

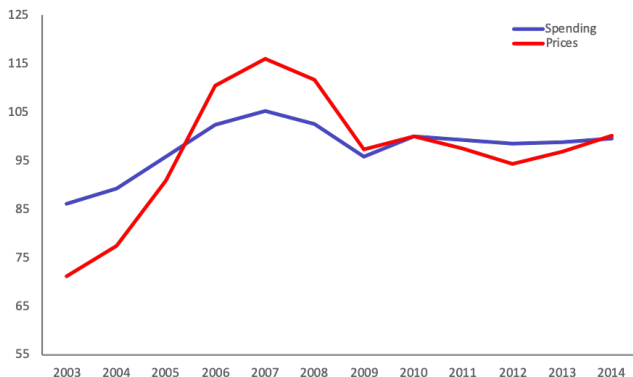
Housing wealth or collateral:

How home value shocks drive home equity extraction and spending

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CEPR

House Prices and Spending in Denmark

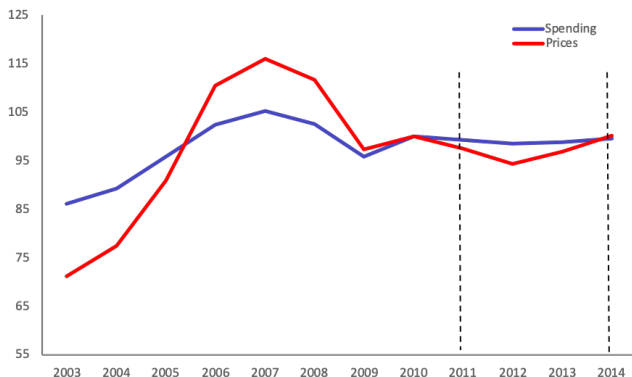
- ▶ House prices and spending move together



- ▶ Do house prices movements cause spending?

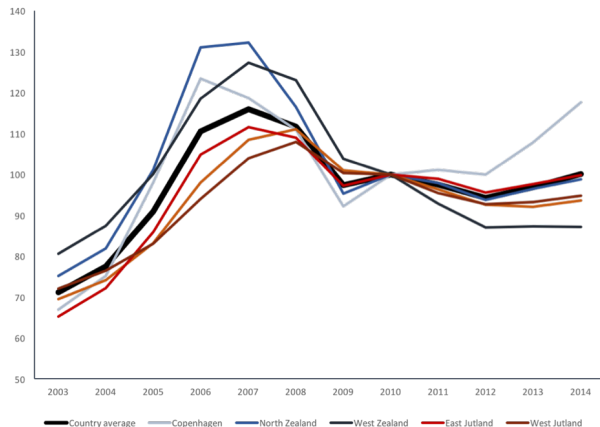
House Prices and Spending in Denmark

- ▶ House prices and spending move together



- ▶ Consider micro data with information about home value expectations for the period 2011-2014.

Prices across Regions



- Plenty of variation in house prices across regions in this period.

Theoretical Background

- ▶ Life cycle framework where agents consume housing and non-housing goods ¹
- ▶ Budget constraint:
 - Fixed labor supply and income balanced with spending
 - Three assets: risk free deposit, housing and mortgage
 - Transaction costs associated with adjusting housing and mortgage
- ▶ Incomes and house prices are stochastic and potentially subject to aggregate shocks
- ▶ Agents are forward looking and form subjective expectations to income and home value

¹Attanasio, Leicester, and Wakefield (2011) provide an example where such a model structure is implemented

Three potential explanations

▶ Wealth effect

- Unanticipated wealth gain (\sim winning the lottery)
- If entirely unconstrained: no additional mortgage borrowing

$$P^H \uparrow \downarrow \Rightarrow C \uparrow \downarrow$$

▶ Collateral/credit effect:

- House price increase creates more collateral

$$P^H \uparrow \Rightarrow \text{Collateral} \uparrow \Rightarrow C \uparrow$$

▶ Common factor / productivity

- (Expected) income drives house prices and spending

$$\begin{aligned} Y \uparrow \downarrow &\Rightarrow P^H \uparrow \downarrow \\ &\Rightarrow C \uparrow \downarrow \end{aligned}$$

Three potential explanations

▶ Wealth effect

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- If entirely unconstrained: no additional mortgage borrowing

$$P^H \uparrow \downarrow \Rightarrow C \uparrow \downarrow$$

▶ Collateral/credit effect:

- House price increase creates more collateral
- One way \rightarrow asymmetric response to ΔP^H

$$P^H \uparrow \Rightarrow \text{Collateral} \uparrow \Rightarrow C \uparrow$$

▶ Common factor / productivity

- (Expected) income drives house prices and spending

$$\begin{aligned} Y \uparrow \downarrow &\Rightarrow P^H \uparrow \downarrow \\ &\Rightarrow C \uparrow \downarrow \end{aligned}$$

Three potential explanations

► Wealth effect

- Unanticipated wealth gain (\sim winning the lottery)
- OLD (short in housing market)

$$P^H \uparrow\downarrow \Rightarrow C \uparrow\downarrow$$

► Collateral/credit effect:

- House price increase creates more collateral
- YOUNG (more often constrained)

$$P^H \uparrow \Rightarrow \text{Collateral} \uparrow \Rightarrow C \uparrow$$

► Common factor / productivity

- (Expected) income drives house prices and spending
- YOUNG (more years to reap gains)

$$\begin{aligned} Y \uparrow\downarrow &\Rightarrow P^H \uparrow\downarrow \\ &\Rightarrow C \uparrow\downarrow \end{aligned}$$

Three potential explanations

Literature unresolved

▶ Wealth effect

- Muellbauer and Murphy (1990),
- Campbell and Cocco (2007)
- Skinner (1996)
- ...

$$P^H \uparrow\downarrow \Rightarrow C \uparrow\downarrow$$

▶ Collateral/credit effect:

- Browning et al. (2013)
- Paiella & Pistaferri (2016)
- Leth-Petersen (2010)
- ...

$$P^H \uparrow \Rightarrow \text{Collateral} \uparrow \Rightarrow C \uparrow$$

▶ Common factor / productivity

- Attanasio and Weber (1994)
- Attanasio et al. (2009)
- King (1990)
- Pagano (1990)
- ...

$$Y \uparrow\downarrow \Rightarrow P^H \uparrow\downarrow \\ \Rightarrow C \uparrow\downarrow$$

Three potential explanations

Link to US crisis literature

▶ Wealth effect

- Foote et al. (2016)

$$P^H \uparrow\downarrow \Rightarrow C \uparrow\downarrow$$

▶ Collateral/credit effect:

- Mian and Sufi (2011)
- Mian, Rao, Sufi (2013)

$$P^H \uparrow \Rightarrow \text{Collateral} \uparrow \Rightarrow C \uparrow$$

▶ Common factor / productivity

- Adelino et al. (2016),
- Foote et al. (2016)
- (Davidoff, 2016)

$$\begin{aligned} Y \uparrow\downarrow &\Rightarrow P^H \uparrow\downarrow \\ &\Rightarrow C \uparrow\downarrow \end{aligned}$$

Additional hypothesis:

Mortgage refinancing can amplify effect

- ▶ In Denmark (as in the US) fixed rate mortgages can be refinanced to lock in lower market interest rate
- ▶ Refinancing a long-term loan brings a persistent reduction in debt service
- ▶ Also possible to extract equity when refinancing if collateral constraint ($LTV < 80\%$) is not binding
- ▶ Refinancing is costly: owners who wish to extract equity should do that when profitable to refinance to economize on transaction costs.
- ▶ Mortgage refinancing can amplify effect of home value changes on spending (Bhutta and Keys, 2016)

What do we do?

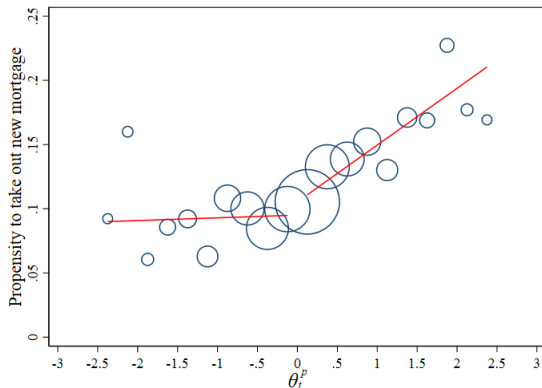
- ▶ We ask a random sample from the Danish population about house price and income expectations, 2011-2015
 - Longitudinal data about expectations to housing wealth (and income)
 - 12,949 observations / 5,353 Individuals

- ▶ Merge with objective 3rd party reported administrative data with information about wealth and savings
 - Subjective expectations and outcomes cannot be driven by same reporting bias

What do we find?

- ▶ Unanticipated housing wealth gains \Rightarrow Mortgage refinancing

Figure: Propensity to actively take out new mortgage and unanticipated house price gains



- ▶ ...and equity extraction and increased spending

What is new?

- ▶ Subjective expectations \Rightarrow clean test of wealth effect hypothesis
- ▶ Measure both balance sheet and spending outcomes
 - Can see how households manage household budget while measuring spending
- ▶ Longitudinal data
 - Control for selection effects when measuring the response
 - Check for mean reversion – durable vs non-durable spending

Outline

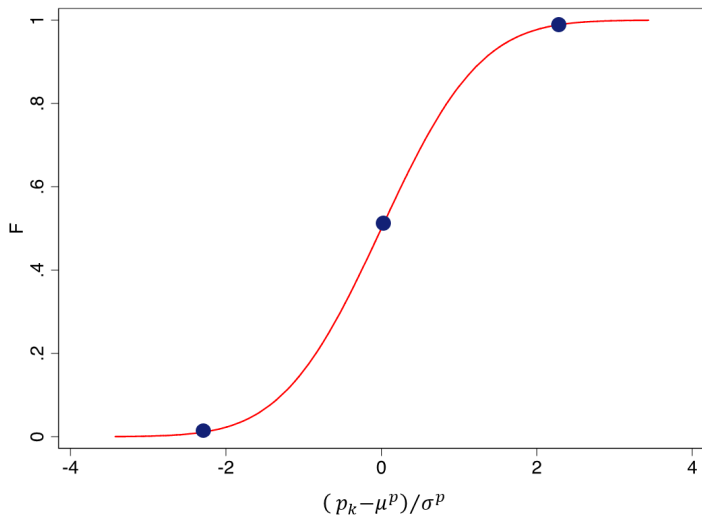
1. Asking about expectations
2. Data
3. Results
 - Bivariate graphical evidence
 - Multivariate analysis
 - Robustness
4. Summary

How do we do it?

- ▶ Ask about housing wealth expectations, week 4-9, 2011-2014
- ▶ Question: (free translation)
 - “What is the maximum price you could get for your house one year from now?” p^{max}
 - “What is the minimum price you could get for your house one year from now?” p^{min}
 - “What is the chance that your house will be worth less than $p^{mid} = p^{min} + (p^{max} - p^{min})/2$ ”
- ▶ Expected price 12 months ahead: (Dominitz 1997, Manski 2004, etc)
 - Interpret p_k : $p^{min}, p^{mid}, p^{max}$ as points on the support of a normal distribution
 - Interpret F_k : $prob = \Phi(p^{mid})$, and assume $0.01 = \Phi(p^{min}), 0.99 = \Phi(p^{max})$
 - “What is the chance that your house will be worth less than $p^{mid} = p^{min} + (p^{max} - p^{min})/2$ ”
 - Fit data points using NLS for each individual to give individual estimates of μ^P and σ^P

$$\min_{\mu^P, \sigma^P} \sum_{k=1}^3 \left[F_k - \Phi \left(\frac{p_k - \mu^P}{\sigma^P} \right) \right]^2$$

How do we do it?



How do we do it?

- ▶ Question: (12 months later)
 - “How much could you sell your house for today?” p_t

- ▶ Split price change into expected and unexpected part
 - Expected price change: $E_{t-1}[\Delta p_t]$
 - Unexpected price change (shock): $\theta_t^p = \Delta p_t - E_{t-1}[\Delta p_t]$

How do we do it?

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- ▶ Similar for income
 - Expected income change: $E_{t-1}[\Delta y_t]$
 - Unexpected income change (shock): $\theta_t^y = \Delta y_t - E_{t-1}[\Delta y_t]$

Empirical Model and Test of Hypotheses

$$\Delta c_{it} = \beta_1 \theta_{it}^p + \beta_2 E_{it-1}[\Delta p_{it}] + \beta_3 \theta_{it}^y + \beta_4 E_{it-1}[\Delta y_{it}] + \lambda_t + \mu_i + v_{it}$$

Wealth effect

Empirical Model and Test of Hypotheses

$$\Delta c_{it} = \beta_1 \theta_{it}^p + \beta_2 E_{it-1}[\Delta p_{it}] + \beta_3 \theta_{it}^y + \beta_4 E_{it-1}[\Delta y_{it}] + \lambda_t + \mu_i + v_{it}$$

Wealth effect Productivity

- ▶ Left hand-side: always 3rd party reported admin. register information
- ▶ Right hand-side: always survey

Empirical Model and Test of Hypotheses

$$\Delta c_{it} = \beta_1 \theta_{it}^P + \beta_2 E_{it-1}[\Delta p_{it}] + \beta_3 \theta_{it}^Y + \beta_4 E_{it-1}[\Delta y_{it}] + \lambda_t + \mu_i + v_{it}$$

- ▶ Identification: $cov(\theta_{it}^P, v_{it}) = 0$
- ▶ Sentiments:
 - "Thinking about the Danish economy, how do you think it will develop this year?" (improve, no change, deteriorate)
- ▶ Risk:
 - Infer subjective risk from subjective expectations data: σ^P, σ^Y

Administrative Register and Survey Data

Survey Data

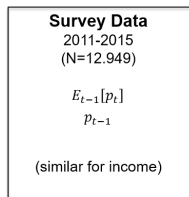
2011-2015
(N=12.949)

$$E_{t-1}[p_t]$$

$$p_{t-1}$$

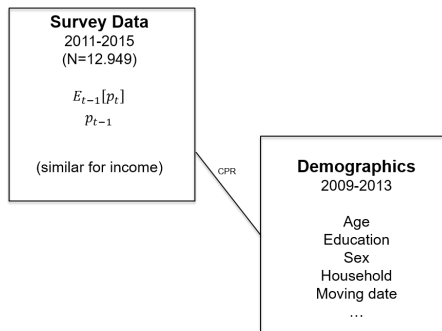
(similar for income)

Administrative Register and Survey Data

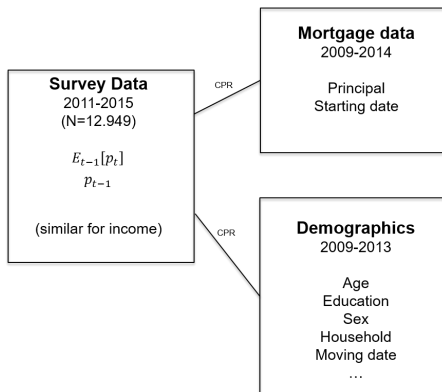


- ▶ Telephone survey, January 2011-2015
- ▶ Random sample
- ▶ Repeated interviews. Refreshment to reach about 6000 interviews in each round.
- ▶ Here, only consider house owners. Movers and self employed not included

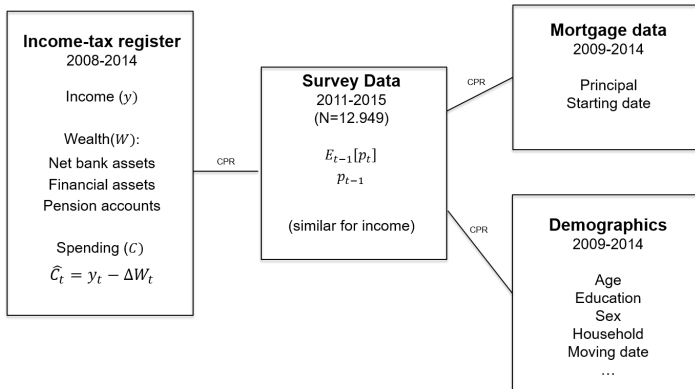
Administrative Register and Survey Data



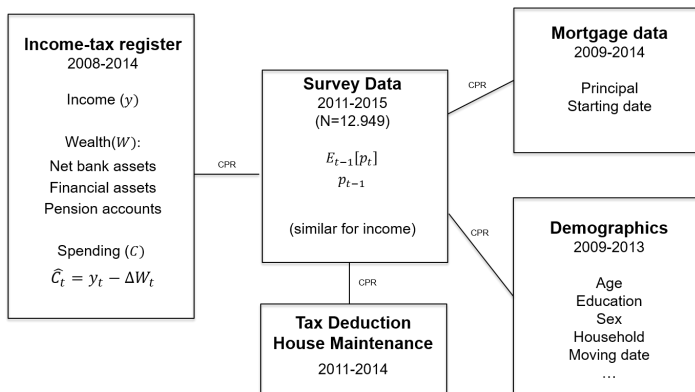
Administrative Register and Survey Data



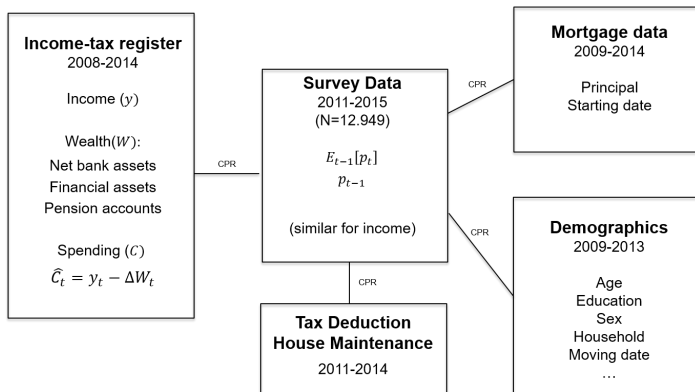
Administrative Register and Survey Data



Administrative Register and Survey Data



Administrative Register and Survey Data



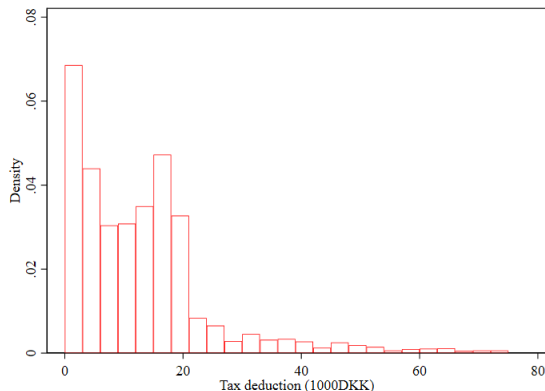
All economic variables normalized by average income (average over the period 2008-2010)

Tax Deduction for House Maintenance

- ▶ The “Housing-Job Scheme” (“BoligJob-ordningen”)
 - Started June 2011
- ▶ Tax deduction for services (i.e. only for labor)
 - Related to maintaining, repairing, or improving the house
 - Cleaning, gardening services, child care
- ▶ Maximum deduction: 15.000 DKK pr. Person
 - Value of tax deduction is $\sim 30\%$, i.e. at most 5000 DKK
- ▶ Report online to Tax Authorities
 - Upload receipt from supplier
 - Not complete picture of expenditure – an indicator of the type of spending

Tax Deduction for House Maintenance

- ▶ 25% of the observations in our sample have deductions recorded



- ▶ Conditional on deducting the average amount reported is 17,000DKK

Timing

Year, t

2011

2012

January

December

January

December

$E_{2010}[p_{2011}]$

p_{2010}

p_{2011}

Timing

Year, t

2011

2012

January

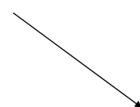
December

January

December



$E_{2010}[p_{2011}]$



p_{2010}



p_{2011}



θ_{2011}

$$\theta_t = \Delta p_t - (E_{t-1}[p_t] - p_{t-1})$$

Timing

Year, t

2011

2012

January

December

January

December



$E_{2010}[p_{2011}]$

p_{2010}

p_{2011}

θ_{2011}

$$\theta_t = \Delta p_t - (E_{t-1}[p_t] - p_{t-1})$$

Registry (31 December)

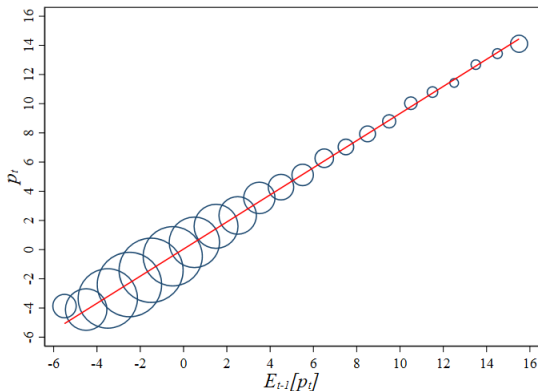
ΔC_{2011}

Timing

Year, t	2011	2012	2013	2014	2015
Survey (January)	$E_{10}[p_{11}]$	$E_{11}[p_{12}]$	$E_{12}[p_{13}]$	$E_{13}[p_{14}]$	
	p_{10}	p_{11}	p_{12}	p_{13}	p_{14}
$\theta_t = \Delta p_t - (E_{t-1}[p_t] - p_{t-1})$		θ_{11}	θ_{12}	θ_{13}	θ_{14}
Registry (31 December, t-1)		Δc_{11}	Δc_{12}	Δc_{13}	Δc_{14}

Results

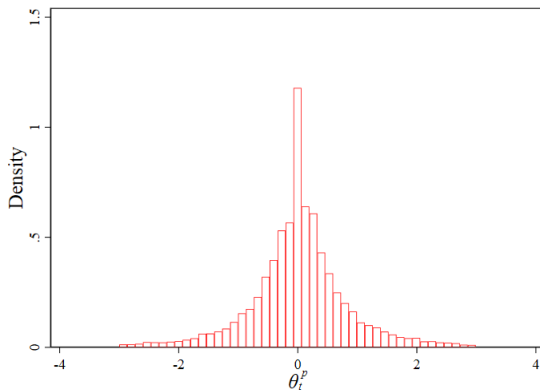
Stated actual price changes vs Expected price changes



Expectations are in the right direction

Results

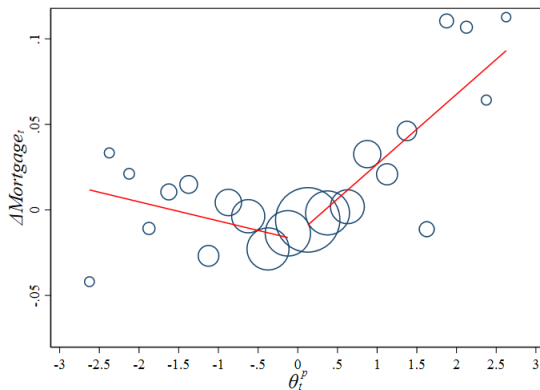
Distribution of house price shocks θ_t^p



Note: Unanticipated change is normalized by average income (average over the period 2008-2010)

Results

Unanticipated home value growth and mortgage debt growth.

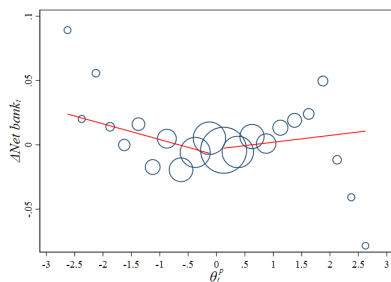


Mortgage growth for positive home value shocks

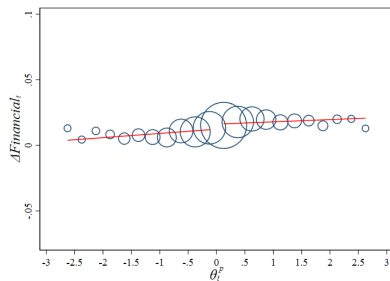
Results

House price shock and balance sheet adjustment

Net deposits



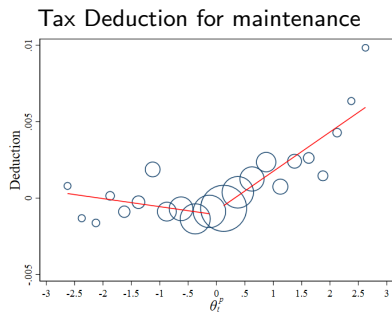
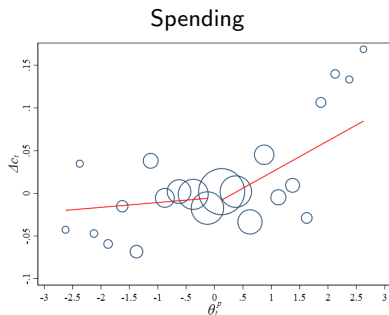
Financial assets



No adjustments in other parts of the balance sheet

Results

House price shock and spending, and mortgage growth



Spending responds to positive home value shocks

Multivariate analysis

	Δ Mortgage	Δ NetBank	Δ Financial	Δ Spending	Δ Spending, $t + 1$	Deduction
	b/se	b/se	b/se	b/se	b/se	b/se
	(1)	(2)	(3)	(4)	(5)	(6)
(a) Unanticipated price increase, $\theta^p > 0$	0.033*** (0.006)	-0.004 (0.005)	0.002 (0.002)	0.038*** (0.007)	-0.039*** (0.011)	0.001*** (0.000)
(b) Unanticipated price decrease, $\theta^p < 0$	-0.000 (0.005)	0.004 (0.005)	-0.001 (0.003)	0.004 (0.008)	-0.010 (0.010)	0.000 (0.000)
(c) Anticipated price increase, $[\Delta p] > 0$	0.028* (0.016)	-0.023** (0.012)	0.001 (0.008)	-0.009 (0.029)	-0.039 (0.041)	0.001 (0.001)
(d) Anticipated price decrease, $[\Delta p] < 0$	-0.028** (0.012)	0.012 (0.010)	0.004 (0.005)	-0.023 (0.020)	0.024 (0.026)	-0.000 (0.001)
(e) Unanticipated income increase, $\theta^y > 0$	-0.012 (0.020)	0.061*** (0.021)	-0.009 (0.013)	0.032 (0.038)	-0.025 (0.049)	0.004*** (0.001)
(f) Unanticipated income decrease, $\theta^y < 0$	-0.014 (0.015)	-0.003 (0.014)	-0.012* (0.006)	-0.013 (0.025)	-0.048 (0.032)	0.001* (0.001)
(g) Anticipated income increase, $[\Delta y] > 0$	-0.014 (0.016)	0.037** (0.017)	0.015* (0.008)	-0.008 (0.040)	0.024 (0.041)	-0.000 (0.001)
(h) Anticipated income decrease, $[\Delta y] < 0$	-0.056** (0.024)	-0.011 (0.027)	0.031** (0.014)	-0.177*** (0.044)	-0.028 (0.064)	-0.000 (0.001)
(i) Subjective price variance, σ^p	0.000*** (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000*** (0.000)	0.000*** (0.000)	-0.000 (0.000)
(j) Subjective income variance, σ^y	-0.000 (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.001*** (0.000)	-0.000 (0.000)	-0.000* (0.000)
(k) DK economy +	0.003 (0.006)	-0.000 (0.006)	-0.003 (0.003)	-0.001 (0.014)	-0.028 (0.017)	0.001 (0.000)
(l) DK economy -	0.005 (0.006)	0.006 (0.007)	-0.001 (0.004)	0.009 (0.014)	-0.020 (0.017)	-0.001** (0.001)
<i>N</i>	12,946	12,946	12,946	12,946	7,594	12,946

Multivariate analysis

		$\Delta Mortgage$ b/se (1)	$\Delta NetBank$ b/se (2)	$\Delta Financial$ b/se (3)	$\Delta Spending$ b/se (4)	$\Delta Spending, t + 1$ b/se (5)	$Deduction$ b/se (6)
(a)	Unanticipated price increase, $\theta^p > 0$	0.033*** (0.006)	-0.004 (0.005)	0.002 (0.002)	0.038*** (0.007)	-0.039*** (0.011)	0.001*** (0.000)
(b)	Unanticipated price decrease, $\theta^p < 0$	-0.000 (0.005)	0.004 (0.005)	-0.001 (0.003)	0.004 (0.008)	-0.010 (0.010)	0.000 (0.000)
(c)	Anticipated price increase, $[\Delta p] > 0$	0.028* (0.016)	-0.023** (0.012)	0.001 (0.008)	-0.009 (0.029)	-0.039 (0.041)	0.001 (0.001)
(d)	Anticipated price decrease, $[\Delta p] < 0$	-0.028** (0.012)	0.012 (0.010)	0.004 (0.005)	-0.023 (0.020)	0.024 (0.026)	-0.000 (0.001)
(e)	Unanticipated income increase, $\theta^y > 0$	-0.012 (0.020)	0.061*** (0.021)	-0.009 (0.013)	0.032 (0.038)	-0.025 (0.049)	0.004*** (0.001)
(f)	Unanticipated income decrease, $\theta^y < 0$	-0.014 (0.015)	-0.003 (0.014)	-0.012* (0.006)	-0.013 (0.025)	-0.048 (0.032)	0.001* (0.001)
(g)	Anticipated income increase, $[\Delta y] > 0$	-0.014 (0.016)	0.037** (0.017)	0.015* (0.008)	-0.008 (0.040)	0.024 (0.041)	-0.000 (0.001)
(h)	Anticipated income decrease, $[\Delta y] < 0$	-0.056** (0.024)	-0.011 (0.027)	0.031** (0.014)	-0.177*** (0.044)	-0.028 (0.064)	-0.000 (0.001)
(i)	Subjective price variance, σ^p	0.000*** (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000*** (0.000)	0.000*** (0.000)	-0.000 (0.000)
(j)	Subjective income variance, σ^y	-0.000 (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.001*** (0.000)	-0.000 (0.000)	-0.000* (0.000)
(k)	DK economy +	0.003 (0.006)	-0.000 (0.006)	-0.003 (0.003)	-0.001 (0.014)	-0.028 (0.017)	0.001 (0.000)
(l)	DK economy -	0.005 (0.006)	0.006 (0.007)	-0.001 (0.004)	0.009 (0.014)	-0.020 (0.017)	-0.001** (0.001)
N		12,946	12,946	12,946	12,946	7,594	12,946

- ▶ Effect of home value increase on mortgage extraction and spending
- ▶ Spending effect mean reverts + deduction effect \Rightarrow like durable spending

Collateral constraints – split by ex ante LTV and age

	(1)	(2)	(3)	(4)	(5)	(6)	
	$\Delta Mortgage$	$\Delta NetBank$	$\Delta Financial$	$\Delta Spending$	$\Delta Spending, t + 1$	$Deductions$	
	b/se	b/se	b/se	b/se	b/se	b/se	
	Young, High LTV						
(a)	Unanticipated price increase, $\theta^p > 0$	0.093*** (0.013)	-0.006 (0.007)	-0.001 (0.002)	0.091*** (0.019)	-0.099*** (0.026)	0.001*** (0.000)
	Unanticipated price decrease, $\theta^p < 0$	0.005 (0.012)	0.003 (0.008)	0.001 (0.002)	0.018 (0.017)	-0.007 (0.024)	-0.000 (0.000)
	Young, Low LTV						
(b)	Unanticipated price increase, $\theta^p > 0$	0.022** (0.010)	0.001 (0.012)	0.000 (0.004)	0.034** (0.015)	-0.023 (0.023)	0.001 (0.001)
	Unanticipated price decrease, $\theta^p < 0$	0.001 (0.007)	0.005 (0.010)	0.005 (0.005)	-0.012 (0.017)	-0.007 (0.023)	-0.000 (0.000)
	Old, High LTV						
(c)	Unanticipated price increase, $\theta^p > 0$	0.021* (0.011)	0.000 (0.010)	-0.001 (0.004)	0.019 (0.020)	-0.042* (0.024)	0.001* (0.001)
	Unanticipated price decrease, $\theta^p < 0$	0.017 (0.015)	-0.005 (0.009)	-0.006 (0.005)	0.035 (0.025)	-0.050 (0.032)	0.002** (0.001)
	Old, Low LTV						
(d)	Unanticipated price increase, $\theta^p > 0$	0.003 (0.009)	-0.006 (0.008)	0.005 (0.003)	0.013 (0.013)	-0.013 (0.015)	0.001 (0.000)
	Unanticipated price decrease, $\theta^p < 0$	-0.014** (0.006)	0.006 (0.009)	-0.002 (0.006)	-0.017 (0.015)	0.005 (0.016)	-0.000 (0.000)

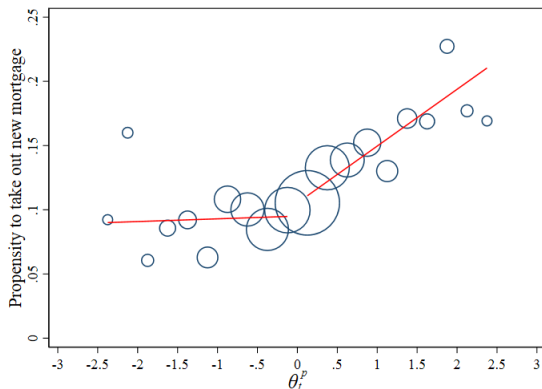
Collateral constraints – split by ex ante LTV and age

	(1)	(2)	(3)	(4)	(5)	(6)	
	$\Delta Mortgage$	$\Delta NetBank$	$\Delta Financial$	$\Delta Spending$	$\Delta Spending, t + 1$	$Deductions$	
	b/se	b/se	b/se	b/se	b/se	b/se	
Young, High LTV							
(a)	Unanticipated price increase, $\theta^p > 0$	0.093*** (0.013)	-0.006 (0.007)	-0.001 (0.002)	0.091*** (0.019)	-0.099*** (0.026)	0.001*** (0.000)
	Unanticipated price decrease, $\theta^p < 0$	0.005 (0.012)	0.003 (0.008)	0.001 (0.002)	0.018 (0.017)	-0.007 (0.024)	-0.000 (0.000)
Young, Low LTV							
(b)	Unanticipated price increase, $\theta^p > 0$	0.022** (0.010)	0.001 (0.012)	0.000 (0.004)	0.034** (0.015)	-0.023 (0.023)	0.001 (0.001)
	Unanticipated price decrease, $\theta^p < 0$	0.001 (0.007)	0.005 (0.010)	0.005 (0.005)	-0.012 (0.017)	-0.007 (0.023)	-0.000 (0.000)
Old, High LTV							
(c)	Unanticipated price increase, $\theta^p > 0$	0.021* (0.011)	0.000 (0.010)	-0.001 (0.004)	0.019 (0.020)	-0.042* (0.024)	0.001* (0.001)
	Unanticipated price decrease, $\theta^p < 0$	0.017 (0.015)	-0.005 (0.009)	-0.006 (0.005)	0.035 (0.025)	-0.050 (0.032)	0.002** (0.001)
Old, Low LTV							
(d)	Unanticipated price increase, $\theta^p > 0$	0.003 (0.009)	-0.006 (0.008)	0.005 (0.003)	0.013 (0.013)	-0.013 (0.015)	0.001 (0.000)
	Unanticipated price decrease, $\theta^p < 0$	-0.014** (0.006)	0.006 (0.009)	-0.002 (0.006)	-0.017 (0.015)	0.005 (0.016)	-0.000 (0.000)

Results driven by young owners with high loan to value (LTV) ratios

Mortgage Refinancing

Propensity to actively take out a new mortgage



Mortgage Refinancing

- ▶ Fixed rate mortgage (FRM) borrowers can refinance if the market rate has dropped significantly below the market interest rate
- ▶ Identify FRM borrowers with an incentive to refinance by rule-of-thumb: $D_{it}^{Incentive} = 1$ if
 - Loan volume $\geq 500,000$ DKK
 - ≥ 10 years until maturity
 - Market rate ≤ 1 %-point below coupon rate
- ▶ Reestimate model while adding $D_{it}^{Incentive}$ as a regressor as well as interactions between unanticipated home value changes and $D_{it}^{Incentive}$.

Mortgage Refinancing

	New Mortgage b/se (1)	FRM Refinance b/se (2)	Δ Mortgage b/se (3)
Unanticipated price increase, $\theta^p > 0$	0.019*** (0.005)	0.008** (0.003)	0.029*** (0.008)
Unanticipated price decrease, $\theta^p < 0$	-0.000 (0.004)	0.006** (0.003)	0.005 (0.007)
Unanticipated price increase \times Incentive, $\theta^p > 0$		0.062* (0.034)	0.219*** (0.049)
Unanticipated price decrease \times Incentive, $\theta^p < 0$		-0.023 (0.051)	0.081 (0.062)
Incentive to refinance		0.598*** (0.028)	-0.084*** (0.031)
<i>N</i>	11,933	11,933	11,933

- ▶ Unanticipated home value increase drives uptake of new mortgage

Mortgage Refinancing

	New Mortgage b/se (1)	FRM Refinance b/se (2)	Δ Mortgage b/se (3)
Unanticipated price increase, $\theta^p > 0$	0.019*** (0.005)	0.008** (0.003)	0.029*** (0.008)
Unanticipated price decrease, $\theta^p < 0$	-0.000 (0.004)	0.006** (0.003)	0.005 (0.007)
Unanticipated price increase \times Incentive, $\theta^p > 0$		0.062* (0.034)	0.219*** (0.049)
Unanticipated price decrease \times Incentive, $\theta^p < 0$		-0.023 (0.051)	0.081 (0.062)
Incentive to refinance		0.598*** (0.028)	-0.084*** (0.031)
<i>N</i>	11,933	11,933	11,933

- ▶ Unanticipated home value increase drives uptake of new mortgage
- ▶ The effect of an unanticipated home value increase is reinforced by refinancing motive

Additional Analyses / Robustness

Results are robust to

- ▶ Fixed effects
- ▶ Capital gains on financial assets
- ▶ Controlling for municipality \times year dummies
- ▶ Endogenous price growth
- ▶ Household outcomes

Conclusion

- ▶ House price increases cause spending: ($\partial c / \partial p = 0.03 - 0.05$)
- ▶ Concentrated on durable spending
- ▶ Effect strongest among young house owners (with higher LTV) suggesting that the effect of home value gains on spending operates through the **collateral channel**
- ▶ Effect is driven by take-up of new mortgage loans and refinancing of existing fixed rate mortgage loans
- ▶ Incentive to refinance FRM loans amplifies the effect
- ▶ Findings suggest that monetary policy can play a role in amplifying the effect of home value gains on spending by affecting interest rates on mortgage loans.