

Can Kings Create Towns that Thrive?

The effects of town plantation on urbanisation and agriculture in Sweden 1570-2010

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The questions

Q1. Can urbanisation cause agricultural growth?

- Agricultural surplus is a pre-requisite for urban development.
 - Childe (1936), Wrigley (1985), Allen (2001)
- Causality from urbanisation to development.
 - Jacobs (1969), Kopsidis and Wolf (2012), Martinelli (2015)

Q2. Can policy interventions lead to permanent effects?

- Fundamentals explains long-run location of production.
 - Davis and Weinstein (2002)
- Long-term effects of policy intervention
 - Eg. infrastructure investments (Jedwab & Moradi, 2016, Berger & Enflo, 2017)

Testing the specialisation model

- Parish A becomes a town.

How will the neighbouring parish B respond?

Full specialisation if:

$$\text{Surplus}_B > \text{Subsistence need}_A - \text{Transportation costs}_{AB} - \text{Tax}$$

- Sweden as the testing ground:

- Autarky?

- Prohibition of trade on the country-side since the 13th century.
- Customs of all goods traded in towns 1/32 of sales value.
- Was the policy enforced? Ending rural trade was as difficult as to "catch all the wolves of the woods". *Heckscher (1963, p.77)*

- An open economy?

- Towns had monopoly rights to trade with their hinterland, only staple towns had rights to trade with foreign ports.



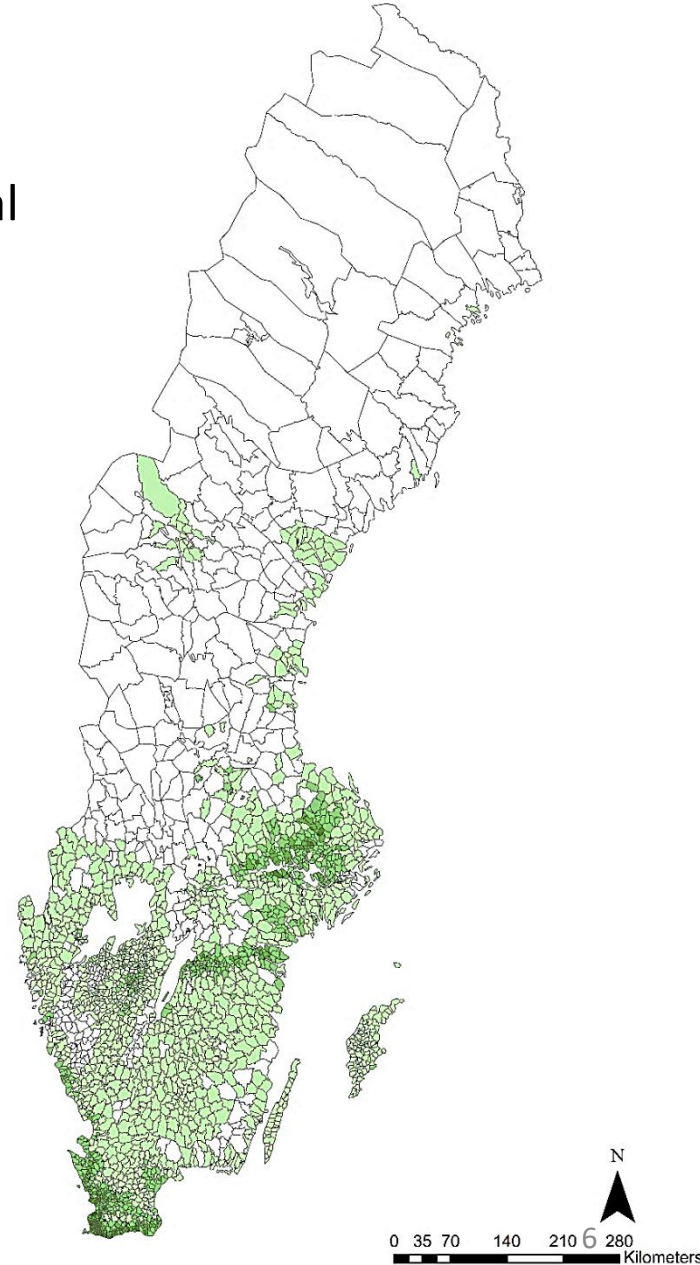
The town plantation policy

- According to Gustav II Adolf, Swedish towns were "lacking trade, rotten, and falling apart . . . broken down and impoverished". *Rystad (1987, p. 92)*
- Deliberate town plantations.
 - 32 planted town between 1570 and 1810.
 - Control and tax trade.
 - Little urban development. Location based on land availability. *Sandberg (1996, p. 186)*
 - Unparalleled policy in Europe during the early modern period.
 - All the parishes granted town charters materialized as built towns.
 - There are few cases of parishes that were to be granted town charters, but the Monarchs eventually changed their minds.



Our approach

- Test the impact of planted towns on agricultural surplus in their neighbouring parishes.
- 2,218 geocoded parishes measured at 60 year intervals (panel).
 - Extensive growth:
 - Population
 - Gross production
 - Intensive growth (surplus):
 - Gross production per capita
 - Yields



Data sources

- Lilja (1996), Town populations
- Andersson-Palm (2012a,b, 2013) Linde, 2012, Linde & Andersson-Palm (2014) , Gothenburg University
 - ✓ Constant parish borders 1571-1810
- Original data from kameral and fiscal sources:
 - 1570: Tax Records (*Älvsborgs lösen*, 1571), Church registers. For Denmark, *Lunds stifts landebok*.
 - 1630: Tax records (boskaps- och utsädeslängderna), Church registers (Jordeboken).
 - 1690: *Indelningsverk* eller *indelningsjordeböcker*.
 - 1750: Church registers, Estate inventories, Official Statistics.
 - 1810: Church registers, Estate inventories, Official Statistics.

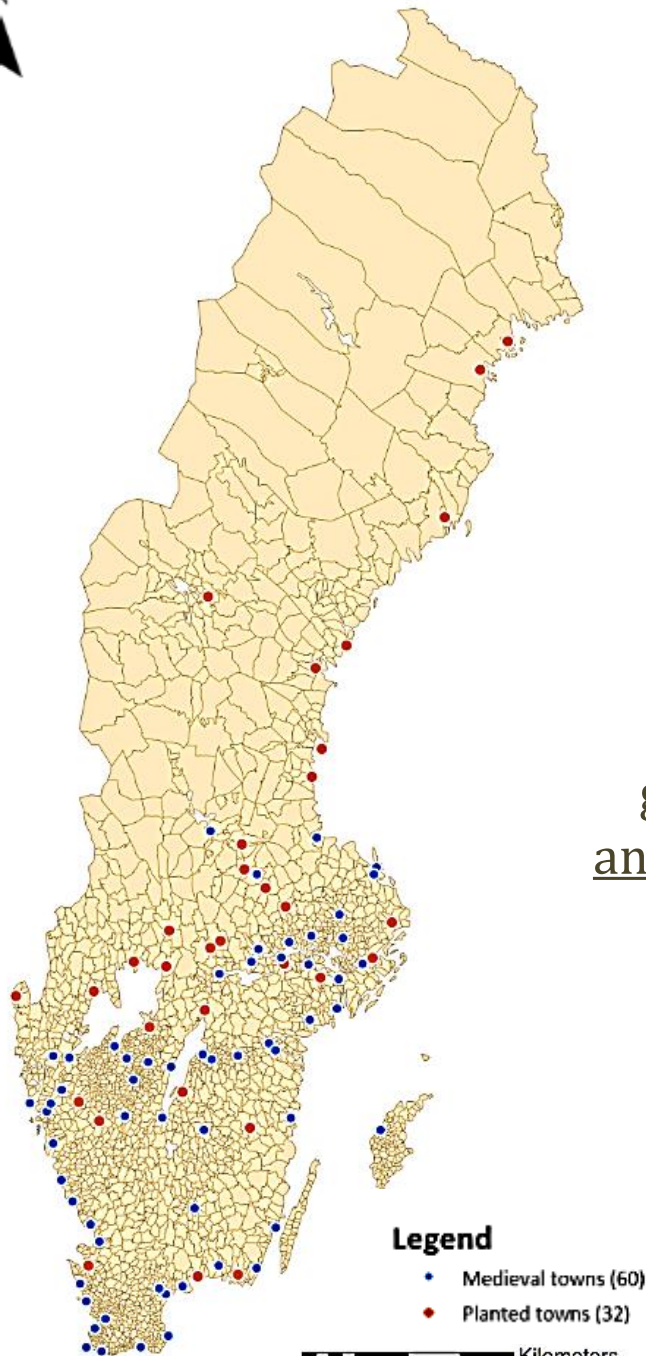
The image shows two pages of handwritten tax records from 1571. The left page is titled 'Älvsborgs lösen 1571' and lists various items and amounts. The right page is titled 'Lösen i Jordestorp' and lists similar items and amounts. The handwriting is in a historical script, likely Latin or a local dialect.

Item	Amount
2 ar 11.	5
8	8
8	8
Johan om	5 p
Lösen	
penningar	29 p 6 sin
Wanns i offrenad	
Bilff	19 68
Rupp	4 #
S.oxen	2
Risv	5
4 ar 11.	7
3 ar 11.	7
2 ar 11.	7
1 ar 11.	1
fär	3
fär	5
fär	10 p
Lösen	
penningar	27 p 10 sin
Jakobum i öfren	
Rupp	5 # 5 p
S.oxen	3
Risv	8
2 ar 11.	4
1 ar 11.	1
fär	11
3 ar 11.	4

Item	Amount
fär	4 om 55 inf
Lösen	
penningar	58 inf
Lösen i Jordestorp	
Rupp	1 1/2 #
S.oxen	4
Risv	4
1 ar 11.	1
fär	7
fär	3
fär	10 p
Lösen	
penningar	12 1/2 inf
Jakobum i öfrenad	
Bilff	3 68
Rupp	5 1/2 #
S.oxen	9
Risv	15
4 ar 11.	5
3 ar 11.	5
2 ar 11.	6
fär	24
fär	5
fär	20 p
Lösen	
penningar	43 inf



Planted towns

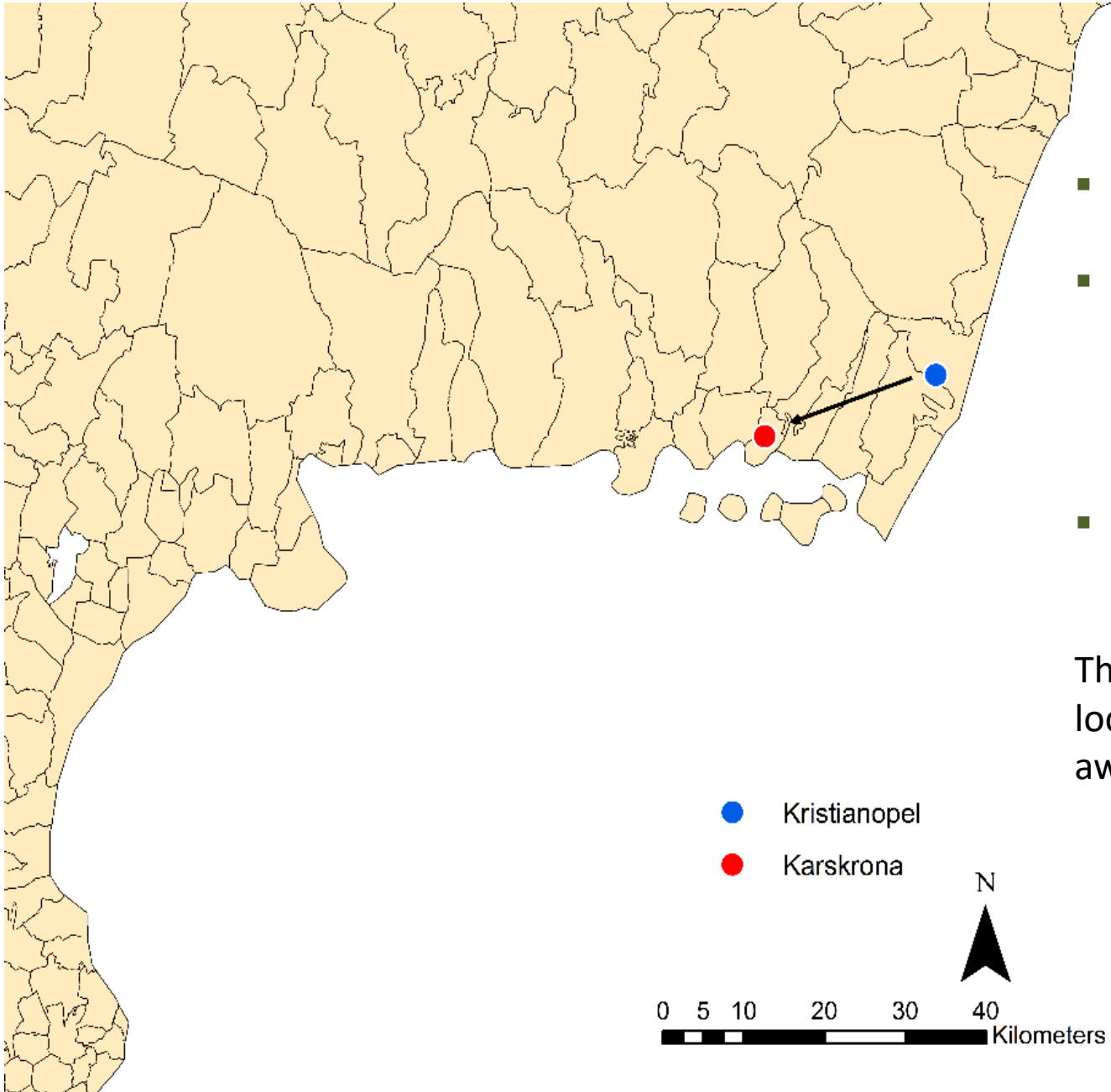


	TOWNS	PLANTED	ENDED
1570	60		
1630	73	16	3
1690	82	12	3
1750	81		1
1810	83	2	

“... privileges of township were conferred upon a great number of communities which were without any potentialities for urban economic development.”

Hecksher (1963, page 50)



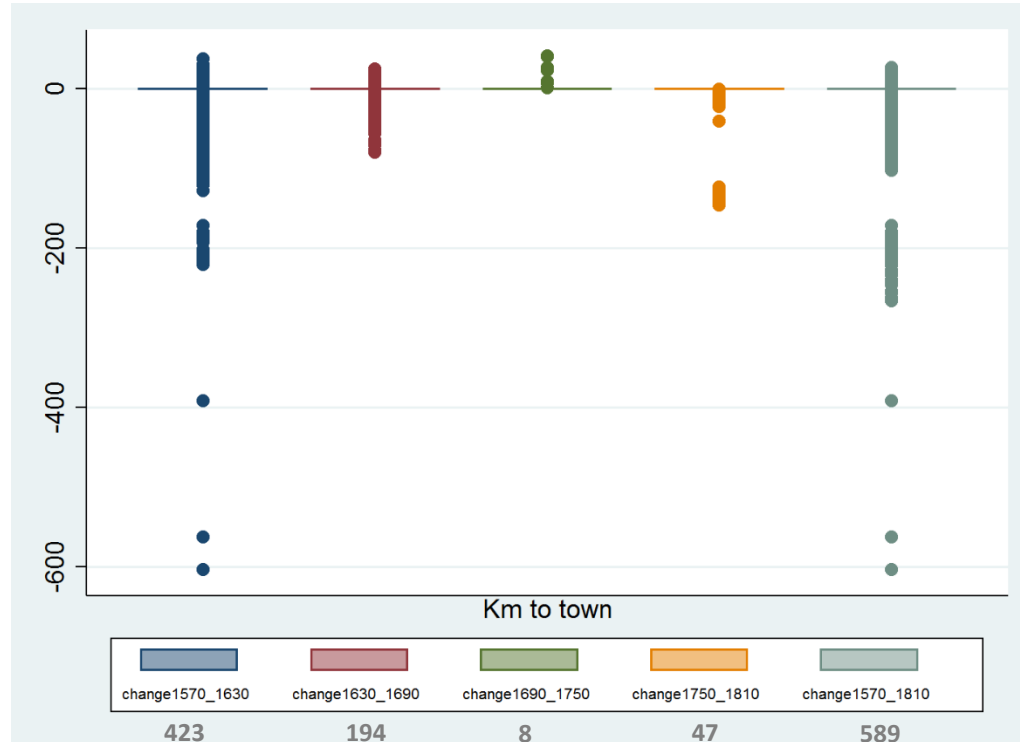


- Arbitrary locations.
- Kristianopel named after Kristian IV of Denmark – First renaissance town of the Nordic countries.
- Burnt down in 1611 by Gustav Adolphus.

The Swedes favoured location of Karlskrona 35 km away in 1680.



672 changes in "distance to town" ...



...can be used in a panel model with fixed effects
(diff-in-diff model with varying treatment intensities):

$$\ln(\text{outcome})_{it} = a + \beta_1 * \text{distance to town}_{it} + \gamma_t + \rho_i + \varepsilon_{it}$$



A 'settlement policy'

Parishes exposed to a planted town (= "treated") had lower grain production, surplus and soil quality **on average**

Averages in 1570	Whole Sample	Treated	Untreated	Means diff (p.val H0≠0)
Population	238	257	231	(0.001)
Distance to town	31	60	20	(0.000)
Area (km ²)	65	96	54	(0.000)
Population density	6.1	5.0	6.5	(0.000)
Grain gross production/area	23	16	25	(0.000)
Grain surplus/area	16	11	17	(0.000)
Grain yield	3.3	3.4	3.3	(0.193)
Cows area	2.4	2.1	2.5	(0.000)
Pigs per area	1.8	1.2	2.1	(0.000)
Soil quality	2,864	2,617	2,959	(0.003)
Observations	2,129	589	1,540	



$$\ln(\text{outcome})_{it} = a + \beta_1 * \text{distance to town}_{it} + \gamma_t + \rho_i + \varepsilon_{it}$$

VARIABLES	Extensive growth		Intensive growth	
	(1)	(2)	(3)	(4)
	Population density	Gross Production / Area	Gross Production / Person	Yield
Planted town < 10 km	0.513*** (0.040)	0.434*** (0.084)	-0.079 (0.086)	0.029 (0.071)
Planted town 10 -20 km	0.461*** (0.034)	0.474*** (0.072)	0.013 (0.074)	0.102* (0.061)
Planted town 20-30 km	0.439*** (0.034)	0.545*** (0.071)	0.106 (0.073)	0.050 (0.060)
Planted town 30-50 km	0.342*** (0.032)	0.496*** (0.067)	0.154** (0.069)	-0.046 (0.057)
Planted town 50-70 km	0.0714* (0.040)	-0.030 (0.083)	-0.102 (0.085)	0.055 (0.070)
Observations	10,645	10,645	10,645	10,645
R-squared	0.747	0.463	0.184	0.215
Number of parishes	2,129	2,129	2,129	2,129
Parish FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

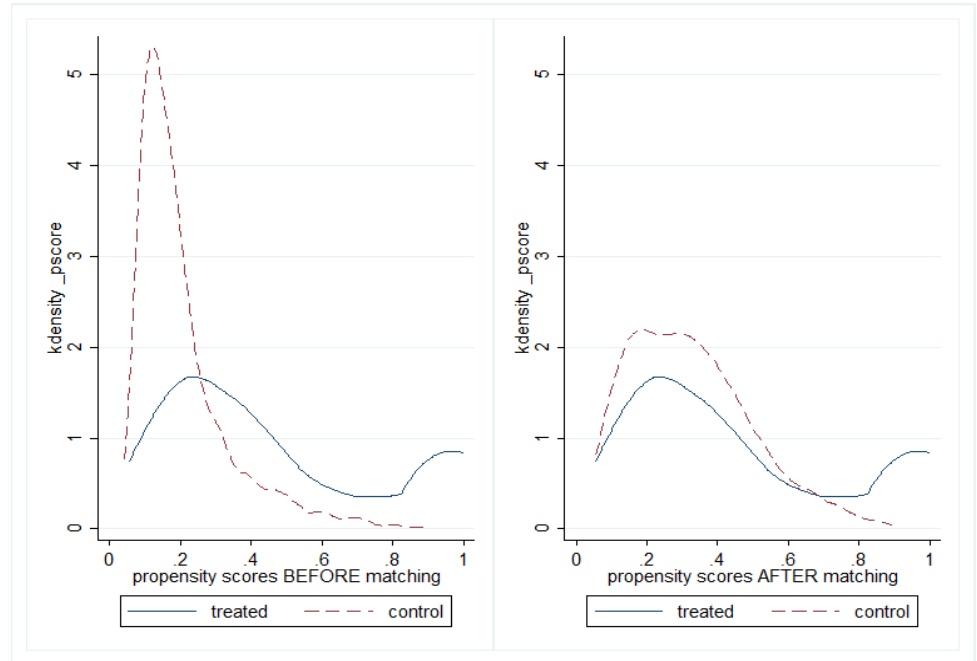
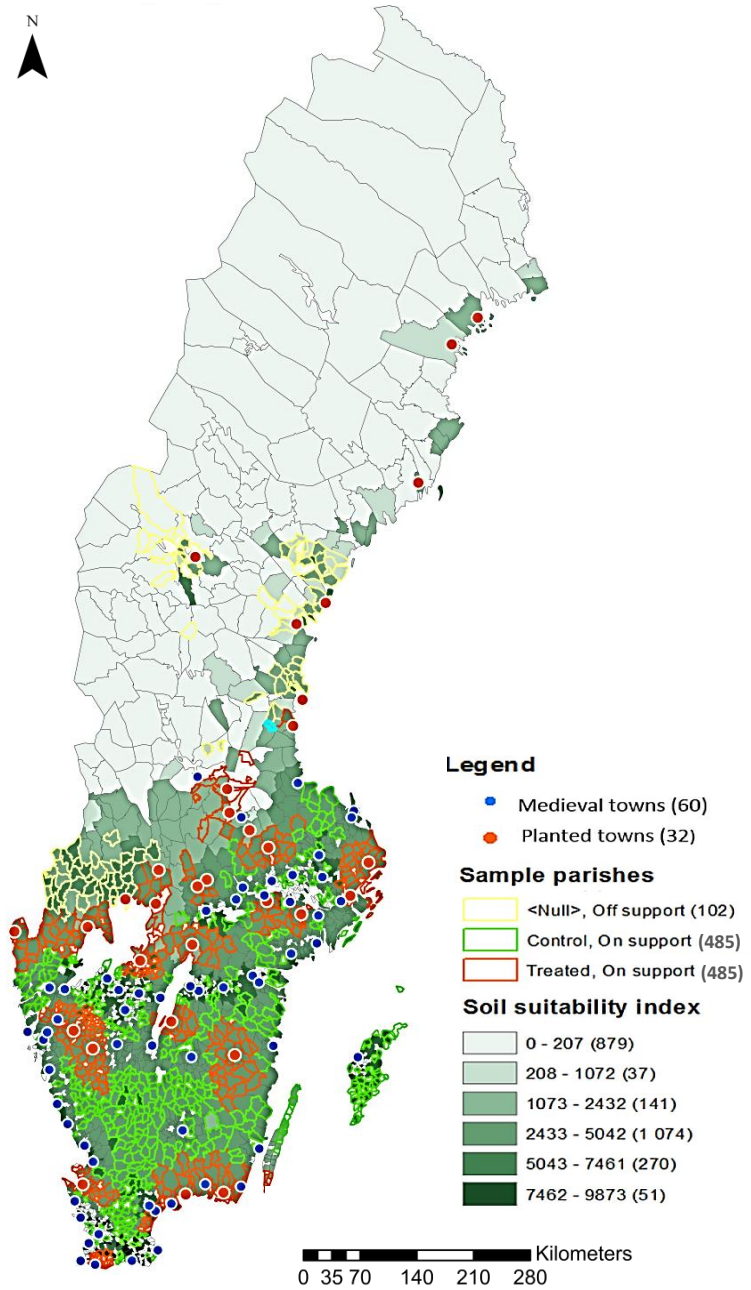


"Under the Yoke", by Eero Järnefelt , 1893



Parish selection based on soil suitability and distance to medieval town

Crop suitability index value for rain-fed cereals from Global Agro-Ecological Zones



Average 1570	Treated	Matched	Means diff (p.val H0≠0)
Population	264	231	(0.003)
Distance to town	33	31	(0.026)
Area (km2)	82.2	70.2	(0.004)
Population density	5.7	4.9	(0.006)
Grain gross production/area	18.7	16.4	(0.177)
Grain surplus/area	12.7	11.0	(0.1666)
Grain yield	3.2	3.1	(0.467)
Cows per area	2.2	2.3	(0.799)
Pigs per area	1.4	1.8	(0.004)
Soil Quality	2,796	2,999	(0.14)
Observations	485	485	

$$\ln(\text{outcome})_{it} = a + \beta_1 * \text{distance to town}_{it} + \gamma_t + \rho_i + \varepsilon_{it}$$

with balanced sample

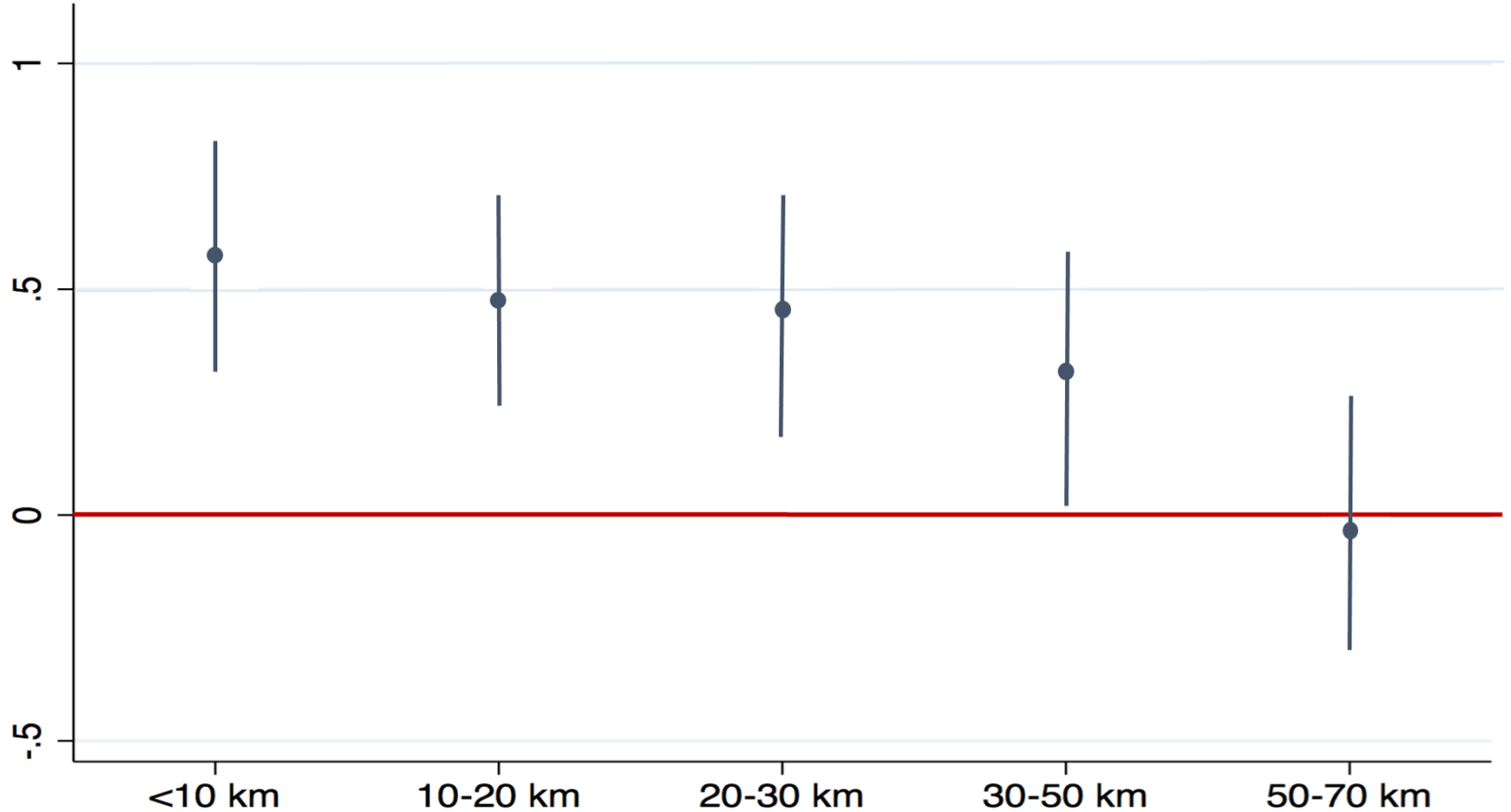
VARIABLES	Extensive growth		Intensive growth	
	(1) Population density	(2) Gross Production / Area	(3) Gross Production / Person	(4) Yield
Planted town < 10 km	0.548*** (0.141)	0.533*** (0.173)	-0.015 (0.120)	0.049 (0.281)
Planted town 10 -20 km	0.492*** (0.131)	0.578*** (0.178)	0.086 (0.122)	0.109 (0.298)
Planted town 20-30 km	0.464*** (0.135)	0.646*** (0.175)	0.181 (0.115)	0.046 (0.291)
Planted town 30-50 km	0.343** (0.146)	0.607*** (0.183)	0.263** (0.114)	-0.014 (0.308)
Planted town 50-70 km	-0.024 (0.165)	-0.087 (0.241)	-0.063 (0.172)	0.056 (0.338)
Observations	4,850	4,850	4,850	4,850
R-squared	0.764	0.497	0.217	0.236
Number of parishes	970	970	970	970
Parish FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

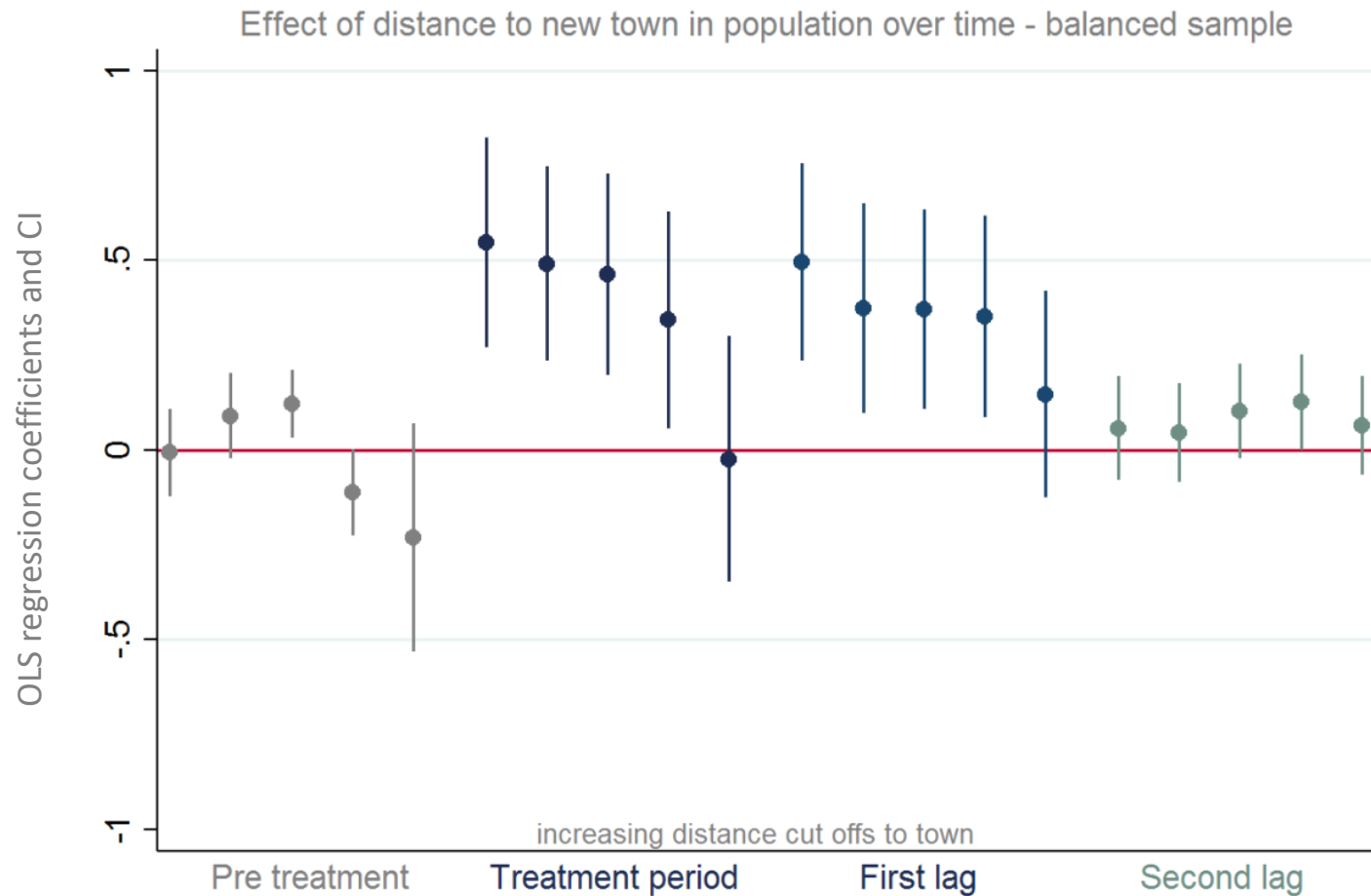


Immediate effects on $\ln(\text{population})$

Effect of distance to new town in population – balanced sample



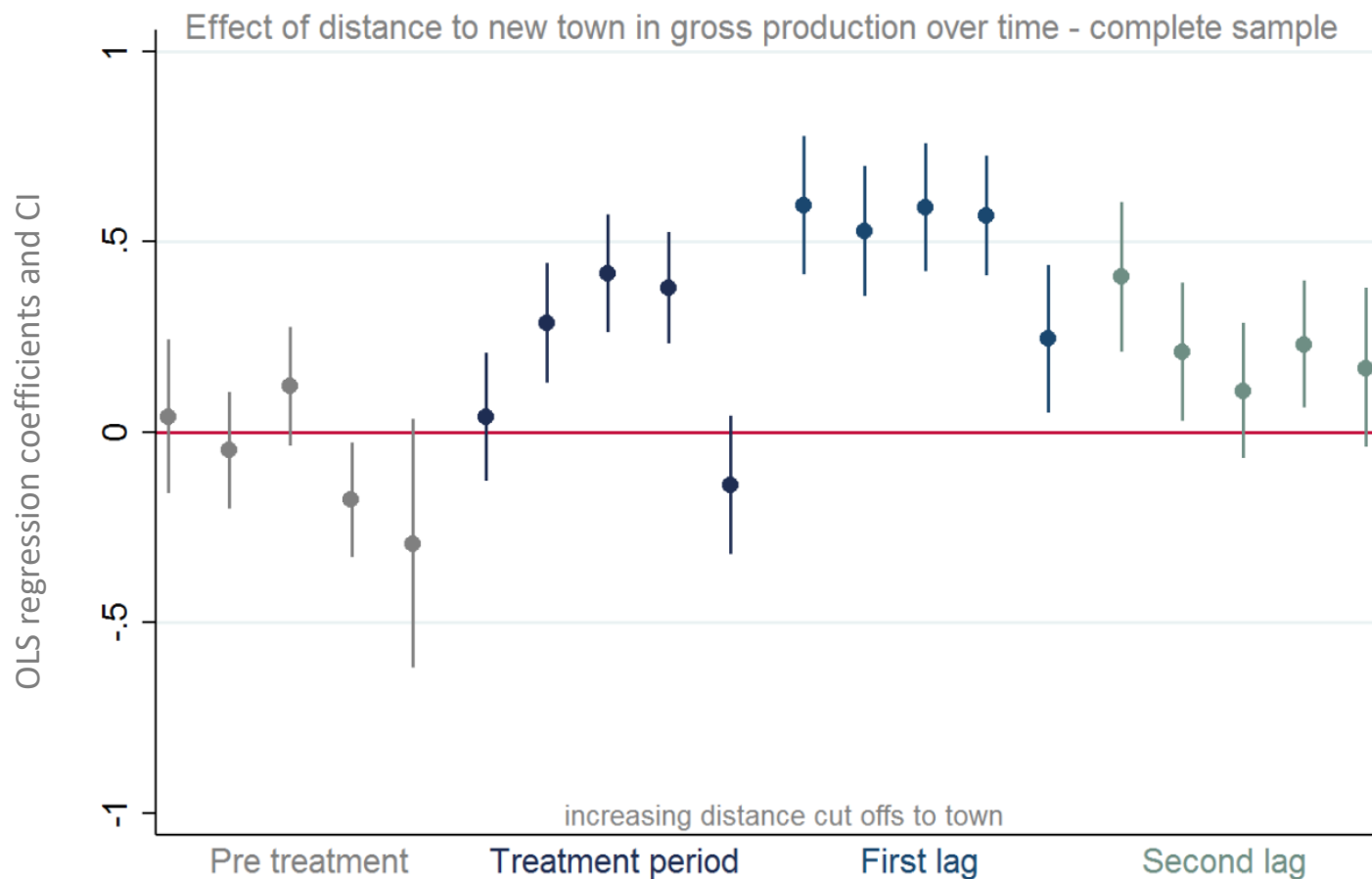
Dynamic effects on ln(population)



Treatment period and distance cut-offs at < 10km, 10-20 km, 20-30km, 30-50km, 50-70km



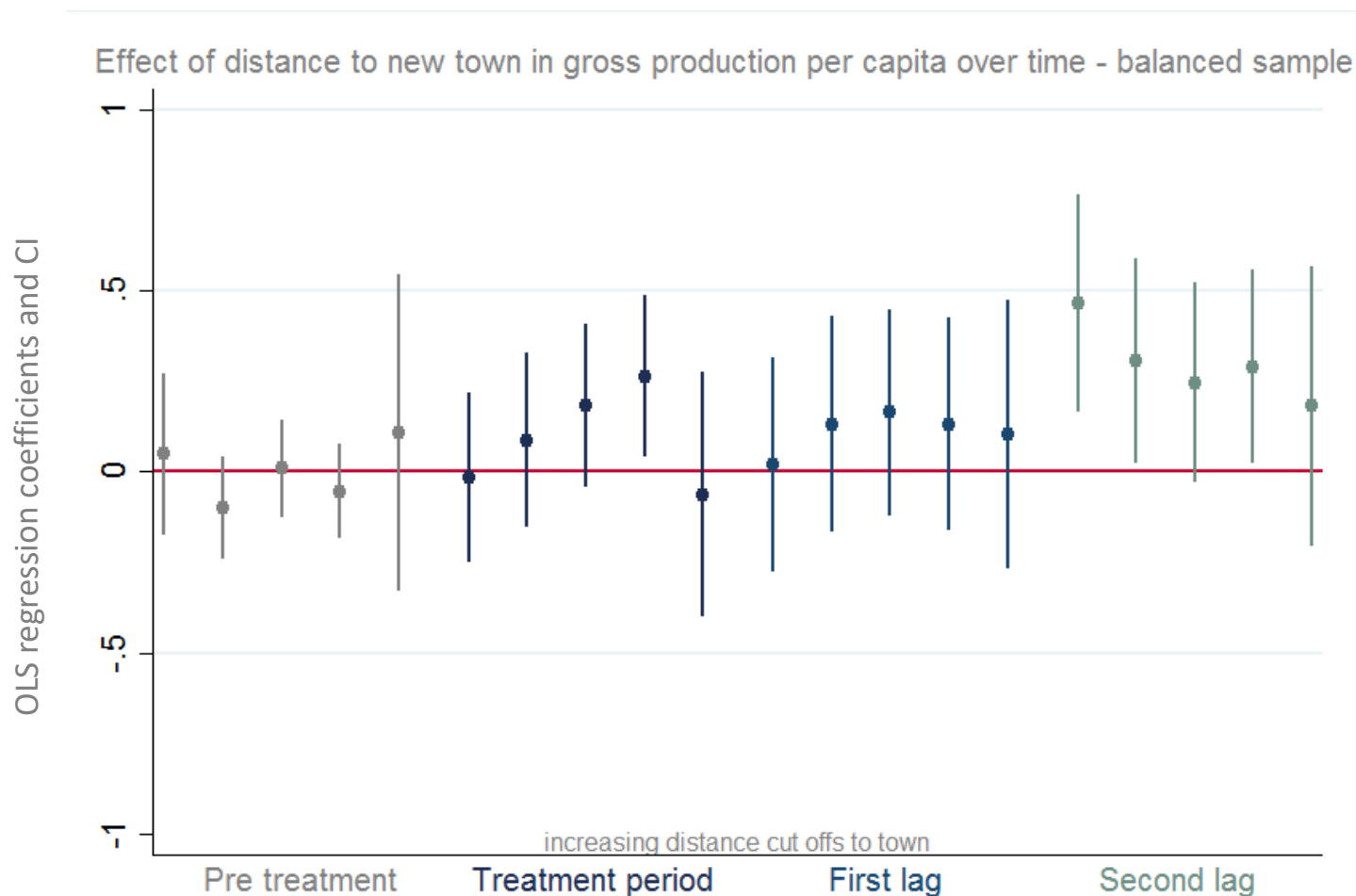
Dynamic effects on ln(gross production per area)



Treatment period and distance cut-offs at < 10km, 10-20 km, 20-30km, 30-50km, 50-70km



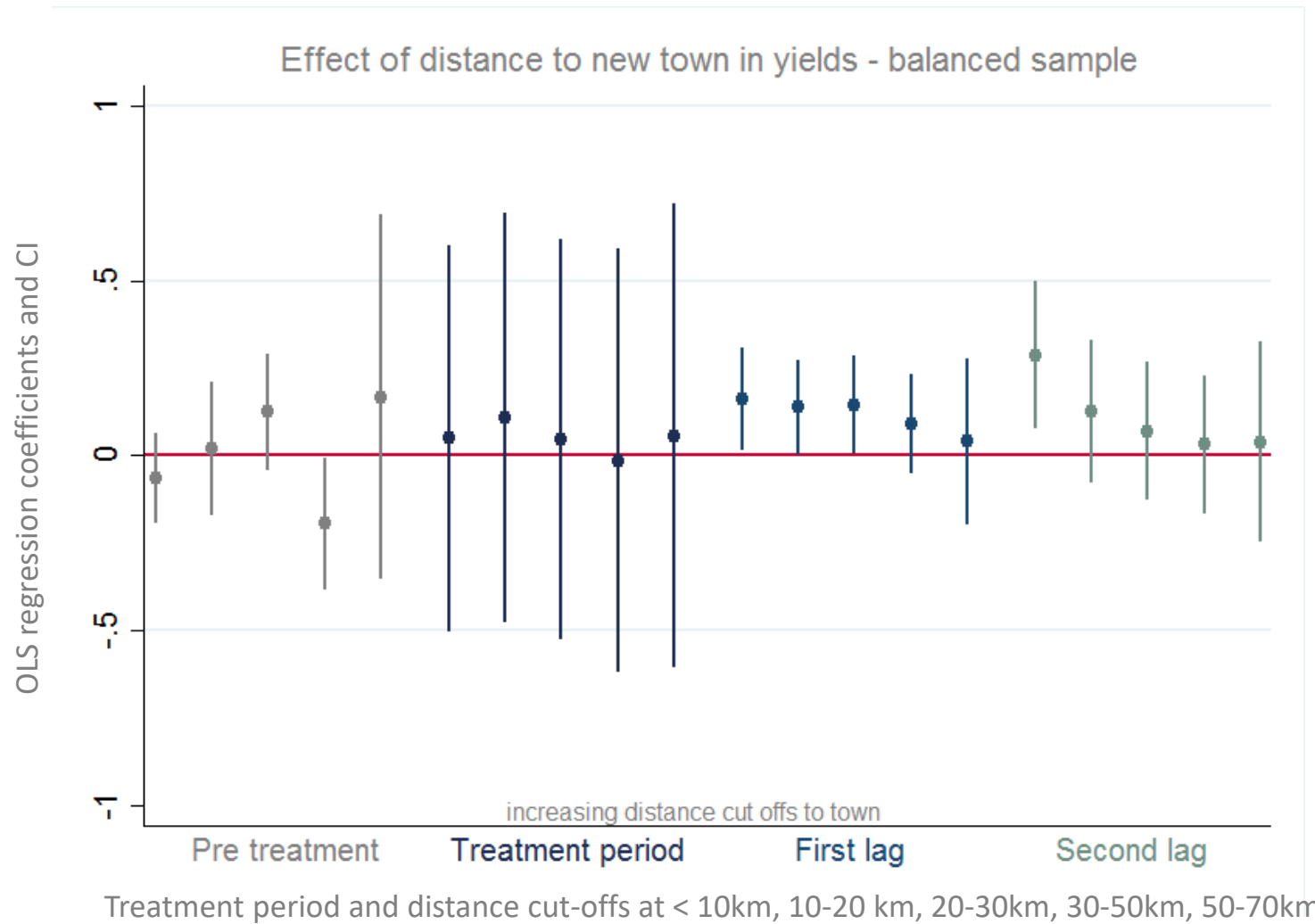
Dynamic effects on $\ln(\text{gross production per capita})$



Treatment period and distance cut-offs at < 10km, 10-20 km, 20-30km, 30-50km, 50-70km



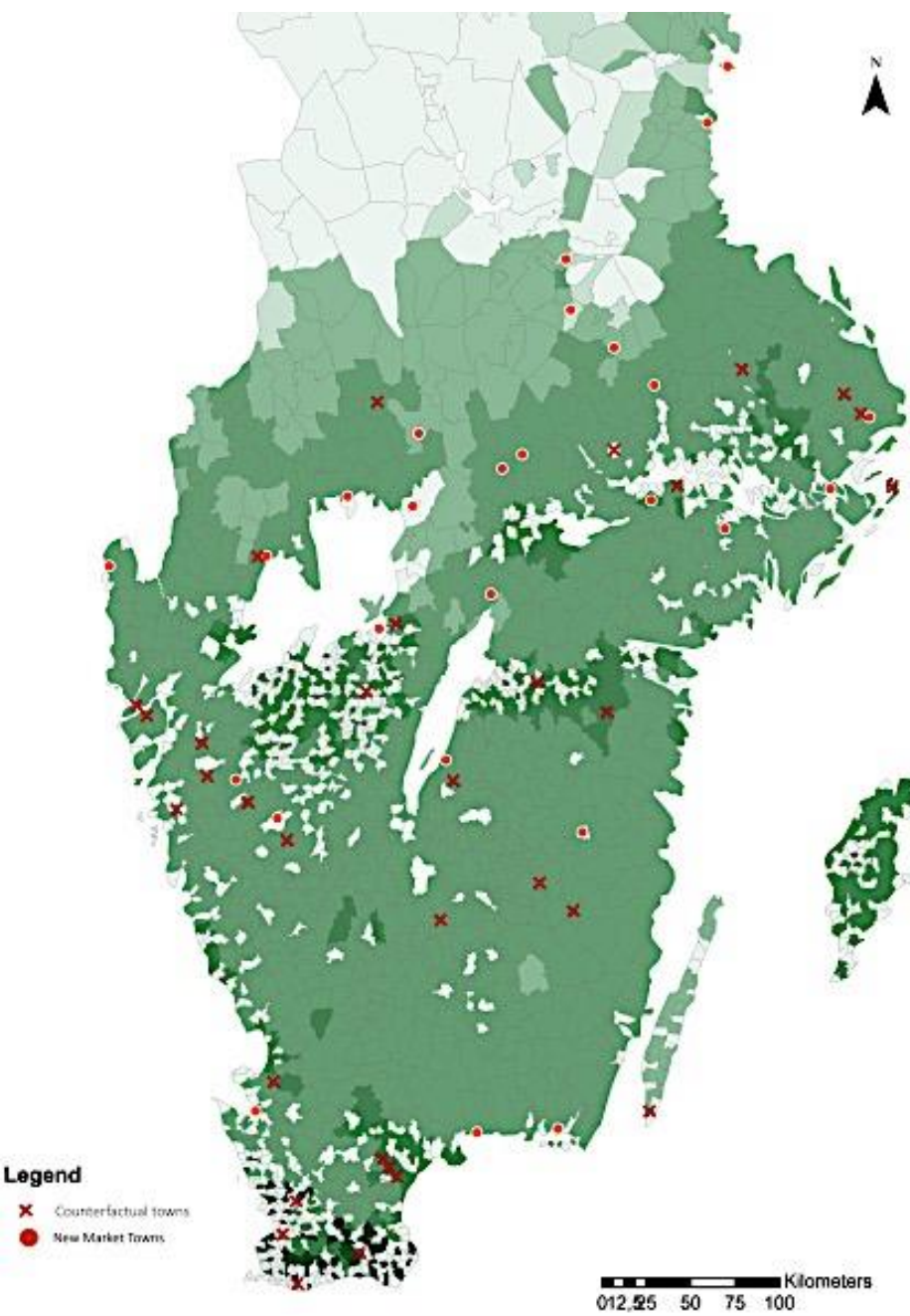
Dynamic effects on $\ln(\text{yields})$



“Reapers” painting by Carl Johan Billmark (1839) from Olsson (2005).

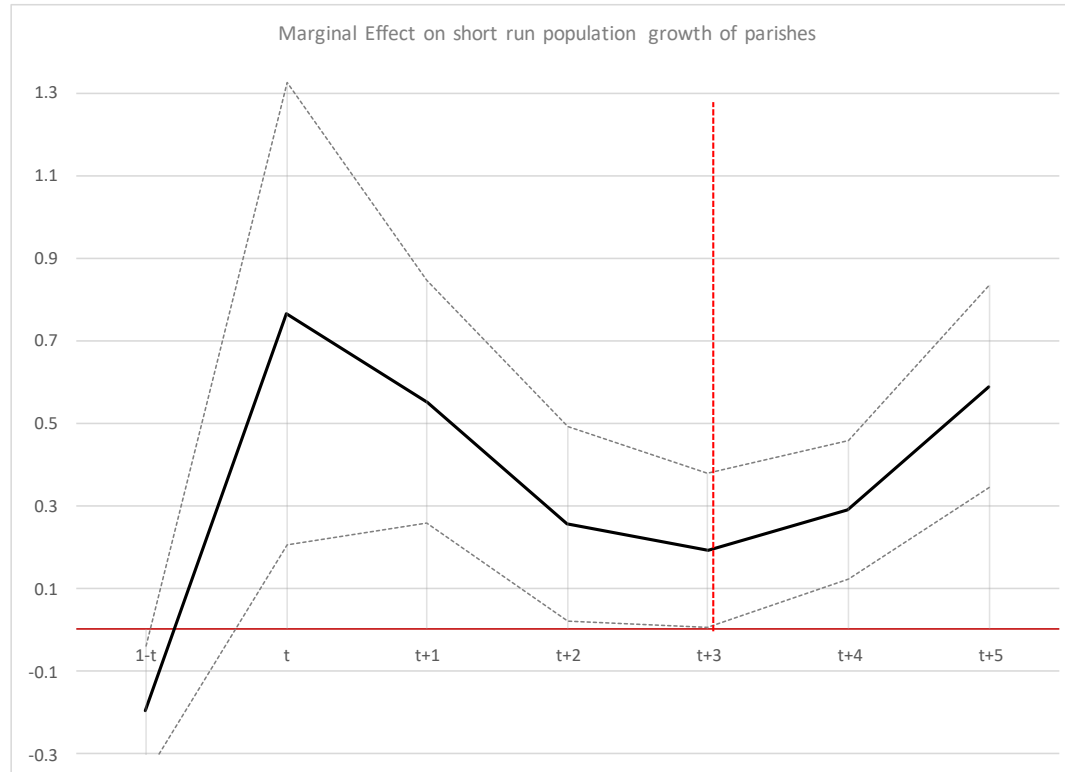


Counterfactual allocation of towns based on population density and being in the neighbourhood of the same medieval town



Average 1570	Treated	Counterfactual	Means diff (p.val H0≠0)
Population	201	265	(0.305)
Distance to town	103	25	(0.006)
Area (km ²)	50.5	51.9	(0.921)
Population density	5.4	6.5	(0.419)
Grain gross production / area	15.9	17.3	(0.813)
Grain yield	3.8	2.9	(0.078)
Cows per area	3.0	2.9	(0.831)
Pigs per area	2.3	2.0	(0.828)
Soil Quality	1,865	2,499	(0.229)
Observations	32	32	

Growth effect market vs counterfactual (short run)



Organic constraints in towns

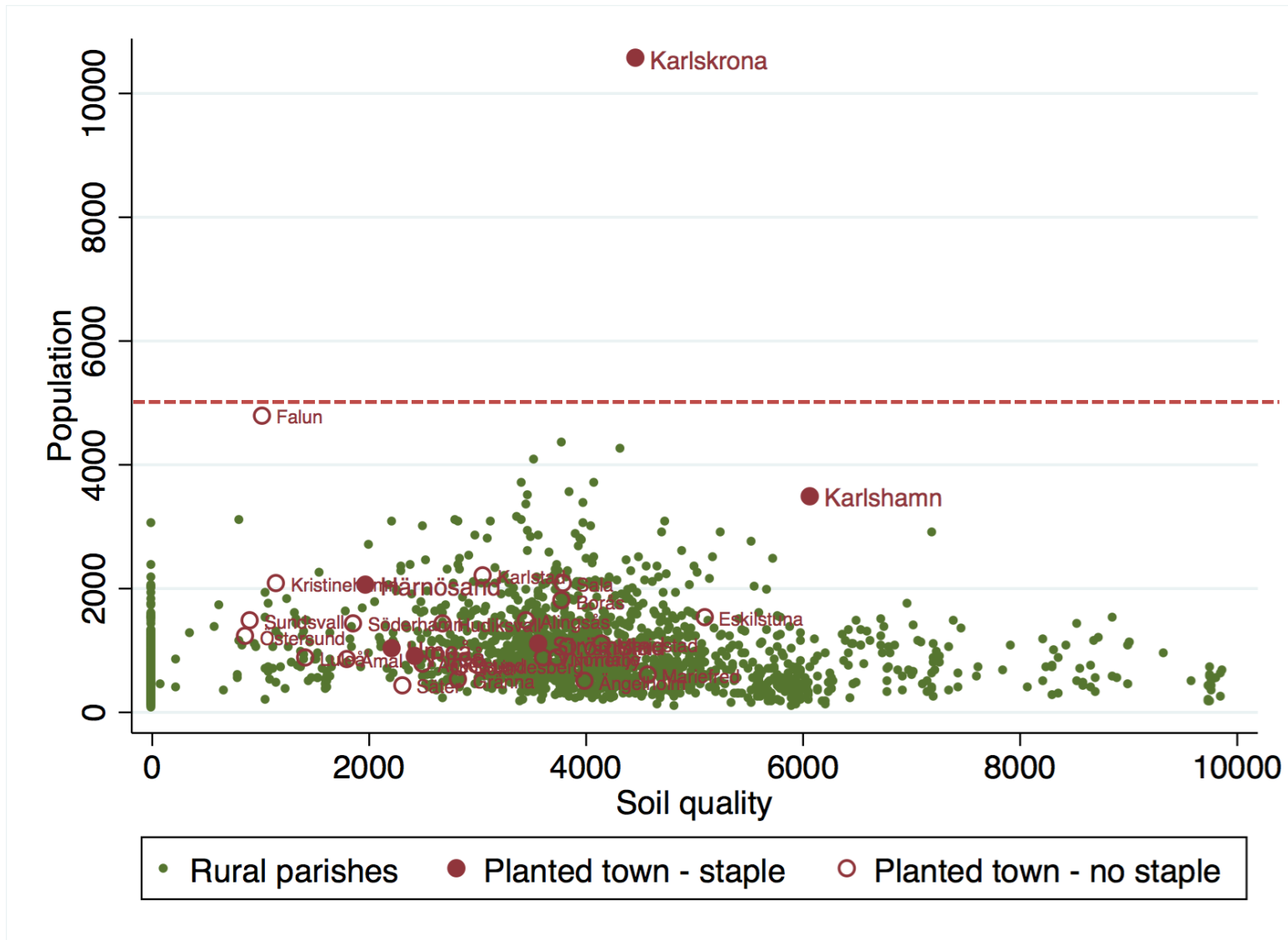
- Illustrative example in Woude, de Vries and Hayami (1990):
A 5,000 inhabitants town would need:
 - 15-30 cartloads of firewood per day.
 - 5 cartloads with bread grain per day.
 - implied the need for forest reserve of 25-40 km².

Country	Soil Suitability Index			GJ/pc Annual Firewood Consumption (1800)
	Max	Mean	SD	
England	9,987	4,182	2,877	2.2
Sweden	9,889	1,312	1,867	37.8
Germany	10,000	5,220	2,297	7.4
Italy	10,000	2,340	2,474	9.3
Spain	9,835	2,696	1,820	12.7
France	10,000	5,364	2,799	9.2

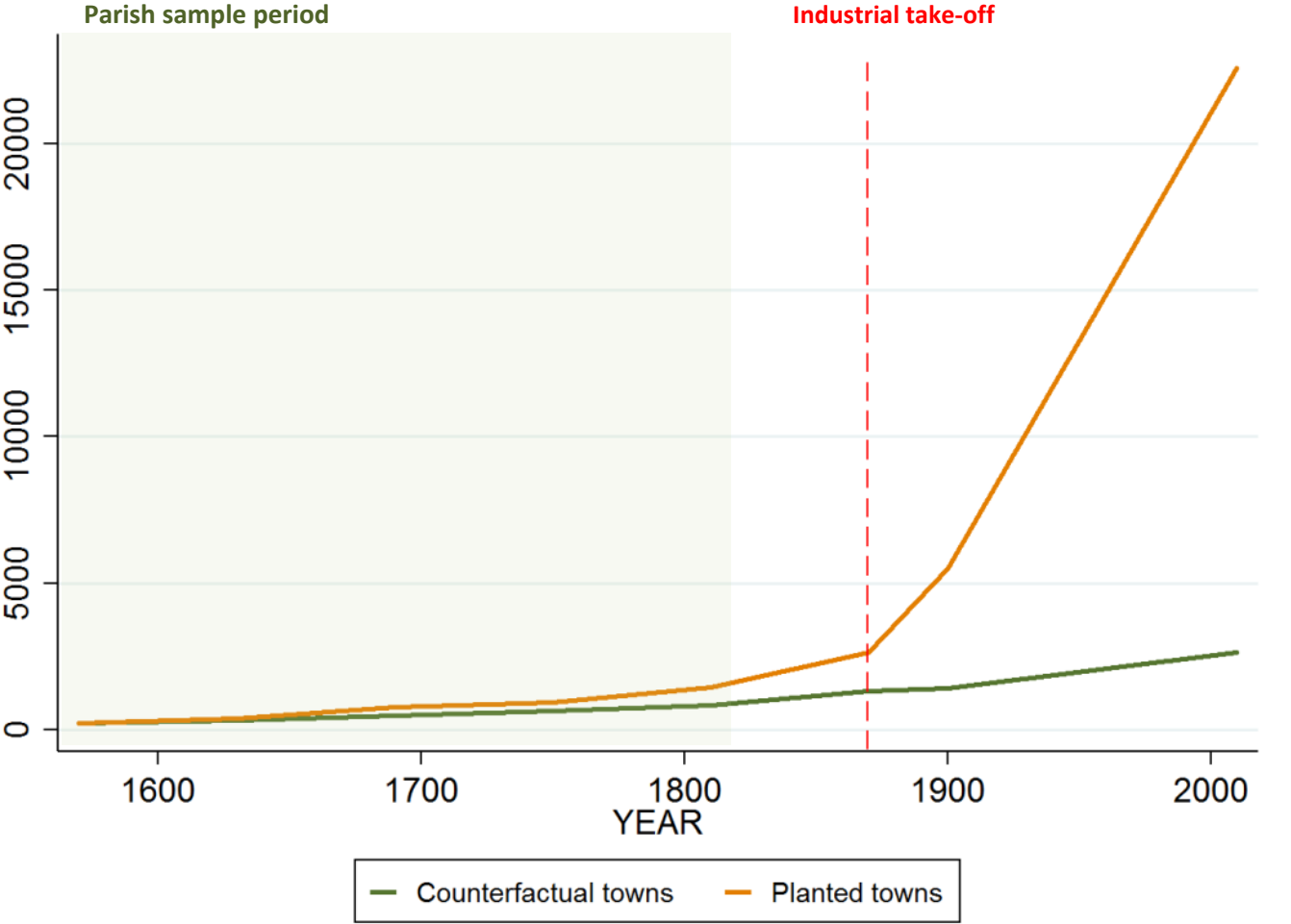
Source: *Crop suitability index (value) for high input level rain-fed cereals from FAO/IIASA, 2011-2012. Annual Firewood Consumption in 1800 from Kander et al (2013) and Teives and Borowiecki (2017).*



Heckscher (1954, p.50): "These communities remained rural settlements equipped with the legal status of a town"



Mean population of planted towns and counterfactual parishes



Conclusions

Q1. Can urbanisation cause agricultural growth?

- YES. But mainly through **extensive** growth.
- **Intensive** growth dependent on sufficient soil quality and takes time.
- The result show the organic constraints to urbanisation in the pre-industrial era.

Q2. Can geographical interventions have persistent long-run effects?

- The planted towns were nothing more than just 'rural settlements equipped with legal status of a town' by 1810.
- YET, path-dependency created towns that thrived until today.
- Potential mechanisms are:
 - coordination of future investments or
 - sunk investments with slow depreciation rates.



Thank you!