Financial Econometrics – Cross Section and Panel Data

Discussion of “The Impact of Repossession Risk on Mortgage Default” by O’Malley, JF 2021

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Reminder – questions for discussion

- What is/are the economic question(s) the paper is trying to answer? What is the paper's "unique selling point" (USP), i.e. how does it move the literature forward?
- What is the empirical approach? Potential endogeneity issues & how does the paper address them?
- Data used & main results? Economic interpretation?
- What do you like about the paper?
- What could be improved / wasn't clear to you?

Try to link in particular to things we discussed in the lectures. Also think about the way results are communicated (tables/figures/writing).

Economic question and the paper's USP

- How do government debt relief policies affect borrowers' propensity to default on their loan ("strategic default") ?
  — could frame more broadly: to what extent does collateral mitigate moral hazard?

- USP: a natural experiment in Ireland that made repossession of homes by banks illegal, but only for mortgages originated before a certain date.
  — in July 2011, a judge ruled that properties mortgaged before Dec 2009 could no longer be repossessed in the event of default.

- Administrative data on loan performance
  — additional information on deposits for subset of borrowers to allow estimation of heterogeneity in treatment effects

Empirical approach

- Generally there is simply no variation in repossession risk across different borrowers within same country
- The judgement in July 2011 naturally created two groups
  - — treated: loans originated before Dec 2009
  - — control: those originated after (which remain subject to repossession risk)
  - — Note: it's key that the judgement happened *after* the cut-off date

- One difficulty: loans that have been open for longer naturally have higher default rates; lending standards may have changed over time, and loans also differ in their interest rates
  - — author tries to make treatment & control group more comparable by using 6-month windows around Dec 2009 originations, and matching on observable characteristics

Data

- Quarterly loan-level data covering about 2/3 of the Irish market, for Oct 2010 – July 2012 (one year pre/post)
  — 7,913 loans, of which 4,488 "treated" (originated pre-Dec 2009)

Table I
Summary Statistics

This table reports mean values for continuous control variables (top panel) and proportions in percent for discrete control variables (bottom panel). Estimates are computed on data in the period immediately preceding the judgment (March 2011). Also reported is the variable dictating treatment status, that is, distance from cutoff, which is given as the number of days between the loan origination date and the December 1 cutoff date.

	Mean		
	All	Control	Treatment
Treated	0.50		
Interest rate (%)	4.11	3.89	4.33
Loan-to-value ratio (%)	77.42	78.59	76.25
log(Income)	10.95	10.96	10.95
Borrower 1 year-of-birth	1973	1973	1972
Outstanding balance (€)	176,080.10	180,299.20	171,861.10
Term remaining (months)	276.26	283.38	270.12
Monthly installment (€)	952.54	939.62	965.49
Distance from cutoff (Origination days since 1st December 2009)	−4.12	88.9	−97.2

	Proportion (%)		
	All	Control	Treatment
Fixed interest rate	40.34	55.56	25.11
First-time purchaser	49.57	53.06	46.07

Notice differences in some relevant observables… not clear if this table is based on sample after matching?

Also, why are 50% treated (vs. description)?

Graphical illustration of main effect

- Model transition into 90-day default (afterward, drop from sample – i.e. default is an absorbing state)

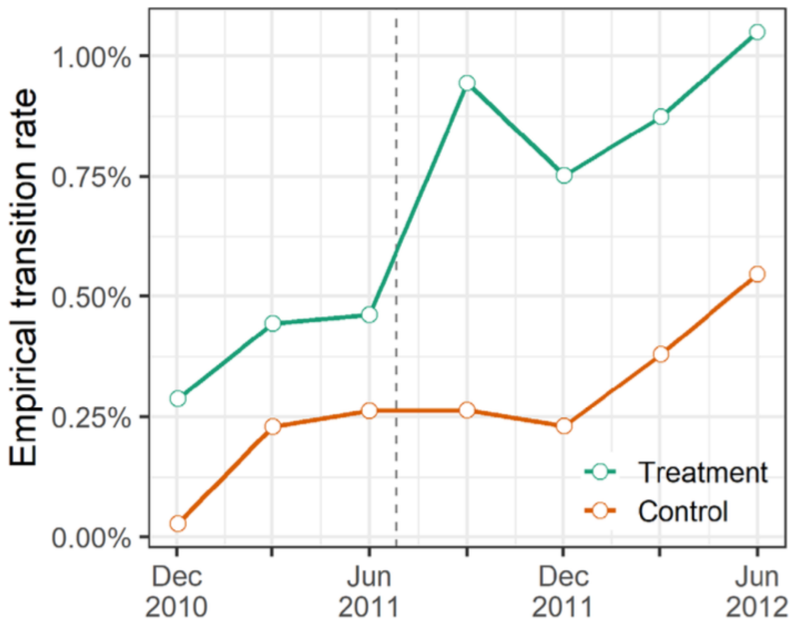


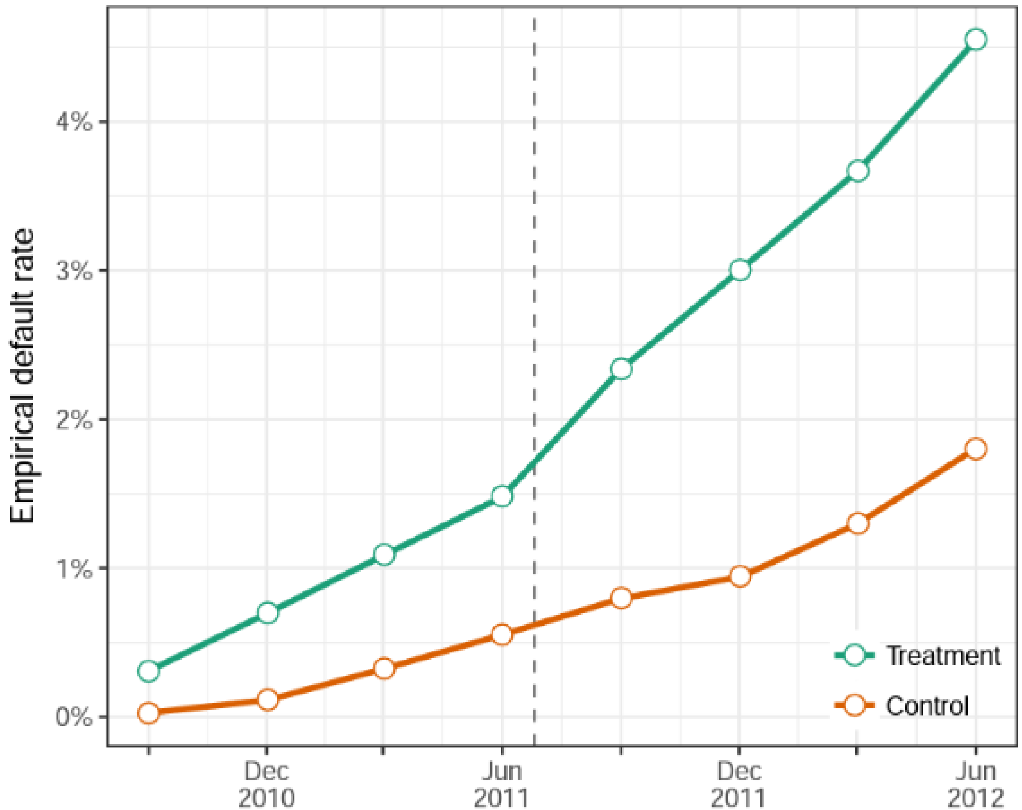
Figure 1. Empirical default rates by group. This figure plots the empirical default rates over time by treatment group. Data are quarterly transition-to-delinquency rates. The dashed vertical line indicates the date of Dunne judgment ruling. The treatment groups comprise loans originated up to six months before the cutoff date specified in the judgment. The control group comprises loans originated within the six months after the judgment. (Color figure can be viewed at wileyonlinelibrary.com)

Thoughts on this figure?

What does it say about validity of research design?

Graphical illustration of main effect

- From working paper version: default rates <u>in levels</u> (on the ”stock” of loans)



Thoughts on this figure?

Main regression specification

$$\text{Default}_{ijbgrt} = \alpha + c_i + \beta^{DD}(\text{Treatment}_j \times \text{Post}_t) + \mathbf{X}'_{it}\Psi + \phi_{rt} + \tau_{bgt} + \epsilon_{ijbgrt}, \quad (1)$$

where i, j, b, g, r, and t are index loan, treatment group, issuing bank, product type, borrower region, and time, respectively, and β^{DD} is the treatment effect of interest to be estimated from the data. Under the assumption that the error term is exogenous conditional on the model covariates, $\hat{\beta}^{DD}$ is the causal effect of the Dunne judgment on default and hence an estimate of the sensitivity of mortgage default to the removal of repossession risk.

- What are the key assumptions here?
  - — linear effects of treatment and fixed effects/controls on probability of entering default
  - — origination time does not independently matter for default
- Role of fixed effects and controls?

Main table

- Part 1…

	Default						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treated×Post	0.0034***	0.0036***	0.0038***	0.0038***	0.0033***	0.0034***	0.0033***
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Treated	0.0021***	0.0007	0.0006	0.0006	0.0022***		
	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0006)		
Post	0.0016***	−0.0001	0.0004	0.0005		0.0016***	
	(0.0005)	(0.0005)	(0.0005)	(0.0005)		(0.0005)	
Installment (€)		−0.000001					
		(0.000001)					
Loan-to-value (%)		0.0001***					
		(0.00001)					
Negative equity		0.0007	0.0037***	0.0037***			
		(0.0008)	(0.0007)	(0.0007)			
log(Outstanding balance)			0.0042***	0.0041***			
			(0.0005)	(0.0005)			
Borrower 1 year-of-birth		−0.0002***	−0.0002***	−0.0002***			
		(0.00004)	(0.00004)	(0.00004)			
log(Income at origination)		−0.00003	−0.0024***	−0.0024***			
		(0.0007)	(0.0006)	(0.0006)			
Interest rate			−0.0008	−0.0011**			
			(0.0007)	(0.0005)			
Above median interest rate			0.0011				
			(0.0008)				
Variable rate		0.0038***	0.0038***	−0.0053*			
		(0.0005)	(0.0005)	(0.0027)			
Variable rate×interest rate				0.0023***			
				(0.0007)			
Fixed effects							
Region		Y	Y	Y			
Time					Y		
Vintage (month)						Y	Trend
Observations	80,259	80,084	80,251	80,251	80,255	80,259	

What do coefficients Treated X Post and Treated tell us (across columns)?

Is treatment effect big or small?

Main table

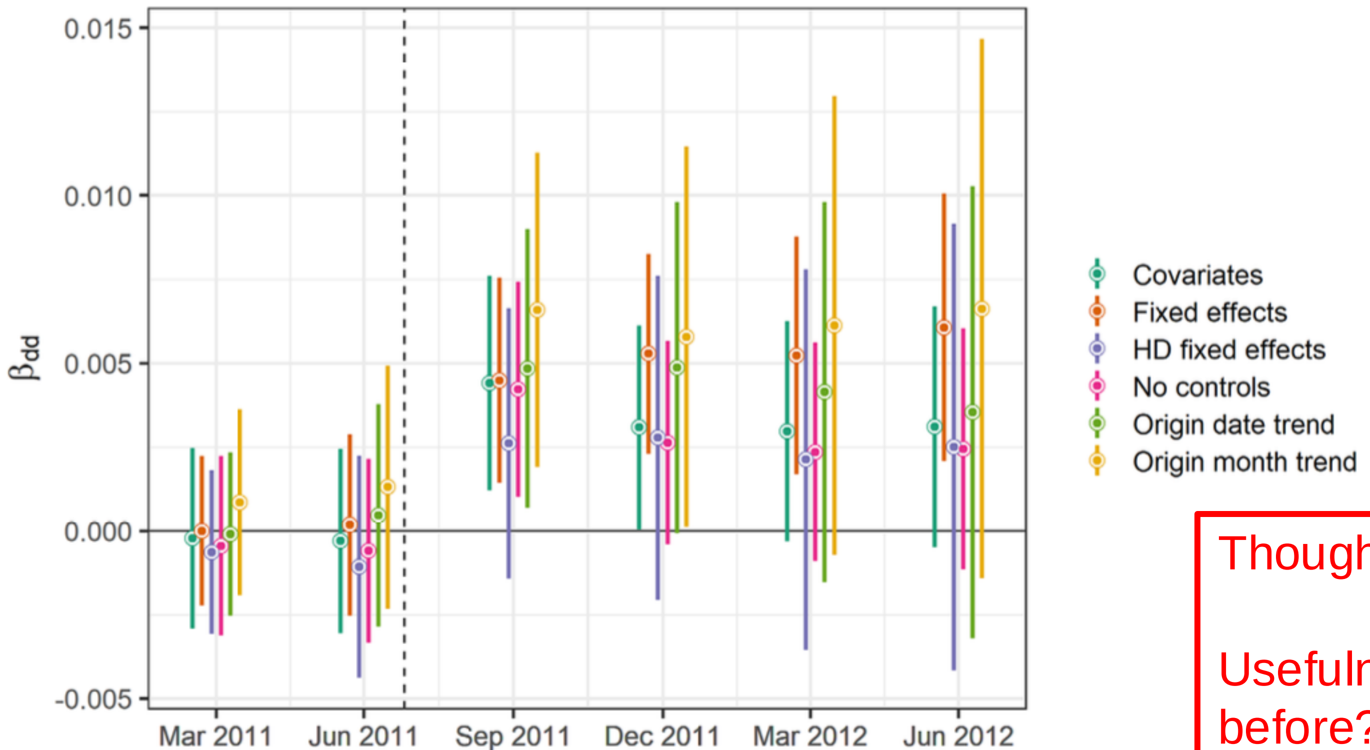
- …and Part 2

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Treated×Post	0.0050**	0.0029***	0.0035**	0.0043***	0.0048**	0.0035*	0.0035*
	(0.0020)	(0.0009)	(0.0014)	(0.0015)	(0.0020)	(0.0019)	(0.0019)
Treated	0.1149	0.0013**	−0.0001				
	(0.1298)	(0.0006)	(0.0012)				
Installment (€)						−0.00003***	−0.00003***
						(0.00001)	(0.00001)
Loan-to-value (%)						0.0007***	0.0007***
						(0.0001)	(0.0001)
Negative equity						0.0021	0.0022
						(0.0014)	(0.0014)
log(Outstanding balance)			0.0042***	0.0041***			
			(0.0005)	(0.0005)			
Interest rate			−0.0008	−0.0011**			
			(0.0007)	(0.0005)			
Above median interest rate			0.0011				
			(0.0008)				
Variable rate						0.0041	0.0044
						(0.0031)	(0.0032)
Origination date			−0.0001				
			(0.0003)				
Origination date×time			0.0000	−0.000000**			
			(0.000000)	(0.000000)			
Origination date×post						−0.00002**	
						(0.00001)	
Fixed effects							
Loan				Y	Y	Y	Y
Time	Y	-	Y	Y	Y	Y	-
Bank-Product-Time		Y					
Vintage (month)	Trend				Y		
Vintage (Linear)-Time							Y
Observations	80,259	80,259	80,259	80,259	80,259	80,084	80,084

- Clearly information overload – but also shows how many different specifications can be considered here

Event study specification

$$\text{Default}_{ibfgrt} = \alpha + c_i + \sum_{t \neq \text{Dec2010}} \{\beta_t \times \mathbb{1}(\text{Quarter}_t) + \beta_t^{DD}$$
$$\times \mathbb{1}(\text{Quarter}_t) \times (\text{Treated}_g)\} + \mathbf{X}_{it}'\Psi + \phi_{r,t} + \tau_{b,f,t} + \epsilon_{ibfgrt}. \quad (2)$$

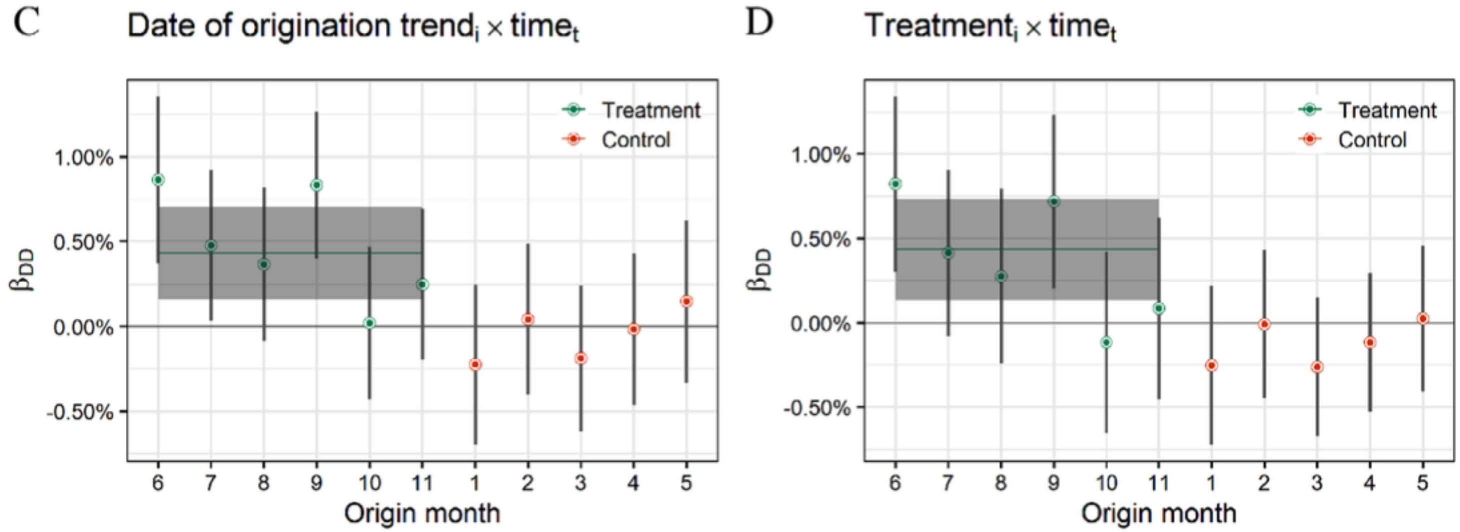


Thoughts on this chart?

Usefulness vs. table from before?

Other analyses

- Estimate treatment effect separately by month of origination, with idea that should "jump" in post-period for originations just before vs. just after Dec 2009 threshold
  - — referee request…
  - — results really don't look that good – Oct/Nov 2009 originations look more like 2010 originations. But he does not add controls here – a bit puzzling (also the discussion)…



Other analyses

- Changing the "bandwidth" of the sample window
  — +/- 180 days, vs. 30 to 270 days
  — doesn't matter much – nice figure that shows this

- Permutation inference – recognizing that effectively only have two groups / clusters
  — run random "placebo" experiments to simulate the distribution of estimated treatment effects & get p-values

- Heterogeneous treatment effects via triple-diff
  — interact with terciles of liquid wealth distribution or with terciles of loan-to-value ratio, using only loans from one bank
  — results shown on next slide

Heterogeneous treatment effects

distribution. Conventional standard errors are shown in parentheses and loan-clustered standard errors are shown below them in brackets. *, ** and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Default	
	Liquidity (1)	LTV (2)
Treated × Post	0.0150 (0.0053)*** [0.0088]*	−0.0046 (0.0052) [0.0051]
Post × Account Balance T2	−0.0034 (0.0049) [0.0045]	
Post × Account Balance T3	−0.0069 (0.0049) [0.0039]*	
Post × LTV T2		−0.0035 (0.0050) [0.0046]
Post × LTV T3		−0.0063 (0.) [0.0041]
Treated × Post × Account Balance T2	−0.0102 (0.0074) [0.0103]	
Treated × Post × Account Balance T3	−0.0166 (0.0075)*** [0.0090]*	
Treated × Post × LTV T2		0.0115 (0.0074) [0.0077]
Treated × Post × LTV T3		0.0198 (0.0074)*** [0.0087]**
Observations	7,998	7,998
Loan FE	Y	Y

Interpretation?

Standard errors?

What I liked / what could be improved

- Clear “natural experiment”, important policy question
- Very thorough analysis that illustrates how “messy” even a setting that seems quite simple can be
- Event study chart
- Good discussion of economic magnitudes of effects and external validity issues

- Room for improvement: more focus on a subset of specifications – ideally the same across event study, main table, and robustness checks
  - rest could go into online appendix
- Some of the discussion not clear (e.g. of matching)
- “Month of origination” analysis partly undermines credibility of results