



Rage against the machines

Labor-saving technology and unrest in England, 1830-32

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Research Question

When do new technologies cause social unrest?



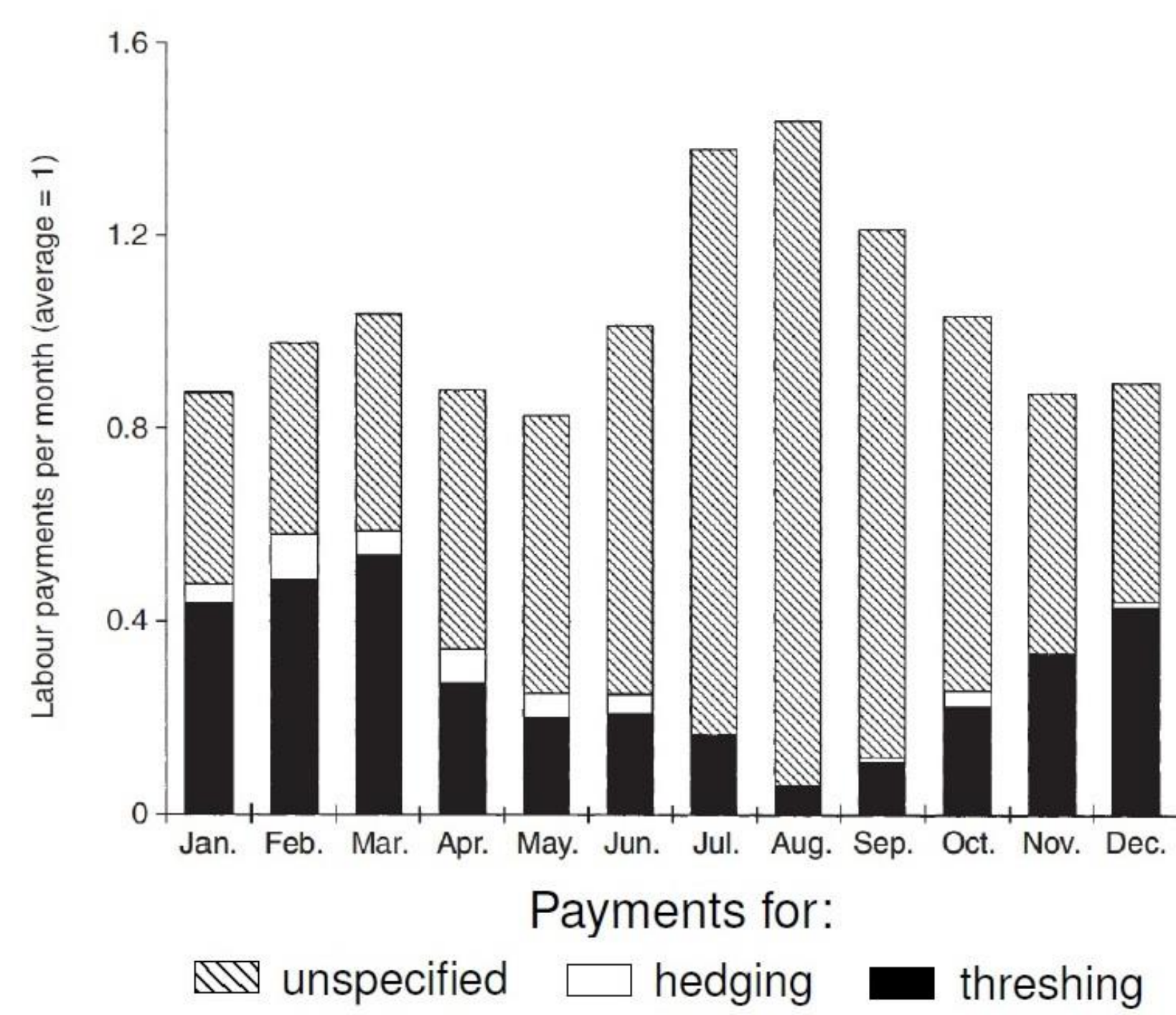
... 1. Labor market effects of new technologies.

2. Economic determinants of civil conflict.

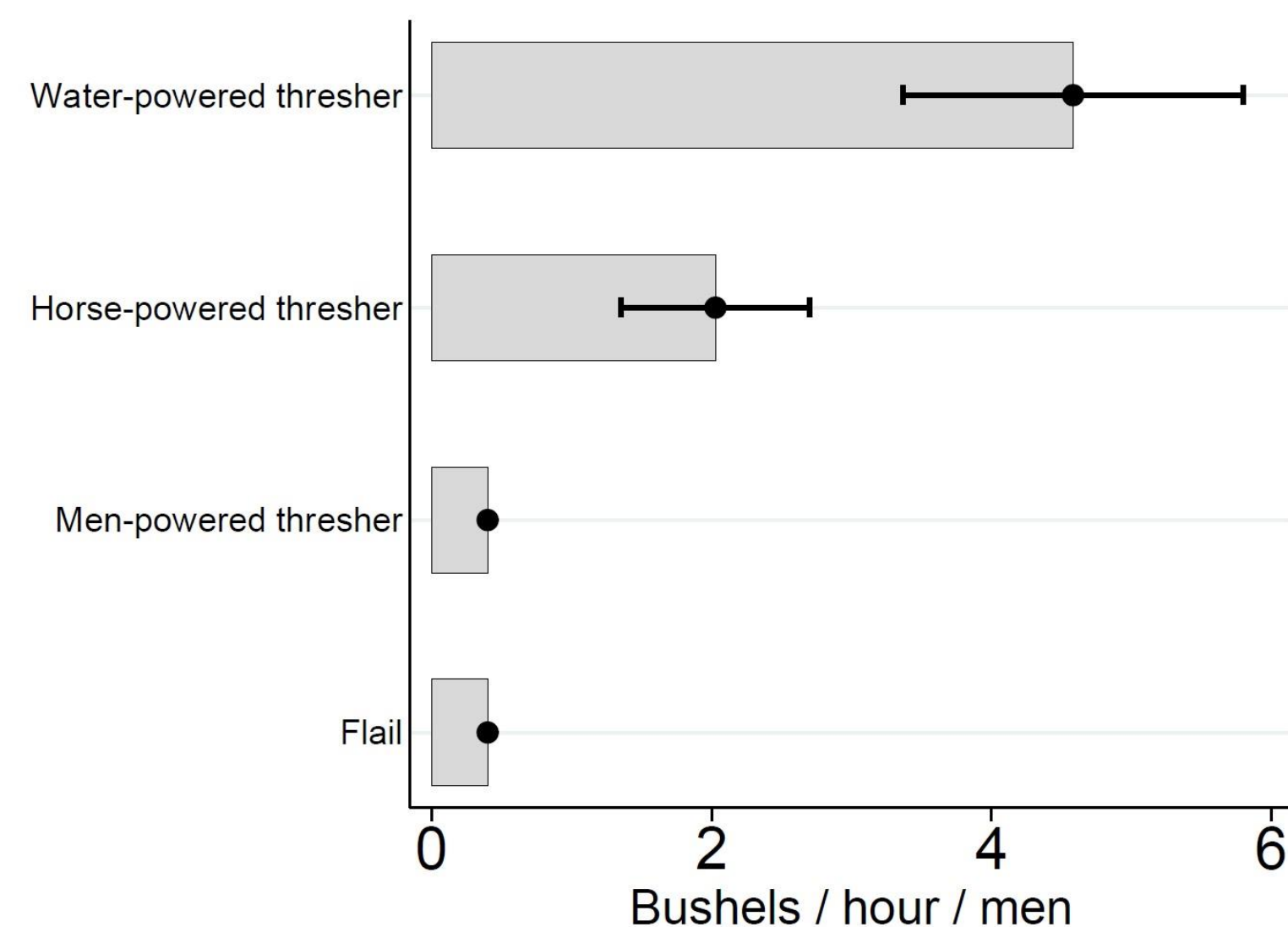
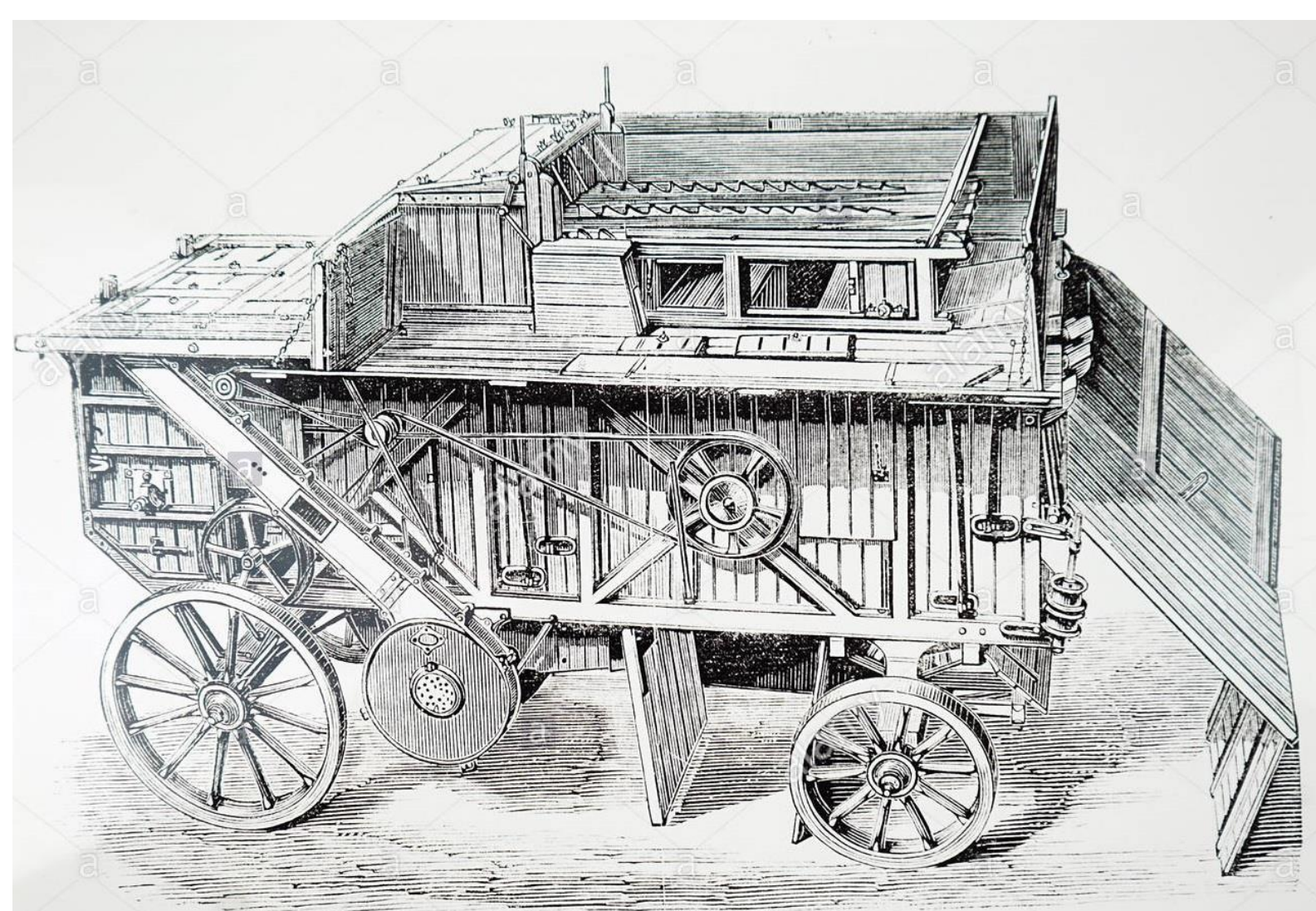


1800 England

In 1800, *threshing* is the most important winter task for rural workers.

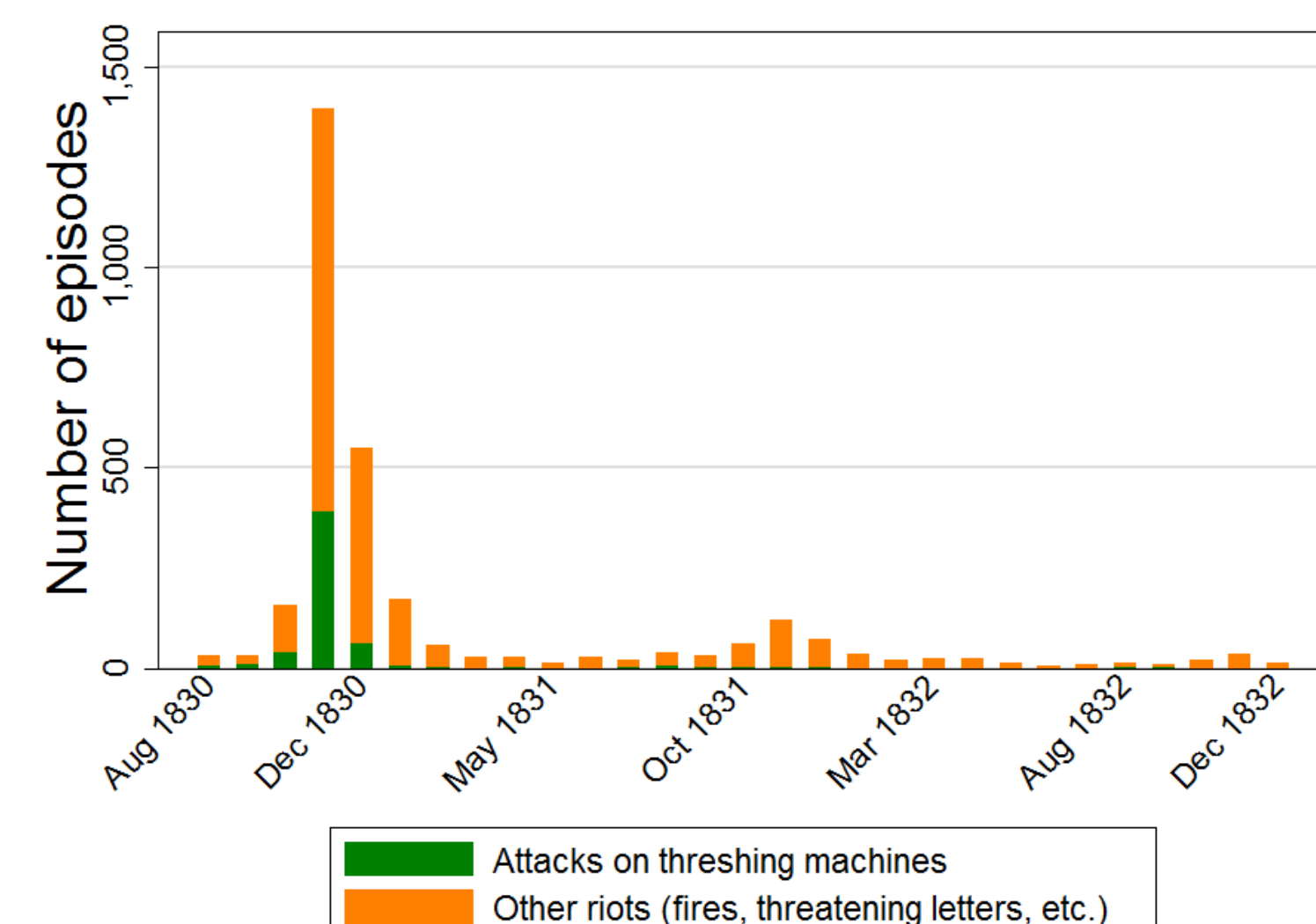
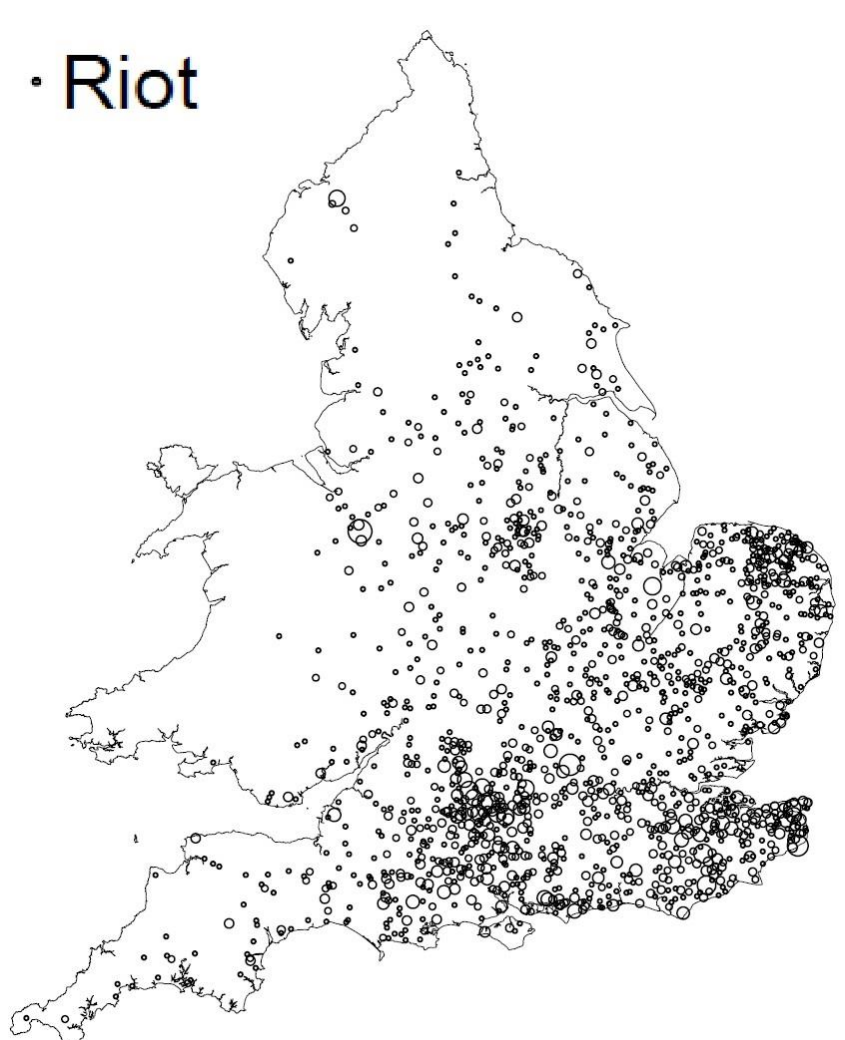
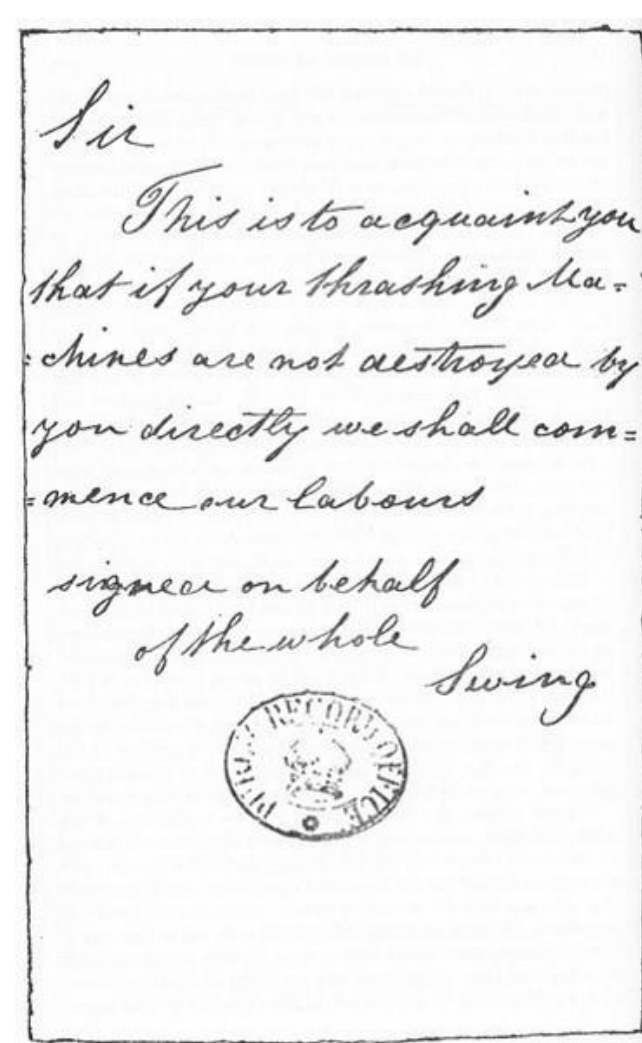


In 1786, new labor-saving technology arrives: the *threshing machine*.



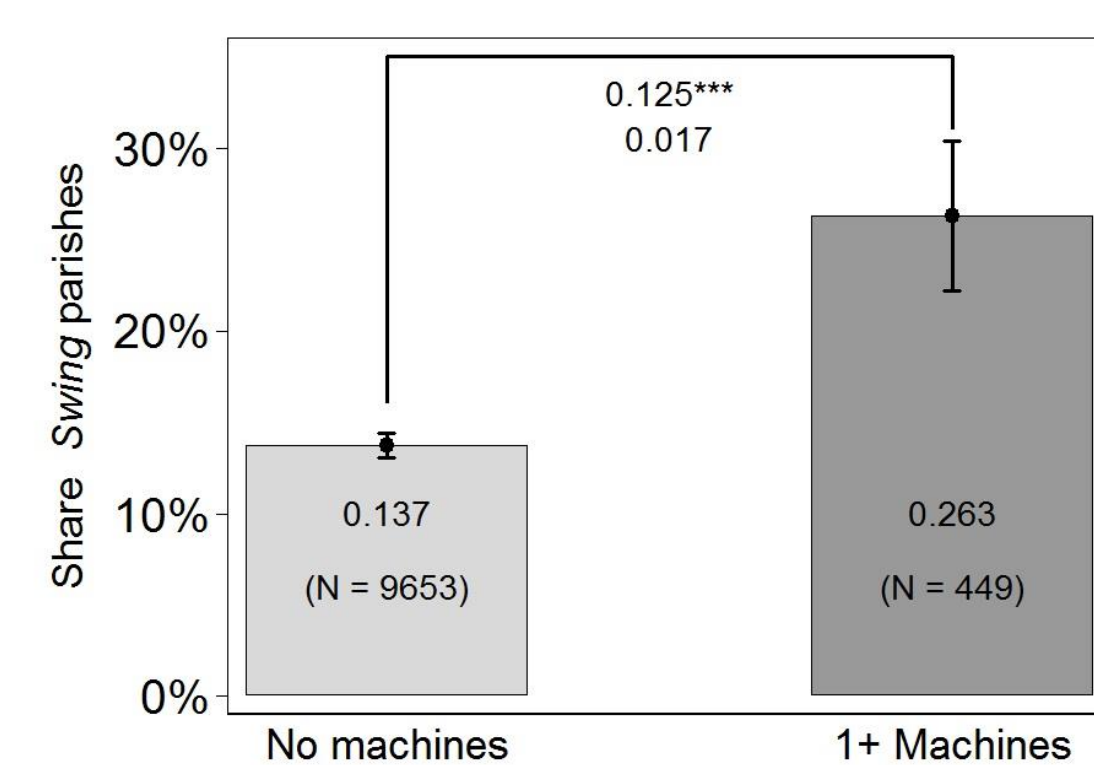
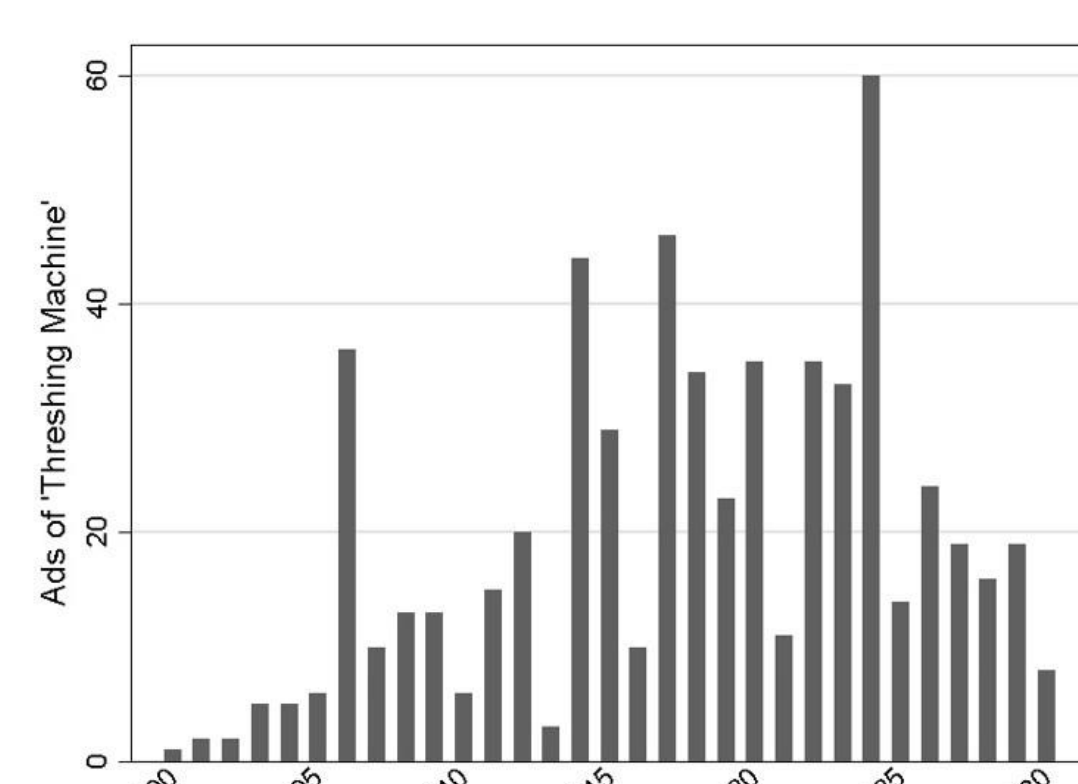
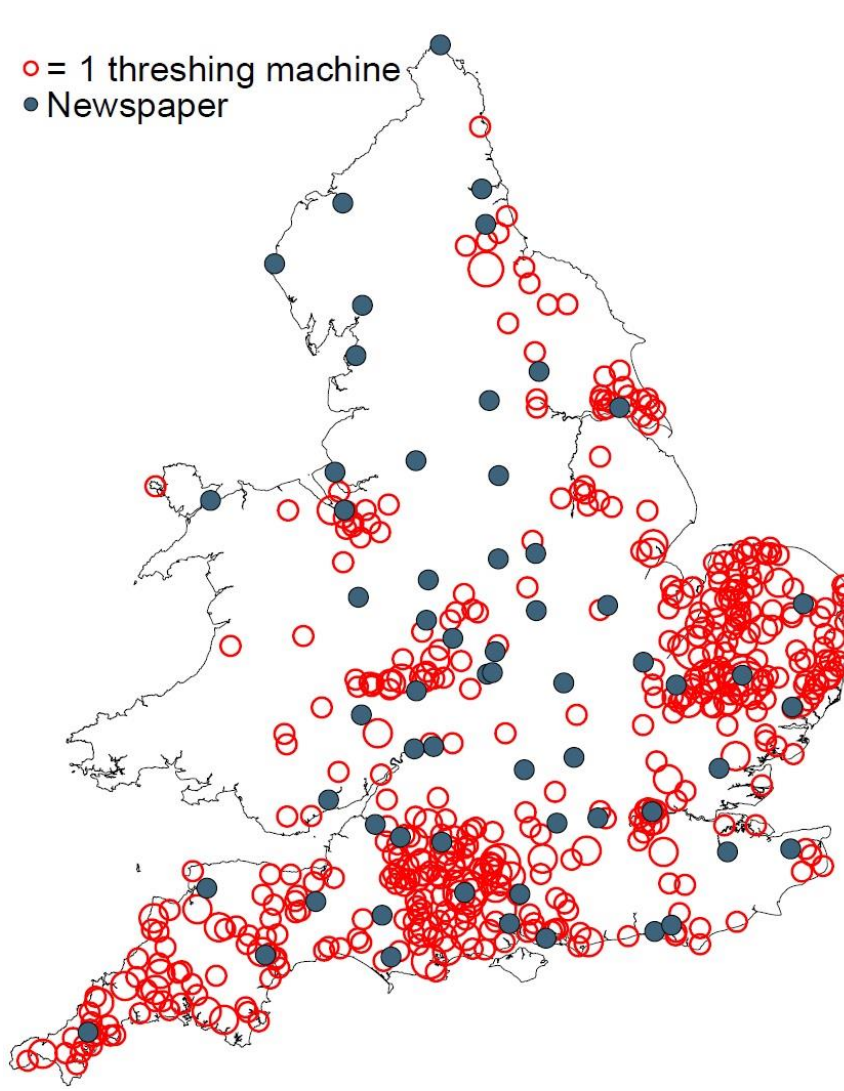
The 1830 "Swing" riots

1830-1832: largest rural revolt in the history of England.
3000+ episodes across 45 counties.



Machines & riots

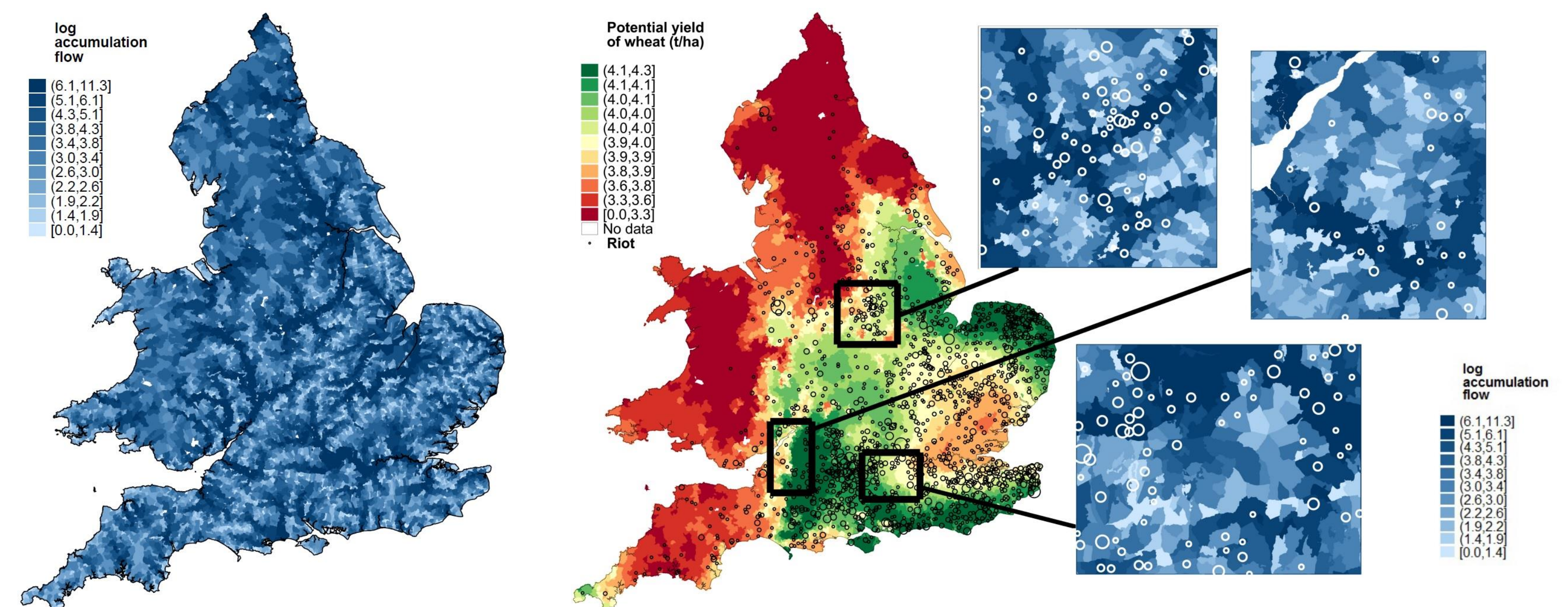
New database on threshing machine diffusion from newspapers' ads.



⇒ Riots and machines very correlated.

Is it causal? Identification strategy

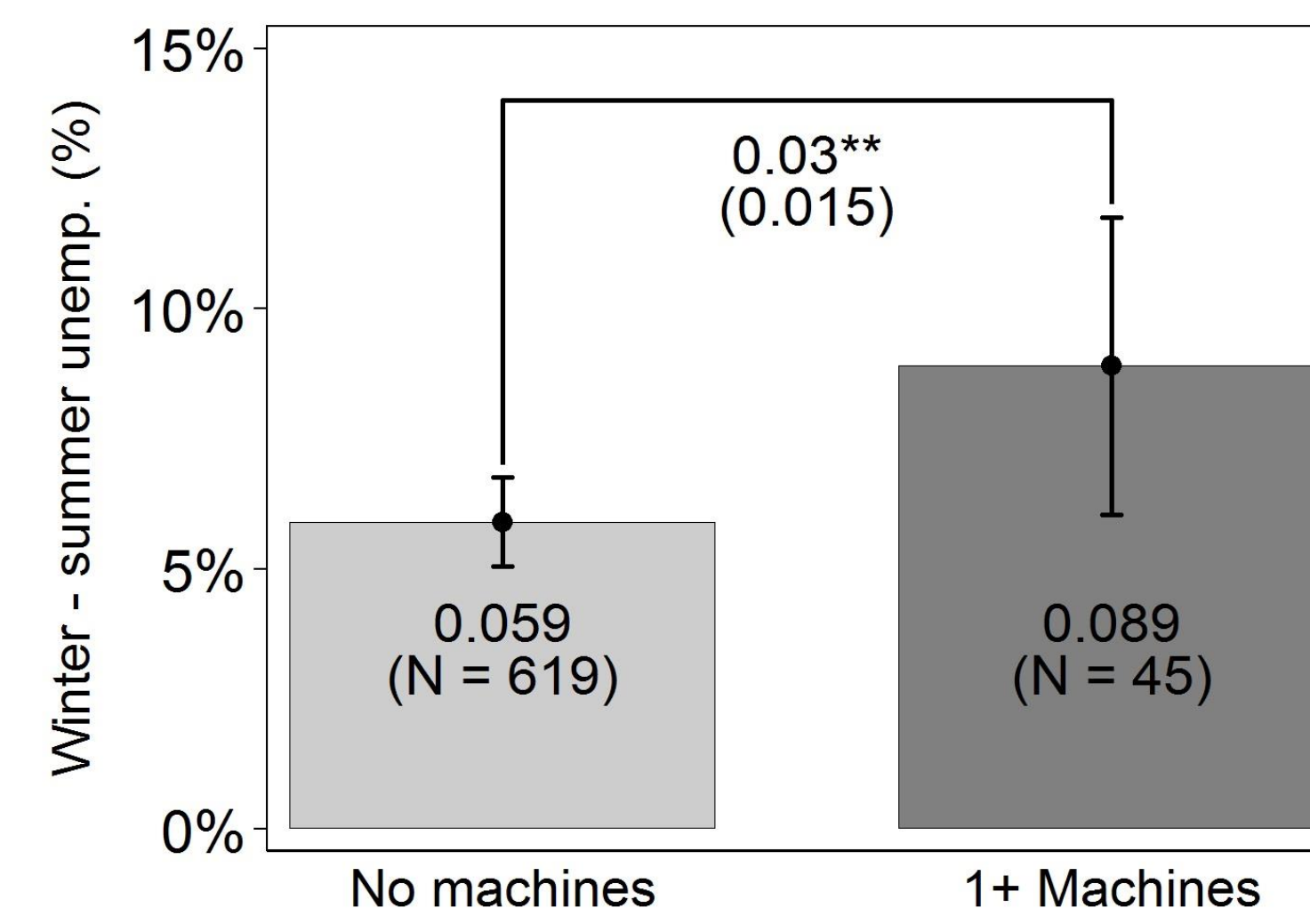
1. Most productive machines operated by water ⇒ accumulation flow
2. Threshing machines useful to thresh wheat ⇒ wheat suitability



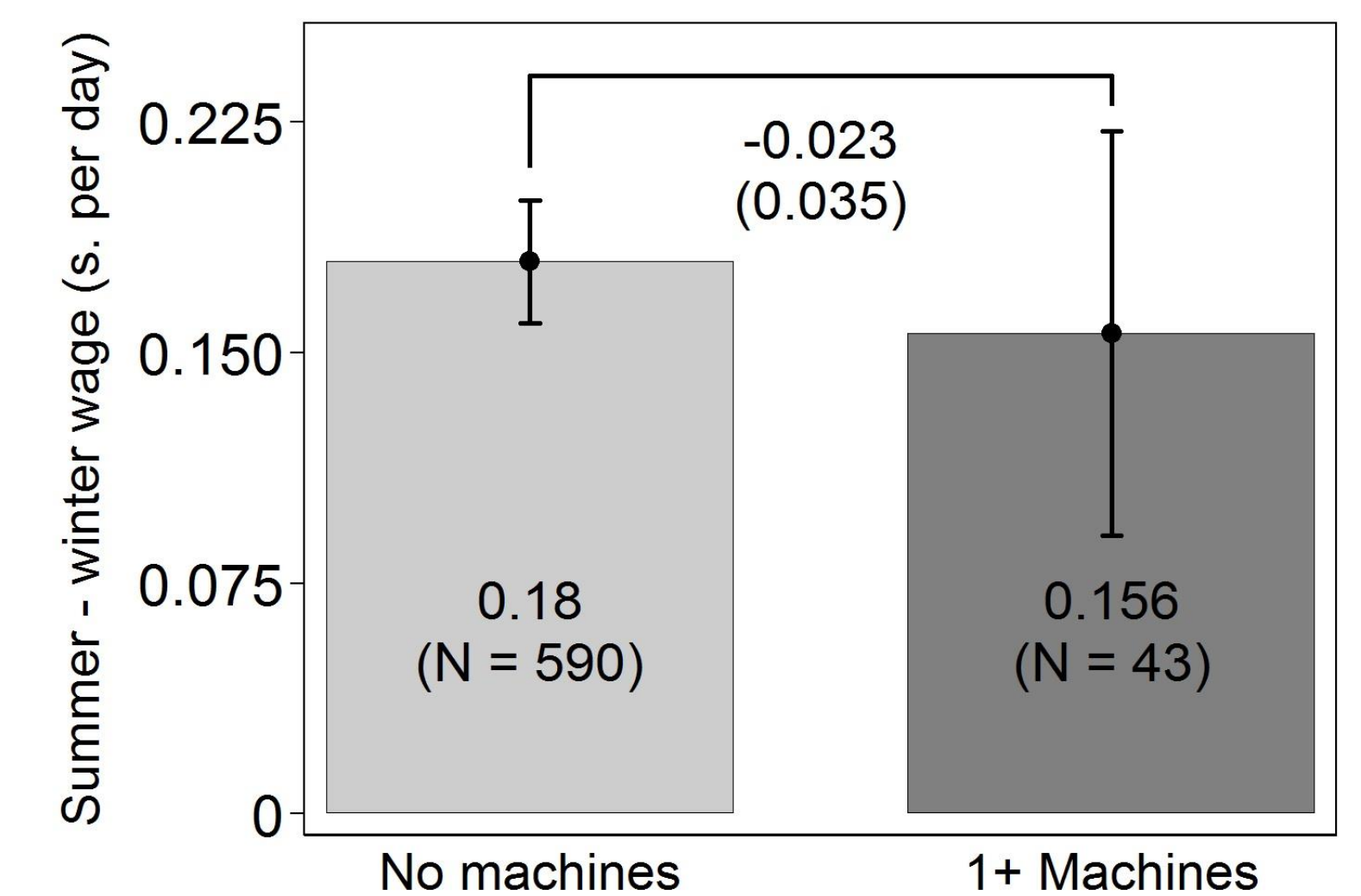
Dep. var.:	% 1801		Balance		% 1821		First stage			Reduced form			2 stages least squares		
	wheat area	log 1821 population	wheat area	log area	sex ratio	agri workers	Threshing machines			"Swing" riots			"Swing" riots		
log wheat suit. × log acc. flow	0.035 (0.022)	-0.422*** (0.117)	0.035 (0.022)	-0.150 (0.130)	-0.002 (0.006)	0.022* (0.012)	0.030*** (0.011)	0.029** (0.012)	0.033*** (0.010)	0.218*** (0.082)	0.103*** (0.052)	0.209*** (0.045)	7.322*** (2.345)	6.737*** (2.184)	6.229*** (1.771)
log wheat suit.	0.085 (0.088)	0.633 (0.456)	0.085 (0.088)	-0.722 (0.524)	-0.009 (0.022)	-0.030 (0.043)	-0.032 (0.039)	-0.023 (0.043)	-0.056* (0.031)	-0.105 (0.318)	-0.242 (0.197)	-0.333** (0.160)	0.126 (0.150)	-0.087 (0.156)	0.015 (0.104)
log acc. flow	-0.048 (0.031)	0.708*** (0.158)	-0.047 (0.030)	0.179 (0.175)	-0.002 (0.008)	-0.037** (0.017)	-0.040*** (0.015)	-0.038** (0.016)	-0.044*** (0.013)	-0.294*** (0.109)	-0.252*** (0.069)	-0.272*** (0.059)	0.001 (0.012)	0.006 (0.011)	-0.000 (0.010)
log 1821 pop															
Parish controls															
5 region FEs															
Obs.	3,326	10,099	3,326	10,099	10,099	10,099	10,099	10,099	10,099	10,099	10,099	10,099	10,099	10,099	10,099
R ²	0.066	0.059	0.066	0.400	0.052	0.357	0.019	0.022	0.040	0.061	0.092	0.102	-2.853	-2.357	-1.973
F-stat							7.1	5.7	11.7						
Rubin-Anderson test (p-value)													0.007	0.000	0.000

Mechanisms

New technology created «technological unemployment».



1832 Unemployment



1832 Wages

New technology more disruptive where:

1. Welfare support was less generous;
2. There were more enclosures;
3. Manufacturing centers were farther away.

Dep. var.:	Welfare support		"Swing" riots		Distance to industry	
	Non-generous	Generous	Many	Few	Far away	Close
log wheat suitability × log accumulation flow	0.252*** (0.072)	-0.025 (0.810)	0.988*** (0.253)	0.536* (0.322)	0.268*** (0.047)	0.129* (0.073)
log wheat suitability	-0.763*** (0.247)	4.107 (3.799)	-0.801 (0.743)	0.339 (1.174)	-0.589*** (0.144)	0.286 (0.295)
log accumulation flow	-0.291*** (0.084)	0.057 (1.093)	-1.354*** (0.343)	-0.738* (0.445)	-0.329*** (0.058)	-0.181* (0.098)
Parish controls						
5 region FEs						
Observations	664	669	3,502	3,517	5,049	5,050
R-squared	0.168	0.172	0.107	0.111	0.135	0.081
p-value of equality of effect		0.724		0.199		0.184

Consequences of the riots

Lower adoption of labor saving technology in 1832-1853 where rioters attacked threshing machines.

Opposite effect for non-labor saving machines (seed drills & chaffers).

