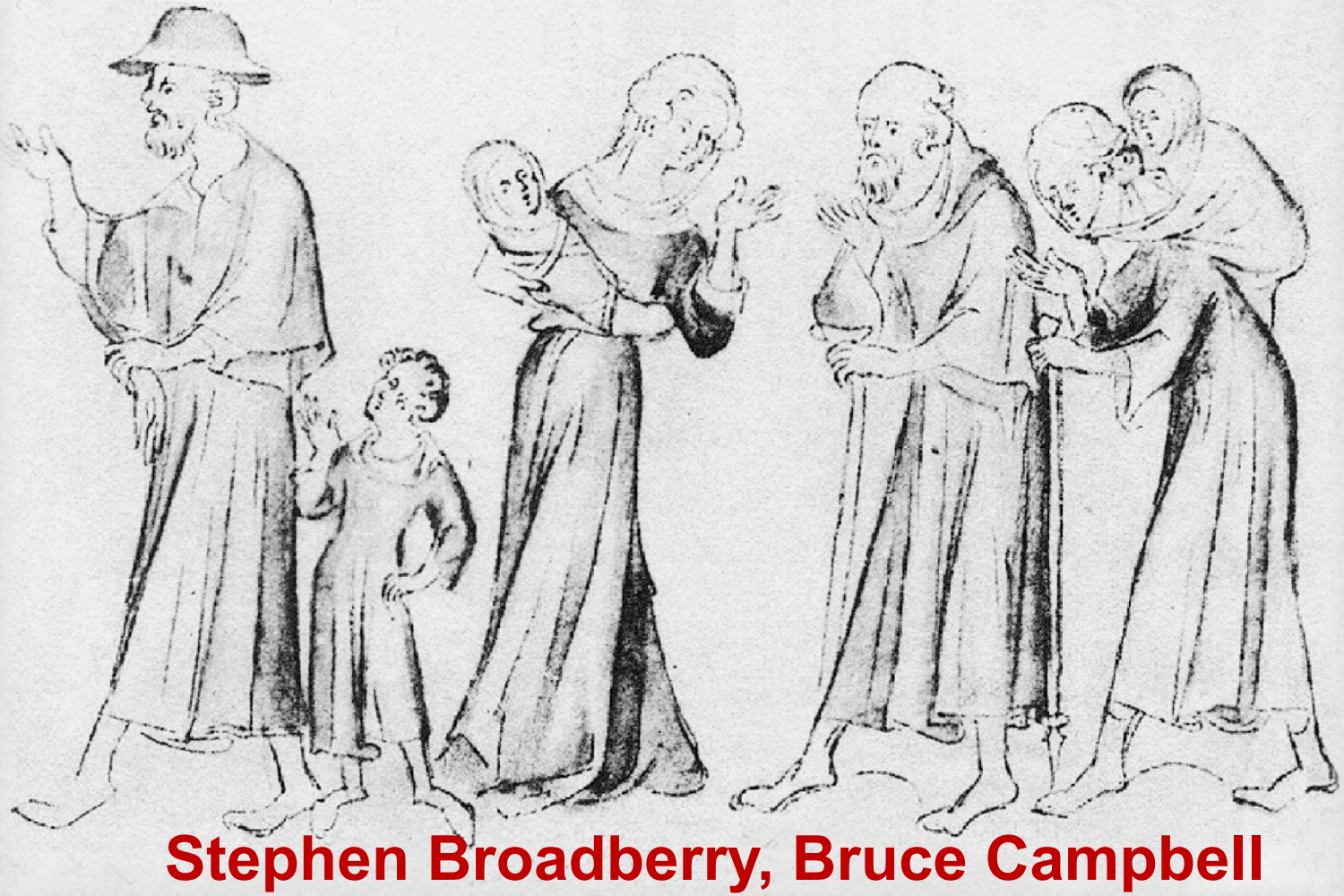
Estimating English medieval population: reconciling time series and cross-sectional evidence



Stephen Broadberry, Bruce Campbell and Bas van Leeuwen

ENGLISH POPULATION, 1250-1751

The size of the population affects estimates of both:

a) **Total GDP**

b) **GDP per capita.**

Year	Total population (m.)		Year	Total population (m.)
1250	4.23		1450	1.90
1290	4.75		1490	2.14
1300	4.73		1541	2.77
1315	4.69		1551	3.02
1348	4.81		1601	4.13
1351	2.60		1651	5.28
1377	2.50		1701	5.20
1400	2.08		1751	5.92

ENGLISH POPULATION, 1250-1751

Pre-1801 = pre-census

Pre-1538 = pre-census and pre parish registration of baptisms, marriages and burials

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ENGLISH POPULATION, 1250-1751

After 1541 we use the widely accepted estimates of Wrigley & Schofield.

Before 1541 both the size and trend of the population are controversial.

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Key national sources of cross-sectional data include:

- **1086 – Domesday Book** (landowners & head tenants)
- **1290, 1327, 1332, 1334 – lay subsidies** (means-tested lay taxpayers)
- **1377 – Poll Tax** (per caput tax on all adults)
- **1522 , 1524, 1525 – muster rolls and lay subsidies** (able-bodied males & means-tested lay taxpayers)

The information available for reconstructing England's late-medieval population is superior to that available for most other European countries.

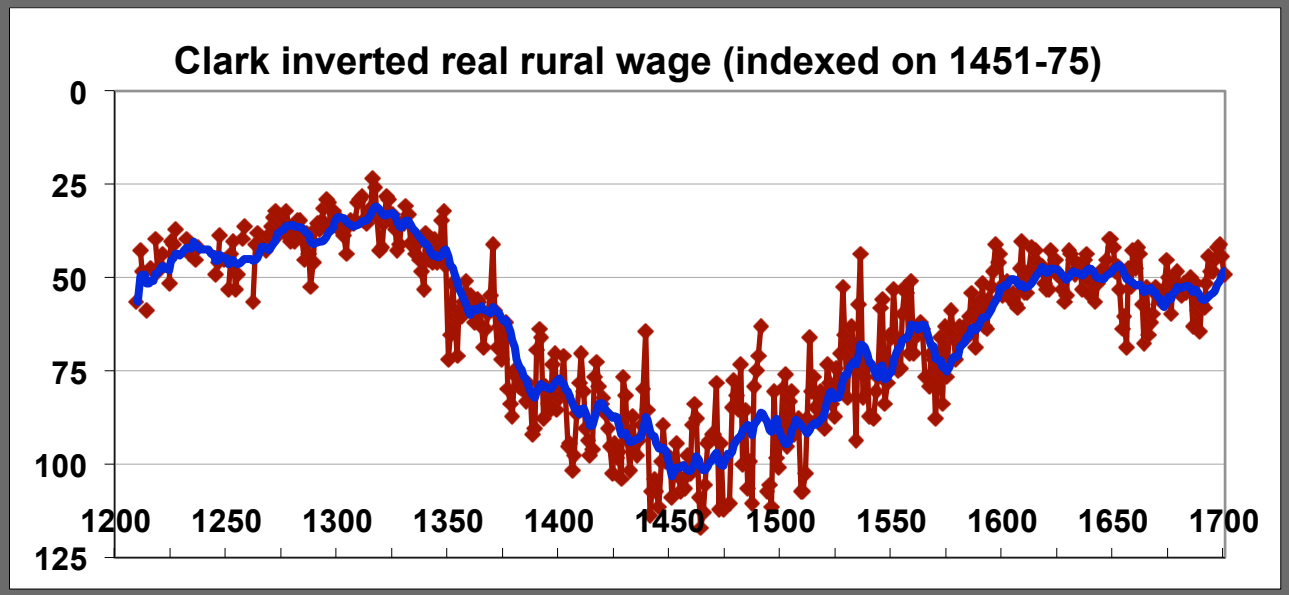
Complementary local time-series data are:

- H. E. Hallam's counts of tenant numbers
- T. H. Hollingsworth's calculations of adult-male replacement rates of tenants-in-chief of the Crown
- S. Thrupp and R. Gottfried's replacement rates of 15th century male testators
- L. R. Poos's series of tithingpenny payments for individual manors
- Reconstitution studies of individual manorial populations, e.g. Z. Razi on Halesowen.

The information available for reconstructing England's late-medieval population is superior to that available for most other European countries.

Indirect guides to the size and trend of population are:

- Estimated kilocalorie output
- Land rents
- Real wage rates:



Because of the quantity and quality of these sources there is broad consensus concerning:

1.The basic chronological sequence of

(i) growth to c.1290

(ii) crisis, c.1290-1348

(iii) decline and stagnation, 1348 – 1450/1475

(iv) renewed growth and recovery, from 1450/1475.

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2. The evolving national distribution of population as captured by (i) Domesday Book in 1086, (ii) the lay subsidies 1290/1327-34, (iii) the Poll Tax in 1377, (iv) E. A. Wrigley's recent county reconstruction of population in 1600.

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3. The probable size range of the population at key benchmark dates.

Debate therefore focuses upon:

i. The absolute size of the population at the key benchmark dates of 1086, c.1300, 1348, 1377, c. 1450, and 1525.

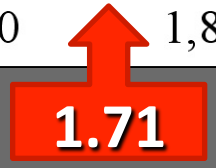
ii. The magnitude of the reduction in population precipitated by the Black Death.

iii. The precise timings of the successive transitions from (1) growth to crisis, (2) decline to stagnation, and (3) stagnation to recovery.

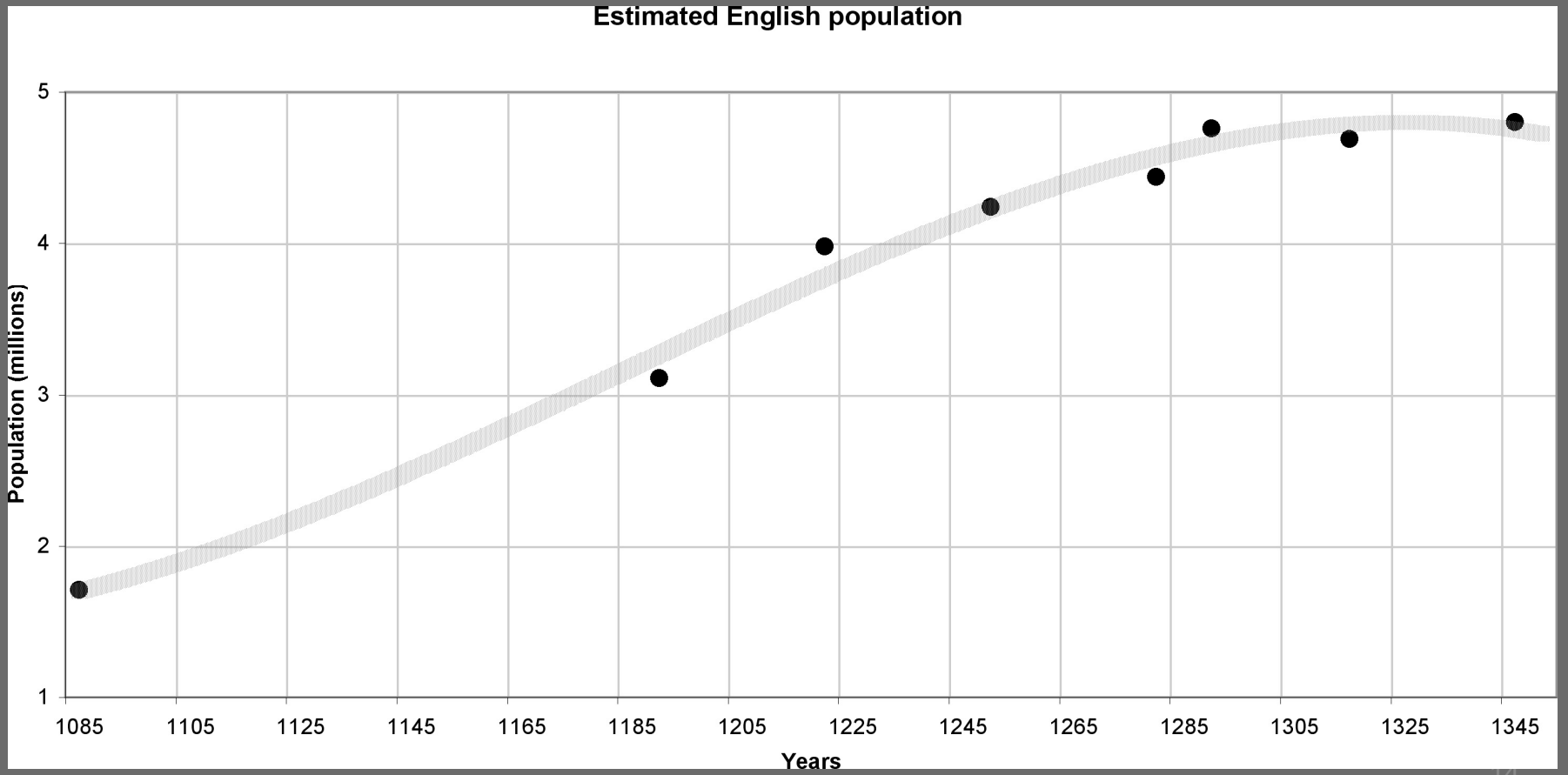
Our aim has been to produce a set of estimates of (i) size, (ii) distribution, and (iii) trend, which are mutually reconcilable and consistent with our independent estimates of kilocalorie food output and Allen and Clark's reconstructions of trends in real wage rates.

For 1086 we estimate a total English population of 1.71 m. (above Darby's maximum estimate of 1.6 m. but below Harvey's maximum estimate of 1.9 m.).

	Russell	Darby (I)	Darby (II)	Harvey
Recorded rural households	268.3	268.3	268.3	268.3
Omissions rate (%)	0.0	5.0	5.0	25.0
Allowance for omissions	0.0	13.4	13.4	67.1
Tenants-in-chief	1.1	1.1	1.1	1.1
Under-tenants	6.0	6.0	6.0	6.0
Northern counties	6.8	6.8	6.8	6.8
Total rural households	282.2	295.6	295.6	349.3
Household multiplier (persons)	3.5	4.5	5.0	5.0
Total rural population	987.7	1,330.2	1,478.0	1,746.5
Urban population	117.4	120.0	120.0	120.0
Total population	1,105.1	1,450.2	1,598.0	1,866.5

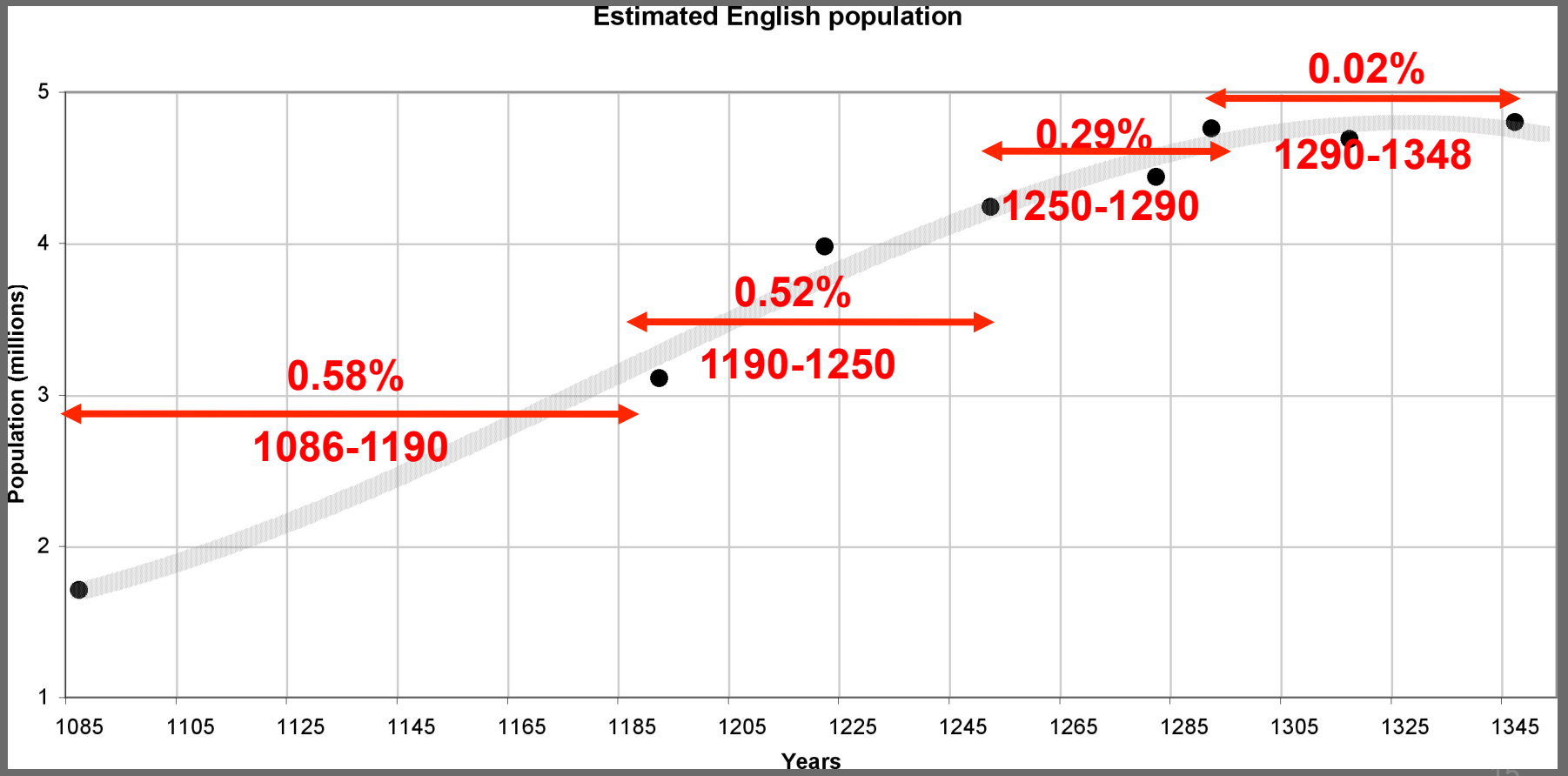


In line with the trend of tenant numbers derived from H. E. Hallam's manorial listings of tenant numbers plus some additional data, we estimate that the population then grew by 2.5 – 3.0 fold to c.4.75 m. in 1290:

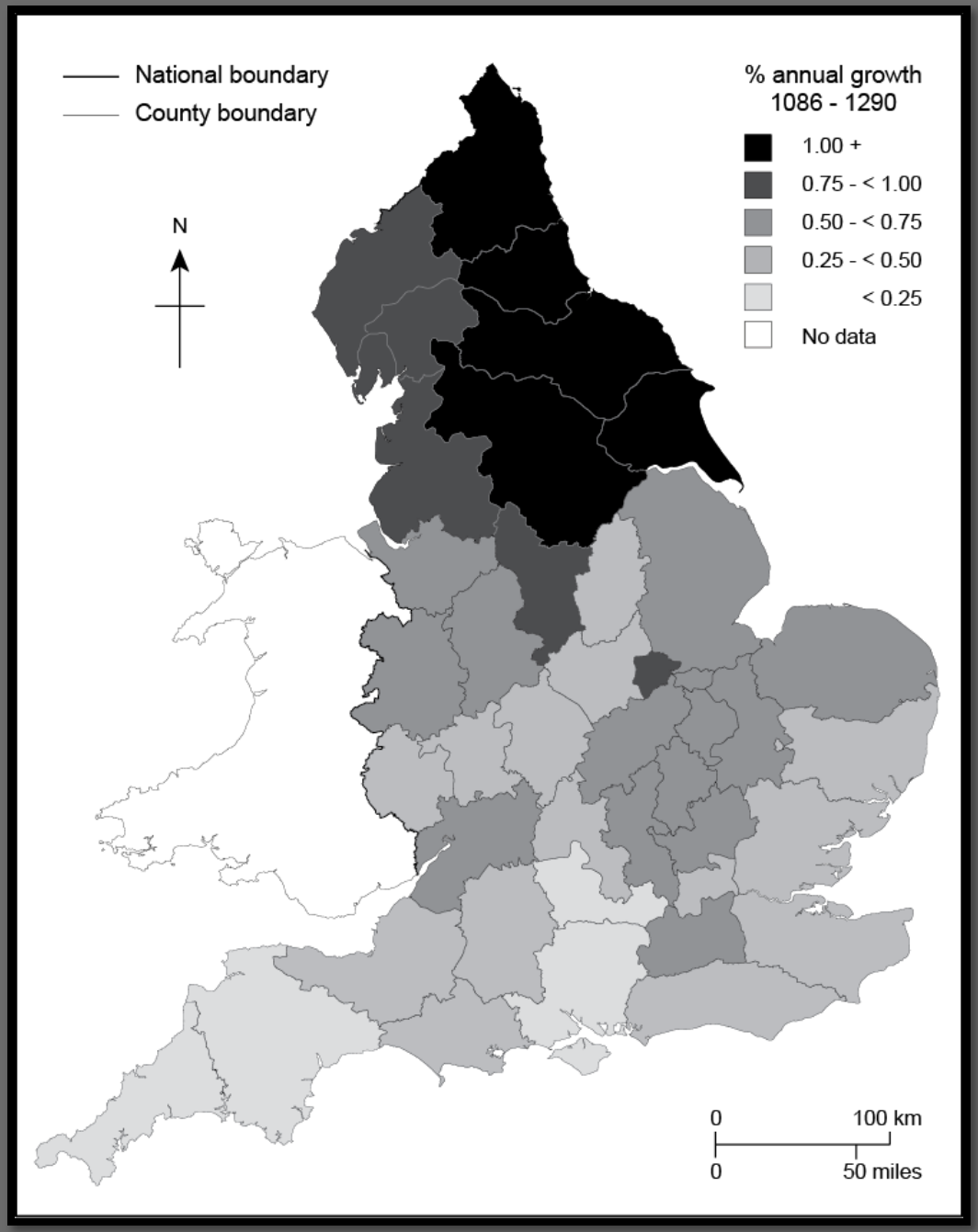


This is above my own hitherto preferred figure of 4.0m. but well below the maximum estimates in the range 5.0 – 7.0 m. advanced by many other scholars.

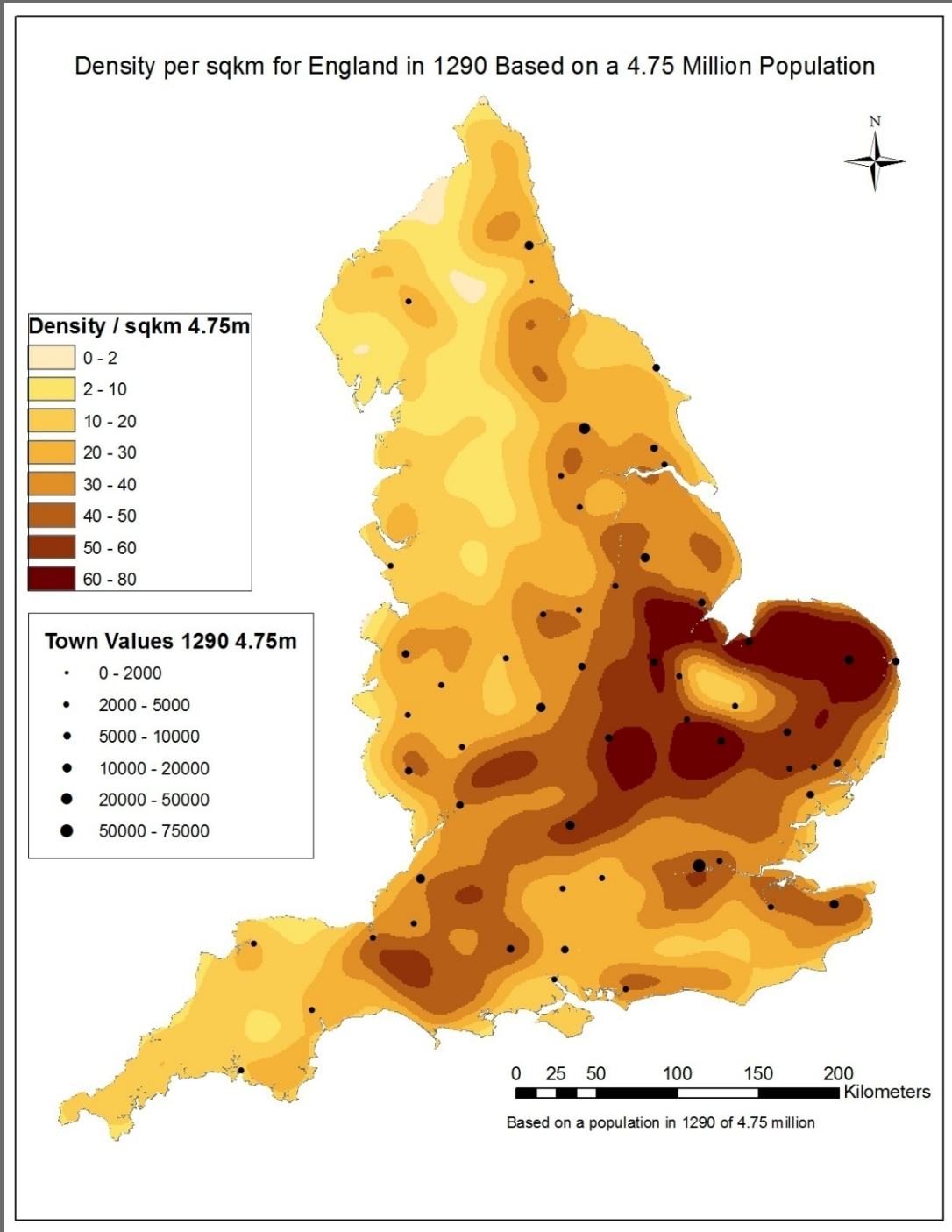
It is consistent with aggregate annual growth rates of:



And consistent with this regional pattern of population growth 1086-1290:

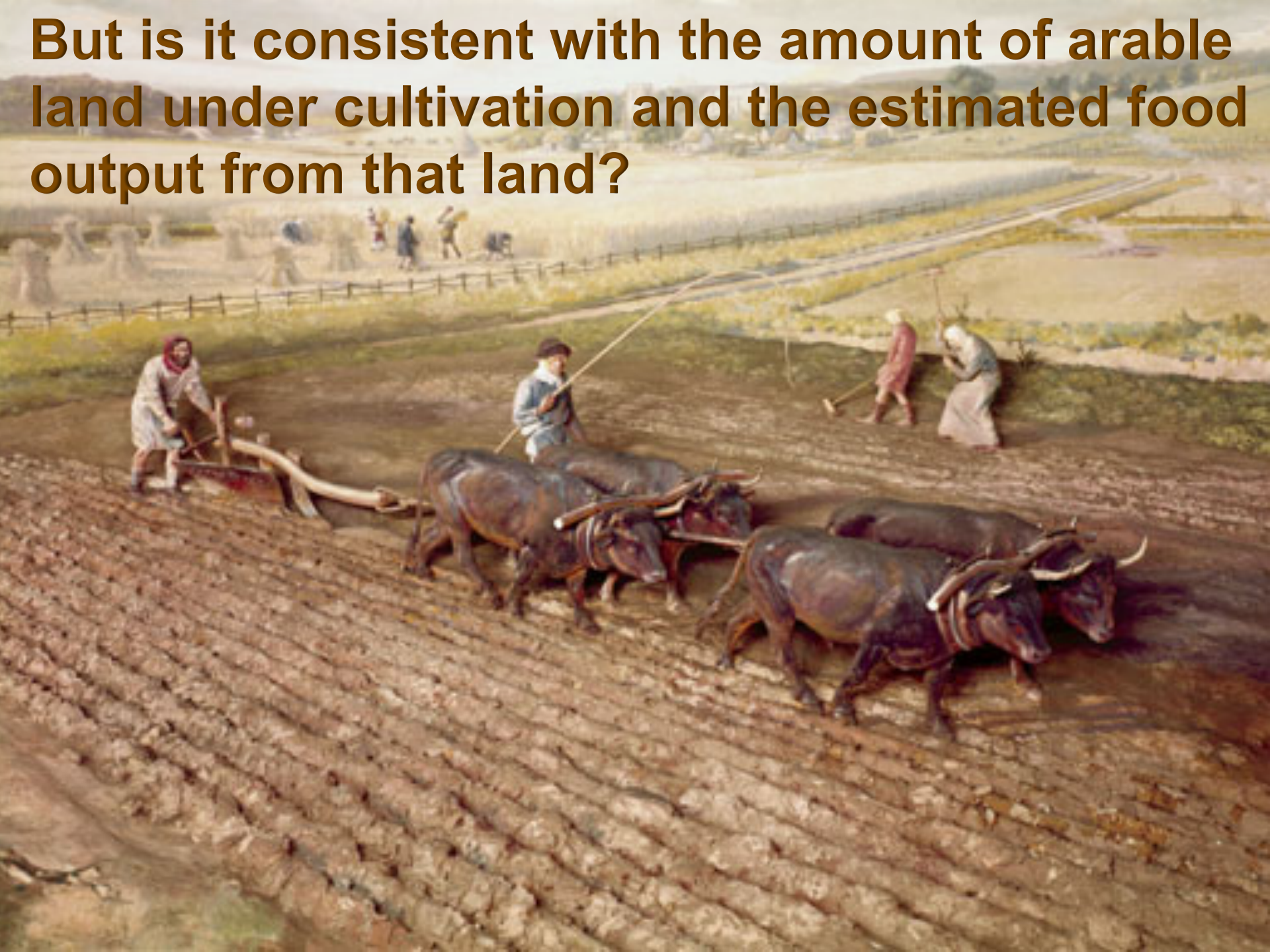


Also, this geographical distribution of population in 1290:



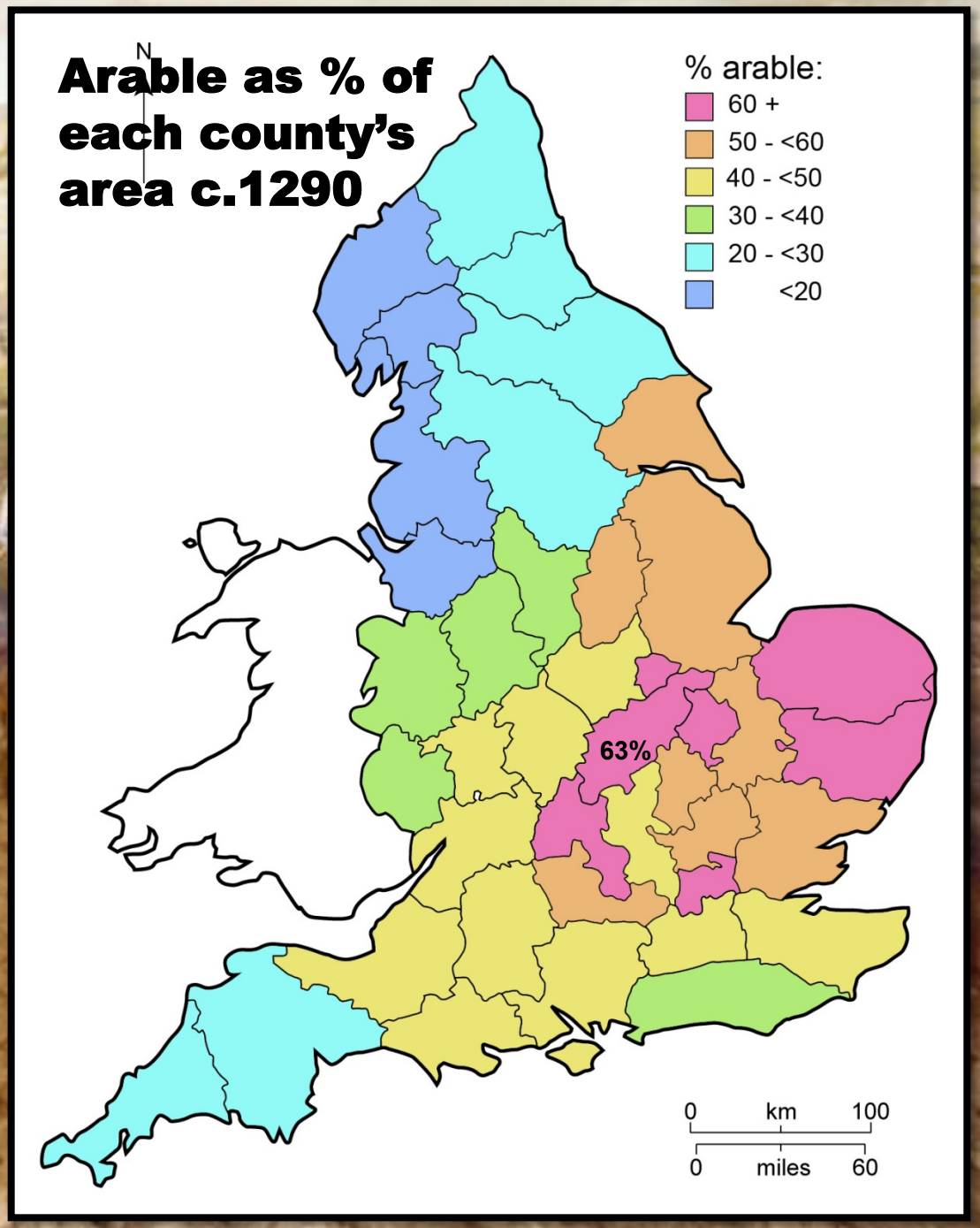
Note:
30 per kilometer^2 = 78 per mile^2
50 per kilometer^2 = 130 per mile^2

But is it consistent with the amount of arable land under cultivation and the estimated food output from that land?



Sources:

- ❑ % arable 1836/71
- ❑ % arable 1801
- ❑ Population density c.1290
- ❑ Williamson's estimate for N'hants of 63% arable
- ❑ Density of DMVs.



Region	Pop^{n} /mile^{2} 1290	% arable 1290	% arable 1836/71
Eastern England	156	59.0	61.6
NE midlands	112	49.0	39.4
South-east	109	45.0	53.8
SW midlands	113	45.0	33.7
W midlands	83	40.5	43.4
North-east	64	27.5	37.7
South-west	58	25.0	31.9
North-west	41	17.5	26.4
ENGLAND	94	38.8	42.9

Estimated arable area c.1290 = 12.72m. acres
(i.e. 1.53m. acres more than in 1801)

On our estimates of agriculture's kilocalorie output c.1290 it is difficult to see how more people could have been fed, given the meagre per capita food allowance of < 2,000 Kcal.

Decade	Popⁿ (m.)	Total arable (m. acres)	Arable acres per capita	Per capita arable Kcal net of seed, fodder & losses	% food extraction rate	Arable Kcal as % total per capita Kcal	Total per capita food Kcal
1080s	1.71	5.88	3.44				
1270s	4.40	12.52	2.85	1,602	*55*	*76*	2,115
1300s	4.72	12.72	2.69	1,425	*57*	*73*	1,950
1310s	4.63			1,376	*57*	*72*	1,899
1380s	2.36	9.64	4.08	2,078	*52*	*83*	2,493
1420s	2.03	8.75	4.31	1,767	*51*	*80*	2,213
1450s	1.93	8.44	4.37	1,787	*53*	*78*	2,285
1600s	4.27	8.87	2.08	1,595	*54*	*79*	2,009
1650s	5.35	9.63	1.80	1,484	*50*	*79*	1,870
1700s	5.26	9.56	1.82	1,514	*51*	*78*	1,950

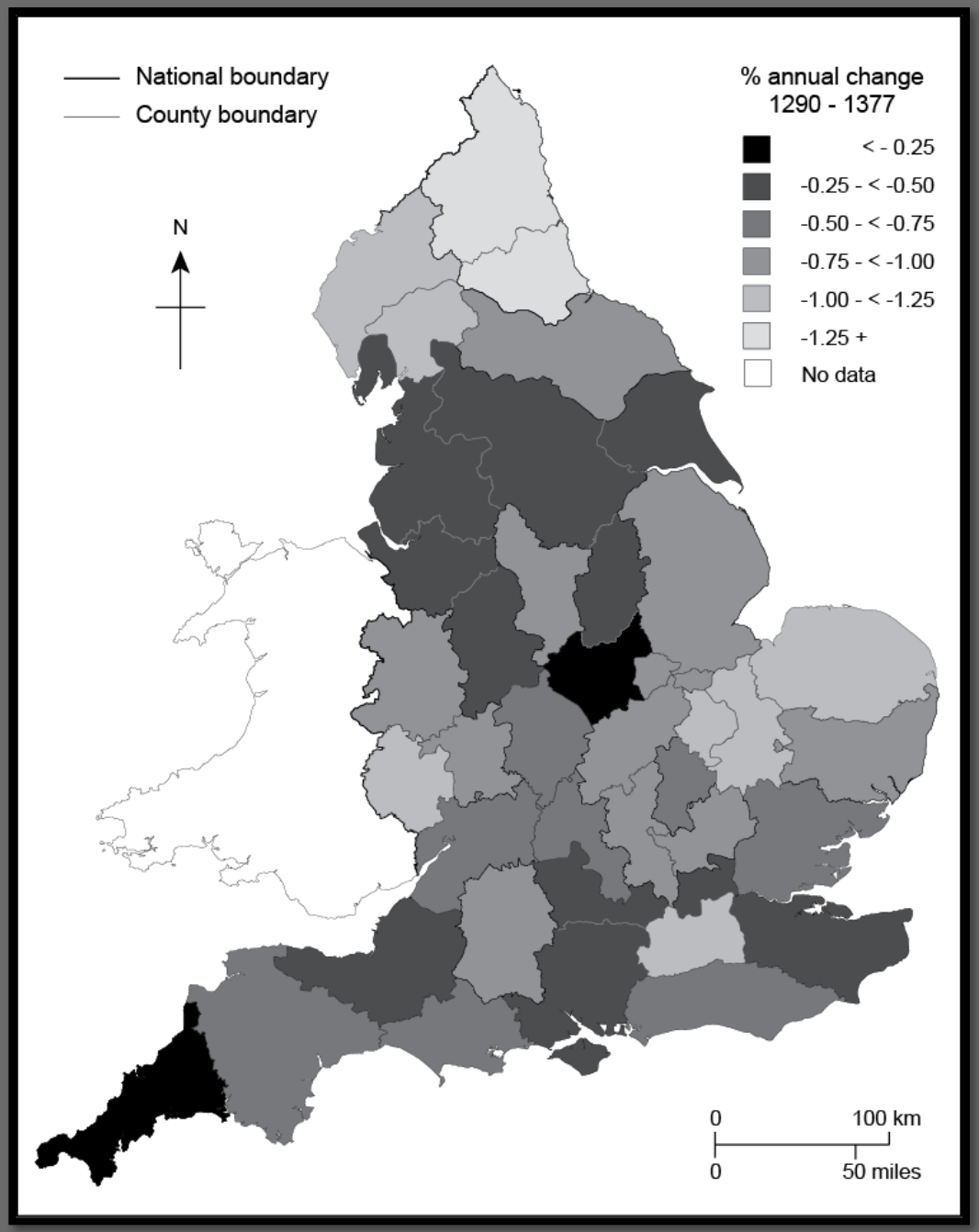
After 1290 population trends on different manors and in different regions tended to diverge, rendering the aggregate trend very difficult to read. Overall, we have plumped for:

- A cessation of growth after 1290.
- A 12% drop in population 1315-25 as a direct result of the Great European Famine.
- A strong post-famine recovery to 4.8 m. on the eve of the Black Death.
- A 46% fall in numbers during the first plague outbreak.
- A continuing net fall in population following the Black Death, reducing to 2.5 m. by 1377.
- Ongoing demographic decline thereafter.

Our estimate of 2.5 m. in 1377 is derived from the Poll Tax as follows:

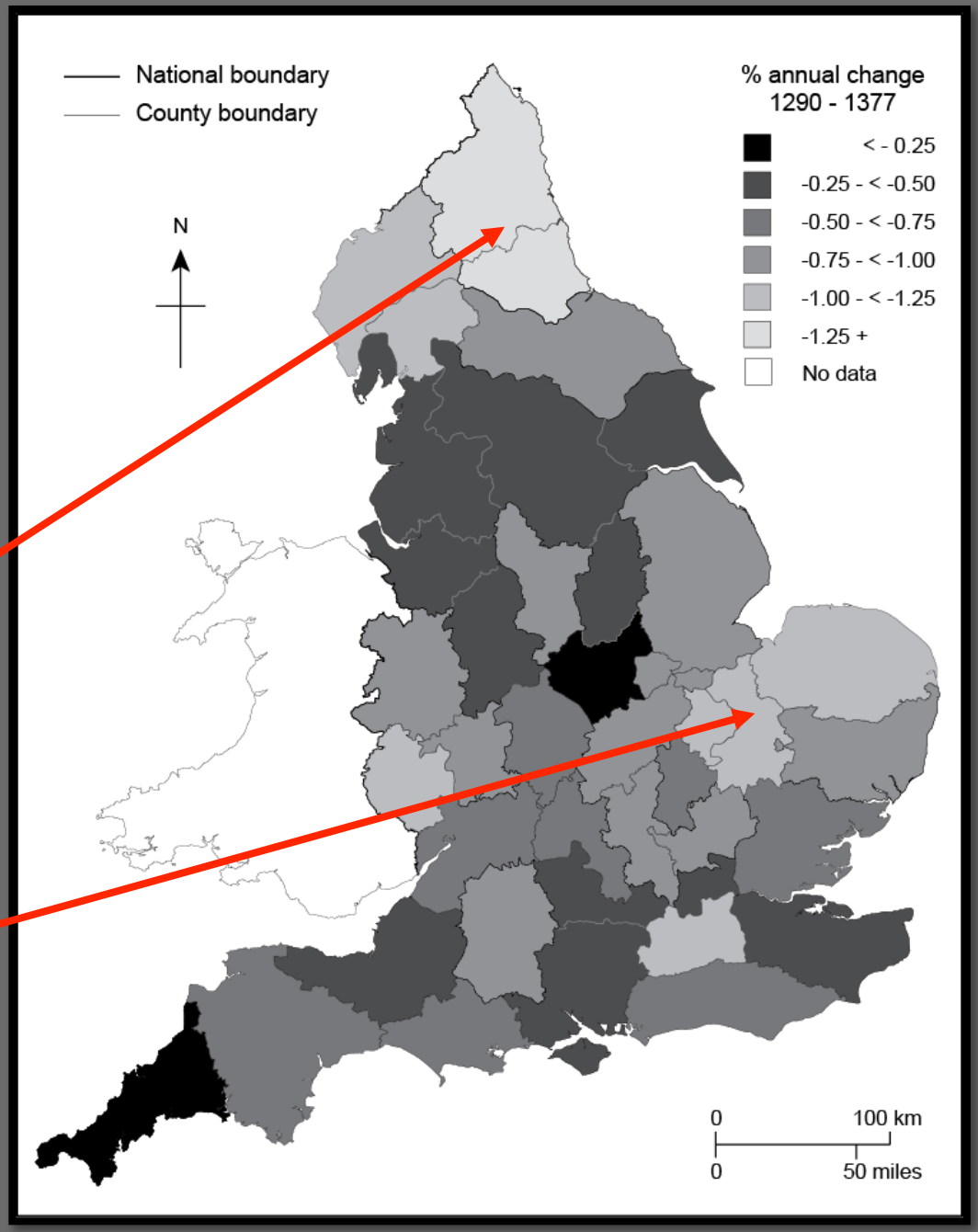
	Russell	Postan	"Best estimate"
Laity	1,355,555	1,355,555	**1,355,555**
Clergy	30,641	30,641	**30,641**
Allowance for Cheshire, Durham & mendicant friars	31,994	31,994	**31,994**
Adult total	1,417,380	1,417,380	**1,417,380**
Share of population under-15	33.3%	45.0%	**37.5%**
Allowance for children	708,690	1,159,675	**850,428**
Total including children	2,126,070	2,577,055	**2,267,808**
Assumed rate of under-enumeration	5%	25%	**10%**
Allowance for under-enumeration	106,303	644,264	**226,781**
Total population	2,232,373	3,221,319	**2,494,589**

The rate of decline in population between 1290 and 1377 was geographically very uneven.



The rate of decline in population between 1290 and 1377 was geographically very uneven.

Losses were greatest in:
(1) the northern border counties
(2) the once crowded counties of Norfolk, Cambridgeshire and Huntingdonshire.

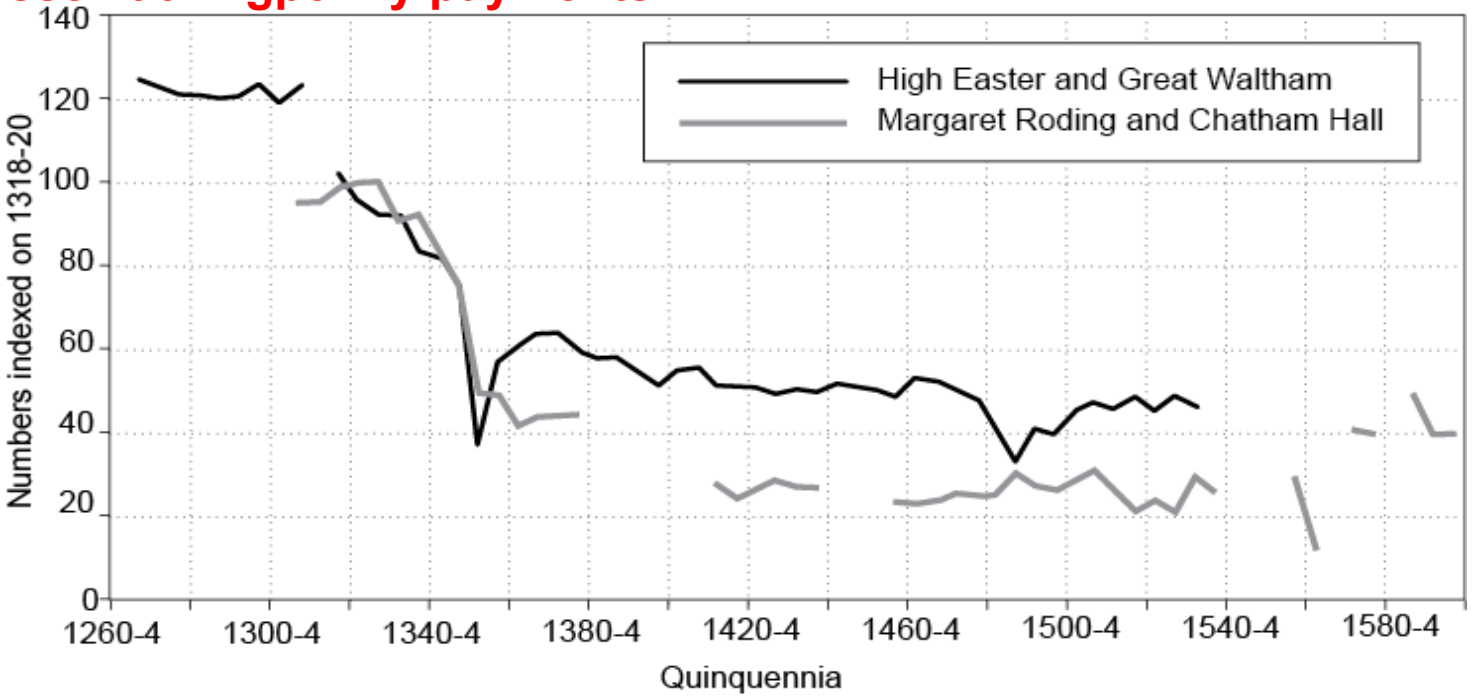


After 1377 the next fixed demographic point is Wrigley & Schofield estimate of 2.77 m. in 1541.

Between these two key benchmark dates we infer the aggregate trend of population from trends in:

- **tenant numbers.**
- **tithingpenny payments.**
- **the replacement rates of male tenants-in-chief of the Crown, as calculated by Hollingsworth.**
- **replacement rates of testators 1420-80 estimated by Thrupp and Gottfried**
- **real wage rates (which peaked in the mid-15th century, and then commenced a long decline).**

Essex tithingpenny payments:



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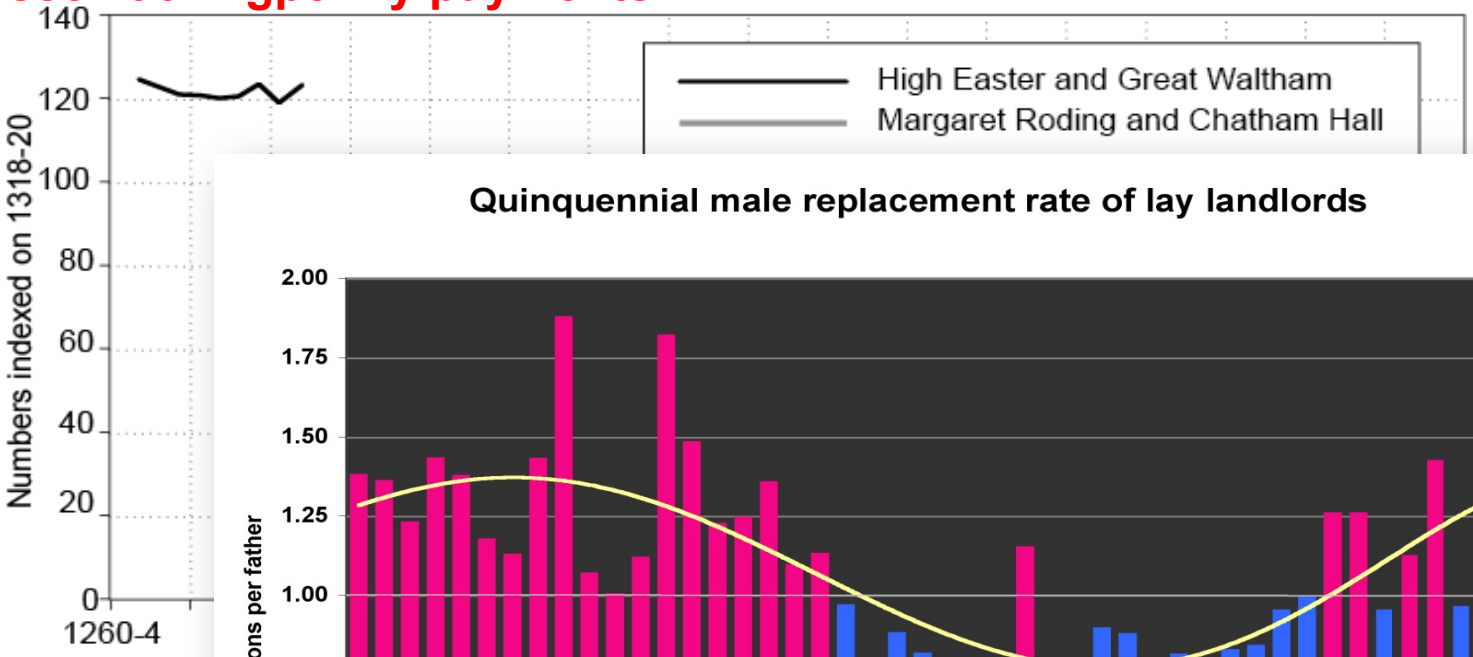

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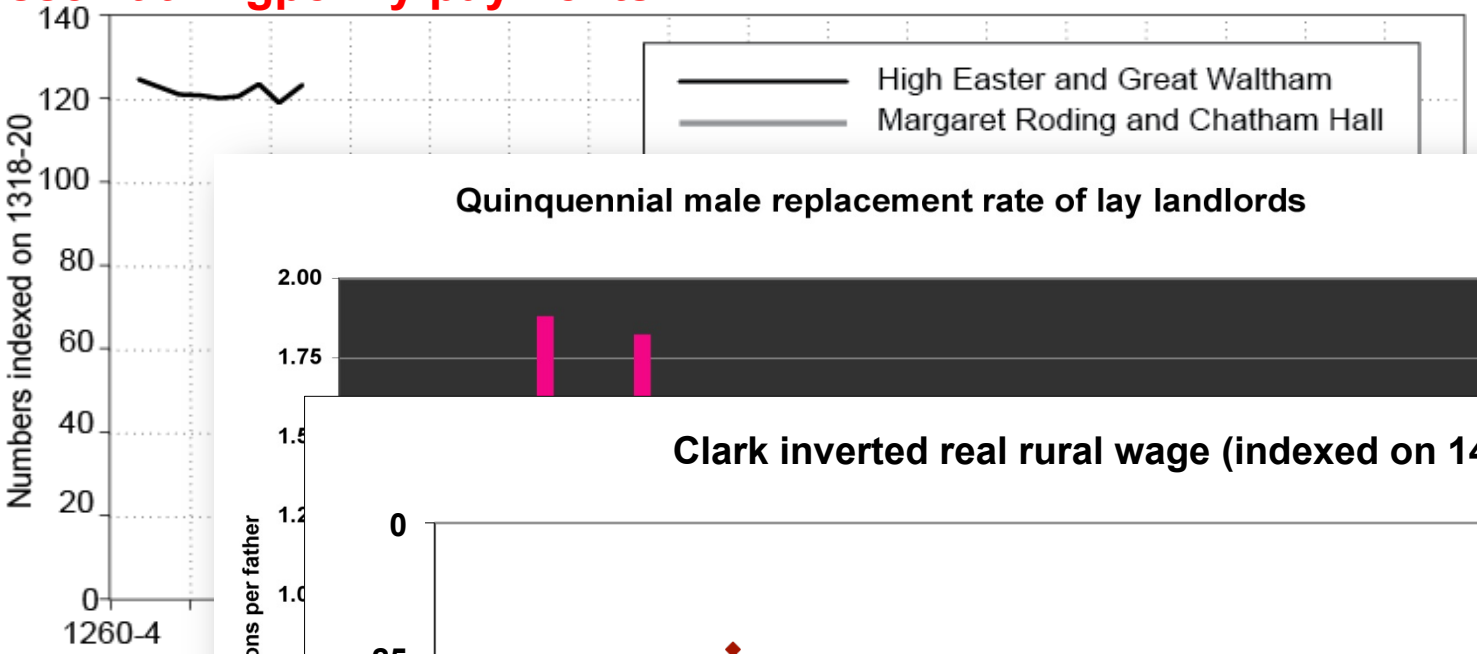
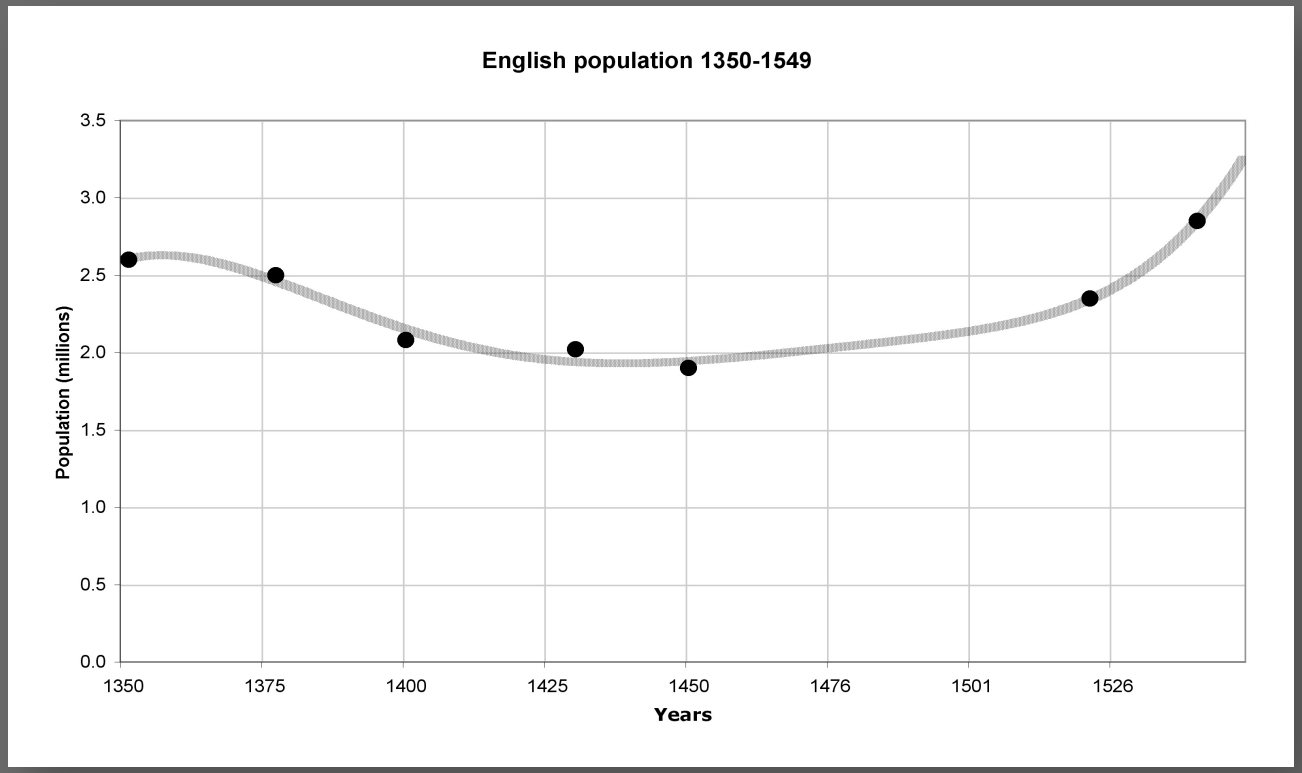


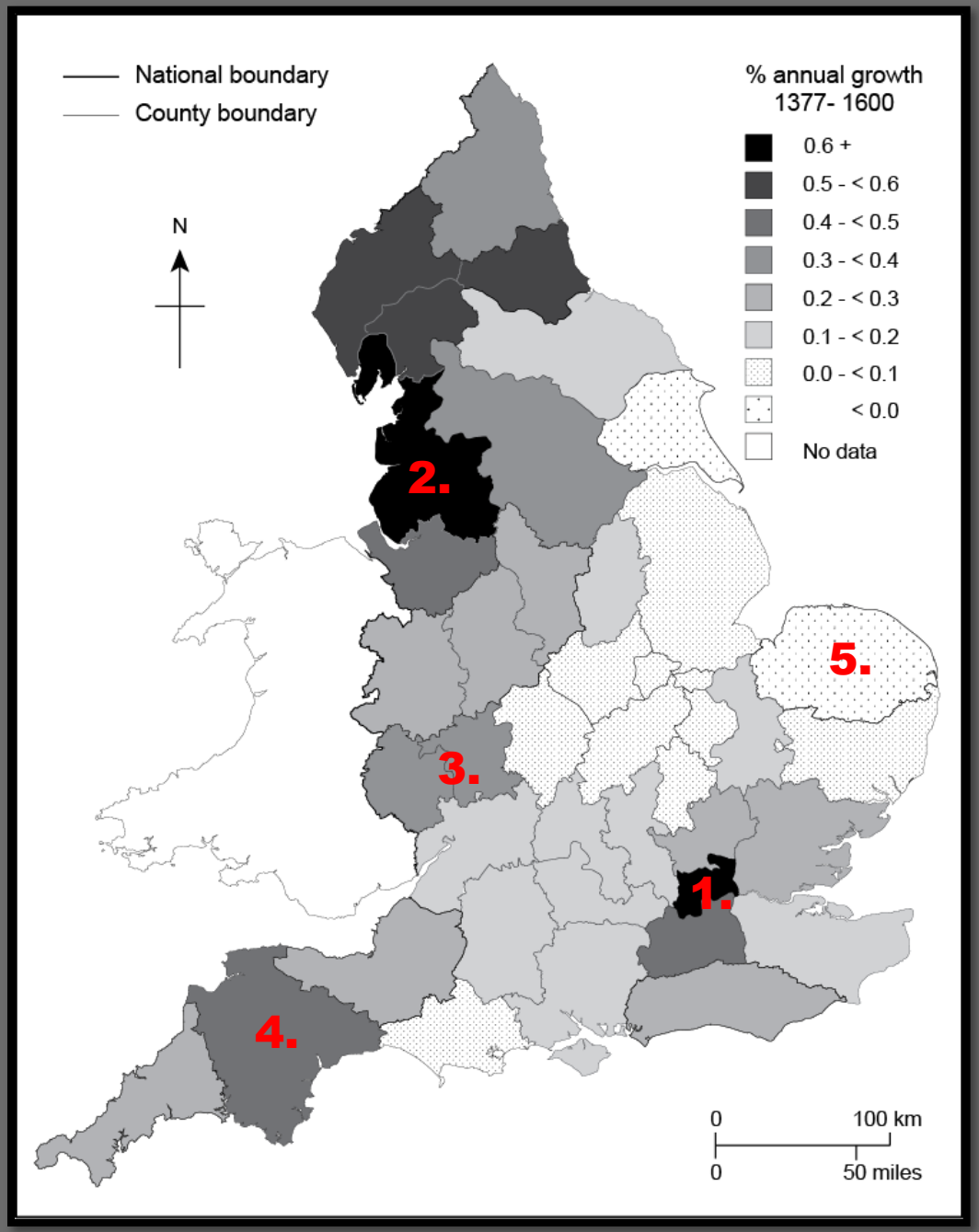
These all suggest that:

- Population decline ceased in the mid-15th century, when the population was at a minimum of c.1.9 m.
- Recovery was underway by the final decades of that century.
- By the second quarter of the 16th century the population was growing fast at almost 1% p.a..



Recovery plainly began sooner and was stronger in some regions than others, above all in:

1. London and its environs.
2. the north-west.
3. the west midlands.
4. the south-west.
5. Recovery was least pronounced in the eastern counties & east midlands.



It is these population estimates:

Year:	Total population:	Year:	Total population:
1086	1.71	1348	4.81
1190	3.10	1351	2.60
1220	3.97	1377	2.50
1250	4.23	1400	2.08
1279	4.43	1430	2.02
1290	4.75	1450	1.90
1315	4.69	1522	2.35
1325	4.12	1541	2.77

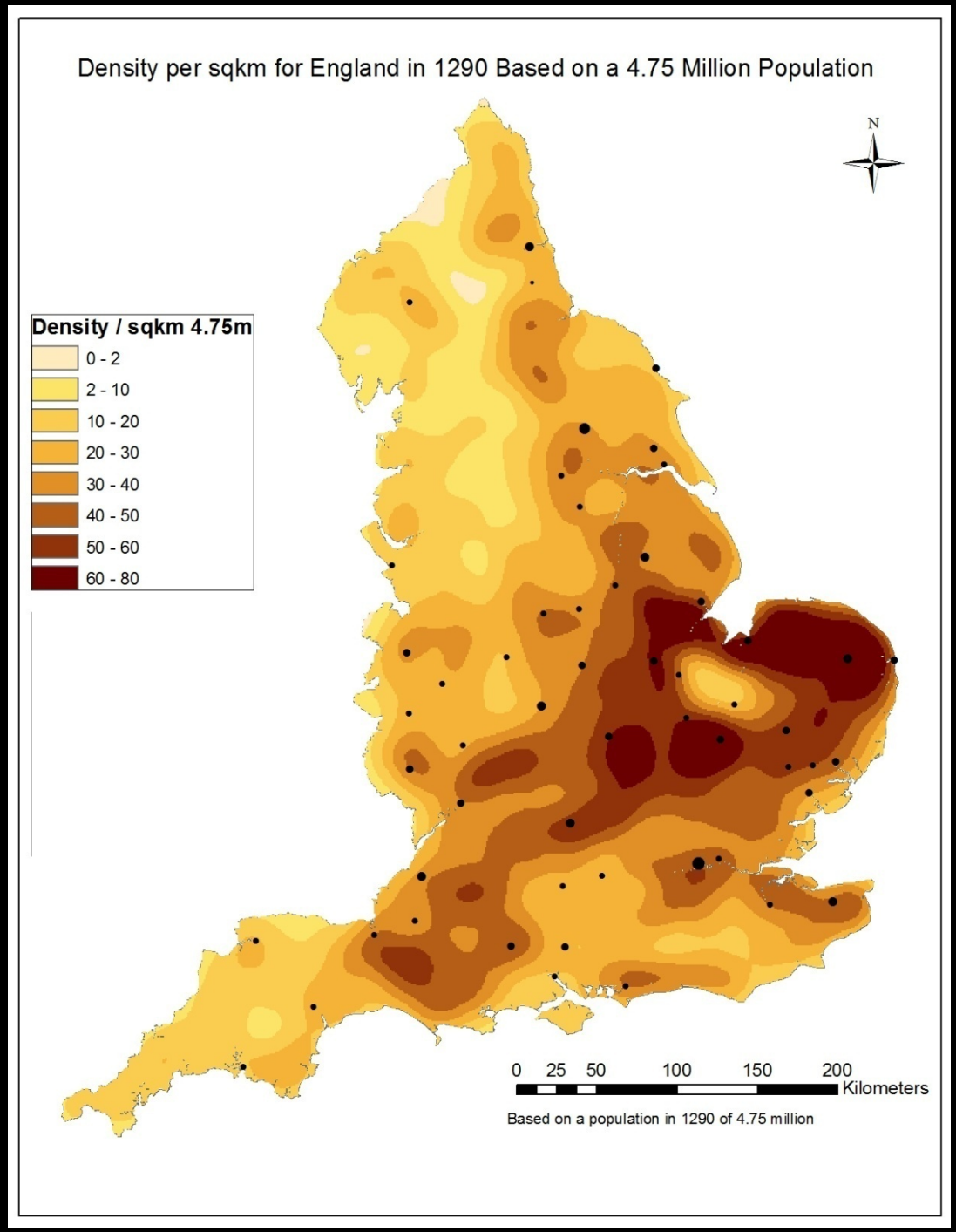
which underpin our estimates of:

1. National income.
2. GDP per capita.
3. Labour productivity in the three main output sectors of agriculture, industry, and services.

At its medieval peak, with more arable than in 1801, England's population numbered less than 5m. It is difficult to see how more could have been fed.

Producing the bread-and-ale component of the diet required high inputs of land, capital, and draft power and was extravagant of the raw un-processed kilocalories.

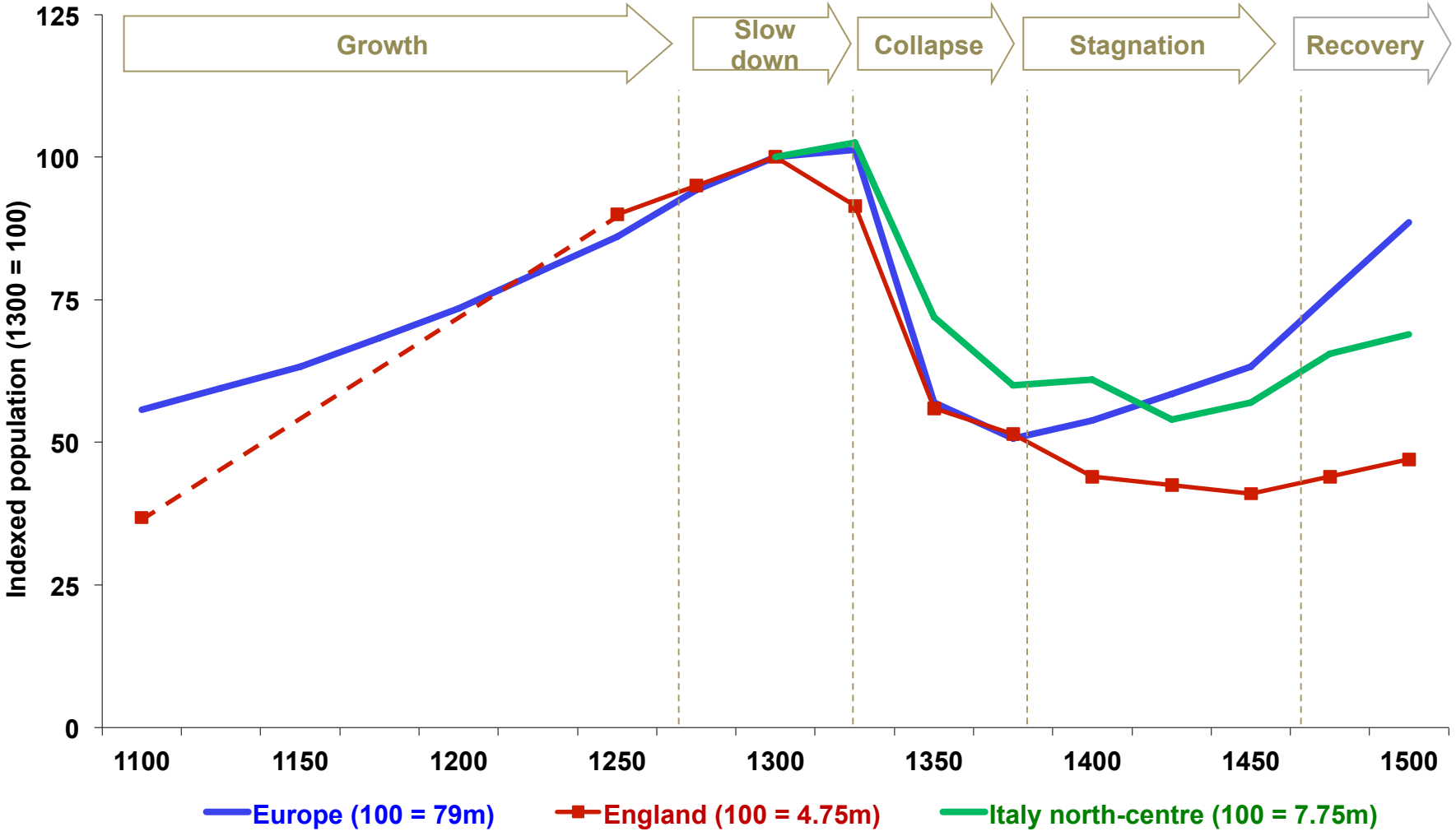
Pastoral products also contributed to diets and the wool of over 10m. grass-fed sheep was exported.



In 1300 England was one of the most densely populated countries in Europe:

Country	Source:	Mean population density per sq km in 1300
Italy (centre & north)	Federico & Malanima 2004	48
Low Countries	van Bavel 2010	41
Holland (province)	van Bavel 2010	38
England	Broadberry, Campbell & van Leeuwen 2010	36
France & Low Countries	Russell 1958	25
Ireland	Campbell 2007	14
Portugal	Prados de la Escosura 2011	11
Europe W of Urals	Livi-Bacci 2000	10
Scotland	Campbell & Barry 2011	9
Poland	Pounds 1974	9
Spain	Prados de la Escosura 2011	9

Puzzlingly, its population was one of the slowest to recover after c.1450:



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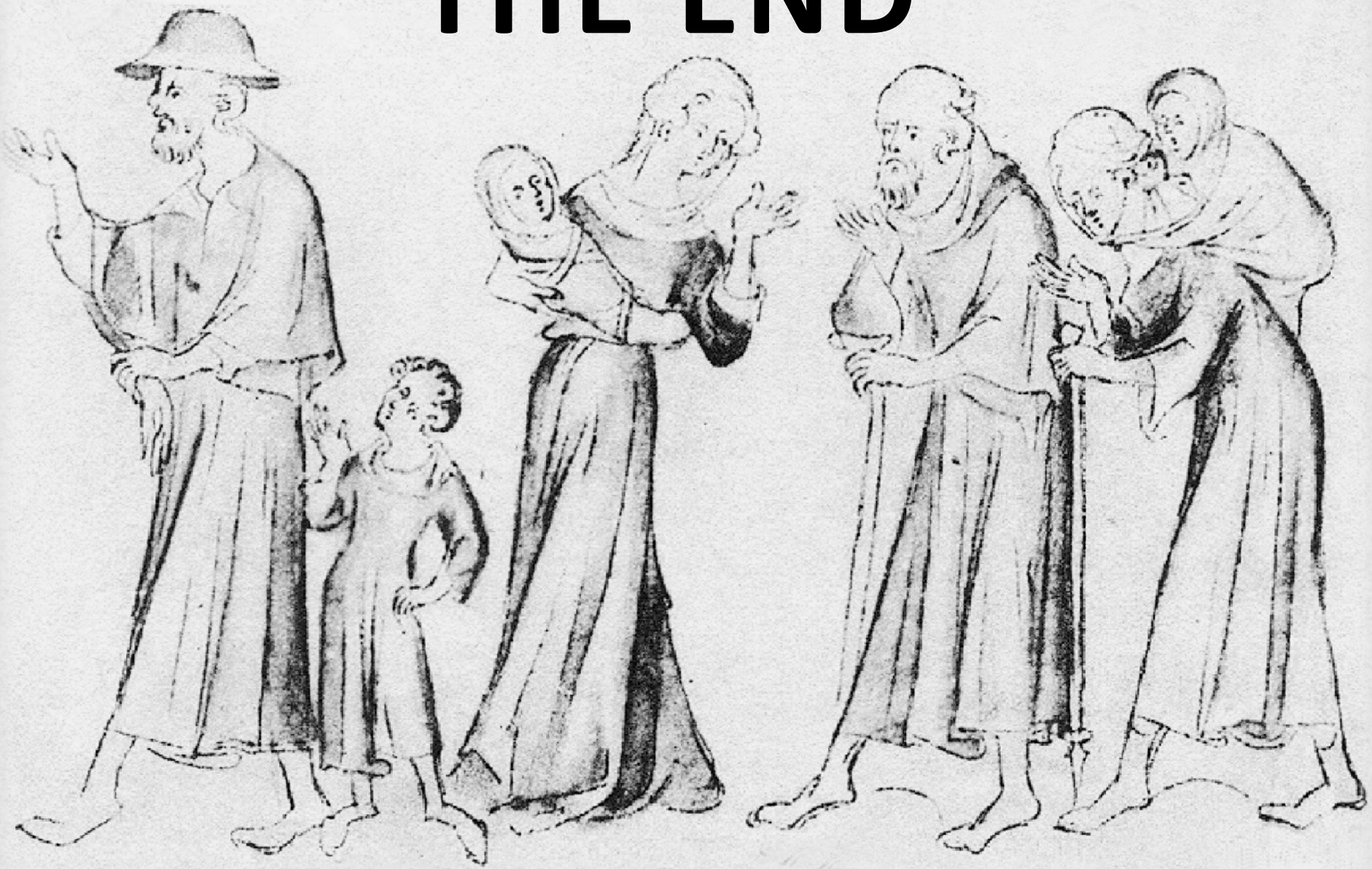

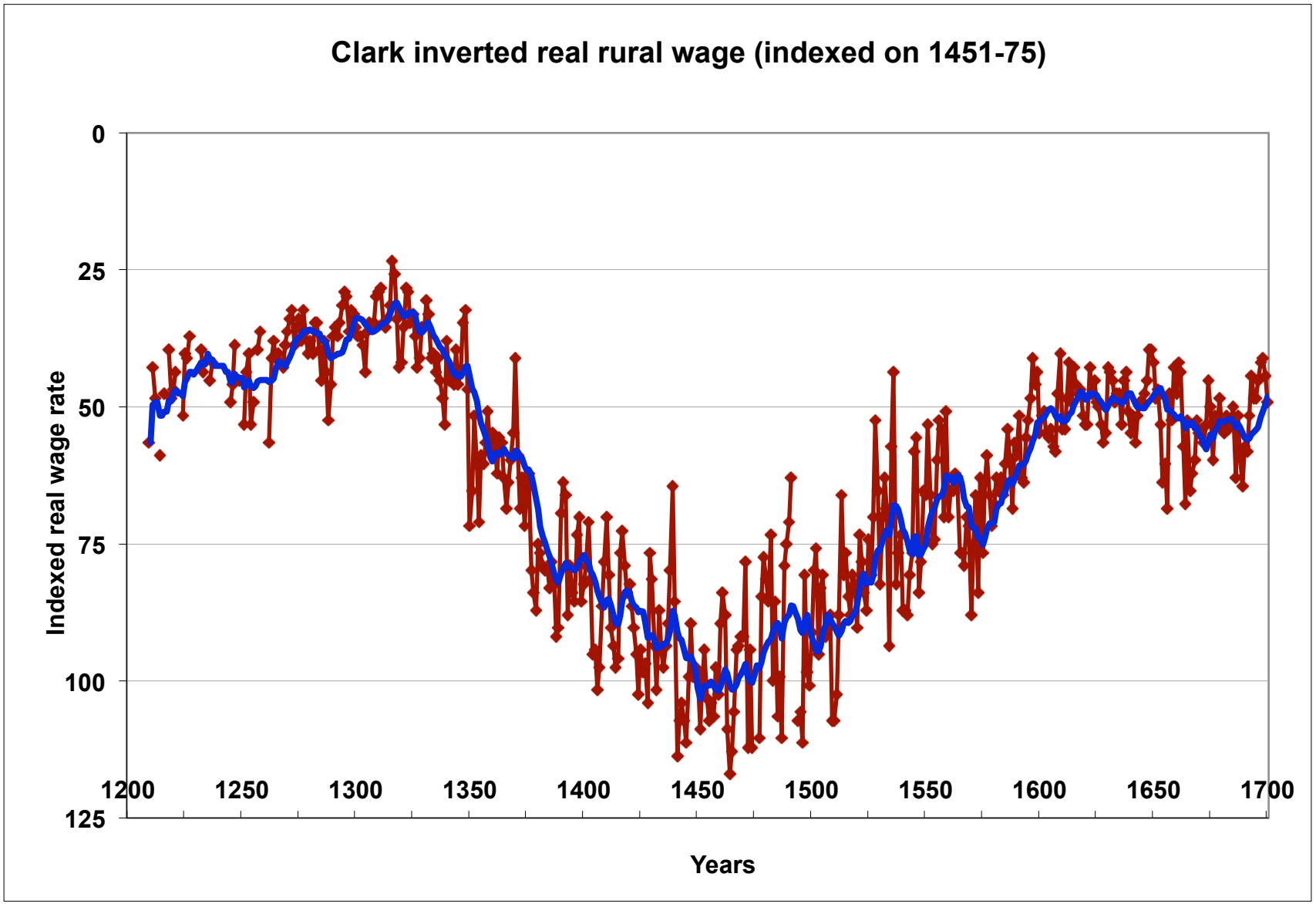
Clark inverted real rural wage (indexed on 1451-75)
Indexed real wage rate
0
25
50
75
100
125
1200
1250
1300
1350
1400
1450
1500
1550
1600
1650
1700
Years