INCOME DYNAMICS OF COUPLES: CORRELATED RISKS AND HETEROGENEOUS WITHIN-HOUSEHOLD INSURANCE

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Motivation

- Individuals face labor market risk → household earnings risk?
- HH earnings risk matters for
  - Fiscal Policy: private vs. public insurance (e.g., Wu & Krueger)
  - Monetary Policy: MPCs (e.g., Bardóczy ’20)
  - Macro models w/ micro data: bachelor household (e.g., HSV ’10)

HSV ’10: Wages and hours worked are characteristics recorded at the individual level, while consumption and welfare are typically measured at the level of the household. This presents an obvious challenge for the bachelor model as a lens for interpreting micro data.
Motivation (cont.)

- Traditional focus:
  - HH-insurance: **out-of-LF female** reacting to male income shock
  - Measurement: individuals (males) or **stably married** HHs

But...
Motivation (cont.)

- Traditional focus:
  - HH-insurance: **out-of-LF female** reacting to male income shock
  - Measurement: individuals (males) or **stably married** HHs

But...

- Female labor force participation ↑ in most countries
  - Especially married women (e.g., Olsson ’20)
- Same time: divorce and formation of new couples
  - on avg. 2.5 spouses / individual in our sample
This Paper

Characterize earnings dynamics:

- in two-earner households
- with family formation and dissolution over the life-cycle
- in Denmark: high female LF participation throughout

Key role of

- **Correlation** of spouses’ incomes (risk)
  - **Sorted** by: education, occupation, industry, firm, . . .

Implications for

- **Heterogeneity** of intra-household **insurance**
This Paper, more specifically

1. Analyze **co-movement** of earnings changes
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2. Heterogeneity by labor market characteristics of couples
   ▶ More similar partners $\rightarrow$ worse earnings stabilization
   ▶ Matters within different groups: age, wealth
This Paper, more specifically

1. Analyze **co-movement** of earnings changes

2. **Heterogeneity** by **labor market characteristics** of couples
   - More **similar** partners $\rightarrow$ **worse** earnings stabilization
   - Matters within **different groups**: age, wealth

3. Pass-through to household-level
   - Household income & **consumption**
This Paper, more specifically

1. Analyze **co-movement** of earnings changes

2. **Heterogeneity** by **labor market characteristics** of couples
   - More **similar** partners $\rightarrow$ **worse** earnings stabilization
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3. Pass-through to household-level
   - Household income & **consumption**

4. Ongoing: Role of heterogeneity for life-cycle dynamics
   - Joint income process with singles/couples & marriage/divorce
Outline

Intro

Data

Joint Income Changes

Pass-Through to Household

A Joint Earnings Process

Amplification: Sorting Patterns

Summary and Outlook
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Summary and Outlook
Data: Danish tax register & social security

- Whole Danish population panel 1991–2018
- Links individuals (couples)
- Info on:
  - Age, education, occupation, sector, firm
  - Earnings: total annual labor earnings
  - Taxes, transfers, assets
- Benchmark analysis: 5.3 million couple-year observations
Data: Some Details

- **Main data:** IDA (Integrated Database for Labour Market Research)
  - BEF (Demographic characteristics and family linkages)
  - UDDA (Education)
  - AKM (Employment)

- **Sample:** age 18-59 with employment info

- **Classifications**
  - 2 Education groups: College and non-college (High and Low)
  - DISCO Classification: 2-digit level $\rightarrow$ 26 occupations
  - NACE Classification: Level 1 $\rightarrow$ 21 industries
Flexible Approach to Joint Income Changes

Consider log earnings changes of head and spouse:

\[
\Delta y_{t}^{sp} = f(\Delta y_{t}^{hd})
\]  (1)
Flexible Approach to Joint Income Changes

- Consider log earnings changes of head and spouse:

\[ \Delta y_{sp} = f(\Delta y_{hd}) \]  \hspace{1cm} (1)

- Specify \( f(\cdot) \) flexibly:
  1. **Non-linear** in \( \Delta y_{hd} \)
  2. **Heterogeneity by similarity** of labor market characteristics
     - Education, Occupation, Industry, Firm
  3. Other sources of heterogeneity
     - Age, Wealth
     - #Children
Measures of Spousal Earnings Comovement

- Implied spousal earnings changes for each group

\[ \Delta y_{t}^{sp} = f(\Delta y_{t}^{hd}; \hat{\beta}) \]  \hfill (2)

- ‘Elasticities’

\[ \hat{\epsilon}^{sp} = \frac{\Delta y_{t}^{sp}}{\Delta y_{t}^{hd}} \]  \hfill (3)
Spousal Change—Education Groups

(a) Sorting by Education
Spousal Change—Occupation Groups

(b) Sorting by Occupation
Spousal Change—Sector Groups

(c) Sorting by Sector

Head Earnings Change (20 bins)

Spouse Earnings Change

- 0.04 0.00 0.04 0.08

Not Same Sector
Same Sector
Spousal Change—Sector×Occupation Groups

(d) Sorting by Sector×Occupation

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Spousal Change—Firm Groups

(e) Sorting by Firm

Madera & Groes (LMU, SMU & CBS): Correlated Risks
Implied Spousal Earnings Elasticity
Implied Spousal Earnings Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks 14 / 34
Implied Spousal Earnings Elasticity

(f) Spousal Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Implied Spousal Earnings Elasticity

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Implied Spousal Earnings Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks

(f) Spousal Elasticity
Implied Spousal Earnings Elasticity—control age

(g) Spousal Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Other Sources of Heterogeneity

- Spousal labor income (adjustments) one channel of insurance
- Other channels: household savings; public transfers
  - Interaction?
  - Different relative importance for different groups?
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- Spousal labor income (adjustments) one channel of insurance
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- Role of labor market sorting by:
  - Age
  - Wealth (before change)
    - (cash+deposits+stocks+shares+property+cars−liabilities)

⇒ Sorting matters within groups
By Age Groups: Spousal Earnings Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
By **Wealth** Groups: Spousal Earnings

By Wealth Groups: Spousal Earnings

Net Wealth ≤ 0

0 < Net Wealth ≤ P50

Net Wealth > P50

Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
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Summary and Outlook
Measures of *Pass-Through* to Household Earnings

- Head earnings change → Spouse earnings change
Measures of *Pass-Through* to Household Earnings

- Head earnings change → Household earnings change
- Combines *active* and *passive* intra-household insurance
Measures of *Pass-Through* to Household Earnings

- Head earnings change → Household earnings change
- Combines **active** and **passive** intra-household insurance
- Implied household earnings changes for each group

\[ \Delta y_{hh}^t = f(\Delta y_{hd}^t; \hat{\beta}) \]  \hspace{1cm} (4)

- ‘Elasticities’

\[ \hat{\epsilon}_{hh} = \frac{\Delta y_{hh}^t}{\Delta y_{hd}^t} \]  \hspace{1cm} (5)
Household Earnings Elasticity
Household Earnings Elasticity

(i) Household Elasticity: Sector

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
From Income To Consumption

\[ C = Y - T - \Delta A \] (6)
From Income To Consumption

\[ C = Y - T - \Delta A \] (6)

- Components of budget in data:
  - \( Y \): Labor + capital income (+imputed cons. value housing)
  - \( T \): Tax payments – transfer receipts
  - \( \Delta A \): Change asset value
    (cash+deposits+stocks+shares+property+cars–liabilities)

⇒ Consumption

⇒ Lines up with Expenditure Survey

(De Giorgi, Frederiksen & Pistaferri, ReStud’20)
Measures of Pass-Through to Consumption

- Implied household consumption changes for each group

\[ \Delta y_t^c = f(\Delta y_{t}^{hd}; \hat{\beta}) \]  

(7)

- ‘Elasticities’

\[ \hat{\varepsilon}_c = \frac{\Delta c_t^{hh}}{\Delta y_t^{hd}} \]  

(8)
Household Consumption Change
Household Consumption Change

(j) Consumption Change: Step-by-Step
Household Consumption Change

(j) Consumption Change: Step-by-Step
Household Consumption Change

(j) Consumption Change: Step-by-Step

- Not Same Occupation
- Not Same Sector
- Same Occ.
Household Consumption Change

(j) Consumption Change: Step-by-Step

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Household Consumption Change

(j) Consumption Change: Step-by-Step

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
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Income Dynamics: Adding Some Structure

- Household earnings:
  - Two earnings (processes)
  - Correlated innovations
  - Transitory-permanent decomposition
    (e.g., Blundell, Pistaferri & Saporta-Eksten, AER’16)

- Used in quantitative models
  (e.g., Attanasio, Low & Sánchez-Marcos, JEEA’05; Krueger & Wu, AEJ:M’21)
Income Dynamics: Adding Some Structure

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- Allow for heterogeneity by couple-type!
A Simple (Joint) Income Process
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\[
y_t^i = z_t^i + \varepsilon_t^i \\
z_t^i = z_{t-1}^i + \eta_t^i
\]  
(9)

- If in couple in \( t \), \( \varepsilon_t^i \) & \( \eta_t^i \) correlated
- Covariances \( \sigma_{\eta\eta}(s_t) \) & \( \sigma_{\varepsilon\varepsilon}(s_t) \) depend on sorting group \( s_t \)
A Simple (Joint) Income Process

\[ y_t^i = z_t^i + \varepsilon_t^i \]
\[ z_t^i = z_{t-1}^i + \eta_t^i \]  

▷ If in couple in \( t \), \( \varepsilon_t^i \) & \( \eta_t^i \) correlated

▷ Covariances \( \sigma_{\eta\eta}(s_t) \) & \( \sigma_{\varepsilon\varepsilon}(s_t) \) depend on sorting group \( s_t \)

→ Estimate on (co-)moments of differences:

\[
\text{var}(\Delta y_t^i) = \sigma_{\eta}^2 + 2\sigma_{\varepsilon}^2 \\
\text{cov}(\Delta y_t^i, \Delta y_{t+1}^i) = -\sigma_{\varepsilon}^2 \\
\text{cov}(\Delta y_t^m, \Delta y_{t+1}^f|s_t = s; s_{t+1} = s') = \sigma_{\eta\eta}(s') + \sigma_{\varepsilon\varepsilon}(s) + \sigma_{\varepsilon\varepsilon}(s') \\
\text{cov}(\Delta y_t^m, \Delta y_{t+1}^f|s_t = s; s_{t+1} = s') = -\sigma_{\varepsilon\varepsilon}(s')
\]
Estimates

Consider different versions for $s$:

1. none
2. Education sorting: $s \in \{\text{same educ, not same educ}\}$
3. Occupation sorting: same occ vs. not same occ
4. Sector, Career, Firm
Estimates

- Consider different versions for $s$:
  1. none
  2. Education sorting: $s \in \{ \text{same educ}, \text{not same educ} \}$
  3. Occupation sorting: same occ vs. not same occ
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Correlations (old version): $\rho_\varepsilon = -2.69\%$ and $\rho_\eta = 3.74\%$

- With educ sorting:
  $\rho_\varepsilon(\text{same}) = -4.42\%$, $\rho_\varepsilon(\text{not}) = -2.86\%$
  $\rho_\eta(\text{same}) = 5.14\%$, $\rho_\eta(\text{not}) = 2.28\%$

- With occup sorting:
  $\rho_\varepsilon(\text{same}) = -3.73\%$, $\rho_\varepsilon(\text{not}) = -7.03\%$
  $\rho_\eta(\text{same}) = 10.45\%$, $\rho_\eta(\text{not}) = 3.21\%$
Richer Income Process

- Process estimated on ‘stable couples’ not representative
  - Estimate individual male and female processes
  - ...using male and females data
  - ...together with process of ‘marriage’ and ‘divorce’
- Resulting income dynamics:
  - Correlated shocks while in couple
  - Additional conditional income shock upon divorce

\[
y^i_t = z^i_t + \varepsilon^i_t + \delta^\varepsilon_t \cdot 1 \{ \text{div}_t = 1 \} \\
z^i_t = z^i_{t-1} + \eta^i_t + \delta^\eta_t \cdot 1 \{ \text{div}_t = 1 \}
\] (10)
Richer Income Process

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\[ y_t^i = z_t^i + \varepsilon_t^i + \delta_t^{\varepsilon_i} \cdot 1 \{ \text{div}_t = 1 \} \]
\[ z_t^i = z_{t-1}^i + \eta_t^i + \delta_t^{\eta_i} \cdot 1 \{ \text{div}_t = 1 \} \]  \hspace{1cm} (10)

- Marriage and divorce shocks orthogonal to income shocks
  - Separately identified!
Earnings dynamics and family changes

At every age, each single male and female can:

- form a couple with probability $p^\text{form}$: receive $\varepsilon, \eta$, correlated with her spouse’s $\varepsilon, \eta$ in the next period
- stay single: receive $\varepsilon, \eta$

At every age, each male and female in couples can:

- divorce with probability $p^\text{div}$: receive $\varepsilon, \eta$, correlated with her (outgoing) spouse’s $\varepsilon, \eta$ AND $\delta^\eta, \delta^\varepsilon$
- stay in the couple: receive $\varepsilon, \eta$, correlated with her spouse’s $\varepsilon, \eta$
Couple formation Process ($p_{form}^\text{form}$)

- Age
- + tenure

(k) HH Formation

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Divorce Process ($p^{div}$)

![Graph showing the probability of divorce against age with different factors considered: Age, + kids, + kids + tenure, + tenure.]
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Summary and Outlook
Sorting Patterns

- One simple measure (Eika, Mogstad, Zafar, JPE'19):

\[
s(a, b) = \frac{\text{actual joint distribution}}{\begin{aligned} &P(e^{sp} = a, e^{hd} = b) \\ &P(e^{sp} = a)P(e^{hd} = b) \end{aligned}}
\]

(random: product of marginals)
Sorting Patterns

- One simple measure (Eika, Mogstad, Zafar, JPE’19):

\[
s(a, b) = \frac{\text{actual joint distribution}}{P(e^{sp} = a, e^{hd} = b)} \cdot \frac{P(e^{sp} = a)P(e^{hd} = b)}{\text{random: product of marginals}}
\]  

- Couples positively sorted by characteristics
  - Education Sorting: \( s(H, H) \approx 2 \) and \( s(L, L) \approx 1.2 \)
  - Occupation and Sector: \( \approx 2.2 \)
  - Amplifies aggregate importance of above channels

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Sorting Coefficient Across Occupation-Pairs

(12) Manager large firm - (12) Manager large firm
(Correlation = 0.84)

(41) Office Clerk - (13) Manager small firm
(Correlation = -0.26)

(23) Teacher - (51) Service
(Correlation = 0.48)

(m) Sorting Coefficient
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Summary

- Full population Danish register data
Summary

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- Study couples’ income co-movement
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- Study couples’ income co-movement
- **Heterogeneity** of joint labor market characteristics
  - Matters for joint *earnings changes*
  - Holds within groups of age, wealth
  - Translates to household outcomes: *consumption*
Summary

- Full population Danish register data
- Study couples’ income co-movement
- **Heterogeneity** of joint labor market **characteristics**
  - Matters for joint **earnings changes**
  - Holds within groups of age, wealth
  - Translates to household outcomes: **consumption**
- Couples **sort**: 
  - Education, sector, occupation
  - Amplifies role of similarity for aggregate

*Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks*
Outlook: Current & Future Steps

- Life-cycle dynamics for different sorting groups
  - Use panel dimension of data
  - Divorce risk, marriage risk
- Decompose spousal labor supply vs. savings vs. transfers
- Extensive margin of adjustment
  - Subsample: spell data
- Source of heterogeneous reaction to policy
Thanks
Next: Quantitative Model

- Sorting/distribution of couples matters for
  - Within-household insurance ("added worker effect")
  - Evaluation of public insurance
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- Sorting/distribution of couples matters for
  - Within-household insurance ("added worker effect")
  - Evaluation of public insurance

- Model featuring:
  - Incomplete markets
  - Distribution of couples over pairs of occupation
  - Head earnings process; Spouse wage process
    - Endogenous labor supply of spouse
  - Tax & transfer function
Joint Dynamics: Average by Group

- Spousal income changes:

\[ \Delta y_{t}^{sp} = \beta_0 + \tilde{f}(\Delta y_{t}^{hd}) + X_{t}^{sp} \gamma + Y \delta + u_{st} \]  \hspace{1cm} (12)

with

\[ \tilde{f}(\Delta y_{t}^{hd}) = (l_{o_{t}^{hd}} \neq o_{t}^{sp} \beta_{\text{not same } x} + l_{o_{t}^{hd}} = o_{t}^{sp} \beta_{\text{same } x}) \Delta y_{t}^{hd} \]  \hspace{1cm} (13)

- \( X_{t}^{sp} \): age quadratic, education dummies, occupation dummies
- \( Y \): year dummies
- \( \Delta y_{t}^{i} \): 1-year income change
Group-Specific Coefficients

(n) Elasticities for Different Sorting Vars

$\beta = 0.03$
Group-Specific Coefficients: By Education Pairs

$\beta = 0.03$

(o) Elasticities—Educ $\otimes$ Sorting Var

Back to Average
Household Change—Step-Wise Conditioning
Household Change—Step-Wise Conditioning

(p) Household Change: Step-by-Step

Household Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Household Change—Step-Wise Conditioning

(p) Household Change: Step-by-Step

Household Elasticity

Not Same Occupation
Not Same Sector

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Household Change—Step-Wise Conditioning

Household Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Household Change—Step-Wise Conditioning

Household Earnings Change

(p) Household Change: Step-by-Step

Not Same Occupation
Not Same Sector
Same Occ.
Same Sector

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
Household Change—Step-Wise Conditioning

(p) Household Change: Step-by-Step

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Household Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
By Age Groups: Spousal Earnings

By Age Groups: Spousal Earnings

- Not Same S - Same S

Head Earnings Change (20 bins)

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
By **Age** Groups: Household Consumption

18<=Age<35
1.0
0.5
0.0
-0.5
-1.0
-1.5

35<=Age<49
1.0
0.5
0.0
-0.5
-1.0
-1.5

50<=Age<65
1.0
0.5
0.0
-0.5
-1.0
-1.5

- Not Same S • Same S

Head Earnings Change (20 bins)

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
By **Wealth** Groups: Spousal Earnings

By Wealth Groups: Spousal Earnings

**By Wealth Groups:** Spousal Earnings

- **Net Wealth <= 0**
- **0 < Net Wealth <= P50**
- **Net Wealth > P50**

- **Spouse Earnings Elasticity**
- **Head Earnings Change (20 bins)**

- Not Same S • Same S

Head Earnings Change (20 bins)
By **Wealth** Groups: Household Consumption

![Graph showing household consumption elasticity by wealth groups.](image)

- Net Wealth $\leq 0$
- $0 < \text{Net Wealth} \leq P50$
- Net Wealth $> P50$

- Not Same S • Same S

Head Earnings Change (20 bins)
By Recent Income Groups: Spousal Earnings

Earnings Decile = 1

Earnings Decile = 2

Earnings Decile = 3

Earnings Decile = 4

Head Earnings Change (20 bins)

- Not Same S
- Same S

Elasticity

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
By Recent Income Groups: Household Consumption

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks
By Recent Income Groups: Spousal Earnings

- Not Same S • Same S
By Recent Income Groups: Household Consumption

By Recent Income Groups: Household Consumption

- Not Same S
- Same S

Head Earnings Change (20 bins)
676 Underlying Occupation Pairs

Busch, Madera & Groes (LMU, SMU & CBS): Correlated Risks