Social insurance programs are inherently dynamic
1 specify a full time profile of benefits
2 affect dynamics of household behavior

How should we design optimal time profile of benefits?
- UI policy debate: pressure for steeper benefit profiles
- SS policy debate: pressure for increase in full retirement age
- debate lacks evidence-based welfare framework

Sufficient statistics literature on “average” generosity of SI
⇒ empirical implementation, but silent about optimal timing

Theoretical literature on optimal timing of UI in particular
⇒ insights are model-dependent and hard to connect to data
We revisit the **optimal timing of UI** and provide:

(1) a **simple** characterization

(2) in a **general** framework

(3) that connects to **data**.

We then implement this characterization:

- use Swedish data from **UI registers** linked to **consumption surveys** and **admin data on income and wealth**
- estimate all relevant statistics to provide an evidence-based evaluation of the benefit profile.
Consider dynamic model of unemployment (with search, heterogeneity, duration dependence, assets, ...)

**Key Result:** Baily ['78] intuition generalizes for UI benefit $b_t$ paid at any unemployment duration $t$:

1. *Insurance gain* depends on drop in consumption at $t$
2. *Incentive cost* depends on response of (full) survival function to $b_t$

**Implication:** Simple to evaluate welfare of a benefit profile. Identifying model’s primitives is not necessary (Chetty ’06, ’09)
Extensive literature on unemployment responses to UI
- limited attention for timing of benefits

We implement a Regression Kink design using Swedish UI registers
- exploit variation in the time profile of benefits
- consider the impact on the relevant moments of the survival function

Incentive cost of UI decreases over the spell
- estimated cost of increasing benefits is high overall ($\varepsilon \approx 1.5$)
- incentive cost for ST benefits $\geq$ LT benefits. (LT $\geq$ 20 wks)
Limited evidence on impact of labor shocks on consumption

- Gruber (’97) studies consumption drop when unemployed
- consumption survey data: limited ability to observe unemployment status and duration

We link consumption surveys to unemployment registers in Sweden. We also obtain residual measure of yearly expenditures using unique admin data on income and wealth

Insurance gain of UI increases over the spell

- household consumption drops: 6% for ST and 13% for LT unemployed
- limited ability to smooth consumption, but generous LT benefits
Empirics Preview II: Consumption Profile

- Limited evidence on impact of labor shocks on consumption
  - Gruber ('97) studies consumption drop when unemployed
  - Consumption survey data: limited ability to observe unemployment status and duration

- We link consumption surveys to unemployment registers in Sweden. We also obtain residual measure of yearly expenditures using unique admin data on income and wealth

- Insurance gain of UI **increases** over the spell
  - Household consumption drops: 6% for ST and 13% for LT unemployed
  - Limited ability to smooth consumption, but generous LT benefits

⇒ Evaluated at a flat profile in Sweden, our evidence indicates that benefits are too high overall, but inclining profile increases welfare!
Outline

1. Introduction

2. Theory: Identifying Sufficient Statistics in Dynamic Setting

3. Context & Data

4. Empirics I: Duration Responses

5. Empirics II: Consumption Profiles

6. Welfare Calibrations
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
  \[
  S(t) = \sum_{i=1}^{N} \left[ \prod_{s=0}^{t} (1 - h_{i,s}) \right] / N
  \]

Each individual \( i \) optimizes intertemporal consumption
- results in contingent consumption plan \( c_{i}^{e} \) and \( c_{i,t}^{u} \)
- observed unemployment consumption at duration \( t \)
  \[
  C^{u}(t) = \sum_{i=1}^{N} \left[ \frac{S_{i}(t)}{S(t)} \times c_{i,t}^{u} \right] / N
  \]
We consider policies of the form \((b_1, b_2, \ldots)\) 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 funded by a uniform tax \(\tau\) on the employed.

The average unemployment duration equals sum of survival rates at each duration:

\[
D = \sum_t S(t) = \sum_{0}^{B_1} S(t) + \sum_{B_1}^{B_2} S(t) + \ldots + \sum_{B_{n-1}}^{T} S(t),
\]

where \(D_i\) is the average duration spent receiving benefit \(b_i\).
Illustration: Two-Part Policy

The graph illustrates the relationship between UI benefits and unemployment duration. The x-axis represents the unemployment duration, while the y-axis represents the UI benefits. The graph shows a disjunctive function where UI benefits are constant until a certain point, indicated by the vertical line at point B, beyond which the benefits remain constant. The levels of UI benefits are labeled as $b_1$ and $b_2$. 
**Average unemployment duration equals** \( D = \sum_t S(t) \).
Average duration spent receiving benefit $b_1$ equals $D_1 = \sum_{0}^{B} S(t)$.
Average unemployment duration \( D = \sum_t S(t) = D_1 + D_2 \).
Gvt BC: \[ \tau \cdot (T - D) = b_1 \cdot D_1 + b_2 \cdot D_2. \]
The optimal unemployment policy solves

$$\max_{b, \tau} \sum_i U_i(b, \tau) \text{ for } U_i(b, \tau) = \max_{\tilde{x}_i \in X} U_i(\tilde{x}_i|b, \tau)$$

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

Baily-Chetty benchmark: the optimal flat profile $b_s$ solves

$$E[u'(c_u)] - E[u'(c_e)] = CS_{b_s} = \epsilon D, \quad b_s = MH_{b_s}. \quad (1)$$

Key insight (Env. Thm): behavioral responses have first-order welfare effect through the fiscal externality only.
The optimal unemployment policy solves

$$\max_{b, \tau} \sum_i U_i(b, \tau) \quad \text{for} \quad U_i(b, \tau) = \max_{\tilde{x}_i \in X} U_i(\tilde{x}_i | b, \tau)$$

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

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

$$\frac{E[u'(c^u)] - E[u'(c^e)]}{E[u'(c^e)]} = \varepsilon_{D,b} \cdot CS_b \Rightarrow MH_b$$  

(1)
The optimal unemployment policy solves

$$\max_{b, \tau} \Sigma_i U_i(b, \tau) \text{ for } U_i(b, \tau) = \max_{\tilde{x}_i \in X} U_i(\tilde{x}_i | b, \tau)$$

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

Baily-Chetty benchmark: the optimal flat profile \( b \) solves

$$\frac{E[u'(c^u)] - E[u'(c^e)]}{E[u'(c^e)]} = \varepsilon_{D,b} \cdot \text{CS}_b = \text{MH}_b \quad \text{(1)}$$

Key insight (\( \sim \) Env. Thm): behavioral responses have first-order welfare effect through the fiscal externality only.
Baily-Chetty formula generalizes for benefit paid at any duration \( t \)

Two-part example;

\[
E[u'(c_u)|t \leq B] - E[u'(c_e)] = \varepsilon D_1 b_1 + \varepsilon D_2 b_2 \\
E[u'(c_e)] = b_1 D_1 b_2 D_2 \cdot \varepsilon D_1 D_2,
\]

\[
E[u'(c_u)|t > B] - E[u'(c_e)] = b_1 D_1 b_2 D_2 \cdot \varepsilon D_1 D_2,
\]
Optimal Unemployment Policy: Dynamic Baily-Chetty

- Baily-Chetty formula generalizes for benefit paid at any duration $t$
- Two-part example:

$$
\text{for } b_1 : \frac{E[u'(c^u) | t \leq B] - E[u'(c^e)]}{E[u'(c^e)]} = \varepsilon_{D_1,b_1} + \frac{b_2 D_2}{b_1 D_1} \cdot \varepsilon_{D_2,b_1}
$$
• Baily-Chetty formula generalizes for benefit paid at any duration $t$

• Two-part example:

$$
\text{for } b_1 : \frac{E[u'(cu) | t \leq B] - E[u'(ce)]}{E[u'(ce)]} = \varepsilon_{D_1,b_1} + \frac{b_2 D_2}{b_1 D_1} \cdot \varepsilon_{D_2,b_1}
$$

$$
\text{for } b_2 : \frac{E[u'(cu) | t > B] - E[u'(ce)]}{E[u'(ce)]} = \frac{b_1 D_1}{b_2 D_2} \cdot \varepsilon_{D_1,b_2} + \varepsilon_{D_2,b_2}
$$
Baily-Chetty formula generalizes for benefit paid at any duration $t$

Two-part example;

For $b_1$:

$$
\frac{E[u'(c^u) \mid t \leq B] - E[u'(c^e)]}{E[u'(c^e)]} = \epsilon_{D_1,b_1} + \frac{b_2D_2}{b_1D_1} \cdot \epsilon_{D_2,b_1}
$$

For $b_2$:

$$
\frac{E[u'(c^u) \mid t > B] - E[u'(c^e)]}{E[u'(c^e)]} = \frac{b_1D_1}{b_2D_2} \cdot \epsilon_{D_1,b_2} + \epsilon_{D_2,b_2}
$$
A Sufficient Statistics Approach

- **Generality:**
  - Robust to variations in underlying primitives of the model
  - Allows for duration dependence, heterogeneity, assets, etc.
  - Externalities, equilibrium effects, internalities ⇒ additional terms

- **Sufficient for what?**
  - Statistics sufficient for characterizing optimal benefit profile
  - Evaluate welfare effect of small deviations from actual policy

  \[ CS_k \geq MH_k \Rightarrow \uparrow b_k \]

- **Implementation:**
  - \( MH_k \) cost: estimated from the benefit duration response to \( \Delta b_k \)
  - \( CS_k \) gain: consumption implementation \( CS_k \approx \gamma_k \cdot \Delta C_k / C \)

  \[ CS_2 / CS_1 \geq MH_2 / MH_1 \Rightarrow \uparrow b_2 / b_1 \]
\[ \varepsilon_{D_1, b_1} = b_1 \times \frac{\Delta D_1}{D_1} \]
\[ \varepsilon_{D_2, b_1} = b_1 \cdot \Delta D_2 / D_2 \]
\[ \varepsilon_{D_1, b_2} = b_2 \times \frac{\Delta D_1}{D_1} \]
\[ \varepsilon_{D_2, b_2} = b_2 \times \frac{\Delta D_2}{D_2} \]
\[ \Delta C_k = \sum S(t) \frac{(C^u(t) - C^e)}{D_k} \]

\[ CS_k \equiv \gamma_k \frac{\Delta C_k}{C^e} \]

Consumption

Unemployment duration

\[ C^u(t) \]

\[ C^e \]

\[ \Delta C_1 \]

\[ \Delta C_2 \]
If $CS_{bt}$ and $MH_{bt}$ were constant over the spell, constant benefits would be optimal. However,

- **Forward-looking job seekers** $\Rightarrow$ $MH_{bt}$ increasing over the spell
  - *declining* benefits become optimal
  - see Shavel&Weiss ’79, Hopenhayn&Nicolini ’97,...

- **Unobservable savings** $\Rightarrow$ $CS_{bt}$ increasing over the spell
  - *inclining* benefits would be optimal
  - see Werning ’02, Shimer&Werning ’08,...

- **Non-stationarity, heterogeneity** $\Rightarrow$ ??
  - example: negative duration dependence of exit rates
  - $MH_{bt}$ may well be decreasing over the spell $\Rightarrow$ *inclining* benefits
  - see Pavoni ’09, Shimer&Werning ’09
Introduction

Theory: Identifying Sufficient Statistics in Dynamic Setting

Context & Data

Empirics I: Duration Responses

Empirics II: Consumption Profiles

Welfare Calibrations
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.
1 Introduction

2 Theory: Identifying Sufficient Statistics in Dynamic Setting

3 Context & Data

4 Empirics I: Duration Responses

5 Empirics II: Consumption Profiles

6 Welfare Calibrations
Flat Benefit Profile with Benefit Cap [’99-’00]

Daily Benefits (SEK)

- b1: benefit for the first 20 wks
- b2: benefits after 20 wks

1999-2000 Kink in b1 and b2

Daily Wage (SEK)
Duration-Dependent Benefit Cap ['01]

- b1: benefit for the first 20 wks
- b2: benefits after 20 wks

**Kink in b2**

- **2001**
- Daily Benefits (SEK)
  - 600
  - 650
  - 700
  - 750
  - 800
  - 850
- Daily Wage (SEK)

KLNS (LSE)  
Optimal Timing of UI  
March 17, 2016  
31 / 56
Flat Benefit Profile (with High Benefit Cap) ['02-'06]

Daily Benefits (SEK)

- 2002-2006
- No Kink

Daily Wage (SEK)

- b1: benefit for the first 20 wks
- b2: benefits after 20 wks

2002-2006
No Kink

KLNS (LSE)
Optimal Timing of UI
March 17, 2016
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 \( w = \bar{w}_k \)

- **Non-parametric identification** of the average marginal effect of \( b_k \) on \( Y \):
  \[
  \alpha_k = \frac{\lim_{w \to \bar{w}_k^+} \frac{\partial E[Y|w]}{\partial w} - \lim_{w \to \bar{w}_k^-} \frac{\partial E[Y|w]}{\partial w}}{\lim_{w \to \bar{w}_k^+} \frac{\partial b_k}{\partial w} - \lim_{w \to \bar{w}_k^-} \frac{\partial b_k}{\partial w}} = \frac{\hat{\delta}_k}{\nu_k}
  \]
  - \( \hat{\delta}_k \): estimated change in slope between \( Y \) and \( w \) at kink \( \bar{w}_k \)
  - \( \nu_k \): deterministic change in slope between \( b_k \) and \( w \) at kink \( \bar{w}_k \)

- **Identifying assumptions:**
  - direct marginal effect of \( w \) on \( Y \) is smooth
  - smooth pdf of \( \varepsilon \) at \( \bar{w}_k \)
Wage and Unemployment Duration: Kink in $b_1$ and $b_2$

Kink in $b_1$ and $b_2$
Wage and Unemployment Duration: Kink in $b_2$

The graph shows a scatter plot of the duration of unemployment spell against daily wage (SEK). The data points are plotted with a red line indicating a kink in $b_2$ only. The x-axis represents daily wage in SEK, ranging from 600 to 850, and the y-axis represents the duration of unemployment spell, ranging from 15 to 35 weeks.
RKD: Estimated Duration Responses

- Kink in b1, b2
  \( \varepsilon_D = 1.53 (.13) \)

- Kink in b2
  \( \varepsilon_D = .68 (.13) \)

- No kink

Estimated Change in Slope in D
1999-2000
2001
2002-2006
Estimates imply $MH_{b_1} > MH_{b_2}$

- $\varepsilon_{D,b_1} = \varepsilon_{D,b} - \varepsilon_{D,b_2} = .84 (.19) \geq \varepsilon_{D,b_2} = .69 (.14)$
- $MH_{b_k} = \varepsilon_{D,b_k} \frac{D_k}{D}$, for flat profile, and $D_1 \approx D_2$

Unemployed are forward-looking ($\varepsilon_{D_1,b_2} > 0$), but 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:
- RKD by year
- Smooth pdf density
- Covariate tests
- Bandwidth tests
- Placebo kinks
- Inference
- Polynomial order
### RKD: Estimated Responses for $D_1$

<table>
<thead>
<tr>
<th>Period</th>
<th>Kink in $b_1$, $b_2$</th>
<th>Kink in $b_2$</th>
<th>No kink</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\varepsilon_{D_1}$</td>
<td>1.32 (.06)</td>
<td>.60 (.10)</td>
<td></td>
</tr>
</tbody>
</table>

#### Estimated Change in Slope in $D_1$

<table>
<thead>
<tr>
<th>Year Range</th>
<th>$\varepsilon_{D_1}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2000</td>
<td>-0.04</td>
</tr>
<tr>
<td>2001</td>
<td>-0.02</td>
</tr>
<tr>
<td>2002-2006</td>
<td>0.02</td>
</tr>
</tbody>
</table>

---

**KLNS (LSE)**

Optimal Timing of UI

March 17, 2016 39 / 56
Non-stationarity: Elasticity of Remaining Duration

Estimated elasticity of remaining duration conditional on survival

Time $t$ since start of spell (months)

KLNS (LSE)
1 Introduction

2 Theory: Identifying Sufficient Statistics in Dynamic Setting

3 Context & Data

4 Empirics I: Duration Responses

5 Empirics II: Consumption Profiles

6 Welfare Calibrations
**Data**: household consumption surveys (HUT) merged with universe of administrative UI records:
- flow measure of consumption at time of HUT interview
- observe full employment history of individuals surveyed in the HUT.
- sample: individuals unemployed or who will be unemployed

**Event Study**:

\[ c_{it} = \sum_{t} \beta_t \cdot 1[HUT = t] + X_i' \gamma + \varepsilon_{it} \]  

1 \([HUT = t]\): indicator for being surveyed at spell time \(t\)
- investigate role of selection on consumption levels and profiles

**Robustness**: Confirm all findings with registry-based residual measure of consumption using comprehensive admin data on income and wealth
Household Consumption Over the Spell

Pre-U level: 343 (k2003SEK)

Δ consumption after 1 year (%): -18.1 (5.4)

Consumption (cst SEK): -18, -12, -6, 0, 6, 12, 18

Months relative to start of U spell

Optimal Timing of UI
March 17, 2016
Log Household Consumption Relative To Pre-U

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1[0 &lt; t \leq 20 \text{ wks}])</td>
<td>-0.0606*</td>
<td>-0.0415</td>
<td>-0.0379</td>
<td>-0.0465</td>
</tr>
<tr>
<td></td>
<td>(0.0316)</td>
<td>(0.0302)</td>
<td>(0.0305)</td>
<td>(0.0413)</td>
</tr>
<tr>
<td>(1[t &gt; 20 \text{ wks}])</td>
<td>-0.130***</td>
<td>-0.131***</td>
<td>-0.113***</td>
<td>-0.108***</td>
</tr>
<tr>
<td></td>
<td>(0.0328)</td>
<td>(0.0326)</td>
<td>(0.0379)</td>
<td>(0.0414)</td>
</tr>
<tr>
<td>(1[L &gt; 20 \text{ wks}])</td>
<td></td>
<td></td>
<td>-0.0294</td>
<td>-0.0342</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0300)</td>
<td>(0.0378)</td>
</tr>
<tr>
<td>(1[t \leq 20 \text{ wks}] \times 1[L &gt; 20 \text{ wks}])</td>
<td>0.0134</td>
<td></td>
<td></td>
<td>0.0134</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.0629)</td>
</tr>
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<table>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year F-E</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Calendar months F-E</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Marital status</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Family size</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Age group F-E</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

\(R^2\)          0.0493  0.139  0.139  0.0872
\(N\)            1551   1548   1548   1548

**Notes:** Robust standard errors in parentheses. * p<.10, ** p<.05, *** p<.01
Household consumption drops significantly and quickly over the spell

- average drop in consumption after a year $\approx$ average drop in annual household income

- corroborated by evidence from residual measure of expenditures based on registry-data

Limited means to smooth consumption (high MPC out of UI)

- majority starts spell with **no financial nor real assets**

- limited added-worker effect

- limited use of debt over the spell

- UI transfers basically do all the smoothing for the LT unemployed
Consumption-Implementation approach:
- CS gains can be approximated using consumption drops

\[ CS_k \approx \gamma \cdot \Delta C_k / C \]

- Consumption ↓ ⇒ CS gains ↑ over U spell

Robustness to dynamic selection:
- with heterogeneous preferences, selection on consumption levels or profiles would matter
- limited evidence of selection on risk preferences

Consumption vs Expenditures
- unemployed increase home production
- unemployed decrease durable good expenditures
- no dynamic selection on various categories of expenditures
<table>
<thead>
<tr>
<th>(1) Moral hazard cost, $MH_x$</th>
<th>(2) Consumption drop, $\Delta C_x$</th>
<th>(3) Value of kroner spent, $CS_x / MH_x$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$b$</td>
<td>.10</td>
<td>$\gamma \times .07$</td>
</tr>
<tr>
<td>(.13)</td>
<td>(.01)</td>
<td></td>
</tr>
<tr>
<td>$b_1$</td>
<td>.06</td>
<td>$\gamma \times .04$</td>
</tr>
<tr>
<td>(.37)</td>
<td>(.03)</td>
<td></td>
</tr>
<tr>
<td>$b_2$</td>
<td>.13</td>
<td>$\gamma \times .09$</td>
</tr>
<tr>
<td>(.27)</td>
<td>(.03)</td>
<td></td>
</tr>
</tbody>
</table>

- Benefits are too high throughout the spell (for "standard" $\gamma = 2$)
- Value of marginal kroner spent on unemployed after 20wks is twice as high as before 20wks (for constant $\gamma$)
- Flat profile in place: our local evaluation pushes towards inclining profile!
- Calibration: optimal inclining tilt $b_2 \geq b_1$ survives for lower generosity
Optimal Profile: CS vs. MH in Calibrated Model

![Graph showing the comparison between CS and MH in a calibrated model](image)

- **MH**: Marked with solid lines
- **CS**: Marked with dashed lines

The graph illustrates the costs/gains ratio for different values of parameter $b$. The optimal timing for UI can be determined by analyzing the curves and their intersections with the costs/gains axis.
We provided a simple framework to connect theory to data in the context of dynamic UI policies:

- focus on the timing of benefits for behavioral responses
- use admin data to evaluate consumption smoothing effects
- 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 estimates on hazard rates at the SEK725 kink

Estimated effect on hazard rate vs. Time t since start of spell (weeks)

-0.002 -0.001 0 0.001 0.002

- Effect of b1 and b2
- Effect of b2

Time t since start of spell (weeks)
RKD estimates at the SEK725 kink by year of entry

<table>
<thead>
<tr>
<th>Year of entry into unemployment</th>
<th>Kink in b1 &amp; b2</th>
<th>Kink in b2</th>
<th>No kink</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>-0.075</td>
<td>-0.05</td>
<td>-0.025</td>
</tr>
<tr>
<td>2000</td>
<td>-0.025</td>
<td>0</td>
<td>0.025</td>
</tr>
<tr>
<td>2001</td>
<td>0.025</td>
<td>0.05</td>
<td>0.075</td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
McCrory tests

Discontinuity: 994.6 (596.5)
1st deriv. discontinuity: -31.1 (22.7)
RKD: Wage and Fraction Men

![Graph showing the relationship between daily wage (SEK) and the fraction of men.](image)

Fraction of Men

600 650 700 750 800 850

Daily Wage (SEK)
RKD: Wage and Fraction Foreigners

![Graph showing the relationship between daily wage (SEK) and the fraction of foreigners.](image)
RKD: Wage and Fraction With Higher Education

![Graph showing the relationship between daily wage (SEK) and fraction with higher education. The x-axis represents daily wage (SEK) ranging from 600 to 850, while the y-axis represents the fraction with higher education ranging from 0 to 0.75. The graph includes a trend line indicating a negative correlation between daily wage and the fraction with higher education.](image-url)
RKD Estimates by Bandwidth Size

Estimated Change in Slope in D

Bandwidth (Daily Wage (SEK))

Bandwidth (SEK)

25 50 75 100 125
Non-parametric detection using placebo kinks

R-square of polynomial model vs. Location of placebo kink (daily wage SEK)
RKD estimates: Inference

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
</table>
|                      | Unemployment | Duration $D_1$ | Duration $D_2$
|                      | Duration $D$ | ($< 20$ weeks) | ($\geq 20$ weeks) |
| I. 1999-2000: Kink in $b_1$ and $b_2$ | | | |
| Linear - $\delta_k$ | -.0569 | -.0246 | -.0299 |
| Robust s.e.          | (.0047) | (.0013) | (.0036) |
| Bootstrapped s.e.    | (.0050) | (.0012) | (.0039) |
| 95% CI - permut. test| [-.0595 ; -.0566] | [-.0319 ; -.0189] | [-.0402 ; -.019] |
| II. 2001: Kink in $b_2$ only | | | |
| Linear - $\delta_k$ | -.0255 | -.0115 | -.0105 |
| Robust s.e.          | (.005) | (.0021) | (.0028) |
| Bootstrapped s.e.    | (.0049) | (.0020) | (.0030) |
| 95% CI - permut. test| [-.0325 ; -.0190] | [-.0127 ; -.0103] | [-.0115 ; -.0091] |
RKD estimates: Sensitivity to polynomial order

<table>
<thead>
<tr>
<th></th>
<th>(1) Unemployment Duration $D$</th>
<th>(2) Duration $D_1$ (&lt; 20 weeks)</th>
<th>(3) Duration $D_2$ (≥ 20 weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Linear - $\delta_k$</strong></td>
<td>-0.0569 (.0047)</td>
<td>-0.0246 (.0013)</td>
<td>-0.0299 (.0036)</td>
</tr>
<tr>
<td>RMSE</td>
<td>28.285</td>
<td>7.049</td>
<td>23.972</td>
</tr>
<tr>
<td>AIC</td>
<td>1785650.8</td>
<td>1264546</td>
<td>1723601.1</td>
</tr>
<tr>
<td><strong>Quadratic - $\delta_k$</strong></td>
<td>-0.0474 (.0185)</td>
<td>-0.0344 (.0049)</td>
<td>-0.0183 (.0143)</td>
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<tr>
<td>RMSE</td>
<td>28.285</td>
<td>7.048</td>
<td>23.971</td>
</tr>
<tr>
<td>AIC</td>
<td>1785650.5</td>
<td>1264518.9</td>
<td>1723588.4</td>
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<tr>
<td><strong>Cubic - $\delta_k$</strong></td>
<td>-0.0527 (.0455)</td>
<td>-0.0291 (.0122)</td>
<td>-0.0221 (.0351)</td>
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<tr>
<td>MSE</td>
<td>28.284</td>
<td>7.046</td>
<td>23.971</td>
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<tr>
<td>AIC</td>
<td>1785644.8</td>
<td>1264394.7</td>
<td>1723590</td>
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</table>

I. 1999-2000: Kink in $b_1$ and $b_2$
### Summary Statistics at Start of U Spell: HUT Sample

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>P10</th>
<th>P50</th>
<th>P90</th>
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<tbody>
<tr>
<td><strong>I. Unemployment</strong></td>
<td></td>
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<tr>
<td>Duration of spell (wks)</td>
<td>26.64</td>
<td>2.86</td>
<td>13.43</td>
<td>65.29</td>
</tr>
<tr>
<td>Duration on $b_1$ (wks)</td>
<td>12.87</td>
<td>2.86</td>
<td>13.43</td>
<td>20</td>
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<tr>
<td>Duration on $b_2$ (wks)</td>
<td>12.22</td>
<td>0</td>
<td>0</td>
<td>45.29</td>
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<td><strong>II. Demographics</strong></td>
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<tr>
<td>Age</td>
<td>34.12</td>
<td>21</td>
<td>33</td>
<td>51</td>
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<tr>
<td>Fraction men</td>
<td>.49</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Fraction married</td>
<td>.39</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Number of children</td>
<td>1.27</td>
<td>0</td>
<td>1</td>
<td>3</td>
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<tr>
<td><strong>III. Income and Wealth, SEK 2003(K)</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Gross earnings (individual)</td>
<td>202.9</td>
<td>9.8</td>
<td>172.6</td>
<td>386.2</td>
</tr>
<tr>
<td>Household disposable income</td>
<td>354.4</td>
<td>116.9</td>
<td>330.1</td>
<td>585.3</td>
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<tr>
<td>Household consumption</td>
<td>343</td>
<td>150.3</td>
<td>305.1</td>
<td>572.6</td>
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<tr>
<td>Household net wealth</td>
<td>510.1</td>
<td>-258.3</td>
<td>0</td>
<td>1691.6</td>
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<tr>
<td>Household bank holdings</td>
<td>65.6</td>
<td>0</td>
<td>0</td>
<td>149.8</td>
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<tr>
<td>Household real estate</td>
<td>770.7</td>
<td>0</td>
<td>44</td>
<td>1948.3</td>
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<tr>
<td>Household debt</td>
<td>427.2</td>
<td>0</td>
<td>193.3</td>
<td>1154.3</td>
</tr>
</tbody>
</table>
Household Consumption: Registry Based Measure

Δ consumption after 1 year (%): -15.8 (1.6)

Consumption relative to last quarter before U (cst SEK): -12 -18 0 6 12

Months relative to start of unemployment spell:

-12 -18 0 6 12 18
Yearly Income of All Other HH Members

\[ \Delta \text{income after 1 year (\%) = -0.6 (\pm 0.8)} \]

Income relative to last quarter before U (cst SEK)

-12 -6 0 6 12 18

Months relative to start of unemployment spell

\[ \Delta \text{income after 1 year (\%)} = -0.6 (\pm 0.8) \]
Yearly Change in Non-Mortgage Debt

$\Delta$ change in debt after 1 year (%)
-29.6 (11.3)

Income relative to last quarter before U (cst SEK)
-12 -6 0 6 12 18

Months relative to start of unemployment spell

$\Delta$ change in debt after 1 year (%)
-29.6 (11.3)
Decomposition: Earnings

Pre-U level: 151 (k2003SEK)

Consumption relative to last quarter before U (cst SEK)

Quarter relative to start of unemployment spell
Decomposition: + Transfers

Pre-U level: 160 (k2003SEK)

Δ consumption flow after 1 year (%)
-27 (.7)

Consumption relative to last quarter before U (cst SEK)

Quarter relative to start of unemployment spell

Earnings
Earnings + Transfers
Decomposition: + Other Income

Pre-U level:
140 (k2003SEK)

Δ consumption flow
after 1 year (%)
-26 (.4)

Consumption relative to last quarter before U (cst SEK)
-3
0
1
4
8

Quarter relative to start of unemployment spell

Earnings
Earnings + Transfers
Disposable Income

Δ consumption flow after 1 year (%)
-26 (.4)
Decomposition: + Changes in Assets

Pre-U level: 137 (k2003SEK)
Average change after 1 year (%): -26 (1.8)
-150000
-100000
-50000
0
25000

Consumption relative to last quarter before U (cst SEK)
-3
0
1
4
8

Quarter relative to start of unemployment spell

Earnings
Earnings + Transfers
Disposable Income
Consumption

Average change after 1 year (%): -26 (1.8)
<table>
<thead>
<tr>
<th></th>
<th>(1) Total exp.</th>
<th>(2) Food</th>
<th>(3) Rents</th>
<th>(4) Purch. of new vehicles</th>
<th>(5) Furn. &amp; house appl.</th>
<th>(6) Transport.</th>
<th>(7) Recreation</th>
<th>(8) Restaurant</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I[t \leq 20 \text{ weeks}]$</td>
<td>-0.0606*</td>
<td>-0.0441</td>
<td>-0.0404</td>
<td>-0.418**</td>
<td>-0.160</td>
<td>-0.0788</td>
<td>-0.106</td>
<td>-0.0807</td>
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<tr>
<td></td>
<td>(0.0316)</td>
<td>(0.0388)</td>
<td>(0.0380)</td>
<td>(0.187)</td>
<td>(0.102)</td>
<td>(0.0661)</td>
<td>(0.0649)</td>
<td>(0.0876)</td>
</tr>
<tr>
<td>$I[t &gt; 20 \text{ weeks}]$</td>
<td>-0.130***</td>
<td>-0.0823*</td>
<td>0.0430</td>
<td>-0.252</td>
<td>-0.0883</td>
<td>-0.348***</td>
<td>-0.189***</td>
<td>-0.165*</td>
</tr>
<tr>
<td></td>
<td>(0.0328)</td>
<td>(0.0441)</td>
<td>(0.0310)</td>
<td>(0.176)</td>
<td>(0.0884)</td>
<td>(0.0803)</td>
<td>(0.0719)</td>
<td>(0.0888)</td>
</tr>
<tr>
<td>Year fixed effects</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Marital status</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Family size</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
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<tr>
<td>$R^2$</td>
<td>0.0493</td>
<td>0.0650</td>
<td>0.0365</td>
<td>0.0205</td>
<td>0.00975</td>
<td>0.0208</td>
<td>0.0252</td>
<td>0.0154</td>
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<tr>
<td>N</td>
<td>1551</td>
<td>1548</td>
<td>798</td>
<td>982</td>
<td>1548</td>
<td>1488</td>
<td>1543</td>
<td>1119</td>
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</table>
Pre-U characteristics of individuals with spells ≥ 20 wks

<table>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
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<tbody>
<tr>
<td><strong>Duration of future spell ≥ 20 weeks</strong></td>
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<tr>
<td>Age: 30 to 39</td>
<td>0.129***</td>
<td>0.118***</td>
<td>0.116***</td>
<td>0.119***</td>
<td>0.120***</td>
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<tr>
<td></td>
<td>(0.00237)</td>
<td>(0.00250)</td>
<td>(0.00251)</td>
<td>(0.00305)</td>
<td>(0.00311)</td>
</tr>
<tr>
<td>Age: 40 to 49</td>
<td>0.164***</td>
<td>0.153***</td>
<td>0.153***</td>
<td>0.162***</td>
<td>0.163***</td>
</tr>
<tr>
<td></td>
<td>(0.00277)</td>
<td>(0.00293)</td>
<td>(0.00295)</td>
<td>(0.00357)</td>
<td>(0.00363)</td>
</tr>
<tr>
<td>Age: 50+</td>
<td>0.272***</td>
<td>0.261***</td>
<td>0.265***</td>
<td>0.281***</td>
<td>0.282***</td>
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<tr>
<td></td>
<td>(0.00288)</td>
<td>(0.00307)</td>
<td>(0.00319)</td>
<td>(0.00367)</td>
<td>(0.00371)</td>
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<tr>
<td>Gender: Female</td>
<td>-0.00226</td>
<td>-0.00209</td>
<td>-0.00279</td>
<td>-0.0146***</td>
<td>-0.0135***</td>
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<tr>
<td></td>
<td>(0.00192)</td>
<td>(0.00193)</td>
<td>(0.00193)</td>
<td>(0.00230)</td>
<td>(0.00230)</td>
</tr>
<tr>
<td>0&lt;Net wealth≤200k</td>
<td>-0.0503***</td>
<td>-0.0116***</td>
<td>-0.0122***</td>
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<tr>
<td></td>
<td>(0.00234)</td>
<td>(0.00271)</td>
<td>(0.00315)</td>
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<tr>
<td>200k&lt;Net wealth≤500k</td>
<td>-0.0466***</td>
<td>-0.0146***</td>
<td>-0.0114***</td>
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<td></td>
<td>(0.00324)</td>
<td>(0.00350)</td>
<td>(0.00425)</td>
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<tr>
<td>500k&lt;Net wealth≤5M</td>
<td>-0.0186***</td>
<td>0.00576*</td>
<td>0.00774*</td>
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<td>(0.00300)</td>
<td>(0.00336)</td>
<td>(0.00418)</td>
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<tr>
<td>Net wealth&gt;5M</td>
<td>0.0731***</td>
<td>0.0852***</td>
<td>0.0866***</td>
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<td>(0.0173)</td>
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<td><strong>Fraction of portfolio in stocks</strong></td>
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<td>3rd quartile</td>
<td>-0.000542</td>
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<td></td>
<td>(0.00787)</td>
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<tr>
<td>4th quartile</td>
<td>0.0303***</td>
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<td>(0.00259)</td>
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<td><strong>Leverage: debt / assets</strong></td>
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<tr>
<td>2nd quartile</td>
<td>0.0153***</td>
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<td>(0.00390)</td>
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<tr>
<td>3rd quartile</td>
<td>-0.0120***</td>
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<td></td>
<td>(0.00322)</td>
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<tr>
<td>4th quartile</td>
<td>-0.00629*</td>
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<tr>
<td></td>
<td>(0.00361)</td>
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<tr>
<td><strong>R²</strong></td>
<td>0.0465</td>
<td>0.0490</td>
<td>0.0511</td>
<td>0.0624</td>
<td>0.0620</td>
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<td>269931</td>
<td>269931</td>
<td>190176</td>
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</table>
Consumption Implementation: Taylor Approximations

- **Homogeneous preferences**

\[
CS_k \approx \frac{v' (\bar{c}_k^u) - v' (\bar{c}_0)}{v' (\bar{c}_0)} \approx -\frac{v'' (\bar{c}_0) \bar{c}_0}{v' (\bar{c}_0)} \times \frac{\bar{c}_0 - \bar{c}_k^u}{\bar{c}_0},
\]

(3)

- **Heterogeneous preferences**

\[
CS_k \approx \frac{E_k [v'_i (c_{i,0})] - E_0 [v'_i (c_{i,0})]}{E_0 [v'_i (c_{i,0})]} - \frac{E_k [v''_i (c_{i,0}) (c_{i,0} - c_{i,t}^u)]}{E_0 [v'_i (c_{i,0})]}.
\]

(4)