The Foreign Currency Fisher Channel: Evidence from Households

Online Appendix

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- Appendix A presents additional figures and tables.

- Appendix B provides details on the data.

- Appendix C provides a detailed discussion of the robustness exercises, including ensuring robustness to measurement error.

- Appendix D presents results from a quantitative model.

- Appendix E provides additional cases of widespread foreign currency lending to households.

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A   Appendix Figures and Tables

Figure A.1: Adjustable and Fixed Rate Originations in Swiss Franc

Notes: This figure shows the volume of new Swiss franc-denominated loan originations by adjustable and fixed-rate loans. Solid lines represent new originations of adjustable-rate mortgages and home equity loans, while dashed lines represent fixed-rate mortgages and home equity loans. Loan amounts are expressed in billion HUF. The data are from MNB.

Figure A.2: Distribution of Loan-to-Value Ratio for New Mortgage Loan Originations
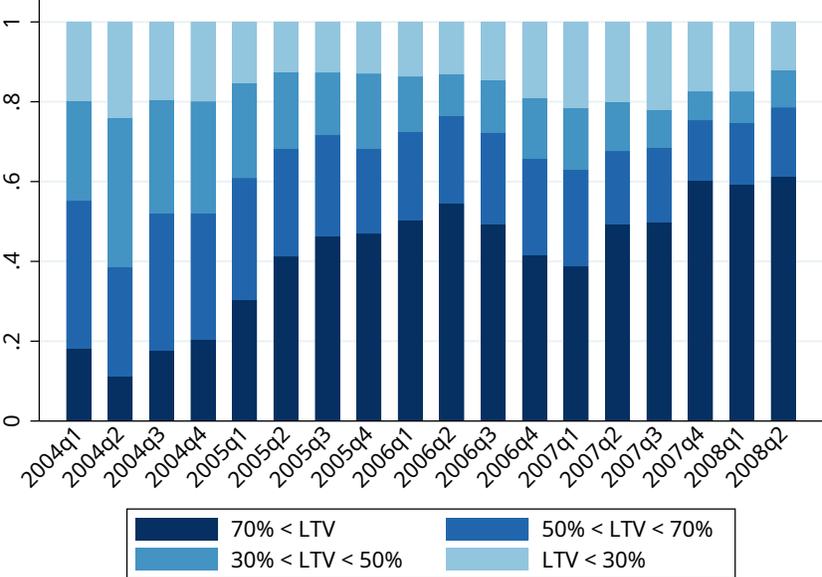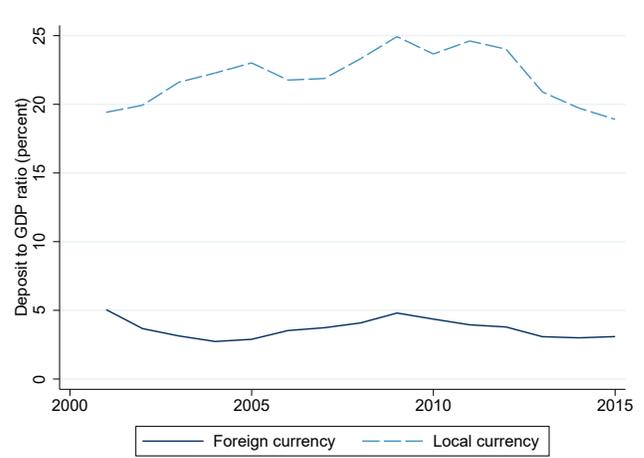

Notes: This figure shows the loan-to-value distribution of new mortgage loans over time. The data are from MNB (2008).

Figure A.3: Exchange Rate Expectations, Deposits by Currency, Default Rates, and Net Exports
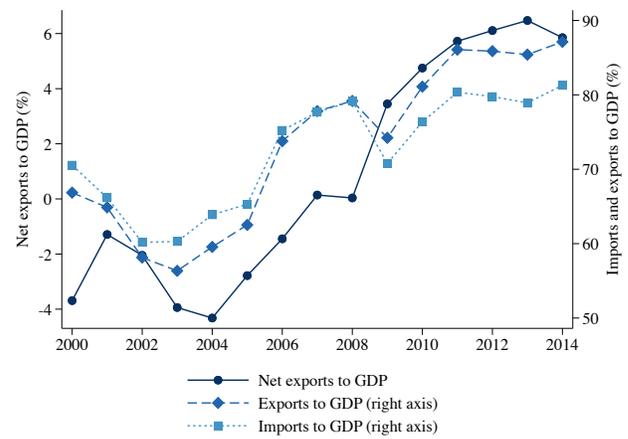

(a) Exchange rate expectations
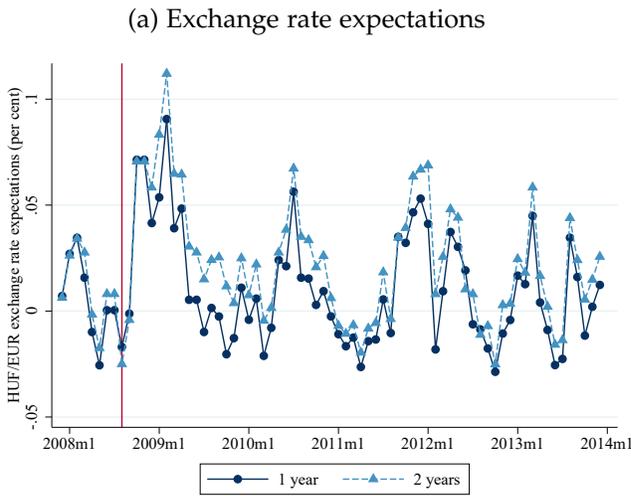
(b) Domestic currency and foreign currency household deposits as a share of GDP

(c) Default rates on housing loans

(d) Net export, exports, and imports to GDP

Notes: Panel (a) plots the HUF/EUR exchange rate expectations at the 1- and 2-year horizon from Consensus Economics forecasts. An increase in the series represents an expected depreciation of the HUF relative to the EUR. The vertical line represents September 2008. Panel (b) plots foreign currency and local currency denominated household deposits as a share of GDP. We use end of year (December) information for the deposits from regulatory bank balance sheet data. Panel (c) shows the aggregate default rate on housing loans by currency denomination and loan type. The vertical line represents September 2008. Panel (d) shows net exports, exports, and imports, all as a percentage of GDP. Exports and imports are plotted on the right axis.

Figure A.4: Foreign Currency Debtors With and Without Foreign Currency Savings
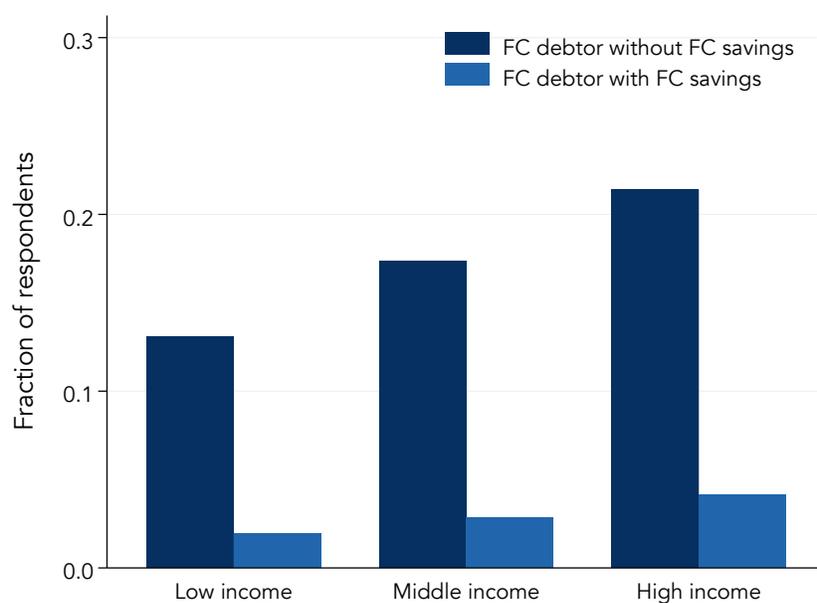
Notes: This figure plots the fraction of households with FC debt across the income distribution, differentiating between households that report holding FC savings and households without FC savings. The figure uses the sample of Hungarian households in the Euro Survey Project in survey waves 2007 through 2011. The figure shows that most FC debtors do not have FC savings. Moreover, the rising exposure to depreciation risk across the income distribution is robust to accounting for FC savings.

Figure A.5: Mortgage and Home Equity Interest Rates and CHF-LIBOR
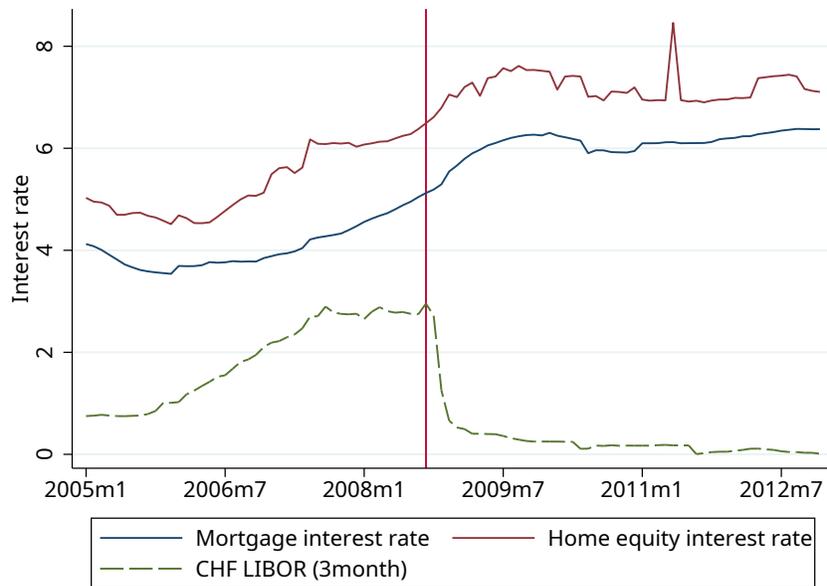
Notes: This figure shows the average interest rates on Swiss franc-denominated mortgages and home equity loans in Hungary, weighted by the outstanding loan stock at the end of each month. The dashed line represents the 3-month CHF-LIBOR rate. The vertical line represents September 2008. Source: MNB.

Figure A.6: Distribution of Household Characteristics in 2008 by Borrower Status

(a) Household size

(b) Age of household head

(c) Consumption to income

(d) Food expenditure to income

(e) Log income per capita

(f) Education
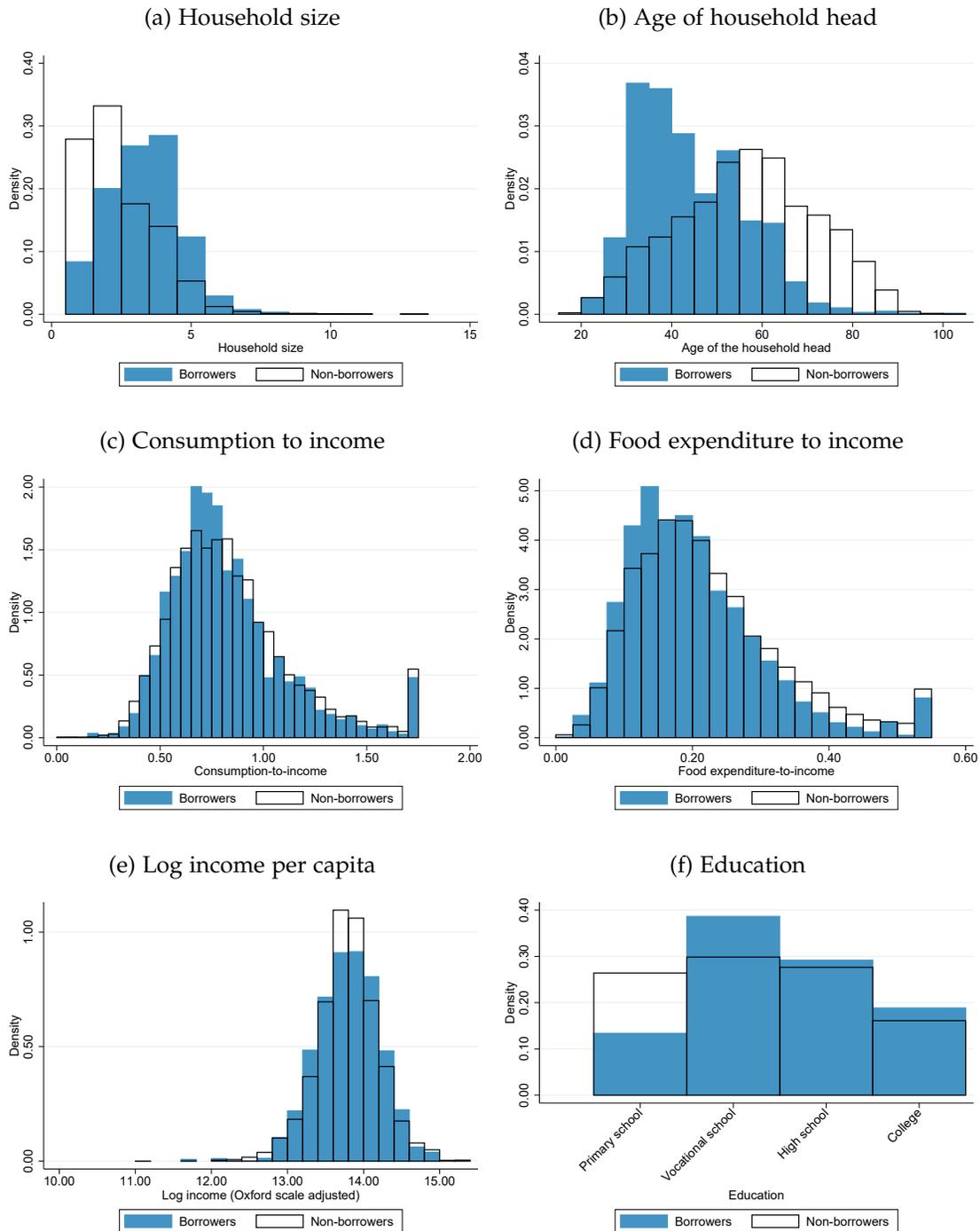
Notes: This figure shows the distribution of household characteristics for borrowers and non-borrowers in 2008. Data are from the HKÉF household survey.

Figure A.7: Inflation Exposure across Foreign and Local Currency Debtors
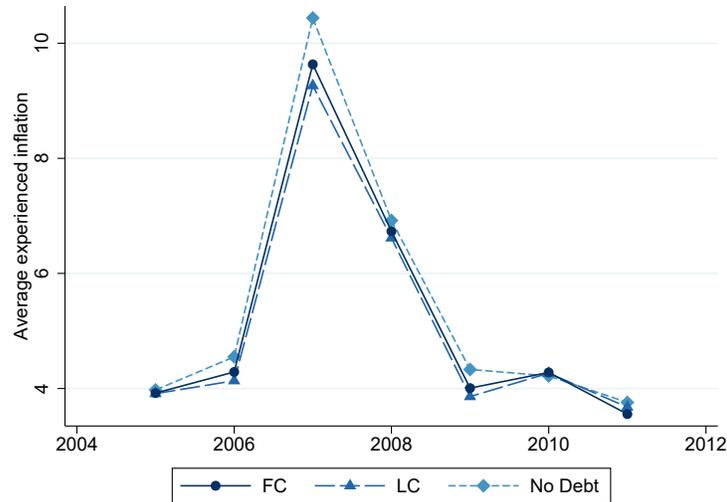
Notes: This figure plots the experienced inflation by FC debt status. We use the two-digit COICOP level inflation, weighted by the 2008 consumption basket of households.

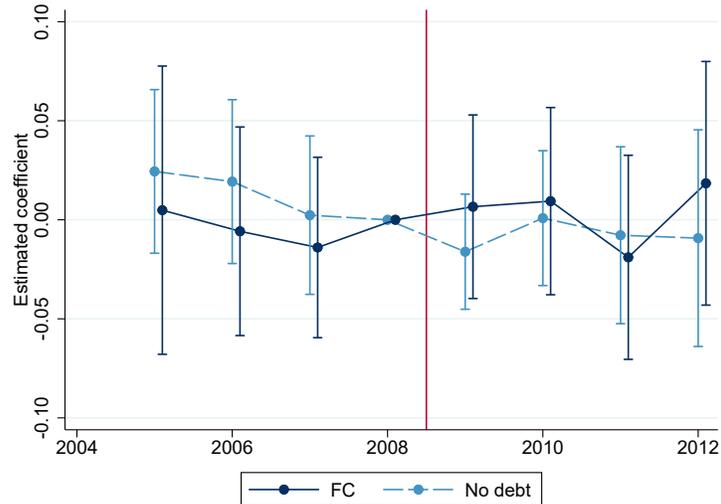Figure A.8: Foreign Currency Debt Exposure and House Prices

Notes: This figure plots the coefficients of interest from estimating equation (2) with the log of self-reported house price as the dependent variables. Controls in both specifications include age of the household head, gender of the household head, educational attainment of the household head, household size, and region (58 units) fixed effect. All control variables are interacted with year fixed effects. Standard errors are clustered at the household level. Error bars represent 95% confidence intervals.

Figure A.9: Effect on MPC from Simulating Measurement Error in Loan Characteristics

(a) Measurement error in borrowed amount

(b) Measurement error in borrowed amount, with income as control

(c) Measurement error in maturity

(d) Measurement error in maturity, with income as control

(e) Simulating the payment scheme (annuity vs equal amortization)
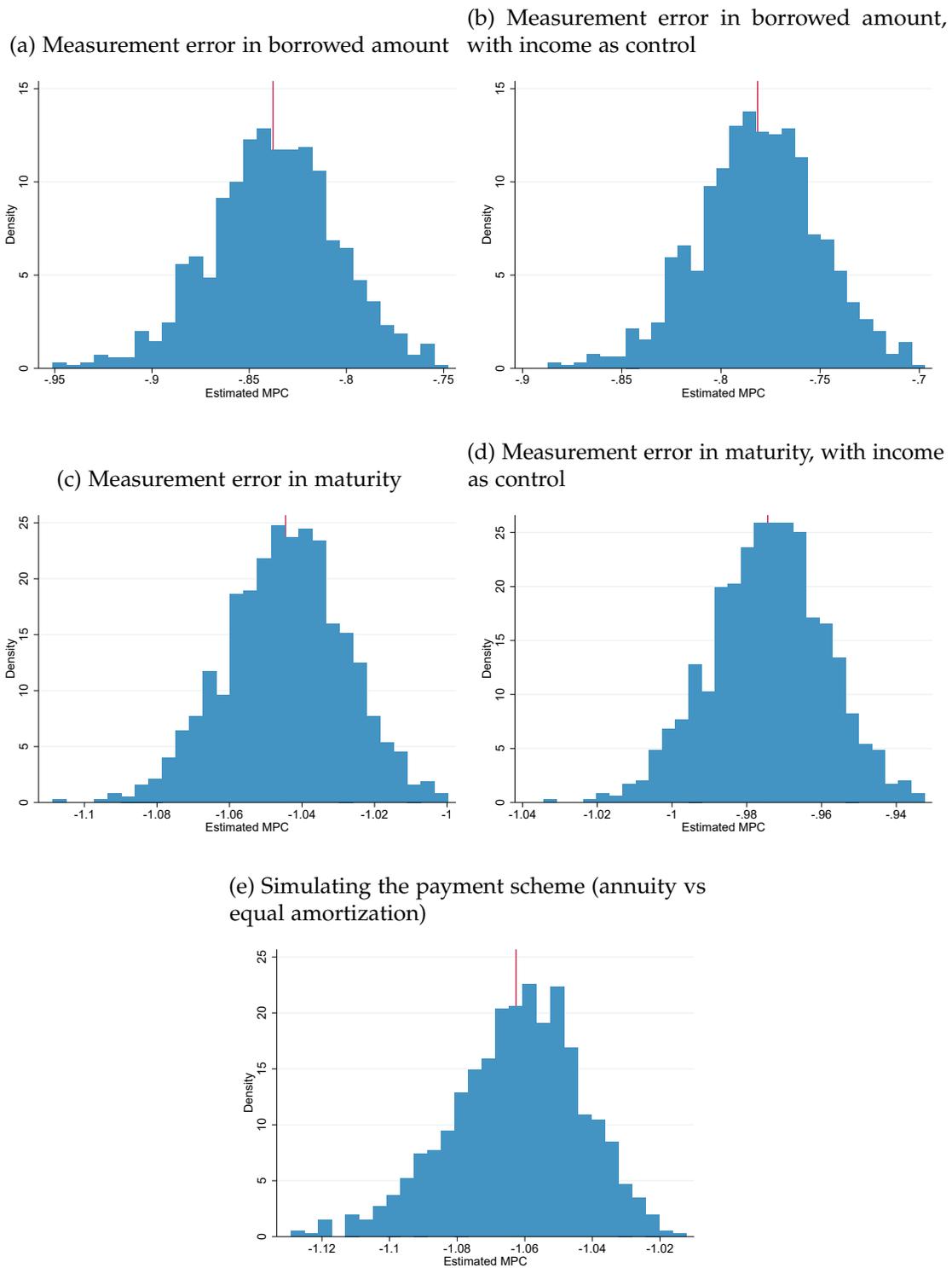
Notes: Panels (a)-(d) show the distribution of marginal propensity to consume estimates when measurement error added to the borrowed amount and maturity. Panel (e) shows the distribution of MPC estimates when assuming that 90% of loans are annuity loans and 10% of loans are equal amortization payment loans.

Figure A.10: Intensive and Extensive Margins of Adjustment

(a) Intensive vs. extensive margin

(b) Extensive margin: Entry vs exit

(c) Intensive margin: Price vs quantity
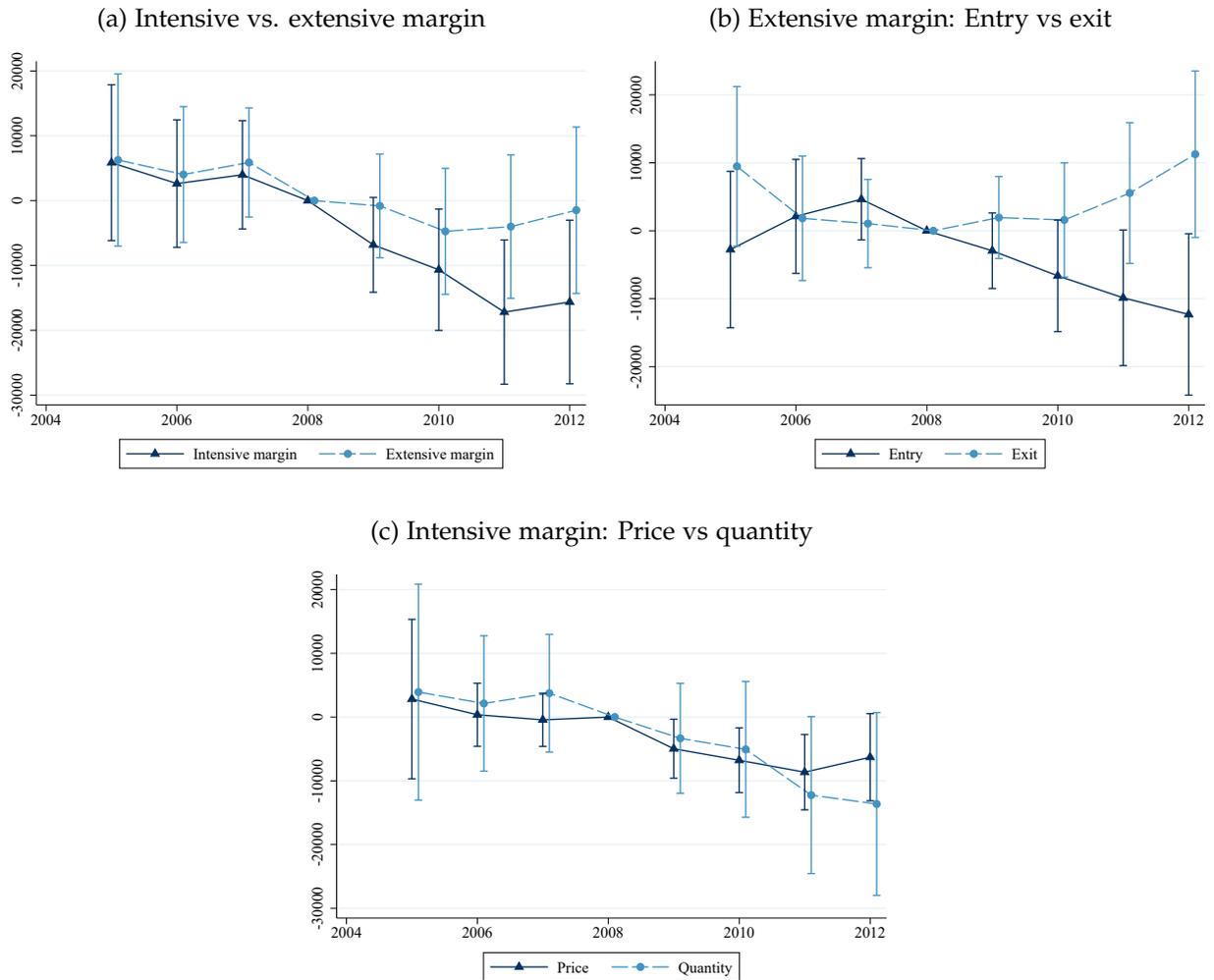
Notes: This figure plots the coefficients of interest from equation (8) using the different margins of adjustment as outcomes. Controls include age of the household head, gender of the household head, educational attainment of the household head, household size, and region (58 units) fixed effect. All control variables are interacted with year dummies. Standard errors are clustered at the household level. Error bars represent 95% confidence intervals.

Figure A.11: Dynamic Impact of Foreign Currency Debt on Household Size

(a) Household size

(b) Number of adults

(c) Number of children below age 14
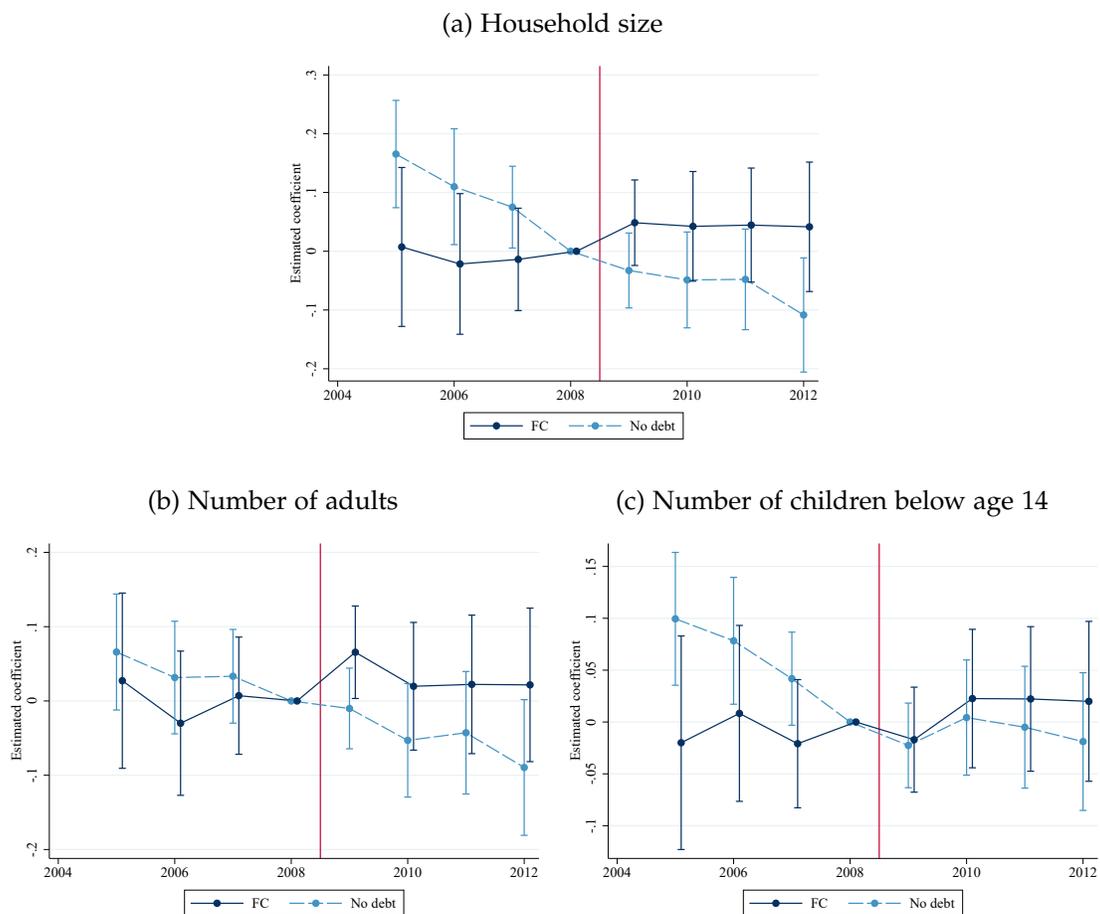
Notes: This figure plots the coefficients of interest from estimating the effect of foreign currency debt on various measures of equivalence scales and household size. The coefficients are estimated using equation (2). To avoid compositional changes driven by aging, we define an adult to be a person who was born in 1990 or earlier, while children are defined as a person born after 1990. Error bars represent 95% confidence intervals.

Table A.1: Descriptive Statistics by Household Loan Currency Denomination in 2008 for Households Borrowing after 2003

	FC mean/sd	LC mean/sd	FC-LC difference b/t
Primary school	0.15	0.14	0.01
	0.36	0.35	0.14
Vocational school	0.41	0.36	0.04
	0.49	0.48	0.55
High school	0.29	0.33	0.00
	0.45	0.48	0.02
College	0.16	0.17	-0.05
	0.36	0.38	-0.77
Household size	3.27	3.51	-0.25
	1.32	1.30	-1.35
Age	43.75	45.81	-2.01
	12.53	10.32	-1.42
Female	0.17	0.15	0.05
	0.37	0.36	0.98
Income (1000 HUF)	1050.72	1138.88	-69.79
	462.04	560.38	-0.91
Consumption to income	0.82	0.82	-0.02
	0.30	0.26	-0.53
Food exp. to income	0.20	0.20	0.00
	0.10	0.10	0.34
Payment to income	0.15	0.14	0.02
	0.08	0.08	1.52
Have liquid assets	0.23	0.32	-0.10
	0.42	0.47	-1.48
Capital	0.16	0.05	0.11**
	0.37	0.22	3.67
County capital	0.24	0.27	-0.09
	0.43	0.45	-1.34
Town	0.30	0.30	-0.00
	0.46	0.46	-0.04
Village	0.30	0.38	-0.02
	0.46	0.49	-0.24
Observations	961	52	1013

Notes: The table presents descriptive statistics as of 2008 by loan currency denomination for households borrowing after 2003 in the HKÉF household survey. The first three columns show the average characteristics of foreign currency borrower households and local currency borrowers. The third column reports the difference between the average characteristics of foreign and local currency borrowers. The first seven rows report the characteristics of the household head, and the remaining rows show household-level characteristics. Consumption and income are scaled by the Oxford equivalence scale.

Table A.2: Descriptive Statistics by Household Loan Currency Denomination in September 2008 using Household Credit Registry Data

	FC mean/sd	LC mean/sd	FC-LC difference b/t	Normalized difference
Borrowed amount (1,000,000 HUF)	5.85	5.22	0.63**	0.018
	33.65	6.35	12.86	
Mortgage	0.44	0.93	-0.50**	-0.89
	0.50	0.25	-609.93	
Home equity	0.56	0.07	0.50**	0.89
	0.50	0.25	609.93	
Maturity	17.89	17.54	0.35**	0.038
	6.82	6.26	24.85	
Currency: CHF	0.94	0.00	0.94**	3.84
	0.24	0.00	2718.07	
Currency: EUR	0.04	0.00	0.04**	0.19
	0.18	0.00	134.91	
Currency: JPY	0.03	0.00	0.03**	0.17
	0.17	0.00	121.49	
Outstanding debt (1,000,000 HUF)	5.30	4.60	0.70**	0.022
	30.51	6.16	15.69	
Monthly payment (1,000 HUF)	47.82	46.64	1.18**	0.004
	240.56	108.44	3.07	
Borrower's year of birth	1967.90	1967.24	0.66**	0.046
	10.33	9.92	29.72	
Population (settlement)	267202.25	300155.06	-32952.81**	-0.039
	580985.52	608435.80	-21.61	
Income per capita (settlement)	1457.59	1485.73	-28.14**	-0.073
	267.77	273.50	-40.68	
Observations	501684	366087	867771	

Notes: This table reports descriptive statistics on household loans from the credit registry as of September 2008, disaggregated by currency denomination. Columns (1) and (2) display the average characteristics of foreign currency and local currency loans, respectively. Column (3) shows the difference between these two groups. The last column reports the normalized difference between foreign currency and local currency borrowers. The normalized difference is defined as $\frac{\bar{X}_1 - \bar{X}_0}{\sqrt{V_1 + V_0}}$, where $\bar{X}_\omega$ (V_ω) is the sample average (variance) for the treatment and control groups, as defined in Imbens and Wooldridge (2009). For further details on the household credit registry data, see Verner and Gyöngyösi (2020).

Table A.3: Descriptive Statistics by Loan Currency Denomination in September 2008 using Bank Customer Data

	FC	LC	FC-LC difference	Normalized difference
Primary education	0.05	0.08	-0.02	-0.070
	(0.22)	(0.26)	(-1.55)	
Secondary education	0.58	0.52	0.07*	0.093
	(0.49)	(0.50)	(2.20)	
Tertiary education	0.36	0.41	-0.04	-0.060
	(0.48)	(0.49)	(-1.41)	
Household size	1.67	2.16	-0.49**	-0.355
	(0.94)	(1.02)	(-8.09)	
Age	40.00	37.49	2.50**	0.197
	(9.82)	(8.00)	(5.17)	
Male	0.46	0.37	0.09**	0.132
	(0.50)	(0.48)	(3.16)	
Current account inflow (1000 HUF)	93.44	73.28	20.17**	0.142
	(103.91)	(96.43)	(3.48)	
Borrowed amount (1,000,000 HUF)	6.38	5.71	0.67*	0.097
	(5.14)	(4.64)	(2.41)	
Maturity	18.34	18.26	0.08	0.007
	(8.40)	(6.63)	(0.18)	
Observations	6026	293	6319	6319

Notes: The table presents descriptive statistics by loan currency denomination for individuals using bank customer data in September 2008. The first two columns show the average characteristics of foreign currency borrower individuals and local currency borrower individuals. The third column reports the difference between the average characteristics of foreign and local currency borrowers. The fourth column reports the normalized difference between foreign currency and local currency borrowers. The normalized difference is defined as $\frac{\bar{X}_1 - \bar{X}_0}{\sqrt{V_1 + V_0}}$, where $\bar{X}_\omega$ (V_ω) is the sample average (variance) for the treatment and control groups, as defined in Imbens and Wooldridge (2009).

Table A.4: Marginal Propensity to Spend Out of the Foreign Currency Debt Service Shock using Monthly Bank Customer Data Focusing on Primary Accounts

	Reduced form (in HUF)			IV (MPS)		
	(1)	(2)	(3)	(4)	(5)	(6)
FC $\times$ Post	-13868.6**	-12549.2**	-9801.0**			
	(4482.5)	(4764.3)	(2703.7)			
Housing loan payment surprise				-1.160**	-1.204**	-0.940**
				(0.374)	(0.456)	(0.256)
Household & month FE	Yes	Yes	Yes	Yes	Yes	Yes
Household controls		Yes	Yes		Yes	Yes
Money received			Yes			Yes
First stage F-statistic				1633.4	308.9	309.2
N	151729	146025	146025	151729	146025	146025

Notes: This table presents estimates of the marginal propensity to spend out of an increase in monthly debt service induced by the foreign currency debt revaluation using bank customer data. The analysis restricts the sample to those individuals who received at least the minimum wage in their current account in two thirds of the pre-crisis sample period. Columns 1-3 present the reduced form estimates of the effect of FC exposure on the level (in forints) of individual spending. Columns 4-6 present the instrumental variable estimates of the MPS based on equation (4). Monthly debt payment surprise is instrumented by FC exposure interacted with $Post_t$. We use the same main control variables as in Table 2, gender, household size, age, and educational categories. All control variables are interacted with the $Post_t$ indicator. Standard errors are clustered at individual level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.5: Heterogeneity in the MPC Estimates: Proxies of Liquidity

	Income in 2008		Liquid savings in 2008		Access to informal credit		Debt-to-income in 2008	
	(1) Low	(2) High	(3) Low	(4) High	(5) No	(6) Yes	(7) Low	(8) High
Payment surprise	-1.275*	-0.776+	-1.126**	-0.668	-1.170**	-0.467	-0.774	-1.052**
	(0.606)	(0.442)	(0.400)	(0.723)	(0.426)	(0.617)	(0.704)	(0.404)
Household & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12594	12358	16127	8825	21902	9307	2268	1886

Notes: This table presents estimates of the marginal propensity to consume for various subsamples split by household characteristics. Columns 1 and 2 estimate equation (4) separately for households with above and below median income in 2008. Columns 3 and 4 split the sample into households that report having low and high liquid savings. Low liquidity households are those who report in the survey that they cannot pay for an "unexpected and large" expense shock. Columns 5 and 6 split by access to informal credit in the pre-crisis years. Households with access to informal credit are those that provided or received financial support for daily living expenses from relatives, friends, or NGOs. Column 7-8 split by debt-to-income in September 2008. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.6: Heterogeneity in the MPC Estimates: Other Household Characteristics

	Education		Age	
	(1) Low	(2) High	(3) Young	(4) Old
Payment surprise	-1.217*	-0.941+	-1.056**	-1.013
	(0.508)	(0.486)	(0.356)	(1.094)
Household & Year FE	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
N	13679	11273	13357	11595

Notes: This table presents estimates of the marginal propensity to consume by household characteristics. Columns 1-2 and 3-4 split by above and below median education and age. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.7: Heterogeneity in the MPS Estimates using Bank Customer Data

	Current account inflow , 2008m9		Balance of current account, 2008m9		Education		Age	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Low	High	Low	High	Low	High	Young	Old
Payment surprise	-1.421**	-1.078*	-1.698**	-0.962**	-1.036*	-1.596**	-0.852*	-2.403**
	(0.405)	(0.454)	(0.626)	(0.348)	(0.464)	(0.430)	(0.372)	(0.484)
Household & month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	145170	142826	143876	144120	189614	98382	153027	134969

Notes: This table presents estimates of the marginal propensity to spend by individual characteristics using bank customer data. Columns 1 and 2 estimate equation (4) separately for individuals with above and below median current account inflow in 2008m9. Columns 3 and 4 split the sample into individuals with low and high current account balance in 2008m9. Columns 5-6 and 7-8 split by above and below median education and age. Standard errors are clustered at individual level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.8: Foreign Currency Debt Exposure and Consumption Categories

	COICOP categories											
	(1) Food & non-alc	(2) Alcohol Tobacco	(3) Clothing Footwear	(4) Housing utilities	(5) Furnishing HH equipment	(6) Health	(7) Transport	(8) Communication	(9) Recreation Culture	(10) Education	(11) Restaurants Hotels	(12) Misc
$FC \times Post$	-0.0183	-0.0625	-0.0500	-0.0137	-0.114	-0.0765	-0.0559	-0.131**	-0.0739	-0.0832	-0.0240	-0.0840*
	(0.0248)	(0.0591)	(0.0472)	(0.0529)	(0.0701)	(0.0692)	(0.0512)	(0.0321)	(0.0474)	(0.142)	(0.0832)	(0.0411)
Household and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	59321	51821	58671	59249	59179	57214	48544	58188	58661	23216	37371	59253

Notes: This table reports results from estimating equation (1) by Poisson pseudo-maximum likelihood (PPML) for various categories of consumption. Standard errors are clustered at household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.9: Effect of Foreign Currency Debt Shock on Nondurable Consumption: Instrumenting FC Debt Status with Origination Before or After Policy Change

	ln(Non-durable consumption)		
	(1)	(2)	(3)
FC × Post	-0.0415**	-0.0415**	-0.0372**
	(0.0131)	(0.0138)	(0.0133)
Household & year FE	Yes	Yes	Yes
Household controls		Yes	Yes
Contemporaneous inc.			Yes
First stage F-statistic	1523.3	1623.4	1623.2
N	11993	11989	11986

Notes: This table reports results from 2SLS regressions estimating the effect of FC debt status on nondurable consumption. The instrument is an indicator variable equal to one for loans originated after 2003 (after the removal of LC subsidies). See Table 2 for a definition of the control variables. All control variables are interacted with the $Post_t$ indicator. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.10: Marginal Propensity to Consume: Instrumenting Payment Surprise with Origination Before or After Policy Change

	ln(Non-durable consumption)		
	(1)	(2)	(3)
Payment surprise	-1.169**	-1.093**	-0.948**
	(0.350)	(0.359)	(0.348)
Household & year FE	Yes	Yes	Yes
Household controls		Yes	Yes
Contemporaneous inc.			Yes
First stage F-statistic	758.5	707.2	706.5
N	11993	11989	11989

Notes: This table reports results from 2SLS regressions estimating the effect of loan payment surprise on nondurable consumption. The instrument for the loan payment surprise is an indicator variable equal to one for loans originated after 2003 (the removal of LC subsidies). See Table 2 for a definition of the control variables. All control variables are interacted with the $Post_t$ indicator. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.11: Effect of Foreign Currency Debt Shock on Nondurable Consumption: Subsamples by Year of Origination around 2003 Policy Change

	Year of origination 2002-2005		Year of origination 2001-2006		Year of origination 2000-2007	
	(1)	(2)	(3)	(4)	(5)	(6)
FC $\times$ Post	-0.0405	-0.0355	-0.0457*	-0.0410*	-0.0433**	-0.0370*
	(0.0250)	(0.0237)	(0.0192)	(0.0184)	(0.0168)	(0.0163)
Household & year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes	Yes
Contemporaneous inc.		Yes		Yes		Yes
N	4569	4569	6424	6423	8377	8376

Notes: This table reports results from estimating equation (1) by Poisson pseudo-maximum likelihood (PPML) for subsamples by year of origination of the loan. Columns 1-2 restrict the sample to loans issued between 2002 and 2005. Columns 3-4 extend the window to include loans from 2001 to 2006, while columns 5-6 further broaden the window to cover the 2000-2007 period. The dependent variable is log nondurable consumption, adjusted for family composition by the Oxford equivalence scale. *FC* is an indicator variable for households with FC debt. *Post* is an indicator variable that equals one after 2008. See Table 2 for a definition of the control variables. All control variables, except for contemporaneous income, are interacted with the *Post* indicator. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.12: Marginal Propensity to Consume: Subsamples by Year of Origination around 2003 Policy Change

	Year of origination 2002-2005		Year of origination 2001-2006		Year of origination 2000-2007	
	(1)	(2)	(3)	(4)	(5)	(6)
Payment surprise	-0.998*	-0.925^{+}	-1.025*	-0.958*	-1.032**	-0.944**
	(0.504)	(0.484)	(0.407)	(0.389)	(0.343)	(0.328)
Household & year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes	Yes
Contemporaneous inc.		Yes		Yes		Yes
First stage F-statistic	330.2	328.5	586.4	584.4	763.0	761.2
N	4569	4569	6424	6424	8381	8381

Notes: This table presents estimates of the marginal propensity to consume out of an increase in annual debt service induced by the foreign currency debt revaluation for subsamples by year of origination of loans. Columns 1-2 restrict the sample to loans issued between 2002 and 2005. Columns 3-4 extend the window to include loans from 2001 to 2006, while columns 5-6 further broaden the window to cover the 2000-2007 period. The instrumental variable estimates of the MPC based on equation (4). Annual debt payment surprise is instrumented by FC exposure interacted with $Post_t$. See Table 2 for a definition of the control variables. All control variables are interacted with the $Post_t$ indicator. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.13: Balancedness for Propensity Score Matched Sample, LC Debtors as Controls

	Treatment	Control	Treatment-Control Diff.	t-statistic	Normalized Diff.
Primary school	0.12	0.11	0.01	0.30	0.02
Vocational school	0.46	0.46	-0.00	-0.02	-0.00
High school	0.30	0.32	-0.02	-0.46	-0.03
College	0.13	0.11	0.01	0.54	0.03
Household size	3.24	3.22	0.02	0.13	0.01
Age	43.35	43.04	0.31	0.28	0.02
Female	0.15	0.13	0.02	0.84	0.05
Income (1000 HUF)	1023.58	1035.19	-11.61	-0.30	-0.02
Consumption to income	0.83	0.82	0.01	0.33	0.03
Food exp. to income	0.20	0.21	-0.00	-0.26	-0.02
Payment to income	0.15	0.15	-0.00	-0.05	-0.00
Have liquid assets	0.08	0.10	-0.01	-0.37	-0.03
Capital	0.15	0.11	0.04	1.22	0.09
County capital	0.23	0.32	-0.09+	-1.86	-0.14
Town	0.30	0.33	-0.03	-0.77	-0.05
Village	0.32	0.24	0.08*	2.07	0.13

Notes: This table presents the average characteristics of treatment (FC debtor) and control (LC debtors) households for the propensity score matched sample. The Normalized Difference is defined as $\frac{\bar{X}_1 - \bar{X}_0}{\sqrt{V_1 + V_0}}$, where $\bar{X}_\omega$ (V_ω) is the sample average (variance) for the treatment and control groups, as defined in Imbens and Wooldridge (2009).

Table A.14: Balancedness for Propensity Score Matched Sample: LC Debtors and Non-debtors as Controls

	Treatment	Control	Treatment-Control Diff.	t-statistic	Normalized Diff.
Primary school	0.14	0.12	0.02	1.13	0.04
Vocational school	0.42	0.40	0.02	0.68	0.03
High school	0.29	0.33	-0.04	-1.42	-0.06
College	0.15	0.15	-0.00	-0.01	-0.00
Household size	3.22	3.18	0.04	0.48	0.02
Age	44.01	45.19	-1.18	-1.62	-0.07
Female	0.17	0.17	0.00	0.17	0.01
Income (1000 HUF)	1053.90	1017.08	36.81	1.32	0.06
Consumption to income	0.83	0.85	-0.02	-0.97	-0.04
Food exp. to income	0.20	0.22	-0.02**	-3.03	-0.13
Have liquid assets	0.08	0.12	-0.05*	-2.54	-0.11
Capital	0.16	0.19	-0.03	-1.10	-0.05
County capital	0.23	0.25	-0.02	-0.89	-0.04
Town	0.30	0.27	0.03	1.32	0.05
Village	0.31	0.29	0.02	0.60	0.03

Notes: This table presents the average characteristics of treatment (FC debtor) and control (LC debtors and non-debtors) households for the propensity score matched sample. The Normalized Difference is defined as $\frac{\bar{X}_1 - \bar{X}_0}{\sqrt{V_1 + V_0}}$, where $\bar{X}_\omega$ (V_ω) is the sample average (variance) for the treatment and control groups, as defined in Imbens and Wooldridge (2009).

Table A.15: Effect of Foreign Currency Debt on Consumption: Robustness on a Propensity Score Matched Sample

	LC control		LC & NoDebt control	
	(1)	(2)	(3)	(4)
FC × Post	-0.0499*	-0.0469*	-0.0513**	-0.0460**
	(0.0231)	(0.0188)	(0.0170)	(0.0167)
Household & Year FE	Yes	Yes	Yes	Yes
Household controls		Yes		Yes
N	7125	7125	11856	11856

Notes: This table presents estimates of equation (1) on a propensity score matched sample. The dependent variable is log nondurable consumption. Households are matched within waves. The baseline household control variables for calculating the propensity score are: age of the household head, gender of the household head, educational attainment of the household head, household size, and the location of the household. The caliper is set to 0.001. Columns 1 and 2 present results using only LC debtors as controls. Columns 3 and 4 present results using both LC debtors and non-debtors as controls. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.16: Effect of Foreign Currency Debt Shock on Nondurable Consumption: Excluding Non-borrowers

	ln(Non-durable consumption)			
	(1)	(2)	(3)	(4)
FC × Post	-0.0456**	-0.0410*	-0.0349*	-0.0395*
	(0.0158)	(0.0160)	(0.0156)	(0.0158)
Household & year FE	Yes	Yes	Yes	Yes
Household controls		Yes	Yes	Yes
Contemporaneous inc.			Yes	Yes
Dep. var. 2008				Yes
N	11265	11261	11258	5016

Notes: This table reports versions of Table 2 excluding non-borrowers. See Table 2 for details on the variable definitions and control variables. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.17: Marginal Propensity to Consume Out of the Foreign Currency Debt Service Shock: Excluding Non-borrowers

	Non-durable consumption					
	Reduced form			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
FC × Post	-33598.6**	-32959.0*	-29143.4*			
	(12730.7)	(13069.8)	(12728.3)			
Loan Payment surprise				-0.956**	-0.917*	-0.821*
				(0.363)	(0.365)	(0.357)
Household & year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household controls		Yes	Yes		Yes	Yes
Contemporaneous inc.			Yes			Yes
First stage F-statistic				785.1	744.7	743.3
R^2	0.874	0.876	0.884			
N	11265	11261	11261	11265	11261	11261

Notes: This table reports versions of Table 3 excluding non-borrowers. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.18: Foreign Currency Debt Exposure and Spending on Different Categories of Consumption: Excluding Non-borrowers

	Panel A: By durability			
	Strict non-durables	Semi durables	Services	Durables
	(1)	(2)	(3)	(4)
	PPML	PPML	PPML	PPML
FC $\times$ Post	-0.0126	-0.0366	-0.0905**	-0.180[+]
	(0.0178)	(0.0415)	(0.0238)	(0.0925)
Household and year FE	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
N	11261	11253	11261	10513

	Panel B: Broad spending response			
	Total consumption		Housing investment	Total spending
	(1)	(2)	(3)	(4)
	PPML	IV	PPML	IV
FC $\times$ Post	-0.0477**		-0.367[+]	
	(0.0169)		(0.218)	
Loan payment surprise		-1.154**		-1.263**
		(0.411)		(0.424)
Household and year FE	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
First stage F-statistics		744.7		744.7
N	11261	11261	8361	11261

Notes: This table reports versions of Table 4 excluding non-borrowers. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.19: Effect of Foreign Currency Debt Shock on Nondurable Consumption: Un-weighted

	ln(Non-durable consumption)			
	(1)	(2)	(3)	(4)
NoDebt × Post	0.0102	0.00773	0.00698	0.00224
	(0.0126)	(0.0132)	(0.0130)	(0.0127)
FC × Post	-0.0457**	-0.0455**	-0.0416**	-0.0458**
	(0.0159)	(0.0160)	(0.0156)	(0.0152)
Household & year FE	Yes	Yes	Yes	Yes
Household controls		Yes	Yes	Yes
Contemporaneous inc.			Yes	Yes
Dep. var. 2008				Yes
N	59373	59321	59310	24951

Notes: This table reports versions of Table 2 with unweighted regressions. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.20: Marginal Propensity to Consume Out of the Foreign Currency Debt Service Shock: Unweighted

	Non-durable consumption					
	Reduced form			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
FC × Post	-33474.2*	-35067.0**	-32532.6*			
	(13019.3)	(13119.4)	(12717.6)			
Loan Payment surprise				-0.933*	-0.968**	-0.909*
				(0.363)	(0.364)	(0.354)
Household & year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household controls		Yes	Yes		Yes	Yes
Contemporaneous inc.			Yes			Yes
First stage F-statistic				814.7	873.2	873.1
R^2	0.879	0.880	0.884			
N	59373	59321	59321	59373	59321	59321

Notes: This table reports versions of Table 3 with unweighted regressions. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.21: Foreign Currency Debt Exposure and Spending on Different Categories of Consumption: Unweighted

	Panel A: By durability			
	Strict non-durables	Semi durables	Services	Durables
	(1)	(2)	(3)	(4)
	PPML	PPML	PPML	PPML
FC × Post	-0.0193	-0.0624	-0.0842**	-0.196*
	(0.0175)	(0.0405)	(0.0245)	(0.0906)
Household and year FE	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
N	59321	58986	59319	53539

	Panel B: Broad spending response			
	Total consumption		Housing investment	Total spending
	(1)	(2)	(3)	(4)
	PPML	IV	PPML	IV
FC × Post	-0.0549**		-0.457*	
	(0.0165)		(0.229)	
Loan payment surprise		-1.262**		-1.417**
		(0.400)		(0.419)
Household and year FE	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
First stage F-statistics		873.2		873.2
N	59321	59321	43202	59321

Notes: This table reports versions of Table 2 with unweighted regressions. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.22: Effect of Foreign Currency Debt Shock on Nondurable Consumption: Alternative FC Debtor Classification

	ln(Non-durable consumption)			
	(1)	(2)	(3)	(4)
NoDebt × Post	0.0147	0.0141	0.0134	0.0115
	(0.0131)	(0.0134)	(0.0131)	(0.0134)
FC × Post	-0.0536**	-0.0511**	-0.0474**	-0.0489**
	(0.0178)	(0.0176)	(0.0171)	(0.0171)
Household & year FE	Yes	Yes	Yes	Yes
Household controls		Yes	Yes	Yes
Contemporaneous inc.			Yes	Yes
Dep. var. 2008				Yes
N	57335	57283	57272	23968

Notes: This table reports versions of Table 2 with an alternative foreign currency debtor classification. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.23: Marginal Propensity to Consume Out of the Foreign Currency Debt Service Shock: Alternative FC Debtor Classification

	Non-durable consumption					
	Reduced form			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
FC × Post	-39511.6**	-39554.7**	-37723.7**			
	(14285.3)	(14260.0)	(13774.4)			
Loan Payment surprise				-1.050**	-1.047**	-0.999**
				(0.379)	(0.379)	(0.366)
Household & year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household controls		Yes	Yes		Yes	Yes
Contemporaneous inc.			Yes			Yes
First stage F-statistic				623.4	649.5	649.4
R^2	0.879	0.880	0.884			
N	57335	57283	57283	57335	57283	57283

Notes: This table reports versions of Table 3 with an alternative foreign currency debtor classification. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.24: Foreign Currency Debt Exposure and Spending on Different Categories of Consumption: Alternative FC Debtor Classification

	Panel A: By durability			
	Strict non-durables	Semi durables	Services	Durables
	(1) PPML	(2) PPML	(3) PPML	(4) PPML
FC × Post	-0.0173 (0.0195)	-0.0486 (0.0495)	-0.108** (0.0270)	-0.125 (0.103)
Household and year FE	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
N	57283	56952	57281	51671

	Panel B: Broad spending response			
	Total consumption		Housing investment	Total spending
	(1) PPML	(2) IV	(3) PPML	(4) IV
FC × Post	-0.0559** (0.0185)		-0.333 (0.240)	
Loan payment surprise		-1.241** (0.423)		-1.358** (0.438)
Household and year FE	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
First stage F-statistics		649.5		649.5
N	57283	57283	41748	57283

Notes: This table reports versions of Table 4 with an alternative foreign currency debtor classification. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.25: Effect of Foreign Currency Debt Exposure on Payment Difficulties

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

Notes: This table presents estimates of equation (1) with various measures of payment difficulties as the dependent variable. Household controls are defined in Table 2. All control variables are interacted with the $Post_t$ indicator. Standard errors are clustered at household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.26: Price and Quality Adjustment using Alternative Decomposition of the Intensive Margin

	Total expenditures	Intensive		Intensive	
		Laspeyres price	Paasche quantity	Paasche price	Laspeyres quantity
FC × Post	-26724.11*	-5394.04	-14272.8*	-5169.53+	-14053.64*
	(10531.05)	(3320.97)	(5953.95)	(3011.8)	(6262.96)
Household and Year FE	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes
N	39689	39689	39689	39689	39689
Percent of total	–	20.18%	53.4%	19.34%	52.58%

Notes: This table reports the estimated effect of FC debt exposure on various measures of household spending based on the decomposition equation (B.9) and (B.10). +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.27: Foreign Currency Debt Shock and the Import Content of Consumption

	Goods		Services		Total Expenditures	
	(1) Direct	(2) Total	(3) Direct	(4) Total	(5) Direct	(6) Total
FC × Post	-0.00888*	-0.00333	-0.00188	-0.00304	-0.00112	0.00423
	(0.00438)	(0.00245)	(0.00185)	(0.00309)	(0.00399)	(0.00340)
Household & year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.679	0.726	0.663	0.662	0.670	0.683
N	59321	59321	59223	59223	59321	59321

Notes: This table reports the estimated effect of FC debt exposure on the import share of consumption expenditures based on the estimation of equation (1). Each column represents a different outcome variable: the direct import share of goods expenditures (column 1), the total import share of goods expenditures accounting for input-output linkages (column 2), the direct import share of services expenditures (column 3), the total import share of goods expenditures accounting for input-output linkages (column 4), the direct import share of total expenditures (column 5), and the total import share of total expenditures (column 6). See Appendix B for details on how the import shares are constructed. Household controls are defined in Table 2. All control variables are interacted with the $Post_t$ indicator. Standard errors are clustered at household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.28: Heterogeneity in Labor Supply Responses by Local Labor Market Conditions

	Labor market participation		Unemployment		Total income		Oxford adjusted income	
	Low	High	Low	High	Low	High	Low	High
FC × Post	-0.0119	-0.00370	-0.00719	0.0215	0.00385	-0.0231	-0.0143	-0.0335
	(0.0175)	(0.0214)	(0.0220)	(0.0202)	(0.0227)	(0.0263)	(0.0237)	(0.0278)
Household & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes				
Household controls					Yes	Yes	Yes	Yes
R^2	0.679	0.702	0.513	0.522				
N	82745	71338	39749	34761	30964	28357	30964	28357

Notes: This table reports the estimated effect of FC debt exposure on various measures of labor supply by local labor market conditions. We split regions into two groups by the increase in local unemployment rate and separately estimate the effect of FC debt exposure on various labor market outcomes. Standard errors are clustered at the household level. +, * and ** denote significance at the 10%, 5%, and 1% level, respectively.

B Data Appendix

B.1 Household Survey Data: Additional Information

The Household Budget and Living Conditions Survey (HKÉF) is a representative survey of 8,000-10,000 households residing in Hungary. Our sample period is 2005-2012. The sample period ends in 2012, as KSH started data collection with a completely new set of households in 2013 for the EU-SILC survey.

The survey consists of two parts, a consumption diary and an interview. In the consumption diary, participants write a detailed diary tracking all expenditures for two weeks. An example of the diary is presented in Figure B.1. The interview part of the survey takes place in the first quarter of the following year. In the interview, KSH surveys households about their major expenditures in the previous year. The interview is also used to collect detailed information on the household and each members' socioeconomic background, including age, education, and region (county and settlement type).[35] Household members are also surveyed about their labor market status, income, and transfers in the previous year.

B.2 Household Debt in the Household Survey Data

Determining the currency denomination of debt HKÉF contains two sets of information on household debt. First, every year households are surveyed about whether they have debt obligations. From this we know whether they have debt, the year of borrowing, the amount borrowed, the maturity of debt, and the monthly installment.

Table B.1: Variables on Household Debt

	Year of wave							
Variable name	2005	2006	2007	2008	2009	2010	2011	2012
Asked when questions are about the apartment characteristics								
Has housing loan	Y	Y	Y	Y	Y	Y	Y	Y
Borrowed amount	Y	Y	Y	Y	Y	Y	Y	Y
Year of origination	Y	Y	Y	Y	Y	Y	Y	Y
Maturity	Y	Y	Y	Y	Y	Y	Y	Y
Asked when questions are about collateralized debt								
Has housing loan					Y	Y	Y	Y
What is the collateral					Y	Y	Y	Y
Type of loan (mortgage vs home eq)					Y	Y	Y	Y
Year of origination					Y	Y	Y	Y
Currency denomination					Y	Y	Y	Y
Total payment in the year					Y	Y		
Monthly payment							Y	Y
Household has other types of loans					Y	Y	Y	Y
Questions on personal, car, etc. loans					Y	Y	Y	Y
Delinquent loan due to cash shortage					Y	Y	Y	Y

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[35]Information on the county and settlement type (Budapest, county capital, town, village) allows us to partition the country into 58 regions.

Figure B.1: Example of the Consumption Diary from HKÉF

(a) Original

Sorszám	Nap	Mire mennyit költött? (Kérjük, hogy a ruházat és a lábbeli vásárlása esetén a személyt is nevezzék meg)	Kiadási kód						Mennyiség			Forint	Személy-sor-szám
01	1	2,8%-os tartós tej, 1 liter	0	1	1	4	1	0	1 0 0			2 0 0	
02	1	1 kg fehér kenyér	0	1	1	1	2	1	1 0 0			2 5 0	
03	1	25 dkg baromfípárízsí	0	1	1	2	5	3	2 5			2 2 5	
04	1	1 doboz cigaretta	0	2	2	1	1	0				5 0 0	
05	2	1 csomag kávé, 25 dkg	0	1	2	1	1	1	2 5			5 3 0	
06	2	2 korsó sör (sörözőben)	1	1	1	1	2	8				8 0 0	
07	2	munkahelyi étterem, 1 ebéd	1	1	1	2	1	1				5 5 0	
08	2	10 db tojás	0	1	1	4	7	0	1 0			3 0 0	
09	3	tornacipő Petínek, 1 pár	0	3	2	1	3	2	1			8 5 0	0 5

Példa a kiadások tételenként történő beírásához

(b) Translated

Num.	Day	Item and quantity purchased (Please indicate the member of the household for whom the item was bought, if clothing or shoes)	Expenditure item code	Quantity	Forint	Num. of household member
01	1	Milk, UHT, 2.8 percent fat	011410	1	200	
02	1	1 kg bread	011121	1	250	
03	1	250g cold cuts	011253	250	225	
04	1	1 pack of cigarettes	022110		500	
05	2	1 pack of coffee	012111	25	530	
06	2	2 pints of beer (in pub)	111128	2	800	
07	2	Workplace cafeteria, 1 lunch	111211	1	550	
08	2	10 eggs	011470	10	300	
09	3	Sport shoes for Peter, 1 pair	032132	1	850	05

Example of the detailed registration of consumption expenditures

Notes: This figure shows an example from HKÉF of the consumption diary from 2010, with our translation in panel (b).

From 2009, households are also surveyed about their housing debt. This gives us information on whether they have housing debt, the type of debt (mortgage vs home equity), year of origination, the currency denomination of debt (including information on the conversion), the total amount paid in the year as installment, and whether any of the household members have another loan from a financial institution.

To precisely determine loan currency denomination, we collect various pieces of

information that are strong predictors of loan currency denomination. First, we use the information on loan currency denomination collected starting in 2009. Second, we use the year of origination, as essentially all loans originated before 2004 are LC, while 79.3% of loans originated in 2004 or after are FC according to Hungary's household credit registry (see also Figure 2). Third, we use information on participation in the 2012 Exchange Rate Cap or the 2011 Early Repayment Program schemes, since these programs only applied to FC loans. For our baseline FC/LC classification, we count the number of indications of whether a household has an FC or LC loan and classify FC status based on the majority indication. As robustness, we also use the simpler classification based on the loan currency denomination collected starting in 2009. See Appendix C.4 for evidence that the results are very similar across the two approaches.

Annuity model   We calculate households' debt burdens and loan payments (debt service) by using the following loan characteristics: year of origination, maturity, loan type, and currency denomination. With this information we use an annuity formula to impute the monthly payment and remaining balance for each loan. The use of an annuity formula is motivated by the fact that annuity payment was the most common payment structure for mortgage and home equity loans. Based on the Hungarian household credit registry maintained by the Hungarian National Bank, Table B.2 shows that loans with an annuity payment structure accounted for almost 75% of all housing loans. In principle, some of the loans in the "Grace period" and "Other" category may also have repayment structures that are very similar to annuity loans. Equal installment and bullet repayment loans account for only 5% of mortgage and home equity loans according to the household credit registry.

Table B.2: Frequency of Loan Payment Types in the Credit Registry for Loans Originated between 2000 and 2008

	Nr	Share (%)
Annuity	514,033	73
Bullet repayment	8,518	1
Grace period	65,511	9
Equal principal payment	16809	2
Other	101,415	15
Observations	706,286	100

Notes: This table reports the frequency of mortgage and home equity loans by repayment type for loans originated in the period 2000-2008. Data is from the Hungarian household credit registry, which covers 79% of all outstanding household debt in 2008.

For each loan i in currency c of type k originated at time t_0 with maturity m and remaining periods $n = t_0 + m - t + 1$, we denote the imputed values of the monthly

payment and remaining loan balance as $\tilde{P}_{it}$ and $\tilde{D}_{it}$. These are computed as

$$\tilde{P}_{it} = \tilde{D}_{it} \left(\frac{1 - R_{ckmt}^{-n}}{R_{ckmt} - 1} \right)^{-1}$$

$$\tilde{D}_{it} = \tilde{D}_{i,t-1} \cdot R_{ckm,t-1} - P_{i,t-1},$$

where $D_{it_0} = \tilde{D}_{it_0}$ is the originated amount. R_{ckmt} is the average monthly gross interest rate charged for that specific loan product (currency, loan type) in period t.

This formula hence calculates the sequence of payments and outstanding debt that we would observe in the absence of default, assuming that loan i pays the average variable rate charged for that loan product. We do not believe that the assumption that loans remain current is severe drawback for this methodology because default rates were very low before the 2008 crisis (see Figure A.3c).[36]

High liquidity proxy   We use several proxies to measure household liquidity positions. First, we assess whether a household can cover an unanticipated expenditure shock equivalent to their monthly net income using their own savings. Specifically, we rely on two questions from HKÉF: whether the household could cover a large unexpected expense from their own savings, and the maximum amount they could cover. We classify households as having high liquidity if they are able to cover an unexpected expense at least equal to their monthly net income. Second, we consider access to informal credit. Households are asked whether they gave or received financial support from relatives, friends, or NGOs for daily living expenses. We classify households as having access to informal credit if they responded affirmatively to either question in the pre-crisis period. Third, we use the household's debt-to-income ratio in September 2008 as a measure of liquidity. Fourth, we use household income in 2008 as an additional proxy for liquidity.

Individual-level identifier   The data contain a household identifier, but not an individual-level panel identifier. Therefore, for the analysis on individual level data in Table 8, we create an individual-level identifier by matching individuals within households across waves using date of birth (year and month), gender, and educational attainment.

B.3   Import Content of Consumption

To measure the import content of consumption expenditures, we start with a sector level input-output table for Hungary. The input-output table has several relevant pieces of information. First, for each sector, it has sector level information on the value of domestic and foreign inputs. Second, it contains the final output by sector. Third, sector level household consumption is also divided into domestic and imported consumption. These allow us to calculate the overall (direct and indirect) share of import content of household consumption.

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[36]Statistics from the National Bank of Hungary show that the fraction of non-performing loans was below 1% for both local currency loans and foreign currency housing loans in 2008Q3.

Figure B.2: Calculated Annuity Payment and Reported Payment Comparison
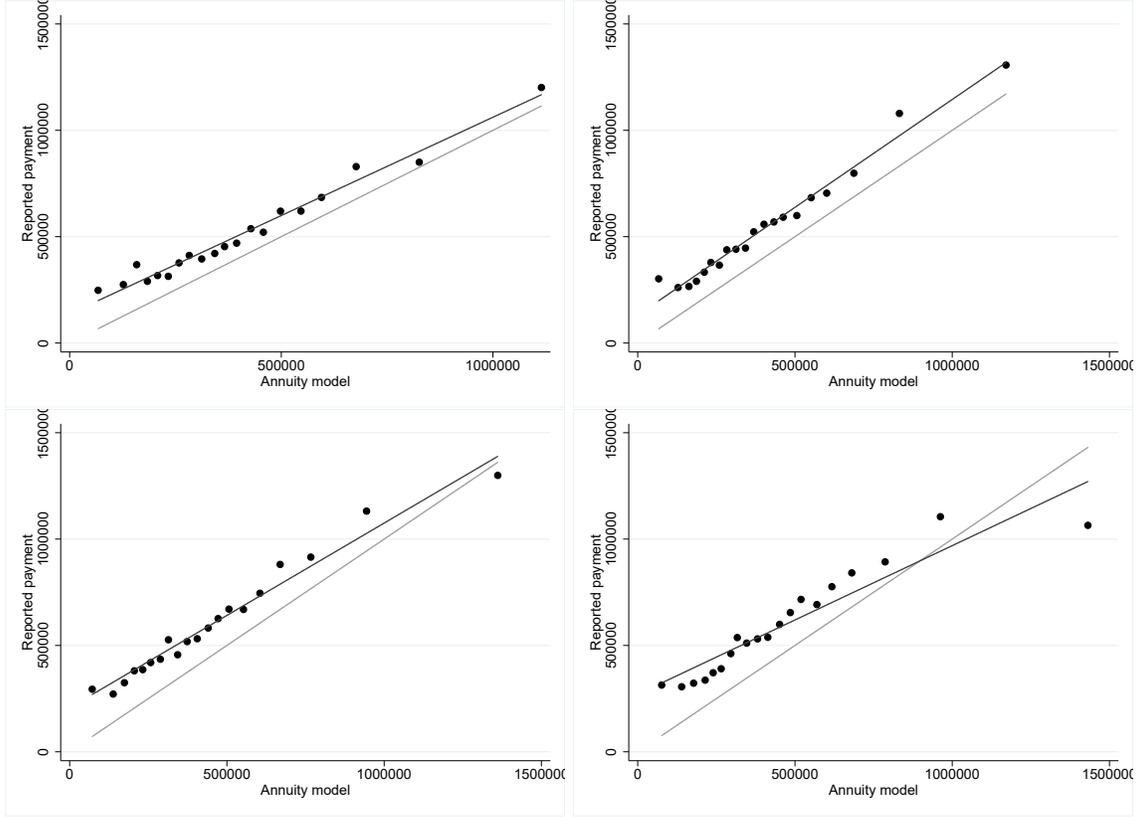
Notes: The figures show the calculated annuity payment and the reported payment by households in 2009 (top left), 2010 (top right), 2011 (bottom left), and 2012 (bottom right).

The overall import share of consumption is given by

$$S_i^{HH} = s_i^{HH,Direct} + (1 - s_i^{HH,Direct}) \times S_i^F.$$

Tto ease the notation, we disregard the time index in this derivation. Here, s_i^{Total} is the share of household consumption from sector i that is directly imported from abroad, and $(1 - s_i^{Direct})$ is the share of household consumption from sector i that is domestically produced. As this production can also have import needs, we multiply it with the sum of import needs of firms in sector i, s_i^F.

The total import share of firms in sector i is defined recursively as

$$S_i^F = s_i^{F,Direct} + (1 - s_i^{F,Direct}) \times \sum_j A_{ij} S_j^F,$$

where $s_i^{F,Direct}$ is the direct import share of sector i, $(1 - s_i^{F,Direct})$ is the indirect import share, and A_{ij} is the share of inputs from sector j to sector i.

Combining the import share of consumption at the sector level with sector-COICOP

Figure B.3: Average Individual FC Exposure at the Locality Level vs Exposure in Administrative Data
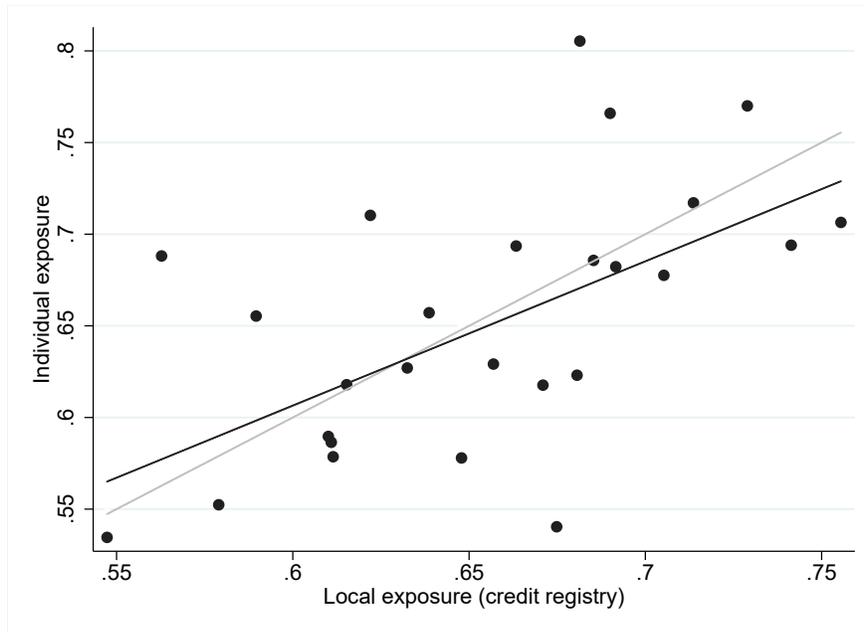

Notes: This figure presents a binscatter of local FC debt exposure in the household credit registry with individual-level exposure from the household consumption survey. While we expect some noise, given the relatively small number of households in each region in the household survey, there is a strong positive correlation, indicating our approach correctly distinguishes between FC and LC debtor households.

mapping from the U.K. Office for National Statistics, we can determine the import share of COICOP consumption categories. This mapping gives the import share of 111 major consumption categories. Figure B.4 reports the import share of the product groups over time. To focus on FC borrower households' adjustment to debt revaluation shock, we disregard the economy-wide adjustment during the crisis and use the 2008 import shares.

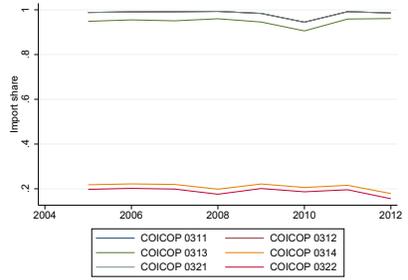# Figure B.4: Import Share of COICOP Consumption Product Categories

(a) Food and non-alcoholic beverages
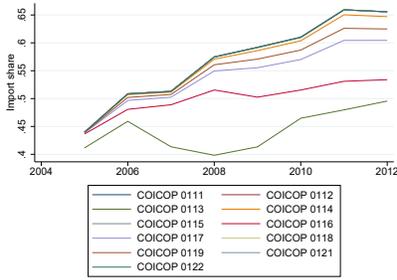
(b) Alcohol and tobacco
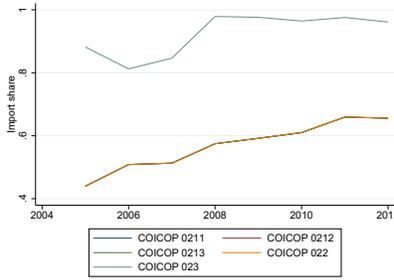
(c) Clothing and footwear

(d) Housing, water, electricity, gas and other fuels
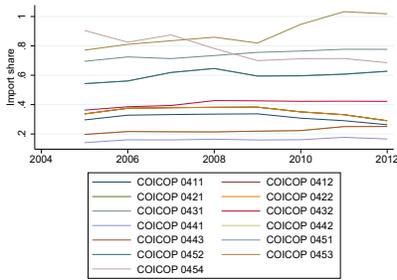
(e) Furnishings, household equipment and routine maintenance

(f) Health

(g) Transport

(h) Communication

(i) Recreation and culture

(j) Education

(k) Restaurants and hotels

(l) Miscellaneous goods and services

Notes: This figure plots the import share of consumption S_{it}^{HH} for 111 major consumption categories.

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B.4 Alternative Indices for Decomposing the Intensive Margin

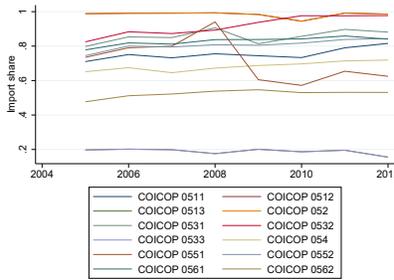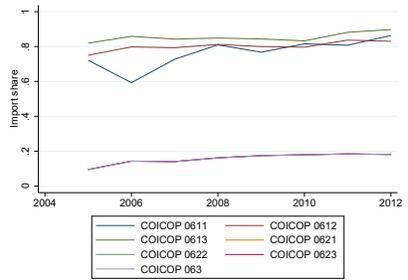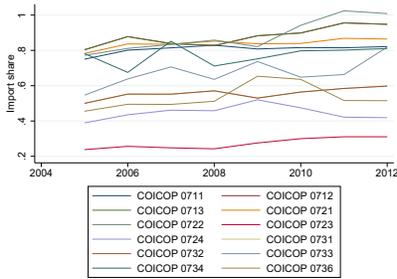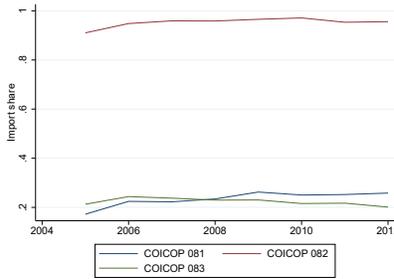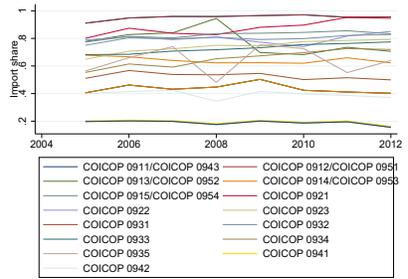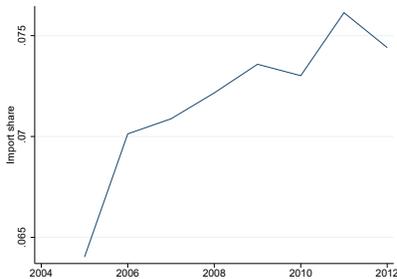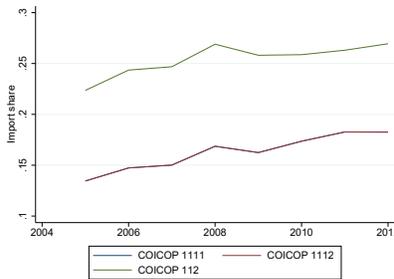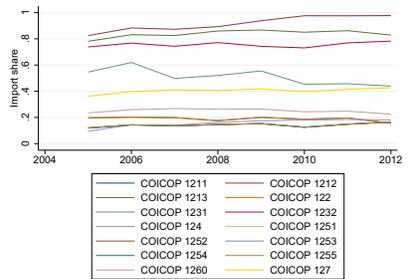In the main analysis, we use the Marshall-Edgeworth index for the decomposition. Here we discuss alternative indices for decomposition. In particular, we use the Laspeyres and Paasche indices. The intensive margin of the change in expenditures can be decomposed as follows:

$$
\sum_{j \in J_{t/t-1}} e_{jt} - \sum_{j \in J_{t/t-1}} e_{j,t-1} = \sum_{j \in J_{t/t-1}} p_{jt} q_{jt} - \sum_{j \in J_{t/t-1}} p_{j,t-1} q_{j,t-1}
$$

$$
= \underbrace{\sum_{j \in J_{t/t-1}} \Delta p_{jt} q_{j,t-1}}_{\text{Laspeyres price change}} + \underbrace{\sum_{j \in J_{t/t-1}} \Delta q_{jt} p_{jt}}_{\text{Paasche quantity change}} \tag{B.9}
$$

$$
= \underbrace{\sum_{j \in J_{t/t-1}} \Delta p_{jt} q_{jt}}_{\text{Paasche price change}} + \underbrace{\sum_{j \in J_{t/t-1}} \Delta q_{jt} p_{j,t-1}}_{\text{Laspeyres quantity change}} \tag{B.10}
$$

The Laspeyres price change uses the quantities from $t-1$ as weights, while the Paasche price index uses the quantities from t. This implies that the Laspeyres index is likely to overstate the change in prices as it does not account for the fact that households can change the quantities. The opposite is true for the Paasche index. Table A.26 presents decomposition of the intensive margin using these alternative decompositions.

B.5 Common Examples of Equivalence Scales

The use of equivalence scales allows us to compare outcomes that are equivalent across households, adjusting outcomes both for household size and composition. Table B.3 shows the adult equivalent for different household compositions using the Oxford, OECD and square root scales. The Oxford scale gives a weight of 1 to the first adult in the household, 0.7 to subsequent adults and 0.5 to children. The OECD scale attaches a weight of 1 to the first adult, but gives a weight of 0.5 for all the consecutive adults, while children get a weight of 0.3. The square root equivalence scale divides consumption expenditures by the square root of household size.

Table B.3: Equivalence Scales for Common Family Types

Family type	Oxford scale	OECD scale	Square root
1 adult	1	1	1
2 adults	1.7	1.5	1.41
1 adult + 1 child	1.5	1.3	1.41
2 adults + 1 child	2.2	1.8	1.73
2 adults + 2 children	2.7	2.1	2
2 adults + 3 children	3.2	2.4	2.24

Notes: This table shows equivalence scales for common family types for the most common scaling methods.

C Robustness Tests

This appendix provides details on the robustness of the consumption results from Section 5.

C.1 Propensity score matching using survey data

Although FC and LC debtor households are broadly similar on observables, there are statistically significant differences between the two groups in terms of educational attainment (Table 1). While the estimates are robust to controlling for these differences, we further ensure that our results are not driven by these differences by matching FC debtor households to control households using propensity score matching. We select two groups of control households: only LC debtors, or both LC debtors and non-debtors. We match households within waves and use the baseline household control variables for calculating the propensity score: age of the household head, gender of the household head, educational attainment of the household head, household size, and the location of the household.

The balance test for the two matched samples are presented in Table A.13 and Table A.14. For all observables, the differences between treatment and control groups are small and not statistically different from zero. Moreover, the Imbens and Wooldridge (2009) normalized differences are also small. Table A.15 presents the results from estimating equation (1) on the matched sample. For both sets of control groups, the estimates are essentially indistinguishable from the baseline estimates in Table 2.

C.2 House Price Shocks

To further support the identifying assumption that FC borrowers were not exposed to other differential shocks, we show that the value of housing assets evolved similarly for FC and LC debtor households.[37] We use self-reported house price data from the survey to test whether FC debtor households perceived their house price differently from LC borrower households by estimating equation (2) for house prices. Figure A.8 plots the dynamic impact of FC debt status, which shows that perceived house prices evolved similarly for FC and LC borrower households.

C.3 Alternative Sample and Weighting

In our analysis based on survey data, we keep non-borrowers in the sample, as their consumption behavior provides a useful benchmark. To ensure that this does not affect our results, we re-estimate our main regression using a subsample excluding non-borrower households. Table A.16, Table A.17 and Table A.18 present the PPML, MPC and MPS

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[37]Although the HKÉF survey does not contain information on financial assets, households report the self-assessed value of their homes. As real estate constitutes the most important asset class for households and the homeownership rate is almost 91% in the 2011 census in Hungary, housing capture a large part of household assets.

results, respectively. They are close to our main estimates proving their robustness to sample choice.

As an additional robustness check, we limit the sample to loans originated around the time of the late-2003 phase-out of the subsidy program. Re-estimating the PPML and MPC specifications on these narrower subsamples yields results that closely align with our main findings, as shown in Tables A.11 and A.12, respectively.

We use weights provided by the Central Statistical Office to make sure that the sample accurately reflects the population. However, the weighting does not take into account debtor status of households.[38] Therefore we re-estimate our main regressions weighting households equally and report the results in Table A.19, Table A.20 and Table A.21. These estimates are similar to the main results, suggesting that our results are robust to alternative weighting schemes.

C.4 Robustness to Potential Measurement Error in FC Debtor Status

We next conduct several robustness checks to show that potential measurement error in the household survey data is unlikely to materially affect our main results.

In the main analysis, we rely on several pieces of information to classify debtors' loan currency denomination. In particular, we use self-reported currency denomination, the date of origination, and participation in a debt relief program targeting FC borrowers to determine the currency denomination of loans. The motivation behind using various pieces of information is to construct what we believe is the most accurate FC classification.

Next, we show that our results are not sensitive to using this exact classification. In particular, we show that our results are robust to using only the self-reported currency denomination to classify FC debt status, ignoring the other variables. We re-estimate the main regressions in Table 2, Table 3, and Table 4 using this simpler FC/LC classification method. The results are reported in Table A.22, Table A.23 and Table A.24. These tables show that the new point estimates and the original point estimates are quantitatively very similar. For example, FC exposure leads to 4.89% reduction using the simpler classification versus 4.46% is the original classification. The MPC is 0.999 using the simpler classification versus 0.920 in the original classification. This indicates that our results are robust to alternative methods to classify foreign currency debtor households. In fact, the baseline classification method is slightly conservative in terms of the magnitudes of the estimates.

C.5 Robustness to Potential Measurement Error in Debt Payments

Our measure of outstanding debt $\tilde{D}_{it}$ and debt service cost $\tilde{P}_{it}$ relies on an annuity model using self-reported information (date of origination, borrowed amount, maturity, currency denomination). As in any setting using survey data, if a household reports any debt-related information erroneously, it can lead to measurement error that may bias our

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[38]The Central Statistical Office calculates weights relying on the census and use demographics and geographical location variables to calculate weights.

estimates. Note that this only affects the analysis on the MPC using household survey data in Section 5.2.

Two facts alleviate concerns about measurement error in outstanding debt and debt service. First, instrumenting the payment surprise with FC debt status removes the attenuation bias stemming from classical measurement error in the payment surprise (Hausman, 2001). Second, we find similar estimates using administrative bank customer data. While bank customer data could also have measurement error from leakages, the fact that the results are similar across two independent datasets gives us confidence that the findings are not substantially biased by measurement error.

In this section, we present a simulation analysis to further verify that our results are not materially biased by measurement error. Specifically, we conduct a simulation exercise to evaluate how measurement error in the reported debt characteristics impacts our estimates of the MPC out of increased debt service cost. We consider measurement error in both the borrowed amount and maturity. We assume the measurement error is normally distributed, with a mean of zero and a variance equal to the sample variance of the original variables. Using the borrowed amount with measurement error, we re-calculate the outstanding debt and loan payment and re-estimate equation (5) for the marginal propensity to consume. We run 1000 simulations and estimate the IV regression from Table 3 column 5 (baseline controls) and column 6 (with income as an additional control). In a second step, we repeat this exercise for maturity, again applying a measurement error of mean zero and variance equal to the sample variance of maturity.

Figure A.9 reports the distribution of the estimated marginal propensity to consume from the simulation. Panels (a)-(b) consider measurement error in the borrowed amount. For this simulation, the MPC is slightly lower than our baseline (around 0.84 versus 0.95). This suggests that the measurement error in borrowed amount biases our MPC estimates downward and that the true estimate may be even larger.

Figure A.9 panels (c)-(d) considers measurement error in maturity. The results show that despite the added measurement error, the average estimated MPC (0.97-1.04) is reasonably close to our baseline MPC estimate reported in Table 2. Moreover, the distribution of MPCs is reasonably tight, with most of the mass between 0.94 and 1.08 across the two panels. This suggests that our approach is robust to a reasonable degree of mis-measurement in maturity parameter of the annuity model.

As a further check, we also assess the validity of the annuity model assumption. In an annuity model, borrowers have constant debt service cost, conditional on the interest rate and currency denomination. In an equal principal payment scheme, a borrower has higher payments at the beginning of the loan and lower payments closer to maturity. As foreign currency housing loans were originated between 2004 and 2008, the annuity model assumption implies relatively lower payments during the crisis period between 2009 and 2012, given the long average maturity of these loans.

We run simulations that randomly assign annuity and equal amortization payment schemes to loans. We assume that 10% of the loans have a constant amortization scheme, which is conservative based on data on loan types from Hungary's household credit registry reported in Table B.2. We run 1000 simulations and re-estimate the marginal propensity to consume. Figure A.9 panel (e) plots the distribution of MPCs and shows that the average MPC of 1.06, not too far from our baseline estimate.

These simulation exercises illustrate that adding measurement error equal with variance equal to the population variance in borrowed amount and maturity or assuming that some loans do not follow an annuity only changes the estimate MPC by about 0.1. Moreover, the direction of the potential bias depends on the source of measurement error. Overall, we take this as indication that the results are unlikely to be substantially biased by measurement error.

C.6   Results on Difficulties Making Debt Payments

As additional evidence supporting the adverse balance sheet effect of FC debt exposure in the crisis, we analyze survey questions about households' difficulties making payments on their obligations. Table A.25 presents the results of estimating equation (1) with indicator variables for whether households have difficulties making payments on items such as their mortgage and other credit. FC debtors are significantly more likely to report having difficulties making their mortgage payments, common cost payments, and payments on other credit after the onset of the crisis. For example, FC debtors see an 8.7 percentage point increase in the likelihood of reporting difficulties making their mortgage payments, compared to similar LC debtors.

D Lifecycle Model with Long-Term FC Mortgage Debt

This appendix presents a simple quantitative consumption-saving model with long-term foreign currency debt. We use the model to study the consumption response to a large persistent depreciation, as in our empirical setting.

D.1 Model set-up

We consider an economy with a continuum of *ex ante* identical homeowners with mortgage debt. Each household lives for T periods, and time runs from $t = 1, ..., T$. Homeowners begin life with initial long-term mortgage debt d_0 with maturity $T_M \leq T$. Mortgages are denominated in foreign currency, and the initial mortgage debt is drawn from a distribution F_{d_0}. For simplicity, we do not explicitly model housing and mortgage choice. Similar to our empirical setting, we take households' mortgage debt as given and study the response to a large depreciation shock.[39]

Households have preferences over consumption (c_t) and labor (n_t) given by

$$\mathbb{E} \sum_{t=1}^{T} \beta^t u(c_t, n_t).$$

The household's flow of funds constraint is given by

$$c_t + a_{t+1} + \mathcal{E}_t pmt_t = w_t n_t + (1 + r_a) a_t,$$

where a_t is a liquid asset that earns return r_a, pmt_t is the mortgage payment (in FC), w_t is the wage, and $\mathcal{E}_t$ is the exchange rate. We assume the exchange rate $\mathcal{E}_t$ follows a Markov process with transition matrix $\Pi_{\mathcal{E}}$. We also assume that there is a borrowing constraint on the liquid asset:

$$a_{t+1} \geq \underline{a}.$$

Following our empirical setting, we assume the mortgage payment (in FC) follows an annuity:

$$pmt_t = d_t \frac{r}{1 - (1 + r)^{-T_M + t - 1}}, \quad \text{for } 1 \leq t \leq T_M.$$

When the loan is repaid after T_M, the payment is zero. The evolution of a household's debt (in FC) without default follows a standard annuity formula

$$d_{t+1} = d_t(1 + r) - pmt_t$$
$$= d_t \left((1 + r) - \frac{r}{1 - (1 + r)^{-T_M + t - 1}} \right).$$

---

[39]Similarly, Campbell and Cocco (2015), who study default, also do not model housing or mortgage choice.

To introduce uninsurable idiosyncratic risk, we assume the wage follows an exogenous process

$$w_t = \rho w_{t-1} + u_t,$$

where u_t is an iid uninsurable shock. The household's exogenous state variables are thus $(t, \mathcal{E}_t, w_t, d_t)$ and the endogenous state variable is a_t.

D.2   Calibration

We solve the model backwards using the method of endogenous gridpoints. Given the limited labor supply response we estimate in the data, we assume the following GHH functional form for preferences (Greenwood et al., 1988) :

$$u(c,n) = \frac{1}{1 - \frac{1}{\sigma}} \left(c - \phi \frac{n^{1+\frac{1}{\eta}}}{1 + \frac{1}{\eta}} \right)^{1 - \frac{1}{\sigma}}. \tag{D.11}$$

In contrast to standard separable preferences, this specification removes the wealth effect on labor supply, ensuring that households do not counterfactually boost labor supply in response to the increase in debt burdens. To see this, note that the marginal utilities are

$$u_c = \left(c - \phi \frac{n^{1+\frac{1}{\eta}}}{1 + \frac{1}{\eta}} \right)^{-\sigma}, \quad u_n = -\phi \left(c - \phi \frac{n^{1+\frac{1}{\eta}}}{1 + \frac{1}{\eta}} \right)^{-\sigma} n^{\frac{1}{\eta}}, \tag{D.12}$$

so intra-temporal first-order condition is

$$w_t = -\frac{u_n(c_t, n_t)}{u_c(c_t, n_t)}$$

$$\Rightarrow w_t = \phi n_t^{\frac{1}{\eta}},$$

which is independent of consumption c_t.

Table D.4 summarizes the parameter values we use in the calibration. We assume that the mortgage maturity is $T_M = 20$ based on the modal mortgage maturity for FC loans originated before the crisis in the MNB credit registry. The average foreign currency borrower is aged 44 in 2008 (Table 1), and the average age at origination is 41. The WHO life expectation at age 41 in 2010 was 32 years for men and 39 for women, so we assume the household lives (i.e., has a remaining life at the time of borrowing) for $T = 35$ years. We set the mortgage rate equal to $r = 5.5\%$ based on the average interest rate on FC loans from published interest rate data by the Hungarian National Bank (MNB). We set the return on the liquid asset equal to $r - 2.5\%$ based on the average deposit rate from 2005-2012 from MNB deposit rate data.

For the initial debt distribution F_{d_0}, we target a debt payment-to-income distribution

of $\mathcal{N}(0.15, 0.1^2)$ based on the mean and variance of the pre-crisis debt payment-to-income reported in Table 1.

We model the exchange-rate as a five-state Markov process $\mathcal{E} \in \{1, 1.23, 1.32, 1.5, 1.59\}$. The values of the exchange rate are set to the average depreciation from 2008m9 to the average of 2009, 2010, 2011, and 2012 (see Figure 2b). We assume that the exchange rate follows a transition matrix of the form

$$\Pi_{\mathcal{E}} = \begin{bmatrix} 0.94 & 0.04 & 0.02 & 0.0 & 0.0 \\ 0.0 & 0.85 & 0.1 & 0.03 & 0.02 \\ 0.0 & 0.0 & 0.85 & 0.1 & 0.05 \\ 0.0 & 0.0 & 0.0 & 0.9 & 0.1 \\ 0.0 & 0.0 & 0.0 & 0.0 & 1.0 \end{bmatrix}.$$

Calibrating the exact household beliefs about the future likelihood and size of the depreciation is challenging, as there is limited data on the household exchange rate expectations. This transition matrix allows households to anticipate a small change of a depreciation. Pellényi and Bilek (2009) present survey evidence that 74.4% of households with FC debt were informed about currency risk, but 87.2% of households did not expect FX volatility at the 2008 level. This motivates setting a non-zero but small probability of a substantial depreciation. Moreover, it allows households to expect a risk of further depreciation, once the initial depreciation has occurred. For example, Fidrmuc et al. (2013) find that the depreciations in emerging Europe led households to revise upward their estimate of the chance of additional depreciation. Pellényi and Bilek (2009) find that in November 2008, after the initial depreciation started, FC borrowers would have been willing to pay 5% of their installment to to avoid additional exchange rate risk, suggesting they appreciated some risk of an additional depreciation. We assume further that there is no chance of an appreciation once the exchange rate has depreciated.

We set the discount factor to $\beta = 0.970$, which is similar to values typically used in macroeconomic models (de Ferra et al., 2019; Auclert et al., 2021, e.g.). We set the elasticity of intertemporal substitution to $\sigma = 1$, a standard value used for open-economy macroeconomic models with heterogeneous agents (de Ferra et al., 2019; Auclert et al., 2021, e.g.). We set the Frisch elasiticty to $\eta = 0.16$ based on the value calibrated by Gyongyosi and Verner (2024), which studies the income response to a debt relies policy in the aftermath of Hungary's FC debt crisis. This Frisch elasticity accords with other microeconomic estimates of the labor supply elasticity (Chetty et al., 2011; de Silva, 2023), but is lower than typically assumed in macroeconomic models.

D.3 Results

Model experiment. Figure D.5 plots the results of simulating a debt revaluation shock in the model of the same magnitude as in the data. Panel (a) plots the exchange rate path with the depreciation as in the data. The cumulative depreciation from 2008 to 2012 is 59%. We also consider a counterfactual without a depreciation. Note that the depreciation shock is unlikely, but not fully unexpected by households in the model.

Figure D.5b plots the evolution of debt in local currency terms. The depreciation leads

Table D.4: Calibration

	Parameter	Value	Source
Remaining life	T	35	WHO life tables
Discount factor (annual)	β	0.970	Auclert et al. (2021)
EIS	σ	1	de Ferra et al. (2019)
Frisch elasticity	η	0.16	Gyongyosi and Verner (2024)
Labor disutility	ϕ	1	Normalization: income=1
Wage process persistence	ρ	0.94	HKÉF survey estimate
Wage process volatility	σ_w	0.18	HKÉF survey estimate
Liquid asset return	r_a	0.025	MNB interest rate data
Mortgage rate	r	0.055	MNB interest rate data
Mortgage maturity	T_M	20	MNB credit registry

to a sizable debt revaluation. Average income in the economy is 1, so the debt revaluation implies an increase in debt-to-income of over 40 percentage points by 2012, relative to the counterfactual without the depreciation. Figure D.5c shows that debt payment-to-income rises from 15% to 24%.
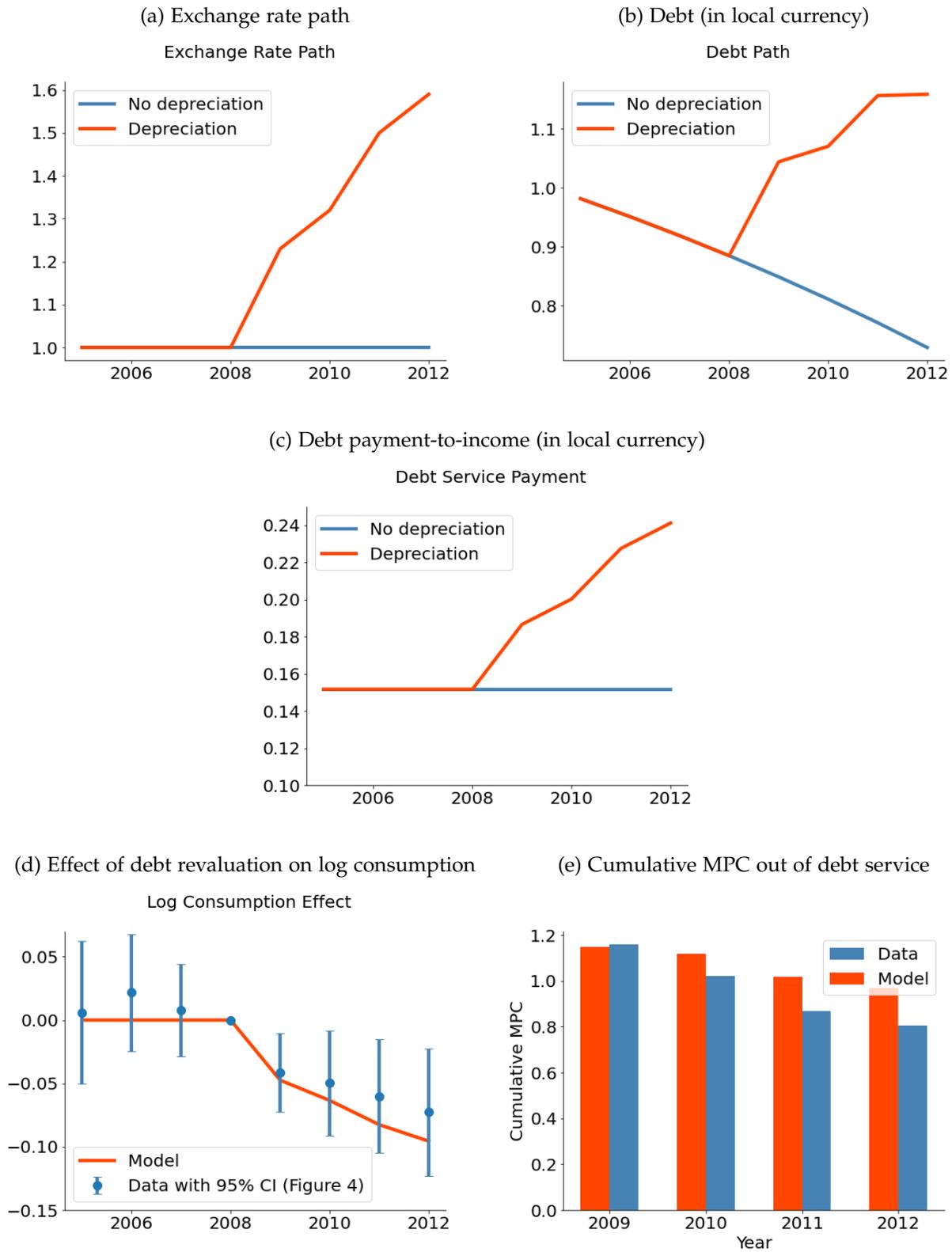
Figure D.5d plots the effect of the depreciation on log consumption in the model. We also overlay the response in the data from Figure 4. The model quantitatively matches the gradual and persistent decline in consumption observed in the data in response to the debt revaluation shock.

Figure D.5e plots the cumulative MPC. The cumulative MPC in the model is calculated in the same way as in the empirical analysis based on equation (5). In particular, this captures the cumulative reduction in consumption relative to the (negative) cumulative increase in debt service payments. The model captures the high MPC. The model implied MPC out of the increase in debt service is 0.970 , which sits in the middle of the estimates reported in Table 3 (0.92 to 0.99). Moreover, Figure D.5e reveals that the MPC is highest in 2009 and 2010 and then declines over time, similar to the MPC in the data. Finally, by construction given our assumption of GHH preferences, the model implies there is no effect of the debt revaluation shock on labor supply, which is similar to the small negative response in the data (see table D.5).

Table D.5: MPC and Labor Supply Response to Debt Revaluation Shock in the Model

	Model	Data	Data source
Marginal propensity to consume (MPC)	0.970	0.92–0.99	Table 3, Cols. (4)–(6)
Labor supply response (in logs)	0.000	-0.009	Table 8C, Col. (1)

Figure D.5: Debt Revaluation Shock in the Model

(a) Exchange rate path

Exchange Rate Path

(b) Debt (in local currency)

Debt Path

(c) Debt payment-to-income (in local currency)

Debt Service Payment

(d) Effect of debt revaluation on log consumption

Log Consumption Effect

(e) Cumulative MPC out of debt service

E Foreign Currency Lending to Households: Other Cases

This appendix provides additional examples of episodes where household foreign currency debt left households and banks exposed to adverse balance sheet effects. We discuss both episodes captured in Figure 1 and narrative accounts from other episodes where data is not available.

Argentina In Argentina during its crisis and devaluation in 2002, 80% of mortgages were denominated in dollars, while earnings of borrowers with dollar debt was mainly in pesos (IMF, 2003a). Many Argentine homeowners fell behind on mortgage payments after the devaluation (Weisbrot and Sandoval, 2007). The adverse balance sheet effects from the devaluation led to a forceful and disruptive policy of "pesofication" to convert assets and liabilities into pesos, which benefitted dollar debtors relative to dollar depositors (Kiguel, 2011; Halac et al., 2004).[40]

Australia Following the deregulation of Australian financial markets in the early 1980s, some nonfinancial firms and households (including farmers) borrowed unhedged in Swiss francs in what became known as the "Swiss loans affair." Kingston (1995) notes that FC loans were mass-marketed by banks and estimates between 2,000 and 3,000 foreign currency loans were originated during this time. When the Australian dollar more than halved in value relative to the Swiss franc in 1985 and 1986, these borrowers experienced large losses (James and Vallence, 2020). This resulted in significant litigation by borrowers against banks (Kingston, 1995).

Austria During the mid-2000s, 12% of Austrian households reported having a Swiss franc or Japanese yen loan. In 2007, one-third of new lending to households was FC-denominated. In Austria, this exposure was concentrated among higher-income and risk-loving households (Beer et al., 2010).

Azerbaijan Following Azerbaijan's devaluation in 2015, consumers with dollar debts saw installments rise by over one-third, resulting in financial distress and bank loan losses (Fitch, 2015; IWPR, 2015).

The Baltics Estonia, Latvia, and, to a lesser extent, Lithuania also saw significant FC lending to households in the 2000s. Latvia provides an example of an economy with widespread foreign currency debt during a severe bust and balance-of-payments crisis where policy maintained a currency peg and pursued an internal devaluation (Blanchard et al., 2013). Devaluation of the Latvian currency was eschewed in part because of the risk of insolvencies from widespread foreign currency debt exposures.

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[40]Deposits were "pesofied" at 1.4 pesos/dollar (well below market rates), while bank loans in FC were converted to pesos at the highly favorable 1 peso/dollar rate.

Central and Eastern Europe   As with the case of Hungary examined in this paper, foreign currency (often Swiss franc) lending to households was widespread during the 2000s in emerging European economies, including Bulgaria, Croatia, Poland, Serbia, Slovenia, Romania, and Ukraine (e.g., Rosenberg and Tirpák, 2008). This resulted in financial distress for foreign currency debtors, rising non-performing loans, and years of legal disputes about the resolution of these debts. In Poland, for example, legal risks associated with FC mortgages originated before the 2008 financial crisis remained a threat to financial stability in 2021 (Reuters, 2021).

Greece   Approximately 70,000 households in Greece borrowed in Swiss francs during the 2000s, especially between 2006 and 2010. This resulted in adverse balance sheet effects when the Swiss franc appreciated against the euro starting in 2010. The Greek Supreme Court Ruled in 2019 that borrowers would have to repay loans in full.

Iceland   During Iceland's banking and currency crisis in 2008, about 20% of household loans were in foreign currency (often in Swiss franc and Japanese yen), up from less than 5% in the early 2000s, and many households did not have foreign currency income. Furthermore, almost all mortgages were indexed to inflation and thereby indirectly exposed to devaluation risk. This drove borrowers toward insolvency, and these debts were subsequently aggressively restructured (Benediktsdóttir et al., 2017).

Mexico   Mexico's sudden stop and currency crisis in 1994-95 was preceded by rapid lending growth to households (Musacchio, 2012; Müller and Verner, 2021). These loans were often denominated in foreign currency or had floating rates that adjusted monthly and led to sharp increases in installments with the spike in interest rates that followed the collapse of the peso (Karaoglan and Lubrano, 1995; Corsetti et al., 1999). The devaluation of the peso resulted in rising non-performing loans and financial distress for these indebted households.

Peru   The Peruvian exchange rate depreciated significantly (about 25%) against the dollar from mid-2013 to 2016 onward, following the Taper Tantrum (Humala, 2019). Despite sustained de-dollarization, especially for household loans, about 34% of mortgage loans were still denominated in dollars in 2014 (IMF, 2015).[41] The macro-financial risks from foreign currency household debt in this episode were contained, although 15% of debtors, mostly high-income households, had elevated debt-to-income ratios (IMF, 2016).

Russia   At the onset of the Global Financial Crisis, about 13% of household credit in Russia was FC-denominated (mainly dollar), leading to higher default rates on FC household loans with the depreciation of the ruble (Sprenger and Urošević, 2011). Before the 2014 depreciation of the ruble, the share of household debt in FC declined substantially,

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[41]The Peruvian financial system has been highly dollarized following instability and hyperinflation in the 1970s and 1980s, although efforts at de-dollarization had gradually lowered the share of dollar loans and deposits (IMF, 2015).

and estimates of the number of FC mortgage holders ranged from 25,000 to 150,000.[42] While this represented a small minority of borrowers, the 2014 depreciation of the ruble more than doubled domestic currency installments on dollar loans and led to severe financial distress for many FC borrowers, as well as protests demanding loan restructuring (Business Insider, 2014).

Uruguay   Uruguay's devaluation in 2002 resulted in an 89% increase in the dollar exchange rate. The financial system was highly dollarized, both in terms of credit and deposits. In 2002, 87% of bank lending was FC-denominated (IMF, 2003b). Some households with dollar debt experienced a doubling in debt payments (e.g., NYT, 2002).

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[42]Based on data from the Central Bank of Russia, by 2014 only 2.5% of household debt was denominated in FC in 2013.