Unconventional Monetary Policy and Household Credit Inequality

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Outline

- Motivation and Research Question
- Literature Review
- Data
- Cross-Quintile Analysis
- Property as the Driver
- Transmission Channels of UMP
- Extensions and Robustness
- Conclusions and Policy Implications

Motivation I

- Distributional effects of unconventional monetary policy
  - stimulates economic activities, improves employment, increases household income $\Rightarrow$ reduces inequality (Bivens, 2015; Hohberger et al., 2020; Guerello,2018)
  - boosts asset prices $\Rightarrow$ increases inequality (Montecino et al, 2015; Domanski et al., 2016; Saiki and Frost, 2014)
  - "neutral" $\Rightarrow$ no effect on inequality (Bernanke, 2015)

Motivation II

- Credit inequality
  * Household credit inequality $= 2\times$ household income inequality, in the Euro area (Cazenave-lacroutz, 2015)
  * Before the GFC, household credit expansion was concentrated at the bottom of the income distribution (Moore and Palumbo, 2010; Mayer and Pence, 2008)

Motivation III

- ECB asset purchase programmes (APP): Oct 2014 - Dec 2018
- A positive aggregate effect on household credit

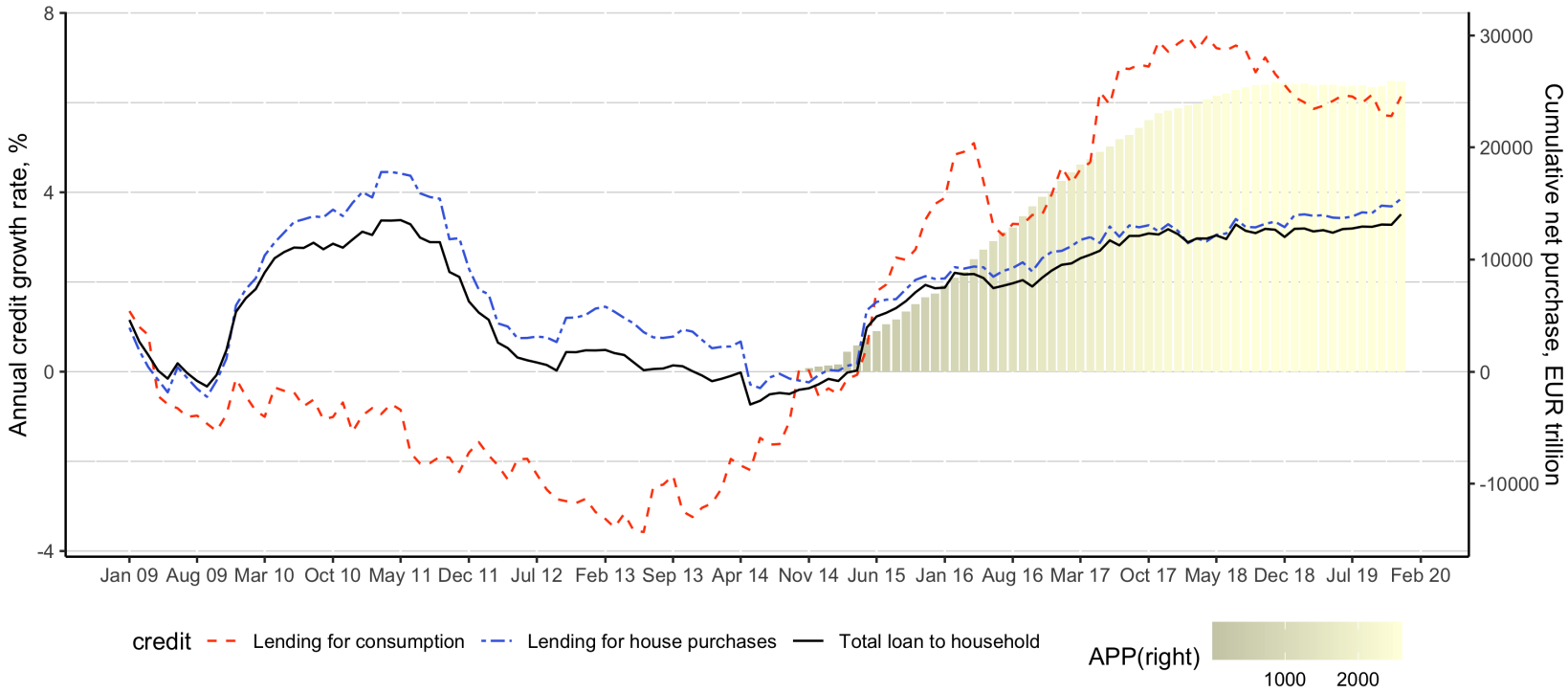


Figure: Annual growth rate of household credit and APP cumulative net purchases, Euro area

Research questions

- What is the distributional effect of the ECB Asset Purchase Programmes on household credit? (If yes, increase / decrease?)
- What is the role of household asset portfolios in credit expansion and credit distribution?
- What are the policy transmission channels that contribute to the distributional effect?

Main Takeaways

- APP widens the credit gap between the top and the bottom of the distribution.
- Among all quintiles, the middle-wealth households increase the most their credit after APP implementation.
- APP affects household credit by boosting property prices and the higher property prices lead to credit expansion by property owners.
- The credit risk channel increases credit inequality and the credit constraint channel decreases credit inequality.

Literature Review

- Distributional effect of central bank policies (such as: Colciago et al., 2019)
- Impact of unconventional monetary policy: interest rates, credit supply, GDP and inflation. (Andrade et al., 2016; Chakraborty et al. 2020, and so on)
- Household credit as a policy transmission channel: QE in the US leads to mortgage rate reductions and originations of new mortgages increases by banks, a positive consumption response, increased refinancing activity(Di Maggio et al., 2017, 2020)
- Household debt (Mian et al., 2013, Mian and Sufi, 2018, and so on)

Data

- Household-level data:
  - The ECB Household Finance and Consumption Survey (HFCS) collects household-level data on households' finances and consumption.
  - **second wave (pre-APP period)** and **third wave (post-APP period)**
  - more than 138000 observations, 17 Eurozone countries. Table A.1
- National-level data:
  - housing price index, bank interest rates on deposits: ECB
  - stock market index: Datastream

1. Cross–Quintile Analysis

Cross-Quintile Analysis: Empirical Strategy

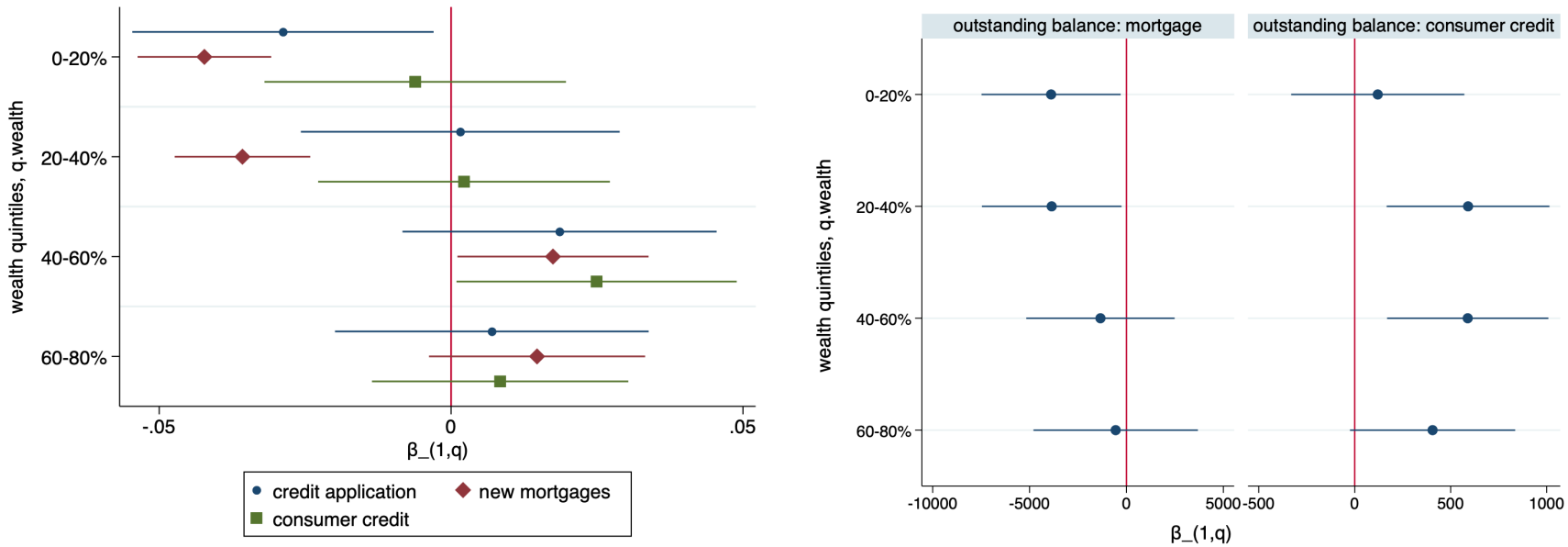
Weighted least squares: probability weight

$$credit_{ijt} = \sum_{q=1}^{4} \beta_{1,q} APP_t \times q.Wealth_{ijt} + \sum_{q=1}^{4} \beta_{2,q} q.Wealth_{ijt} + \beta_3 HC_{ijt} + \gamma_{jt} + \epsilon_{ijt}$$

$credit_{ijt}$: household credit-related variables for household i in country j, year t
APP_t: dummy, =1 if post-APP period; =0, otherwise
$q.Wealth_{ijt}$: dummy variables that define which wealth quintile q household belongs to ($1.Wealth_{ijt} = 1$: household i belongs to the bottom 20% wealth group)
HC_{ijt}: household characteristics (education, employment, income, access to credit card, access to overdraft facility, house ownership, age, and household type)

γ_{jt}: country-year fixed effects

Cross-Quintile Analysis: Results (1)



(a) extensive margin

(b) intensive margin

Figure: Household credit among different quintiles

Cross-Quintile Analysis: Refinancing or new residence purchase?

In the Euro area, housing mortgages account for 76% of total household credit (in 2019 Dec, ECB).

- refinancing, which replace the old mortgages, usually to get better loan terms (15.8% $\rightarrow$ 44.4%);
- mortgages for new house purchases (38.2% $\rightarrow$ 40.1%).

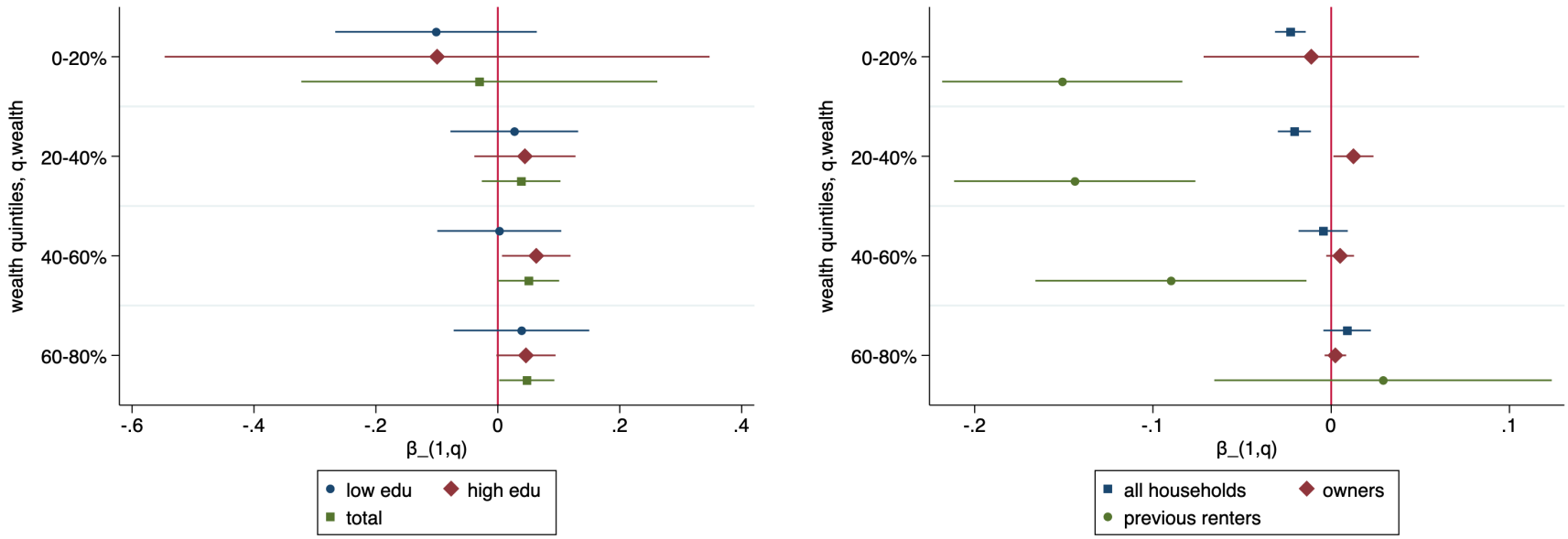
Cross-Quintile Analysis: residence purchases

Residence purchases and new household main residence mortgages

Dependent variable: New mortgages		
	(1)	(2)
purchase	0.601***	0.551***
	(0.0187)	(0.0310)
purchase×APP		0.0740*
		(0.0376)
owned	0.0498***	0.0498***
	(0.00257)	(0.00256)
Household characteristics	Y	Y
Household types FE	Y	Y
Year×Country FE	Y	Y
N	117149	117149

Notes: Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Cross-Quintile Analysis: Results (2)



(a) refinance

(b) residence purchase

Figure: Household refinance and residence purchase among different quintiles

Cross-Quintile Analysis: Summary

- The middle wealth increases the most among all quintiles.
- Compared with the top quintile, the bottom quintile increases the least.
- True for both mortgages and consumer credit, at extensive margin and intensive margin.

2. Household Asset Portfolio

Household Asset Portfolio

So far, all analyses based on household total asset...
Does household portfolio composition matter for policy transmission?

Household Asset Portfolio: Compositions

Market value of each asset type among total household portfolio, sample average, %

Wealth quintile	Asset types				Risky asset				
	Property	Risky assets	Deposits	Business	Bonds	Mutual funds	Managed accounts	Stocks	Other financial assets
1	6.38	0.93	45.03	0.89	0.11	0.35	0.0030	0.26	0.20
2	49.74	2.26	24.14	1.98	0.43	0.87	0.030	0.65	0.28
3	76.14	1.46	10.11	1.40	0.32	0.53	0.027	0.38	0.20
4	79.92	1.79	7.97	1.76	0.39	0.62	0.042	0.55	0.20
5	73.38	4.14	7.47	6.47	0.59	1.15	0.11	1.96	0.32

Notes: This table presents the share of each asset type among household total portfolios across wealth quintiles. The share of each asset type is the market value of each asset divided by the total asset each household has. Risky assets include bonds, stocks, mutual funds, managed accounts, and other financial assets. Shares do not add up to 100% for each quintile because other assets such as vehicles, other valuables, pensions, life insurance, and money lent to others are not considered part of the household portfolio but are included in the total asset.

Household Asset Portfolio: Empirical Strategy (1)

$$credit_{ijt} = \beta_1 asset_{ijt} + \beta_2 asset_{ijt} \times APP_t + \beta_3 HC_{ijt} + \gamma_{jt} + \epsilon_{ijt},$$

$credit_{ijt}$: dummies, whether household i in country j, year t has new household main residence mortgages, mortgage refinancing, mortgages for new residence purchases, or consumer credit.

$asset_{ijt}$: shares of different asset categories within the household's total portfolio, including the share of real estate, deposits, risky financial assets, and privately owned business.

APP_t: dummy, post- or pre-APP period

HC_{ijt}: household characteristics

γ_{jt}: country-year fixed effects

Household portfolio and APP effects on household credit

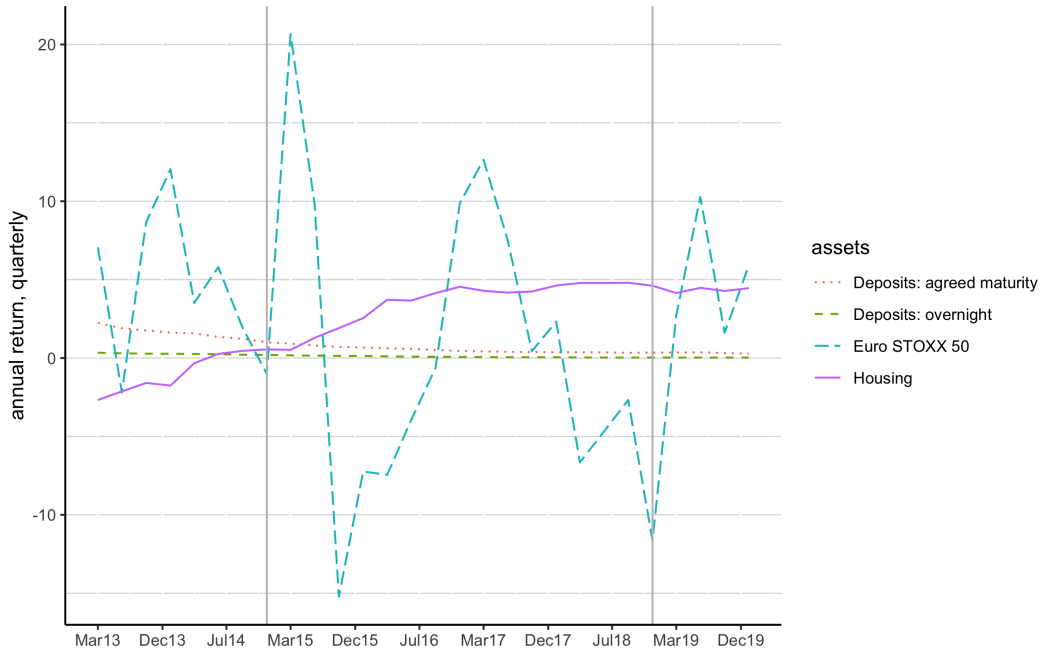
Asset type	Real Estate	Deposits	Risky Assets	Business
	(1)	(2)	(3)	(4)
Dependent variable		a. New Mortgages		
share of asset type	0.078***	-0.039***	-0.056***	-0.036***
	(0.004)	(0.004)	(0.008)	(0.009)
share of asset type × APP	0.037***	-0.060***	-0.036***	0.0164
	(0.005)	(0.006)	(0.012)	(0.015)
Dependent variable		b. Refinance		
share of asset type	0.074***	-0.041***	-0.038***	-0.035***
	(0.004)	(0.004)	(0.011)	(0.009)
share of asset type × APP	0.015***	-0.030***	-0.035**	0.00483
	(0.004)	(0.005)	(0.014)	(0.013)
Dependent variable		c. Mortgages for New Residence Purchases		
share of asset type	0.035***	-0.015***	-0.018***	-0.023***
	(0.003)	(0.002)	(0.004)	(0.004)
share of asset type × APP	0.018***	-0.031***	-0.025***	-0.000476
	(0.003)	(0.004)	(0.007)	(0.008)
N	115,819	115,819	115,819	115,819
Dependent variable		d. Consumer Credit		
share of asset type	-0.035***	-0.050***	-0.129***	-0.079***
	(0.007)	(0.014)	(0.034)	(0.030)
share of asset type × APP	0.007	-0.040**	-0.028	0.0209
	(0.008)	(0.016)	(0.040)	(0.038)
N	136,973	136,973	136,973	136,973
Year × Country fixed effects	Y	Y	Y	Y
Household characteristics	Y	Y	Y	Y
Household type fixed effects	Y	Y	Y	Y

Notes: Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Household Asset Portfolio: Rising Housing Prices

Why mixed effects?...divergent valuation effects on different asset categories from the APP.

Figure: Asset returns, euro area



Household Asset Portfolio: Empirical Strategy (2)

$$credit_{ijt} = \beta_1 asset_{ijt} + \beta_2 asset_{ijt} \times APP_t + \beta_3 asset_{ijt} \times return_{jt} + \beta_4 HC_{ijt} + \gamma_{jt} + \epsilon_{ijt}$$

$credit_{ijt}$: dummies, whether household i in country j, year t has new household main residence mortgages, or consumer credit.
$return_{jt}$: the asset return for each asset category in country j in year t $asset_{ijt}$: shares of different asset categories within the household's total portfolio, including the share of real estate, deposits, and stocks.
APP_t: dummy, post- or pre-APP period
HC_{ijt}: household characteristics

γ_{jt}: country-year fixed effects

Household portfolio and asset returns on household credit

Asset Type	Real Estate	Deposits	Stocks
	(1)	(2)	(3)
Dependent variable	a. New Mortgages		
share of asset type	0.077***	-0.041***	-0.083***
	(0.004)	(0.008)	(0.018)
share of asset type × APP	0.006	-0.059***	-0.037
	(0.005)	(0.007)	(0.028)
share of asset type × asset return	0.010***	0.002	0.001*
	(0.001)	(0.006)	(0.000)
N	115,819	110,476	115,819
Dependent variable	b. Consumer Credit		
share of asset type	-0.034***	-0.032	-0.313***
	(0.007)	(0.024)	(0.047)
share of asset type × APP	0.032***	-0.048***	0.047
	(0.009)	(0.018)	(0.061)
share of asset type × asset return	-0.008***	-0.021	-0.001
	(0.001)	(0.015)	(0.002)
N	136,973	131,630	136,973
Year × Country fixed effects	Y	Y	Y
Household characteristics	Y	Y	Y
Household type fixed effects	Y	Y	Y

Notes: Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Household Asset Portfolio: Property as the Key Driver

- mortgage
  $\beta_3 > 0$: APP $\rightarrow$ housing price increases $\rightarrow$ mortgage increases
- consumer credit
  $\beta_2 > 0$: APP $\rightarrow$ overall easing of credit $\rightarrow$ consumer credit increases
  $\beta_3 < 0$: APP $\rightarrow$ mortgage available $\rightarrow$ substitute expensive non-collateral debt (consumer credit) for property-based debt (mortgages) $\rightarrow$ consumer credit decreases

3. Transmission Channels of UMP

Transmission Channels of UMP

From previous results, I propose:

- credit risk channel
- credit constraint channel

How does each channel contribute to the policy effect, and by how much?

Transmission Channels of UMP: Empirical Strategy

- Firpo et al (2018): recentered influence function (RIF) regression joint with the Oaxaca-Blindar decomposition method
- RIF regression: the unconditional version of quantile regression
- RIF decomposition: an extension of the traditional OB decomposition method

Transmission Channels of UMP: Empirical Strategy

Three steps:

- estimate the RIF statistics ($RIF(Y;\nu)$) of the dependent variable Y for each observation for a chosen distributional statistic ν
- run the standard regression but replacing the dependent variable Y with the estimated RIF statistics, $RIF(Y;\nu) \Rightarrow$ the RIF coefficients for each explanatory variable X
- RIF decomposition: apply the classic OB decomposition method to decompose the chosen distributional statistic $\nu \Rightarrow$ measure the contribution of individual explanatory variable to the change of household credit inequality after the policy implementation, $\Delta\nu_{post-pre}$

Transmission Channels of UMP: Empirical Strategy

- dependent variable (Y): the outstanding balance of the household liability
- distributions (ν): the shares of liabilities held by the top 30%, 20%, 10%, 5%, 1% indebted households, and the Gini-type coefficient
- components (X): 3 groups: household characteristics (education, employment); credit constraint channel (access to credit); credit risk channel(income, wealth)

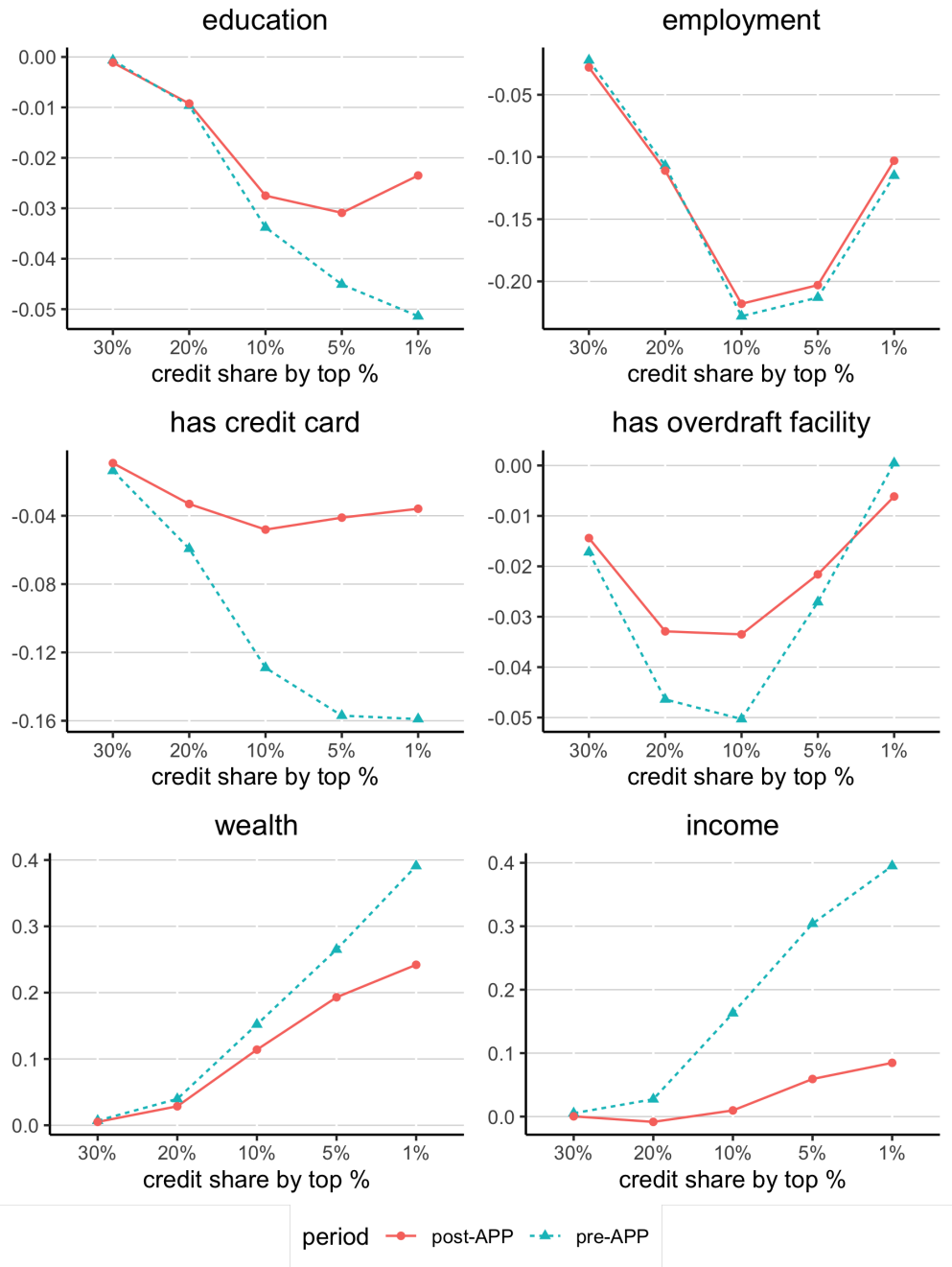


Figure: RIF Regression Coefficients: Pre- and Post-APP

Transmission Channels of UMP: RIF coefficients

- getting employed and higher education level: equalizing effects on household credit
- both access to credit: equalizing effects on household credit
- income and wealth: dis-equalizing effects on household credit.

Decomposition Results: Inequality Measures on Outstanding Balance of Household Liability

	Gini (1)	Share by Top 10% (2)	Share by Top 5% (3)
a. Overall	*diff* $= 0$		
Difference (*post* − *pre*)	0.174	0.715	0.219
	(0.281)	(0.718)	(0.869)
Composition Effects	0.104	0.188	0.444
	(0.121)	(0.317)	(0.320)
Structure Effects	0.070	0.527	-0.224
	(0.257)	(0.653)	(0.819)
b. Composition Effects			
Household characteristics	sum $\beta < 0$		
Edu	-0.032**	-0.085***	-0.096**
	(0.012)	(0.033)	(0.038)
Employ	-0.112***	-0.287***	-0.267***
	(0.038)	(0.099)	(0.093)
Credit constraint channel	sum $\beta < 0$		
Credit Card	-0.058***	-0.130***	-0.111**
	(0.019)	(0.047)	(0.051)
Overdraft	0.028**	0.055*	0.036
	(0.013)	(0.031)	(0.032)
Credit risk channel	sum $\beta > 0$		
Wealth	0.058*	0.125*	0.211*
	(0.031)	(0.064)	(0.112)
Income	0.030	0.032	0.199
	(0.038)	(0.084)	(0.144)

Notes: Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Coefficients are normalized to solve the problem of the base level choice associated with categorical variables, such as countries and household types.

Transmission Channels of UMP: RIF decomposition

- policy effect: APP $\Rightarrow$ changes on distributions of components $\Rightarrow$ contribute to credit inequality change
- the contributions of explanatory variables (offset each other):
  - credit constraint channel: UMP loosens credit constraints $\Rightarrow$ decreases credit inequality after the APP.
  - credit risk channel: UMP increases household income and wealth $\Rightarrow$ increases credit inequality after the APP.

Extensions and Robustness

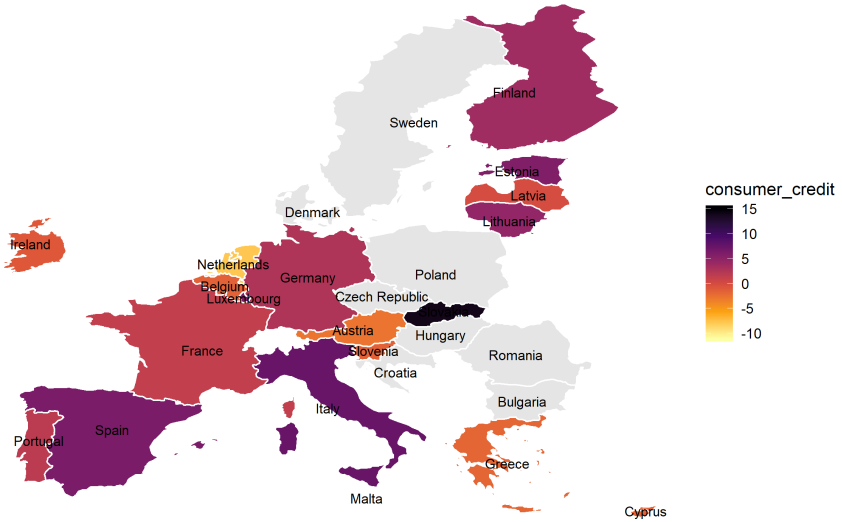
Two extensions follow the baseline results:

- country heterogeneity
- debt repayment ability

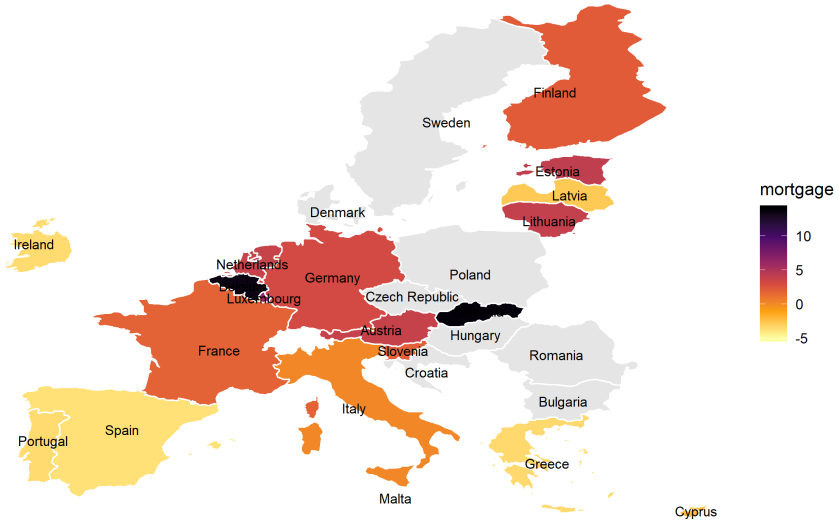
Results are robust and some deviations from the baseline results can be explained by country heterogeneity.

Extensions 1: country heterogeneity

Country heterogeneity: Average household credit growth rates (%, 2014 Oct - 2016 Dec)



(a)



(b)

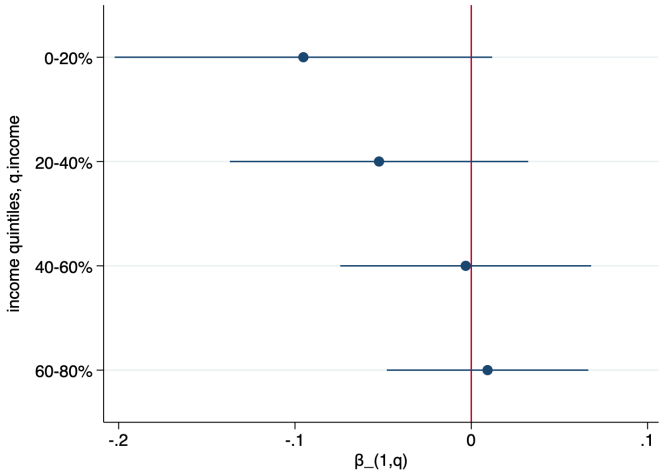
Extensions 1: country heterogeneity

Divergent policy effects on credit distribution among countries. I run the baseline regressions using two sub-samples.

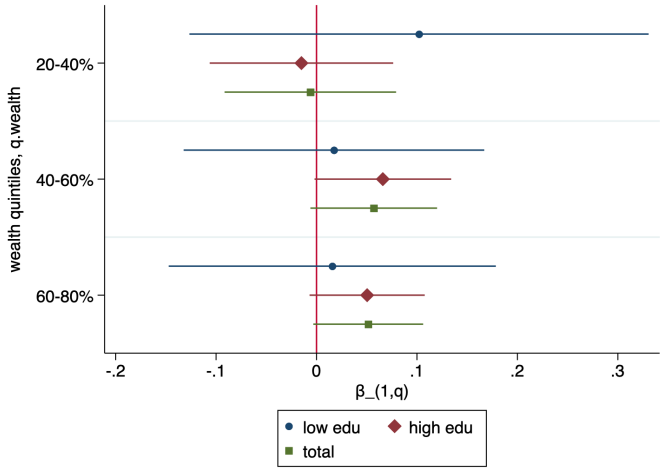
- Core countries (Austria, Belgium, Germany, France, Finland, Luxembourg, and the Netherlands): mostly consistent with the baseline results.
- Peripheral countries (Ireland, Portugal, Italy, Greece, and Cyprus): deviations from the baseline results (and core country results).

Country Heterogeneity: Refinancing

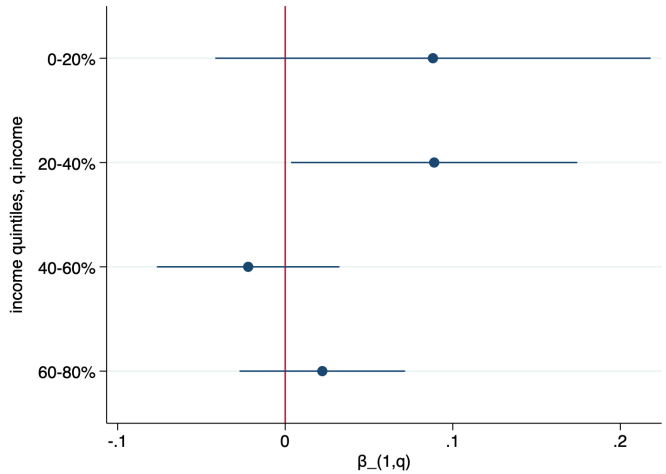
(a) core countries, income quintile



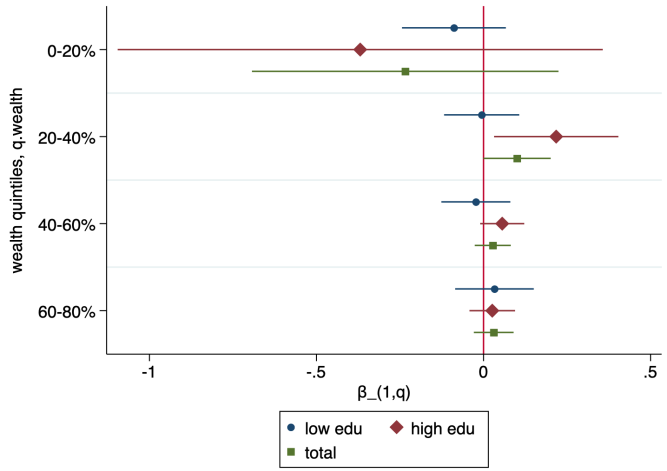
(b) core countries, wealth quintile



(c) peripheral countries, income quintile



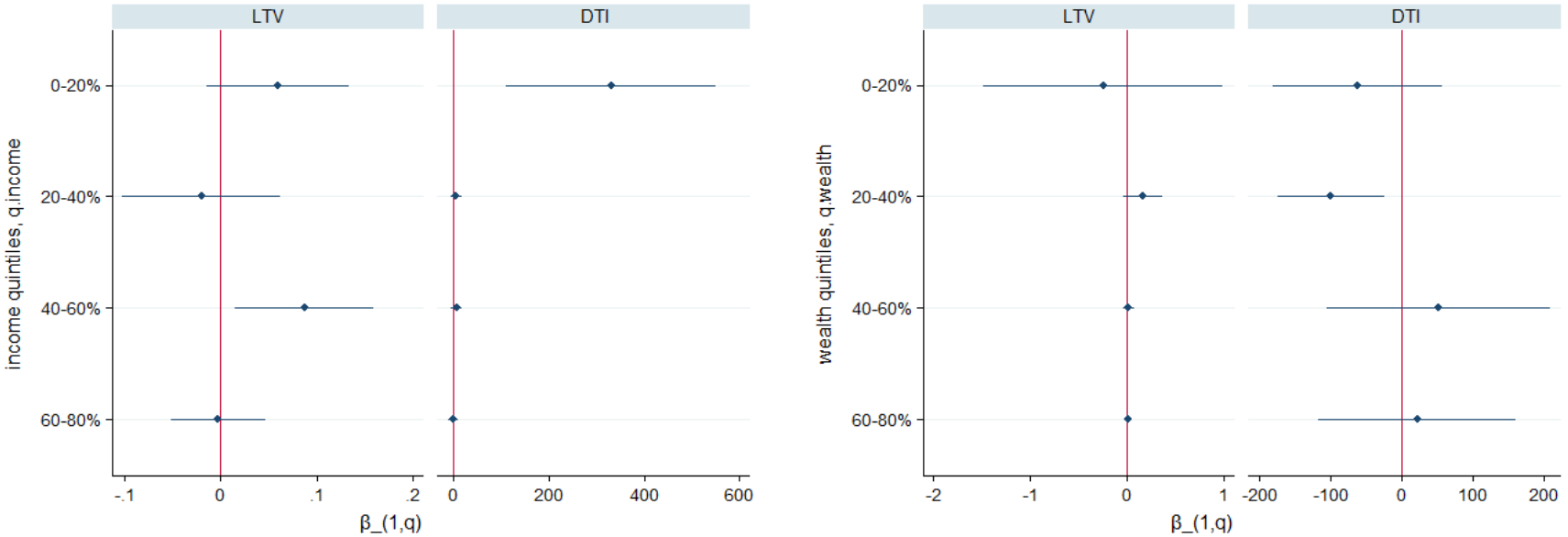
(d) peripheral countries, wealth quintile



Extensions 1: country heterogeneity

- Compared with core countries, in peripheral countries, households from the relatively lower ends of income and wealth distribution increase their credit more after the APP.
- The credit equalizing effect of the APP policy through the credit constraint channel works stronger in peripheral countries than in core countries.

Extensions 2: debt repayment ability



(a) (b)

Figure: Household Credit among Different Quintiles: Debt Repayment Ability

Extensions 2: debt repayment ability

- the bottom income quintile has increased their debt-to-income (DTI) ratios far much more than other income quintiles after the APP policy. (pay rent $\Rightarrow$ pay mortgages, DTI $\uparrow$)
- the middle income quintile increase the most their loan-to-value (LTV) ratios compared with other households.

Robustness

- Add additional household characteristics such as age (exclude Malta and Ireland): consistent.
- Use the middle quintile as the base group: consistent.
- OLS without weights: the top 60-80% wealth quintile increases most their participation in the credit market and refinances the most their HMR mortgages after the APP (baseline: 40-60%). The unweighted regression results are biased towards countries with more observations, such as France.
- Divide income and wealth quintiles among all countries, rather per country: within the Euro area, households in the top 60-80% wealth quintile increase the most their participation in the mortgage market and refinance most after the APP (baseline: 40-60%).

Conclusions I

- Does unconventional monetary policy have a distributional effect on household credit? I address this question using granular data from the ECB Household Finance and Consumption Survey (HFCS) covering 17 Euro area countries and comparing household credit in the "pre-APP (ECB's Asset Purchase Programmes policy)" period with household credit in the "post-APP" period.

  ...YES!

Conclusions II

- The credit gap between the top and the bottom of the distribution widens while the middle wealth households increase their credit the most after the policy implementation.
- By investigating household asset portfolios, I find property ownership and rising housing prices are the key drivers of household financing decisions after the APP.

Conclusions III

- The recentered influence function regression and decomposition results suggest two potential policy transmission channels on household credit inequality: (1) the credit risk channel, which is expected to increase inequality through the assets valuation effect, and (2) the credit constraint channel, which is expected to reduce inequality by facilitating access to credit for lower and middle wealth households.

Policy Implications I

- We should be aware of the distributional effects of central bank policies, including UMP such as APP:
  It could be those who were indebted are increasing more credit after the policy.
- credit inequality $\Rightarrow$ wealth inequality ?

Policy Implications II

- We should be careful about the potential risk to the financial stability following the UMP:
  Higher property prices $\Rightarrow$ excessive risk-taking and debt accumulation by the household sector
- Macroprudential policy: limit on LTV, DSTI, DTI and so on.

Thank you!

Questions, comments, suggestions?
Thank you very much!

Appendix: Data

Table A.1. Reference years and number of observations for each country

Country	Wave 2		Wave 3	
	Reference year	# obs	Reference year	# obs
Austria	2014	2997	2017	3072
Belgium	2014	2238	2017	2329
Cyprus	2014	1289	2017	1303
Germany	2014	4461	2017	4942
Estonia	2013	2220	2017	2679
Finland	2013	11030	2016	10210
France	2014	12035	2017	13685
Greece	2014	3003	2018	3007
Ireland	2013	5419	2018	4793
Italy	2014	8156	2016	7420
Luxembourg	2014	1601	2018	1616
Latvia	2014	1202	2017	1249
Malta	2013	999	2016	1004
Netherlands	2013	1284	2017	2556
Portugal	2013	6207	2017	5924
Slovenia	2014	2553	2017	2014
Slovakia	2014	2135	2017	2179
Total		68829		69982

Appendix: Data

Table A.2a. Definitions of variables

Variable	Definitions
Dependent variables	
CreditApplication	$= 1$ if household has applied for credit in past 3 years; $= 0$ otherwise.
NewMortgage	For wave2, if $YearMortgage = 2013/2014$, $NewMortgage = 1$; $= 0$ otherwise; For wave3, if $YearMortgage > 2014$, $NewMortgage = 1$; $= 0$ otherwise, where $YearMortgage$ is the year when the last loan taken/refinanced using household main residence (HMR) as collateral.
BalanceMortgage	Outstanding balance of HMR mortgages. (Unit: Euro)
BalanceConsumption	Outstanding balance of consumer credit. (Unit: Euro)
ConsumerCredit	$= 1$ if $BalanceConsumption > 0$; $= 0$ otherwise.
Purchase	For wave2, if $YearAcq = 2013/2014$, $Purchase = 1$; $= 0$ otherwise; For wave3, if $YearAcq > 2014$, $Purchase = 1$; $= 0$ otherwise, where $YearAcq$ is the year of HMR acquisition.
Refinance	$= 1$ if the HMR mortgage is a refinancing mortgage; $= 0$ otherwise.
MortgagePurchase	$= 1$ if $NewMortgage \times Purchase = 1$, i.e., household has new mortgages for new residence purchases; $= 0$ otherwise.
DTI	Debt-to-income ratio.
LTV	Loan-to-value ratio of the main residence.
BalanceLiability	Outstanding balance of household total liabilities. (Unit: Euro)

Appendix: Data

Table A.2b. Definitions of variables (continue)

Independent variables	
APP	$= 1$ if survey conducted after 2014 (wave3); $= 0$ otherwise.
OthMortgage	$= 1$ if household has other property debt other than HMR mortgages; $= 0$ otherwise.
BalanceOthMortgage	Outstanding balance of mortgages on other properties. (Unit: Euro)
Ownership	$= 1$ if household has the ownership of the main residence; $= 0$ otherwise.
Owned	For wave2, if $YearAcq < 2013$, $Owned = 1$; $= 0$ otherwise; For wave3, if $YearAcq < 2015$, $Owned = 1$; $= 0$ otherwise.
Age	Age of the household reference person.
Edu	Education level of the household reference person, the higher value the more advanced education level.
Employ	$= 1$ if the household reference person is employed; $= 0$ otherwise.
Income	Total household gross income. (Unit: hundred thousands Euro)
q.Income	Quintile of gross income, per country, weighted, $q \in [1, 5]$.
Wealth	Household gross wealth. (Unit: million Euro)
q.Wealth	Quintile of gross wealth, per country, weighted, $q \in [1, 5]$.
CreditCard	$= 1$ if household has credit card; $= 0$ otherwise.
Overdraft	$= 1$ if household has credit line or overdraft facility; $= 0$ otherwise.
Rent	Monthly amount paid as rent. (Unit: Euro)
HouseholdType	Dummies, 10 types based on characteristics of household composition. Details in Appendix B.
ShareRealEstate	market value of properties household owns divided by household total assets, %
ShareBusiness	market value of household investments in not publicly traded business divided by household total assets, %
ShareRiskyAsset	market value of household investments in risky assets divided by household total assets, %; risky assets include shares, bonds, mutual funds, managed accounts, or other financial assets.
ShareDeposits	value of household sight accounts and saving accounts divided by household total assets, %
ShareBonds	market value of household investments in bonds divided by household total assets, %
SharStocks	market value of household investments in stocks divided by household total assets, %
DepositsReturn	annualized interest rates on deposits with a maturity of up to one year, %
StocksReturn	annual return on national stock market index, %
RealEstateReturn	annual growth rates of housing price index, %

Appendix: Data

Table A.3. Distribution of household types

Type	Definition	Freq.	Percent
6	2 adults, < 65	21,448	15.45
7	2 adults, at least 1 > 65 +	24,780	17.85
8	3 or 3 + adults	10,186	7.34
9	1 parent with children	6,049	4.36
10	2 adults with 1 child	12,620	9.09
11	2 adults with 2 children	15,069	10.86
12	2 adults with 3 or 3+ children	6,541	4.71
13	3 or 3+ adults with children	6,061	4.37
51	1 adult, < 64	19,952	14.37
52	1 adult, > 65	16,102	11.60
Total		138,808	100.00

Appendix: Data

Table A.4. Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Country no data
CreditApplication	138,775	0.219	0.414	0	1	
NewMortgage	117,571	0.039	0.194	0	1	FI
BalanceMortgage	138,811	27,158	77,837.360	0	5,500,000	
BalanceConsumption	138,811	1,703.382	12,431.700	0	2,600,000	
ConsumerCredit	138,811	0.192	0.394	0	1	
Purchase	117,571	0.026	0.159	0	1	FI
Refinance	117,571	0.046	0.210	0	1	FI
MortgagePurchase	117,571	0.015	0.121	0	1	FI
DTI	138,811	70.952	4,004.911	0	812,035	
LTV	34,261	0.492	0.508	0	25.133	
BalanceLiability	138,811	43,419.610	163,452.200	0	3.05E+07	
APP	138,811	0.504	0.500	0	1	
OthMortgage	138,749	0.065	0.246	0	1	
BalanceOthMortgage	138,811	9,884.762	125881.300	0	3.05E+07	
Ownership	138,811	0.722	0.448	0	1	
Owned	138,811	0.572	0.495	0	1	
Age	126,592	55.254	16.038	16	85	IE, MT
Edu	138,452	3.267	1.407	1	5	
Employ	138,811	0.583	0.493	0	1	
Income	138,810	0.527	0.808	-1.620	55.195	
Wealth	138,729	0.436	2.085	-0.001	369.452	
CreditCard	138,811	0.318	0.466	0	1	
Overdraft	138,811	0.282	0.450	0	1	
Rent	138,811	116.680	275.899	0	7,770	
ShareRealEstate	138,811	0.594	0.394	0	1	
ShareBusiness	137,334	0.030	0.118	-1.197	1	
ShareRiskasset	137,334	0.024	0.087	0	1	
ShareDeposits	137,334	0.162	0.260	-0.984	1	
ShareBonds	137,334	0.004	0.035	0	0.994	
ShareStocks	137,334	0.009	0.050	0	1	
DepositsReturn	133,392	0.856	0.577	0.030	2.630	
StocksReturn	138,811	-19.180	271.108	-2,815	35.755	
RealEstateReturn	138,811	2.321	4.625	-8.029	15.561	

Appendix: Transmission Channels of UMP: Empirical Strategy

Given distribution F_Y, the **influence function** of statistic ν is defined as

$$IF(y_c; \nu(F_Y)) = \lim_{\varepsilon \to 0} \frac{\nu((1-\varepsilon)F_Y + \varepsilon H_{y_c}) - \nu(F_Y)}{\varepsilon} \tag{1}$$

H_{y_c} is a probability distribution with all its mass at point y_c.

IF quantifies how statistics ν changes if distribution F_Y is contaminated by a small amount of data mass at point y_c, i.e., it quantifies the influence of data point y_c on ν.

Appendix: Transmission Channels of UMP: Empirical Strategy

Recentered influence function is equivalent to the first two terms of the von Mises (1947) linear approximation of the corresponding distributional statistic ν:

$$RIF(y_i; \nu(F_Y)) = \nu(F_Y) + IF(y_i; \nu(F_Y)) \tag{2}$$

using RIF is crucial for the implementation of RIF decomposition.