The Mechanics of Industrial Revolution - eine kritische Analyse

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Seminar Applied Data Analysis der FernUni Hagen am 23-24. Mai 2024 in Nürnberg

Agenda

A. Motivation

B. Kritische Analyse des Regressionsmodells

- Ausreißer
- nicht-parametrische Funktion

C. Nicht auffindbare Referenz

D. Ausblick

Motivation

A

Gründe für industrielle Revolution

Warum nicht früher? Warum nicht woanders?

- technol. Fortschritt (Spinn-, Dampfmaschine)
- Geografie Englands (Küsten, Wasserwege, Kohle)
- Absatzmärkte in Übersee
- Beschaffungsmärkte in Übersee
- Property Rights
- Politische Stabiltität
- "Entrepeneurship"
- Zentrale-Orte-Theorie
- **billige Arbeitskräfte**
- Bevölkerungswachstum durch Modernisierung der Landwirtschaft
- Produktivitätswachstum durch Agglomeration
- lange Friedensperiode
- "ursprüngliche Akkumulation" (Marx)
- **Feinmechanik und Werkzeugmacher**
- große Wirtschaftseinheit
- "Glück"
- **Fazit**: *industrielle Revolution ist ein kompelxer sozio-ökonomischer Prozess über viele Jahrzehnte*

Kernaussage des Papiers

Industrialisierung enstand in Regionen mit
niedrigen Löhnen, hohen "mechanical skills" und Zugang zu "substantiellen" Märkten.
Bildung, Energie und Finanzen spielten hingegen keine Rolle.

"We find that the percentage of men working as mechanics and toolmakers, alongside low wages in the 1760s, explains 70% of the variation in textile employment in 1831. The effect sizes are substantial: the supply of skilled workers has an elasticity of 2, and wages have an elasticity of 5. Given the limited use of steam in textiles, proximity to coal has as little explanatory power, as we would expect." (S. 63)

TABLE 1

TEXTILE EMPLOYMENT IN 1831 AND 1851: SEMIPARAMETRIC SPATIAL REGRESSIONS

(41 Observations)

	DEPENDENT VARIABLE: SHARE OF MEN EMPLOYED IN TEXTILES					
	1831			1851		
	(1)	(2)	(3)	(4)	(5)	(6)
Skills, 1790s	2.022	2.466	2.020	1.151	1.079	1.007
	(.503)	(.668)	(.511)	(.398)	(.532)	(.377)
Wage, 1760s	−4.776	−5.402	−4.783	−3.035	−3.004	−1.623
	(2.742)	(2.817)	(2.937)	(2.109)	(2.138)	(2.056)
Market potential, 1750	.712	.592	.712	.503	.514	.403
	(.301)	(.320)	(.306)	(.217)	(.227)	(.209)
Distance to coal		.720			−.127	
		(.685)			(.650)	
Water power			.001			−.664
			(.425)			(.348)
Adjusted R^2	.684	.695	.676	.813	.810	.865
AIC	131.1	130.6	132.9	88.7	89.5	74.3
S(lon,lat)	.641	.534	.768	.070	.076	.013

NOTE.—Dependent variable is the employment share of textiles among all males over 20 in 1831 and among males aged 20–29 in 1851. Semiparametric regressions with a thin-plate spline in longitude and latitude: S(lon, lat) gives the approximate significance. Standard errors are in parentheses. Regressions include a dummy in 1831 for Shropshire and a dummy in 1851 for Staffordshire. All other variables are in logs. AIC = Akaike information criterion.

Kritik

B

Alterstruktur

Dataset: Integrated Census Microdata (I-CeM) - England and Wales, 1851

1851-1911

Variable Ages: Age bands

Values	Categories	N	
1	0-4	2286886	13.0%
2	5-9	2065119	11.7%
3	10-14	1890279	10.7%
4	15-19	1724646	9.8%
5	20-24	1633920	9.3%
6	25-29	1443405	8.2%
7	30-34	1257575	7.1%
8	35-39	1072606	6.1%
9	40-44	955054	5.4%
10	45-49	789177	4.5%
11	50-54	696208	3.9%
12	55-59	521196	3.0%
13	60-64	475113	2.7%
14	65-69	326094	1.8%
15	70+	500421	2.8%
Sysmiss		73345	

SUMMARY STATISTICS

Valid cases	17637699
Missing cases	73345
This variable is numeric	

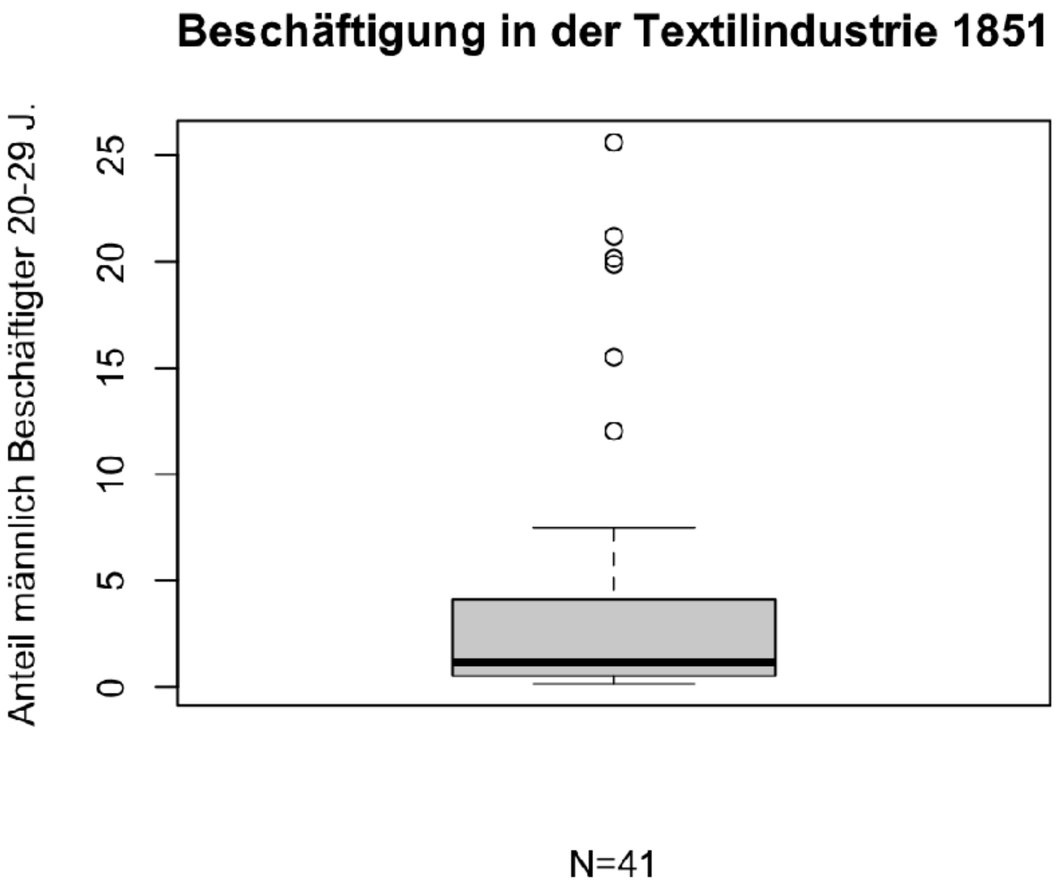
Wenig Fälle in der abh. Variablen

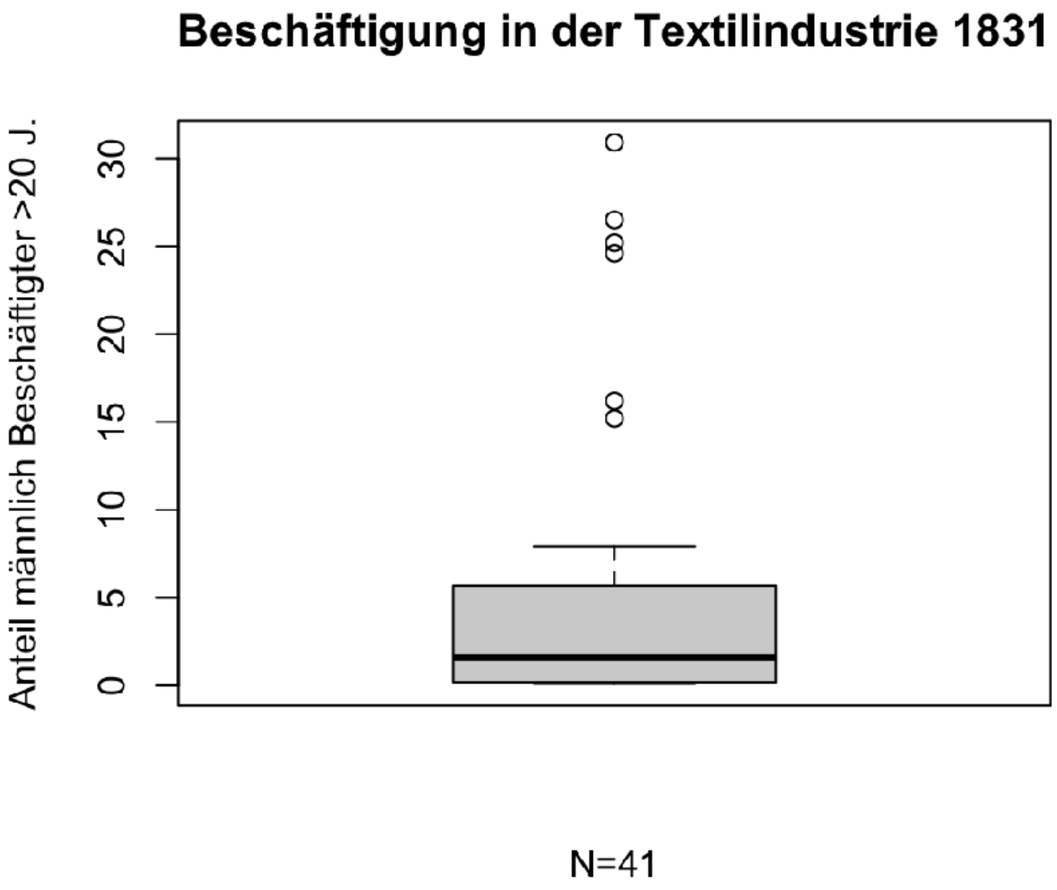
```
# Beispielcode
exp(Industry$Population)*exp(Industry$Textiles_1831)/100
head(df[c("Code", "Textile_1831_abs",
"Textile_1851_abs")][order(-df$Textile_1831_abs),])
```

```
> head(df[c("Code", "Textile_1831_abs", "Textile_1851_abs")][order(-df$Textile_1831_abs),])
   Code Textile_1831_abs Textile_1851_abs
4   CHE           417689           272342
40  YNR           261615           252689
6   CNW            57415            45304
30  SHP            54775            52434
10  DRS            49002            42210
9   DRH            36452            28855
> tail(df[c("Code", "Textile_1831_abs", "Textile_1851_abs")][order(-df$Textile_1831_abs),])
   Code Textile_1831_abs Textile_1851_abs
38  WTS              225             2133
35  WML              148              719
15  HNT              146              339
29  SFF               97              342
14  HMP               54              154
13  GLC               39               55
```

ENGLAND & WALES
An INDEX MAP, shewing the contiguity of the Counties.
Explanation of the County Maps
Turnpike Roads
Direct R^ds but not Turnp^ds
Seats of the Nobility & Gentry
Market towns in Roman Print
Character thus ... Penryn
Boroughs are distinguished by Stars, which also denote the number of members they return to Parliament at ...
The Houses attached to the Market towns denote their distance from London.
Cities in Roman Capitals thus ... YORK
County Towns ... HONITON
Route of the Mail Coaches
SCOTLAND
IRELAND
IRISH SEA
GERMAN OCEAN
ST GEORGE'S CHANNEL
BRISTOL CHANNEL
ENGLISH CHANNEL
FRANCE
Isle of Man
Cumberland
Northumberland
Durham
Westmore land
North Riding
York Shire
East Riding
West Riding
Lancashire
Mouth of the Humber
Lincoln Shire
Cheshire
Derby Shire
Nottingham Sh.
Flint
Denbigh Sh.
Carnarvon Shire
Anglesea I.
Merioneth Shire
Montgomery Shire
Shrop Shire
Stafford Shire
Leicester Shire
Rut land Sh.
Norfolk
Cambridge S.
Huntingdon S.
Suffolk
Cardigan Bay
Radnor Shire
Cardigan Sh.
Hereford Shire
Worcester Shire
Warwick Shire
Northampton Shire
Bedford Sh.
Pembroke Sh.
Carmarthen Shire
Brecknock Shire
Monmouth Shire
Glamorgan Shire
Gloucester Shire
Oxford Sh.
Buckingham Sh.
Hertford Shire
Essex
Mouth of the Thames
Berk Shire
Middlesex
Wilt Shire
Hamp Shire
Surry
Kent
Sussex
Somerset Shire
Devon Shire
Dorset Shire
Lundy I.
Cornwall
Isle of Wight
Straits of Dover
The Cities and County Towns are denoted by red, & the respective Rapes, Lathes & Hundreds, of each County by different Colours, which distinctions are peculiar to the Superior Edition.
6 Longitude West fr. London.

Ausreißer in abhängige Variable





Regression aus Papier mit p-Werten

Regression mit t- und p-Werten. Abh. Variable: Textilbeschäftigung 1831 (1-3) und 1851 (4-6)

	(1)	(2)	(3)	(4)	(5)	(6)
Skills 1790s	2.022	2.466	2.020	1.151	1.079	1.007
	t = 4.019	t = 3.691	t = 3.949	t = 2.893	t = 2.029	t = 2.672
	p = <0.001	p = <0.001	p = <0.001	p = 0.009	p = 0.057	p = 0.017
Wage 1760s	−4.776	−5.402	−4.783	−3.035	−3.004	−1.623
	t = −1.742	t = −1.917	t = −1.628	t = −1.439	t = −1.405	t = −0.789
	p = 0.091	p = 0.065	p = 0.114	p = 0.166	p = 0.176	p = 0.441
Mkt Potential 1750	0.712	0.592	0.712	0.503	0.514	0.403
	t = 2.364	t = 1.852	t = 2.325	t = 2.316	t = 2.266	t = 1.931
	p = 0.024	p = 0.074	p = 0.027	p = 0.031	p = 0.035	p = 0.071
Distance to Coal		0.720			−0.127	
		t = 1.052			t = −0.196	
		p = 0.301			p = 0.847	
Water Power			0.001			−0.664
			t = 0.003			t = −1.911
			p = 0.998			p = 0.074
Num.Obs.	41	41	41	41	41	41
R2	0.684	0.695	0.676	0.813	0.810	0.865
AIC	131.1	130.6	132.9	88.7	89.5	74.3

- sehr hoher GoF
- Löhne sind nicht signifikant!
- *Widerspricht dies nicht der Aussage im Paper?*

Regression ohne Ausreisser

Regression mit t- und p-Werten. Abhängige Variable: Textilbeschäftigung 1831 (1-3) und 1851 (4-6)

	(1)	(2)	(3)	(4)	(5)	(6)
Skills 1790s	1.777	2.079	1.871	1.219	0.912	0.342
	t = 3.366	t = 3.082	t = 3.554	t = 3.731	t = 2.236	t = 1.187
	p = 0.003	p = 0.005	p = 0.002	p = 0.001	p = 0.040	p = 0.985
Wage 1760s	−6.240	−6.407	−8.633	−4.145	−3.510	1.569
	t = −2.282	t = −2.269	t = −2.624	t = −2.498	t = −2.103	t = 2.417
	p = 0.032	p = 0.033	p = 0.015	p = 0.021	p = 0.052	p = 0.982
Mkt Potential 1750	1.012	0.895	1.059	0.661	0.702	0.259
	t = 3.421	t = 2.766	t = 3.592	t = 3.794	t = 3.917	t = 2.134
	p = 0.002	p = 0.011	p = 0.001	p = 0.001	p = 0.001	p = 0.983
Distance to Coal		0.535			−0.557	
		t = 0.755			t = −1.143	
		p = 0.458			p = 0.270	
Water Power			0.567			−1.045
			t = 1.182			t = −5.949
			p = 0.249			p = 0.978
Num.Obs.	33	33	33	33	33	33
R2	0.620	0.632	0.615	0.690	0.749	1.000
AIC	99.6	99.5	100.2	59.8	53.3	−480.0

- 8 eliminierte counties
- etwas geringere Modellgüte
- Löhne sind nun signifikant

Regression ohne Geodaten

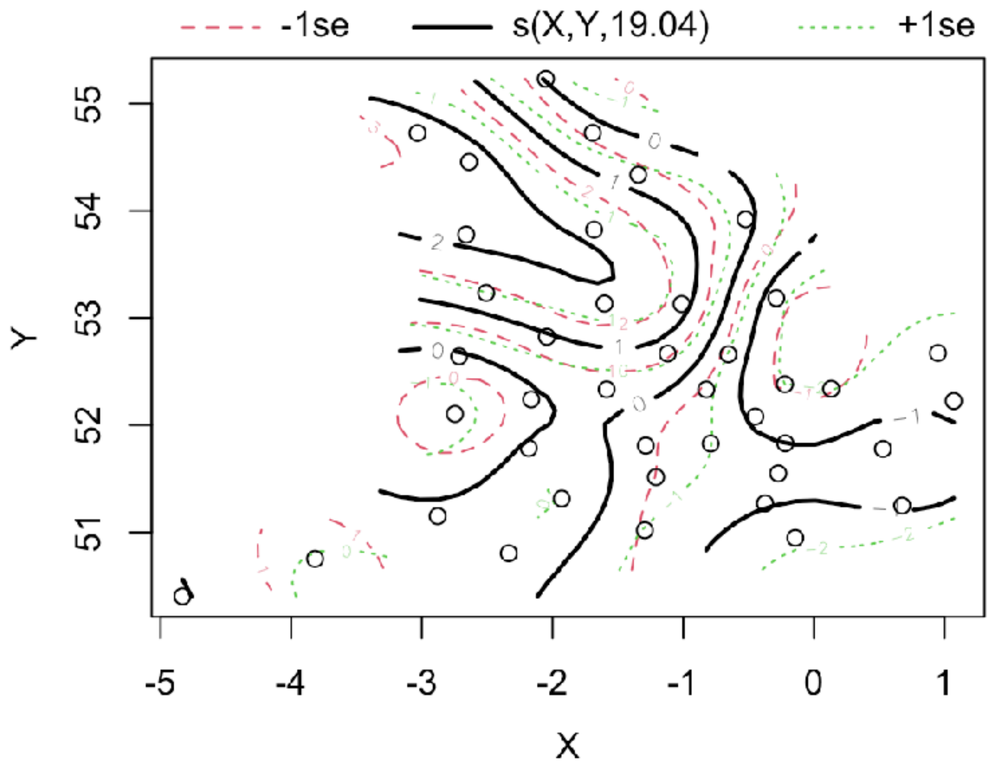
Regression ohne Geodaten

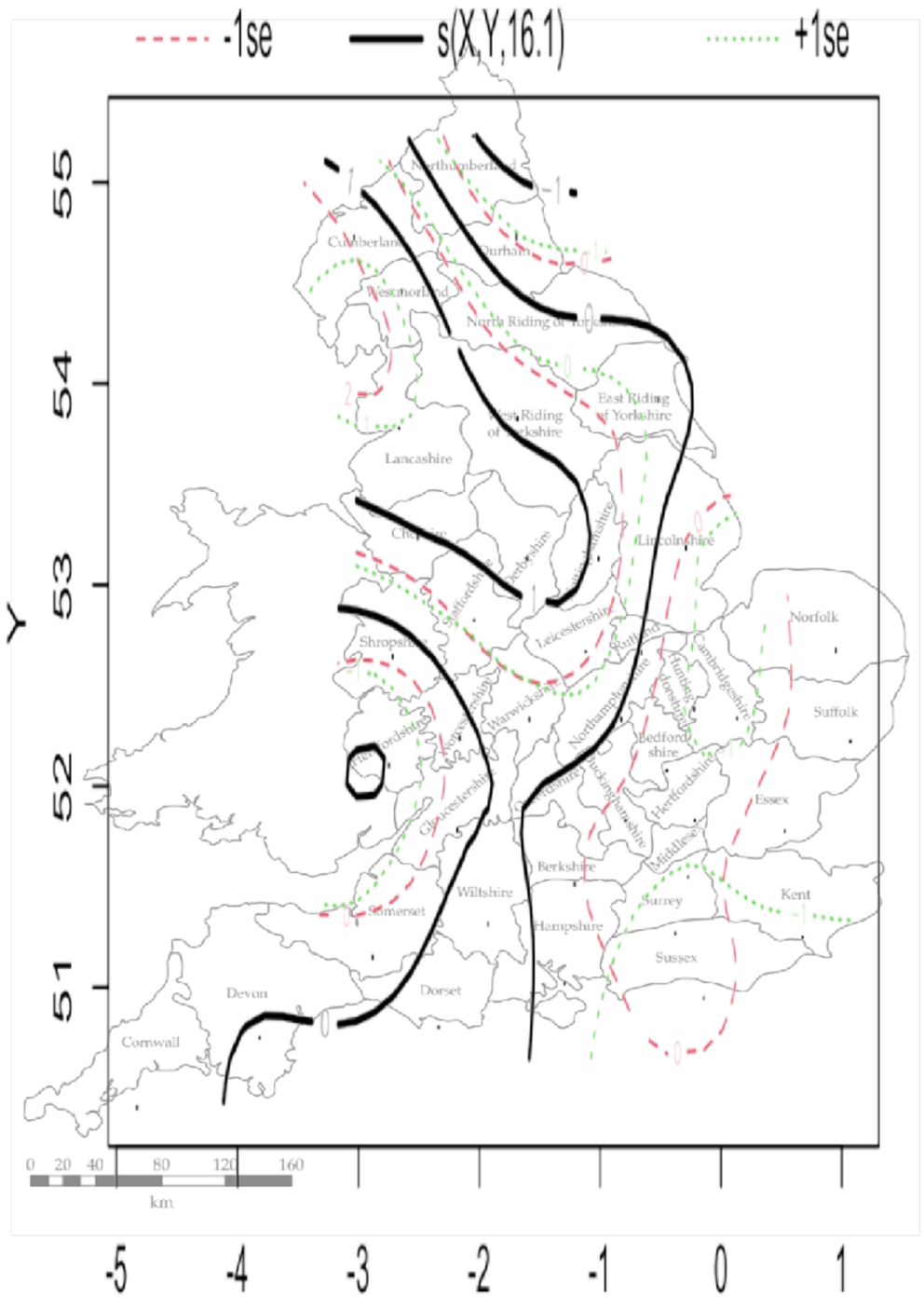
	(1)	(2)	(3)	(4)	(5)	(6)
Skills 1790s	2.125	1.987	2.166	1.703	1.603	1.697
	s.e. = 0.464	s.e. = 0.599	s.e. = 0.468	s.e. = 0.369	s.e. = 0.472	s.e. = 0.376
	p = <0.001	p = 0.002	p = <0.001	p = <0.001	p = 0.002	p = <0.001
Wage 1760s	−6.960	−6.336	−6.247	−4.908	−4.450	−5.021
	s.e. = 1.722	s.e. = 2.422	s.e. = 1.920	s.e. = 1.330	s.e. = 1.885	s.e. = 1.501
	p = <0.001	p = 0.013	p = 0.003	p = <0.001	p = 0.024	p = 0.002
Mkt Potential 1750	0.713	0.754	0.679	0.499	0.528	0.504
	s.e. = 0.286	s.e. = 0.309	s.e. = 0.290	s.e. = 0.222	s.e. = 0.240	s.e. = 0.227
	p = 0.017	p = 0.020	p = 0.025	p = 0.031	p = 0.034	p = 0.033
Distance to Coal		−0.168			−0.121	
		s.e. = 0.453			s.e. = 0.348	
		p = 0.713			p = 0.730	
Water Power			0.229			−0.036
			s.e. = 0.268			s.e. = 0.211
			p = 0.400			p = 0.865
Num.Obs.	41	41	41	41	41	41
R2	0.689	0.691	0.696	0.651	0.653	0.652
R2 Adj.	0.655	0.647	0.652	0.613	0.603	0.602
AIC	131.4	133.2	132.5	110.8	112.6	112.7

- Löhne, "mechanical skills" und Marktpotential signifikant
- etwas geringere Modellgüte
- "räumliche Koeffizienten" nicht signifikant
- *Warum überhaupt eine semiparametrische Regression mit räumlicher Funktion?*

Geo Spline

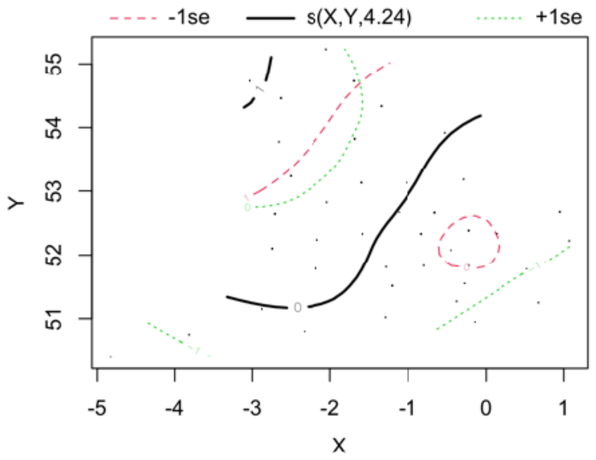
```
tex7 = gam(Textiles_1851 ~ Skills + Wage + Potential +
        Water_Flow + STF+ s(X,Y), data=Industry)

plot(tex7, residuals=TRUE, pch=1, cex=1)
```



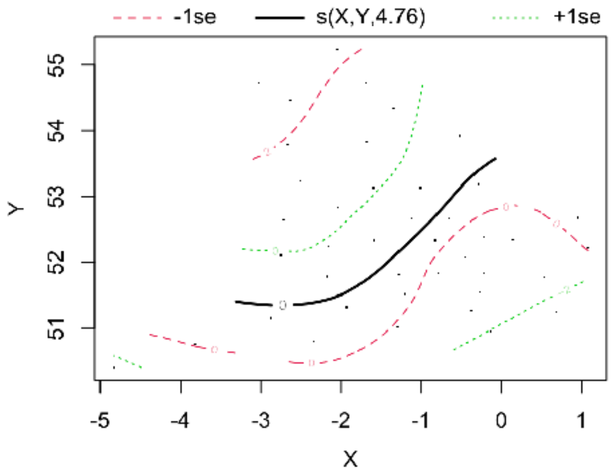


Vergleich der Geo Splines

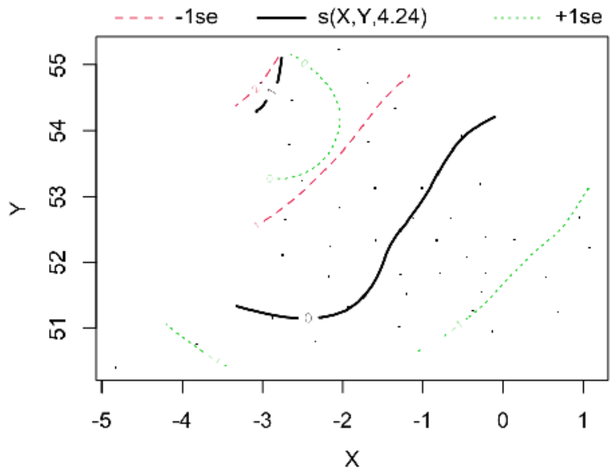
"The S(lat, lon) term gives the approximate significance level of the penalized spline in latitude and longitude. For the 1831 regressions this has little explanatory power, whereas for 1851 there is a somewhat stronger spatial pattern to the observations." (S. 77)



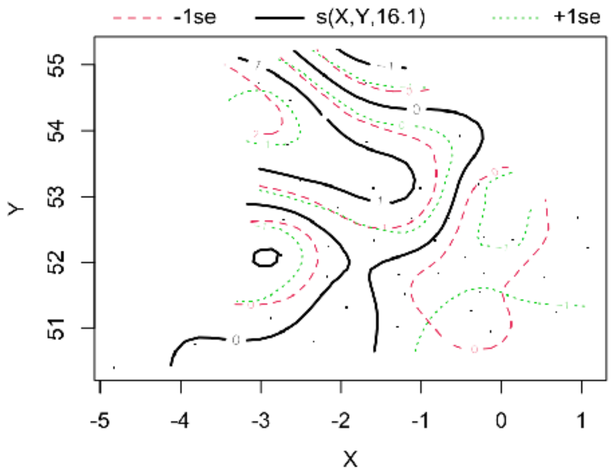

```
gam(Textiles_1851~Skills+Wage
      +Potential+SHP+s(X,Y))
```

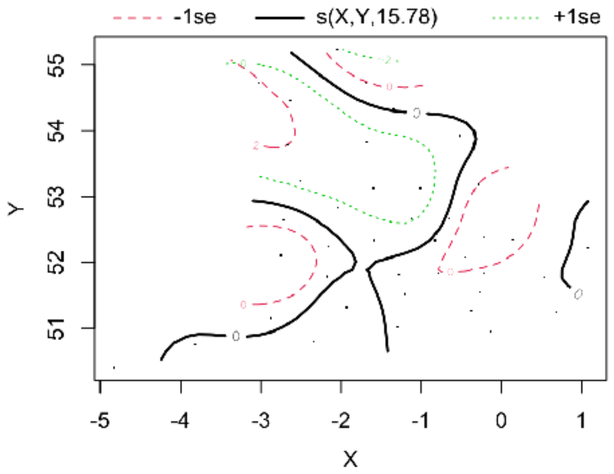


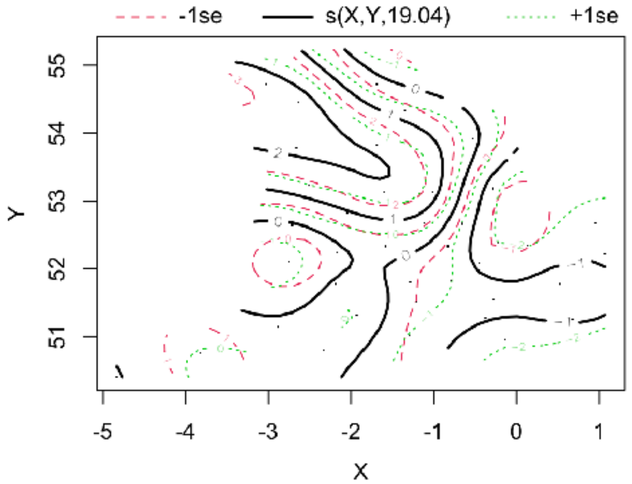

```
gam(Textiles_1851~Skills+Wage+Potential+
     Coal_Distance+SHP+s(X,Y))
```




```
gam(Textiles_1851~Skills+Wage+Potential+
     Water_Flow+SHP+s(X,Y))
```







Nicht auffindbare Referenz

C

Marshall, John. 1833. *A Digest of All the Accounts Relating to the Population, Productions, Revenues, [. . .] of the United Kingdom of Great Britain and Ireland: Diffused through [. . .] Journals, Reports, and Papers Presented to Parliament during the Last Thirty-Five Years.* London: J. Haddon.

"Textile employment in 1831 is from Marshall (1833, 10–11)." S. 89

A

DIGEST OF ALL THE ACCOUNTS

RELATING TO THE

POPULATION, PRODUCTIONS, REVENUES,

FINANCIAL OPERATIONS,

MANUFACTURES, SHIPPING, COLONIES, COMMERCE, &c. &c

OF THE UNITED KINGDOM OF

Great Britain and Ireland,

DIFFUSED THROUGH MORE THAN

600 VOLUMES OF JOURNALS, REPORTS, AND PAPERS,

Presented to Parliament during the last Thirty-five Years.

IN TWO PARTS.

WITH A SEPARATE INDEX TO EACH.

ARRANGED BY J. MARSHALL,

And Printed pursuant to the following Recommendation of the Select Committee of the House of Commons, on Public Documents, March 1, 1833:—

"Your Committee think it right to observe that Mr. MARSHALL's Digest of Information, derived from Parliamentary Documents from 1799, has been made with great labour, and contains important information which cannot be obtained from any existing work, nor from the Compilation about to be made under the direction of the Board of Trade; the Committee therefore recommend the attention of the House to the Evidence before the Committee, and that 1250 copies of the work be placed, when complete, at the disposal of Parliament."

Confirmed by a Vote of the Whole House, on the 29th of April of the same year.

LONDON:

PRINTED BY J. HADDON, CASTLE STREET, FINSBURY SQUARE.

1833.

STATEMENT showing the *Superficies in Statute Acres, and Rental*, of each County of ENGLAND; the Number of *Persons* returned as dependant on Agriculture in 1801; the Number of *Families* so dependant at each of the three periods, 1811, 1821, and 1831; and the Number of Male Persons at the latter date, 20 Years of age and upwards effectively employed in Agriculture; shewing also the average of Superficies to each occupier, or average extent of the Farms; of Laborers to each occupier; and the proportion of the Total to every 100 acres in each County.

The average extent of the Farms in Col. 12 has been deduced after deducting from Col. 2 an average of 10 acres for each occupier not employing Laborers. In looking at the relative No. of Laborers in each County there are two things to be considered,—Viz., the proportion of unproductive Land, and the greater or lesser extent of Tillage.

COUNTIES arranged in order of their Extent of Superficies.	Superficies in Statute Acres, according to the Trignometrical Survey.	Superficies in Statute Acres, according to the Details of Parishes.	RENTAL, according to Property Tax Returns in 1815. £	Persons returned as employed in Agriculture, in 1801.	Families returned as employed in Agriculture, 1811.	Families returned as employed in Agriculture, 1821.	Families returned as employed in Agriculture, 1831.	Male Agriculturalists, 20 years of age, and upwards, in 1831. Occupiers employing Laborers.	Male Agriculturalists, 20 years of age, and upwards, in 1831. Occupiers, not employing Laborers.	Male Agriculturalists, 20 years of age, and upwards, in 1831. Laborers.	Male Agriculturalists, 20 years of age, and upwards, in 1831. Total of the 3 preceding Columns.	Average of Land to each Occupier.	No of Laborers to each Occupier.	Proportion of Col. 11, to every 100 Acres.	No. of Select Vestries.	No. of Assistant Overseers.
1 Lincoln	1,758,720	1,663,850	1,581,940	60,584	29,881	34,900	35,749	6,901	6,204	32,167	45,272	232	4 .66	2 .72	119	112
2 Devon	1,650,560	1,636,450	1,217,547	96,208	33,044	37,037	35,505	9,328	3,356	35,311	47,995	173	3 .77	2 .93	81	99
3 York, West Riding	1,658,000	1,629,890	1,555,608	55,695	30,868	31,613	31,188	7,096	10,636	24,502	41,234	214	3 .45	2 .53	142	172
4 Norfolk	1,338,880	1,292,300	931,842	61,791	31,454	36,368	37,610	5,229	2,718	37,466	45,413	241	7 .16	3 .51	58	104
22 Chester	673,280	649,050	676,664	36,623	16,396	18,120	16,397	4,374	4,059	15,094	23,527	139	3 .45	3 .62	119	119
23 Derby	656,640	663,180	621,693	31,743	14,283	14,582	13,324	3,320	4,257	10,593	18,170	186	3 .19	2 .73	56	73
24 Northampton	650,880	646,810	696,637	29,303	15,235	18,974	18,334	3,015	1,117	17,775	21,907	210	5 .89	3 .38	55	67
25 Dorset	643,200	627,220	489,025	28,204	12,982	14,821	14,601	2,243	967	14,056	17,266	270	6 .56	2 .75	25	46
26 Warwick	577,280	567,930	645,139	34,756	15,131	16,779	15,880	2,838	1,142	15,644	19,624	196	5 .51	3 .45	37	53
27 Hereford	550,400	543,800	453,607	31,261	12,599	13,558	12,888	2,505	1,679	12,213	16,397	210	4 .87	3 .01	38	55
28 Cumbridge	549,120	536,853	453,256	28,054	12,831	15,536	16,093	2,421	1,266	15,698	19,385	216	6 .43	3 .61	14	50
29 Nottingham	535,680	525,800	534,992	23,904	12,293	13,664	13,351	2,643	2,414	11,799	16,856	181	4 .46	3 .20	30	65
30 Leicester	514,560	511,340	702,402	23,623	11,700	13,028	12,352	2,656	2,145	10,542	15,343	180	3 .96	3	57	46
31 Westmoreland	488,320	485,990	221,556	12,141	4,613	5,096	4,454	1,435	1,685	3,474	6,594	326	2 .42	1 .33	59	32
32 Oxford	481,280	467,380	497,625	33,109	13,646	15,965	15,304	2,054	458	15,998	13,510	224	7 .78	3 .96	42	50
33 Berks	483,840	472,270	405,150	38,155	13,409	14,769	14,047	1,711	458	14,802	16,971	273	8 .65	3 .59	23	47
34 Surrey	485,120	474,480	369,901	2,746	12,417	14,944	14,647	1,873	727	16,761	19,361	249	8 .94	4 .08	12	39
35 Buckingham	473,600	463,820	498,677	25,083	13,933	16,640	16,393	2,152	453	16,743	19,348	213	7 .78	4 .17	43	62
36 Worcester	466,560	459,710	516,203	36,865	13,818	14,926	14,654	2,636	1,260	14,590	18,486	169	5 .53	4 .04	43	69
37 Hertford	337,920	400,370	342,350	20[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	399	14,700	16,617	261	9 .68	4 .15	12	38
38 Monmouth	318,720	324,310	203,576	12,871	5,315	6,020	5,614	1,646	1,143	4,845	7,636	189	2 .93	2 .35	16	28
39 Bedford	296,320	297,632	273,621	18,766	9,431	10,754	11,364	1,330	474	11,588	13,392	220	8 .71	4 .49	9	40
40 Huntingdon	236,800	241,690	202,076	9,536	5,361	6,435	6,231	857	397	5,967	7,221	270	6 .96	2 .98	10	19
41 Middlesex	180,480	179,590	349,142	13,417	9,088	9,393	9,882	1,050	490	11,376	12,916	166	10 .83	7 .19	14	52
42 Rutland	95,360	97,500	99,174	3,995	2,025	2,410	2,299	429	424	1,910	2,763	215	4 .45	2 .33	30	13
TOTALS.	32,332,400	31,770,615	27,890,356	1,524,227	607,353	773,732	761 348	141,460	94,883	744,407	980,750	225	5 .25	3 .08	2,234	3,134
Number of Column.	1.	2.	3.	4.	5.	6.	7	8.	9.	10.	11.	12.	13.	14.	15.	16.

(Quelle: Marshall 1833, S. 10)

Superficies, Rental, Agricultural Population, Ratio of Laborers to each Occupier, & to every 100 Acres of Land in each County of England.

STATEMENT showing the *Superficies in Statute Acres, and Rental,* of each County of ENGLAND; the Number of *Persons* returned as dependant on Agriculture in 1801; the Number of *Families* so dependant at each of the three periods, 1811, 1821, and 1831; and the Number of Male Persons at the latter date, 20 Years of age and upwards effectively employed in Agriculture; shewing also the average of Superficies to each occupier, or average extent of the Farms; of Laborers to each occupier; and the proportion of the Total to every 100 acres in each County.

The average extent of the Farms in Col. 12 has been deduced after deducting from Col. 2 an average of 10 acres for each occupier not employing Laborers. In looking at the relative No. of Laborers in each County there are two things to be considered,—Viz., the proportion of unproductive Land, and the greater or lesser extent of Tillage.

COUNTIES arranged in order of their Extent of Superficies.	Superficies in Statute Acres, according to the Trignometrical Survey.	Superficies in Statute Acres, according to the Details of Parishes.	RENTAL, according to Property Tax Returns in 1815. £	Persons returned as employed in Agriculture in 1801.	Families returned as employed in Agriculture. 1811.	1821.	1831.	Male Agriculturalists, 20 years of age, and upwards, in 1831. Occupiers employing Laborers.	Occupiers, not employing Laborers.	Laborers.	Total of the 3 preceding Columns.	Average of Land to each Occupier.	No of Laborers to each Occupier.	Proportion of Col. 11 to every 100 Acres.	No. of Select Vestries.	No. of Assistant Overseers.
1 Lincoln	1,758,720	1,663,850	1,581,940	60,584	29,881	34,900	35,749	6,901	6,204	32,167	45,272	232	4.66	2.72	119	112
2 Devon	1,650,560	1,636,450	1,217,547	96,208	33,044	37,037	35,505	9,328	3,356	35,311	47,995	173	3.77	2.93	81	99
3 York, West Riding	1,658,000	1,629,890	1,555,608	55,695	30,868	31,613	31,188	7,096	10,636	24,502	41,234	214	3.45	2.53	142	172
4 Norfolk	1,338,880	1,292,300	931,842	61,791	31,454	36,368	37,610	5,229	2,718	37,466	45,413	241	7.16	3.51	58	104
5 York, North Riding	1,337,820	1,275,820	856,010	44,061	16,570	16,737	17,964	4,950	4,334	14,646	23,930	249	2.95	1.87	111	47
6 Northumberland	1,197,440	1,165,430	906,789	23,190	10,945	11,567	10,127	2,376	1,268	10,441	14,085	485	4.39	1.20	48	58
7 Lancaster	1,171,840	1,117,260	1,270,344	52,018	23,305	22,723	24,696	6,658	9,714	20,949	37,321	151	3.14	3.34	191	252
8 Somerset	1,050,080	1,028,090	1,335,108	61,434	27,472	31,448	30,452	6,032	3,731	28,107	37,970	164	4.65	3.69	71	116
9 Southampton	1,041,920	1,018,550	594,020	50,696	21,401	24,303	22,761	2,774	1,234	24,675	28,683	362	8.89	2.81	42	77
10 Kent	963,680	972,240	868,138	54,124	27,077	30,869	31,667	4,361	2,152	36,113	42,626	218	8.28	4.38	43	186
11 Essex	960,480	979,000	904,715	65,174	28,517	33,206	34,589	4,561	868	38,234	43,683	212	8.38	4.46	35	82
12 Suffolk	967,680	918,760	694,078	55,744	26,406	30,795	31,491	4,526	1,121	33,040	38,687	200	7.30	4.21	44	117
13 Cumberland	945,920	969,490	469,259	21,062	10,868	11,297	10,630	3,617	2,839	9,010	15,466	260	1.49	3.59	90	86
14 Sussex	936,320	907,920	549,950	38,925	19,778	21,920	22,450	3,160	1,330	26,125	30,615	283	8.26	1.37	31	87
15 Wilts	882,560	869,620	810,627	53,517	22,657	24,972	25,045	3,387	1,239	24,708	29,334	253	7.29	3.37	24	66
16 Salop	858,240	864,360	738,495	45,046	16,693	18,414	17,096	3,832	2,139	17,296	23,267	219	4.77	2.68	43	79
17 Cornwall	849,280	854,770	566,472	42,687	17,465	19,302	18,351	4,608	3,613	16,243	24,464	177	3.52	2.86	37	41
18 York, East Riding	819,220	711,360	700,000	31,538	14,517	15,480	13,025	3,331	1,661	12,727	17,609	190	3.41	2.47	90	43
City and Ainsty		52,440					1,326	340	253	1,184	1,777	154	3.48	3.38		
19 Gloucester	803,840	790,470	805,138	49,420	20,782	23,170	21,185	3,675	1,846	20,927	26,448	210	5.69	3.34	44	85
20 Stafford	734,720	736,290	756,635	43,930	18,361	18,285	18,156	3,781	3,649	16,812	24,242	185	4.44	3.29	60	97
21 Durham	679,040	679,530	506,063	18,217	10,288	9,427	8,408	2,229	1,544	7,556	11,329	297	3.38	1.66	96	68
22 Chester	673,280	649,050	676,864	36,623	16,396	18,120	16,397	4,374	4,059	15,094	23,527	139	3.45	3.62	119	119
23 Derby	656,640	663,180	621,693	31,743	14,283	14,582	13,324	3,320	4,257	10,593	18,170	186	3.19	2.73	56	73
24 Northampton	650,880	646,810	696,637	29,303	15,235	18,974	18,334	3,015	1,117	17,775	21,907	210	5.89	3.38	55	67
25 Dorset	643,200	627,220	489,025	28,204	12,982	14,821	14,601	2,243	967	14,056	17,266	270	6.56	2.75	25	48
26 Warwick	577,280	567,930	645,139	34,756	15,131	16,779	15,880	2,838	1,142	15,644	19,624	196	5.51	3.45	37	53
27 Hereford	550,400	543,800	453,607	31,261	12,599	13,558	12,888	2,505	1,679	12,213	16,397	210	4.87	3.01	38	55
28 Cambridge	549,120	536,853	453,255	28,054	12,831	15,536	16,093	2,421	1,266	15,698	19,385	216	6.48	3.61	14	50
29 Nottingham	535,680	525,800	534,992	23,904	12,293	13,664	13,351	2,643	2,414	11,799	16,856	181	4.46	3.20	30	65
30 Leicester	514,560	511,340	702,402	23,823	11,700	13,028	12,352	2,656	2,145	10,542	15,343	180	3.96	3	57	46
31 Westmoreland	488,320	485,990	221,556	12,141	4,613	5,096	4,454	1,435	1,685	3,474	6,594	326	2.42	1.33	59	32
32 Oxford	481,280	467,380	497,625	33,109	13,646	15,965	15,304	2,054	458	15,998	13,510	224	7.78	3.96	42	50
33 Berks	483,840	472,270	405,150	38,155	13,409	14,769	14,047	1,711	458	14,802	16,971	273	8.65	3.59	23	47
34 Surrey	485,120	474,480	369,901	2,746	12,417	14,944	14,647	1,873	727	16,761	19,361	249	8.94	4.08	12	39
35 Buckingham	473,600	463,820	498,677	25,083	13,933	16,640	16,893	2,152	453	16,743	19,348	213	7.78	4.17	43	62
36 Worcester	466,560	459,710	516,203	36,865	13,818	14,926	14,654	2,636	1,260	14,590	18,486	169	5.53	4.04	43	69
37 Hertford	337,920	400,370	342,350	20,611	11,998	13,485	13,268	1,518	399	14,700	16,617	261	9.68	4.15	12	38
38 Monmouth	318,720	324,310	203,576	12,871	5,315	6,020	5,614	1,648	1,143	4,845	7,636	189	2.93	2.35	16	28
39 Bedford	296,320	297,632	273,621	18,766	9,431	10,754	11,364	1,330	474	11,588	13,392	220	8.71	4.49	9	40
40 Huntingdon	236,800	241,690	202,076	9,536	5,361	6,435	6,231	857	397	5,967	7,221	270	6.96	2.98	10	19
41 Middlesex	180,480	179,590	349,142	13,417	9,088	9,393	9,882	1,050	490	11,376	12,916	166	10.83	7.19	14	52
42 Rutland	95,360	97,500	99,174	3,995	2,025	2,410	2,299	429	424	1,910	2,763	215	4.45	2.83	30	13
TOTALS.	32,332,400	31,770,615	27,890,358	1,524,227	697,353	773,732	761 348	141,460	94,883	744,407	980,750	225	5.25	3.08	2,234	3,134
Number of Column.	1.	2.	3.	4.	5.	6.	7	8.	9.	10.	11.	12.	13.	14.	15.	16.

A Comparative View of the Number of Families in each County of England in 1821 and 1831, returned under each of the three usual heads, viz.—1st, Employed in Agriculture; 2nd, in Trade, Manufactures or Handicraft; and 3rd, all others not included in either of the two preceding classes: and also a Statement of the Male Population in each County, 20 Years of Age and upwards in 1831, under each of six several heads of Occupation or Service; the Counties in the first instance arranged in order of their Total Number of Families, whereby the relative proportion of each class in each county is the more readily discernible; and in the other case, the Counties are arranged in reference to their Manufacturing Predominance, and the Manufacturing Male Population placed immediately in comparison with the Agricultural: another Statement exhibits the Retailers and Handicraftsmen in column 11, under each of 120 heads of Occupation or Service in each County, so classed as to show their extent, relation, and importance to each other, and inconsiderableness of the manufacturing operation in its external point of view, when compared with the interesting combination of internal interests.

**** The comparison of the Number of Families in 1821 and 1831, under each of the three usual heads is remarkable for the increase under the third head as exhibited in column 8, and supposing the comparison to be just, the result would be important; but the comparison is not correct; the Miners, which in the previous Returns were in general entered under the second head, in the last Return have all been entered under the third head; and the greatest increase will be seen to prevail in the Mining Counties, numbers of other Occupations or Service, also, which in the previous Returns were entered under the first and second heads, have in the Return of 1831 been entered under the third head, all conclusions therefore, drawn from the total result as here exhibited under, a supposition of the comparison being just, will be fallacious. The absence however, of fair comparison under these three heads, is more than compensated for, by the ample details which the Returns of 1831 contain, as exhibited in this and contiguous pages.*

COUNTIES, arranged in order of their Total Number of Families in 1831.	Total Number of FAMILIES in 1821.	Total Number of FAMILIES in 1831.	Proportion of FAMILIES, Returned as employed in Agriculture. 1821.	Agriculture. 1831.	Trade, Manufactures, or Handicraft. 1821.	Trade, Manufactures, or Handicraft. 1831.	All others, not included in the two preceding. 1821.	All others, not included in the two preceding. 1831.	Male Persons 20 Years of Age and upwards in 1831, engaged in Occupations as under. Capitalists and Professional Men.	Not engaged in any Specific Occupation.	Retailers and Handicraftsmen.	Labourers other than in Agriculture.
	—1—	—2—	—3—	—4—	—5—	—6—	—7—	—8—	—9—	—10—	—11—	—12—
1 Middlesex	261,871	314,039	9,393	9,882	161,356	173,822	91,122	130,335	49,457	22,549	163,220	79,735
2 Lancaster	203,173	260,025	22,723	24,696	152,271	173,693	28,179	61,636	17,614	11,229	86,079	60,546
3 York, West Riding	161,466	198,646	31,613	31,188	108,841	118,733	21,012	48,725	8,354	10,366	60,109	33,685
4 Surrey	88,806	109,077	14,944	14,647	46,811	49,616	27,051	44,814	14,235	10,756	44,139	24,878
5 Devon	90,714	101,911	37,037	35,505	33,985	33,339	19,692	33,067	5,907	9,078	35,784	14,307
6 Kent	85,399	97,142	30,869	31,667	30,180	29,419	24,890	36,056	5,503	14,570	34,257	15,245
24 Worcester	39,006	45,512	14,926	14,654	18,566	19,630	5,514	11,628	2,085	2,385	13,693	6,544
25 Nottingham	36,603	47,117	13,664	13,351	21,832	25,578	3,107	8,188	2,093	2,339	14,683	5,628
26 Leicester	36,806	42,142	13,027	12,352	20,297	22,934	3,481	6,806	1,421	2,509	13,772	3,701
27 York, North Ridg.	38,732	40,760	16,737	17,964	11,570	11,296	10,424	11,498	1,870	2,836	12,749	4,391
28 Northampton	35,552	39,163	18,974	18,334	11,695	12,895	4,883	7,934	1,264	2,874	13,841	2,619
29 York, East Riding	40,499	36,960	15,480	13,625	16,637	10,825	8,382	13,110	2,398	2,627	12,917	4,663
30 " City & Ainsty		7,704		1,326		3,890		2,486	589	650	4,069	1,212
31 Cumberland	31,804	34,820	11,297	10,630	13,146	12,026	7,361	12,164	1,802	2,530	11,186	6,077
32 Dorset	30,312	33,614	14,821	14,601	10,811	10,106	4,680	8,907	1,624	2,476	10,568	4,451
33 Bucks	26,867	31,849	16,640	16,893	8,318	8,395	3,909	6,561	1,176	1,820	8,604	3,213
34 Oxford	28,841	31,770	15,965	15,304	8,971	9,454	3,905	7,012	2,254	2,547	11,110	3,949
35 Berks	27,700	31,081	14,769	14,047	8,77[illegible]	9,884	4,153	[illegible]	[illegible]	2,224	10,758	3,708
36 Hertford	26,170	30,210	13,465	13,268	7,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,886	9,426	4,101
37 Cambridge	25,603	29,250	15,536	16,093	6,964	8,213	3,103	5,904	1,764	1,882	8,792	3,007
38 Hereford	21,917	23,565	13,558	12,888	5,633	6,105	2,726	4,572	911	1,521	7,576	2,410
39 Bedford	17,373	20,016	10,754	11,364	4,827	5,137	1,792	3,515	577	1,037	5,502	1,474
40 Monmouth	14,122	19,911	6,020	5,614	6,147	8,626	1,955	5,671	805	1,011	6,649	7,173
41 Huntingdon	10,397	11,278	6,435	6,231	2,937	2,940	1,025	2,107	401	649	3,443	971
42 Westmoreland	10,438	10,964	5,096	4,454	3,801	4,116	1,541	2,414	602	746	3,621	1,195
43 Rutland	3,036	4,191	2,410	2,299	1,034	1,102	492	790	150	224	1,373	269
TOTALS.	2,346,717	2,745,336	773,738	761,348	1,118,295	1,182,918	454,690	80[illegible],076	179,983	189,389	964,177	500,950

COUNTIES, arranged in reference to their Manufacturing Predominance.	Males, 20 Years of Age, and upwards, employed in Manufactures.	Agriculture.
Counties. Hosiery. 1 Lancaster	97,517	37,321
2 York, W. Ridg.	74,669	41,234
3 Chester	13,305	23,527
4 Nottingham	14,260	16,856
5 Leicester	12,240	15,343
6 Derby	8,863	18,170
Agricultural Counties. 24 Devon	1,221	47,995
25 Kent	476	42,626
26 Lincoln	167	45,272
27 Essex	871	43,683
28 Southampton	292	28,683
29 Suffolk	676	38,687
30 Sussex	109	30,615
31 Northampton	582	21,907
32 York, E. Ridg.	175	17,609
33 " City & Ai.	211	1,777
34 Dorset	722	17,266
35 Bucks	369	19,348
36 Oxford	711	18,510
37 Berks	521	16,971
38 Hertford	290	16,617
39 Cambridge	39	19,385
40 Hereford	63	16,397
41 Bedford	38	13,392
42 Huntingdon	—	7,221
43 Rutland	12	2,763
TOTALS.	314,106	980,750

(Quelle: Marshall 1833, S. 11)

A Comparative View of the Number of Families in each County of England in 1821 and 1831, returned under each of the three usual heads, viz.—1st, Employed in Agriculture; 2nd, in Trade, Manufactures or Handicraft; and 3rd, all others not included in either of the two preceding classes: and also a Statement of the Male Population in each County, 20 Years of Age and upwards in 1831, under each of six several heads of Occupation or Service; the Counties in the first instance arranged in order of their Total Number of Families, whereby the relative proportion of each class in each county is the more readily discernible; and in the other case, the Counties are arranged in reference to their Manufacturing Predominance, and the Manufacturing Male Population placed immediately in comparison with the Agricultural: another Statement exhibits the Retailers and Handicraftsmen in column 11, under each of 120 heads of Occupation or Service in each County, so classed as to show their extent, relation, and importance to each other, and inconsiderableness of the manufacturing operation in its external point of view, when compared with the interesting combination of internal interests.

**** The comparison of the Number of Families in 1821 and 1831, under each of the three usual heads is remarkable for the increase under the third head as exhibited in column 8, and supposing the comparison to be just, the result would be important; but the comparison is not correct; the Miners, which in the previous Returns were in general entered under the second head, in the last Return have all been entered under the third head; and the greatest increase will be seen to prevail in the Mining Counties, numbers of other Occupations or Service, also, which in the previous Returns were entered under the first and second heads, have in the Return of 1821 been entered under the third head, all conclusions therefore, drawn from the total result as here exhibited under, a supposition of the comparison being just, will be fallacious. The absence however, of fair comparison under these three heads, is more than compensated for, by the ample details which the Returns of 1831 contain, as exhibited in this and contiguous pages.*

COUNTIES, arranged in order of their Total Number of Families in 1831.	Total Number of FAMILIES in 1821. (1)	Total Number of FAMILIES in 1831. (2)	Proportion of FAMILIES, Returned as employed in Agriculture. 1821. (3)	Agriculture. 1831. (4)	Trade, Manufactures, or Handicraft. 1821. (5)	Trade, Manufactures, or Handicraft. 1831. (6)	All others, not included in the two preceding. 1821. (7)	All others, not included in the two preceding. 1831. (8)	Male Persons 20 Years of Age and upwards in 1831, engaged in Occupations as under. Capitalists and Professional Men. (9)	Not engaged in any Specific Occupation. (10)	Retailers and Handicraftsmen. (11)	Labourers other than in Agriculture. (12)
1 Middlesex	261,871	314,039	9,393	9,682	161,356	173,822	91,122	130,335	49,457	22,549	163,220	79,735
2 Lancaster	203,173	260,025	22,723	24,696	152,271	173,693	28,179	61,636	17,614	11,229	86,079	60,546
3 York, West Riding	161,466	196,646	31,613	31,188	108,841	118,733	21,012	48,725	8,354	10,366	60,109	33,685
4 Surrey	83,806	109,077	14,944	14,647	46,811	49,616	27,051	44,814	14,235	10,756	44,139	24,878
5 Devon	90,714	101,911	37,037	35,505	33,985	33,339	19,692	33,067	5,907	9,078	35,784	14,307
6 Kent	85,399	97,142	30,869	31,667	30,180	29,419	24,890	36,056	5,503	14,570	34,257	15,245
7 Somerset	73,537	84,571	31,448	30,452	27,132	28,230	14,957	25,889	4,676	7,074	26,762	12,183
8 Norfolk	74,497	84,232	36,368	37,610	26,201	28,871	11,928	17,751	3,116	5,675	26,543	6,577
9 Stafford	68,780	83,593	18,285	18,156	42,435	43,648	8,060	21,789	3,569	4,245	24,766	22,690
10 Gloucester	72,156	83,466	23,170	21,185	35,907	33,179	13,079	29,082	5,647	5,756	29,716	18,322
11 Warwick	60,123	72,357	16,779	15,880	39,189	43,291	4,155	13,186	4,012	3,729	32,579	10,358
12 Lincoln	58,760	65,903	34,900	35,748	15,845	17,284	8,015	12,870	2,734	3,886	20,490	5,855
13 Essex	59,629	65,319	33,206	34,582	17,160	18,282	9,263	12,448	2,960	4,056	18,953	6,727
14 Chester	52,024	64,955	18,120	16,397	27,105	34,997	6,799	13,561	2,626	3,549	22,134	12,723
15 Southampton	57,942	64,652	24,303	22,761	19,810	20,983	13,829	20,908	3,784	6,117	23,164	10,348
16 Suffolk	55,064	61,533	30,795	31,491	17,418	18,116	6,851	11,926	2,228	4,940	18,167	5,336
17 Cornwall	51,202	59,816	19,302	18,351	15,543	13,382	16,357	28,033	2,508	4,014	15,245	22,706
18 Durham	45,940	54,736	9,427	8,408	20,212	18,511	16,301	27,817	2,871	3,204	19,035	19,473
19 Wilts	47,684	51,659	24,972	25,045	16,982	15,627	5,730	10,987	1,792	4,338	13,089	4,828
20 Sussex	43,565	52,716	21,920	22,450	15,463	17,489	6,182	12,777	3,094	4,094	19,208	8,151
21 Salop	41,636	46,427	18,414	17,096	17,485	16,210	5,737	13,121	1,948	2,800	14,461	11,585
22 Derby	42,404	48,320	14,582	13,324	20,505	20,788	7,317	14,208	1,829	2,863	14,787	10,897
23 Northumberland	43,128	48,364	11,567	10,127	20,565	14,246	10,996	23,991	2,857	3,228	17,149	13,939
24 Worcester	39,006	45,512	14,926	14,654	18,566	19,630	5,514	11,828	2,085	2,885	13,693	6,544
25 Nottingham	38,603	47,117	13,664	13,351	21,832	25,578	3,107	8,188	2,093	2,339	14,683	5,628
26 Leicester	36,806	42,142	13,027	12,352	20,297	22,984	3,481	6,806	1,421	2,509	13,772	3,701
27 York, North Ridg.	38,732	40,760	16,737	17,964	11,570	11,298	10,424	11,498	1,870	2,836	12,749	4,391
28 Northampton	35,552	39,163	18,974	18,334	11,695	12,895	4,883	7,934	1,264	2,874	13,841	2,619
29 York, East Riding	40,499	36,960	15,480	13,025	16,637	10,825	8,382	13,110	2,398	2,627	12,917	4,663
30 " City & Ainsty		7,704		1,326		3,890		2,488	589	650	4,069	1,212
31 Cumberland	31,804	34,820	11,297	10,630	13,146	12,026	7,361	12,164	1,802	2,530	11,186	6,077
32 Dorset	30,312	33,614	14,821	14,601	10,811	10,106	4,680	8,907	1,624	2,476	10,568	4,451
33 Bucks	28,867	31,849	16,640	16,893	8,318	8,395	3,909	6,561	1,176	1,820	8,604	3,213
34 Oxford	28,841	31,770	15,965	15,304	8,971	9,454	3,905	7,012	2,254	2,547	11,110	3,049
35 Berks	27,700	31,081	14,769	14,047	8,773	9,884	4,158	7,150	1,447	2,224	10,758	3,708
36 Hertford	26,170	30,210	13,485	13,268	7,935	8,552	4,750	7,430	1,429	1,886	9,426	4,101
37 Cambridge	25,603	29,250	15,536	16,093	6,964	8,213	3,103	5,904	1,764	1,882	8,792	3,007
38 Hereford	21,917	23,565	13,558	12,888	5,633	6,105	2,726	4,572	911	1,521	7,576	2,410
39 Bedford	17,373	20,016	10,754	11,364	4,827	5,137	1,792	3,515	577	1,037	5,502	1,474
40 Monmouth	14,122	19,911	6,020	5,614	6,147	8,626	1,955	5,671	805	1,011	6,649	7,173
41 Huntingdon	10,397	11,278	6,435	6,231	2,937	2,940	1,025	2,107	401	649	3,443	971
42 Westmoreland	10,438	10,984	5,096	4,454	3,801	4,116	1,541	2,414	602	746	3,621	1,195
43 Rutland	3,936	4,191	2,410	2,299	1,034	1,102	492	790	150	224	1,373	269
TOTALS.	2,346,717	2,745,336	775,732	761,348	1,118,495	1,182,918	454,690	80[illegible],076	179,983	189,589	964,177	500,950

COUNTIES, arranged in reference to their Manufacturing Predominance.		Males, 20 Years of Age, and upwards, employed in Manufactures.	Agriculture.
Weaving Counties. — Hosiery.	1 Lancaster	97,517	37,321
	2 York, W. Ridg.	74,669	41,234
	3 Chester	13,305	23,527
	4 Nottingham	14,260	16,856
	5 Leicester	12,240	15,343
	6 Derby	8,863	18,170
Weaving Counties. — Very Partial.	7 Somerset	4,350	37,970
	8 Norfolk	4,740	45,413
	9 Gloucester	5,992	26,448
	10 Wilts	3,497	29,334
	11 Cumberland	3,214	15,466
	12 York, N. R.	1,005	23,930
Mining Counties. — Iron and Hardwares.	13 Stafford	20,755	24,242
	14 Warwick	11,375	19,624
	15 Worcester	8,024	18,486
	16 Monmouth	3,293	7,636
	17 Salop	1,353	23,267
Mining Counties.	18 Durh m	2,547	11,329
	19 Northumberland	1,252	14,085
	20 Westmoreland	1,074	6,594
	21 Cornwall	107	24,464
Metropolitan.	22 Middlesex	11,064	12,916
	23 Surrey	2,065	19,361
Agricultural Counties.	24 Devon	1,221	47,995
	25 Kent	476	42,626
	26 Lincoln	167	45,272
	27 Essex	871	43,683
	28 Southampton	292	28,683
	29 Suffolk	676	38,687
	30 Sussex	109	30,615
	31 Northampton	582	21,907
	32 York, E. Ridg.	175	17,609
	33 " City & Ai.	211	1,777
	34 Dorset	722	17,266
	35 Bucks	369	19,348
	36 Oxford	711	18,510
	37 Berks	521	16,971
	38 Hertford	290	16,617
	39 Cambridge	39	19,385
	40 Hereford	63	16,397
	41 Bedford	38	13,392
	42 Huntingdon	—	7,221
	43 Rutland	12	2,763
	TOTALS.	314,106	980,750

Ausblick

Fokus der Seminararbeit

- Sensitivitätsanalyse?
  - durchgeführte Cross-Validation (`CVgam Library`) ergab keine auffallende Veränderung der Koeffizienten
- Logistische Regression?
- Modellerweiterung?
  - Wasserwege anders räumlich beurteilen?
  - Preisniveau berücksichtigen?
- andere abhängige Variable?
  - Was ist industrielle Revolution?

"Vielen Dank für die Aufmerksamkeit!"

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Github (Paper & R):
https://github.com/dirkkalmbach/Seminar-Applied-Data-Analysis.git

Google Drive (Copyright-sensitives Material):
https://drive.google.com/drive/folders/1sGs4IWHfNkCZKN4-0OcHi9Urw6x40iPj