

Market Integration and Agricultural Output in Seventeenth-, Eighteenth-, and early Nineteenth-Century England

By J A CHARTRES

Good roads, canals, and navigable rivers, by diminishing the expense of carriage, put the remote parts of the country more nearly upon a level with those in the neighbourhood of the town. They are upon that account the greatest of all improvements. They encourage the cultivation of the remote, which must always be the most extensive circle of the country. They are advantageous to the town, by breaking down the monopoly of the country in its neighbourhood. They are advantageous even to that part of the country. Though they introduce some rival commodities into the old market, they open many new markets to its produce. Monopoly, besides, is a great enemy to good management ...
(Adam Smith, *Wealth of Nations*, I, IX)

Abstract

Discussions of English agricultural change in the long eighteenth century imply significant changes in levels of market integration, and the capacity of farmers to respond clearly to the price signals available in the market. The present speculative paper reviews the empirical evidence for growing market integration over this long period, and raises questions over the ways in which the mercantile and transport changes that underpinned it may have facilitated farmers' reallocation of resources to more productive ends. It attempts to link English price evidence, relatively poor by comparison with that of its European neighbours for much of the period, to changing market opportunities, to which it attributes much of the significant growth of farm output before the period of major technical innovation after 1820.

In several earlier studies, I have attempted to explore the interrelationship of transport improvement, developments in market structure and organization, and changing patterns of agricultural output and productivity in the 'long eighteenth century', broadly covering the period from the 1650s to the 1820s. The present paper revisits this work, and attempts to identify long-term trends in market integration, to examine the empirical data available for its fuller analysis, and to indicate specific mechanisms by which the process of integration affected production decisions at farm level.¹

If we take as a premise for the present analysis the implications of much modern work on UK, predominantly English farming, it can be assumed that at least until the 1820s, rural improvement took place largely through endogenous means. While some external, 'artificial', inputs to farming were available during the period – conditions such as lime, and fertilizers such as 'night soil' for example – and were widely used, it was only at the very end of the period that 'industrialized', wholly exogenous inputs, became available, and led fairly quickly to a new and stepwise jump in grain yields.² The logical corollary of this is that the long-term incremental *improvement* of English farming, widely seen by Crafts and others as perhaps the most significant single component of economic

¹ This is a revised version of a paper first presented at the European Historical Economics Workshop, Lercici, April 1994, and I am grateful to its organizer, Karl Gunnar Persson and all the participants for their constructive criticisms and suggestions. Particular thanks are due to the discussant of the paper, Kevin O'Rourke, to whom specific debts are acknowledged below, and Cormac Ó Gráda. I am grateful also for the comments by two anonymous referees, by Patrick O'Brien, and by Kevin Keasey.

² M E Turner, 'Agricultural productivity in England in the eighteenth century', *Econ Hist Rev*, 2nd ser, XXXV, 1982, pp 489–510.

growth in the period,³ must be attributed to what can crudely be termed integrative and organizational factors. The more efficient employment of given factors of production, and best-practice techniques, were its source, rather than new technology.

This argument effectively highlights many of the issues which will be touched upon in the following paper. It points to the need to integrate the historical analysis of transport changes with that of farming. The nature of information networks needs also to be assessed, since it may well have been in many trades, that speed of information transfer, rather than that of the bulky commodities themselves, was critical to the advancing articulation of market systems, which facilitated changes in land use at the local and regional level. Many of these issues have as yet been little studied in the UK, though several are already familiar themes of research on mainland Europe, notably in studies by scholars such as George Grantham and Jack Thomas.⁴ Consequently, in the pages that follow, there are numerous points at which such gaps in our knowledge have to be highlighted.

I

Economic historians of agricultural markets in England, from Thorold Rogers to Arthur John, have tended to economic 'whiggism', and built in long-term assumptions of progress into their descriptive analysis. This has been critical in the assessment of change in the period 1670-1830, and the first and bulky section of this paper suggests that such an assumption is unfounded, when confronted by a more rigorous assessment of the empirical evi-

dence. A single quotation from a classic study by John serves to establish the point:

A second complicating factor in this period is the existence of a variety of separate markets, particularly for grain. Thorold Rogers, on the basis of Houghton's figures, distinguished six price regions at the end of the seventeenth century. One was based 'on the Thames and its greater affluents, with certain places such as Hitchin or Wycombe near it ... The next district is the Eastern Counties, chiefly Cambridgeshire, Bedfordshire, Essex, parts of Hertfordshire, Suffolk, Norfolk and Huntingdonshire. The Midlands are less definite, but will comprise the counties west of those last named, generally between the Trent and the Thames. The South is the range from Kent to Devonshire, and includes some Surrey markets. The South-west includes Falmouth, Plymouth, Bristol and Pembroke, with the valleys of the Severn and Wye. The North contains the markets north of the Trent and will include Liverpool' ... After 1730, the growth of provincial newspapers, which quoted London prices, helped to break down this sectional autonomy; but it was not until the development of canals and turnpike trusts that a major improvement was effected in this respect.⁵

The firm if implicit 'progressive' model visible in both Rogers and John is clear, and it is proposed in this first section of the paper to demonstrate that it is misplaced, even as a description of the evidence Rogers himself employed as the basis for the definition of 'price regions'. Subsequent data sets indicate that regional price integration both advanced and retarded during the course of the long eighteenth century.

Rogers employed simple averaging as his methodology throughout his study, and the Houghton data, so critical in the longer historiography of the subject as the fixed point of regional price autonomy against which change was subsequently measured, certainly indicates regional differentials in price, when treated in this way. Reworking the data, my own annual averages for wheat for six towns falling within Rogers' 'regions' are presented to illustrate the

³ N F R Crafts, *British Economic Growth during the Industrial Revolution*, 1985, pp 38-47.

⁴ George Grantham, 'Urban provisioning zones before the Industrial Revolution', unpublished typescript, February 1992; J Thomas, paper presented to the 1992 Flaran Conference, forthcoming.

⁵ A H John, 'The course of agricultural change 1660-1760', in L S Pressnell, ed, *Studies in the Industrial Revolution presented to T S Ashton*, 1960, pp 126-7.

TABLE 1
Annual average price of wheat, selected towns, 1693-1700 ('best wheat' in shillings per bushel [c 35.2 litres])

Harvest year	London	Cambridge	Stamford	Retford	Hereford	Pembroke
1693	7.6	7.0	6.0	8.5	5.5	3.9
1694	4.5	3.8	3.5	4.8	3.9	2.6
1695	6.1	6.0	5.5	7.1	4.7	3.5
1696	5.9	5.4	4.9	6.6	5.1	4.3
1697	7.4	6.8	6.6	8.0	6.6	5.5
1698	7.1	6.7	6.7	7.9	6.3	5.2
1699	5.1	4.9	4.5	5.6	4.6	3.9
1700	3.9	3.6	3.3	4.2	4.1	3.5

Source: John Houghton, *Collection for Improvement of Husbandry and Trade*, 1692-1703.

TABLE 2
Annual average price of horse beans, selected towns, 1693-1700 (in shillings per quarter [c 2.82 hl])

Harvest year	London	Cambridge	Stamford	Retford	St Albans	Dunstable
1693	22.3	21.8	21.5	28.7	24.1	22.1
1694	21.1	22.4	25.2	26.0	23.4	23.1
1695	28.2	28.9	22.7	26.5	28.3	30.8
1696	25.2	27.9	21.1	31.8	29.6	28.2
1697	24.7	27.1	24.0	30.0	25.0	18.2
1698	31.0	26.2	27.3	27.7	27.3	26.3
1699	28.1	29.1	32.4	30.0	27.8	32.0
1700	19.6	19.3	20.0	29.2	23.5	26.2

Source: as for Table 1.

point in Table 1. Unfortunately, on the basis of my selection of series, continuity of weekly quotations throughout the period, no representative of Rogers' 'south' is included. As indicated by Table 2, for horse beans, broadly similar patterns may be generated for other commodities. Rogers employed a similar approach, but averaged observations promiscuously, and, so far as I am able to tell, fitted his regional boundaries 'by eye'.

Later series, albeit drawn from a much narrower range of primarily institutional sources, and available on a longer and more variable periodicity than the weekly observations described in the tables, appear to demonstrate a lesser degree of interregional variation. Unfortunately, the most recently published studies, by Richard Perren and

Arthur John, employ 'annual averages' of data derived from provincial newspapers, and none of the points of observation fits that of the Houghton data for the 1690s.⁶ Other studies have tended to employ only the very familiar Eton College, or Winchester series, and present even less convincing spatial coverage. Thus the comparison of proportionate price differentials for markets over time is exceptionally difficult, although as a first stage in the argument presented here, it is an essential element of the context.

Accepting that the crude descriptive data are not what one would wish, some figures indicative of regional price differentials are

⁶ G E Mingay, ed, *The Agrarian History of England and Wales, VI, 1750-1850*, 1989, chapter 3, 'Markets and marketing', by Richard Perren, and 'Statistical appendix', by A H John.

TABLE 3
Wheat and bean prices from English towns, 1770s-1840s (shillings per quarter)

Year	Reading [Thames]	Bedford [Eastern]	Gloucester [S-W]	Derby [Midland]	Leeds [North]
<i>Wheat</i>					
1775	41.44	48.33	39.08	—	39.83
1785	42.27	41.00	41.58	46.17	46.42
1794	65.13	49.17	—	76.58	73.19
1805	78.79	—	83.58	84.17	78.87
1815	66.17	—	59.83	—	69.87
1825	65.92	—	62.50	—	—
1835	44.92	—	44.08	—	—
1845	55.96	—	56.50	—	—
<i>Beans</i>					
1775	29.17	24.83	23.08	—	32.08
1785	39.25	28.83	38.75	36.67	36.67
1794	45.79	25.50	—	51.67	49.31
1805	43.81	—	46.50	48.17	49.21
1815	35.75	—	32.17	—	39.50
1825	49.13	—	50.58	—	46.33
1835	38.83	—	40.83	—	—
1845	41.63	—	41.08	—	—

Source: Mingay, *Agrarian History*, VI, pp 976-87.

reproduced in Table 3. For each decade from the 1770s, prices for identical years falling into the mid-points of the range of prices are presented, together with an indication of the approximate attribution of each town to one of Thorold Rogers' 'regions'. Unfortunately, the poor quality of even this data is demonstrated by the gaps in the record, and at present we must simply note that the quality of UK data, even after the research that has been incorporated into successive volumes of the *Agrarian History of England and Wales*, remains inadequate by comparison with the *mercuriales* of most of our European neighbours. The incomplete series represented in Table 3 suggest a reduction of the dispersion of the range of prices by comparison with the earlier data, but are too limited to do much more.

From the 1790s, and particularly from the reformed administration after 1821, there exist the weekly 'corn averages', collected from a large number of fixed locations, and used as the basis for national

measurement of cereal prices. Modern investigators of these data, Lucy Adrian and Wray Vamplew in particular, have validated their quality, and indicated that while they are clearly imperfect, they represent a reasonable basis for analysis of general price and production trends, and from the late 1820s, provide a weekly national average which can be treated as a fair reflection of the actual market situation.⁷ They support the general point made on the basis of the figures in Table 3, that the range of dispersion of prices was, by the second quarter of the nineteenth century, significantly reduced, and that it is therefore generally supportive of the implicit model of a long-term trend towards market integration expressing itself by the harmonization of prices. By the second quarter of the nineteenth century, on these figures, prices appeared to con-

⁷ L. Adrian, 'The nineteenth century Gazette corn returns from East Anglian markets', *Jnl Hist Geog*, III, 1977, pp 217-36; W. Vamplew, 'A grain of truth: the nineteenth-century corn averages', *Ag Hist Rev*, XXVIII, 1980, pp 1-17.

form to the expectations of basic cobweb theories, and validated general historical expectations of progressive change during the period of the 'industrial revolution'.

II

These views of the nature and structure of the market are clearly not an acceptable analytical basis for the assessment of the extent of integration, and its impact upon decision-making at farm level. Although UK researchers are hampered by the relatively poor availability of data, quite different approaches are needed to meet these issues. This second section of the paper attempts to review the findings and implications of such work, and to create the basis for further exploration of the value of these signals to producers and merchants.

The most interesting and challenging of such studies was that by Granger and Elliott in 1967, which appears to have attracted few followers. They rejected the attempt to measure the extent of market integration by mere descriptive assessment of annual averages, and employed spectral analysis to the available data, at the same time reviewing the somewhat naïve theoretical context in which the topic had previously been discussed. My observation has been that their work remains insufficiently incorporated into the historiography of the topic, and that it requires re-evaluation here. While subsequent work by scholars such as O'Brien and Hueckel have explored the impact of relative prices upon intersectoral resource switching, or its absence, less concern has been demonstrated for the finer analytical issues raised within agriculture.

It will come as no surprise that the data base available for Granger and Elliott was very limited in both geographical range and periodicity. Their work employed 'monthly' data from the Beveridge series

on 'Navy Victualling Series A', from which they generated their own simple annual averages; annual average prices taken from Beveridge's Winchester series, and from Lord Ernle's Eton College series; and Michaelmas spot prices for Lincoln, derived from Hill.⁸ From the outset, then, it is clear that their work embraced no short-term series equivalent in any way to the *mercures* of France.

The analysis concentrated upon the assessment of leads and lags in the observed price series, and provided results that led to questioning of the conventional picture presented by Rogers, and uncritically recycled by John. Although the advanced analytical techniques are arguably excessive for the quality of the data – the unrepentant historian surfaces! – the conclusions are important, and at the risk of over simplification, can be summarized as follows. Assessing the data for two overlapping time periods, 1723–62, and 1754–93, Granger and Elliott produced correlation coefficients for their paired series for both 'long' [over four years] and 'short' [two to four year] fluctuations, and estimated 'leads' and 'lags' from the data. The r^2 outcomes are reproduced in summary form in Table 4.

The authors concluded that the evidence for the earlier period, generating surprisingly short leads and lags, and higher correlations than the then secondary literature would lead one to expect, pointed towards the rejection of the 'regional autonomy' theses of Rogers and John.⁹ In many ways more interesting was the second critical finding of this research, that the second time period appeared to display lower correlations, and thus to suggest that

⁸ C W J Granger and C M Elliott, 'A fresh look at wheat prices and markets in the eighteenth century', *Econ Hist Rev*, 2nd ser, XX, 1967, pp 257–65. Their data were derived from W Beveridge, *Prices and Wages in England*, 1939; Lord Ernle, *English Farming Past and Present*, 4th ed, 1927, p 440; and J W F Hill, *Georgian Lincoln*, 1965 [then 'forthcoming'].

⁹ Granger and Elliott, 'Wheat prices', pp 261–2. Data reproduced in Table 4 are taken from p 263, Tables 1 and 2.

TABLE 4
Granger and Elliott's correlations for wheat price series, 1723-62 and 1754-93

Paired series	1723-62		1754-93	
	Long	Short	Long	Short
London-Lincoln	0.60	0.30	0.65	0.35
London-Winchester	0.90	0.65	0.55	0.15
London-Eton	0.85	0.60	0.70	0.50
Lincoln-Winchester	0.65	0.40	0.40	0.05
Lincoln-Eton	0.70	0.40	0.70	0.20
Winchester-Eton	0.90	0.50	0.65	0.10

interregional integration was less advanced. The reasons which might underlie this are explored later in this paper, though it is worth noting at this stage that Granger and Elliott confined their observations to expressions of surprise. For the moment, acknowledging the deficiencies of the data, it is proposed that we accept this as evidence of retardation of market integration.

Though it has been argued in the present paper that English price data of shorter periodicity are generally fragmentary, there are exceptions, principally those published in John Houghton's *Collection for Improvement of Husbandry and Trade*. The analysis of this material forms the central element of the present section, but, before turning to my relatively crude statistical methods and their outcomes, the source needs evaluation for quality. From 30 March 1692 to 24 September 1703, Houghton published weekly price series for around fifty towns, many of which appeared intermittently, and thus his spatial coverage at some point of the period was significantly greater. Houghton's credentials as a Fellow of the Royal Society were validated at the outset of the enterprise by twenty-eight other fellows, including Plot, Southwell, Evelin [*sic*], Pepys, Hans Sloane, and Edmund Hally [*sic*].¹⁰

¹⁰ Houghton, *Collection*, I, p 1, 30 March 1692. The endorsement is dated 11 November 1691. Nearly all can be identified as Fellows of the Royal Society from standard sources, such as the *Dictionary of National Biography*, though one, Peter Pett, was expelled: many of the remainder were Fellows of the College of Physicians, which is not surprising in the light of Houghton's own profession

Unfortunately, at no stage does Houghton describe the ways by which he collected his 'weekly' price data, and to date I have been able to locate little external evidence to fill that gap. What there is suggests that he possessed an elaborate system of provincial correspondents, whose diligence or its absence accounted for the gaps in the record, and whose general lassitude is revealed by the striking deterioration of most of the series from around 1700/1. One explicit record survives from 28 March 1694, a letter from his Oxford correspondent, providing the market prices 'last Saturday', probably 24 March, but only one of the published prices accords with those in the letter. However, the correspondent, 'An Ch', did report that two others had recently removed from the town, but could still be reached through him, and encouraged Houghton with the words 'I hope your advice to Foreigners goes on'.¹¹ While the data cannot be fully validated in provenance, their origins can thus be suggested with reasonable probability. This also suggests that they lie rather closer to retail prices than most of the other series conventionally analysed.

The better validation may simply lie in examination of the series for presumptive quality, and a single, typical example of the full set of available data for Dunstable, and

of apothecary. We can assume that Houghton's trade involved extended networks of correspondence, and that this may have provided the basis for his ambitious project.

¹¹ British Library, 'Letters of divines', Birch, Add MSS 4275, f 101.

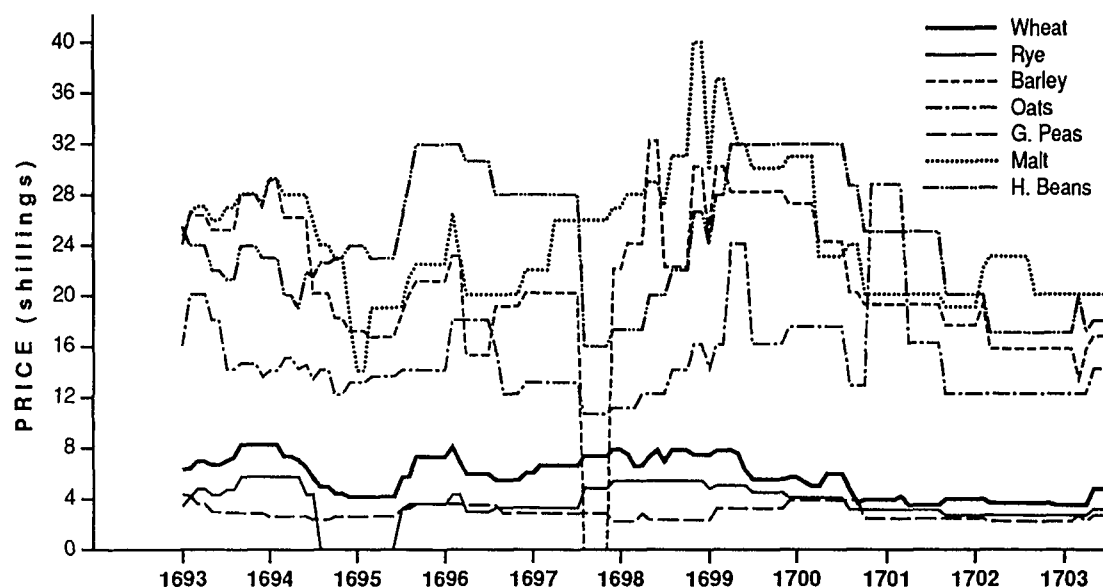


FIGURE 1
Monthly cereal price movements, Dunstable, 1693-1703

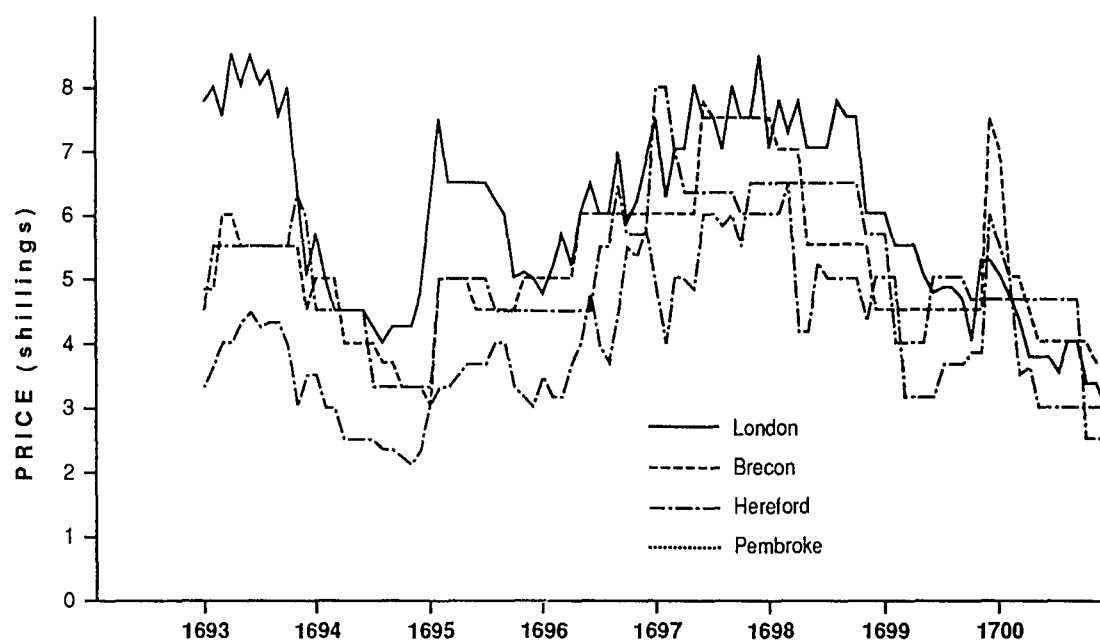


FIGURE 2
Comparative monthly wheat prices, London, Brecon, Hereford and Pembroke, 1693-1700

the comparative plots of wheat for London, Brecon, Hereford and Pembroke is presented in Figures 1 and 2. Although some of the principal cereals quoted, oats for

example, display long horizontal patterns throughout the period covered by the graph, and must be regarded as of no real value as price currents, most suggest the

variability consistent with data which reflects the state of the market in the short and medium term. The quality for wheat data is generally better than that for other cereals, for reasons to which we will be returning in due course, and the chart for that crop for London, Pembroke, Hereford, and Brecon, also looks pretty convincing as 'real data', at least until the final two years, when the series merely repeat themselves. The conclusions are, therefore, that the Houghton data appear to possess presumptive reliability as reflections of local prices and inter-commodity variation, and that, over the difficult years 1693-1700, they show fairly consistent evidence of one complete peak-to-peak or trough-to-trough cycle. They appear to display a spatial range, periodicity, and quality unmatched in Britain before the nineteenth century.¹²

Having established the credentials of the materials, we can turn to their analysis. For a number of reasons, the Houghton data were not subjected to a replication of the spectral analysis techniques employed by Granger and Elliott. Although the data were relatively rich in observations – up to seven commodities for eighteen geographical locations in the initial frame for data collection – the fact that a single price cycle appeared to be involved precluded the estimation of the spectra, although, for other purposes, the fact that the prices appeared to display no underlying trend was helpful.¹³ After piloting the data collection exercise, it became evident that collection of observations on a weekly basis

was not necessary, and that for any analytical purposes monthly observations would suffice. Given the likely leads and lags involved in the transmission of information by correspondence alluded to above, we can assume a range of perhaps two weeks on average between the actual observation and the publication of the price, and precision at the level of the week is probably superfluous.

As is evident from the data plotted in Figures 1 and 2, and the others provided in the Appendices, several years and some commodities had to be screened out before statistical analysis. Of the seven commodities for which data were collected, neither oats nor grey peas produced series of a quality or a range to warrant further statistical analysis, itself suggesting that neither was traded extensively or that the range of locations that emerged from the screening of the data omitted the north, in which oats in particular may have remained the predominant bread grain for most of the eighteenth century.¹⁴ Figure 3 presents the towns for which data were collected, and, as indicated in our earlier discussions of Tables 1 and 2, the limitations of spatial coverage are clear: both the north and the north-west are effectively excluded from the analysis by the deficiencies of data. Corn markets of known significance, such as Liverpool or Wakefield, produced some observations, but too intermittently for our present purposes. The result was therefore to bias the data towards the south and east of England, and, for the reasons explained earlier, to confine the statistical analysis to harvest years 1693-1700.

The data were subjected to the simple but relatively severe test of first-differencing, and then a correlation matrix generated for all the pairs of observations. For the data of the best quality, wheat, this produced fourteen sets of observations, but

¹² Scottish data are somewhat more promising than those for England, and have been the subject of several studies by Rosalind Mitchison, beginning with the useful assessment of the *fiars* annual prices, in 'The movements of Scottish corn prices in the seventeenth and eighteenth centuries', *Econ Hist Rev*, 2nd ser, XVIII, 1965, pp 278-91.

¹³ It is also worth admitting that the author rapidly found himself lost in the arcane mathematics of discussions of the value of spectral techniques, *vide* Marc Nerlove, 'Spectral analysis of seasonal adjustment procedures', *Econometrica*, 32, 3, 1964, pp 241-86, and lacking in software programs available for direct application. Even now, the technique is very limited in use, and stands a little outside the standard portfolio of time series techniques.

¹⁴ E J T Collins, 'Dietary change and cereal consumption in Britain in the nineteenth century', *Ag Hist Rev*, XXIII, 1975, pp 97-115.

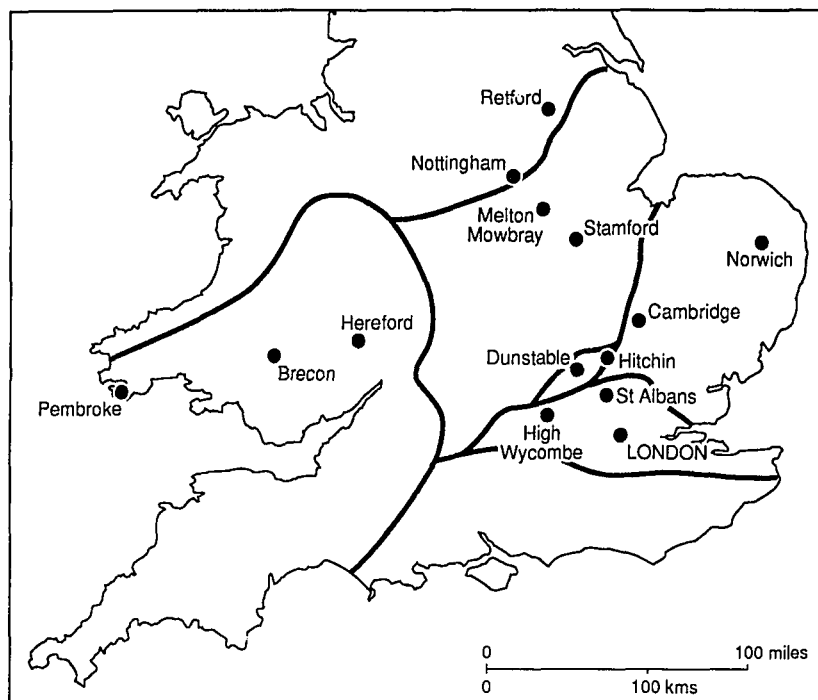


FIGURE 3

Location of towns generating Houghton's price series, with approximate borders of Rogers' 'regions'

dropped successively to nine for each of barley, malt and rye; and eight for horse beans. For each commodity both absolute and relative first differences were tested, observations examined both on an immediate and a one-month lagged basis, and the results are presented in summary form in Tables 5–8. The final commodity examined, horse beans, produced only one pairing at these levels of significance, from twenty-seven possibles, for London and High Wycombe, at 0.25.

These results are extremely interesting in themselves, and all the more so when considered in the light of the predominant tone of the earlier secondary literature. It should be noted that there are reasons for considering the 1690s as an unusual period for observation, in that it provides evidence of a sharp rise and fall in prices, and, like the 1590s and 1790s, was a period in which there is clear evidence of dearth, despite

the level overall trend that would characterize our period treated as a unity.¹⁵ It also saw the beginning of regular exports of English grain under the stimulus of government bounty.¹⁶ Therefore, conditions may not have been wholly typical of the succeeding decades, but for England at least to the 1770s, and arguably throughout the period we are considering, no decade was 'normal' or 'representative', given the distorting impact of state intervention on price levels and the direction of trade flows.¹⁷ It is therefore argued here

¹⁵ R B Outhwaite, 'Dearth and government intervention in English grain markets, 1590–1700', *Econ Hist Rev*, 2nd ser, XXXIV, 1981, pp 389–406.

¹⁶ Chartres, 'Marketing', pp 448–54. Exports under bounty had taken place during the 1670s, but beginning a continuous series from 1689. In the 1690s, they were heavily concentrated on barley and malt, and geographically into the East Anglian region.

¹⁷ A H John, 'English agricultural improvement and grain exports, 1660–1765', in D C Coleman and A H John, eds, *Trade, Government, and Economy in Pre-Industrial England*, 1976, presents a case for a very significant impact of these exports on production, particularly regionally.

TABLE 5
Correlations of wheat prices, by first differences, 1693-1700

Town	Bre	Cbg	Dun	Hfd	Hch	Lon	MM	Nw	Ng	Pbk	Rtf	Stf	HW
St A	—	0.45	0.38	0.26	0.46	0.56	0.33	0.30	0.33	0.27	0.54	0.43	0.55
Bre	—	0.24	0.28	—	—	0.33	0.24	—	0.32	0.33	0.26	0.33	0.30
Cbg			0.43	0.34	0.37	0.32	0.42	0.31	0.27	0.26	0.49	0.29	0.45
Dun				0.28	0.41	0.27	0.29	0.37	0.55	0.24	0.53	0.38	0.49
Hfd					—	0.25	0.27	—	0.24	—	0.27	—	0.33
Hch						0.53	0.33	0.23	0.25	0.26	0.40	0.44	0.29
Lon							0.24	—	0.25	—	0.49	0.29	0.45
MM								0.35	0.25	0.30	0.33	0.31	0.27
Nw									0.36	—	0.27	0.28	0.24
Ng										0.26	0.34	0.33	0.37
Pbk											0.24	0.44	0.32
Rtf												0.36	0.70
Stf													0.31

In this and following tables, towns are abbreviated as follows: St Albans, St A; Brecon, Bre; Cambridge, Cbg; Dunstable, Dun; Hereford, Hfd; Hitchin, Hch; London, Lon; Melton Mowbray, MM; Norwich, Nw; Nottingham, Ng; Pembroke, Pbk; Retford, Rtf; Stamford, Stf; High Wycombe, HW.

Sources: Houghton, *Collection*; these data were first analysed and published in J A Chartres, 'The marketing of agricultural produce', in Joan Thirsk, ed, *The Agrarian History of England and Wales*, V, part II, 1985, pp 406-502, esp pp 459-65. The present paper provides a more detailed exploration of the results of this analysis in a considerably wider historical context. Coefficients in excess of 0.21 are significant at above the 97 per cent level, and those in excess of 0.27 at above of the 99 per cent level. For simplicity in the presentation of these data, indicators of those pairings which emerged as 'significant' on a lagged basis, have been omitted. These accounted for 16 per cent of the pairs for wheat; 15 per cent for barley; 20 per cent for malt; and 8 per cent for rye.

TABLE 6
Correlations of barley prices, by first differences, 1693-1700

Town	Bre	Cbg	Hfd	Lon	MM	Nw	Pbk	Stf
St A	0.27	0.24	0.21	0.30	0.24	—	—	0.33
Bre	—	—	—	0.39	—	—	0.33	—
Cbg			0.23	—	0.41	—	—	0.29
Hfd				—	0.26	—	—	—
Lon						0.22	—	0.38
MM						0.25	—	0.35
Nw							—	0.33
Pbk								0.22

TABLE 7
Correlations of malt prices, by first differences, 1693-1700

Town	Cbg	Dun	Lon	MM	Nw	Pbk	Rtf	Stf
St A	—	0.27	0.53	0.42	—	—	0.44	0.40
Cbg		0.30	0.27	0.22	0.22	—	—	—
Dun			0.36	0.27	—	—	0.23	—
Lon				0.28	—	—	0.30	0.22
MM					0.22	—	—	0.41
Nw						—	—	—
Pbk							—	—
Rtf								0.30

TABLE 8
Correlations of rye prices, by first differences, 1693-1700

<i>Town</i>	<i>Cbg</i>	<i>Hfd</i>	<i>Hch</i>	<i>Lon</i>	<i>Nw</i>	<i>Ng</i>	<i>Rtf</i>	<i>Stf</i>
Bre	—	—	—	—	—	0.22	0.27	0.32
Cbg		0.21	0.45	0.38	0.30	0.38	—	0.31
Hfd			—	—	0.24	—	—	—
Hch				0.48	0.29	0.26	—	0.45
Lon					—	0.25	—	0.34
Nw						0.26	—	0.23
Ng							0.31	0.26
Rtf								0.27

that there is reason to doubt the evidence derived from the 1690s, but that it is insufficient to invalidate the tentative conclusions that can be drawn from the exercise.

If this analytical approach, as is suggested, tests the extent to which price movements were generally synchronized, and that this is a powerful indicator of the extent of practical integration of cereal markets, then important conclusions emerge. The first is that for the bulk of the group of towns tested, wheat prices were remarkably consistent in the extent and direction of change. To that extent, it suggests that the market for wheat, grown largely as a cash crop and thus most likely to suggest capitalistic market structures, was remarkably integrated in the 1690s, and that these results accord well with those derived by Granger and Elliott for the period 1723-62. Of the markets examined, only those in the far west, above all Brecon, generated evidence of serious detachment from the general movement of wheat prices, both in generating few 'significant' pairings, and in producing some inverse relationships. This is not to say that there are not some puzzles in these results: Norwich, for England's second city located at the centre of a major granary, does not produce the strong and consistent correlations that might have been expected with London, but that may indicate how unwise previous studies have been to consider these issues wholly in terms of wheat. Though still

weaker than one would have hypothesized, Norwich does produce a significant coefficient for barley. These results therefore suggest a relatively high level of price integration for wheat in both the 1690s and the period 1723-62, which deteriorated in the second half of the eighteenth century, and which is not fully restored until perhaps some years after 1810.

As interesting, perhaps, are the results for the other cereals, which have been generally neglected in previous British studies of prices. The series for barley and for malt would, of course, be expected to exhibit very similar patterns and, on the comparative evidence of Tables 6 and 7, they do, allowing for the fact that two slightly different sets of towns are involved. The great barley-producing and malting counties to the north of London reveal themselves in the strong presence among the pairings of St Albans and Dunstable, but here above all the relatively inconspicuous position of Norwich is surprising. Already by the 1690s, East Anglia was beginning to concentrate upon barley production, most of it for malting rather than as an inferior bread grain or animal feedstuff, and what is known of the physical flows of trade points to two principal destinations for East Anglian regional exports: London, from the 1690s beginning to develop as the key entrepôt for English grain; and the Netherlands, mainly Rotterdam and Amsterdam, where the lesser English barleys and malts could secure

a valuable markets with the distillers.¹⁸ This dualism may help to explain some of the odd performance of Norwich, and, for present analytical purposes, it is a pity that data of the requisite quality do not survive for the known centres of the barley and malt trades, King's Lynn and Yarmouth. A glance at the locations of these data also suggests a degree of concentration into the east and east midlands, again what would be expected from the existing secondary literature on commercial barley farming. Both barley and its semi-processed form, malt, were clearly also significant cash crops, and although their price behaviour suggests less extensive integration than for the wheat market, it was nonetheless clear, and for some of our pairings of markets, the price harmonization very strong.

The fourth grain, rye, has attracted precious little attention from British historians, and it appears to have been a crop which was well behind barley, oats, and wheat in sown acreage, and probably accounted for less than 15 per cent of total English cereal output in the 1690s.¹⁹ Even then, it was often grown for consumption on the farm, and frequently in mixtures with the other winter grain, wheat, and known as *mancorn* or *maslin*. The evidence of the trade statistics suggests that it was also imported in significant quantities to the east coast ports, as were oats, probably both for animal feedstuffs. Accordingly, it is not surprising to find in the rye data an apparently less integrated market than for the grains higher up the consumption ladder, and one that yields evidence of trade concentrated into the east midlands and eastern counties, with the exception of Brecon. Though these data cannot provide any real certainty, they suggest a greater degree of local and regional autonomy in the markets for rye than for the other grains. Strikingly, the final crop for which data were subjected

to similar tests, horse beans, produced little evidence of integration, and suggested largely localized price determination.

Thus the preliminary conclusions from this exercise are that the market for wheat was advanced in its extent of price integration, but that this diminished significantly as one descended the bread scale. However, one further point needs first to be addressed before the implications of these results are explored. The analytical approach here employed ignored the absolute levels seen as significant by Rogers and his followers, and considered instead relative movements, and this may need some justification. The range of prices of the two crops covered by Tables 1 and 2 is quite striking: can one justify ignoring this in pursuit of analysis based upon harmonization of movements? For several reasons, the answer can be affirmative. The crops we are considering may not be homogenous: 'best' wheat may not be the same in Brecon as in London or Norwich, but may still react to similar disequilibrating factors in the market place. Regional measures differed widely in volume, and in their customary use: some bushels were normally 'struck', and others heaped.²⁰ Although some of the differences in the figures of Tables 1 and 2 are sufficiently large as to explain why Rogers discerned different regions, they may still lie within the range of explanation by such factors. While recognizing grounds for proper scepticism, then, the Houghton data have historical integrity, and corresponding analytical significance.

III

The final two sections of this paper consider the implications of such evidence as we have been able to present on prices and market integration, first by examining the extent to which the picture derived from

¹⁸ See D J Ommrod, *English Grain Exports and the Structure of Agrarian Capitalism, 1700-1760*, Hull, 1985.

¹⁹ Chartres, 'Marketing', p 444.

²⁰ See the discussions by Giles V Harrison, 'Agricultural weights and measures', in Thirsk, *Agrarian History*, V, II, pp 815-25.

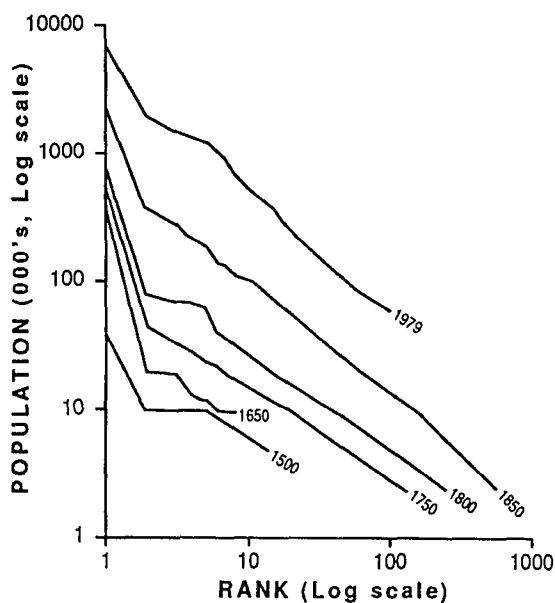


FIGURE 4
Rank-size distribution of English towns, 1500-1979

the work discussed in section II is credible and related to external historical circumstances, and second by examining the extent to which it represented a critical permissive factor in specialization of farm output.

The first issue is one addressed in an earlier paper, but one that can be further explored here.²¹ Put very crudely, the argument is that up to the middle of the eighteenth century, from say the earlier part of the seventeenth, England had been dominated by the massive growth of London, both in absolute and proportionate terms. As is evident from the curves of Figure 4, redrawn from Jan de Vries, this produced an unbalanced urban hierarchy in England, one which displayed striking 'concavity'. From the middle of the eighteenth century, this was gradually reduced, through the relatively faster growth of other urban centres, until, by the earlier nineteenth century, it had achieved a

marked log-linearity, which can be interpreted as evidence of a coherent, efficient, and mature urban hierarchy.²² The kinked and gradually straightening curves of Figure 4 should therefore be treated as a long-term description of England's rapid urbanization, led initially by London to the point at which England came to rival the Netherlands in its proportionate 'urban' population, and successively by the industrial and commercial cities, which assumed relatively greater significance in the century after 1750.²³

It is argued here that this long-term profile of the nature of change in England's urban hierarchy provides some explanation for the outcome of the statistical investigations which gave Granger and Elliott cause for 'surprise'. Although the geographical coverage of their data was very limited, other factors may help to support the case being made here, that the half century or so from the 1750s or 1760s represented a phase of instability and adjustment between two distinct equilibrium positions of integrated cereal markets. It assumes that Granger and Elliott in their analysis of the period 1754-93 (Table 4) did not produce a statistical quirk, but a result that suggested historical actuality.

For several reasons, market conditions may have been more stable for the periods 1690s-1750s, and after, say, 1820, than in the interim. The first is the evident primacy

²² I have opted not to attempt to introduce the whole debate on the theoretical underpinnings of this view here, since in many ways it would represent a diversion from the analytical focus of the present paper. However, it should be noted that it involves a huge literature from economists and regional geographers, which is reviewed by Jan de Vries, *European Urbanization, 1500-1800*, 1984, especially ch 5-6, pp 81-95. One is sometimes led to wonder whether all interval data can ultimately fit the Paretian distribution, which is directly akin to this rank hierarchy analysis. For present purposes, Brian Robson's critical comment - 'the study of size distributions appears to be an elaborate maze which ends only in a cul-de-sac' - cited by de Vries, p 93, will be set aside, as, with de Vries, the data are employed as useful shorthand descriptors for long-term urban changes.

²³ The comment about 'England' is conscious, and based upon E A Wrigley's reinterpretation of much of de Vries's work, in 'Urban growth and agricultural change: England and the Continent in the early modern period', *People, Cities and Wealth*, pp 157-93, which first appeared in the *Journal of Interdisciplinary History*, XV, 1985.

²¹ J A Chartres, 'City and towns, farmers and economic change in the eighteenth century', *Historical Research*, 64, no 154, 1991, pp 138-55.

of London as market for cereals, which would point to its demanding perhaps 8 per cent of gross output in 1750 for food and drink.²⁴ Superimposed upon this key market feature was a second factor, the substantial export trade in grains stimulated and sustained by government bounty payments, and a third, London's disproportionately important position in domestic and foreign shipping. Coupled with its equally dominant position on England's principal river navigation system, and as the hub of a relatively developed road goods carrying network, London came to play a disproportionately large influence in England's grain markets. Integration in our first period may thus be treated as the outcome of London's primacy, which by the 1750s may have led to perhaps a quarter or more of England's wheat being traded physically through the capital.²⁵ Some of Granger and Elliott's 'lead and lag' analysis may be argued to support this case. Though London's provisioning requirements in this period may not have differentiated it significantly from that, say, of Paris on the Île de France,²⁶ these multiplicative trading factors clearly did so. Integration in our first time period can thus be argued to have been the outcome of dominant metropolitan price-setting.

Kevin O'Rourke has posed an important alternative interpretation of these results. Implicitly, in the earlier parts of this paper, four indicators of integration have been posited, and it is perhaps at this point that they need to be made explicit. These are: absolute convergence of price levels; reductions in regional variations of prices, measured by comparative coefficients of variation; increased regional specialization in output; and, finally, an increase in the correlation of prices in different areas.

Dr O'Rourke has suggested that re-investigation of the Granger and Elliott's data produce fewer quirks than at first appear, in other words less conflict with the expected 'whiggish' model of historical integration. Retesting the data using standard rather than spectral statistical approaches, O'Rourke identified the source of Granger and Elliott's declining correlations in the Eton-Winchester relationship: first-differenced correlations for the other series produced no serious conflict with the earlier period. The 'problem' thus could be in part illusory.

Another possible explanation, which may fit better with other implications of the present paper, is that the grain market in the second half of the eighteenth century was subjected to greater shocks than in the preceding or succeeding periods. Employing a formal Roehner model, O'Rourke has confirmed the implicit arguments presented earlier, that regional price differentials theoretically can be assumed to be primarily a function of transport costs. However, if in the context of increased shocks to the networks of supply, given the fact that no region or market was wholly autarchic, then increased price variance could result, and the correlation coefficient could fall without implying any change in market efficiency or the extent of integration. Neither inference drawn here from Granger and Elliott's work can therefore lead to the certain rejection of the 'whiggish', long-term view of growing integration and market efficiency.²⁷

It is also significant that the Houghton data enable seasonal patterns of prices to be examined, and compared with similar data on the transport of cereals. On this basis one can tentatively assess whether the

²⁴ My estimate based upon suggested gross consumption of grains in London, revising N S B Gras's figures, in 'Food consumption and internal trade', in A L Beier and R Finlay, eds, *London 1500-1700: The Making of the Metropolis*, 1986, pp 178-9.

²⁵ That is the implication of *ibid.* and Chartres, 'Marketing'.

²⁶ I am indebted for this comment to discussions with H van der Wee.

²⁷ These paragraphs provide a very brief statement of an important range of empirical and theoretical issues raised primarily by O'Rourke, and by other members of the workshop, none of which can yet be resolved with finality. The need for more intensive work on English short-term price series is clearly reinforced by these arguments, but cannot be comprehended within the present speculative paper.

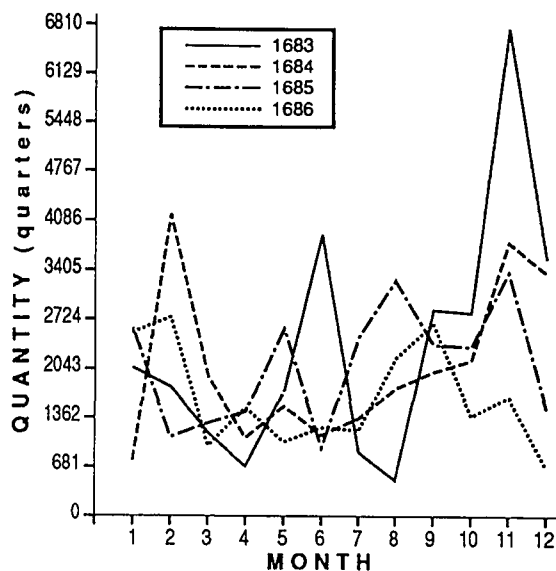


FIGURE 5

Seasonal shipments of grain into Wiggins Key, October 1682–September 1686 (Source: PRO, C113/14 pt II)

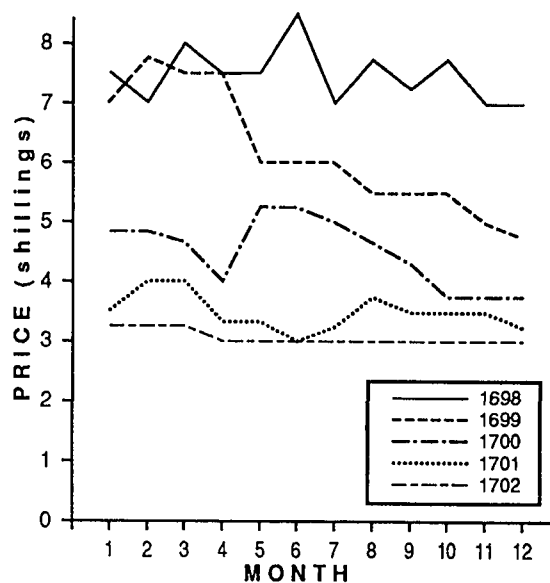


FIGURE 6

Seasonal patterns of wheat prices, London, March 1698–February 1703 (Source: Houghton, Collection)

market possessed the information and storage systems which would be needed to support this hypothesis. Again, the answer to this important question can only be provided for a very limited range of years, and few English data appear to offer the possibility of examining these issues on a comparative basis for later periods. The evidence that can be produced combines seasonal patterns of coastwise grain shipments into London, derived from one of the principal wharfs in the city, Wiggins Key, in the early 1680s, with the monthly London price movements, 1698–1703, derived from Houghton. In combination, on what has to be seen as a very rough-and-ready statistical base, these data, presented in Figures 5 and 6, suggest that physical flows and seasonal price movements were not consistently similar, and clearly point to stockholding in city granaries, and effective information flows as further elements in the price regime of a mature market structure.²⁸ Neither data set

is sufficiently robust to be certain of this conclusion, particularly in the absence of any effective comparative research.

Many new circumstances applied to the succeeding sixty years or so, nearly all of which will be so familiar as to need relatively little recapitulation here. Under pressures of population growth, net exports of grains effectively ceased from the early 1760s, and do not recommence until the mid-1970s,²⁹ thus removing one of the critical elements of London's primacy. From the 1760s, though not completed until around 1815, there was the first technological change in transport capable of turning the traditional internal trades of Britain 'outside in', and refocusing grain trades and those of other bulky, low-value commodities, the advent of the canal.³⁰ The cumulative impact of population growth led to clear regional and local cases

²⁹ Barley only; see B A Holderness, *British Agriculture since 1945*, Manchester, 1985, Table 16, p 174.

³⁰ The most disciplined discussion of canals comes from the assessment of their impact on coal, such as G L Turnbull, 'Canals, coal, and regional growth during the industrial revolution', *Econ Hist Rev*, 2nd ser, XL, 1987, pp 537–60.

²⁸ Both data sets were subjected to formal seasonal analysis: the shipping data produced significant seasonal components, but none was revealed in the grain price series.

of dearth, with potentially severe public order consequences, all indicative of radically altered supply conditions, and these were very pronounced during the hungry '90s. All of these were perhaps secondary to the overwhelming impact of new urban growth, with its very striking consequent provisioning demands. As early as 1801, only one of the top six provincial towns following behind London in England's hierarchy in 1700, Bristol, was still in this group, and in the subsequent years the relative positions of Manchester, Liverpool, Birmingham, Leeds, and Sheffield were further elevated.³¹ Infecting northern and midland England with new poles of attraction for food suppliers, new targets for successive von Thünen rings of specialization, and growing nodes within an evolving transport system, these cities shattered the old equilibrium of market relationships, and the new probably only stabilized in the 1820s.

IV

The final section attempts very briefly to explore the implications of these findings for the analysis of production decisions at farm level, and thus to relate the assessment of trends in market structure and integration to wider considerations of agricultural productivity. This would represent an agenda for a paper in itself, and here the issues are confined to price evidence, and the extent to which it can be related to the key issue of shifting patterns of output.

Patrick O'Brien's estimation of a new series of relative prices for England, 1660–1820, forms the essential point of departure for the argument of the present section. In looking primarily at the John thesis of the centrality of agriculture in the dynamics of a home market based profile to economic growth, O'Brien incidentally raised important questions as to the strength

of price signals to the switching of output between agriculture and industry:

Nevertheless, the new price indices suggest that the reallocation of resources from arable to animal husbandry had little to do with the inducements offered by shifts in relative prices. Between 1660 and 1820 the movement in the relative prices of grains compared to animal produce is almost imperceptible ... On balance, English farmers were not receiving the strong price signals (posited by several agrarian historians) to shift land and other resources from arable to pasture. The argument that agrarian progress became more conditioned by urbanization and patterns of expenditure favourable to animal farming – which in the long run promoted higher levels of overall efficiency – is not supported by price data. Perhaps demand for meat and dairy produce did rise more rapidly than demand for grain over the eighteenth century, but equally that may have been accommodated by cost-reducing innovations in animal husbandry and by imports from Ireland.³²

A number of agrarian historians have indicated that these important challenges to the new orthodoxy of English agrarian history are hard to reconcile with the hard evidence of quite extensive general shifts in the profile of output, and the very pronounced emergence of regional specialization. Paul Glennie, for example, contended that O'Brien's argument applied with force to consumer prices, but provided less certainty about relative levels of farm profits. These may have been sustained by the very economies in the marketing and transport processes indicated by the present paper, and there may also have been very pronounced gains in productivity in both the cereal and livestock sectors, both of which would offer significant gains in farm revenue. In addition, as will be evident below, there were quite distinct and asynchronous regional changes taking place within this market system, and these are not fully captured by the national aggregate price series approach.³³

³² P. K. O'Brien, 'Agriculture and the home market for English industry, 1660–1820', *Eng Hist Rev*, C, 1985, pp. 779–80.

³³ Paul Glennie, 'Continuity and change in Hertfordshire agriculture, 1550–1700: II – trends in crop yields and their determinants', *Ag Hist Rev*, 36, 1988, p. 158.

³¹ Wrigley, 'Urban growth', p. 160.

It is argued here that a number of the implications of the present study of prices, when combined with the evidence of change in transport and distributional systems, suggest that there are ways of reconciling the apparent conflict. The crude summary of the conclusions about market integration being advanced here, is that it was more pronounced on either side of the half century or so from c 1760, than it was during that period. That intervening period has been suggested as being one of complex adjustments, taking place under conditions of relative scarcity of food supply, inflation, the highest rates of population increase, and, at least on Crafts's estimates, relatively retarded growth rates of home agricultural output.³⁴ Another dimension of the adjustment may have been the refocusing of regional and national trading links to the rapidly growing 'new' urban centres. Specific case studies of these symptoms of adjustment or the advance of regional specialization and intensification exist in plenty, and suggest that the general clarification of the price signals may have been perhaps more important than O'Brien's aggregate measures in determining shifts in farm investment decisions. If the middle period was, as argued here, characterized by 'noisier' signals, or confusion resultant upon the fact that many new transmitters were beginning to broadcast, then that too may find support in these cases.³⁵

The two ruling characteristics of the grain market in our first period was that it was generally one in which the home food supply was not in danger, and that this point was reinforced by the buoyancy of exports. The evidence from regional and local studies combines strongly with that of price analysis to suggest that the outcome was one of significantly enhanced regional specialization. East Anglia, above all,

rapidly came to specialize in the large-scale production of barley, and in order to do so devised ways of abolishing much of its fallow, and hence introducing fodder crops to maintain its livestock herds.³⁶ As, after the late 1720s, the export market shifted in favour of wheat, then the cereal output of largely southern and eastern England responded.³⁷ The inland counties of the south and east also demonstrated such responses, as the intensification of arable in the counties north of London, such as Hertfordshire, and in the chalk downlands of the counties to the west of the capital, demonstrated.³⁸ Clarity of information about markets, coupled with significant improvement in the mercantile structure that articulated them, enabled these cereal farmers to intensify labour and other inputs, which appear increasingly to have been the critical sources of gains in the physical product of their lands.³⁹ Greater output at higher yield and higher cropped acreages were the probable sources of their enhanced net farm income in this context, and the superficial evidence of historians' 'national' price indices largely irrelevant to the issue.

The second of our illustrative case studies focuses upon the south midlands and the middle quarters of the eighteenth century. The benefits of clear and consistently-transmitted market signals to specialist wheat and barley farmers have been specified, but how did such factors affect the farmers of the southern midlands of

³⁶ Mark Overton, I am sure, will regard this as a gross oversimplification, but I hope true to the spirit of his critical research findings on the region, and their wider implications. I take as a basis for much of this comment his 'The diffusion of agricultural innovations in early modern England: turnips and clover in Norfolk and Suffolk, 1580-1740', *Trans IBC*, new series, X, 1985, pp 205-21.

³⁷ Chartres, 'Marketing'; much of the present argument was foreshadowed by E L Jones's seminal study, 'Agricultural origins of industry', *Past & Present*, XL, 1968, pp 58-71.

³⁸ Glennie, 'Continuity and change' pp 55-75, 145-61; E Kerridge, *The Agricultural Revolution*, 1967, pp 41-64; Thirsk, *Agrarian History*, V, part I, 1984, esp chapters by R C Richardson, B M Short, and J R Wordie.

³⁹ Glennie, 'Continuity and change'. On the operations of merchants and middlemen in the period, see Chartres, 'Marketing'.

³⁴ O'Brien, 'Agriculture', p 778.

³⁵ I have argued this case earlier in 'City and towns', but this provides a welcome opportunity to clarify and expand the argument.

England, where corn and horn had long been alternative, rather than complementary, cash crops. Part of the answer is to be found in the widespread development within the region of ley farming, somewhat eccentrically termed 'up-and-down-husbandry' by Kerridge, and part by the presence of this region as the geographical locus of the first great wave of parliamentary enclosures in the 1740s. The two issues are best seen as a continuum, permitted and facilitated by the integration of corn markets, which clarified the availability of bread grain supplies from outside the region, and thus permitted the region to respond rationally to market conditions, and to move towards specialization in grazing. Ley farming, as John Broad has demonstrated, was a low-risk intermediate stage in this process, and parliamentary enclosure of open field arable for conversion to grass its logical conclusion.⁴⁰ Robert Allen's challenging researches on the same region suggest a further mechanism, through the enclosure process, which enabled land use to be reallocated in response to this signal.⁴¹

Third, an earlier paper attempted to examine the interactive effects of these integrative and informational changes through the analysis of power relationships in the market place. This was put simply in terms of grains, and the arguments can only be summarized here. Empirical evidence was drawn from the oligopolistic London corn market, from the still more concentrated corn markets visible in the Essex and Kentish ports, and, through David Ormrod's work, the great grain ports of Yarmouth and Lynn, and linked to suggest an asymmetrical power relation-

ship between buyer and seller at each stage of exchange.⁴² This, it can be argued, demonstrates the real power of the holder of information and the ready cash or essential credit facilities, features which are commonplace in the analysis of the market structures of mainland Europe.⁴³ In the actions of the holders of market, perhaps oligopsonistic, power we can find a further mechanism sharpening the power of price signals as integrative forces, and 'taxing' the increment of output in less competitive zones of supply into greater efficiency or diversification. The apparent signs of disintegrative tendencies in the later eighteenth century may be indications of increasing competition between the merchants serving the growing alternative markets outside London, and perhaps of a relative shift of 'power' back towards the producers, as supply conditions became more constrained. I have also suggested that the corn riot in the period, and Edward Thompson's 'moral economy' and custom-based assessment of crowd behaviour, may be interpreted as perfectly rational responses to the adverse impact of these market power structures, and to the manifestations of complex and integrated markets. The behaviour of the urban crowd effectively provided for the economic historian an alternative indicator of these shocks, integrative tendencies, and increasing price variances.

This paper has largely eschewed comments on livestock, and perhaps it would be sensible to add a final case-study or exemplar from this sector to the general case being made. It will be obvious that the problems of comparison of price quotations become still more forbidding when dealing with sheep and cattle, even in the nineteenth century, and fewer statistical

⁴⁰ Again, I am being both speculative and provocative, but these comments are based upon J Broad, 'Alternate husbandry and permanent pasture in the midlands, 1650-1800', *Ag Hist Rev*, 28, 1980, pp 77-89; J Chapman, 'The extent and nature of parliamentary enclosure', *Ag Hist Rev*, 35, 1987, pp 25-35; Kerridge, *The Agricultural Revolution*, pp 181-221.

⁴¹ Robert C Allen, 'Enclosure, farming methods, and the growth of productivity in the south midlands', University of British Columbia, Department of Economics, Discussion Paper, 86-44, December 1986.

⁴² Chartres, 'City and towns'.

⁴³ In many senses the Liguria conference widened my frame of reference, and raised issues to which I shall return, but an example may be seen in Jean Meuvret's *Le problème des subsistances à l'époque Louis XIV, III, Le commerce des grains et la conjuncture*, Paris, 1988, ch 2, pp 47-96.

series of real promise exist for the kinds of analysis I would advocate. However, a very clear case can be made for the existence of an integrative mercantile structure akin to that for corn by about the same period, the early eighteenth century.⁴⁴ There was equally compelling evidence of oligopsonistic power, and exploitative rings. Again the case suggests that extensive market integration was the process which generated productive regional specialization in the livestock trades, which ran from the store-producers of the far west and north, through the graziers of the midlands, to the fatteners of the fringes of London. Very significantly, the key transport innovation of the 1820s, the steam coaster, effectively transformed Aberdeenshire from the first to the last zone.

That the farmer could and did respond to what O'Brien might have seen as weak price signals, and that this response may be a further indication of real market integration, has been shown in the important and interesting work of Andrew Copus. In his examination of the breeds, qualities, and other features of English southern downland sheep after 1780, Copus has shown clearly how the 'democratic' process of breed alteration, or very conscious cross-breeding, was conducted by tenant farmers in response to shifts in the relative prices for wool, tallow, and meat. Responses appear to have been sensitive and relatively rapid, and largely independent of the 'gents' who, as usual, confined their attentions to the production of uncommercial freaks.⁴⁵ There was clearly extensive, subtle, and early integration of livestock markets, which provided a powerful parallel

contribution to cereals in agricultural improvement.

V

The conclusions to this study will be relatively brief. The analysis of such data as are available, which are relatively few, and arguably poorer in quality than those available to many of our neighbours, has traditionally been conducted in ways that have not greatly helped the assessment of market integration. Indeed, the lasting impact of the pioneering work of Thorold Rogers may have been to mislead, by presenting evidence of extensive regional price autonomy at the end of the seventeenth century, which has subsequently been uncritically adopted by other scholars,⁴⁶ as the baseline against which to evaluate the 'progress' of the periods in which they expected it, the traditional area of 'agricultural revolution', largely after 1750.

Recent scholarship outside this field has tended to emphasize two critical revisions to the historiography. The 'industrial revolution' is now more widely accepted as a process rather than a concentrated period of time, and a more extended chronology accorded to growth. This has had the effect of adding emphasis to the later seventeenth and earlier eighteenth centuries as key period for analysis, rather than zones merely contributing 'preconditions' to the revolution. This has been paralleled by the work of the agrarian historians, who had reached many similar conclusions rather earlier, thanks to the work of Eric Jones, Joan Thirsk, and others, and it has become clear that concepts of 'agricultural revolution' are the better explained as constructs

⁴⁴ Discussed at length in Chartres, 'Marketing', esp pp 480-91.

⁴⁵ Andrew K. Copus, 'Changing markets and the development of sheep breeds in southern England, 1750-1900', *Ag Hist Rev*, 37, 1989, pp 36-51; John R. Walton, 'Pedigree and the national cattle herd, circa, 1750-1950', *Ag Hist Rev*, 34, 1986, pp 149-70; Harriet Ritvo, *The Animal Estate: The English and Other Creatures in the Victorian Age*, 1987, reprinted Hammondsouth 1990, ch 1, pp 45-81.

⁴⁶ What in many ways was the study with the best-researched data base was the chapter by P. J. Bowden, in the *Agrarian History*, V, II, which followed up his 1967 study of the sixteenth and early seventeenth centuries of volume IV. When one looks with care at his methodology, it becomes clear that he effectively 'fixes' his regions and their relativities by choosing base series, and correspondingly the price appendices to both volumes, while an immense improvement upon the previous confusion, fail to address what are argued here to be fundamental questions.

felt to be necessary adjuncts to the concept of the industrial revolution, rather than as descriptions of real processes. The commercial, transport, and first sexual revolutions perhaps belong in the same boat. Deeper analysis of the complex processes of long-term change have correspondingly become highlighted, as much in agriculture as in industry or trade.

The radical conclusions beginning to emerge from the work of early modern agrarian historians and historical geographers, principally Mark Overton and Paul Glennie, have combined with those of Michael Turner and Robert Allen, to alter our perceptions of agrarian change in the long eighteenth century. Most strikingly, in the joint work of Overton and Bruce Campbell, it has become clear that technical standards in East Anglian cereal farming, up to at least 1700, were no better than 'best practice' of the great monastic estates of the earlier fourteenth century. Logically, the diffusion of such best practice, largely through the intensification of labour inputs, could explain much of the advance in yields and arable productivity in the first half of the century. Enclosure and the familiar emblems of 'improvement' after 1740 may well have been less productive *per se* than once we thought, and the years 1760-1820 may perhaps be better described as a period of extensification on a given technical base, rather than critical years of technical progress.

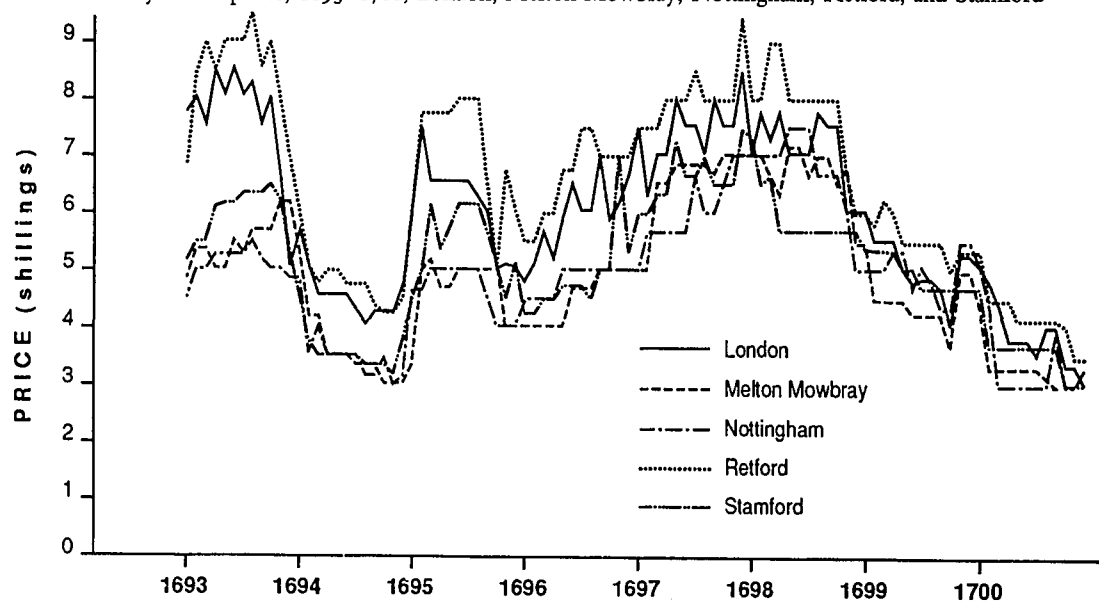
These conclusions lead us to focus upon the unanswered questions about the mech-

anisms which produced change and the diffusion of best practice. The arguments presented in brief here have been that price signals and their mercantile progenitors were critical elements in these processes, and that these help to explain how the intensive regional division of labour in eighteenth-century agriculture, stressed long ago by Jones as the key issue, came about. The close analysis of such data as are available indicates a highly-integrated market up to about the middle of the century, generated perhaps by the 'primacy' of London in England's urban system, which subsequently deteriorated, and only reasserted itself in the less inflated circumstances of the 1820s. Many factors may help to explain this, but the fundamental issue of England's rapid urban growth is suggested as the critical key, in generating a plurality of major centres of demand. Another critical vector for change may have been labour.

The simple conclusions here advanced are thus to put some flesh, and some new chronological perspectives, upon the views of Adam Smith that formed our epigraph. Market integration may have allowed the pack of factors in English agriculture to be reshuffled to produce quite remarkable growth in output. It remains an area in which further research is needed before any formal modelling of these complex interactions could hope to be empirically successful, but it is hoped that the explorations of the present paper have suggested that it might well repay the effort.

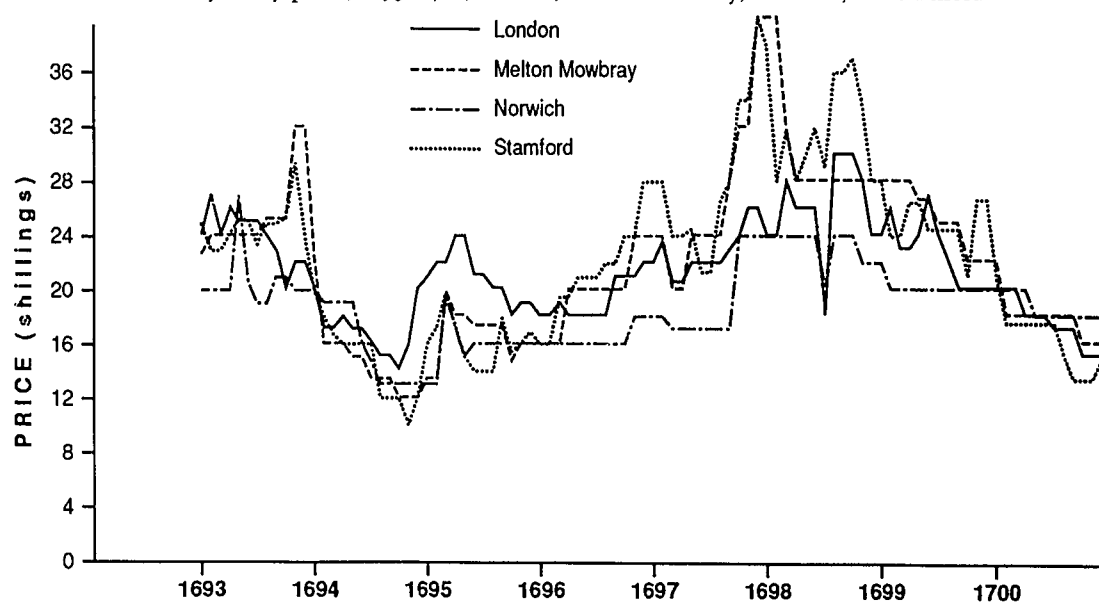
APPENDIX 1

Monthly wheat prices, 1693-1700, London, Melton Mowbray, Nottingham, Retford, and Stamford



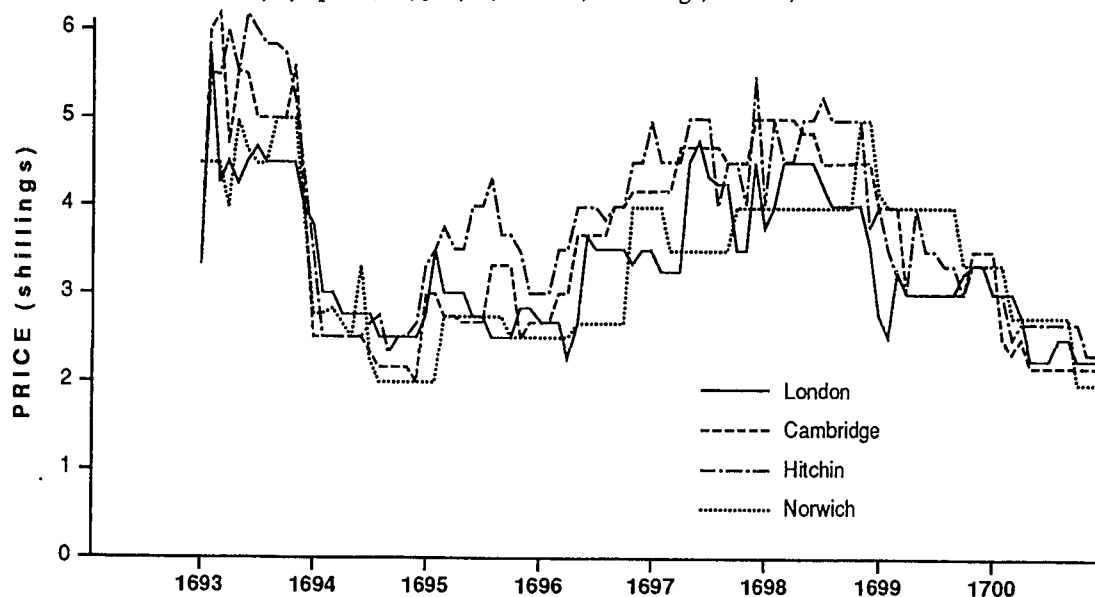
APPENDIX 2

Monthly barley prices, 1693-1700, London, Melton Mowbray, Norwich, and Stamford



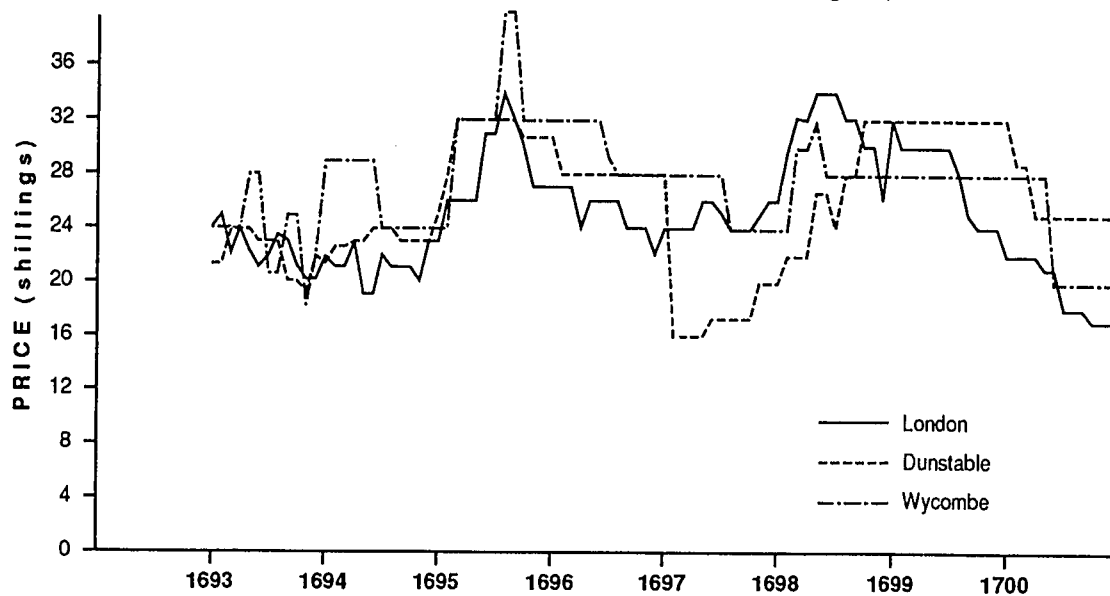
APPENDIX 3

Monthly rye prices, 1693-1700, London, Cambridge, Hitchin, and Norwich



APPENDIX 4

Monthly horse bean prices, 1693-1700, London, Dunstable, and High Wycombe



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