Job Finding Hazards Adjusted for Covariates
Average Daily Job Finding Hazard in First 20 Weeks
.1
0
-.1
-.2
-.3
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

Figure 6c

Effect of Severance Pay Adjusted for Tenure Seasonality

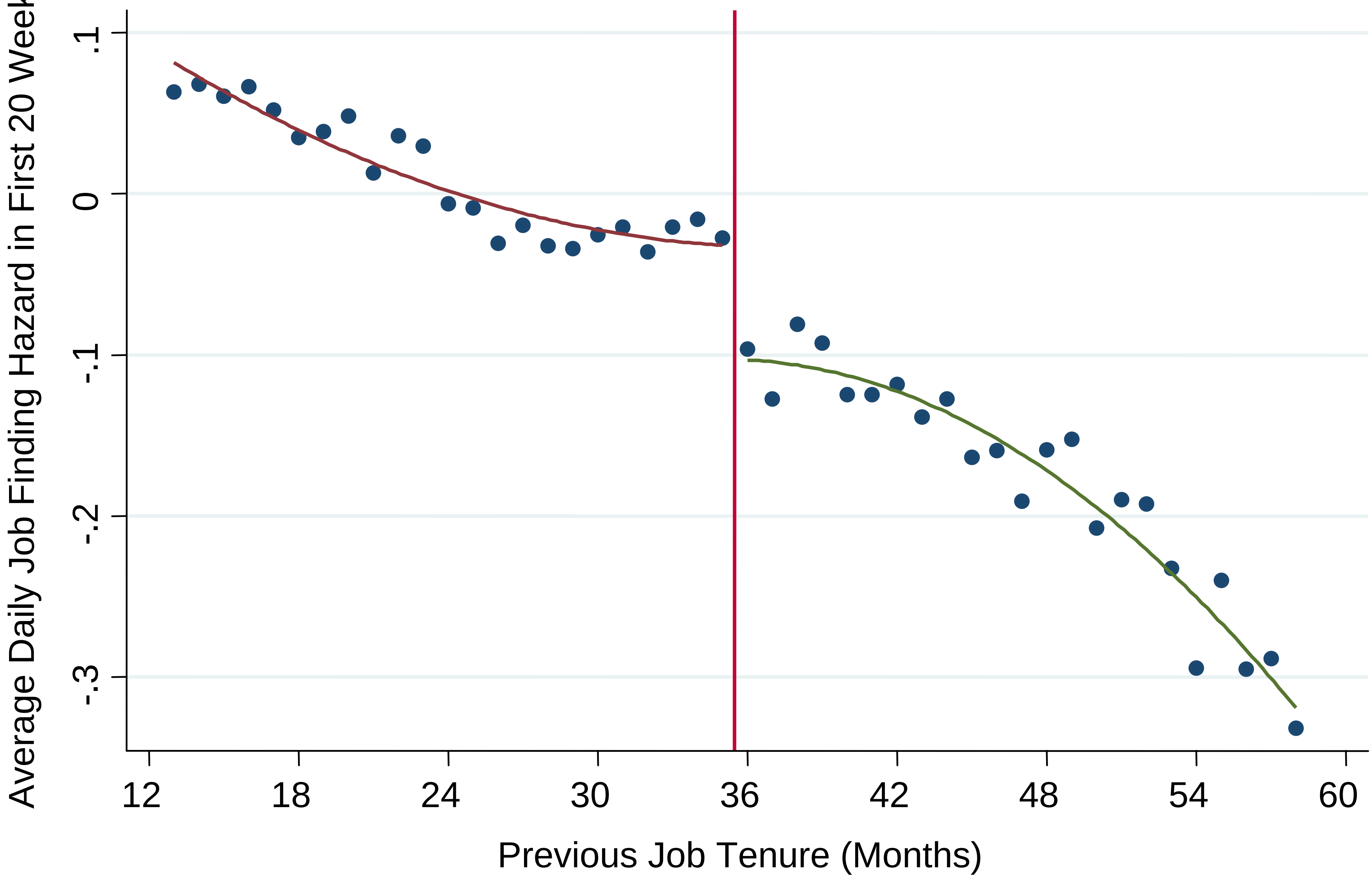


Figure 7

Placebo Test: Lagged Job Tenure and Nonemployment Durations

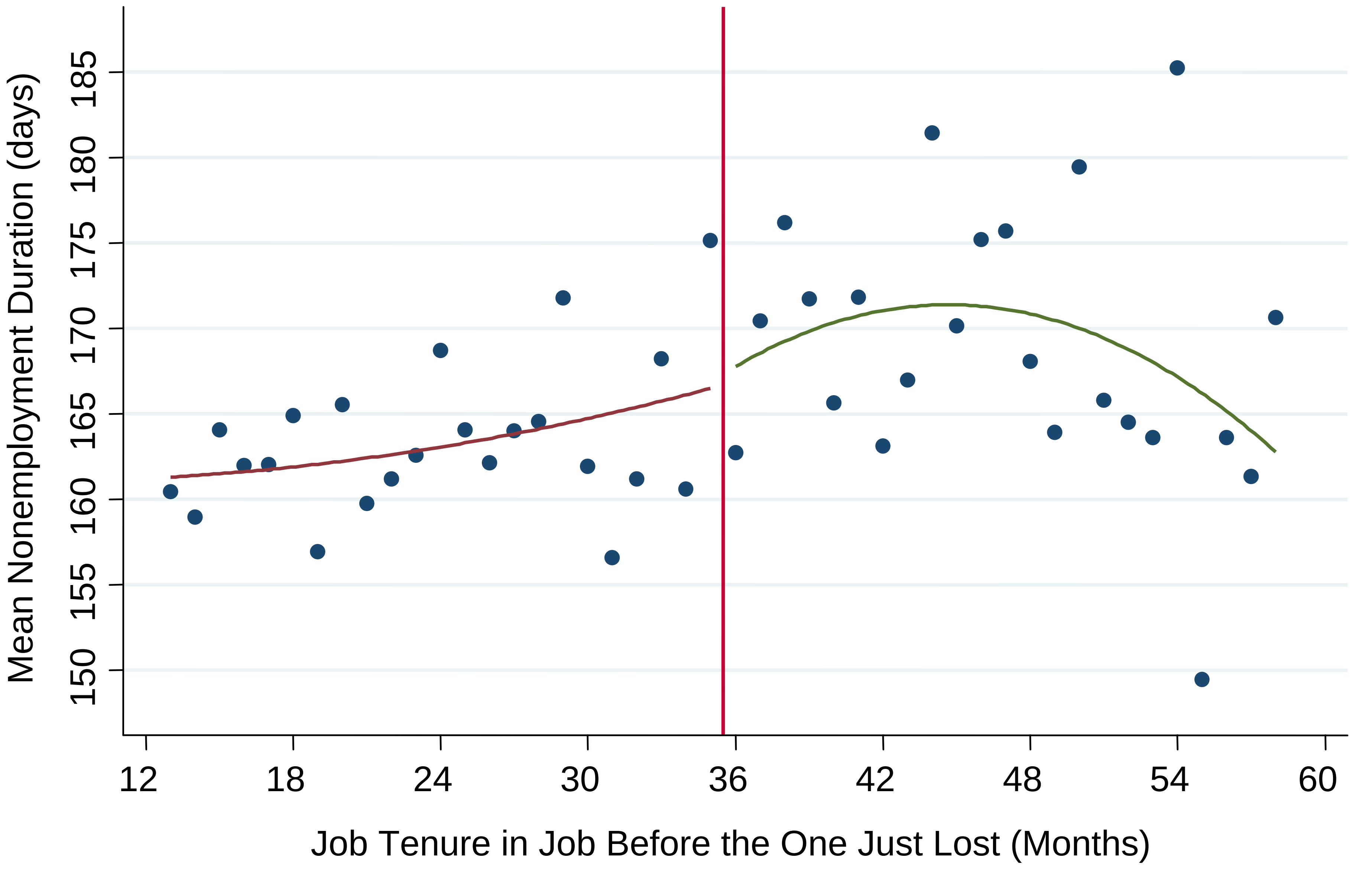


TABLE 1
Testable Predictions

	Model			
Prediction	PIH with complete markets	Buffer stock w/match quality	Buffer stock w/search intensity	Complete Myopia
1. Sev Pay affects duration?	N	Y	Y	Y

Figure 9a

Effect of Benefit Extension on Nonemployment Durations

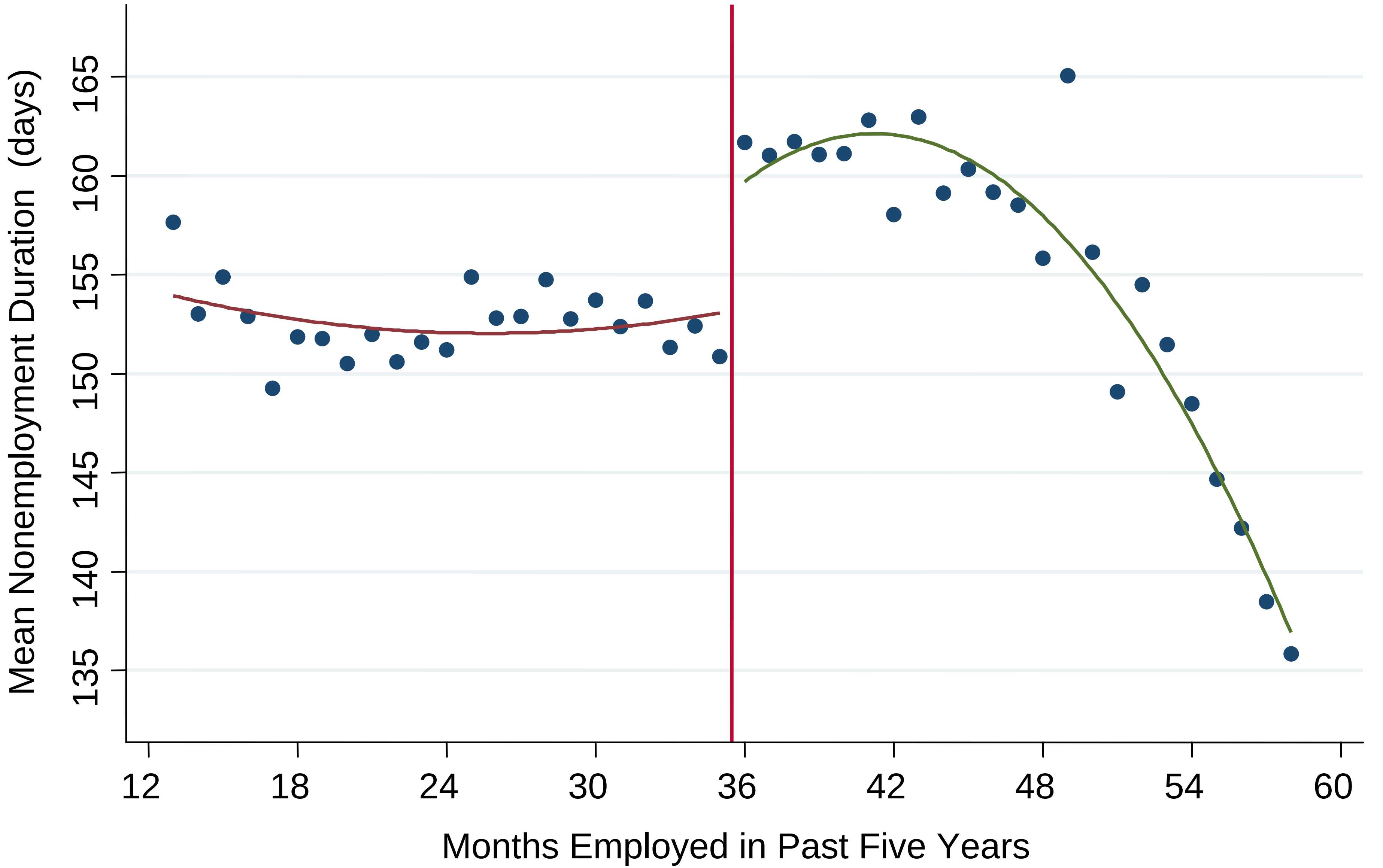


Figure 8b

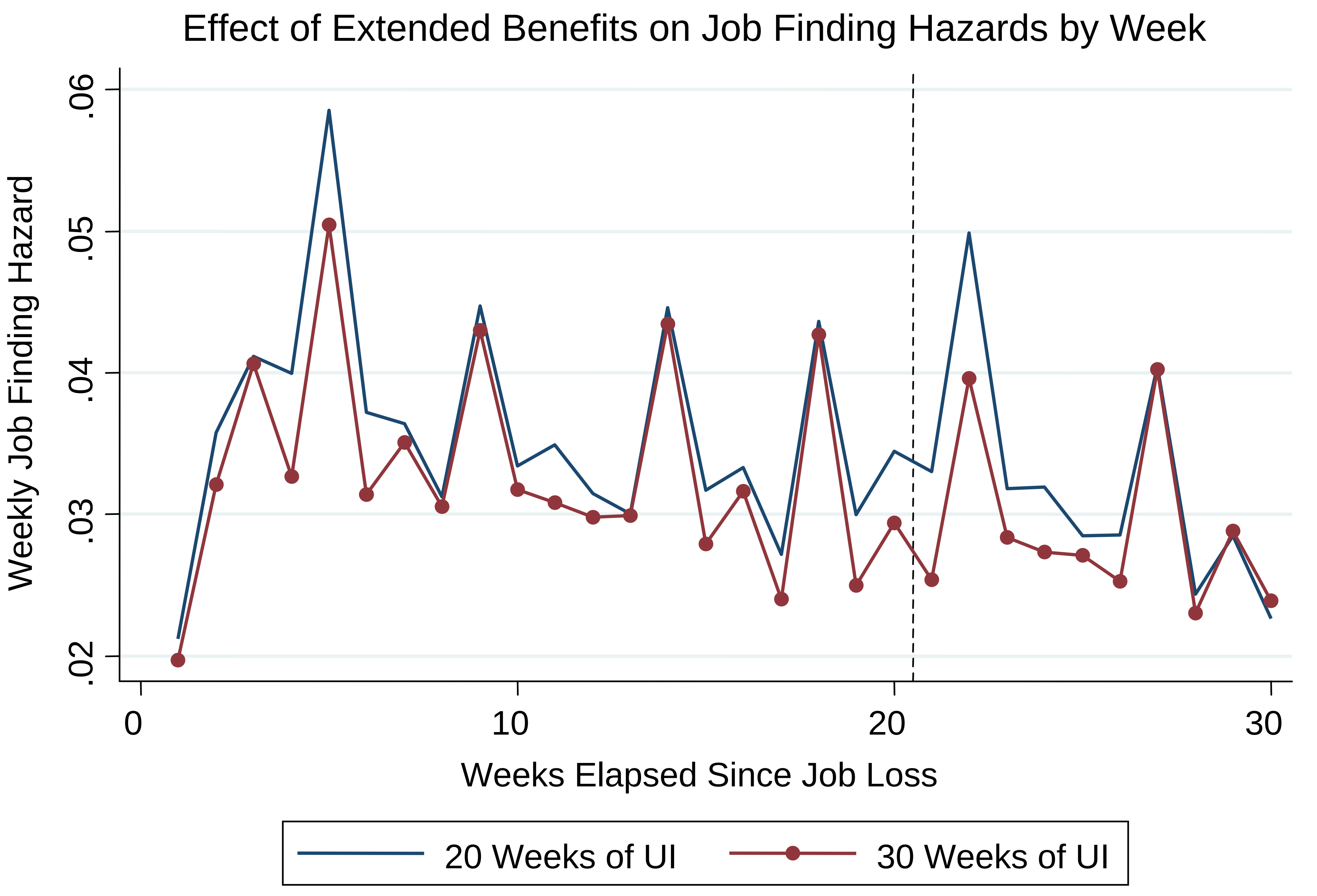

Effect of Extended Benefits on Job Finding Hazards by Week
Weekly Job Finding Hazard
.02
.03
.04
.05
.06
0
10
20
30
Weeks Elapsed Since Job Loss
20 Weeks of UI
30 Weeks of UI

TABLE 1
Testable Predictions

	Model			
Prediction	PIH with complete markets	Buffer stock w/match quality	Buffer stock w/search intensity	Complete Myopia
2. Benefit extension affects *initial* hazards?	Y	Y	Y	N

PARAMETRIC RD MODEL ESTIMATES

- Estimate magnitude of sev pay and EB effects by fitting Cox hazard models with cubic control functions for job tenure and months worked.

- Nonemployment durations censored at 20 weeks

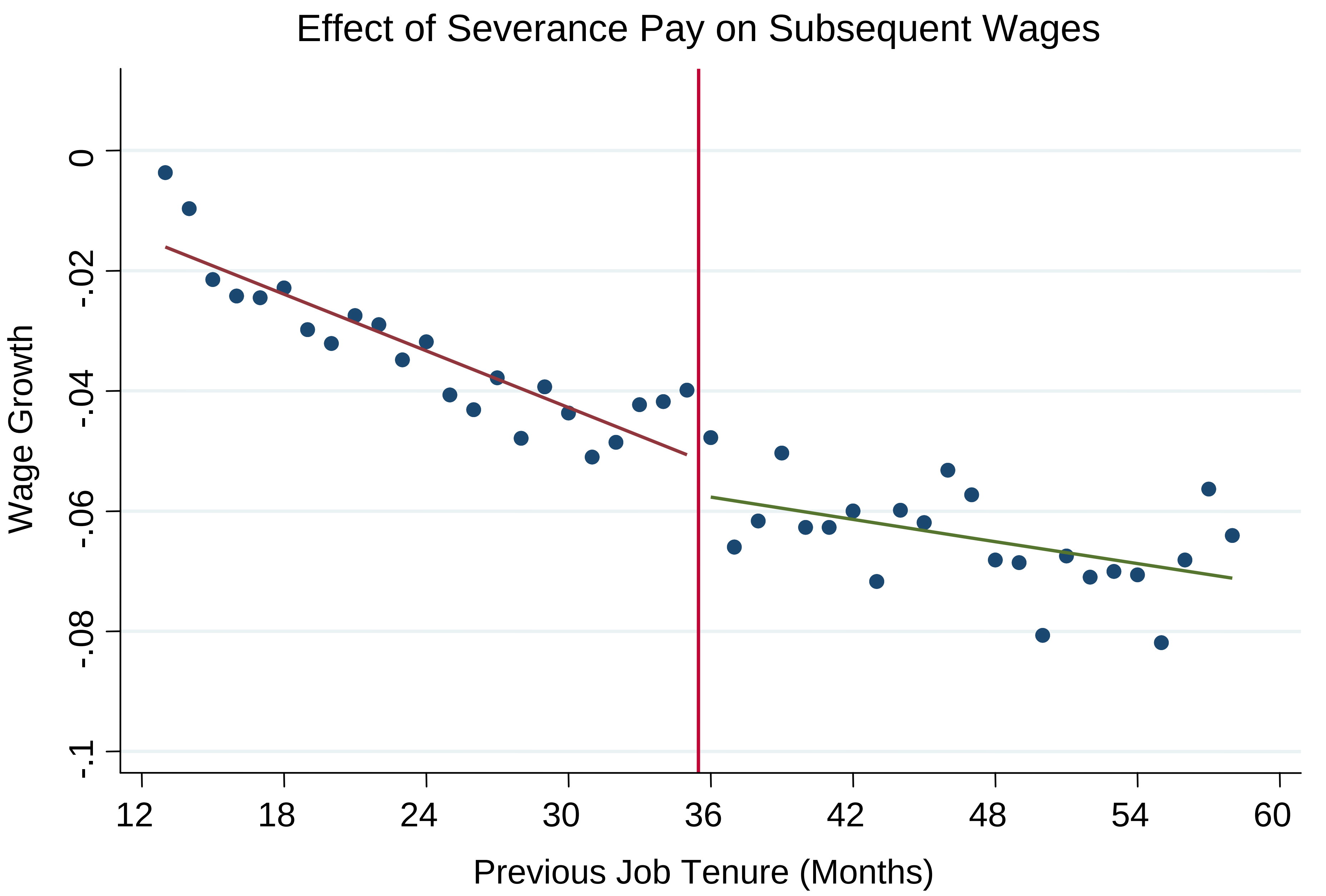
TABLE 3a

Effects of Severance Pay and EB on Durations: Hazard Model Estimates

	(1) **No Controls**	(2) **With Controls**	(3) **Reweight Sample**
Severance pay	-0.125	-0.115	-0.119
	(0.017)	(0.018)	(0.021)
Extended benefits	-0.084	-0.064	-0.064
	(0.016)	(0.017)	(0.019)
Sample size	650,922	565,835	565,835

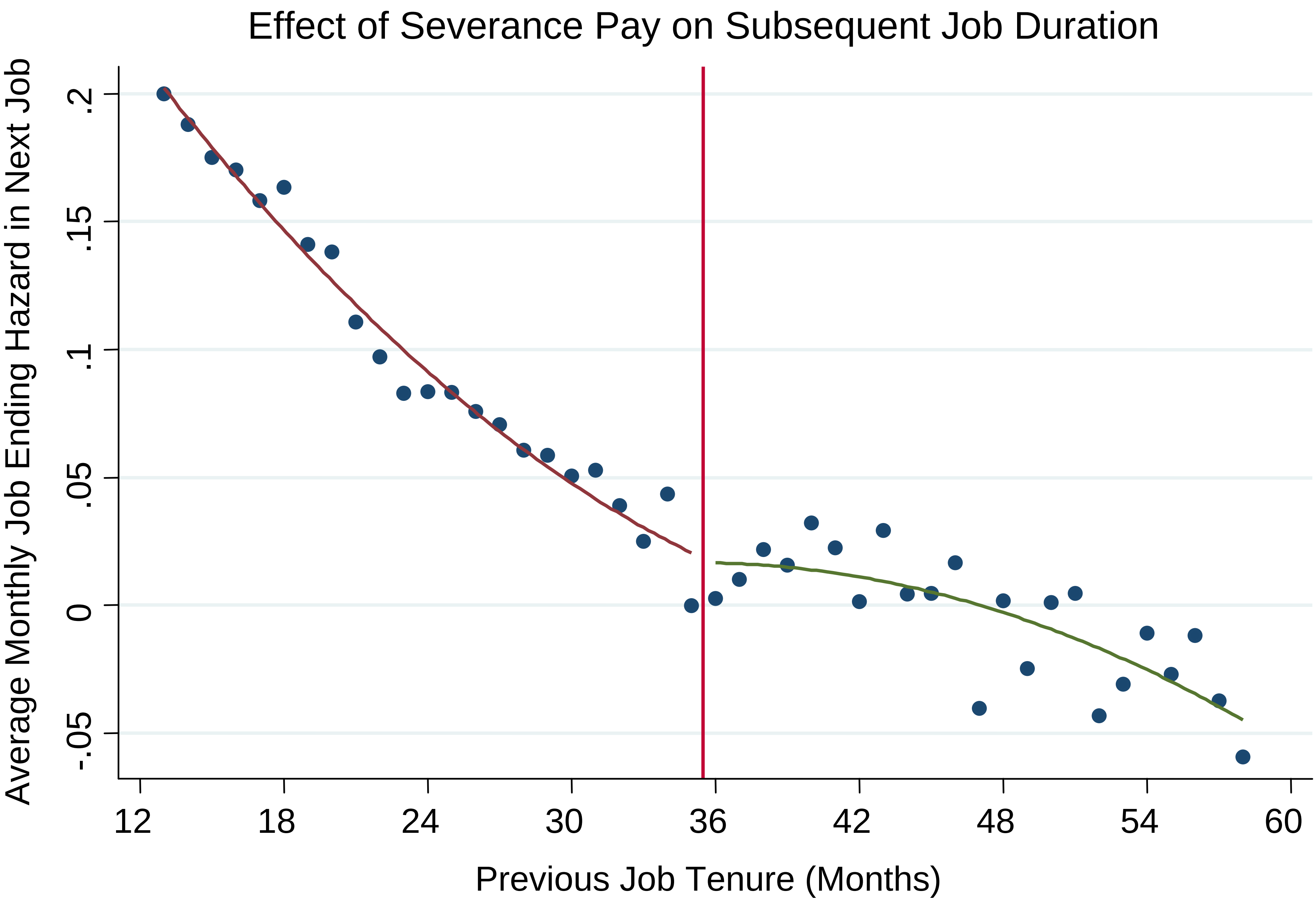
NOTE--All specs are Cox hazard models that include cubic control functions with interactions with sevpay and extended benefit dummy.

Figure 10a



Effect of Severance Pay on Subsequent Wages
Wage Growth
0
-.02
-.04
-.06
-.08
-.1
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

Figure 10b



Effect of Severance Pay on Subsequent Job Duration
Average Monthly Job Ending Hazard in Next Job
.2
.15
.1
.05
0
-.05
12
18
24
30
36
42
48
54
60
Previous Job Tenure (Months)

Figure 11a

Effect of Extended Benefits on Subsequent Wages

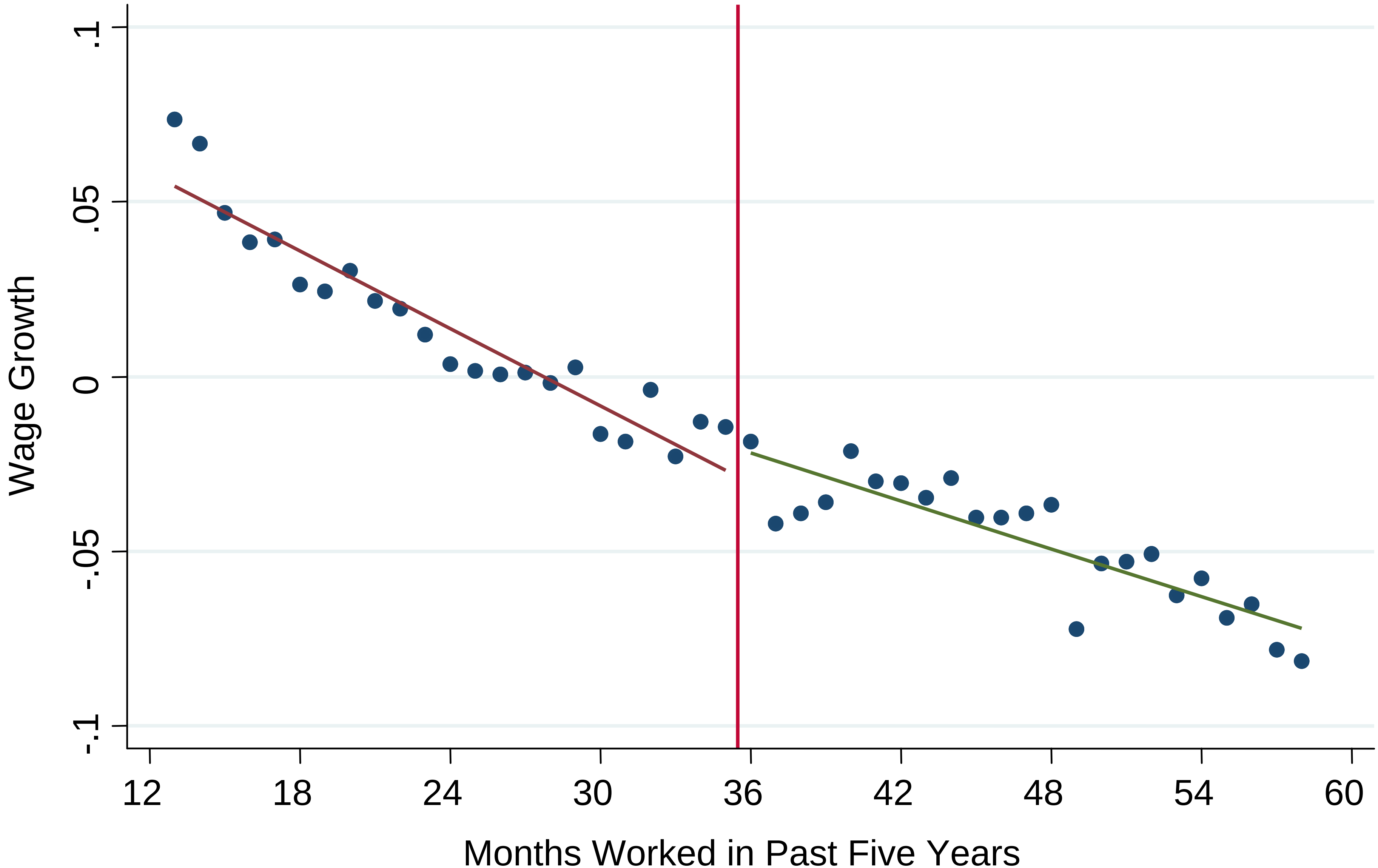


Figure 11b

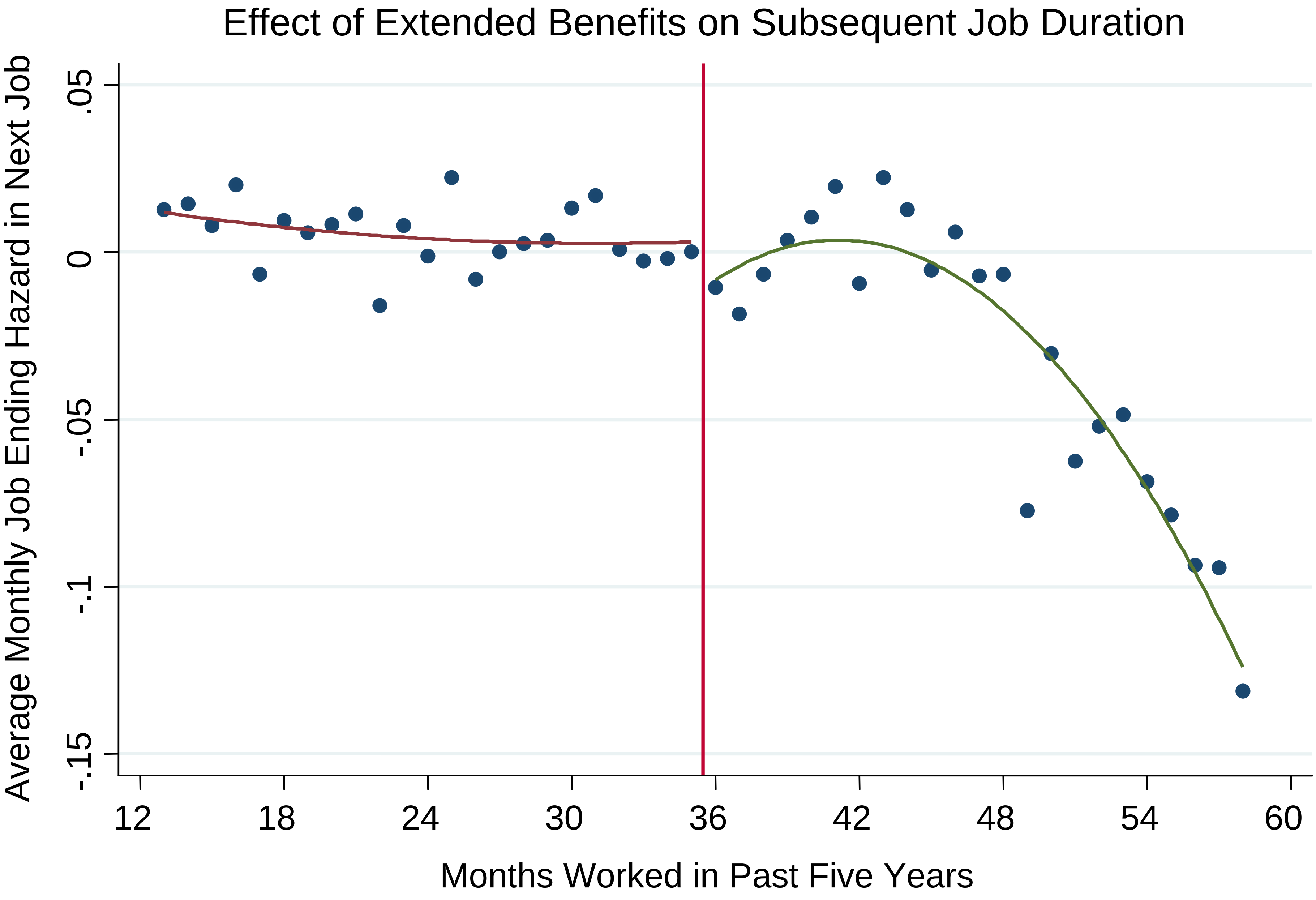

Effect of Extended Benefits on Subsequent Job Duration
Average Monthly Job Ending Hazard in Next Job
.05
0
-.05
-.1
-.15
12
18
24
30
36
42
48
54
60
Months Worked in Past Five Years

TABLE 4

Effects of Severance Pay and EB on Search Outcomes

	(1) **No controls**	(2) **Full controls**	(3) **No controls**	(4) **Full controls**
	log wage change	log wage change	job ending hazard	job ending hazard
Severance pay	-0.009	-0.002	-0.017	0.000
	(0.007)	(0.006)	(0.014)	(0.015)
Extended benefits	-0.005	-0.008	-0.005	0.007
	(0.006)	(0.006)	(0.013)	(0.014)

All specs include cubic polynomials with interactions with sevpay and EB. Columns (1) and (2) report coefficients from OLS regressions; columns (3) and (4) report Cox hazard model coefficient estimates.

TABLE 1
Testable Predictions

Prediction	Model			
	PIH with complete markets	Buffer stock w/match quality	Buffer stock w/search intensity	Complete Myopia
3. Sev Pay, EB affects search outcomes?	U	Y	N	U

TABLE 1
Testable Predictions

	Model			
Prediction	PIH with complete markets	Buffer stock w/match quality	Buffer stock w/search intensity	Complete Myopia
1. Sev Pay affects duration?	N	Y	Y	Y
2. Benefit extension affects initial hazards?	Y	Y	Y	N
3. Sev Pay, EB affects search outcomes?	U	Y	N	U

CALIBRATION

- We characterize models that fit the data using the moment

$$m_2 = \frac{\partial s_0^*/\partial A_0}{\frac{1}{p_2^*}\partial s_0^*/\partial b_2} = \frac{\beta_{sp}}{\beta_{eb}} \times \frac{v_{eb}}{v_{sp}} \times p_2^*$$

- First, calculate empirical value of m_2
  - Calculate scale factor using mean values of UI, UA, sev. pay., family income, and empirical job-finding probabilities.
  - Then use hazard model estimates of sev pay and EB coefficients

→ $\boldsymbol{m_2}$ **= 0.174** (se = 0.041)

PREDICTED VALUES OF MOMENT FOR COMPETING MODELS

- What types of models generate m_2 that fits the data?

- Recall theoretical expression for m_2 from model:

$$m_2 = \frac{u'(c_0^u) - u'(c_0^e)}{u'(c_0^u)} \times \frac{u'(c_0^u)}{u'(c_2^u)} \times (1+\delta)^2$$

- Use this formula to calculate m_2 for two standard models:

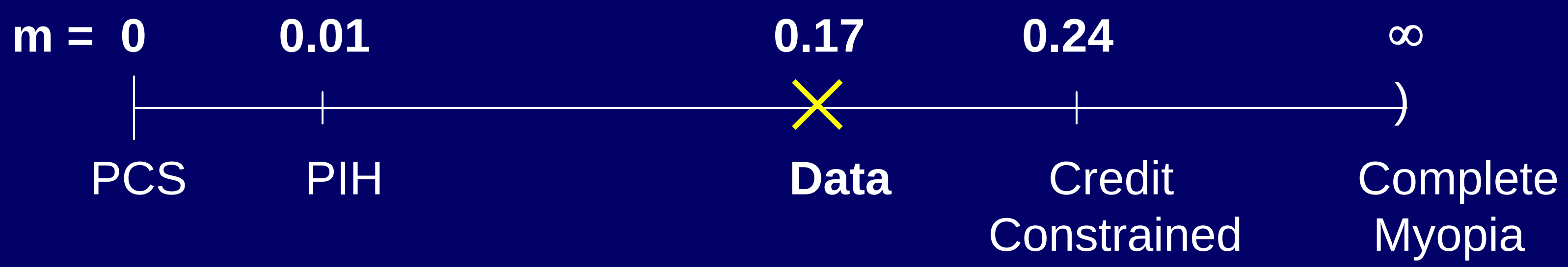
  1. PIH with intertemporal smoothing but no private insurance

  2. Credit constrained but forward looking (binding asset limit)

- Calibration methodology:

  - Assume CRRA utility
  - Compute consumption path using mean values of UI, spouse inc., etc.
  - Annuitization of wealth at interest rate in PIH case
  - Obtain bound on m_2 for PIH by bounding rate of decline in assets

CALIBRATION RESULTS



- These calculations assume *r* = 0.05 and CRRA = 2.
    - PIH rejected with any combination of CRRA < 4 and *r* < 15%

→ Representative household's behavior **70%** of the way between PIH and credit-constrained in terms of sensitivity to cash-on-hand.

IMPLICATIONS FOR MODELS OF HOUSEHOLD BEHAVIOR

- Behavior of job searchers fit by intertemporal models such as:
  - Campbell and Mankiw’s (1991) spenders-savers model with 30% lifecycle maximizers and 70% credit-constrained
  - Deaton (1991) buffer stock model
- Search behavior fit by a model with limited reservation-wage effects
  - Possibly a model with low arrival rate of offers, where agents essentially take first offer they get

IMPLICATIONS FOR PUBLIC FINANCE

- Role for temporary income assistance programs (UI, welfare, etc.) given imperfect smoothing by households

- Liquidity important relative to moral hazard in UI, consistent with Chetty (2006) findings in U.S. data