

# The Impact of Tax Incentives on Portfolio Diversification and Economic Stability

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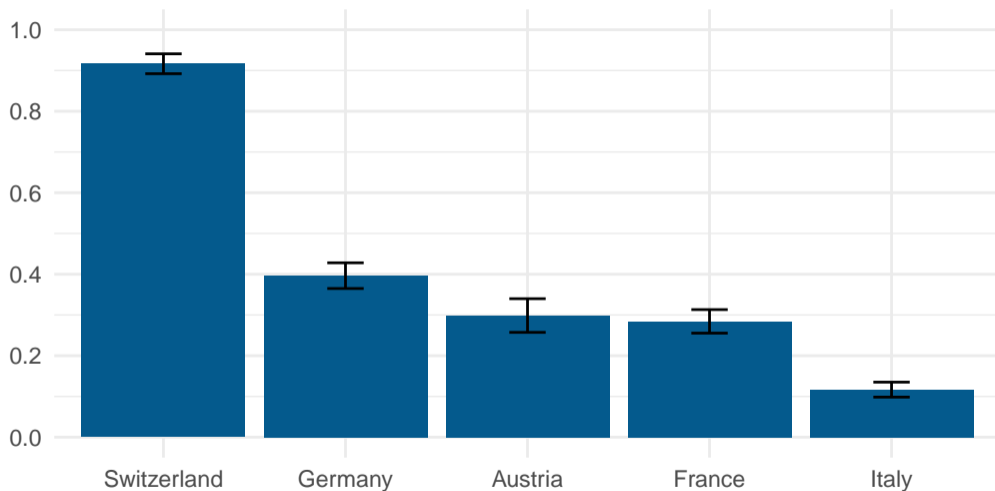
**Winfried Koeniger**, University of St. Gallen, CESifo, CFS, and IZA

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Friday 16<sup>th</sup> December, 2022

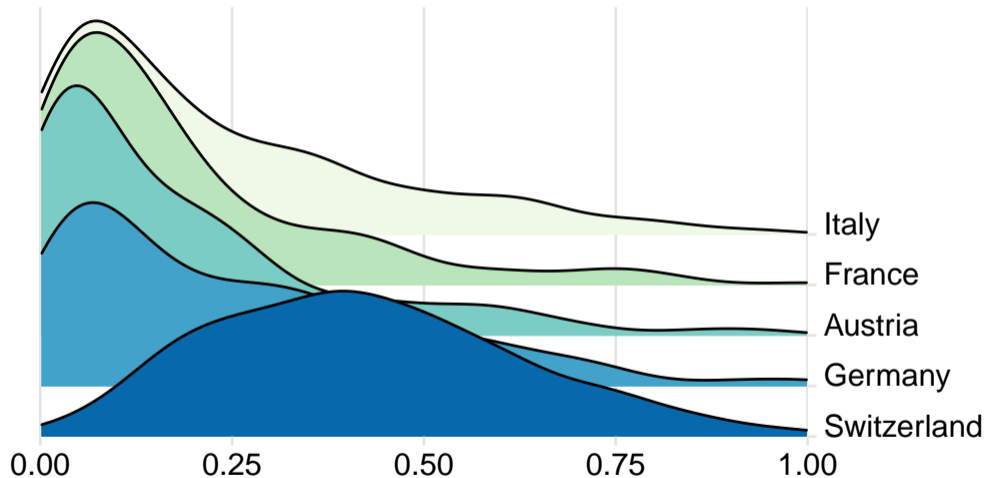
47<sup>o</sup> Simposio de la Asociación Española de Economía

# Outstanding Mortgage Debt Close to Retirement



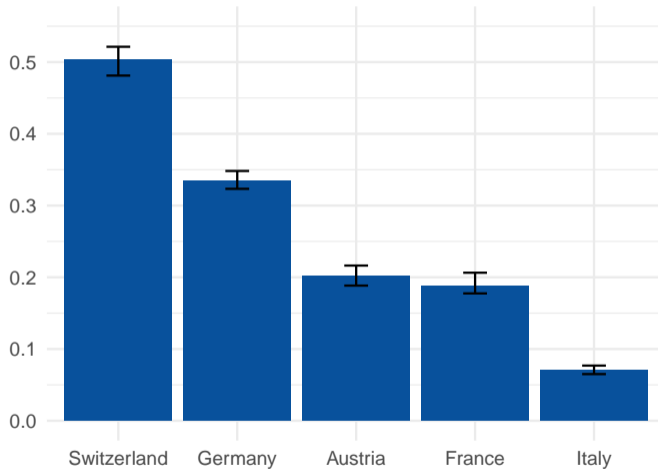
Share of non-retired homeowners between 50 and 65 with mortgage debt. SHARE 2015.

## Swiss Households Have Higher LTVs



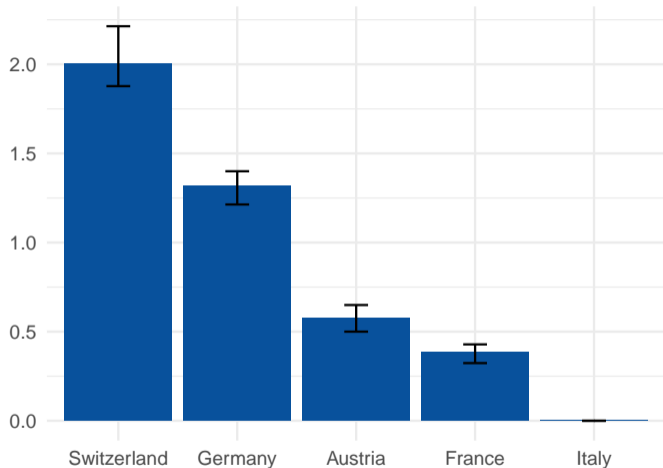
LTV ratios of non-retired homeowners between 50 and 65 with mortgage debt. SHARE 2015.

## Swiss Households Have Higher Share of Non-Housing Wealth



Median of the non-housing wealth divided by net worth. Non-retired homeowners between 50 and 65. SHARE 2015.

## Swiss Households Save More in Pensions



Median of voluntary pension savings over income. Non-retired homeowners between 50 and 65. SHARE 2015.

(Most HHs) Housing main asset + High mortgage debt (= High LTV)

|  
House price bust

↓  
Deep Recessions

→ **Common view:** High LTVs are risky, macroprudential regulation for *low* LTVs

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→ **Common view:** High LTVs are risky, macroprudential regulation for *low* LTVs

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House price bust



Deep Recessions

→ **Common view:** High LTVs are risky, macroprudential regulation for *low* LTVs



1. What explains Swiss Medium LTVs + *higher* Pension savings?  
→ Tax incentives (deductions + tax level/progressivity)
  
2. What is best for (Macro)Economic (consumption) stability?
  - Medium LTVs + *higher* Pension savings → Diversified Portfolio
  - Low LTVs + *lower* Pension savings → Concentrated Portfolio

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# Intuition

(a) Without Tax Deductions.

| Assets             | Liabilities      |                  |
|--------------------|------------------|------------------|
| Home: 150          | Mortgage: 50     | } Net worth: 130 |
|                    | Home equity: 100 |                  |
| Pension assets: 30 | Other equity: 30 |                  |

Total assets: 180 Total liabilities: 180

(b) With Tax Deductions.

| Assets             | Liabilities      |                  |
|--------------------|------------------|------------------|
| Home: 150          | Mortgage: 100    | } Net worth: 130 |
|                    | Home equity: 50  |                  |
| Pension assets: 80 | Other equity: 80 |                  |

Total assets: 230 Total liabilities: 230

# The Model

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- Small open economy (exogenous prices) with discrete time
- Heterogenous, risk-averse, future-discounting homeowners
- Lifecycle: **Active** for  $j = 1, \dots, J$  periods  $\rightarrow$  **Retired** from  $J + 1$  onwards
- Inelastic labour supply + Age-dependent stochastic Income ( $y$ )
- Two assets:
  - **Pension fund** ( $a_p$ ): Illiquid up to  $J + 1$ , pays  $\iota + \zeta_\ell$
  - **Liquid Equity** ( $a$ ): As debt costs  $\iota + \zeta_\ell$  (mortgage), as asset pays  $\iota$  (liquid asset)

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- Rich (progressive) tax system
- Taxable income:
  - + (Exogenous) labour income
  - + Imputed rent
  - Pension contribution
  - ( $a < 0$ ) Mortgage interest payments
  - + ( $a > 0$ ) Returns on liquid asset

 $y$ 
 $(\iota + \zeta_h)\omega h_o \phi_o$ 
 $q_p a'_p - a_p$ 
 $(\iota + \zeta_\ell)q_\ell a'$ 
 $\iota q_a a'$



## Recursive Agent's Problem

$$V_j(a, a_p; y) = \max_{c, a, a'_p} u(c) + \beta \mathbb{E}_{y'} V_{j+1}(a', a'_p; y')$$

$$\text{s.t.} \quad c^{a' \geq 0} = y - T(y_\tau^{a' \geq 0}) - (q_p a'_p - a_p) - (q_a a' - a)$$

$$c^{a' < 0} = y - T(y_\tau^{a' < 0}) - (q_p a'_p - a_p) - (q_\ell a' - a)$$

$$y_\tau^{a' \geq 0} = y + (\iota + \zeta_h) \omega h_0 \phi_0 - \theta_p (q_p a'_p - a_p) + \iota q_a a' + (1 - \theta_p) (\iota + \zeta_p) q_p a'_p$$

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$$q_a = 1/(1 + \iota); \quad q_\ell = 1/(1 + \iota + \zeta_\ell); \quad q_p = 1/(1 + \iota + \zeta_p)$$

$$a' \geq -\bar{\mu} h_1 \phi_a / q_\ell$$

$$q_p a'_p - a_p \geq 0; \quad q_p a'_p - a_p \leq \bar{p}$$

$$y(j) = \exp \left( \psi_0 + \sum_{i=0}^4 \psi_i \cdot j^i + \hat{y} \right)$$

$$\hat{y}' = \rho \hat{y} + \epsilon, \text{ where } \epsilon \sim N(0, \sigma_\epsilon)$$

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## Retirement Period ( $j = J + 1$ )

$$V_{J+1}(a, a_p) = \frac{1}{1 - \beta} u(y - T(y))$$

where  $y = \iota (a + a_p + \phi_a h(1 - \delta)^{J+1}) + \chi \cdot \bar{y}$

$$\bar{y} = \exp \left( \psi_0 + \sum_{i=0}^4 \psi_i \cdot (J + 1)^i \right)$$

$\beta$  Discount factor

$\iota$  Interest rate

$\phi_a$  House price

$a_p$  Pension fund

$a$  Liquid equity

$h(1 - \delta)^{J+1}$  House value

$\chi$  Replacement ratio

$T(y)$  Tax function

# The Impact of Tax Incentives

Mortgage interest rate  $(\iota + \zeta_\ell) >$  Pension return  $(\iota + \zeta_p)$

**Without** Tax Deductions:

→ Mortgage amortisation dominates pension saving

**With** Tax Deductions:

→ Pension after-tax tax returns  $>$  amortisation (far from the borrowing constraint)

→ Substantial pension savings + partial deleverage

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# Counterfactual Exercise

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1. Calibration to Germany
2. Add *Swiss* tax incentives:
  - Imputed rent
  - Deduction mortgage interest payments
  - Deduction pension contributions
3. Switch to Swiss tax level and progressivity

## Calibration to Germany

- Utility function:  $u(c) = c^\sigma$
- Income process estimated from homeowners' income in the data
- Tax level ( $\nu_0$ ) and progressivity ( $\nu_1$ ) as in the data:  $T(y_\tau) = y_\tau - \nu_0 y_\tau^{1-\nu_1}$
- Parametrisation of tax deductions ( $\zeta_h, \omega, \bar{\mu}, \bar{p}, \dots$ ) reflects German/Swiss environment
- Initial distribution of pension fund and liquid equity from *German* HFCS
- Discount factor ( $\beta$ ) chosen to match:
  - Net worth at retirement
  - LTV ratios at retirement

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## Model Fit

|                             | Data      | Model DE  |
|-----------------------------|-----------|-----------|
| Net Worth                   | 350,677 € | 352,453 € |
| Mortgage Incidence          | 35%-41%   | 35.28%    |
| LTV All                     | 9%-12%    | 13.71%    |
| LTV Mortgagors              | 27%-33%   | 38.86%    |
| Home Equity over Net Wealth | 57%-64%   | 47.77%    |

Homeowners between 50 and 65 with mortgage debt. HFCS & SHARE.



## How Much of DE-CH Differences Can Be Accounted for Tax Incentives?

|                            | Data<br>CH | Model<br>DE | Interest<br>Deduction | Imputed<br>Rent | Pension<br>Cap | All |
|----------------------------|------------|-------------|-----------------------|-----------------|----------------|-----|
| Mortgage Incidence         | 91.5%      | 35.28%      |                       |                 |                |     |
| Ratio                      |            | 2.59        |                       |                 |                |     |
| LTV All                    | 38.0%      | 13.71%      |                       |                 |                |     |
| Ratio                      |            | 2.77        |                       |                 |                |     |
| LTV Mortgagors             | 42.0%      | 38.86%      |                       |                 |                |     |
| Ratio                      |            | 1.08        |                       |                 |                |     |
| Home Equity over Net Worth | 52.0%      | 47.77%      |                       |                 |                |     |
| Ratio                      |            | 1.09        |                       |                 |                |     |

Homeowners between 50 and 65 with mortgage debt. SHARE Data.

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|----------------------------|------------|-------------|-----------------------|-----------------|----------------|-----|
| Mortgage Incidence         | 91.5%      | 35.28%      | 37.8%                 |                 |                |     |
| Ratio                      |            | 2.59        | 2.42                  |                 |                |     |
| LTV All                    | 38.0%      | 13.71%      | 15.18%                |                 |                |     |
| Ratio                      |            | 2.77        | 2.5                   |                 |                |     |
| LTV Mortgagors             | 42.0%      | 38.86%      | 40.15%                |                 |                |     |
| Ratio                      |            | 1.08        | 1.05                  |                 |                |     |
| Home Equity over Net Worth | 52.0%      | 47.77%      | 47.39%                |                 |                |     |
| Ratio                      |            | 1.09        | 1.1                   |                 |                |     |

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|----------------------------|------------|-------------|-----------------------|-----------------|----------------|-----|
| Mortgage Incidence         | 91.5%      | 35.28%      | 37.8%                 | 41.7%           |                |     |
| Ratio                      |            | 2.59        | 2.42                  | 2.19            |                |     |
| LTV All                    | 38.0%      | 13.71%      | 15.18%                | 17.16%          |                |     |
| Ratio                      |            | 2.77        | 2.5                   | 2.21            |                |     |
| LTV Mortgagors             | 42.0%      | 38.86%      | 40.15%                | 41.15%          |                |     |
| Ratio                      |            | 1.08        | 1.05                  | 1.02            |                |     |
| Home Equity over Net Worth | 52.0%      | 47.77%      | 47.39%                | 48.33%          |                |     |
| Ratio                      |            | 1.09        | 1.1                   | 1.08            |                |     |

Homeowners between 50 and 65 with mortgage debt. SHARE Data.

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|                            | Data<br>CH | Model<br>DE | Interest<br>Deduction | Imputed<br>Rent | Pension<br>Cap | All |
|----------------------------|------------|-------------|-----------------------|-----------------|----------------|-----|
| Mortgage Incidence         | 91.5%      | 35.28%      | 37.8%                 | 41.7%           | 50.46%         |     |
| Ratio                      |            | 2.59        | 2.42                  | 2.19            | 1.81           |     |
| LTV All                    | 38.0%      | 13.71%      | 15.18%                | 17.16%          | 23.05%         |     |
| Ratio                      |            | 2.77        | 2.5                   | 2.21            | 1.65           |     |
| LTV Mortgagors             | 42.0%      | 38.86%      | 40.15%                | 41.15%          | 45.69%         |     |
| Ratio                      |            | 1.08        | 1.05                  | 1.02            | 0.92           |     |
| Home Equity over Net Worth | 52.0%      | 47.77%      | 47.39%                | 48.33%          | 37.2%          |     |
| Ratio                      |            | 1.09        | 1.1                   | 1.08            | 1.4            |     |

Homeowners between 50 and 65 with mortgage debt. SHARE Data.

## How Much of DE-CH Differences Can Be Accounted for Tax Incentives?

|                            | Data<br>CH | Model<br>DE | Interest<br>Deduction | Imputed<br>Rent | Pension<br>Cap | All    |
|----------------------------|------------|-------------|-----------------------|-----------------|----------------|--------|
| Mortgage Incidence         | 91.5%      | 35.28%      | 37.8%                 | 41.7%           | 50.46%         | 59.91% |
| Ratio                      |            | 2.59        | 2.42                  | 2.19            | 1.81           | 1.53   |
| LTV All                    | 38.0%      | 13.71%      | 15.18%                | 17.16%          | 23.05%         | 30.43% |
| Ratio                      |            | 2.77        | 2.5                   | 2.21            | 1.65           | 1.25   |
| LTV Mortgagors             | 42.0%      | 38.86%      | 40.15%                | 41.15%          | 45.69%         | 50.79% |
| Ratio                      |            | 1.08        | 1.05                  | 1.02            | 0.92           | 0.83   |
| Home Equity over Net Worth | 52.0%      | 47.77%      | 47.39%                | 48.33%          | 37.2%          | 34.95% |
| Ratio                      |            | 1.09        | 1.1                   | 1.08            | 1.4            | 1.49   |

Homeowners between 50 and 65 with mortgage debt. SHARE Data.

## The Role of the Marginal Tax Rate

|                            | Data  | Model  | All    | CH    |
|----------------------------|-------|--------|--------|-------|
|                            | CH    | DE     |        | Taxes |
| Mortgage Incidence         | 91.5% | 35.28% | 59.91% |       |
| Ratio                      |       | 2.59   | 1.53   |       |
| LTV All                    | 38.0% | 13.71% | 30.43% |       |
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| Ratio                      |       | 1.08   | 0.83   |       |
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| Ratio                      |       | 1.09   | 1.49   |       |

Homeowners between 50 and 65 with mortgage debt. SHARE Data.

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|----------------------------|-------|--------|--------|--------|
|                            | CH    | DE     |        | Taxes  |
| Mortgage Incidence         | 91.5% | 35.28% | 59.91% | 52.12% |
| Ratio                      |       | 2.59   | 1.53   | 1.76   |
| LTV All                    | 38.0% | 13.71% | 30.43% | 25.45% |
| Ratio                      |       | 2.77   | 1.25   | 1.49   |
| LTV Mortgagors             | 42.0% | 38.86% | 50.79% | 48.83% |
| Ratio                      |       | 1.08   | 0.83   | 0.86   |
| Home Equity over Net Worth | 52.0% | 47.77% | 34.95% | 35.71% |
| Ratio                      |       | 1.09   | 1.49   | 1.46   |

Homeowners between 50 and 65 with mortgage debt. SHARE Data.

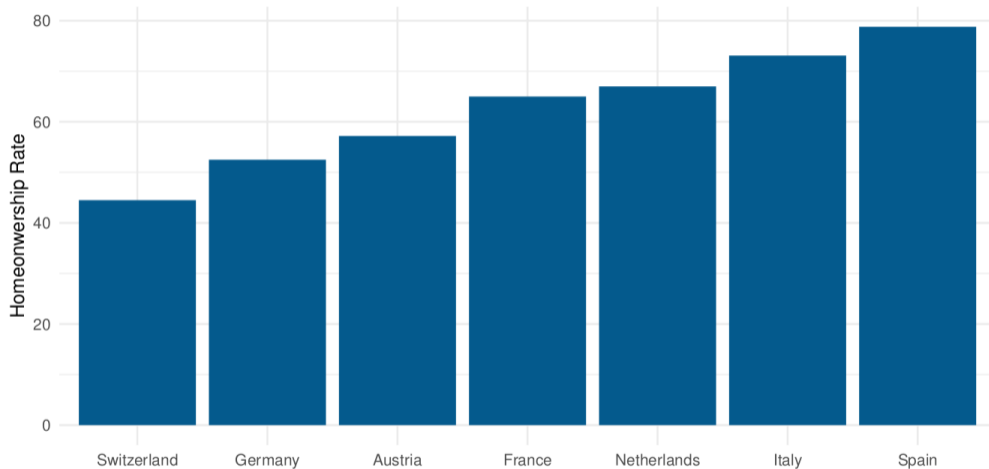
- Add stochastic returns (house price & pension fund)
- Study consumption response to shock to house price:
  - Without tax deductions
  - With tax deductions
- **Question:** Consumption response to shock in economy with/out tax deductions *because* of diversification
  - Correlation of returns
  - Length balance sheet



# Appendix

# Homeownership Rate

◀ Back



Source: EU-SILC.