Peer Effects and Debt Accumulation: Heterogeneity and Consequences for Households' Financial Vulnerability

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[1]The views expressed in this presentation are those of the author, and do not in any way represent the views of Norges Bank.

Questions

- Can peer effects cause debt accumulation?
  1. If my peer increase consumption am I willing to take on new debt in order to increase my own consumption?
  2. What determines my inclination to accumulate debt?
  3. What are the longer-term consequences for households' financial vulnerability?
- Why should we care?
  - Post-financial crisis: household finance and, in particular, household debt center of attention

Existing evidence

- Peer effects and social finance:
  - Veblen (1899); Frank (1985); Manski (1993); Straub and Kuchler (2021); Gomes, Haliassos, Ramadorai (2021)
- Existing evidence:
  - **Consumption:** Kuhn, Kooreman, Soetevent and Kapteyn (2011); Di Girorgi, Fredriksen and Pistaferri (2020); Bertrand and Morse (2016)
  - **Mechanisms**: Bursztyn, Ederer, Ferman, and Yuchtman (2014); Charles, Hurst, and Roussanov (2009); Rayo and Becker (2006); Bursztyn, Ferman, Fiorin, Kanz, Rao (2018)
  - **Debt:** Agarwal, Mikhed, and Scholnick (2021); Georgarakos, Haliassos, and Pasini (2014); Kalda (2020)
- Debt and financial vulnerability :
  - Mian, Rao and Sufi (2014); Dynan (2012); Baker (2018) +++

Approach and contribution

1. **Identification**: Sidesteps self-selection effects by studying how lottery prizes affect neighbors of the winners

2. **Data**: Detailed household-level administrative data from Norway
   - Addresses$\rightarrow$ networks identified as closest neighbors
   - Household balance sheets from 1993 to 2006

- **Contribution**:
  - Causal estimates of the effect of peers' consumption on debt accumulation based on access to both (1) and (2)
  - Novel analysis of heterogeneity
  - Longer-term effects of peer effects on households' debt levels and financial vulnerability

Main results

1. Peer effects cause debt accumulation in neighborhoods
   - On average, neighbors of lottery winners increase debt by a fraction \$2.6/\$100.

2. Extra debt $\approx$ extra spending

3. Debt responses vary by
   - Neighborhood type
   - Family type (children)
   - Tenure
   - Indicators of higher financial literacy

4. After peer treatment, neighbors become more financially vulnerable
   - Higher debt-to-income and higher interest rate exposure
   - Sharper drop in consumption if income falls

Data

- Norwegian administrative data from 1994 to 2006 (2015).
  - Third-party reported data collected by the tax authorities
  - Universe of tax-paying individuals
  - Linked to the population register
- Main variables
  - Addresses (street, house number; move date; building type),
  - Household identifiers and characteristics (children, age, education)
  - Balance sheets (income, debt and wealth)
  - Debt = total debt (incl. mortgages)
  - Lottery prizes (participation rate ≈60%)

Panel regression model

$$Y_{it+h} = \beta_0 + \alpha_i + \tau_t + \beta_1 \mathbf{X}_{it-1} + \gamma^h Lottery_{it} + e_{it}$$

- Y_{ixt}: Outcome (e.g. debt) in levels for household i, in year $t + h$
- α_i, τ_t and $\mathbf{X}_{t-1}$: household- and time-fixed effects, time-varying controls
- $Lottery_i t$: the prize won in year t in the street where household i resides
- γ^h: cumulative debt response as a fraction of the prize at horizon h

- $N_{streets} = 13\,866$
- Standard errors clustered at street level
- Prize range: NOK 10K – NOK 1M ($\approx \$1\,000 - \$100\,000$)
- Treatment group: neighbors living within ten houses from a winner
  - Winner excluded!

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Empirical strategy to identify causal peer effects

- Identifying assumption: timing + size of lottery prize is random for neighbors

  Random assignment | pretreatment responses

- Restrict sample to one-time winning streets:
  - Streets included in sample win only *once* over entire sample period
  - Exclude gamblers
  - Exclude gambling streets

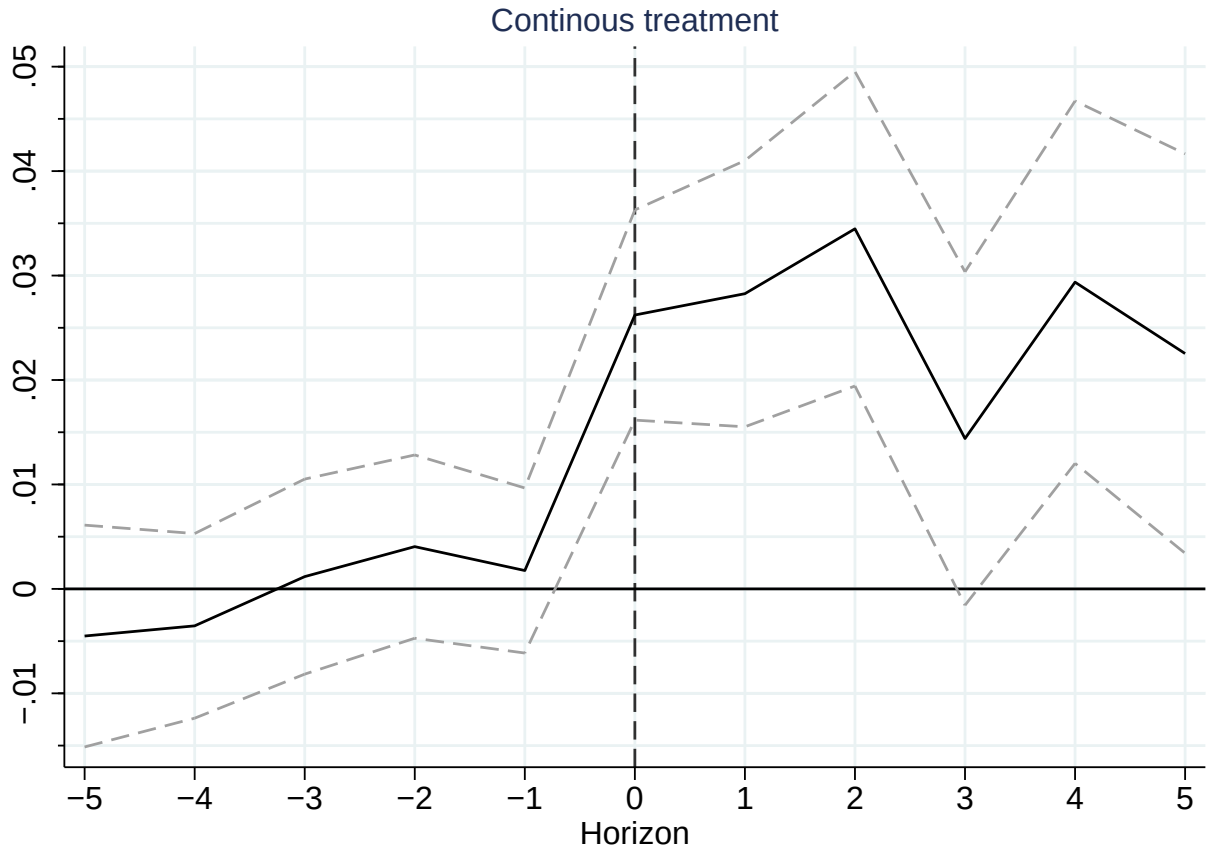
- Do neighbors observe the winners' extra expenditure?
  - Test: do neighbors that are more likely to observe the winner's consumption respond more strongly?
  - Heterogeneity analysis

Summary statistics

Table: Descriptive Statistics the year before treatment; Neighbors and Population

	Neighbors		Population	
	mean	sd	mean	sd
Year_{t-1}	2000	3.45	1999	3.64
Age_{t-1}	52	18.88	50	19.52
$\text{Family Members}_{t-1}$	2	1.38	2	1.36
Debt_{t-1}	391837	527830	377225	51645 9
Deposits_{t-1}	185747	332747	169876	323968
Net Income_{t-1}	289582	161571	273971	156037
$\text{Stocks \& Bonds}_{t-1}$	37328	127830	34116	125225
Observations	186455		1372039	

Result 1: debt accumulation among neighbors



- No sign of pretreatment responses
- Debt stays above pretreatement levels for five years

Result 1: debt accumulation among neighbors

Table: The contemporaneous debt responses among neighbors living within 10 houses from a lottery winner

	Model 1	Model 2
$Lottery_t$	0.026***	0.066***
	(0.005)	(0.0107)
$Lottery_t^2$		-7.75e-08***
		(1.68e-08)
N	612 259	612 259

- On average, neighbors increase debt by 2.6% of the prize
- Non-linear effect: the debt response is *decreasing* in prize size

Back-of-the-envelope-calculation

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Result 2: extra debt ≈ extra spending

Table: Neighbors' income-, liquid assets- and expenditure responses

Horizon:	Treatment year (t)	t+1	t+2
Debt	0.026***	0.028***	0.035***
	(0.005)	(0.007)	(0.008)
Expenditure	0.026***	0.014*	0.005
	(0.005)	(0.005)	0.006
Income	0.002	0.001	0.001
	(0.002)	(0.003)	(0.002)
Liquid assets	0.002	-0.005	-0.005
	(0.004)	(0.004)	(0.005)
N	571 378	555 128	533 883

- Neighbors take on debt to finance increased spending.
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Result 3: heterogeneity

- Basic strategy:
  - split treated households into groups based on observable characteristics
  - add interaction terms to baseline regression

- What factors determine the size of peer effects?

  - Distance & neighborhood type: stronger effects in closer, single-household dwellings (4.6%) Results
  - Family type: similar family types (3.7%) and children (3.5%) boost effect Results
  - Street tenure: no significant effect for "new neighbors" (0.4%)
  - Financial literacy: stronger effects among stock market participants (4.4%) and households with higher education (3.9%) Results

Result 4: financial vulnerability (motivation)

- Neighbors have higher debt-to-income and higher interest exposure after treatment Results
- Financial stability concern (in policy circles):
  - *"higher debt makes households less resilient against fluctuations in income, interest rates and wealth"*
- Do neighbors' consumption become more sensitive due to peer effects?
  - If income drops will the expenditure response be amplified?

Result 4: Peer effects and consumption smoothing

$$Expenditure_{it+1+h} = \beta_0 + \beta_1 \mathbf{X}_{it-1} + \gamma^h Lottery_t + \chi^h Income\ loss_{it+1} + \delta^h Lottery_t \# Income\ loss_{it+1} + \alpha_i + \tau_t + e_{it}$$

- $Income\ loss_{it+1}$: dummy equal to one if income drops 40% or more the year after treatment.
- γ^h average consumption peer effect
- χ^h average consumption response to income loss (in NOKs)
- δ^h additional expenditure response due to peer driven debt accumulation

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Result 4: Peer effects and consumption smoothing

Horizon:	Expenditure response $t+1$	$t+2$	$t+3$
$Lottery_t$	0.019***	0.007	0.006
	(0.006)	(0.006)	(0.006)
$Income\ loss(0/1)_{t+1}$	-12 880***	-15 164***	-7338
	(1182)	(1159)	(1176)
$Lottery_t * Income\ shock(0/1)_{t+1}$	-0.080***	-0.047*	-0.025
	(0.017)	(0.022)	(0.020)
N	555 128	532 522	507 802

- Debt accumulation due to peer effects amplify the expenditure response to an income drop
- Back-of-the-envelope:
  - For the average prize (90K) and the average income shock (-50K):
  - MPC out of income loss increase from 23% to 32%

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Conclusion

- Question: Can peer effects cause debt accumulation?
- Approach: Lottery prizes for identification and detailed household-level panel data
- Results and contribution:
  1. Causal estimates of the effect of peers' consumption on debt accumulation at the intensive margin
  2. Linked expenditure and debt responses
  3. Novel analysis of heterogeneity
  4. Longer-term effects of peer effects on households' debt levels and financial vulnerability

Predictability of winners and neighbors

	Small-prize sample		Big-prize sample	
Treatment	Timing(0/1)	Prize size	Timing(0/1)	Prize size
Age_{t-1}	0.000	0.519	0.000	-0.604
	(1.28)	(0.90)	(0.09)	(-0.48)
Family $Size_{t-1}$	0.001	182.097+	0.001	48.790
	(1.40)	(1.68)	(0.73)	(0.17)
$Moved_{t-1}$	-0.003	-65.722	0.007	895.806
	(-0.99)	(-0.14)	(1.24)	(0.51)
$Income_{t-1}$	0.000	0.000	0.000	0.000
	(0.51)	(0.49)	(0.28)	(0.67)
$Deposits_{t-1}$	-0.000	-0.000	-0.000+	-0.000
	(-0.67)	(-0.55)	(-1.90)	(-1.50)
Stocks & $Bonds_{t-1}$	-0.000	-0.000	0.000	0.000
	(-1.41)	(-0.91)	(0.52)	(0.51)
$Inheritance_{t-1}$	-0.000	-0.000	-0.000	0.000
	(-0.95)	(-0.14)	(-0.01)	(0.10)
$Debt_{t-1}$	0.000	-0.000	-0.000	-0.000
	(0.46)	(-0.81)	(-0.82)	(-1.23)
Constant	0.046***	4007.767**	0.068***	18600.751***
	(4.57)	(2.71)	(6.79)	(6.03)
N	1936287	1936287	840977	840977
adj. R^2	0.006	0.002	0.006	0.003
F (prob>F)	1.12 (.35)	.58 (.80)	1.03 (.40)	.58 (.80)

- F-test: cannot reject the null that all coefficients are zero.

back

Peer effects and the winners' expenditure

- Assume that neighbors observe and respond to the winners *expenditure* response (not the prize event or prize amount itself)
- Back-of-the-envelope calculation: scale neighbors debt response by winners consumption response:
- Winners spend roughly 42% of their prize the first year
- $\rightarrow$ an average peer effect in debt of 6.2 % of the winners' expenditure response

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Heterogeneity: Distance and neighborhood type

- Estimates are consistently higher for next-door neighbors, but differences are not statistically significant
- Stronger peer effects in neighborhoods consisting of single-household dwellings

	All neighbors	Closest neighbors
$Lottery_t$	0.040***	0.046**
	(0.008)	(0.015)
$Lottery_t * Apartments(0/1)$	-0.028**	-0.038*
	(0.010)	(0.018)
N	612 259	150 796

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Heterogeneity: Tenure

- No significant effect among neighbors with shortest tenure (<8 years)

	(1) 1st quartile	(2) 2nd quartile	(3) 3rd quartile	(4) 4th quartile
$Lottery_t$	0.004	0.034**	0.034***	0.018**
	(0.015)	(0.010)	(0.010)	(0.007)
N	79 922	141 618	174 343	216 376

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Expenditure and liquid assets

Table: Responses of neighbors' debt, deposits and expenditure by high and low deposits in $t-1$

	t		$t+1$		$t+2$	
$Deposits_{t-1}$:	High	Low	High	Low	High	Low
Debt	0.008	0.035***	0.015	0.030***	0.017	0.040***
	(0.009)	(0.007)	(0.010)	(0.008)	(0.010)	(0.011)
Deposits	-0.007	0.009***	-0.017*	0.007*	-0.016	0.012*
	(0.008)	(0.003)	(0.009)	(0.003)	(0.011)	(0.005)
Expenditure	0.020***	0.028***	0.016	0.006	0.015	-0.007
	(0.008)	(0.006)	(0.008)	(0.007)	(0.010)	(0.008)
N	266 623	345 636	260 861	334 266	252 315	320 609

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Heterogeneity: Family type

- Stronger effect among households with children
- Stronger effect if winner and neighbor have same family type (children/no children)

	Children	Aligned
$Lottery_t$	0.017**	0.018**
	(0.005)	(0.006)
$Lottery_t * \#Children_t$	0.018**	.
	(0.006)	.
$Lottery_t * Aligned(0/1)$	.	0.019†
	.	(0.010)
N	612 259	612 259

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Heterogeneity: Financial literacy

- Indicators of higher financial literacy → higher debt response

	Income	Stock owner	Education level
$Lottery_t$	0.031***	0.015**	0.007
	0.006	(0.005)	(0.006)
$Lottery_t * Income_{t-1}$	0.015***	.	.
	(0.005)		
$Lottery_t * Stocks(0/1)$	.	0.029**	.
		(0.011)	
$Lottery_t * Education(0)$	.	.	.
$Lottery_t * Education(1)$	.	.	0.022*
			(0.009)
$Lottery_t * Education(2)$	.	.	0.032*
			(0.015)
N	612 259	612 259	612 259

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Households' financial vulnerability: indicators

- Neighbors have higher debt-to-income and higher interest exposure
- Financial stability concern: higher debt makes households less resilient against fluctuations in income, interest rates and wealth

Horizon:	Horizon t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
Net interest exposure$_{t+h}$	0.025***	0.033***	0.039***	0.023*	0.025*	0.0351**
	(0.006)	(0.007)	(0.009)	(0.010)	(0.011)	(0.012)
DTI_{t+h}	1.05***	0.92***	0.84**	0.18	0.85**	0.65*
	(0.21)	(0.24)	(0.28)	(0.31)	(0.30)	(0.32)
N	612 259	595 127	572 924	547 330	519 670	490 755

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