How do Borrowers Adjust in a Household Foreign Currency Debt Crisis

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SUERF-Banca d'Italia-ECB-EIB Conference
April 26-27, 2023

The views in this paper are solely those of the authors and do not reflect the views of the European Central Bank or the Central Bank of Hungary.
Motivation

- **Foreign currency debt** often plays a central role in financial crises, especially in emerging markets
  - Depreciation weakens balance sheets, depressing investment and consumption
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- Less is known about **household** response to foreign currency debt revaluations

- Household balance sheet is an important transmission channel
  - In models of international financial crises (Lorenzoni 2014)
  - In heterogenous agent open economy macro models (de Ferra et al. 2019, Auclert et al. 2021)
Household and Corporate FC Debt Exposures during Selected Crises

This Paper

- Examine the transmission of an exchange rate shock to household consumption and labor supply through household foreign currency debt positions.
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- Focus on the 2008 currency crisis in Hungary
  - 66% of outstanding household debt denominated in FC, mostly Swiss franc
  - Detailed household-level consumption survey data
This Paper

- Examine the transmission of an exchange rate shock to household consumption and labor supply through household foreign currency debt positions.

- Focus on the 2008 currency crisis in Hungary:
  - 66% of outstanding household debt denominated in FC, mostly Swiss franc.
  - Detailed household-level consumption survey data.

- Exploit variation in the currency composition of household debt:
  - Compare foreign currency (FC) borrowers to similar local currency (LC) borrowers and non-borrowers.
  - Variation is driven by a policy change.
Main results

Consumption response:
- Households with FC exposure reduce spending by 5% compared to similar LC borrowers
  - Marginal propensity to consume of \( \approx 1 \) out of increased debt service
  - Consistent with liquidity constraints
- Reduction in both quantities purchased and prices paid
  - Substitution toward cheaper varieties
  - Consistent with flight from quality
  - Suggests non-homothetic preferences

Labor supply response:
- No effect on labor market participation, unemployment, hours or earnings
- Adjustment towards foreign income streams
- Increase in home production
  - Substitution from money toward time-intensive goods
Background
Household credit expansion in the 2000s

- Subsidized LC
- LC subsidies removed
- Entry of FC loans
- Forint depreciates by over 30% against Swiss franc

Household debt-to-GDP

- 2000q1
- 2002q1
- 2004q1
- 2006q1
- 2008q1
- 2010q1
- 2012q1

LC
LC + FC at 2008Q3 exchange rate
LC + FC at market exchange rate
Household credit expansion in the 2000s

Subsidized LC loans introduced
LC subsidies removed
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Household credit expansion in the 2000s

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Household debt-to-GDP

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Household credit expansion in the 2000s

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![Household debt-to-GDP ratio over time](chart)

- LC
- LC + FC at 2008Q3 exchange rate
- LC + FC at market exchange rate

- UIP deviation: 400bp difference between domestic vs foreign lending rates
Household credit expansion in the 2000s

- Subsidized LC loans introduced
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![Chart showing household debt-to-GDP ratio from 2000q1 to 2012q1 with key events:
- Subsidized LC loans introduced
- LC subsidies removed
- Entry of FC loans
- Forint depreciates by over 30% against Swiss franc]

- **UIP deviation:** 400bp difference between domestic vs foreign lending rates
- **Stable exchange rate environment**
Household credit expansion in the 2000s

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- **Supply-side**: Foreign banks expanding their retail market share

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### Graph:
- **Household debt-to-GDP**
- **2000q1 to 2012q1**
- **LC**
- **LC + FC at 2008Q3 exchange rate**
- **LC + FC at market exchange rate**
Household credit expansion in the 2000s

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- UIP deviation: 400bp difference between domestic vs foreign lending rates
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- Supply-side: Foreign banks expanding their retail market share

⇒ FC vs LC debt exposure determined by timing of borrowing
Household credit expansion in the 2000s

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Graph showing household debt-to-GDP ratio from 2000q1 to 2012q1, with key events marked:

- Subsidized LC loans introduced
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Household credit expansion in the 2000s

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- HH debt revaluation
- Raised HH debt-to-GDP by 6-10% of GDP
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Graph with time series data showing changes in household debt-to-GDP from 2000q1 to 2012q1.
Household credit expansion in the 2000s

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- Forint depreciates by over 30% against Swiss franc
- HH debt revaluation
- Raised HH debt-to-GDP by 6-10% of GDP
- FC exposure almost entirely unhedged
- Widespread phenomenon in emerging Europe in 2000s
Data, Empirical Framework
Data

- Household Budget and Living Conditions Survey 2005-2012
  - 8-10 thousand households
  - Panel structure: households followed for four consecutive years

- Detailed consumption information at five-digit COICOP level
- Primary outcome: non-durable consumption expenditure adjusted by Oxford scale (on 2007 prices)
- Information provided on both expenditures and quantities purchased for three main categories (32% of total expenditure)
- Decompose spending: quantities purchased and average prices paid

- Labor market outcomes of all household members

- Household debt information includes loan currency denomination, loan size, and maturity
- Provides household-level exposure to exchange rate depreciation through FC debt position
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Characteristics of FC Debtors and LC Debtors (Pre-Crisis)

(a) Household size

(b) Age of household head

(c) Consumption to income

(d) Log income per capita

(e) Payment to income

(f) Education
Empirical Framework

- Compare evolution of HH spending for FC debtors with LC debtors and non-borrowers:

\[
\ln C_{it} = \alpha_i + \delta_t + \beta FC_i \times POST_t + \gamma NoDebt_i \times POST_t + \Gamma X_{it} + \varepsilon_{it}
\]

where

- In \( C_{it} \) is log consumption
- \( \alpha_i \) and \( \delta_t \) are fixed effects
- \( FC_i \) and \( NoDebt_i \) are indicators of household debt status
- \( Post_t \) is a time dummy indicating post-2008 period
- \( X_{it} \) are control variables interacted with \( Post_t \): age, gender, education, region FE, contemporaneous income
Empirical Framework

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- Identifying assumption: **parallel trends**
Effect of FC Debt Exposure on Consumption
Impact of Foreign Currency Debt Revaluation on HH Consumption

\[ \ln C_{it} = \alpha_i + \delta_t + \sum_{k \neq 2008} \beta_k FC_i \times 1\{t = k\} + \sum_{k \neq 2008} \gamma_k NoDebt_i \times 1\{t = k\} + \Gamma X_{it} + \varepsilon_{it} \]
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Two Benchmark Models

Consumption response to permanent debt shock $\Delta d$

1. Permanent income consumer:

$$\Delta c_{PI} = -r \Delta d$$

2. Hand-to-mouth consumer responds one-for-one with change in per period debt service:

$$\text{Annuity} = d r_1 - (1 + r) - m \Rightarrow \Delta c_{HtM} = -\Delta d r_1 - (1 + r) - m$$

Calibrating using info from credit registry:

$$r = 5\% , m = 18\%$$

$$\Delta c_{PI} \approx \Delta c_{HtM} \approx 0.6$$

$$\text{MPC}_{PI} \approx 0.6 \text{ and } \text{MPC}_{HtM} = 1$$
Two Benchmark Models

Consumption response to permanent debt shock $\Delta d$

1. **Permanent income** consumer: $\Delta c^{Pl} = -r\Delta d$

Calibrating using info from credit registry

$r = 5\%$, $m = 18$

$\Delta c^{Pl} \approx 1 - (1 + r)^{-1} m \approx 0.6$

$MPC^{Pl} \approx 0.6$ and $MPC^{HtM} = 1$
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Marginal Propensity to Consume

- Instrument loan payments with FC status
  - Currency denomination affects consumption only through increased loan payments

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+, *, and ** denote significance at the 10 percent, 5 percent, and 1 percent level
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- Point estimate consistent with hand-to-mouth model
- HH spending decline by 2012: $931 (PPP)
### Heterogeneity in MPC

<table>
<thead>
<tr>
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<th>Income in 2008</th>
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Margins of Household Adjustment
Quantity and quality of expenditures

\[ E_t - E_{t-k} = \sum_{j \in J_{t/t-k}} e_j - \sum_{j \in J_{t/t-k}} e_{j,t-k} + \sum_{j \in J_{t/t-k}} e_{j,t-k} - \sum_{j \in J_{t-k}} e_{jt-k} + \sum_{j \in J_t} e_{jt} - \sum_{j \in J_{t/t-k}} e_{jt}, \]

Intensive margin

Exit

Entry

Extensive margin

Marshall-Edgeworth decomposition of intensive margin:

\[ X_{j \in J_{t/t-k}} e_{jt} - X_{j \in J_{t/t-k}} e_{jt} - X_{j \in J_{t-k}} e_{jt-k} + X_{j \in J_t} e_{jt} - X_{j \in J_{t/t-k}} e_{jt}, \]
Quantity and quality of expenditures

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\[ \sum_{j \in J_{t/t-k}} e_{jt} - \sum_{j \in J_{t/t-k}} e_{j,t-k} = \sum_{j \in J_{t/t-k}} \Delta_k p_{jt} \frac{q_{jt} + q_{j,t-k}}{2} + \sum_{j \in J_{t/t-k}} \Delta_k q_{jt} \frac{p_{jt} + p_{j,t-k}}{2} \]

Intensive margin

Price change

Quantity change
Quantity and quality of expenditures

\[ E_t - E_{t-k} = \sum_{j \in J_{t/t-k}} e_{jt} - \sum_{j \in J_{t/t-k}} e_{j,t-k} + \sum_{j \in J_{t/t-k}} e_{j,t-k} - \sum_{j \in J_{t-k}} e_{jt-k} + \sum_{j \in J_t} e_{jt} - \sum_{j \in J_{t/t-k}} e_{jt}, \]

\begin{align*}
\text{Intensive margin} & \quad \text{Exit} & \quad \text{Entry} \\
\{z\} & \quad \{z\} & \quad \{z\}
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\begin{align*}
\text{Intensive margin} & \quad \text{Price change} & \quad \text{Quantity change} \\
\{z\} & \quad \{z\} & \quad \{z\}
\end{align*}

- Homothetic preferences (e.g. CES): price change component=0
- “Flight from quality”: upward sloping \textit{quality Engel curve} \Rightarrow price change component < 0
### Quantity and quality of expenditures

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<tr>
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<th>Total expenditures</th>
<th>Intensive</th>
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<td></td>
<td>Price</td>
<td>Quantity</td>
<td>Entry</td>
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<td><strong>FC × Post</strong></td>
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<td>-5727.22*</td>
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<td>(9860.08)</td>
<td>(2687.53)</td>
<td>(5860.49)</td>
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<td>(5900.66)</td>
<td>(6189.76)</td>
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<td>Household and Year FE</td>
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<tr>
<td>Percent of total</td>
<td>–</td>
<td>20.03%</td>
<td>50.92%</td>
<td>32.41%</td>
<td>-3.38%</td>
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- 70/30 intensive vs extensive
- 70/30 quantity vs price
Quantity and quality of expenditures

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- Consistent with substitution to lower quality products within the same product category
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<td>Household and Year FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Household controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>39689</td>
<td>39689</td>
<td>39689</td>
</tr>
<tr>
<td>Percent of total</td>
<td>–</td>
<td>20.03%</td>
<td>32.41%</td>
</tr>
</tbody>
</table>

+, *, and ** denote significance at the 10 percent, 5 percent, and 1 percent level

- 70/30 intensive vs extensive
- 70/30 quantity vs price

- Consistent with substitution to lower quality products within the same product category
- Increased product-market search for lower prices of the same goods (Aguiar and Hurst 2005; Kaplan and Menzio 2015)
Other channels

- No effect on labor supply
  - But increased probability of working abroad

- Increased home production
  - Substitute money-intensive goods with time-intensive goods
Conclusion

- Estimate transmission of exchange rate shock to household consumption through foreign currency debt exposure

- Strong household-level responses:
  - One-for-one decline in nondurable consumption
  - Flight from quality
    ⇒ CPI can overstate inflation
  - Evidence consistent with models with liquidity constraints and non-homothetic demand

- Household FC debt can be an important component of the balance sheet channel in crises, especially because households are often unhedged
  - Role for macroprudential policy
Thank you!
Additional results

- Robustness checks
  - Alternative equivalence scales
  - Propensity score matching
  - House prices
- General equilibrium
- Payment difficulties
- FC savings
Rise in Default Rates on FC Loans

0
.1
.2
.3

Share of defaulted loans

2008q1 2009q1 2010q1 2011q1 2012q1 2013q1 2014q1 2015q1

Subsidized domestic currency mortgage
Foreign currency mortgage
Foreign currency home equity
### Characteristics of FC Debtors, LC Debtors, and Non-Borrowers

<table>
<thead>
<tr>
<th></th>
<th>FC mean/sd</th>
<th>LC mean/sd</th>
<th>Non-borr. mean/sd</th>
<th>FC-LC difference b/t</th>
<th>Borrower-non-borr. difference b/t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary school</strong></td>
<td>0.15</td>
<td>0.11</td>
<td>0.26</td>
<td>0.04*</td>
<td>-0.13**</td>
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<tr>
<td></td>
<td>0.35</td>
<td>0.31</td>
<td>0.44</td>
<td>2.07</td>
<td>-11.29</td>
</tr>
<tr>
<td><strong>Vocational school</strong></td>
<td>0.41</td>
<td>0.34</td>
<td>0.30</td>
<td>0.07*</td>
<td>0.09**</td>
</tr>
<tr>
<td></td>
<td>0.49</td>
<td>0.47</td>
<td>0.46</td>
<td>2.25</td>
<td>5.85</td>
</tr>
<tr>
<td><strong>High school</strong></td>
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<td>0.30</td>
<td>0.28</td>
<td>-0.00</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>0.45</td>
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<td>0.45</td>
<td>-0.32</td>
<td>1.06</td>
</tr>
<tr>
<td><strong>College</strong></td>
<td>0.15</td>
<td>0.25</td>
<td>0.16</td>
<td>-0.10**</td>
<td>0.03*</td>
</tr>
<tr>
<td></td>
<td>0.36</td>
<td>0.44</td>
<td>0.37</td>
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<td>0.87**</td>
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<td>1.34</td>
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<td>56.11</td>
<td>0.22</td>
<td>-12.31**</td>
</tr>
<tr>
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<td>12.50</td>
<td>10.35</td>
<td>15.27</td>
<td>0.33</td>
<td>-30.88</td>
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<td>-0.14**</td>
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<td>7.07</td>
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<tr>
<td></td>
<td>459.40</td>
<td>455.80</td>
<td>454.21</td>
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<td>0.50</td>
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<td><strong>Consumption to income</strong></td>
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<td>0.85</td>
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<td>-0.02</td>
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<td>0.33</td>
<td>-0.90</td>
<td>-1.61</td>
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<td><strong>Food exp. to income</strong></td>
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<td>0.20</td>
<td>0.22</td>
<td>0.00</td>
<td>-0.02**</td>
</tr>
<tr>
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<td>0.11</td>
<td>0.07</td>
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<td><strong>Payment to income</strong></td>
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<td>0.15</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.09</td>
<td>0.10</td>
<td>0.00</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td><strong>Have liquid assets</strong></td>
<td>0.08</td>
<td>0.10</td>
<td>0.18</td>
<td>-0.02</td>
<td>-0.09**</td>
</tr>
<tr>
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<td>0.30</td>
<td>0.39</td>
<td>-1.39</td>
<td>-9.89</td>
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<tr>
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<td>0.16</td>
<td>0.20</td>
<td>0.00</td>
<td>-0.04**</td>
</tr>
<tr>
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<td>0.37</td>
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<td>0.20</td>
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</tr>
<tr>
<td><strong>County capital</strong></td>
<td>0.24</td>
<td>0.29</td>
<td>0.23</td>
<td>-0.05</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>0.43</td>
<td>0.45</td>
<td>0.42</td>
<td>-1.89</td>
<td>1.41</td>
</tr>
<tr>
<td><strong>Town</strong></td>
<td>0.30</td>
<td>0.30</td>
<td>0.25</td>
<td>-0.00</td>
<td>0.05**</td>
</tr>
<tr>
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<td>0.46</td>
<td>0.46</td>
<td>0.43</td>
<td>-0.16</td>
<td>3.57</td>
</tr>
<tr>
<td><strong>Village</strong></td>
<td>0.30</td>
<td>0.25</td>
<td>0.31</td>
<td>0.05*</td>
<td>-0.03*</td>
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<tr>
<td></td>
<td>0.46</td>
<td>0.43</td>
<td>0.46</td>
<td>2.02</td>
<td>-2.06</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>982</td>
<td>512</td>
<td>6156</td>
<td>1494</td>
<td>7650</td>
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</tbody>
</table>
Labor supply: labor market participation and unemployment

Panel A: Labor market status

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC × Post</td>
<td>-0.00726</td>
<td>-0.00185</td>
<td>0.00630</td>
<td>0.00520</td>
</tr>
<tr>
<td></td>
<td>(0.0135)</td>
<td>(0.0136)</td>
<td>(0.0150)</td>
<td>(0.0144)</td>
</tr>
<tr>
<td>Household &amp; year FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Individual &amp; year FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Individual controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.689</td>
<td>0.899</td>
<td>0.517</td>
<td>0.723</td>
</tr>
<tr>
<td>$N$</td>
<td>154083</td>
<td>125953</td>
<td>74513</td>
<td>61299</td>
</tr>
</tbody>
</table>

Note: **Panel A:** Labor market status

- **Labor market participation**
- **Unemployment**

- FC: Federal Corporation
- Post: Post-implementation period

- Household & year FE: Fixed effects for household and year
- Individual & year FE: Fixed effects for individual and year
- Individual controls: Control variables for individual characteristics

- $R^2$: Coefficient of determination
- $N$: Sample size
## Labor supply: Hours worked

### Panel B: Hours

<table>
<thead>
<tr>
<th></th>
<th>Primary job</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FC × Post</strong></td>
<td>0.201</td>
<td>0.433</td>
</tr>
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<td>(0.426)</td>
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<td>Yes</td>
</tr>
<tr>
<td><strong>Individual &amp; year FE</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Individual controls</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>$R^2$</strong></td>
<td>0.518</td>
<td>0.504</td>
</tr>
<tr>
<td><strong>$N$</strong></td>
<td>36481</td>
<td>36481</td>
</tr>
</tbody>
</table>

Go back
### Panel C: Income

<table>
<thead>
<tr>
<th>FC × Post</th>
<th>Total</th>
<th>Oxford adjusted</th>
<th>Wage income</th>
<th>Social and other income</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC × Post</td>
<td>-0.00739</td>
<td>-0.0260</td>
<td>-0.0333</td>
<td>0.0213</td>
</tr>
<tr>
<td>(0.0176)</td>
<td>(0.0183)</td>
<td>(0.0292)</td>
<td>(0.0364)</td>
<td></td>
</tr>
<tr>
<td>Household &amp; year FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Household controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>$N$</td>
<td>59373</td>
<td>59373</td>
<td>53043</td>
<td>55387</td>
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</tbody>
</table>
Intensive and extensive margins
Foreign currency exposure is unhedged in Hungary

Fraction of respondents

Low income | Middle income | High income

0.0 | 0.2 | 0.3

FC debtor without FC savings
FC debtor with FC savings
Foreign currency exposure and FC savings in CEE countries

Fraction of respondents

- Low income
- Middle income
- High income

- FC debtor without FC savings
- FC debtor with FC savings
## Characteristics of households borrowing after 2004

<table>
<thead>
<tr>
<th>Category</th>
<th>FC mean/sd</th>
<th>LC mean/sd</th>
<th>FC-LC difference b/t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary school</td>
<td>0.15</td>
<td>0.14</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>0.36</td>
<td>0.35</td>
<td>0.14</td>
</tr>
<tr>
<td>Vocational school</td>
<td>0.41</td>
<td>0.36</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>0.49</td>
<td>0.48</td>
<td>0.55</td>
</tr>
<tr>
<td>High school</td>
<td>0.29</td>
<td>0.33</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>0.45</td>
<td>0.48</td>
<td>0.02</td>
</tr>
<tr>
<td>College</td>
<td>0.16</td>
<td>0.17</td>
<td>-0.05</td>
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<tr>
<td></td>
<td>0.36</td>
<td>0.38</td>
<td>-0.77</td>
</tr>
<tr>
<td>Household size</td>
<td>3.27</td>
<td>3.51</td>
<td>-0.25</td>
</tr>
<tr>
<td></td>
<td>1.32</td>
<td>1.30</td>
<td>-1.35</td>
</tr>
<tr>
<td>Age</td>
<td>43.75</td>
<td>45.81</td>
<td>-2.01</td>
</tr>
<tr>
<td></td>
<td>12.53</td>
<td>10.32</td>
<td>-1.42</td>
</tr>
<tr>
<td>Female</td>
<td>0.17</td>
<td>0.15</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>0.37</td>
<td>0.36</td>
<td>0.98</td>
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<tr>
<td>Income (1000 HUF)</td>
<td>1050.72</td>
<td>1138.88</td>
<td>-69.79</td>
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<td></td>
<td>462.04</td>
<td>560.38</td>
<td>-91.35</td>
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<td>Consumption to income</td>
<td>0.82</td>
<td>0.82</td>
<td>-0.02</td>
</tr>
<tr>
<td></td>
<td>0.30</td>
<td>0.26</td>
<td>-0.53</td>
</tr>
<tr>
<td>Food exp. to income</td>
<td>0.20</td>
<td>0.20</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>0.10</td>
<td>0.10</td>
<td>0.34</td>
</tr>
<tr>
<td>Payment to income</td>
<td>0.15</td>
<td>0.14</td>
<td>0.02</td>
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<tr>
<td></td>
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<td>1.52</td>
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<td>Have liquid assets</td>
<td>0.23</td>
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<tr>
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<td>0.42</td>
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<td>Capital</td>
<td>0.16</td>
<td>0.05</td>
<td>0.11**</td>
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<td>0.37</td>
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<td>3.67</td>
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<tr>
<td></td>
<td>0.43</td>
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<td>Town</td>
<td>0.30</td>
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<td>0.46</td>
<td>0.46</td>
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<td>Village</td>
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<td>0.38</td>
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</tr>
<tr>
<td></td>
<td>0.46</td>
<td>0.49</td>
<td>-0.24</td>
</tr>
</tbody>
</table>

Observations 961 52 1013
Selection into foreign currency debt

- Pellényi-Bilek (2009)
  - Hungarian households in 2008
  - no evidence that Hungarian FC borrowers are better educated, wealthier or more risk-loving than their peers

- Beer-Ongena-Peter (2010)
  - Austrian households
  - Risk seeking, affluent, and married households are more likely to have FC
  - Financially literate or high-income households are more likely to take a housing loan in general

- Verner-Gyöngyösi (2020) and Gyöngyösi-Verner (2022)
  - Tárki Monitor Survey, Euro Project survey
  - FC and LC households have similar characteristics
Foreign currency debt exposure and house prices

- Self reported house prices

![Graph showing estimated coefficients for foreign currency (FC) and no debt scenarios over years 2004 to 2012. The graph indicates a general increase in estimated coefficients for FC with some fluctuations over the years.]
### Panel A: PPML

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Per capita</th>
<th>OECD</th>
<th>Square Root</th>
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<tbody>
<tr>
<td>FC × Post</td>
<td>-0.0325*</td>
<td>-0.0374**</td>
<td>-0.0515**</td>
<td>-0.0415**</td>
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<td>(0.0174)</td>
<td>(0.0143)</td>
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<td>Household and Year FE</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Household controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Contemp. Household size</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>N</td>
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<td>59321</td>
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### Panel B: Marginal propensity to consume

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<th>Square Root</th>
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<td>-0.786*</td>
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<td>-0.872**</td>
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<td>(0.335)</td>
<td>(0.394)</td>
<td>(0.332)</td>
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<td>Yes</td>
</tr>
<tr>
<td>Household controls</td>
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<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Contemp. household size</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>59321</td>
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Go back
## Propensity score matching

<table>
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<tr>
<th></th>
<th>LC control</th>
<th>LC &amp; NoDebt control</th>
</tr>
</thead>
<tbody>
<tr>
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<td>(2)</td>
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<tr>
<td><strong>FC × Post</strong></td>
<td>-0.0499*</td>
<td>-0.0469*</td>
</tr>
<tr>
<td></td>
<td>(0.0231)</td>
<td>(0.0188)</td>
</tr>
<tr>
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<td>Yes</td>
</tr>
<tr>
<td>Household controls</td>
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</tr>
<tr>
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<td>7125</td>
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Go back
## Payment difficulties

<table>
<thead>
<tr>
<th></th>
<th>Mortgage (1)</th>
<th>Common cost (2)</th>
<th>Utilities (3)</th>
<th>Bank credit (4)</th>
<th>Private credit (5)</th>
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</thead>
<tbody>
<tr>
<td>FC × Post</td>
<td>0.0872**</td>
<td>0.0710*</td>
<td>0.0155</td>
<td>0.0527</td>
<td>0.159*</td>
</tr>
<tr>
<td></td>
<td>(0.0320)</td>
<td>(0.0355)</td>
<td>(0.0247)</td>
<td>(0.0571)</td>
<td>(0.0659)</td>
</tr>
<tr>
<td>Household and Year FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Household controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mean outcome in 2008</td>
<td>0.107</td>
<td>0.0891</td>
<td>0.160</td>
<td>0.0937</td>
<td>0.193</td>
</tr>
<tr>
<td>R²</td>
<td>0.663</td>
<td>0.687</td>
<td>0.698</td>
<td>0.650</td>
<td>0.702</td>
</tr>
<tr>
<td>N</td>
<td>7579</td>
<td>18833</td>
<td>56904</td>
<td>7901</td>
<td>7145</td>
</tr>
</tbody>
</table>

*Notes: +, * and ** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.*
How does household FC debt revaluation transmit to local economy?

- 2/3 of borrowers have FC debt (1/5 of households)
- Debt revaluation $\approx 6 - 10\%$ of GDP

Data:

- Loan level data from HH Credit Registry $\rightarrow$ Construct local exposure to HH debt revaluation (city/town/village)
- Local outcomes: default rate, durables spending, unemployment rate
Local Economic Impact of Debt Revaluation

Local exposure to HH FC debt (FC debt share)
Local Economic Impact of Debt Revaluation

Local exposure to HH FC debt

\[ Y_{zt} = \alpha_z + \gamma_t + \sum_{j \neq 2008} \beta_j \times \text{Local FC Debt Exposure}_{z08} \times 1_{t=j} + \epsilon_{zt} \]
Local Economic Impact of Debt Revaluation

Local exposure to HH FC debt

\[ Y_{zt} = \alpha_z + \gamma_t + \sum_{j\neq 2008} \beta_j \times \text{Local FC Debt Exposure}_{z08} \times 1_{t=j} + \epsilon_{zt} \]
Local Economic Impact of Debt Revaluation

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(a) Defaults

(b) Durable spending
Local Economic Impact of Debt Revaluation

Local exposure to HH FC debt

\[ Y_{zt} = \alpha_z + \gamma_t + \sum_{j \neq 2008} \beta_j \times \text{Local FC Debt Exposure}_{z08} \times 1_{t=j} + \epsilon_{zt} \]

(a) Defaults

(b) Durable spending

(c) Unemployment rate
Local Economic Impact of Debt Revaluation

Local exposure to HH FC debt

![Graph showing coefficient estimates and Hedonic/Hedonic HPI trends over time](image-url)
Magnitude: Output Multiplier of Debt Service Shock

Integral multiplier: \[ M_h = \frac{\sum_{j=2009}^{h} \text{OutputLoss}_j}{\sum_{j=2008}^{h} \text{DebtServiceShock}_j} \]
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Integral multiplier: 
\[ M_h = \frac{\sum_{j=2009}^{h} \text{OutputLoss}_j}{\sum_{j=2008}^{h} \text{DebtServiceShock}_j} \]

With MPC=1, comparable to estimates of cross-sectional fiscal multipliers (Chodorow-Reich 2019)

Implies $29k (PPP) increase in annual debt service destroys one job year
Exchange rate expectations

Hungarian Banking Association (2006):

▶ „Since the vast majority of foreign currency loans have a longer term, a possible larger exchange rate fluctuation of a few days does not significantly change the repayment burden. Therefore, households borrowing in foreign currency should not fear that they might suffer serious losses due to the exchange rate risk”

▶ „In the longer term, it is clear that the exchange rate of the forint - at least in real terms - will continue to appreciate”

▶ „Not only a permanent real depreciation of the forint can be excluded from the possible future scenarios, but also a significant and permanent nominal depreciation”
Theory

- How does FC debt transmit exchange rate shock into consumption?
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**Complete markets:** Backus-Smith condition implies consumption increases with real exchange rate depreciation (Backus and Smith 1992)
  - No differential response by FC debtors
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**Complete markets:** Backus-Smith condition implies consumption *increases* with real exchange rate depreciation (Backus and Smith 1992)

- No differential response by FC debtors

**Incomplete markets:**

- Natural hedge: HH net worth and consumption of FC debtors not differentially unaffected by exchange rate shock
- Currency mismatch: HH net worth affected by exchange rate shock
Theory

- How does FC debt transmit exchange rate shock into consumption?

- **Complete markets:** Backus-Smith condition implies consumption increases with real exchange rate depreciation (Backus and Smith 1992)
  - No differential response by FC debtors

- **Incomplete markets:**
  - Natural hedge: HH net worth and consumption of FC debtors not differentially unaffected by exchange rate shock
  - Currency mismatch: HH net worth affected by exchange rate shock

- What is consumption response to FC debt shock under currency mismatch?