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EUROSYSTEM

# Economic crises and the lender of last resort: Evidence from nineteenth century France

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## Motivation

Different central banks apply different eligibility criteria, i.e.

- Who they deal with (counterparties)
- What assets they purchase outright or accept as collateral

Are these differences in the access to the CB neutral with respect to real economic outcomes (e.g. defaults of NFCs)?

Quantitative assessment difficult because

- Crises (income shocks) are rare events
- There might be reverse causality (moral hazard)
- Other policies might change at the same time (identification)

## Contribution

Present quantitative evidence exploiting

- A quasi natural experiment to exclude reverse causality (effect of an agricultural disease on defaults of NFCs)
- a peculiarity of eligibility rules of the 19th century Bank of France to measure differences at the district level of eligibility
- in a context in which neither the policy rate nor fiscal policy was used to smooth the crisis

→ Diff-in-diff strategy to test whether broader access to the lender of last resort limited the increase in defaults of non-agricultural NFCs as a consequence of the disease.

**Result: eligibility rule reduced the default rates of NFCs by about 10-15%.**

## Specification

We estimate the following equation at the district level

$$DR_{it} = \beta \cdot Shock_{it} + \gamma \cdot Elig_{it} + \eta \cdot Shock_{it} \cdot Elig_{it} + \xi Controls_{it} + \delta_t + \alpha_i + \delta_t \cdot \alpha_i + \epsilon_{it}$$

- where  $DR_{it}$  is the default rate of NFCs in district  $i$  at year  $t$
- $Shock_{it}$  measures the depth of the crisis in district  $i$  at year  $t$
- $Elig_{it}$  measures eligibility to the lender of last resort in  $i$  at  $t$
- $Controls_{it}$  including measures for refinancing through national deposit banks

Identification assumptions:

- Absent any financial friction, there is no cost for trading an ineligible assets against an eligible asset
- Eligibility must be neutral during crises

## Eligibility

Discount facility refinanced any trader on demand (no pre-set limit)

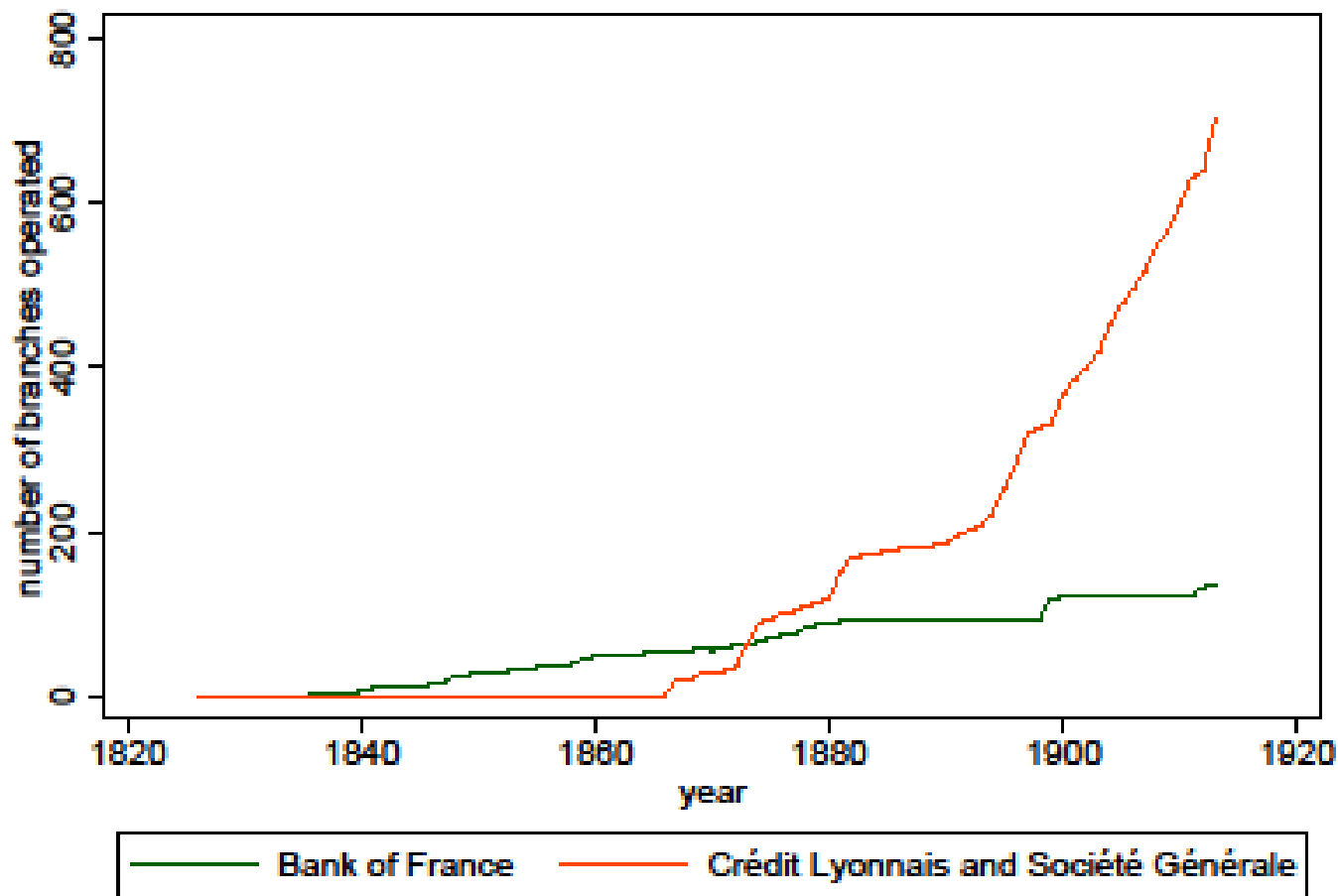
- Outright purchase of bills of exchange of traders (but not of farmers)
- But eligibility required residency close enough to a BoF branch

→ Each opening of a branch increased

- the number of eligible counterparties living close to the newly opened branch
- the amount of eligible bills payable in places close to the newly opened branch

Variations in # or density of branches therefore vary the exposure to the treatment (being eligible).

## Number of branches of BoF and national deposit banks



Source: See text.

## The branches of the Bank of France in 1913



## Phylloxera-induced economic crises

### Negative productivity shock on wine production

- Phylloxera arrived by steamship - innocuous in its original US ecology
- Sucked the sap of vines, which made them die
- Too small to move autonomously from one field to another

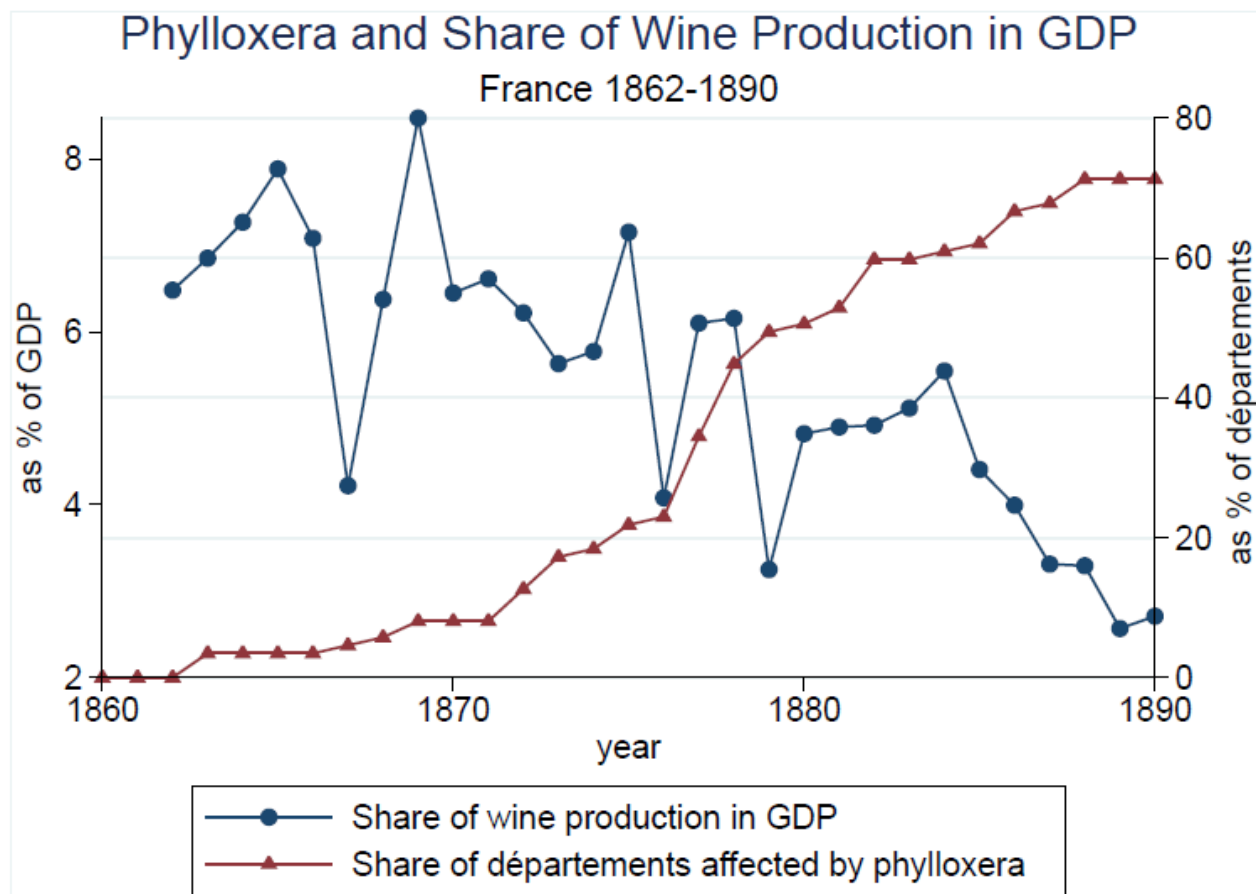
### Policy response

- No fiscal subsidies to compensate farmers, no decreases in policy rates
- No relaxation of credit standards by the BoF (see later)
- Limited to supporting scientific research

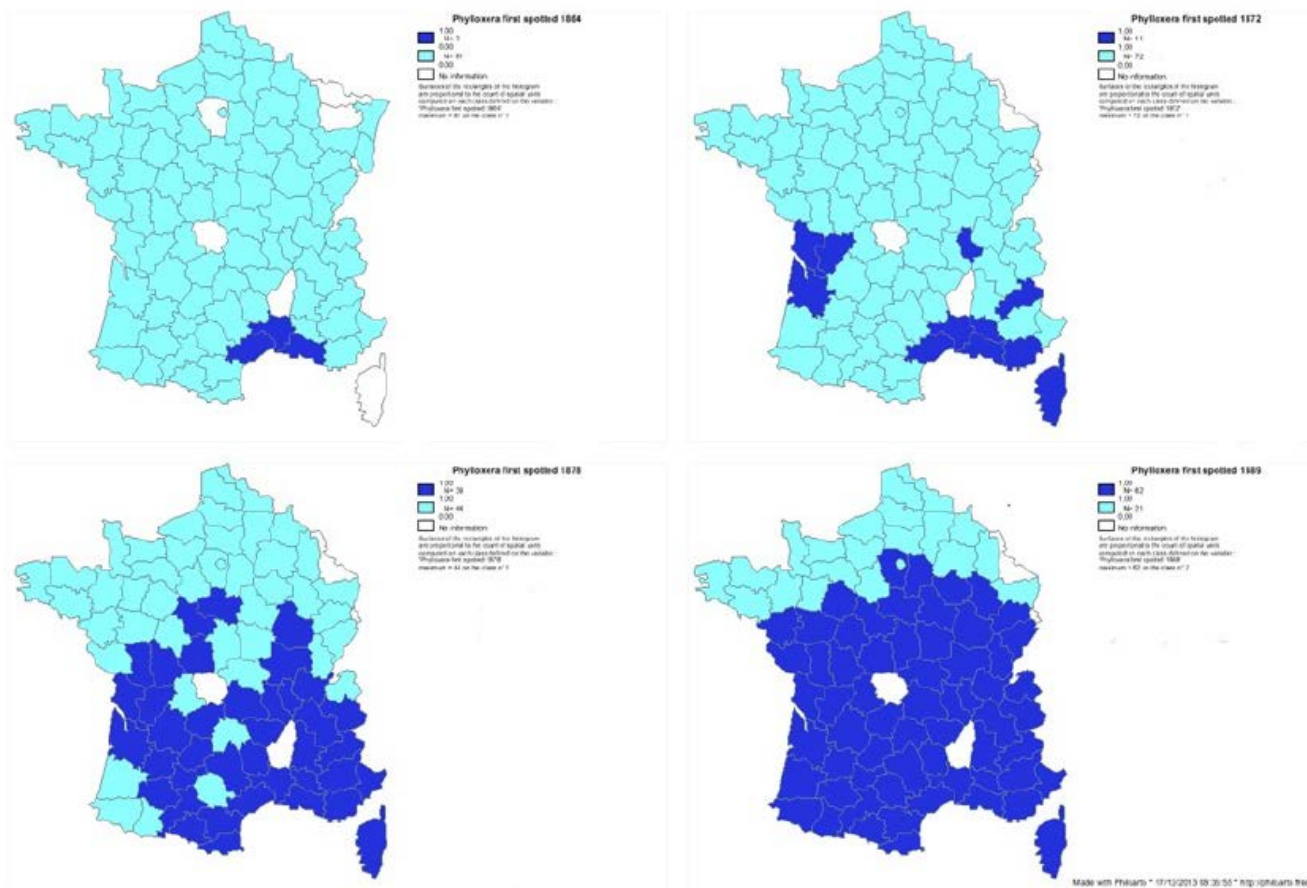
→ The arrival of the disease translated into a negative income shock on the other sectors + distress of local banks



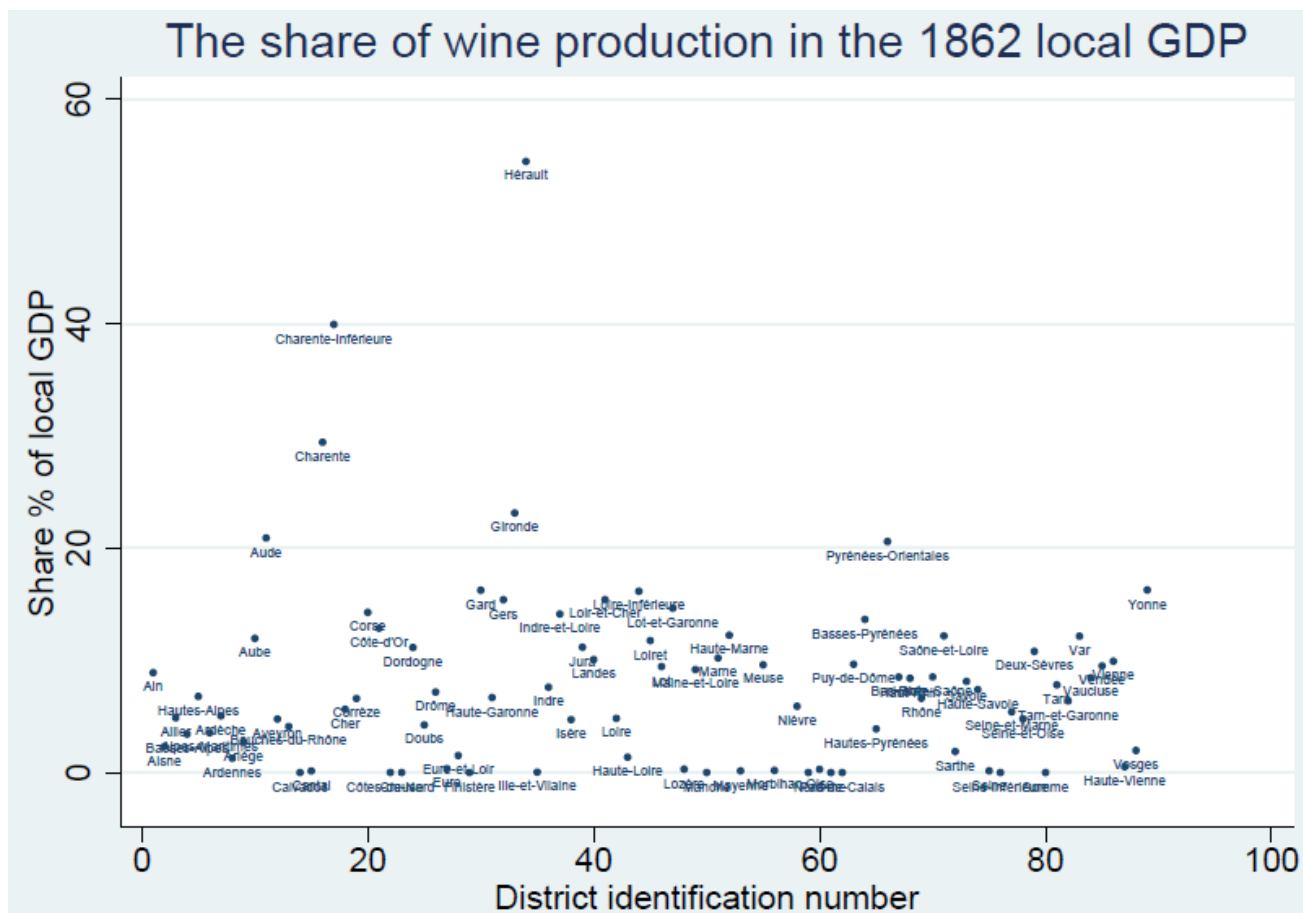
# The spread of phylloxera and share of wine in French GDP



# The spread of Phylloxera onto the territory



## Size of shock to local economy varies across districts



## Definition of variables

Dependent variable: Default rate of banks and NFCs

- Defaults measured by # of new openings of judicial procedure
- Triggered by not honoring payment when due
- Procedure only available for banks and firms in services and industry

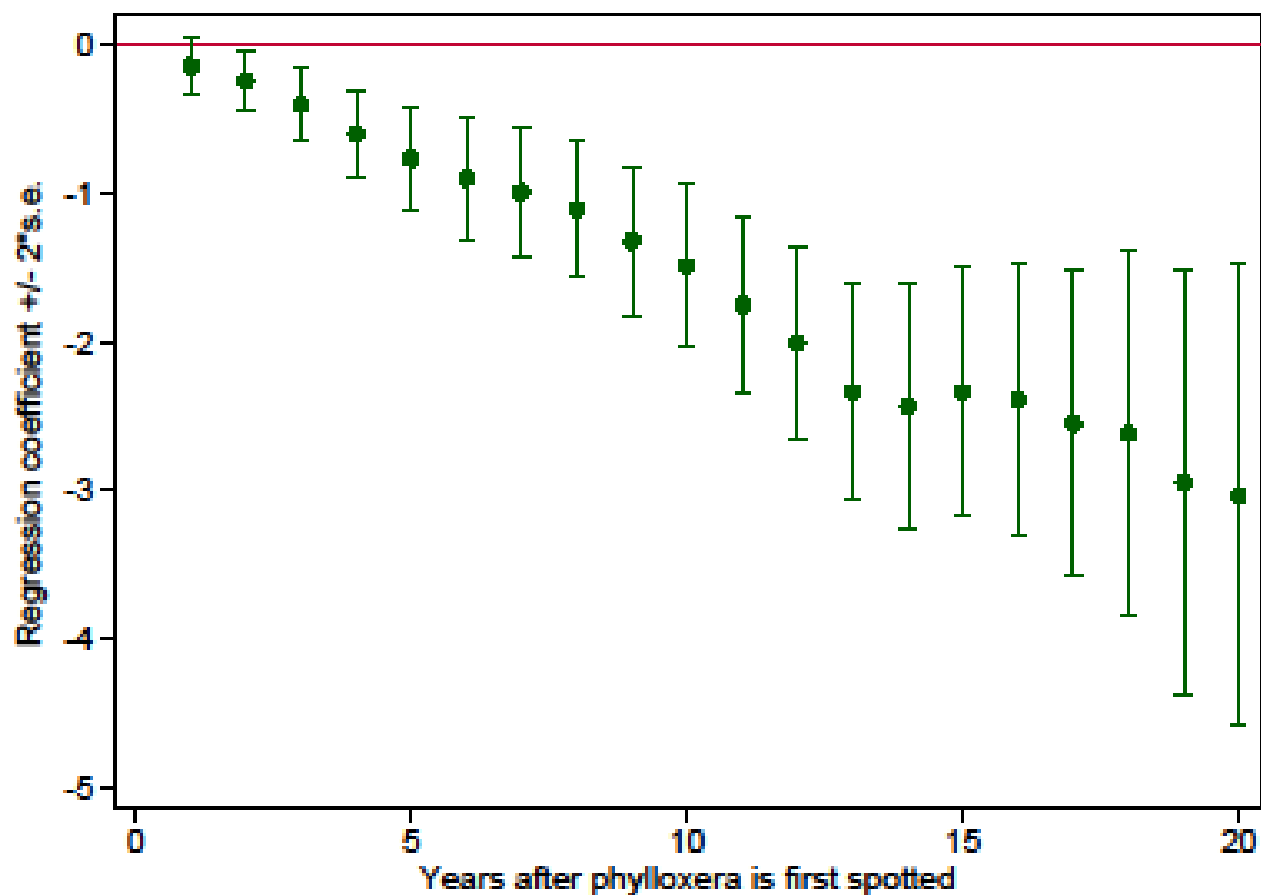
Preferred measure of eligibility is # of branches

- Districts are of roughly equal size

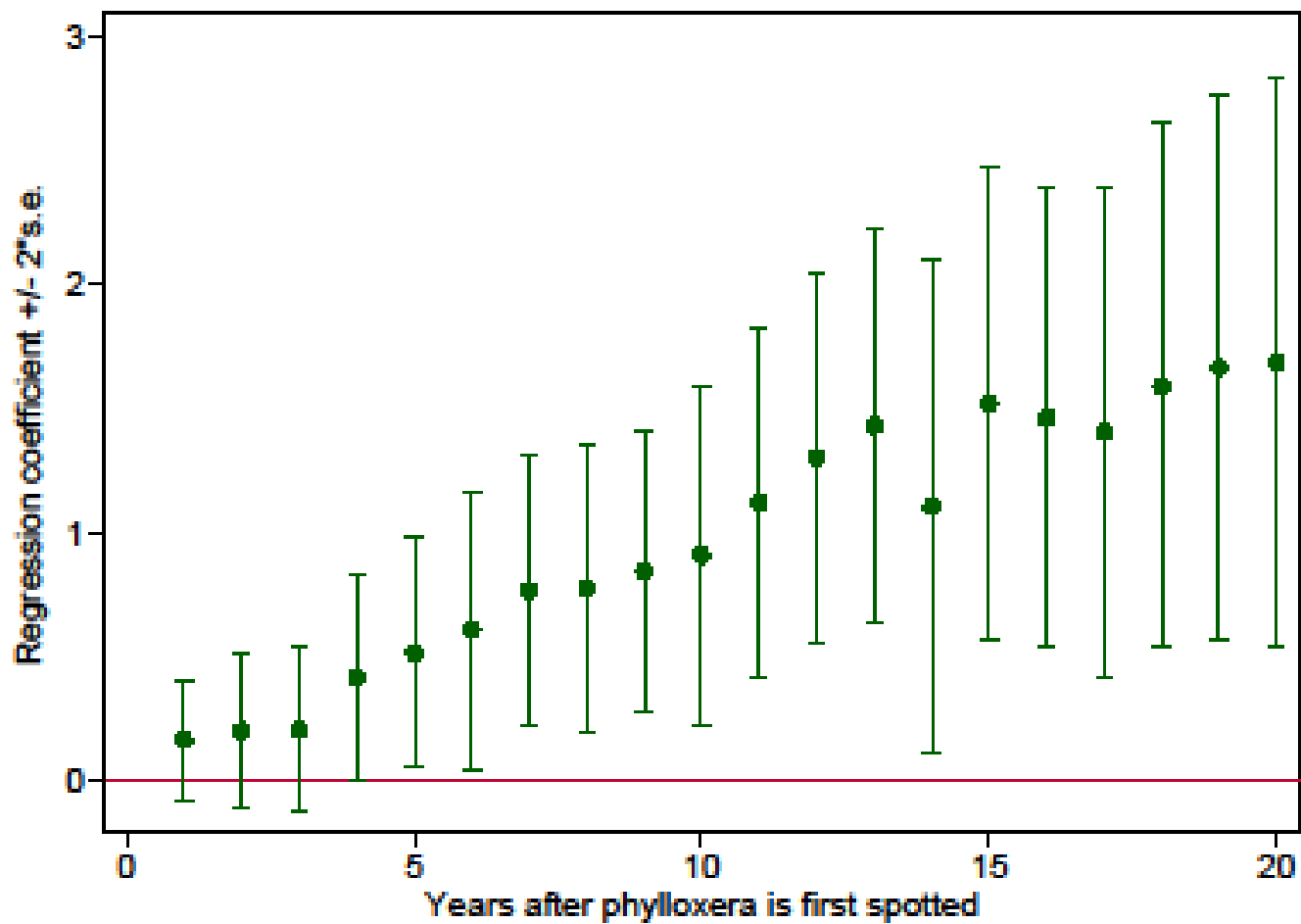
Preferred measure for income shocks is the product of

- Dummy variable = 1 if phylloxera has been spotted in the district during the year t or before AND wine production has declined below pre-phylloxera level
- The actual decline in wine production in year t relative to pre-phylloxera level
- Share of wine production in district GDP before phylloxera reached France
- Set back to 0 when cure is found in 1890
- Specification as used in Banerjee et al. (2010)

## Dynamic effect of phylloxera on wine production



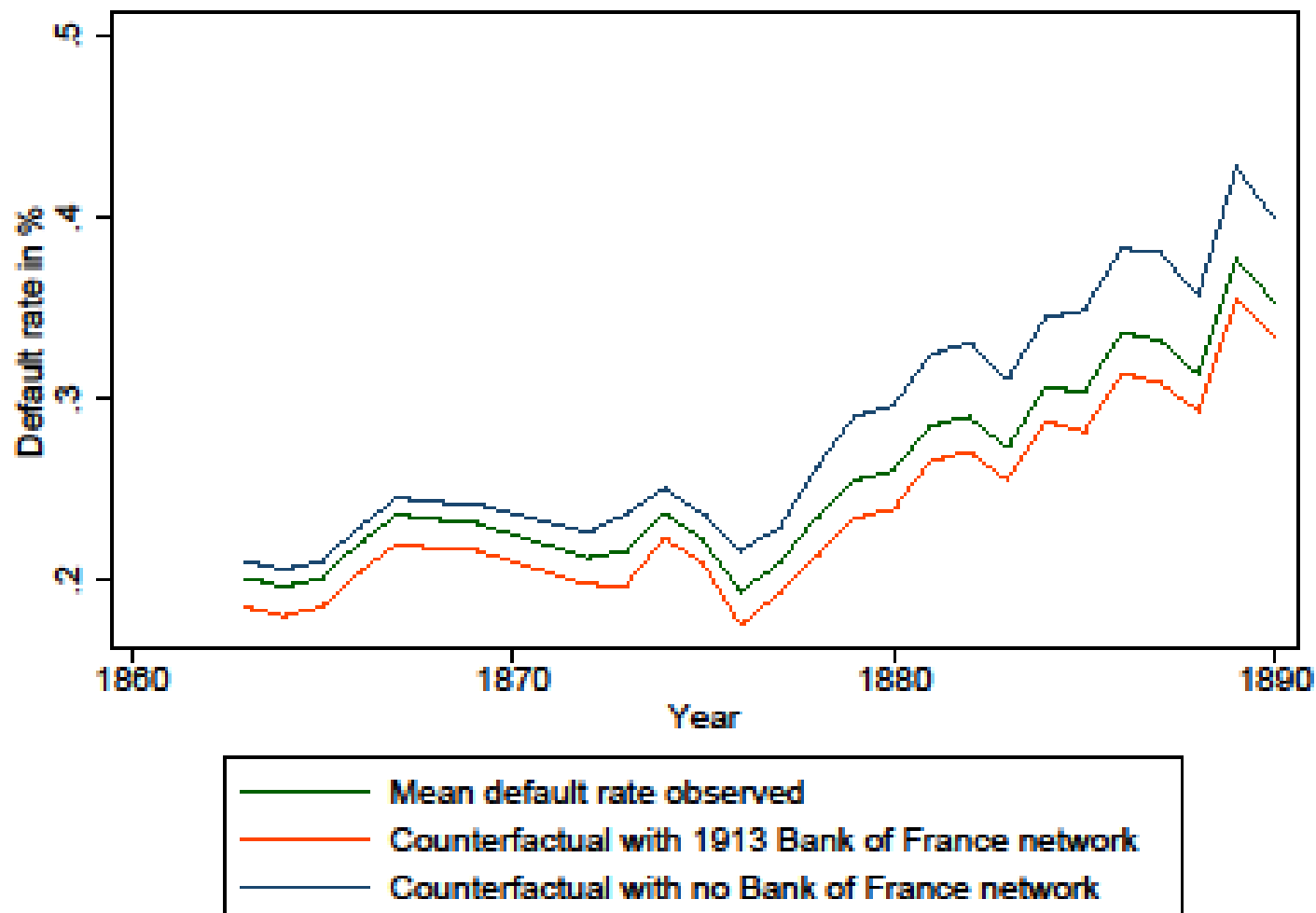
## Dynamic effect of phylloxera on defaults outside agriculture



## Baseline results

	Baseline	Additional controls	Wine intensive	1863-1890
Shock	0.69***	1.21***	1.17***	0.72
	0.23	0.40	0.42	0.45
BdF branches	-0.02	-0.02	-0.02	0.00
	0.01	0.01	0.01	0.01
BdF*shock	-0.46***	-0.75**	-0.91**	-0.72**
	0.11	0.35	0.36	0.29
CL/SG		-0.00	-0.00	-0.00
		0.00	0.00	0.00
CL/SG*shock		0.13*	0.15*	0.07
		0.08	0.08	0.09
Population density		-0.00011***	0.00392	-0.00004
		0.00003	0.00352	0.00003
Firms per capita		-3.23**	-2.86*	-5.01
		1.36	1.61	3.23
Farmsize*shock		-0.082	-0.056	0.035
		0.063	0.064	0.063
$R^2$	0.546	0.549	0.733	0.400
Observations	6880	6880	3010	2080

# Counterfactual





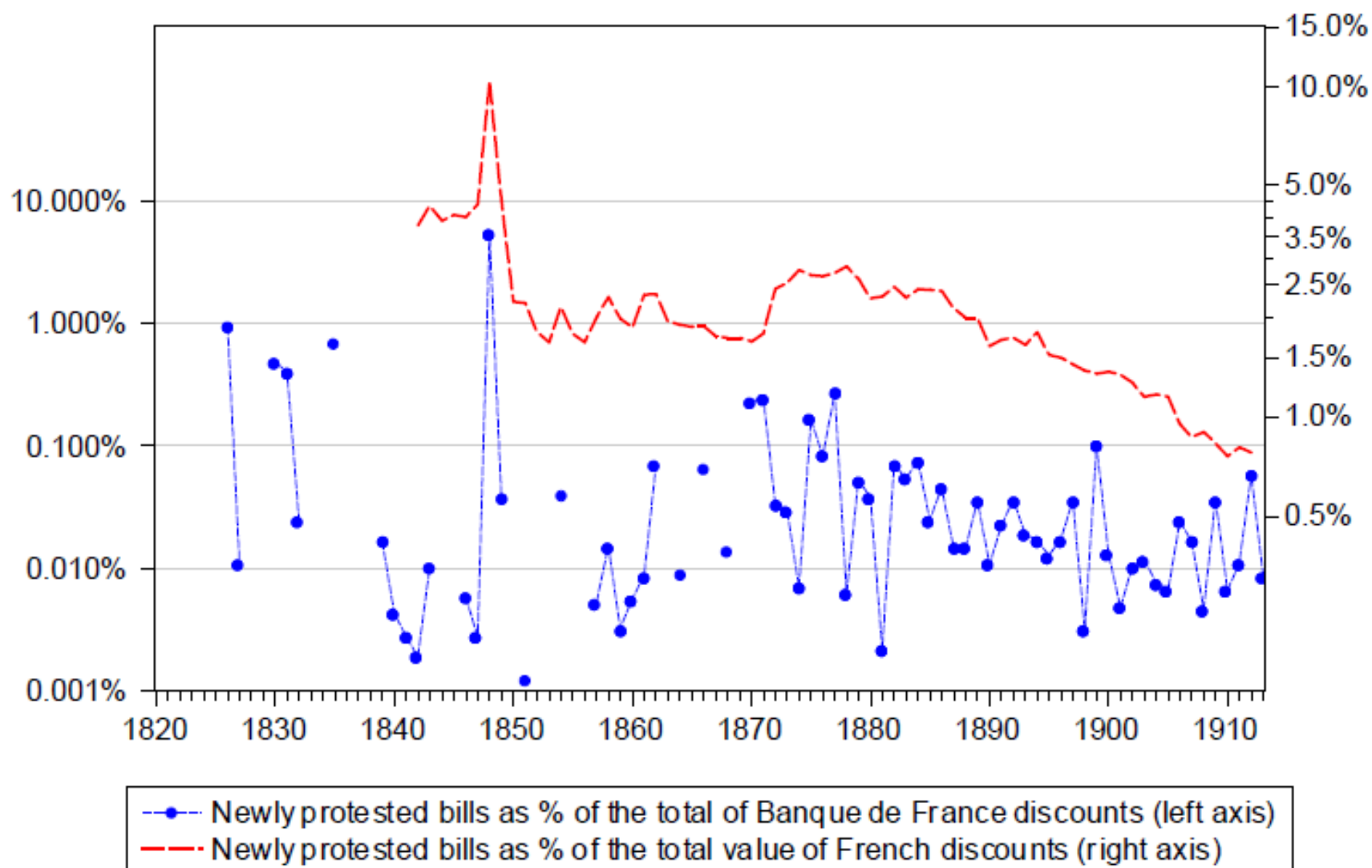
## Controlling for spatial autocorrelation in the error term

	Default rate	Default rate	Default rate	Default rate	Default rate	Default rate
Shock: impactvolume	0.68***	0.71***			1.21***	1.02**
	0.23	0.25			0.39	0.40
Shock: impactdummy			0.19			
			0.12			
Shock: spotted				0.11		
				0.09		
Nb BdF branches	-0.02*		-0.02*	-0.02*	-0.02*	
	0.01		0.01	0.01	0.01	
BdF branches per capita		-2.47				-2.21
		3.59				3.46
BdF*shock	-0.46***	-200.11***	-0.16**	-0.12**	-0.74**	-211.19*
	0.11	59.38	0.06	0.05	0.34	115.80
Nb CL/SG					-0.00	
					0.00	
CL/SG per capita						-0.718
						1.332
CL/SG*shock					0.13*	36.56
					0.07	29.88
Population density					-0.00011***	-0.00011***
					0.00003	0.00003
Firms per capita					-3.30**	-3.17**
					1.35	1.38
Farmsize*shock					-0.09	-0.08
					0.06	0.07
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Spatial						
lambda	6.64**	6.82**	6.88**	6.95**	6.99*	7.13*
	3.27	3.43	3.28	3.30	3.59	3.69
<hr/>						
Variance						
sigma2_e	0.0087***	0.0087***	0.0087***	0.0087***	0.0086***	0.0086***
	0.0031	0.0031	0.0031	0.00306	0.0031	0.0031
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$R^2$	0.021	0.020	0.021	0.021	0.100	0.105
Observations	6880	6880	6880	6880	6880	6880

Table 7: Endogeneity of BdF branching

# Endo- geneity of BoF branching

	(1)	(2)	(3)	(4)	(5)	(6)
	Defaults	Defaults	Shock	Shock	Both	Both
Default rate 5y avg	0.00	2.56e+61			0.00	3.66e+61
Phylloxera			0.70	1.04	0.72	0.98
BoF present in district		0.0014***		0.0014***		0.0014***
Deposit bank in town		4.82***		5.17***		4.81***
Administrative center		4.99***		4.92***		4.98***
District population		1.000001***		1.000002***		1.000001***
District surface		1.000166*		1.000153		1.000166*
Town population		1.000012		1.000011		1.000012
pop_rank_l1=1		1.00		1.00		1.00
pop_rank_l1=2		0.55*		0.55*		0.55*
pop_rank_l1=3		0.38**		0.39**		0.38**
pop_rank_l1=4		0.09***		0.09***		0.09***
pop_rank_l1=5		0.06***		0.06***		0.06***
No. of subjects	1074	1054	1076	1059	1074	1054
No. of failures	86	80	88	82	86	80
Time at risk	50460	35088	50682	35268	50460	35088
Adj. R-Squared	0.00	0.37	0.00	0.37	0.00	0.37
LR chi2	0.202	392.235	0.624	400.815	0.742	392.236



## Eligibility and crises: summing up

Crises induced by a disease (not by a financial crisis)

→ Rule out reverse causality induced by moral hazard

BoF was prohibited to refinance agriculture

→ Rule out endogeneity to crises

Crises result from the contagion of initial shock to other sectors

→ Traditionally a task of monetary policy

Share of population exposed to crises varied & eligibility depends on geographic criterion

→ Control group is identified

No explicit policy by the bank

New channel how central bank branches might impact economy

Counterparties and eligible assets deserve more attention

## Background slides

## Alternative eligibility

	Baseline	Additional controls	Wine intensive	1863-1890
Shock	0.71***	1.00**	0.94**	0.50
	0.26	0.41	0.43	0.50
BdF branches	-2.20	-1.94	-4.34	-0.00
	3.60	3.48	4.75	2.62
BdF*shock	-199.35***	-209.80*	-255.38**	-208.01*
	61.44	118.51	123.86	114.05
CL/SG		-0.78	-0.21	-0.85
		1.34	1.65	1.90
CL/SG*shock		35.29	40.26	10.96
		30.81	30.06	35.81
Population density		-0.00012***	0.00329	-0.00005
		0.00003	0.00371	0.00003
Firms per capita		-3.10**	-2.71	-5.08
		1.38	1.70	3.29
Farmsize*shock		-0.076	-0.055	0.050
		0.073	0.080	0.067
$R^2$	0.545	0.548	0.731	0.399
Observations	6880	6880	3010	2080

# Spotted

	Baseline	Additional controls	Wine intensive	1863-1890
Shock	0.19	0.43*	0.47*	-0.03
	0.12	0.23	0.24	0.18
BdF branches	-0.02*	-0.01	-0.02	0.00
	0.01	0.01	0.01	0.01
BdF*shock	-0.16**	-0.38**	-0.47**	-0.33***
	0.06	0.17	0.18	0.09
CL/SG		-0.00	-0.00	-0.00
		0.00	0.00	0.00
CL/SG*shock		0.06	0.08**	0.08*
		0.04	0.04	0.04
Population density		-0.00012***	0.00385	-0.00005
		0.00003	0.00339	0.00003
Firms per capita		-3.36**	-2.96*	-5.01
		1.37	1.63	3.33
Farmsize*shock		-0.016	-0.016	0.033
		0.024	0.023	0.023
$R^2$	0.544	0.547	0.731	0.399
Observations	6880	6880	3010	2080

## Impact dummy

	Baseline	Additional controls	Wine intensive	1863-1890
Shock	0.11	0.34*	0.39*	-0.11
	0.09	0.21	0.23	0.17
BdF branches	-0.02*	-0.02	-0.02	0.00
	0.01	0.01	0.01	0.01
BdF*shock	-0.12**	-0.27*	-0.38**	-0.23***
	0.06	0.15	0.16	0.06
CL/SG		-0.00	-0.01	-0.00
		0.00	0.00	0.00
CL/SG*shock		0.04	0.06*	0.07
		0.03	0.03	0.05
Population density		-0.00011***	0.00395	-0.00004
		0.00003	0.00339	0.00003
Firms per capita		-3.23**	-2.67	-4.46
		1.40	1.65	3.38
Farmsize*shock		-0.018	-0.017	0.030
		0.019	0.020	0.025
$R^2$	0.544	0.547	0.731	0.398
Observations	6880	6880	3010	2080