The Optimal Timing of Unemployment Benefits: Theory and Evidence from Sweden

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Motivation

- Social Insurance/Transfer Programs specify a **full time profile** of benefits
  - not just a benefit level or some benefit duration
- Policy debate: pressure for **limits in time** and **steeper benefit profiles**
  - opposite to SI practice: insure large rather than small risks
  - debate lacks evidence-based arguments
- Sufficient statistics literature on "average" generosity of SI

  $\Rightarrow$ *empirical implementation, but silent about optimal timing*
- Theoretical literature on optimal timing of UI in particular

  $\Rightarrow$ *insights are model-dependent and hard to connect to data*

This Paper

This paper revisits the optimal timing of UI and provides:

(1) a **simple** characterization

(2) in a **general** framework

(3) that connects to **data**

Theory: Simple and General

- Consider dynamic model of unemployment (with search, consumption, heterogeneity, duration dependence,...)
- **Key Result**: Baily ['78] intuition generalizes for UI benefit b_t paid at *any* unemployment duration t:
  1. *insurance gain* depends on the drop in consumption at t
  2. *incentive cost* depends on the (full) survival function response to b_t
- **Implication**: Simple to evaluate welfare of a benefit profile. Identifying model's primitives is not necessary (Chetty '06, '09)

Empirics I: Survival Function Responses

- Extensive literature on unemployment duration responses to UI
  - focus on responses in average unemployment duration
  - limited attention for timing of benefits
- We use **Swedish UI registers** and implement a Regression Kink design
  - exploit variation in the time profile of benefits
  - consider the impact on the relevant moment of the survival function
- The estimated incentive cost of increasing benefits is high overall ($\varepsilon \approx 1.5$), and **21% larger for ST benefits** than for LT benefits

Empirics II: Consumption Profile

- Limited evidence on impact of labor shocks on consumption
  - Gruber ('97) studies consumption drop when unemployed
  - survey data on consumption (small samples, measurement error,...)
  - limited ability to observe unemployment status and duration
- We use unique **admin data on income and wealth** in Sweden to obtain residual measure of yearly expenditures linked to unemployment spells in UI registers
- Consumption drops **significantly and early** in the spell
  - drop equals 20% for ST and 27% for LT unemployed
  - patterns results from limited ability to smooth consumption and generous LT benefits
- Taken together, we find a large welfare gain from decreasing ST benefits relative to LT benefits (i.e., inclining benefit profile!)

Outline

Setup: Workers' Behavior

- Dynamic model of unemployment: focus on worker's behavior
- Each individual i optimizes her job search strategy
  - results in an exit rate out of unemployment $h_{i,t}$ at each duration t
  - observed survival function equals

$$S(t) = \Sigma_{i=1}^{N} \left[\Pi_{s=0}^{t} (1 - h_{i,s}) \right] / N$$

- Each individual i optimizes intertemporal consumption
  - results in contingent consumption plan c_i^e and $c_{i,t}^u$
  - observed unemployment consumption at duration t

$$C^u(t) = \Sigma_{i=1}^{N} [\frac{S_i(t)}{S(t)} \times c_{i,t}^u] / N$$

Setup: Unemployment Policy

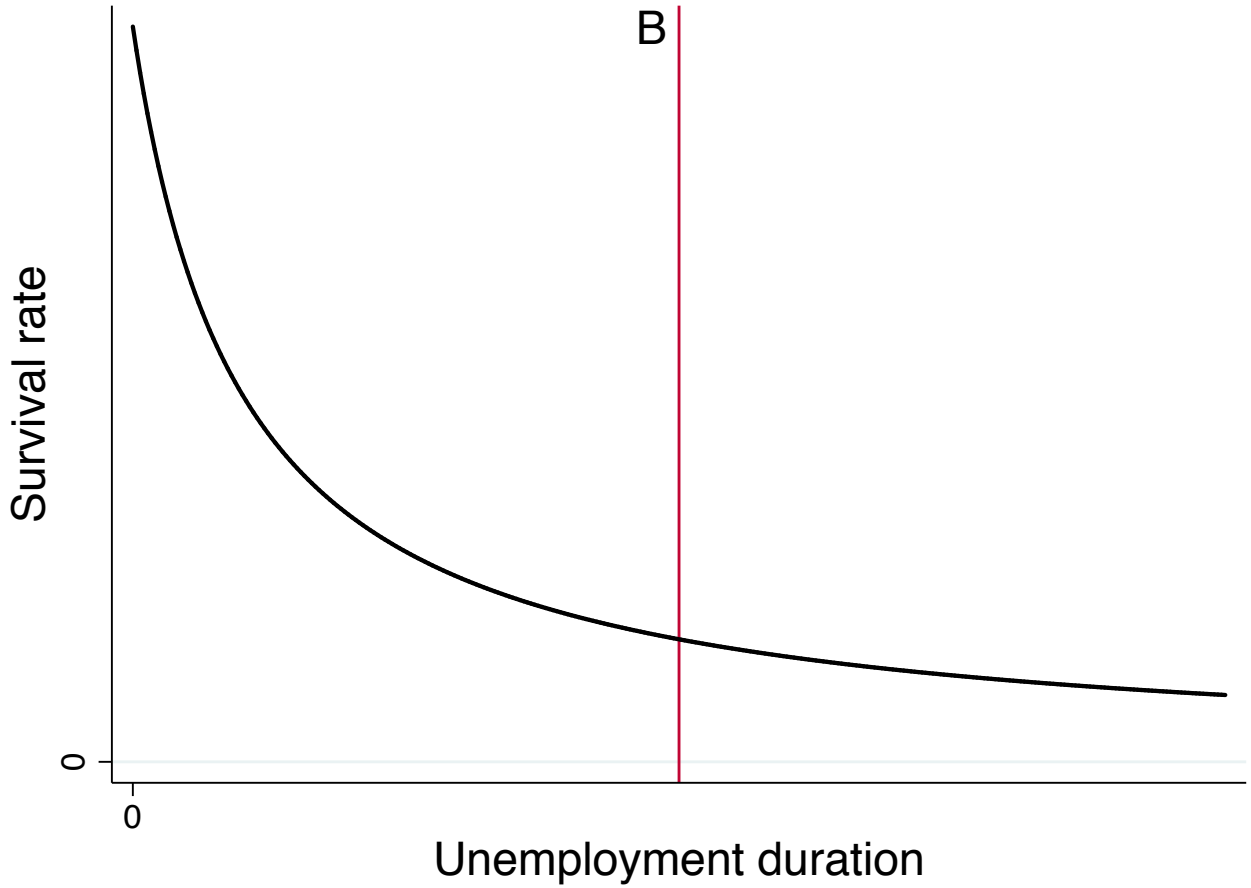
- We consider policies of the form $(b_1, b_2, ...)$ providing UI benefit b_1 for the first B_1 periods of unemployment, b_2 for the next $B_2 - B_1$ periods etc.
- The benefits are paid by a uniform tax τ on the employed.
- The average unemployment duration equals sum of survival rates at each duration:

$$D = \Sigma_t S(t) = \underbrace{\Sigma_0^{B_1} S(t)}_{=D_1} + \underbrace{\Sigma_{B_1}^{B_2} S(t)}_{=D_2} + .. + \underbrace{\Sigma_{B_{n-1}}^{T} S(t)}_{=D_n},$$

where D_i is the average duration spent receiving benefit b_i.

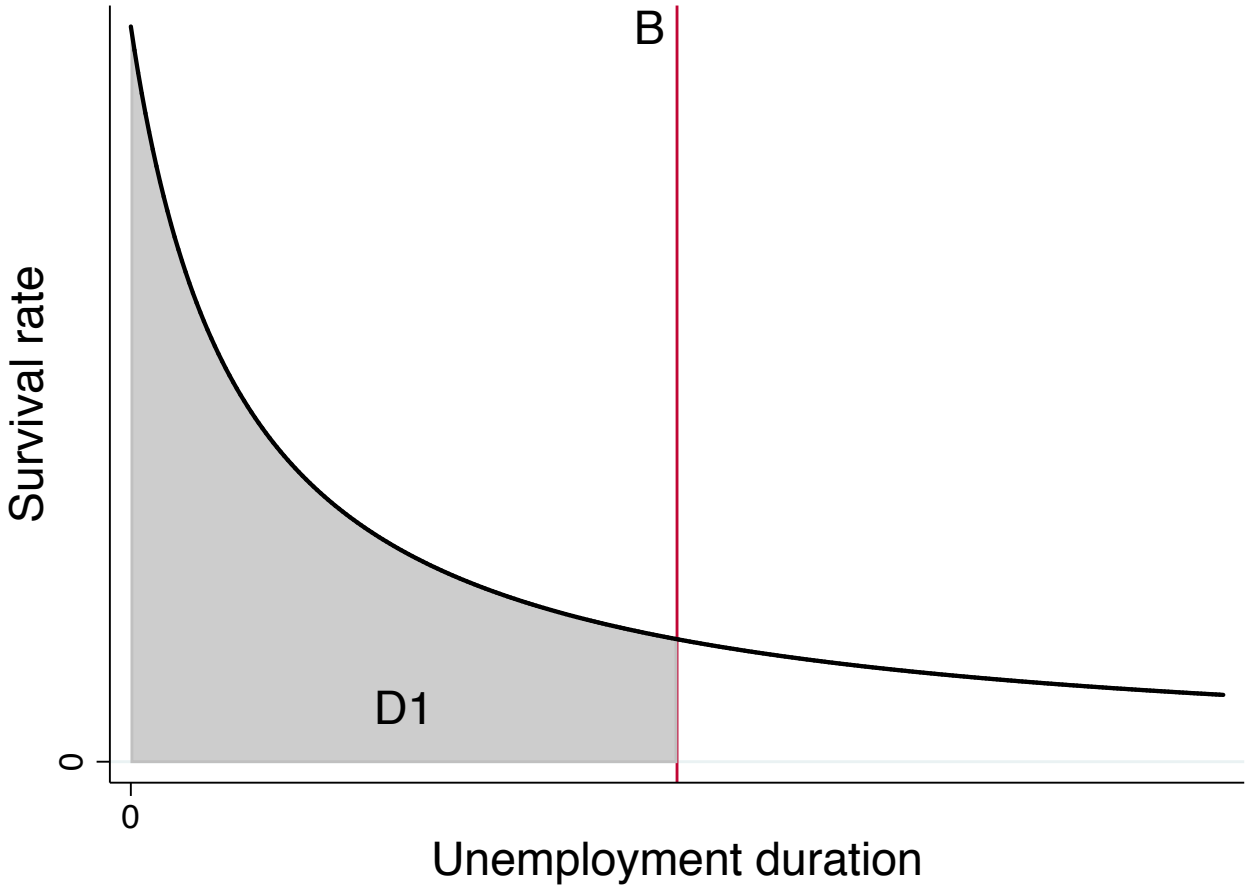
Illustration: Two-Part Policy

Illustration: Survival Rate Function S(t)



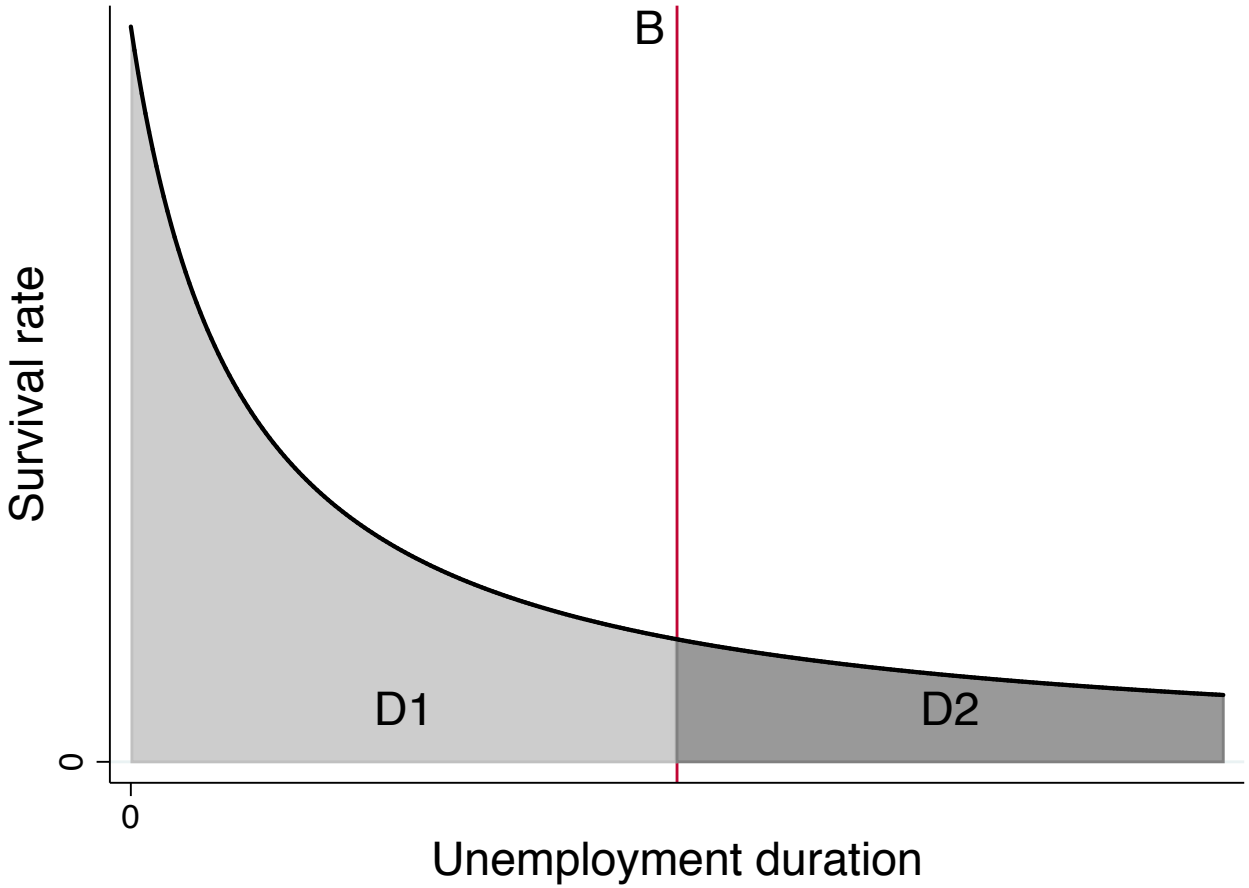
- Average unemployment duration equals $D = \Sigma_t S(t)$.

Illustration: ST Benefit Duration



- Average duration spent receiving benefit b_1 equals $D_1 = \Sigma_0^B S(t)$.

Illustration: LT Benefit Duration



- Average unemployment duration $D = \Sigma_t S(t) = D_1 + D_2$.

Optimal Unemployment Policy: Welfare

- The optimal unemployment policy solves

$$\max_{\mathbf{b},\tau} \quad \Sigma_i \mathcal{U}_i(\mathbf{b},\tau) \text{ for } \mathcal{U}_i(\mathbf{b},\tau) = \max_{\tilde{x}_i} U_i(\tilde{x}_i|\mathbf{b},\tau)$$

such that $\Sigma_k D_k \cdot b_k = [T - D] \cdot \tau$.

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- Baily-Chetty benchmark: the **optimal flat profile** b solves

$$\underbrace{\frac{E\left[u'\left(c^u\right)\right] - E\left[u'\left(c^e\right)\right]}{E\left[u'\left(c^e\right)\right]}}_{=\mathbf{CS_b}} = \underbrace{\varepsilon_{D,b}}_{=\mathbf{MH_b}} . \tag{1}$$

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- **Key insight** ($\sim$ Env. Thm): behavioral responses have *first-order* welfare effect through the fiscal externality only

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- Baily-Chetty formula generalizes for any benefit paid at duration t
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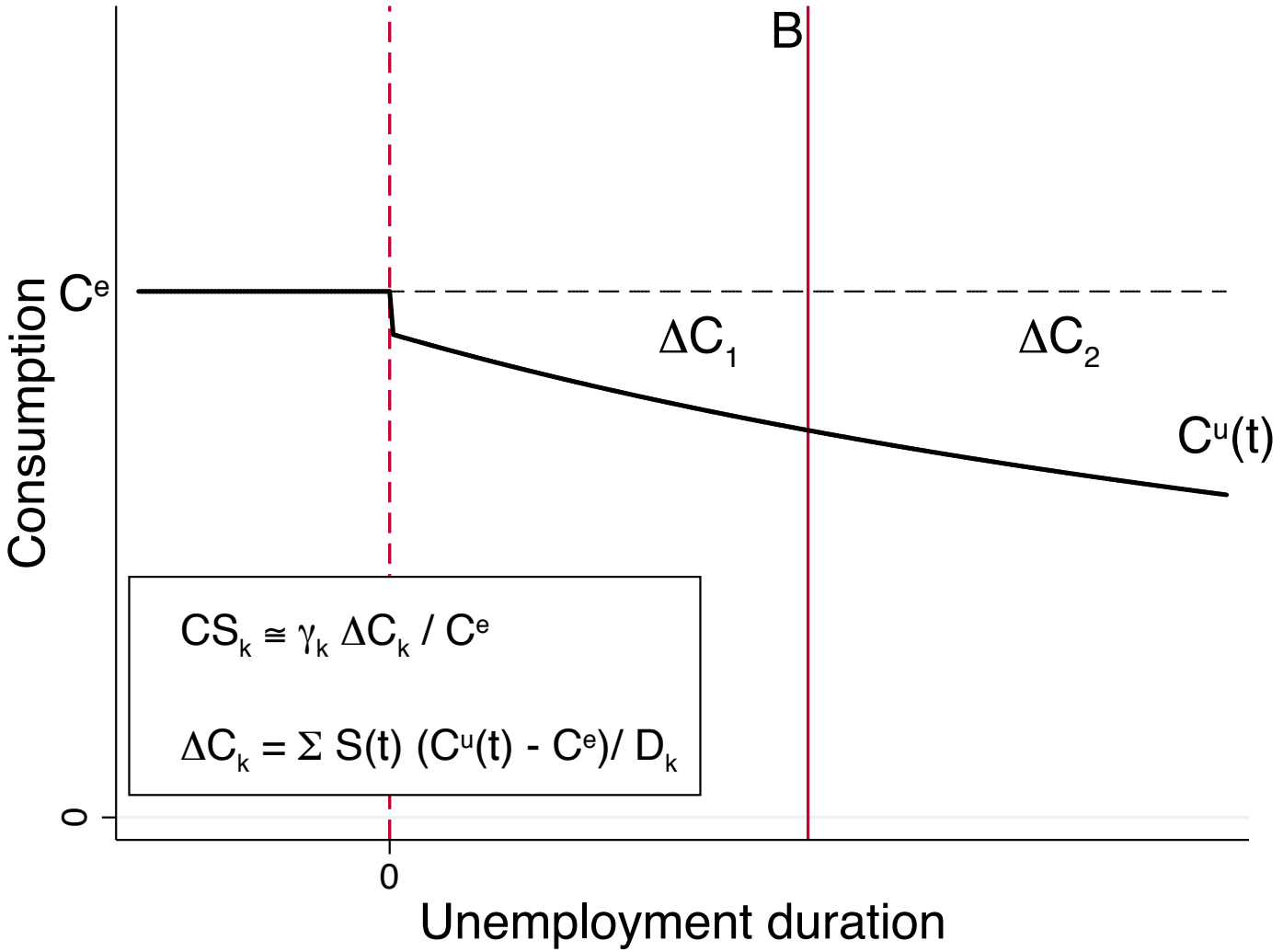
- *Sufficient* to consider for each benefit level b_t:
  - the CS_{b_t} gain: (direct) effect depending on the consumption drop
  - the MH_{b_t} cost: (behavioral) effect captured by the benefit duration elasticities

Sufficiency of Consumption Drop



Sufficiency of Cross-Duration Elasticities

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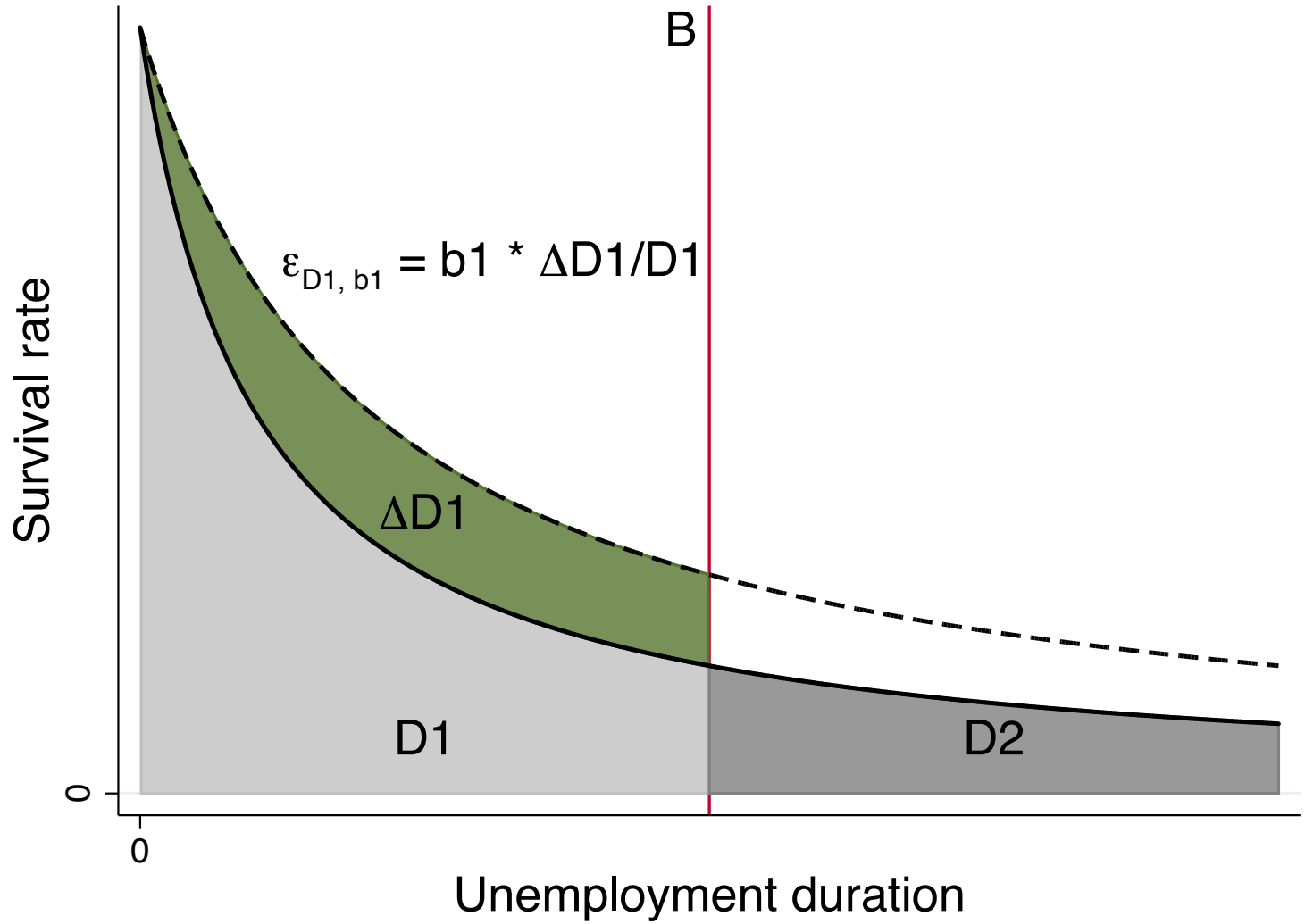

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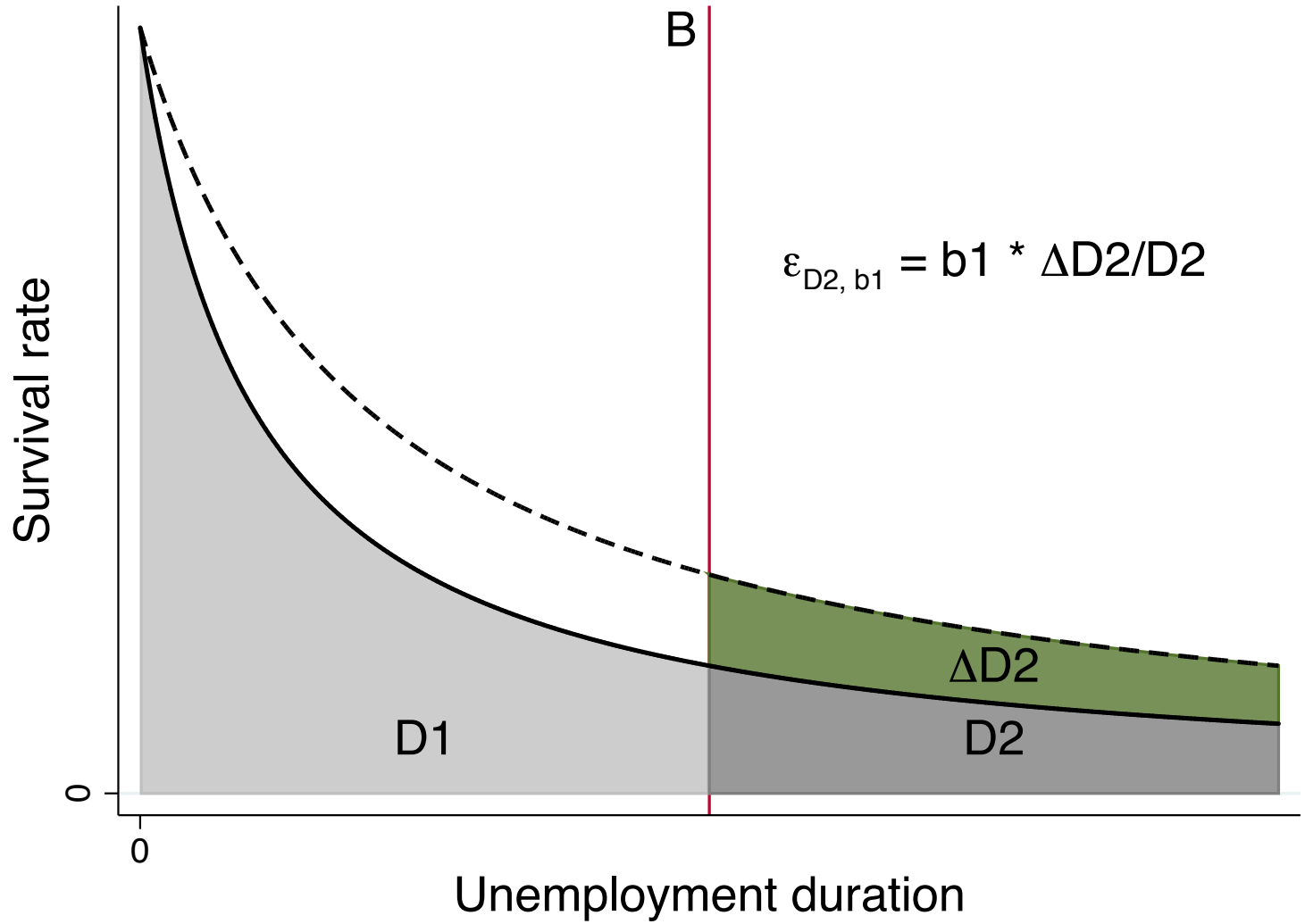

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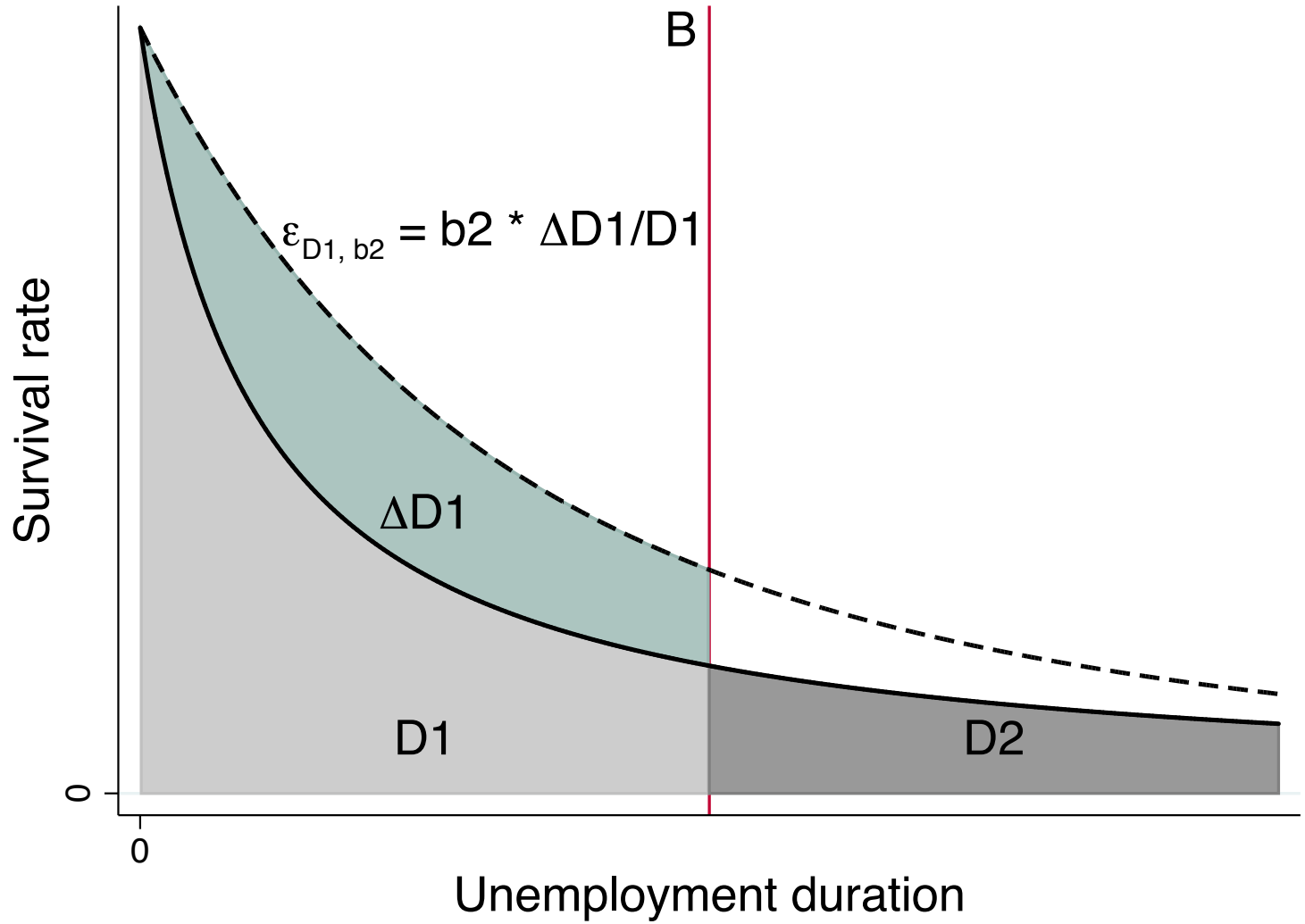

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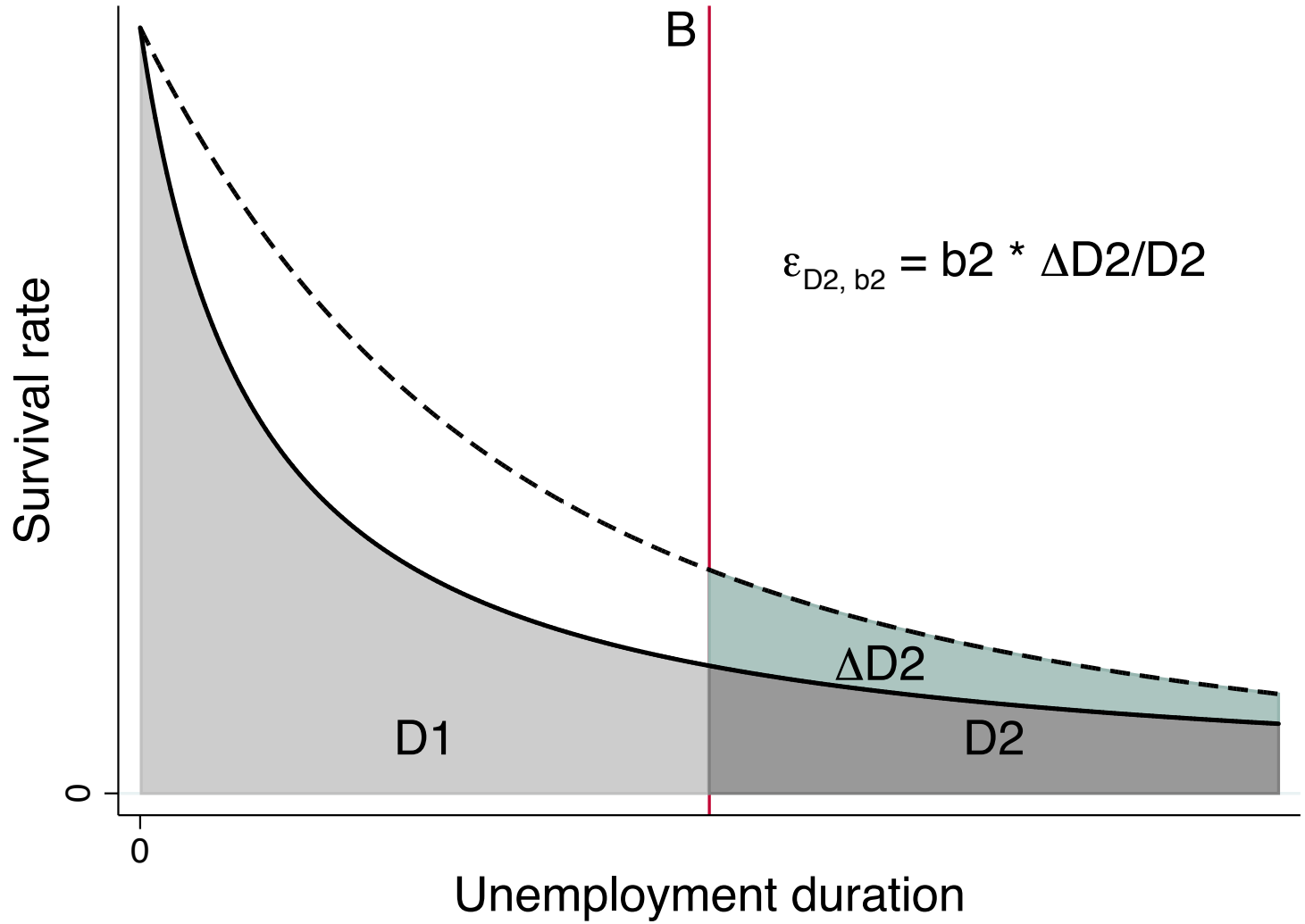


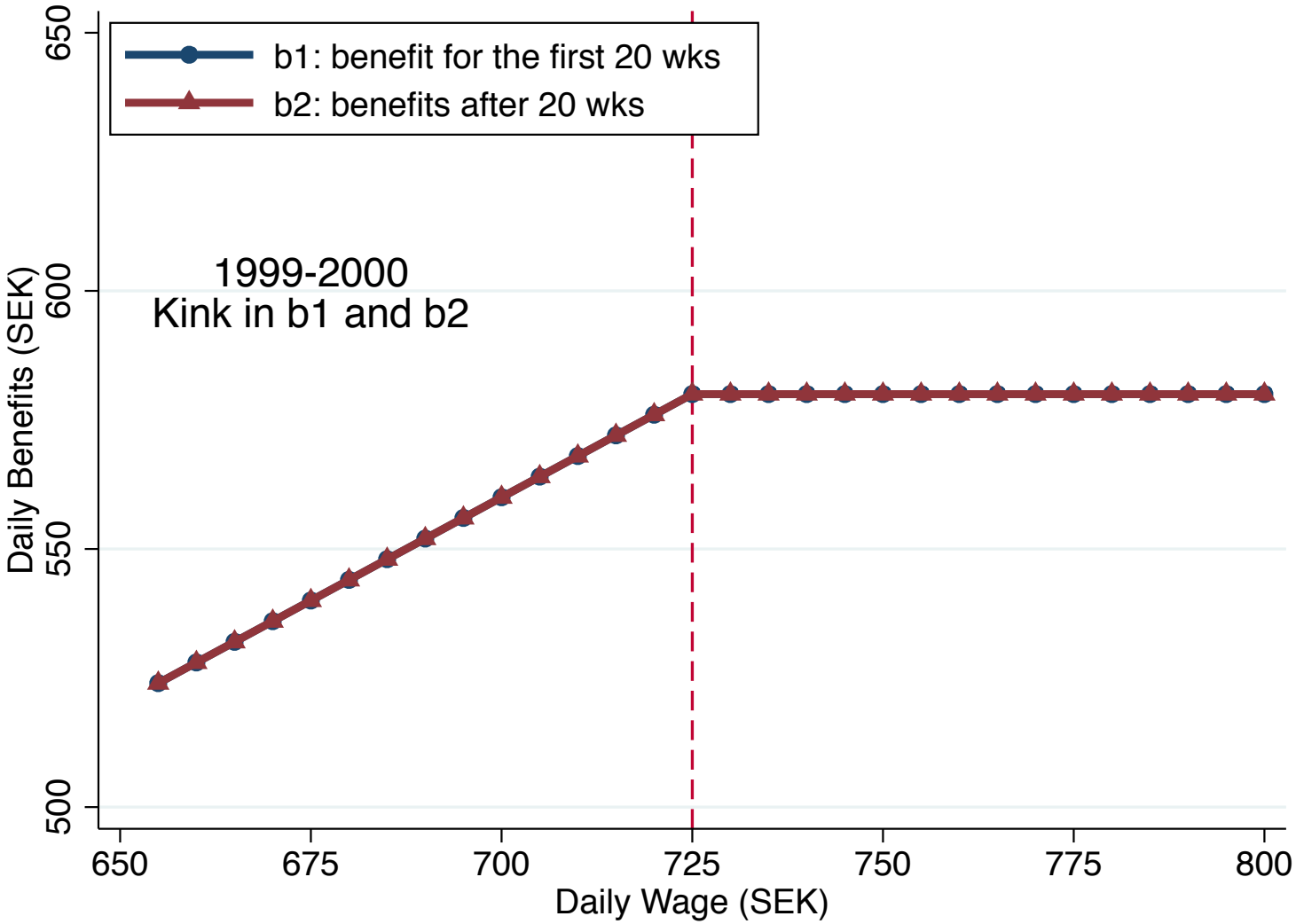
Dynamic Policy Insights Revisited

- For constant CS_{b_k} and MH_{b_k} over the spell $\Rightarrow$ *constant* benefits are optimal
- **Forward-looking** behavior: ST unemployed responding to LT benefits (Shavel&Weiss '79, Hopenhayn&Nicolini '97,...)
  - MH_{b_k} increasing in $k \Rightarrow$ *declining* benefits
- **Unobservable savings**: unemployed draw down assets during unemployment (Werning '02, Shimer&Werning '08,...)
  - CS_{b_k} increasing in $k \Rightarrow$ *inclining* benefits
- **Non-stationarity, heterogeneity** (Pavoni '09, Shimer&Werning '09)
  - e.g., negative duration dependence (either true or by selection)
  - MH_{b_k} may well be decreasing in $k \Rightarrow$ *inclining* benefits

Context and Data

- Universe of unemployment spells from unemployment registers in Sweden (1999-2013)
- Sweden levied a wealth tax, up until 2007. We link unemployment registers to income and wealth registers for full Swedish population (1999-2007).
- Unemployment benefits replace 80% of pre-unemployment wage, but are capped at a threshold close to the median wage
- Unemployment benefits can be received forever. Participation into ALMP is required after 60 or 90 wks of unemployment.

Duration-Dependent Benefit Cap



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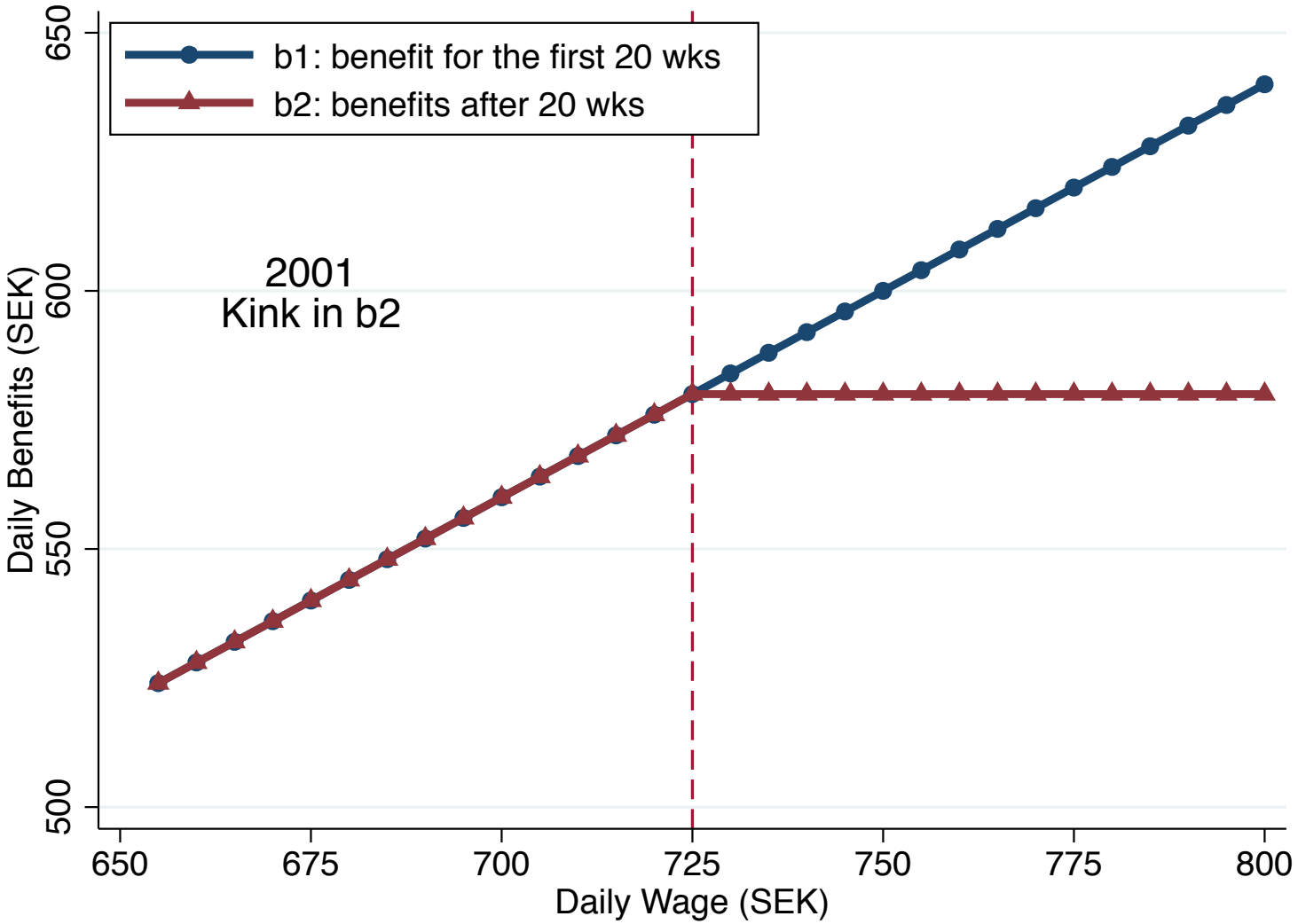

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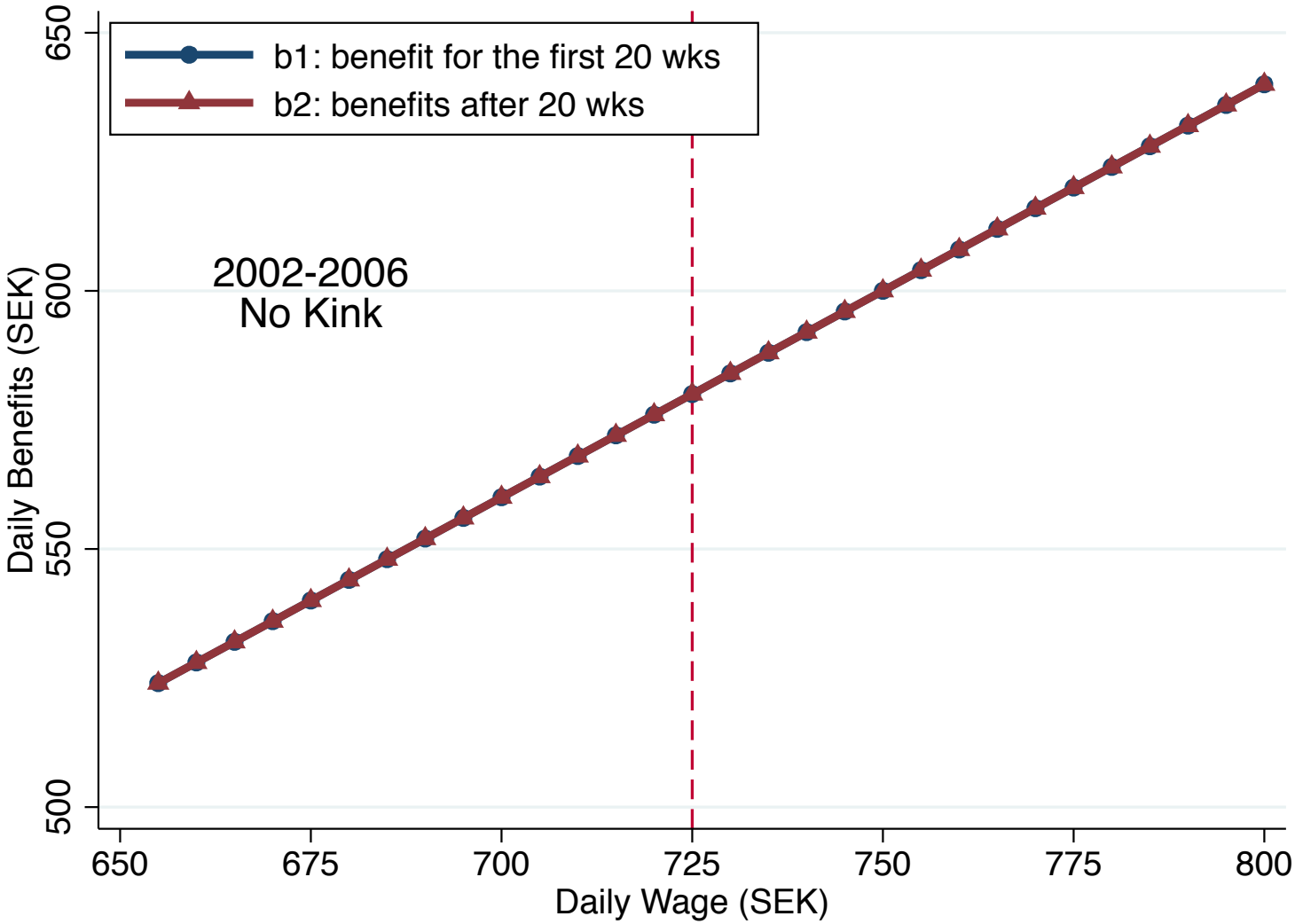


Regression Kink Design

- General model:

$$Y = y(b_1, b_2, w, \varepsilon)$$

  - Y: duration outcome of interest
  - b_k: endogenous regressor of interest; deterministic, continuous function of earnings w, kinked at $w = \bar{w}_k$

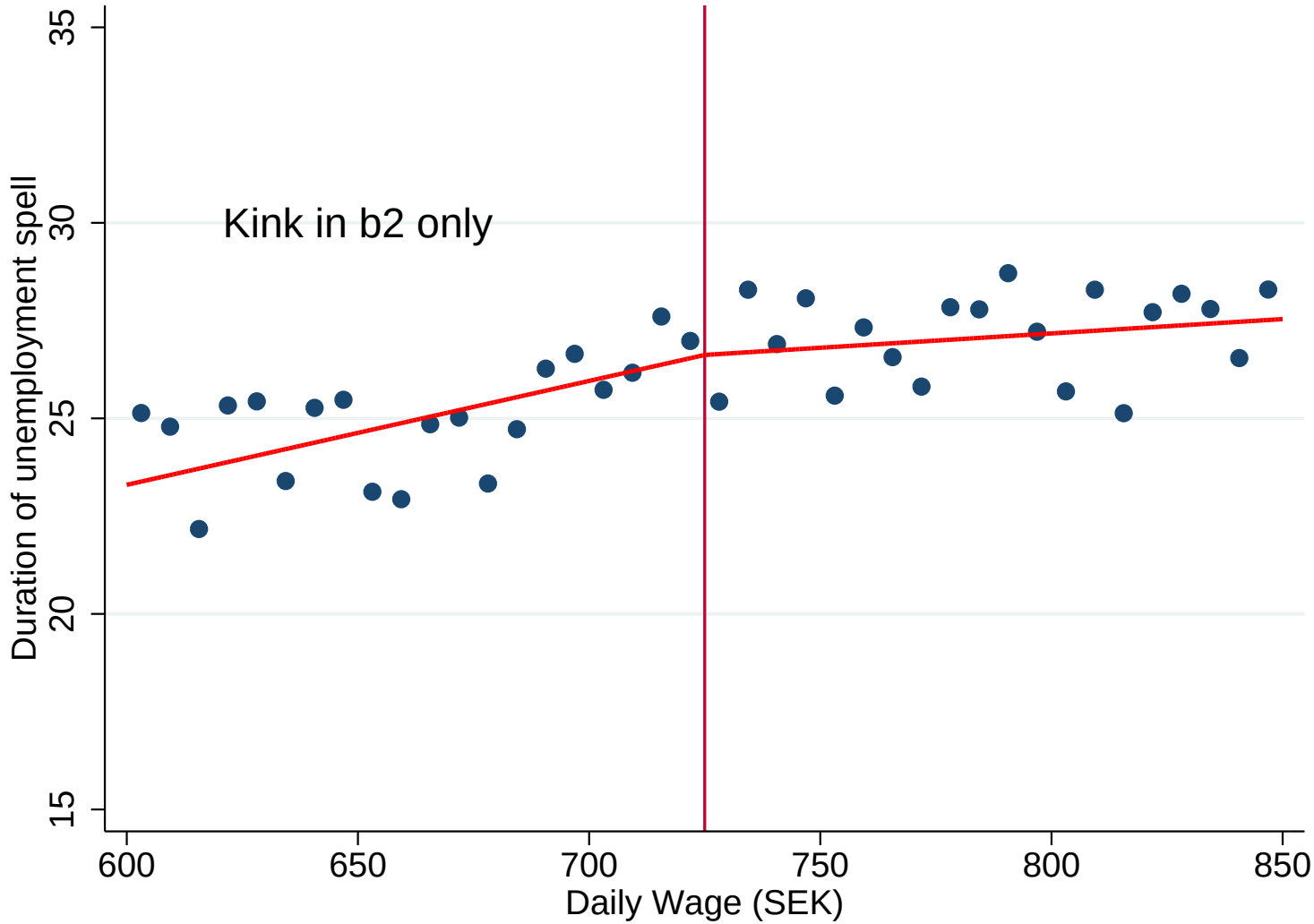
- **Identifying assumptions:**
  - smooth density of forcing variable w
  - direct marginal effect of w on Y is smooth
- **Non-parametric identification** of the average marginal effect of b_k on Y:

$$\hat{\alpha}_k = \frac{\hat{\delta}_k}{\nu_k}$$

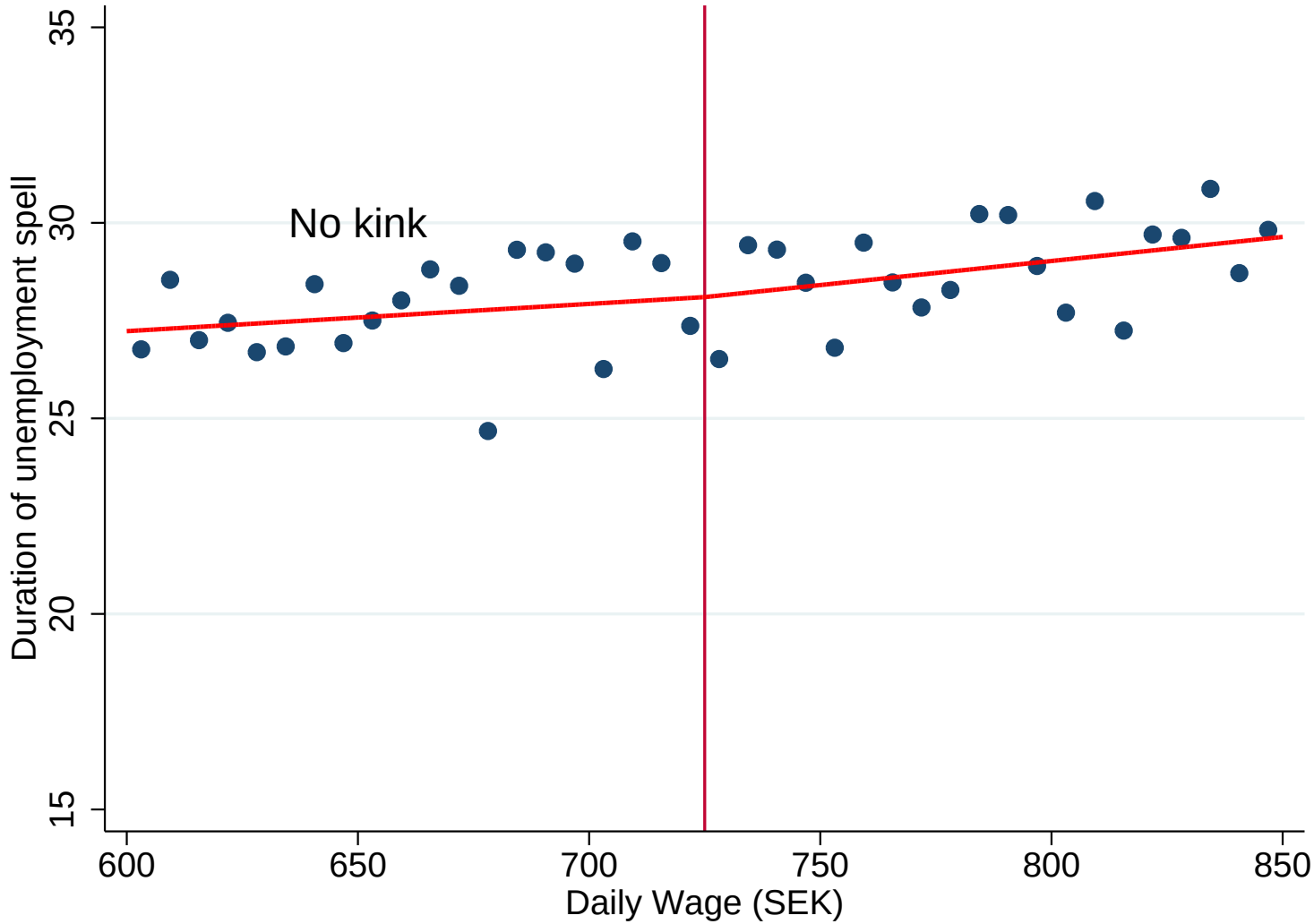
  - $\hat{\delta}_k$: estimated change in slope between Y and w at kink $\bar{w}_k$
  - ν_k: deterministic change in slope between b_k and w at kink $\bar{w}_k$

Wage and Unemployment Duration: Kink in b_1 and b_2

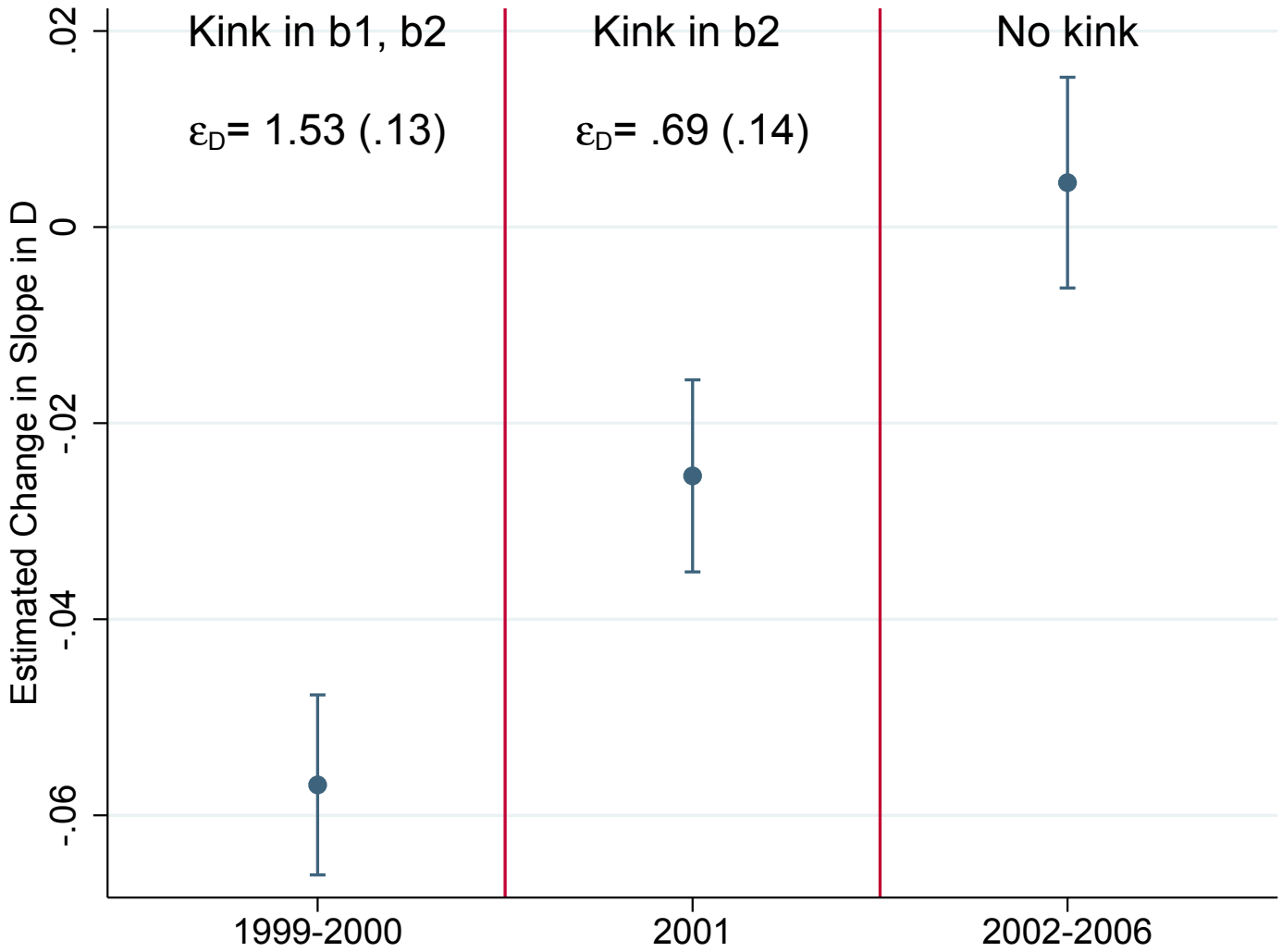
Wage and Unemployment Duration: Kink in b_2



Wage and Unemployment Duration: No Kink



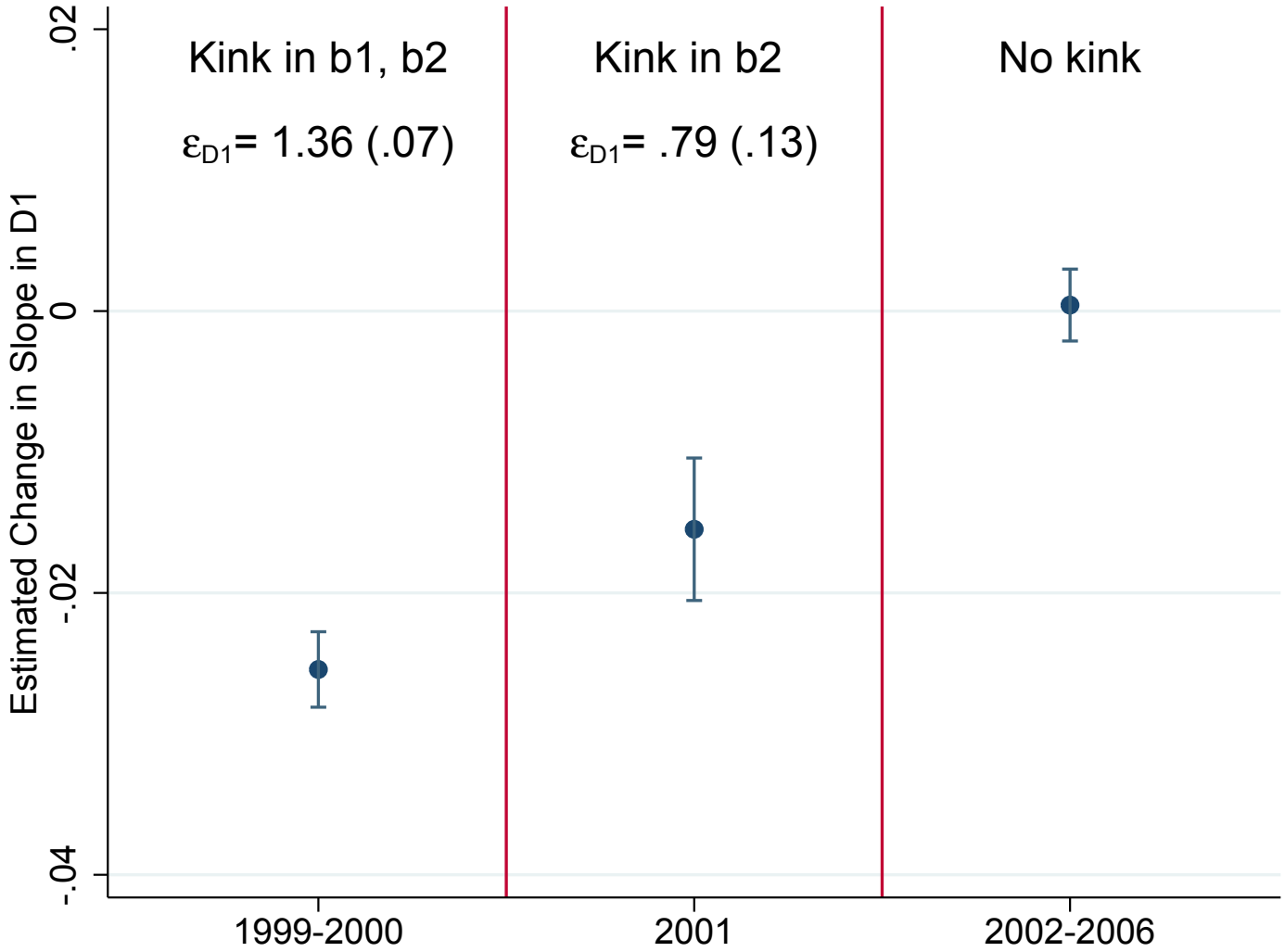
RKD: Estimated Duration Responses



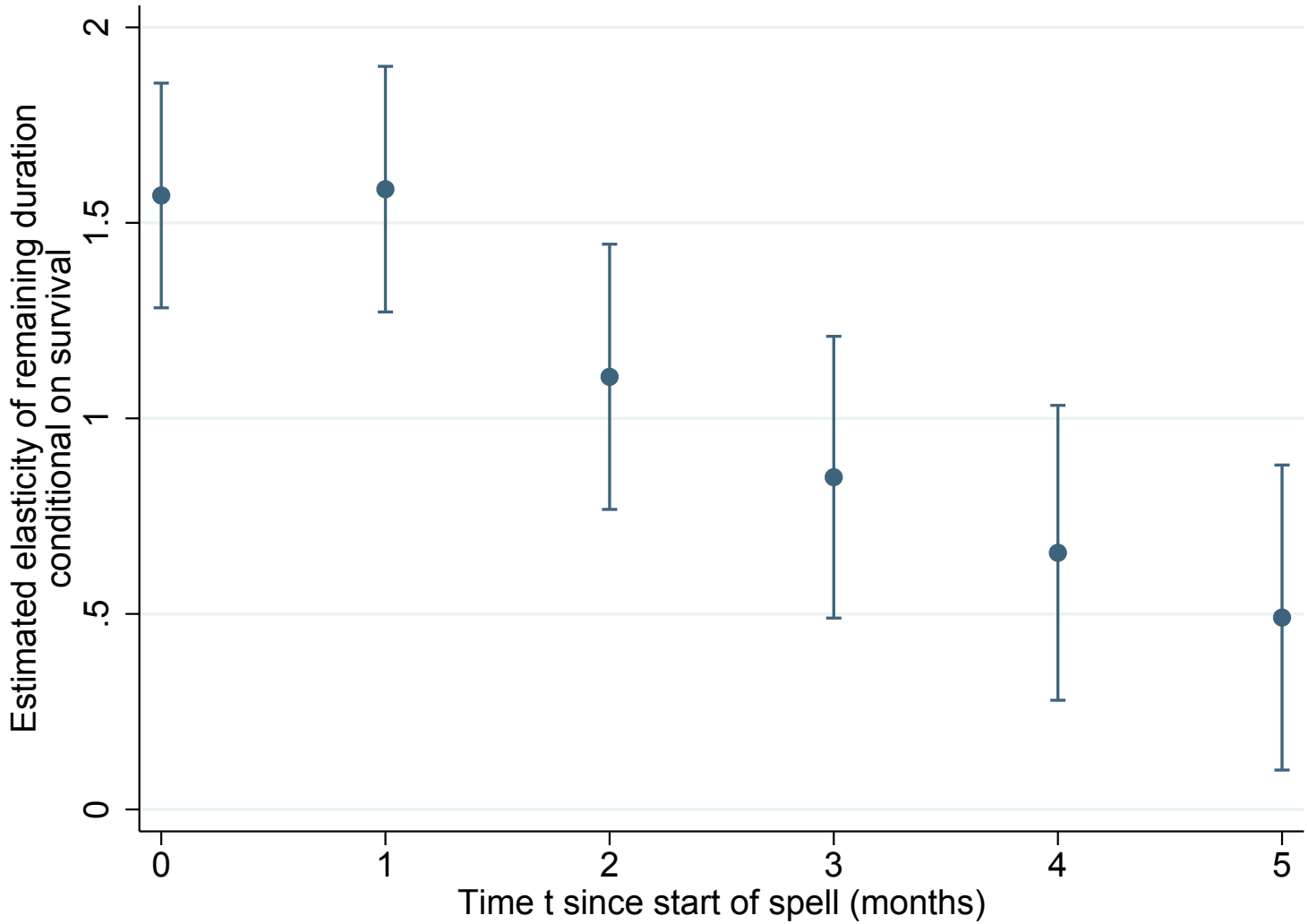
Duration Responses: Takeaways

- Estimates imply $\varepsilon_{D,b_1} = .84\ (.19)\ (> \varepsilon_{D,b_2} = .69\ (.14))$ ▸ Kink in b_1 only
- For flat profile, $MH_{b_k} = \varepsilon_{D,b_k} \frac{D}{D_k}$, implying $MH_{b_1} > MH_{b_2}$
  - Unemployed are forward-looking ($\varepsilon_{D_1,b_2} > 0$)
  - Non-stationary more than offsets this!
- Estimates can explain different findings in earlier works
  - $\varepsilon_{D,b_1} \approx$ Meyer [1990], Landais [2015] in U.S. (where b_1 for 26 weeks)
  - Schmieder&al. [2012], Rothstein [2011], Valetta&Farber [2011] : smaller effects of extensions from long baseline durations
- Robustness: ▸ Smooth pdf density ▸ Covariate tests ▸ Bandwidth tests ▸ Placebo kinks

RKD: Estimated Responses for D_1



Non-stationarity: Elasticity of Remaining Duration



Consumption Measure using Admin Data

- Simple idea: consumption as a residual expenditure measure,

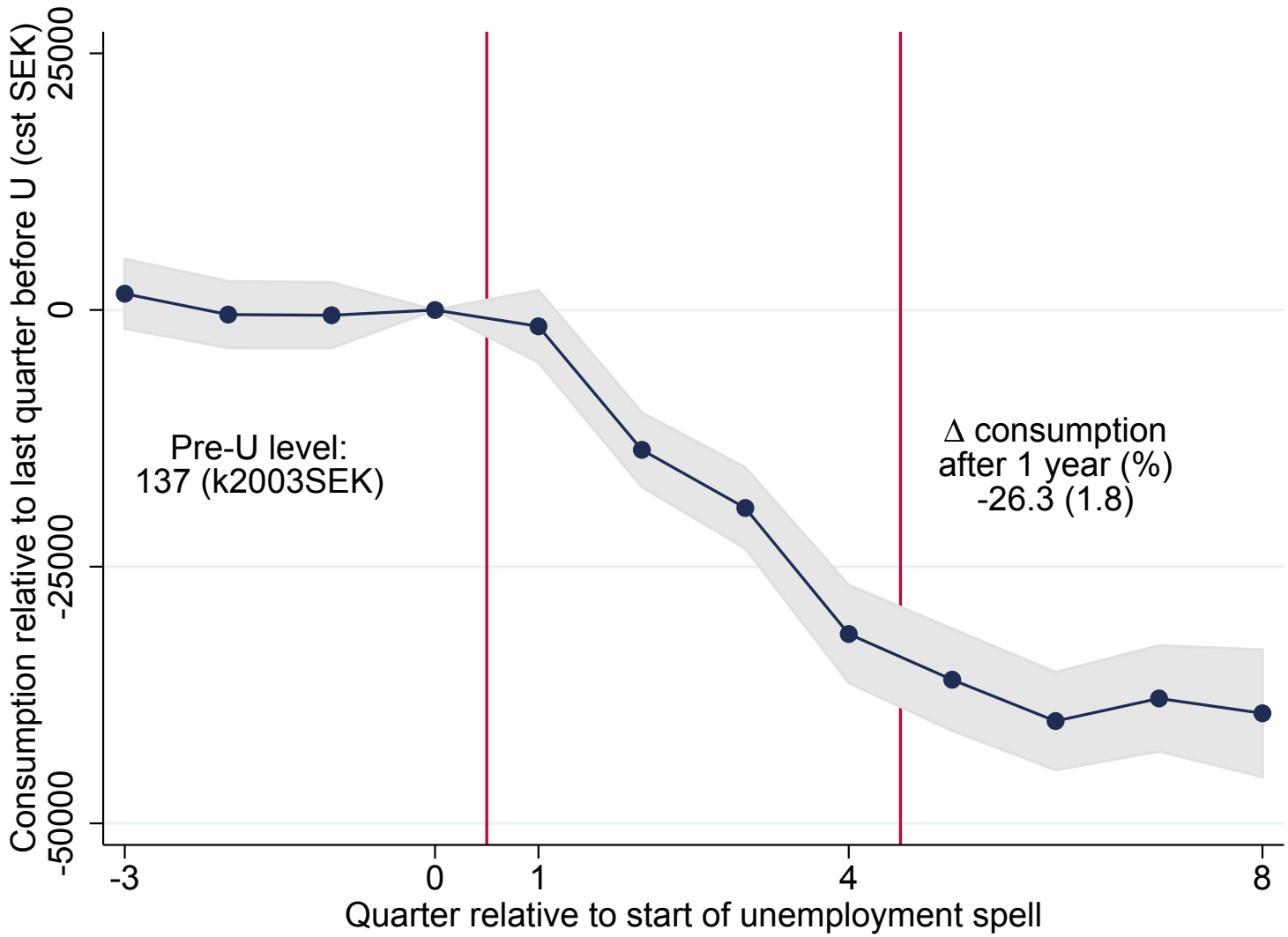
$$consumption_t = income_t - \Delta assets_t$$

- We use admin data (from tax registers) on earnings y, transfers T, bank savings b, outstanding debt d, other financial assets v and real assets h.
  - Account for returns from assets and changes in stock value ▸ Details
  - Majority starts unemployment with **no financial nor real assets** ▸ Table

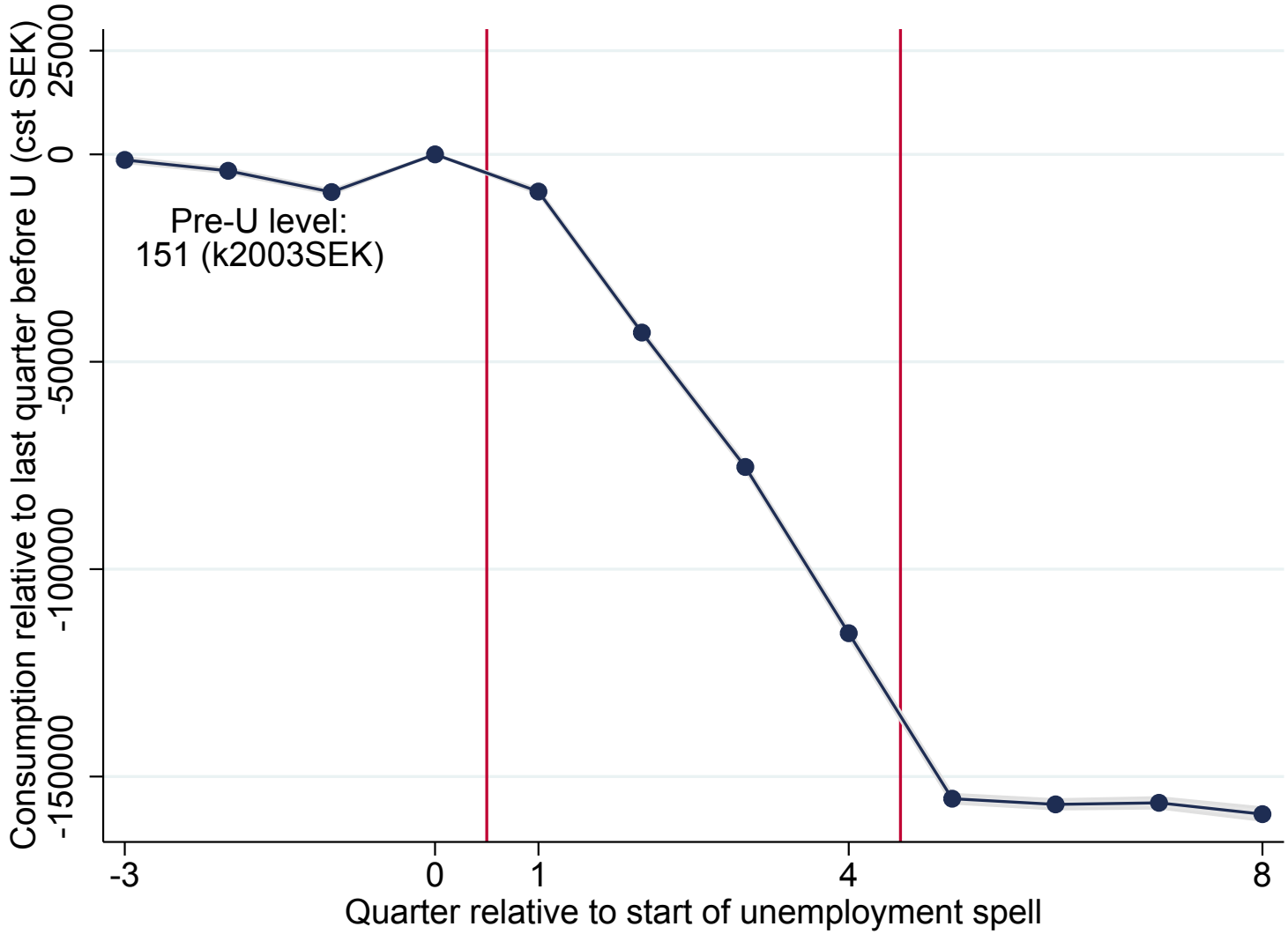
- We construct yearly consumption C and correlate this with spell length t in Dec.

- We check consistency and provide additional evidence based on consumption survey data (Koijen et al. ['11] and Kreiner et al. ['12]) .

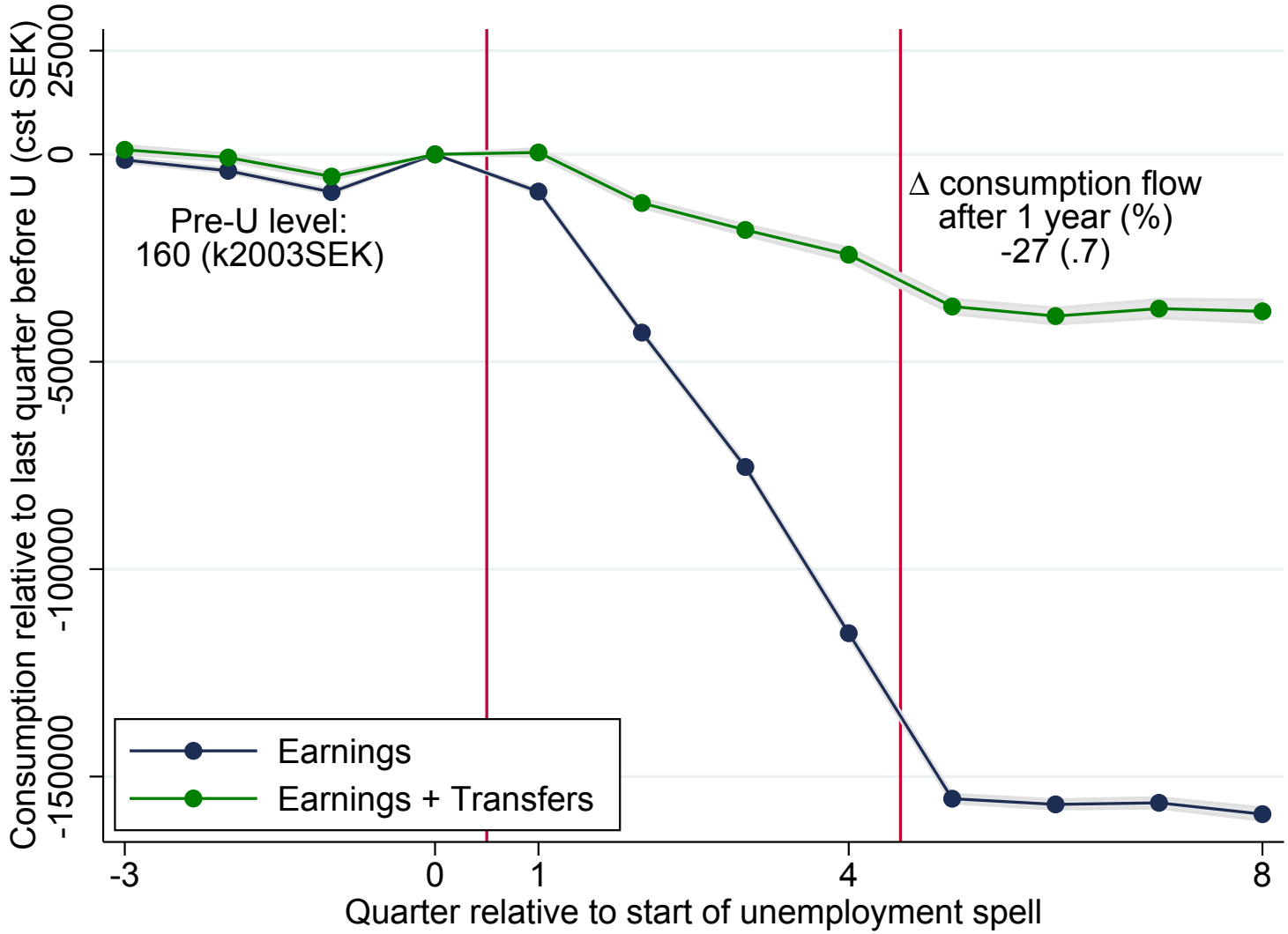
Yearly Consumption over the Spell



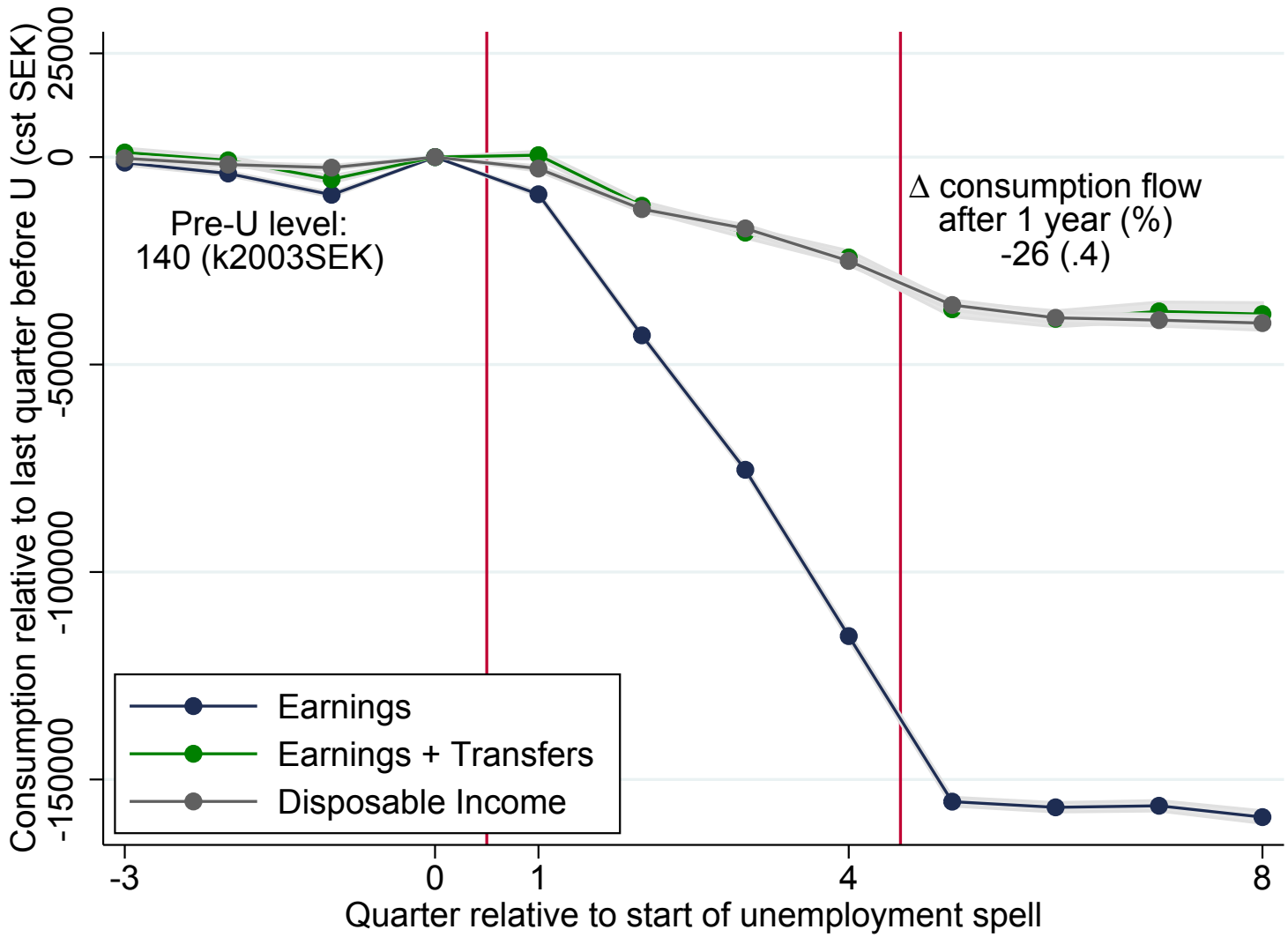
Decomposition: Earnings



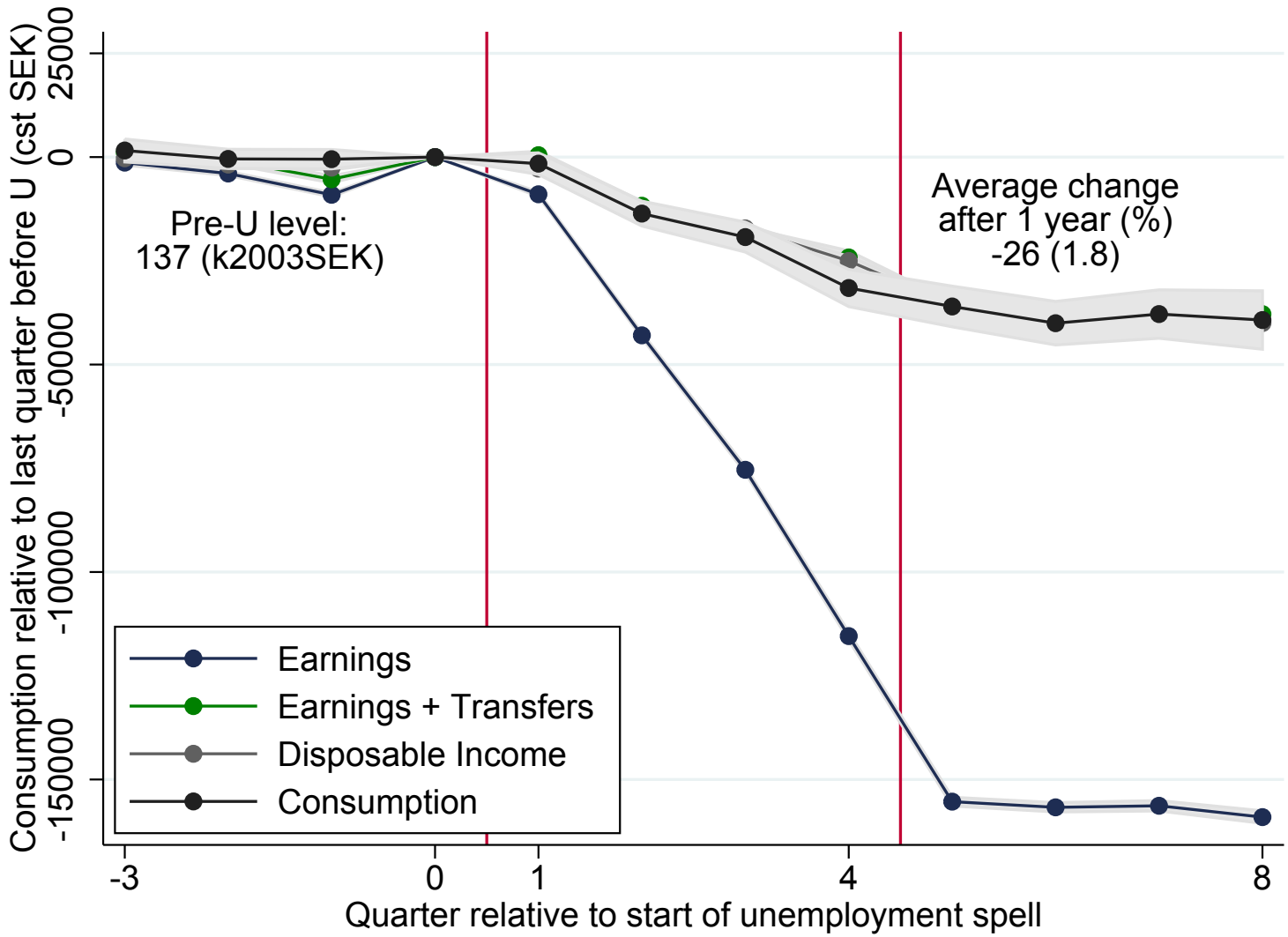
Decomposition: + Transfers



Decomposition: + Other Income



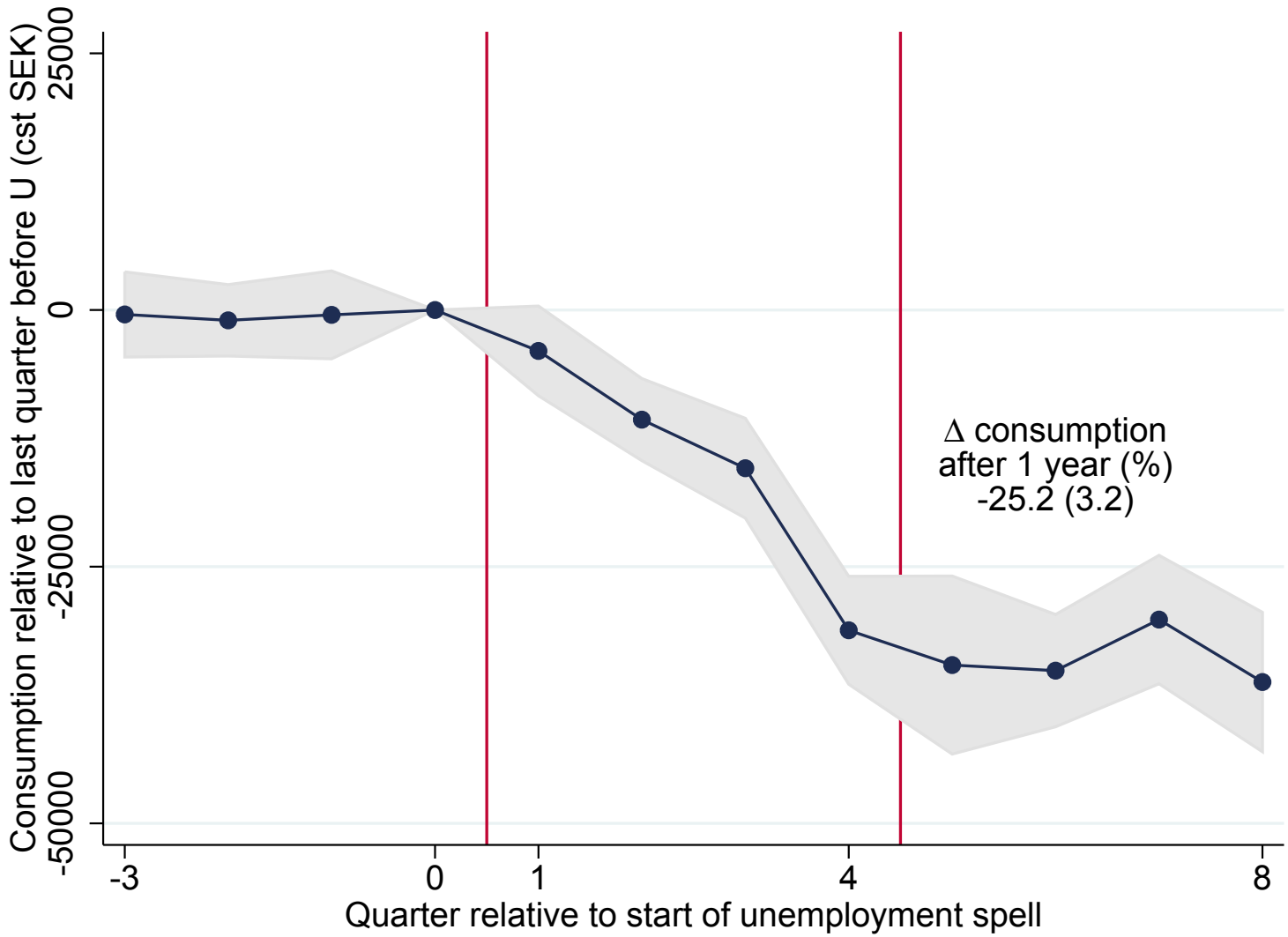
Decomposition: + Changes in Assets



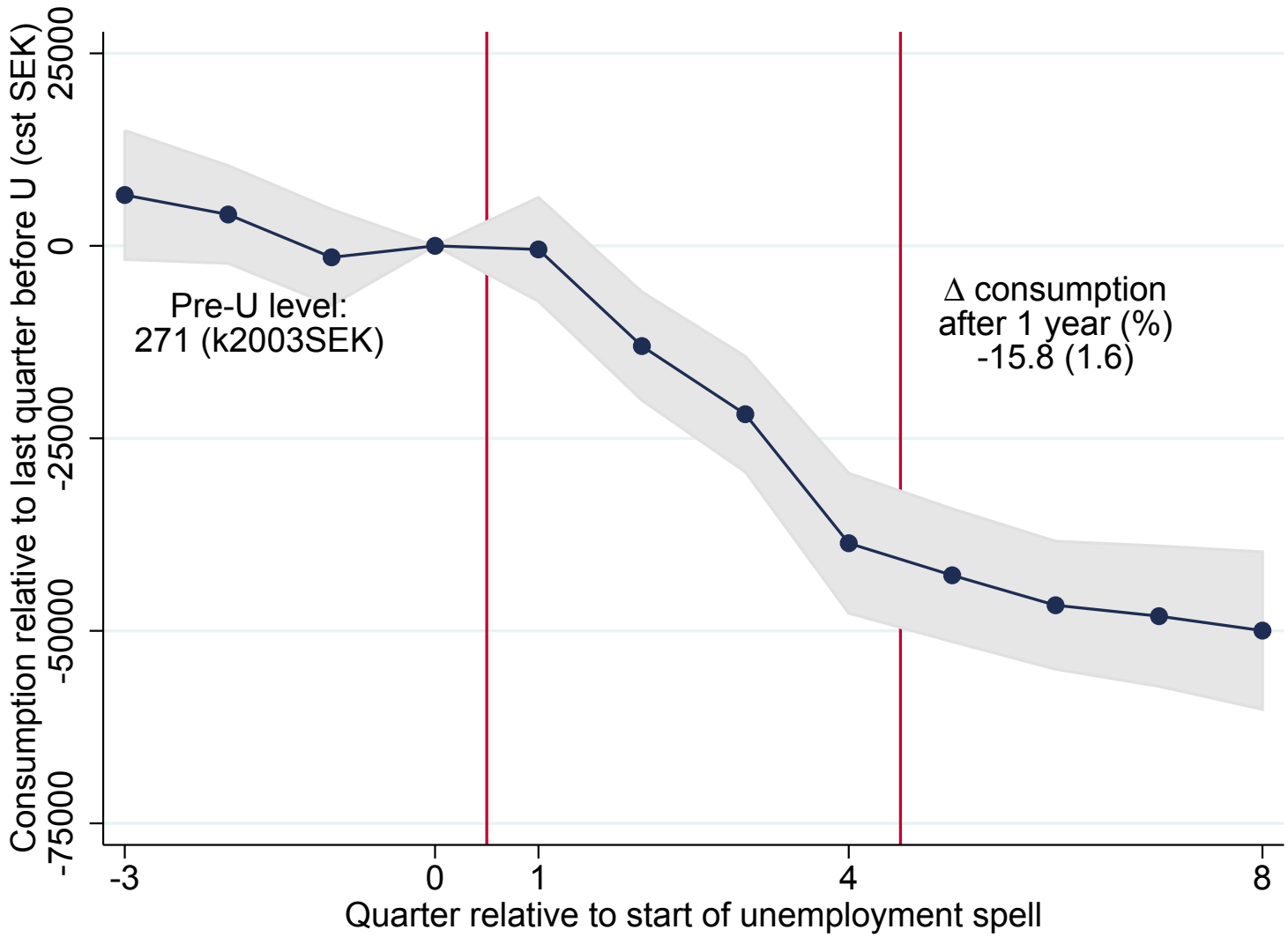
Consumption Out of Assets and Debt

- Relatively limited consumption smoothing out of assets on average and limited impact on overall profile, but key for understanding heterogeneity in responses.
- **After 1 year...**
  - Increase in total consumption from financial assets equals about 5%
    ▸ Bank accounts ▸ Financial assets
  - Reduction in real estate investment, but offset by reduction in mortgage debt
    ▸ Real estate assets ▸ Debt
  - For renters, decrease in consumption from debt of $> 5\%$, indicative of credit constraints
    ▸ Debt for renters

Yearly Consumption: Within-Indiv. Duration Dependence



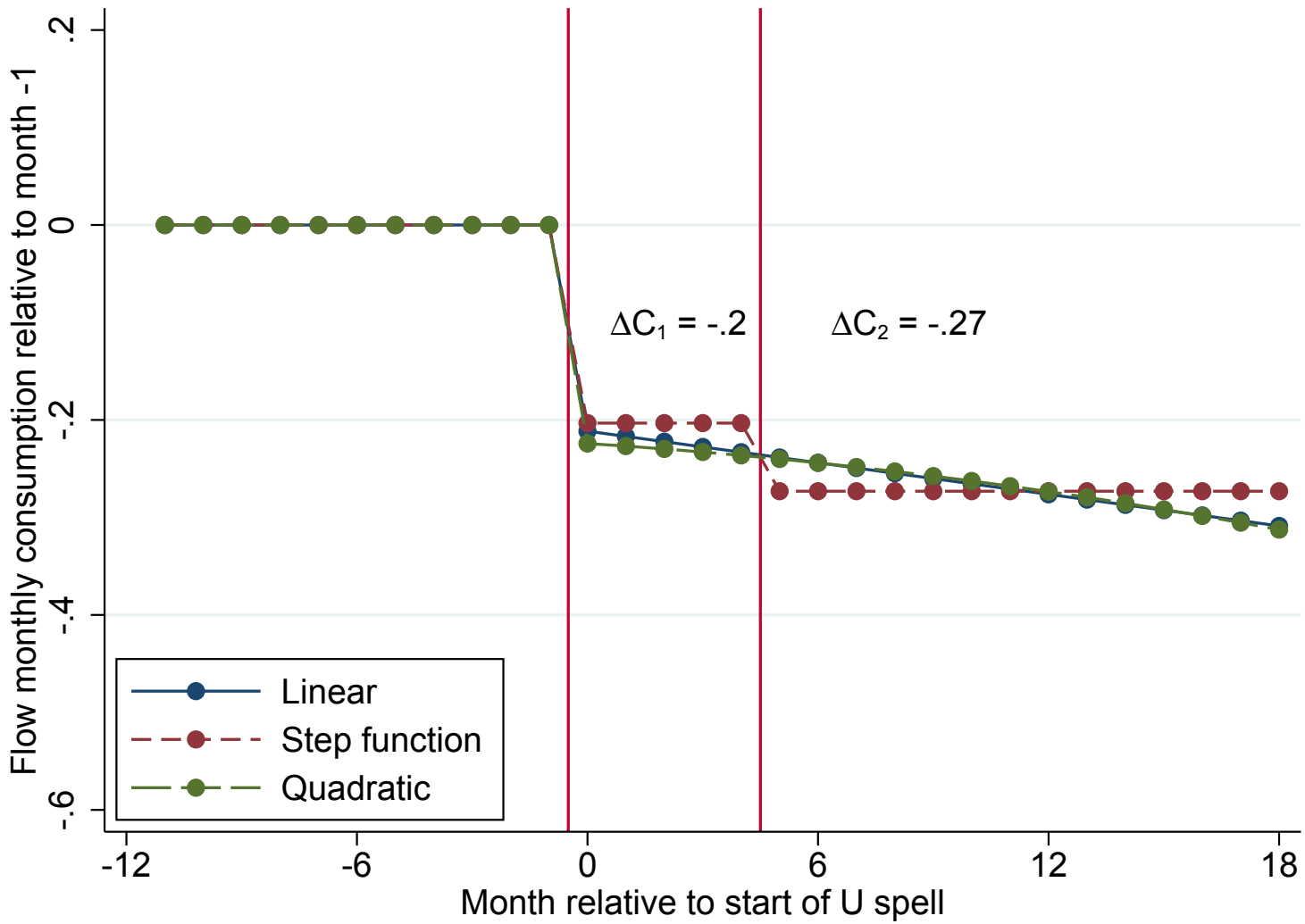
Yearly Consumption: Household Level



Recovering Higher-Frequency Consumption

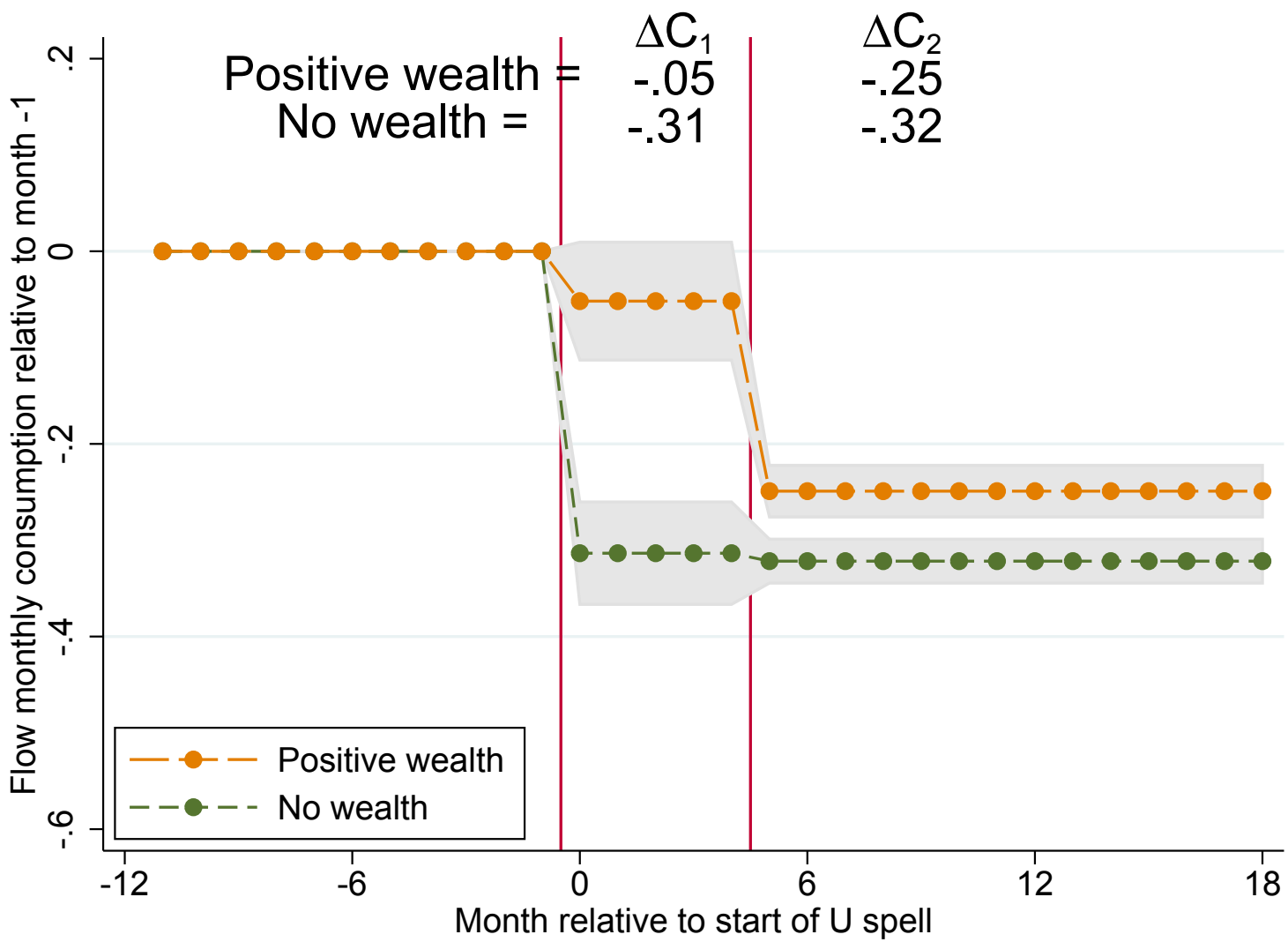
- Can we recover high-frequency unemployment consumption c_t from yearly aggregates?
  - we observe consumption at different spell lengths t, but aggregated over the past year (e.g., $C(t) = \sum_{q=0}^{11} c_{t-q}(t)$)
  - yearly measure mixes c^e and c^u for spells shorter than a year
- Parametric approach:
  - specify parametrically $c_s(t)$ and estimate parameters from $C(t)$
  - **Identifying assumption**: no selection on consumption profile
- Compare to consumption profile from consumption survey:
  - measures of consumption expenditures at the household level
  - flow measures at the time of interview

Monthly Consumption Over the Spell

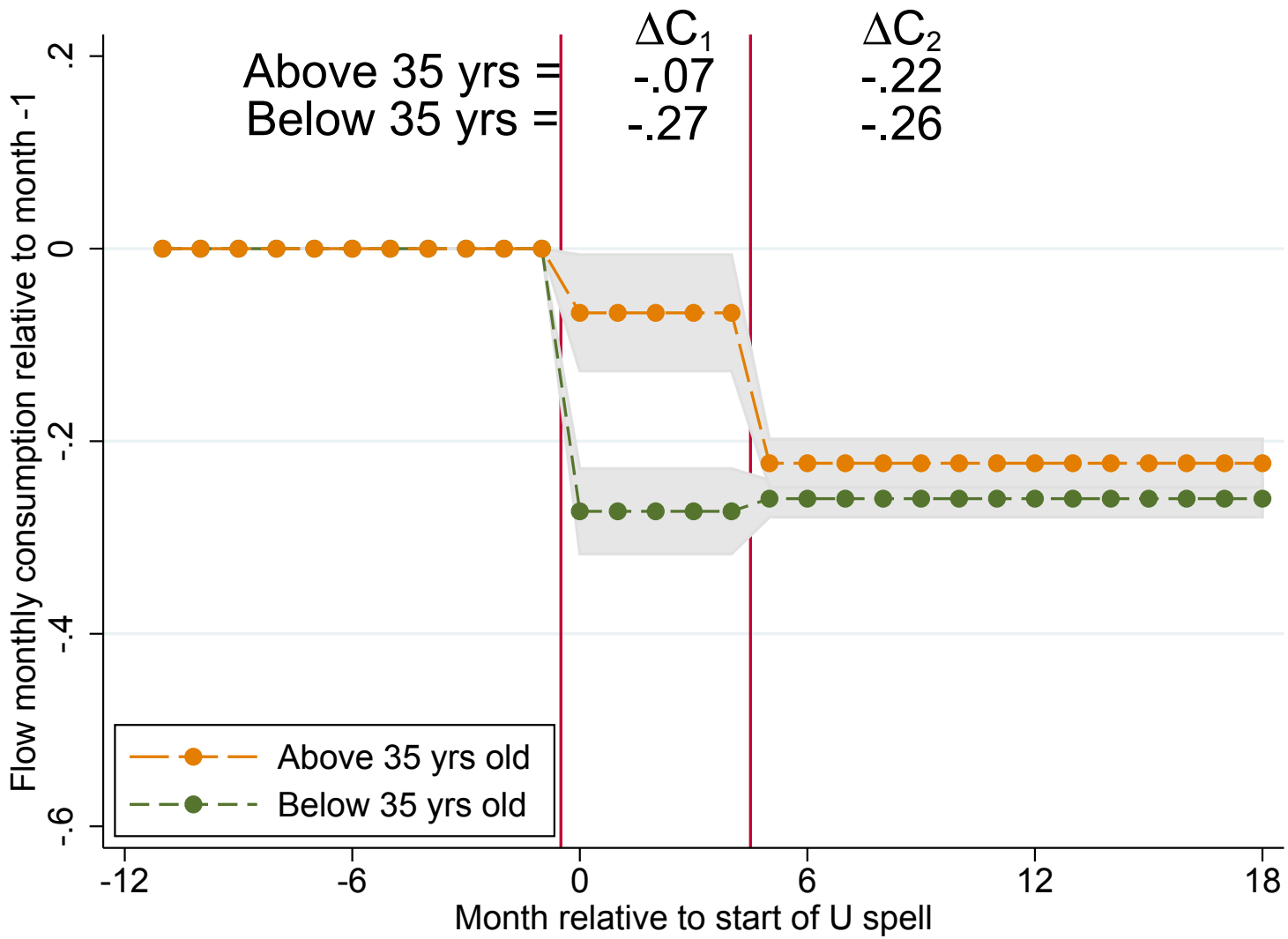


▸ Selection

Heterogeneity by Initial Wealth



Heterogeneity by Age



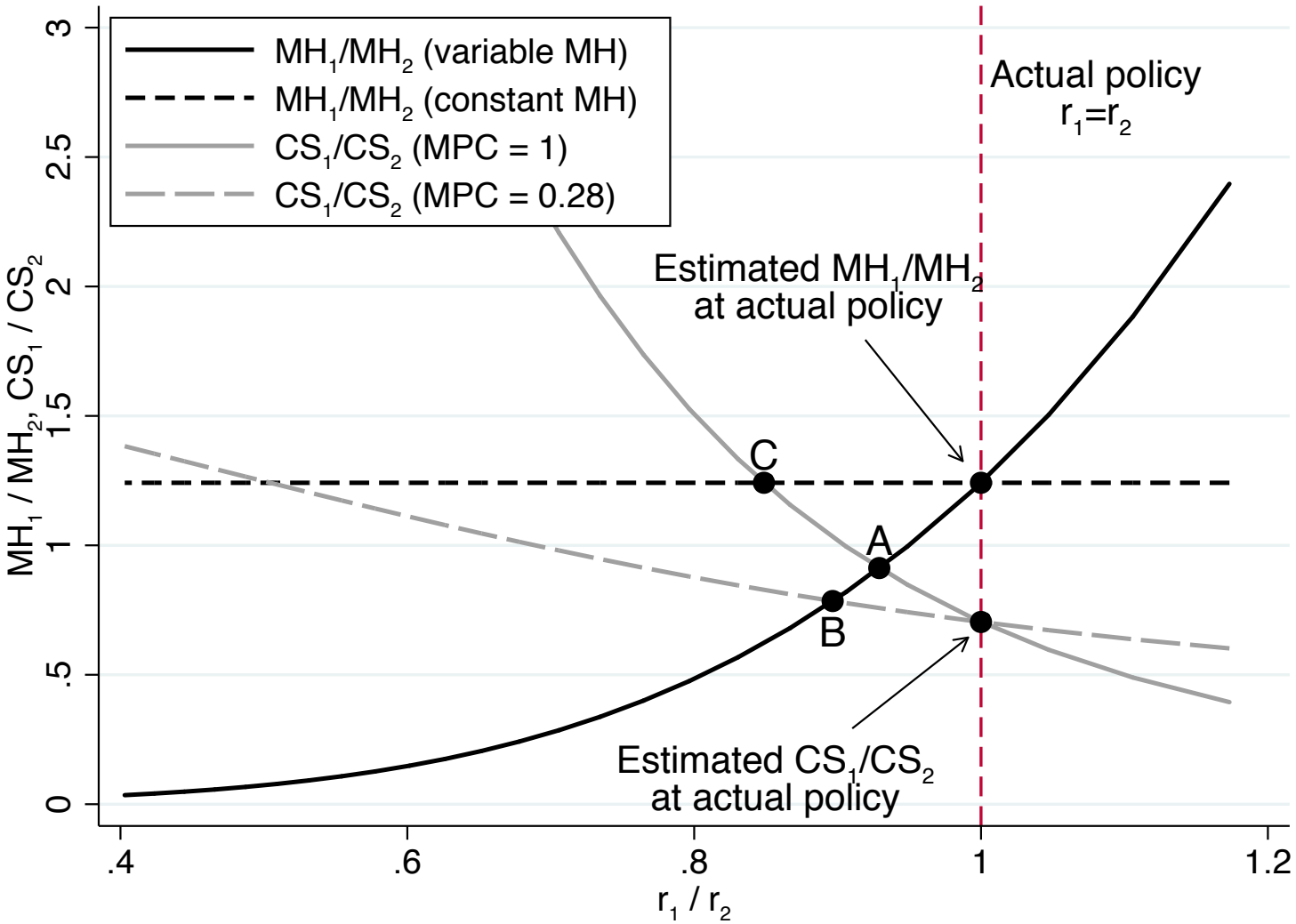
▸ Back

Welfare: Putting Things Together

	(1) Moral hazard costs	(2) Average consumption drop	(3) Value of tax-funded kroner spent
	MH_x	ΔC_x	CS_x / MH_x
b	1.53	.23	$\tilde{\lambda} \times \tilde{\gamma} \times .15$
	(.13)	(.01)	
b_1	1.67	.19	$\tilde{\lambda_1} \times \tilde{\gamma_1} \times .11$
	(.37)	(.03)	
b_2	1.38	.27	$\tilde{\lambda_2} \times \tilde{\gamma_2} \times .20$
	(.27)	(.01)	

- Starting from a flat rate of 80% in Sweden, we find:
  - benefits seem too high throughout the spell (for standard $\gamma \leq 2$)
  - value of marginal kroner spent on unemployed after 20wks is almost twice as high as before 20wks
- Local evaluation pushes towards an inclining benefit profile!
  - back-of-the-envelope: optimal b_2 10% higher than b_1
  - ▸ Calibration
- Robustness: ▸ Surveyed Consumption ▸ Heterogeneity ▸ Consumption vs. Expenditures

Optimal Profile: Relative CS vs. MH



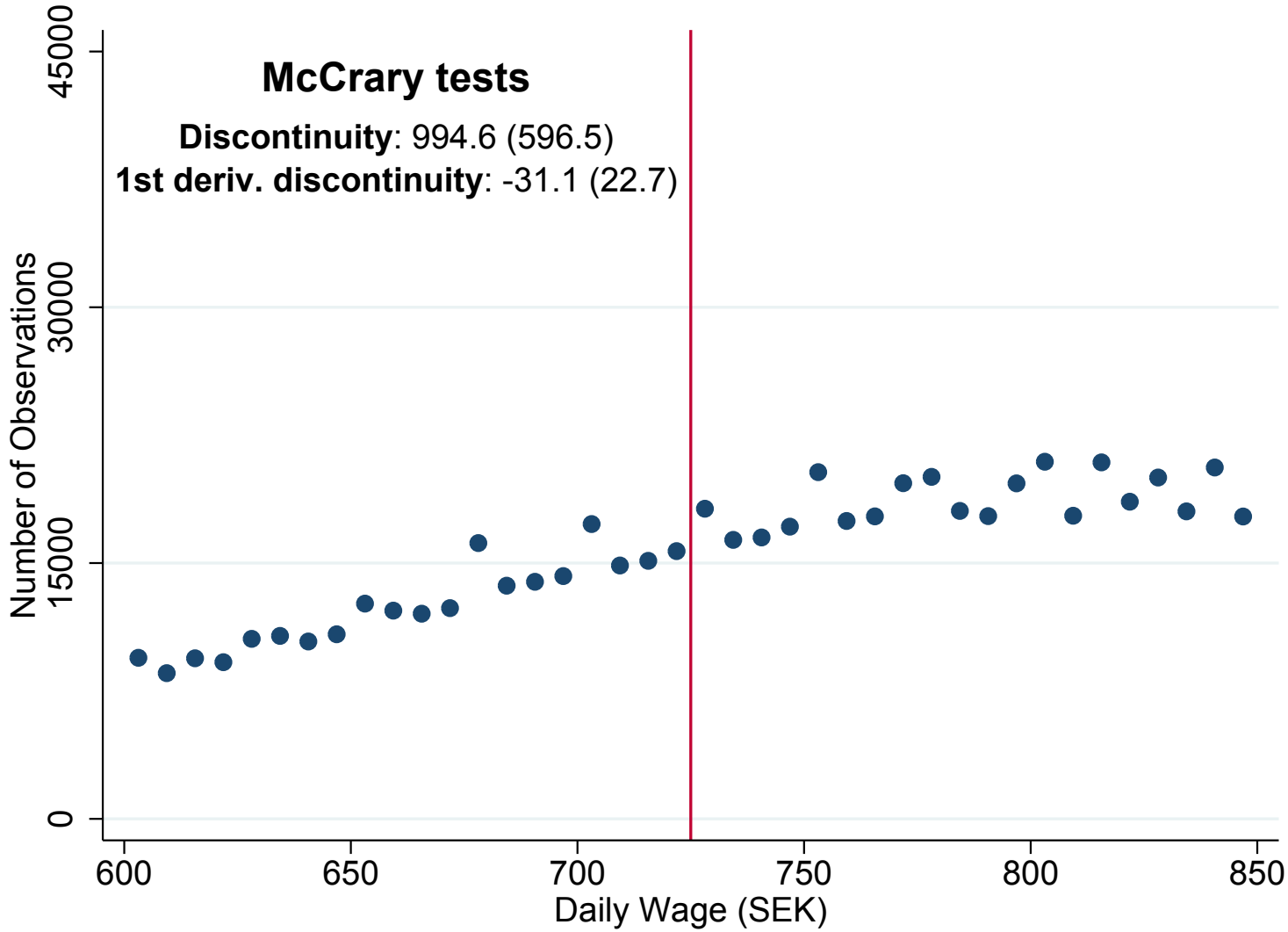
Back

Conclusion

- We provided a simple framework to connect theory to data in the context of unemployment policies:
  - use admin data to evaluate consumption smoothing effects
  - focus on the timing of benefits for behavioral responses
  - find no evidence to support the switch from flat to declining benefit profiles
- Framework can be used to think about various policy-relevant issues: role of business cycles, role of heterogeneity,...
- Framework can be used to think about any time-dependent policies: pensions (career length/age), poverty relief (child's age),...

APPENDIX SLIDES

RKD: P.d.f. of Daily Wage



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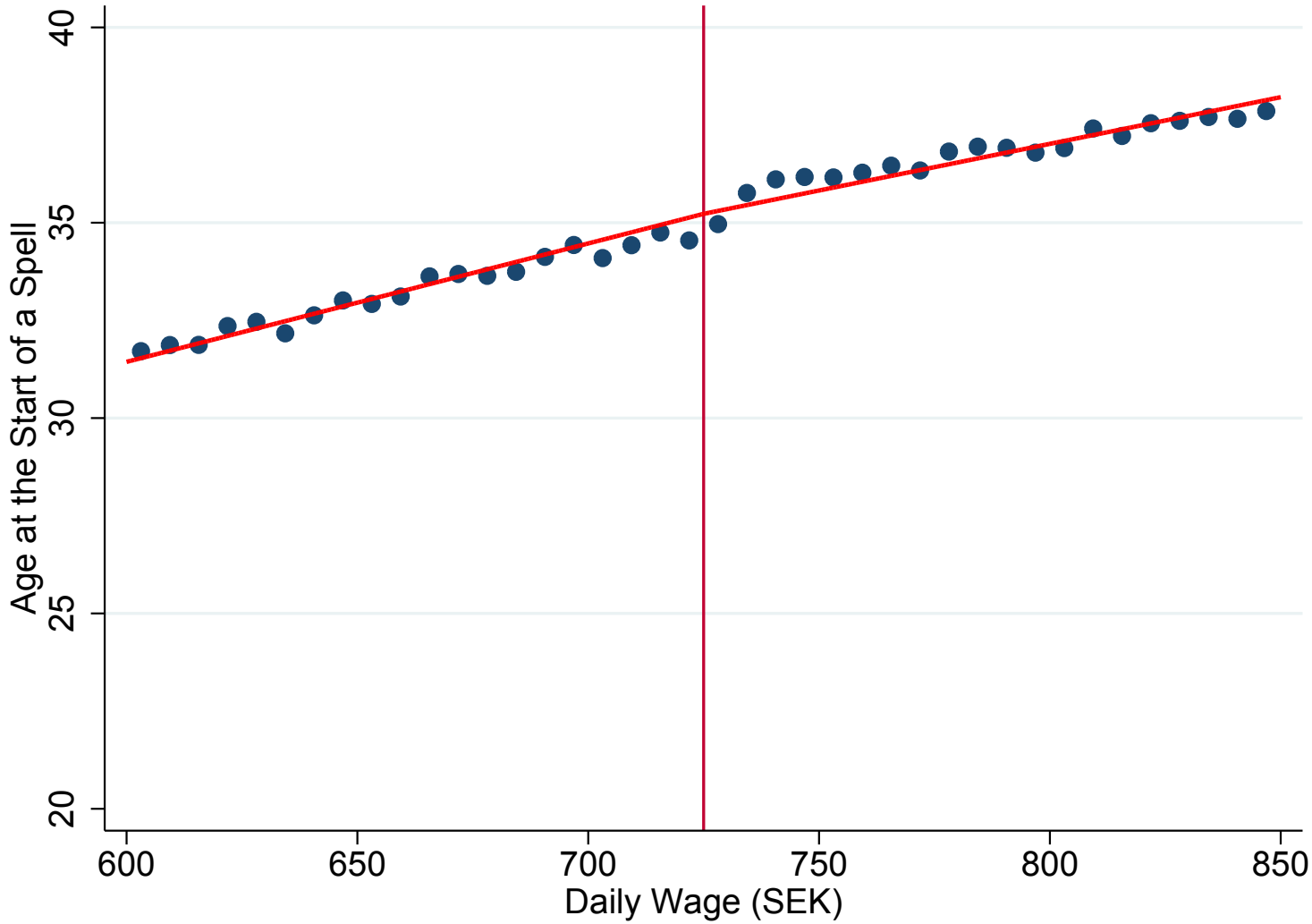
RKD: Wage and Age



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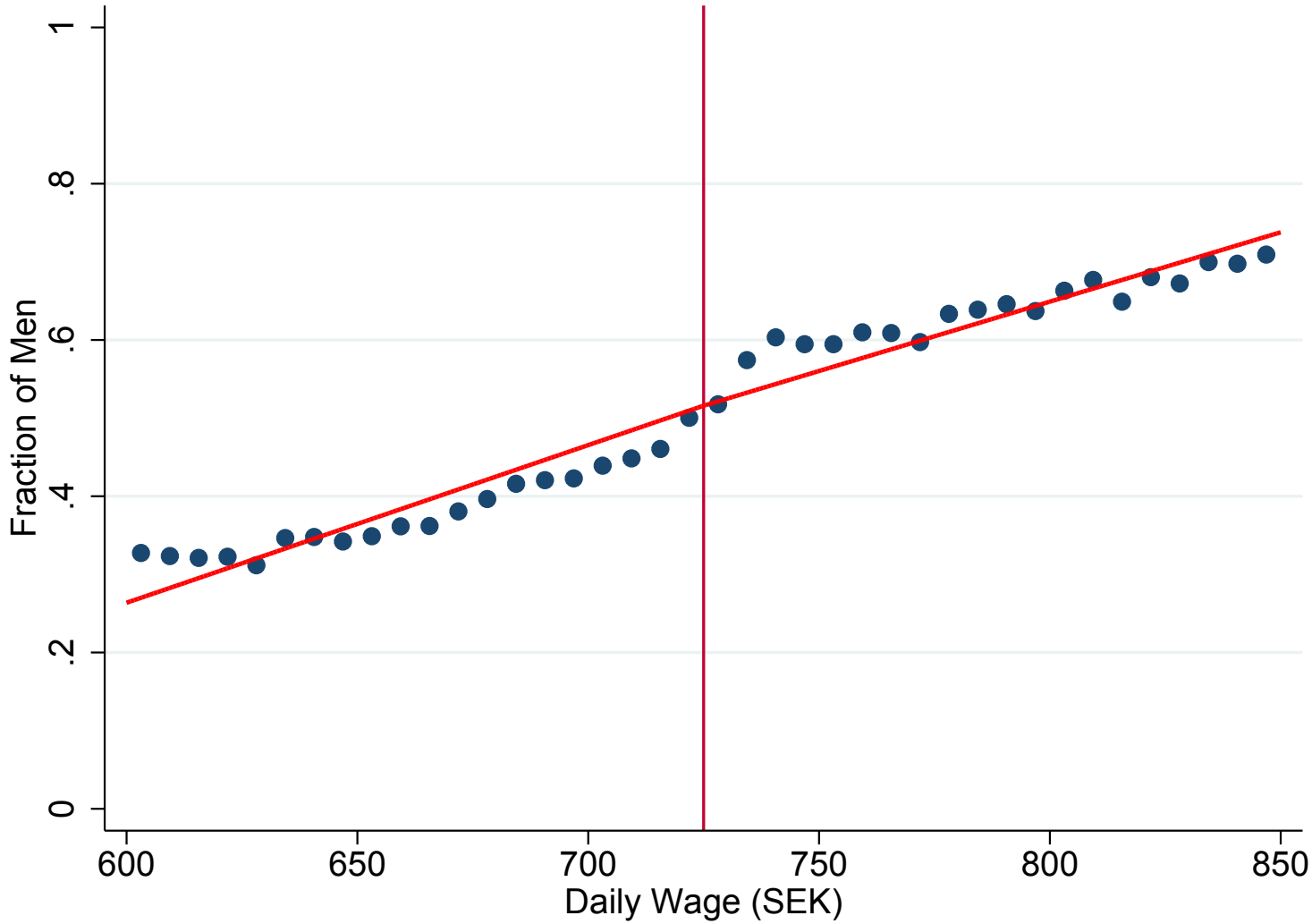
RKD: Wage and Fraction Men



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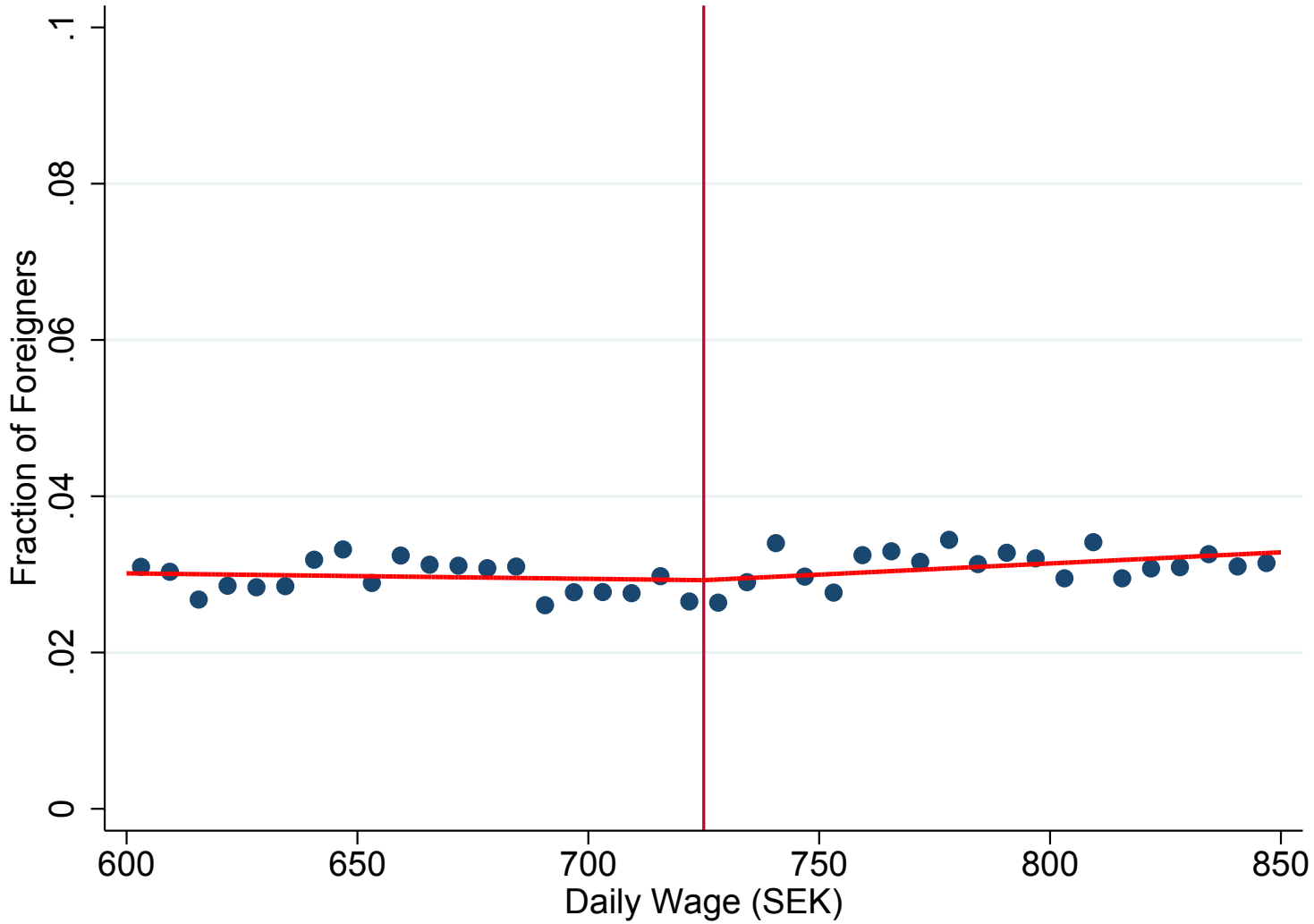
RKD: Wage and Fraction Foreigners



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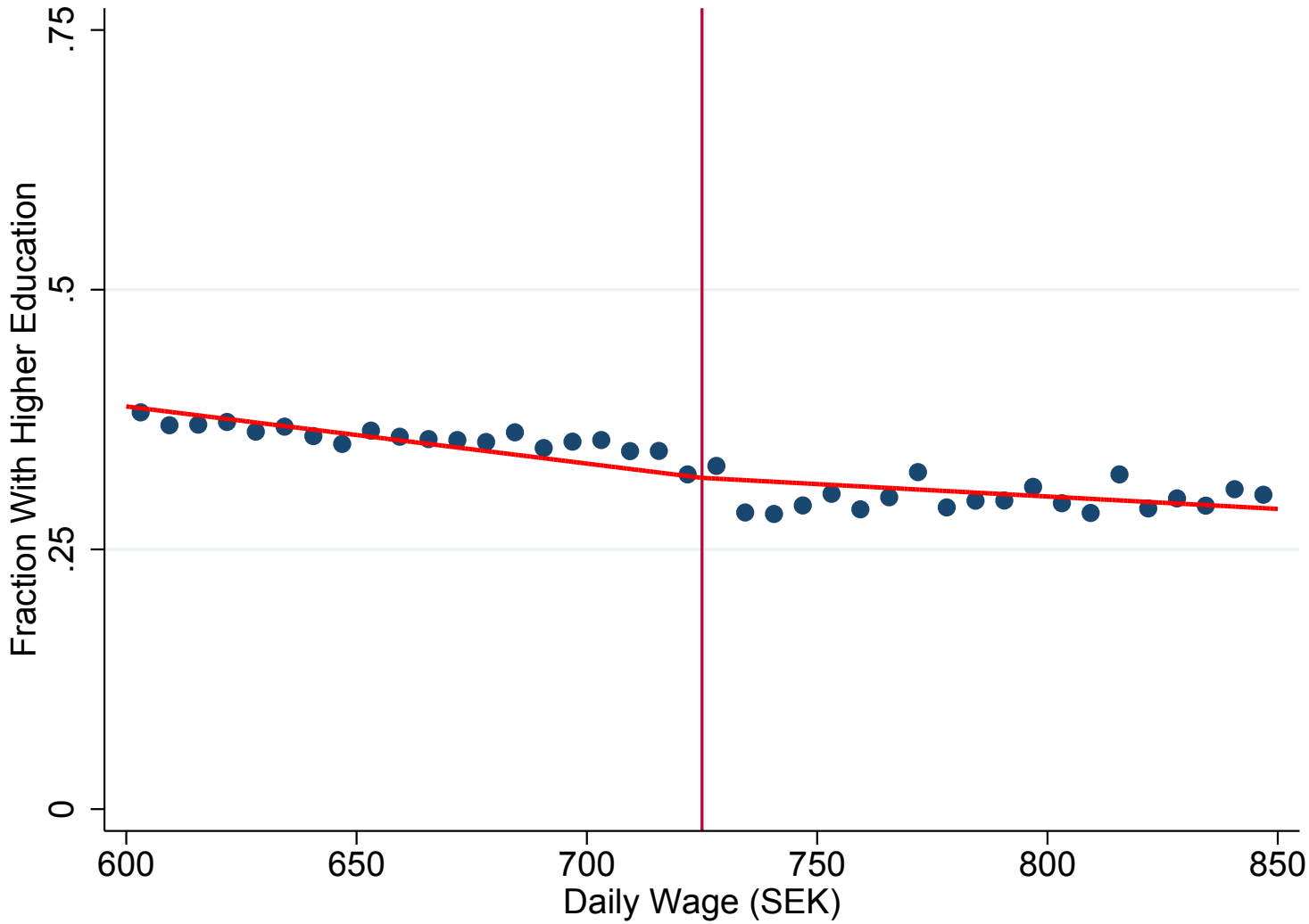
RKD: Wage and Fraction With Higher Education



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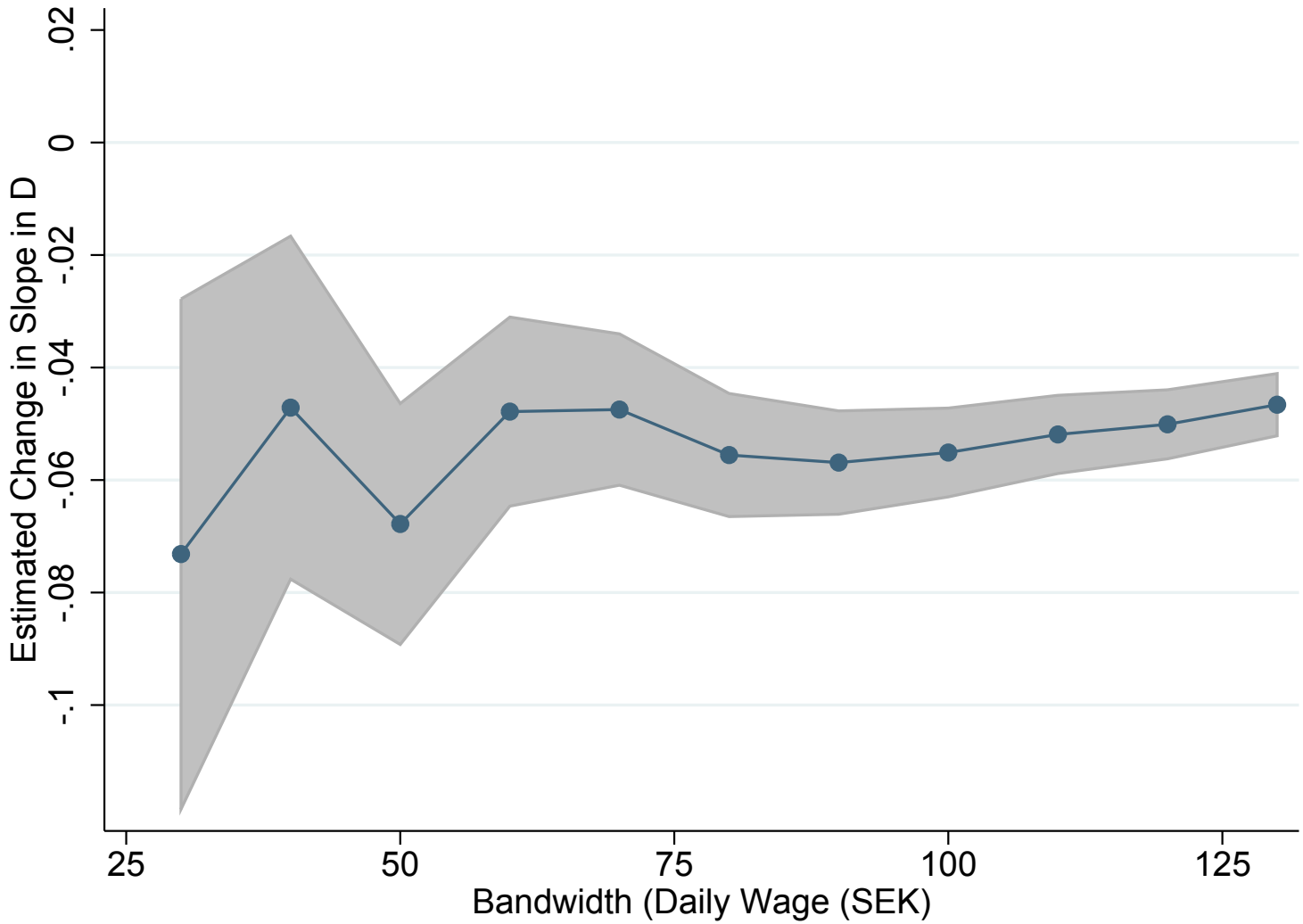
RKD Estimates by Bandwidth Size



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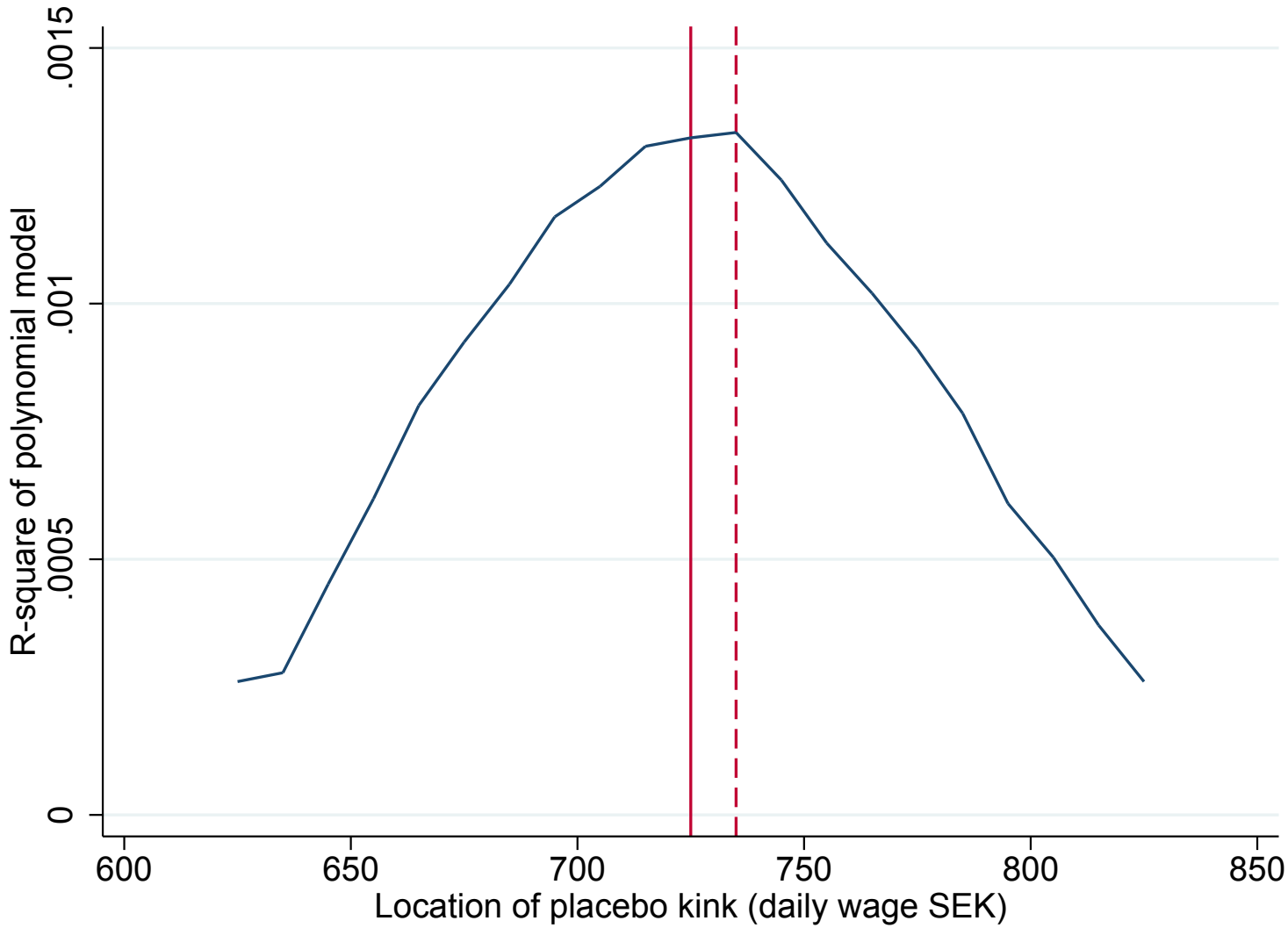
Non-parametric detection using placebo kinks



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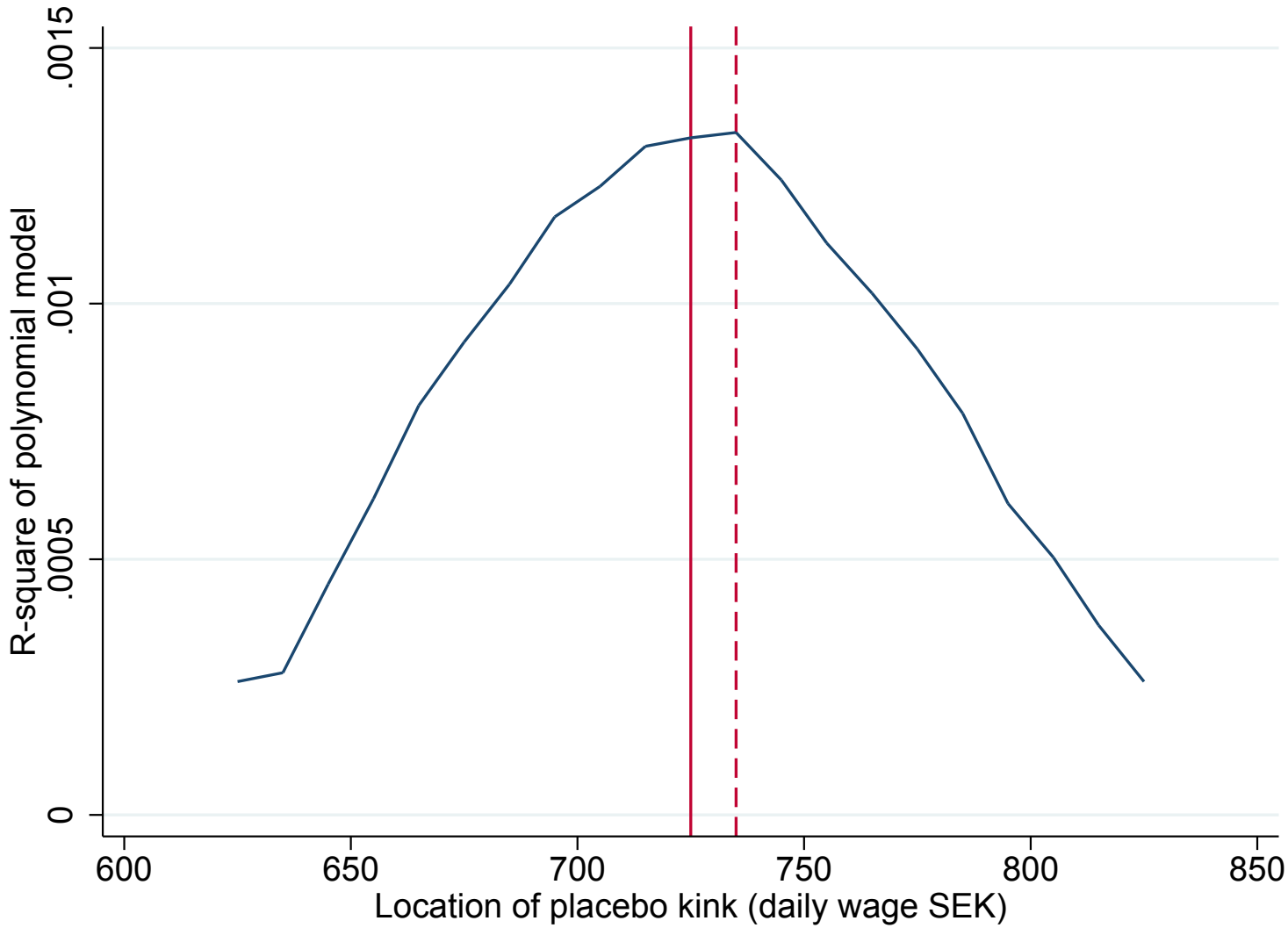
RKD: Kink in b_1 at 850SEK



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Consumption Equation

$$c_t = y_t + T_t + \tilde{c}_t^b + \tilde{c}_t^d + \tilde{c}_t^v + \tilde{c}_t^h$$

- Bank savings: $\tilde{c}_t^b = y_t^b - \Delta b_t$
  - y_t^b : earned interests ; Δb_t : change in bank savings
- Debt: $\tilde{c}_t^d = -y_t^d + \Delta d_t$
  - y_t^d : paid interests ; Δd_t : change in debt
- Other financial assets: $\tilde{c}_t^v = y_t^v - \Delta v_t$
  - y_t^v : interests, dividends, price change $\Delta p_t^v \times q_{t-1}^v$
  - Δv_t : change in stock value $p_t^v q_t^v - p_{t-1}^v q_{t-1}^v$
- Real assets: $\tilde{c}_t^h = y_t^h - \Delta h_t$
  - y_t^h : rent, imputed rent, price change
  - Δh_t : change in stock value

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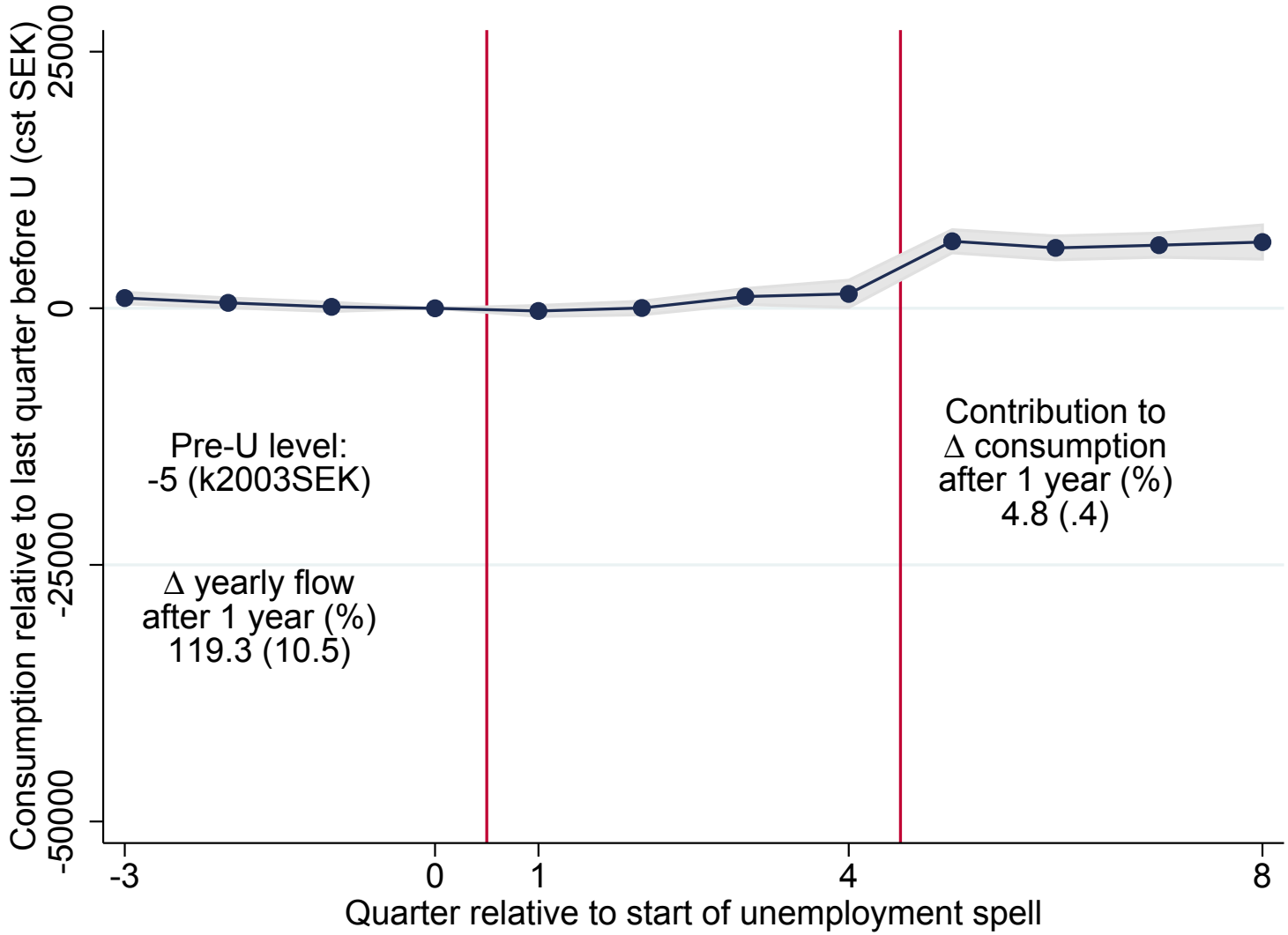
Table : Summary statistics pre-unemployment - 2003KSEK

	Mean	P25	P50	P75	P90
Gross earnings	151	44	135	227	295
Capital Income	.8	0	0	0	3
Disposable Income	140	89	136	180	230
Net worth (A+B-C)	174	-65	0	157	688
As a fraction of disp. income	1.24	-.49	0	1.21	4.34
Financial assets (A)	83	0	4	52	191
As a fraction of disp. income	.66	0	.03	.41	1.44
Bank holdings	29	0	0	14	70
As a fraction of disp. income	.21	0	0	.1	.49
Mutual funds	26	0	0	8	56
As a fraction of disp. income	.23	0	0	.06	.47
Stocks	17	0	0	0	11
As a fraction of disp. income	.12	0	0	0	.08
Real Estate (B)	281	0	0	321	907
As a fraction of disp. income	2.28	0	0	1.94	5.25
Debt (C)	190	0	71	254	514
As a fraction of disp. income	1.7	0	.53	1.77	3.36

Changes in Assets: Bank Accounts



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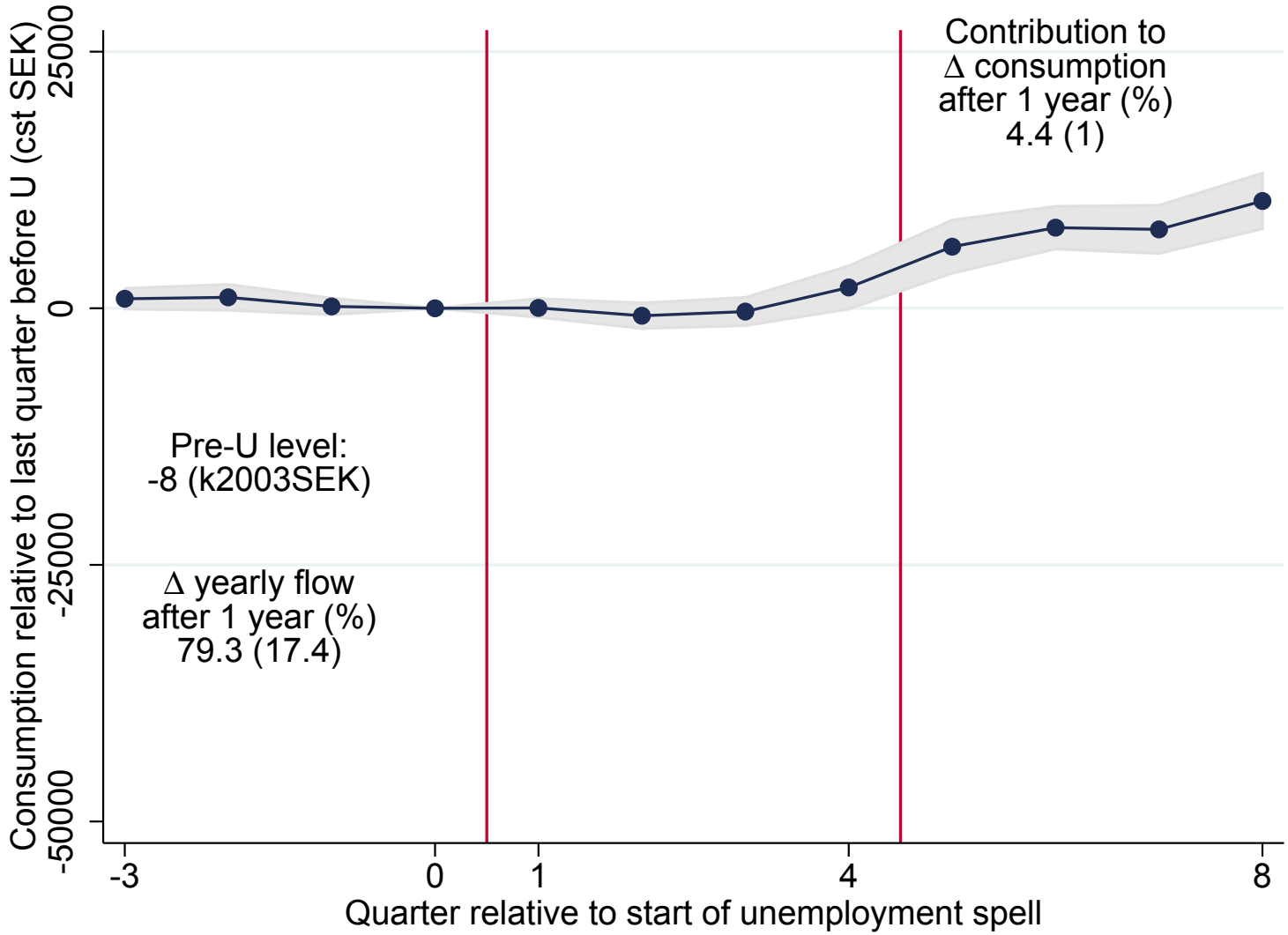
Changes in Assets: Financial Assets



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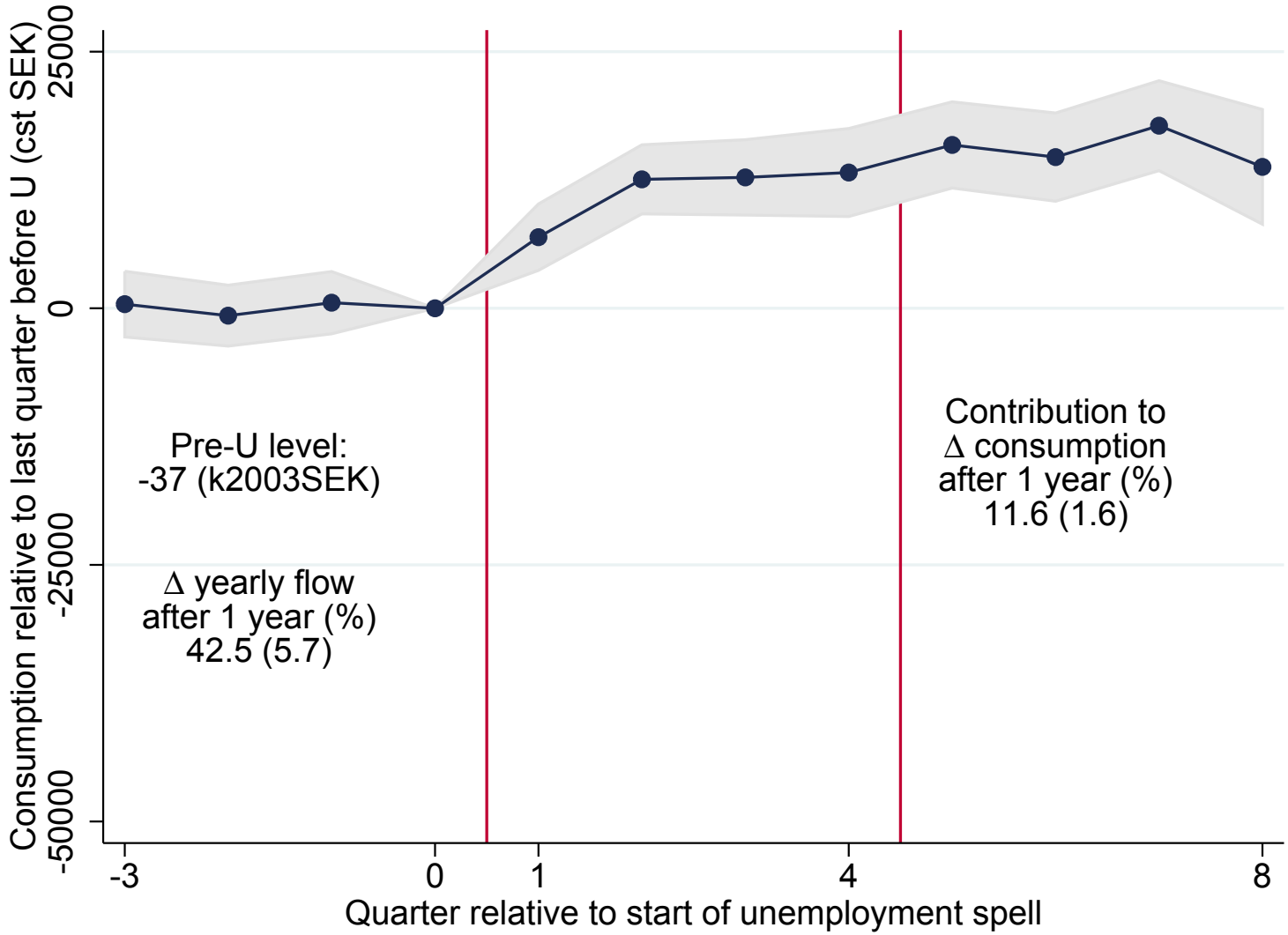
Changes in Assets: Real Estate



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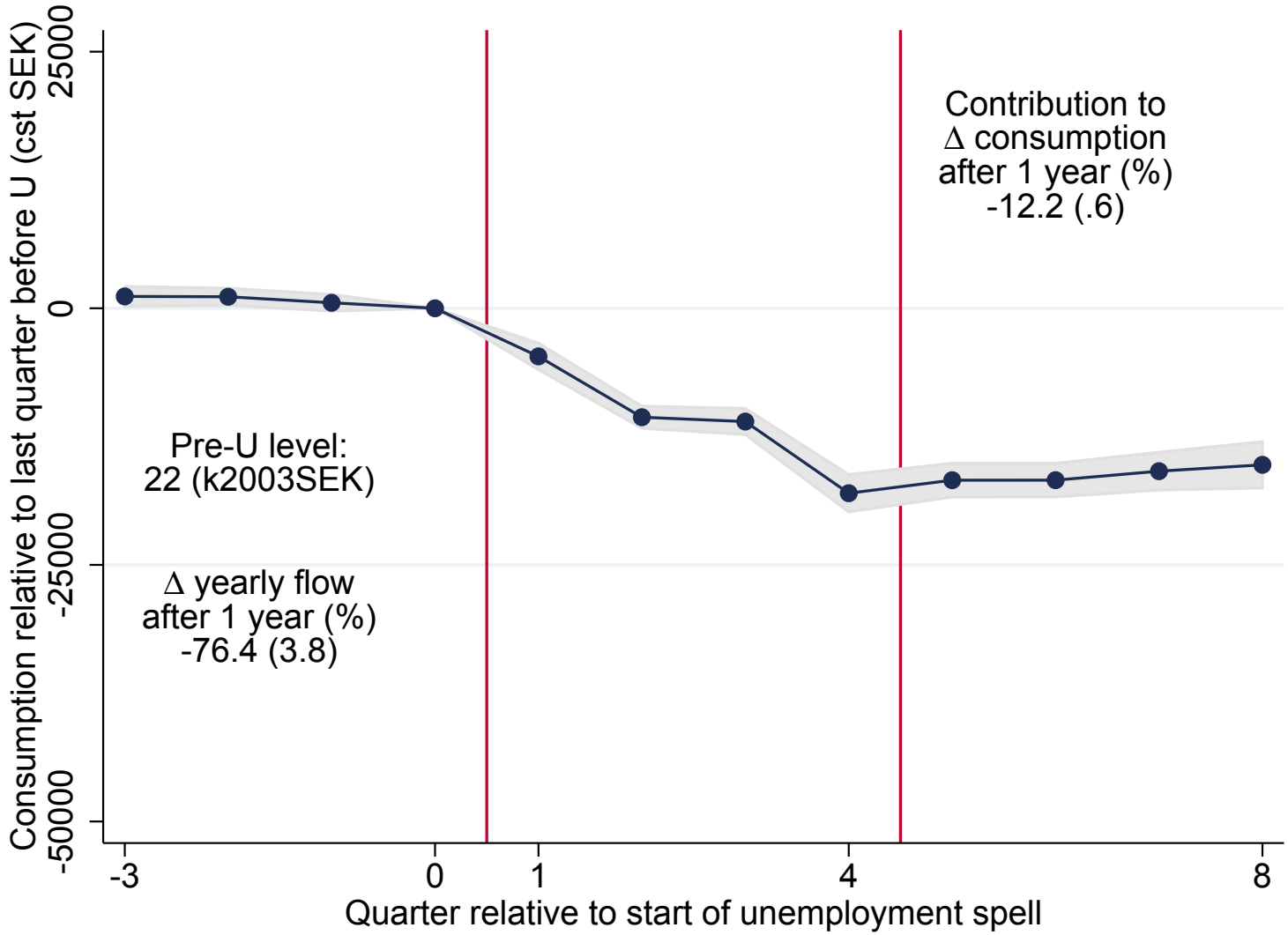
Changes in Assets: Debt



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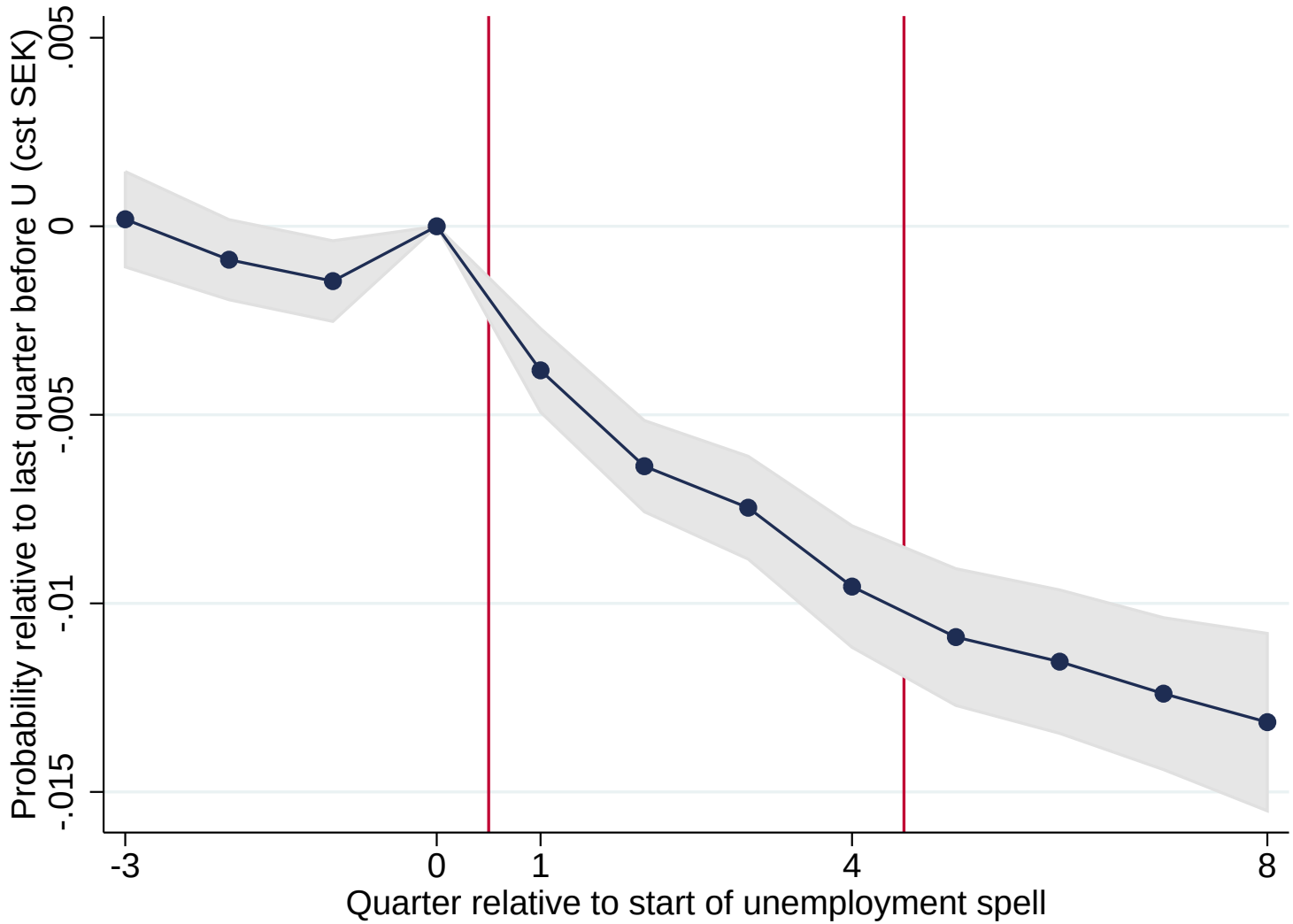
Probability of First-Time Home Ownership



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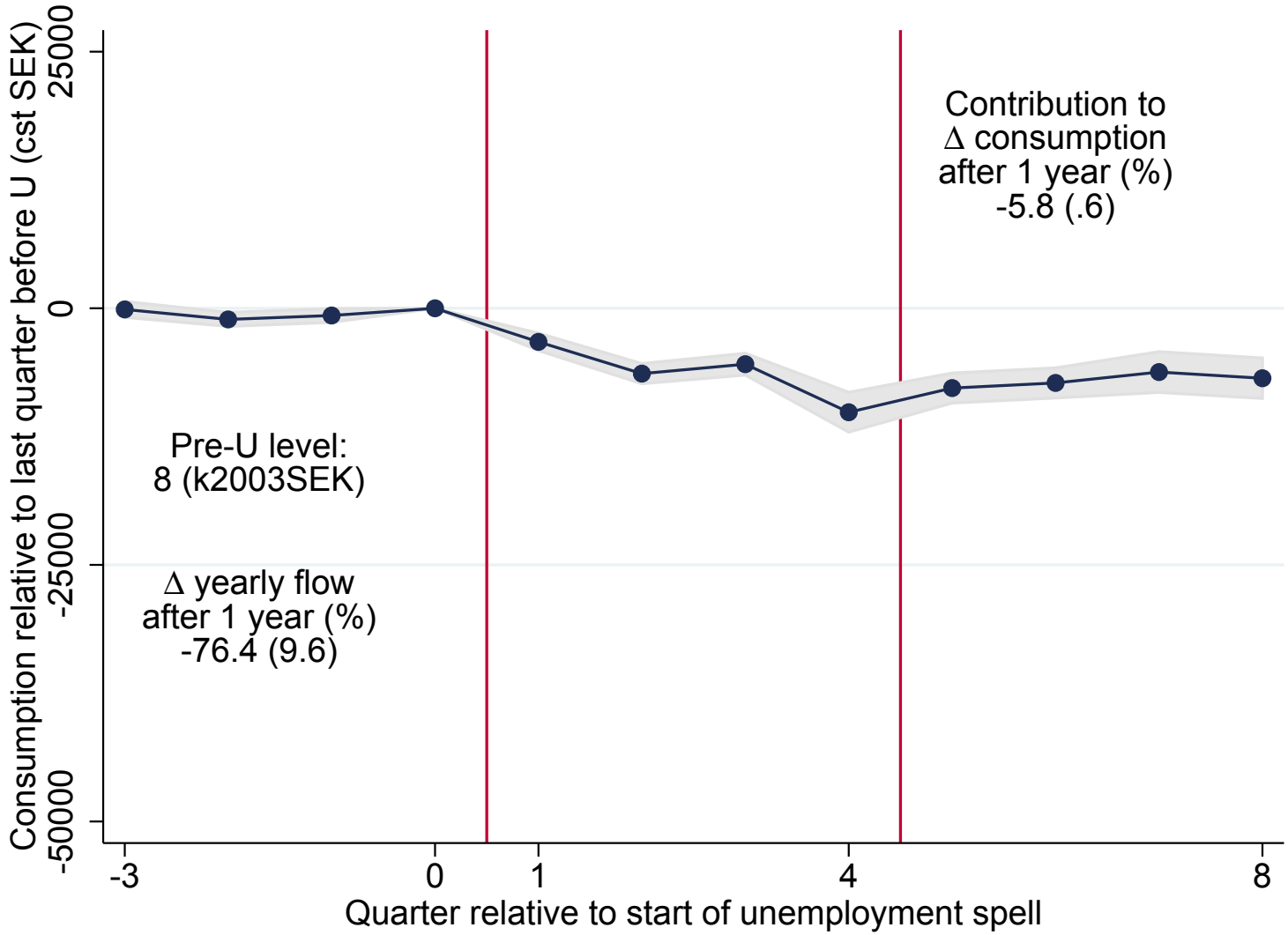
Changes in Assets: Debt for h=0



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Monthly Consumption over the Spell: Selection

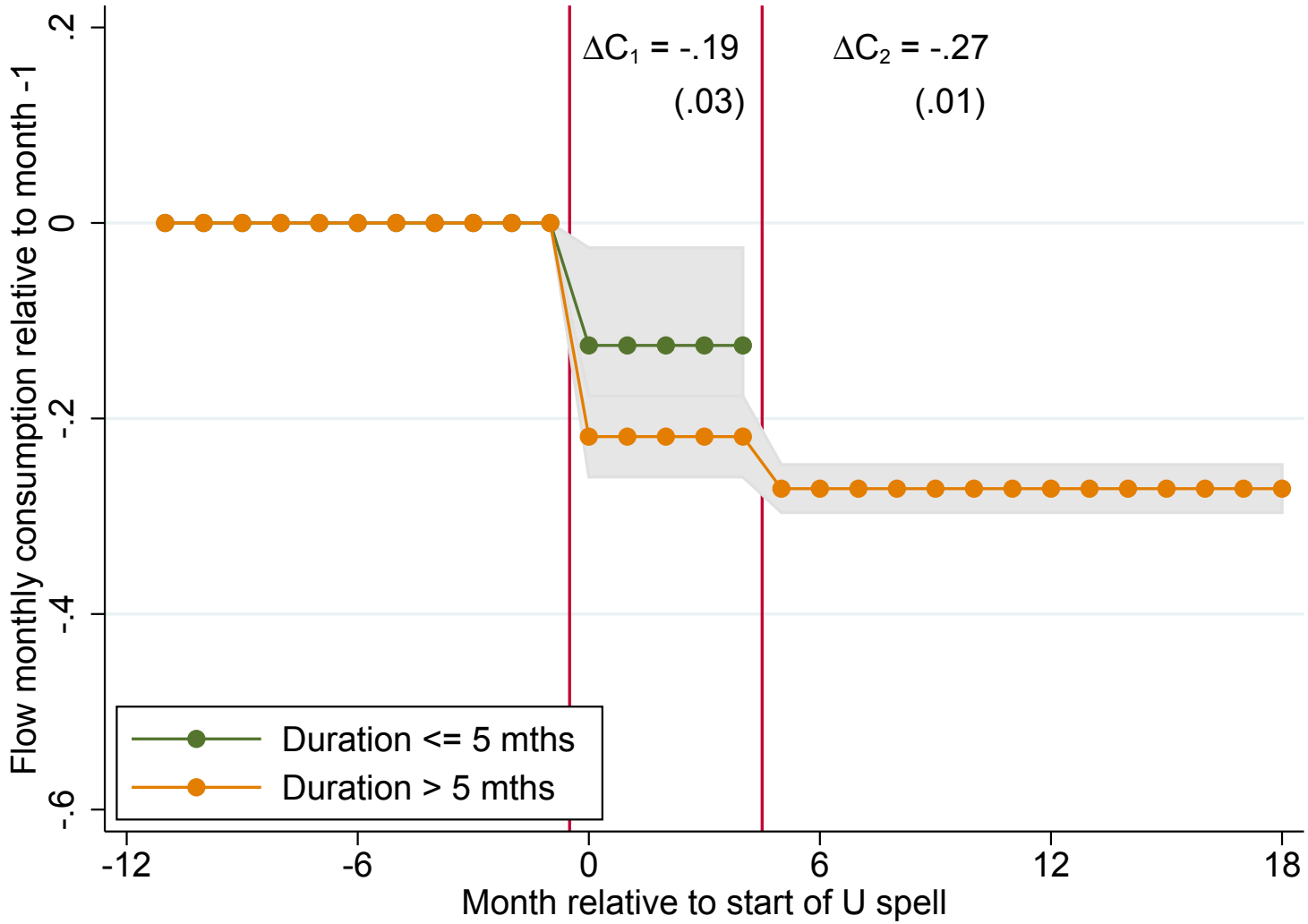

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Table : Household consumption as a function of time spent unemployed: consumption survey estimates

	(1) Total expenditures	(2) Food	(3) Rents	(4) Purchase of new vehicles	(5) Furniture & house appliances	(6) Trans-portation	(7) Recre-ation	(8) Restau-rant
$0 < t \leq 5$ mths	-0.0447	-0.0378	-0.0344	-0.422**	-0.160*	-0.0726	-0.105	-0.106
	(0.0325)	(0.0422)	(0.0413)	(0.184)	(0.0922)	(0.0737)	(0.0672)	(0.0837)
$t > 5$ mths	-0.130***	-0.0751*	0.0119	-0.172	-0.0570	-0.326***	-0.165**	-0.212**
	(0.0348)	(0.0453)	(0.0411)	(0.194)	(0.0958)	(0.0794)	(0.0720)	(0.0928)
Year f-e	×	×	×	×	×	×	×	×
Marital status	×	×	×	×	×	×	×	×
Family size	×	×	×	×	×	×	×	×
R^2	0.0331	0.0622	0.0148	0.0198	0.00991	0.0152	0.0109	0.0104
N	2558	2550	1128	2550	2388	2445	2551	1893

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Heterogeneous Responses

- Ability to smooth shocks and unemployment responses may be very heterogeneous. Differences between LT and ST unemployed may be affected by selection.
- While disentangling heterogeneity and true duration dependence is key focus in labor, our framework indicates that this is not first order for evaluating the benefit profile
- Still, unemployment policy could condition on observables. We can test whether this is desirable.
  - UI can also be age-dependent (e.g., benefit duration) or means-tested (e.g., private UI accounts)
  - UI depends on pre-unemployment earnings (replacement rate + cap)

Consumption vs. Expenditures

- Unemployed try to re-allocate "consumption" to smoothen expenditure shock
  - **Household production** ($\sim$ 'retirement savings puzzle'):
    - unemployed complement expenditures with more time
    - Δu is likely to be smaller; $u'(b)$ may be larger
  - **Durable goods** (Browning & Crossley '99):
    - consumption flow for many periods. Unemployed may defer investments
    - Δu is likely to be smaller; $u'(b)$ may be smaller
  - **Consumption commitment** (Chetty & Szeidl '07):
    - some expenditures are committed (e.g., housing), making the drop in consumption more concentrated
    - Δu is likely to be larger; $u'(b)$ may be larger

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