# DISCUSSION PAPER SERIES

No. 9515

## THE TRUTH, THE WHOLE TRUTH, AND NOTHING BUT THE TRUTH: THE ENGLISH CORN RETURNS AS A DATA SOURCE IN ECONOMIC HISTORY, 1770-1914

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*ECONOMIC HISTORY*

Centre for Economic Policy Research

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# ABSTRACT

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From 1770 to 1914, the British Government collected weekly price and quantity data for all types of grain traded in many market towns; these 'Corn Returns' were published in the London Gazette. We computerised the data published 1770-1864, totalling around 6 million data points. Here we describe the nature of these data; discuss why, when and how they were collected; consider their accuracy and biases; describe how we computerised them; and offer caveats in using these – and similar – data. We highlight the problem of drawing valid inferences in the face of price impact from fluctuating grain quality and rising imports.

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# The truth, the whole truth, and nothing but the truth: the English Corn Returns as a data source in economic history, 1770-1914.

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From 1770 to 1914, the British Government collected weekly price and quantity data for all types of grain traded in many market towns; these 'Corn Returns' were published in the *London Gazette*. We computerised the data published 1770-1864, totalling around 6 million data points. Here we describe the nature of these data; discuss why, when and how they were collected; consider their accuracy and biases; describe how we computerised them; and offer caveats in using these – and similar – data. We highlight the problem of drawing valid inferences in the face of price impact from fluctuating grain quality and rising imports.

The British Government made concerted and sustained efforts to monitor the grain trade throughout England, Wales and Scotland, 1770-1914. At its minimum, this project involved collection and publication of weekly prices for five different grains for 44 counties or regions; at its maximum, it covered weekly prices and quantities traded for seven grains for 290 towns. In total, the Government collected in excess of 6 million data points, 1770-1914. Generally referred to as the Corn Returns, they have

been widely used to construct cost of living indices (Phelps Brown and Hopkins 1954; Clark 2001),[1] measure market integration (Shiue and Keller 2007; Jacks 2011), infer rates of return on commodities (Brunt and Cannon 2012), and even explain cognitive ability (Baten *et al.*, 2012). We computerised all the available data up to 1864 to analyse market integration and other aspects of British economic development. Several recent studies using British grain prices utilize the data set we created, which we describe here (Jacks, 2011; Baten *et al.*, 2012; Brunt and Cannon 2012).

Given their importance in economic historical analysis – international comparative work, as well as purely British research – remarkably little consideration has been given to the characteristics and qualities of these data. Nothing systematic has been written on the subject since Vamplew's critique 32 years ago (Vamplew, 1980a). He cast doubt on their representativeness but his critique contains several inaccuracies and misunderstandings that we set straight here. We introduce the data to a wider audience so that other researchers can use them with a just degree of confidence. Some data have already been placed in the ESRC data archive, some we are making available alongside this paper and the rest will be made available in the near future.

Such a broad and long data set inevitably varies over time, in terms of data collected and format adopted. Hence numerous issues must be considered in a comprehensive survey of the Corn Returns. However, given how frequently the basis and format of modern government statistics change, it will be a pleasant surprise to most economists how *unchanging* were the Corn Returns through 135 years.

Section 1 begins by considering the historical background to the Corn Returns – why, when, where and how they were collected and published. Section 2 considers the accuracy of the Corn Returns data set. Section 3 considers potential biases in the data. Section 4 provides some simple data description. Appendix 1 contains a full list of towns for every period. Appendix 2 discusses nomenclature. Appendix 3

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[1] Some authors prefer the retail price of bread, such as Feinstein (1998); retail bread prices and wholesale wheat prices track each other closely over time, not least because the assize of bread regulated the price of bread as a function of the price of wheat or (later) flour – see Kirkland (1895). Fluctuations in the cost of milling led to some temporary divergence between the price of grain and the price of flour (and hence bread); see Bennett and Elton (1904, vol. 3, p. 292).

establishes the county allocation of Bristol (physically split between two counties). Appendix 4 examines London data deficiency. Appendix 5 outlines the data collection process. Appendix 6 considers missing observations.

## 1. Historical background of the Corn Returns

The Government attempted to regulate the domestic grain price between the 1690s and 1840s, using a raft of legislation known as the Corn Laws (the classic account to be found in Barnes 1930). Regulatory aims were two-fold. First, the Government wanted to keep up prices to encourage investment in agriculture and generate an increase in productive capacity (Gras 1967, pp. 145-7; Fay 1932, pp. 20-1). This was seemingly successful, since farmers undertook investments that led to permanent increases in productive capacity, such as reclaiming land in marshy areas (Darby 1951). Second, the Government wanted to smooth domestic prices to insure farmers and consumers against excessive fluctuations (Fay 1932, pp. 20-1). Grain was the staple food item of the population and demand was highly inelastic; since grain harvests fluctuated wildly from year to year, smoothing prices was difficult. When grain output and prices were about average, imports were subject to high tariffs (sometimes banned) to raise domestic prices and encourage agricultural investment. In plentiful years, prices fell very low and the Government reacted by giving farmers an export bounty (i.e. it paid farmers to export grain and remove it from domestic markets) (Fay 1932, pp. 12-4). In years of dearth, the price rose very high and there was no tariff to pay (i.e. there was a *de facto* price ceiling lying somewhere above the world price, as determined by the declining tariff schedule).

Regulating domestic prices was difficult without official price series (Gras 1967, pp. 149-50). Initially, importation and exportation were based on the honour system – and hence widely abused (Ormrod 1985, p. 24; Barnes 1930, pp. 16-8). To import grain tariff-free, the captain of a vessel simply had to swear before a local worthy that market prices in the port were above a certain (high) price laid down by statute; to export grain and claim the bounty, the captain simply had to swear before a local worthy that market prices in the port were below a certain (low) price laid down by statute (Ormrod 1985, appendix 4(i)). It happened that vessels loaded with grain arrived one day tariff-free (the captain swearing that prices were high) and departed next day claiming the bounty (the captain swearing that prices were low). Obviously,

this could happen only if grains prices fell enormously overnight. In fact, it was widely reported that perjury was rampant – on the part of captains and local worthies, being in cahoots – and the Government was effectively being turned into a 'money pump' (Barnes 1930, 26). Customs Service corruption was also problematic (Hoon 1938, pp. 230-1, 240-1, 261). Eventually, deficits mounted in the Treasury grain department because it paid more in bounties than it collected in tariffs (Barnes 1930, pp. 23-4). Parliament then acted to prevent further abuses. The solution from 1770 onwards was to compile an official grain prices series. Thus the Corn Returns were born.

Precise details of how the system operated in the first few years are unclear because many Parliamentary papers for that period were lost when the old Westminster Palace (the home of the Houses of Parliament) burnt down in 1834. However, we know the outlines for the early period and have detailed information from 1791 onwards. By the Act of 1770, local Justices of the Peace (JPs) were required to send to London weekly price data drawn from two to six market towns in their jurisdiction; since a specific list of towns was not stipulated, it is not known which towns were actually monitored under this Act.[2] The JPs appointed a "proper person" residing in each market town to collect prices; how they should be collected was not stipulated. Under the Act of 1781, a newly-appointed Inspector of Corn Returns reported prices prevailing in the London market, calculated as weighted averages based on sworn trade accounts rendered by every factor trading in the market (21 George III cap. 50). The Act of 1789 extended this system nationwide (29 George III cap. 58). Inspectors forwarded returns of all sales of domestic produce – where "all sales" specifically includes resales of grain that had already been traded in the market – to a Receiver of Corn Returns in London (Giffen 1879, pp. 712-4). The Receiver calculated average prices for each county and each District (Districts being groups of contiguous counties), together with national average prices.

How effective was this administrative machinery and did it change over time? One relevant metric is completeness of the returns. Figure 1 reports annual percentages of missing observations for wheat, 1770-1820. The series is 97 per cent complete from the very beginning, rising to 99.6 per cent by 1771. Notice the

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[2] 10 George II cap. 39; text reported in Ruffhead, *Statutes*, vol. 8, p. 119; and in Pickering, *Statutes*, vol. 34. The text of other Acts cited here was reported by the same sources.

temporary decline in completeness in 1791, down to 98.5 per cent, when the list of towns was set by statute at 210. It seems likely that this involved a significant extension or reallocation of towns and it took a few weeks to find Corn Inspectors for some towns. Evidence supporting this hypothesis comes from the addition of Cardiff to the list on 18 March 1823, when the returns state explicitly that no inspector was available until 21 June (a 13-week delay).

*Figure 1.*

The Corn Laws were always a matter of widespread concern. Ports were opened or closed to grain importation in response to average prices (Vamplew 1980b, 382-3). Farmers and landowners desired high prices; corn factors and industrialists sought free trade, which implied lower grain prices and lower wage bills for industrialists (Fairlie 1965, p. 562). Official price series were therefore a battleground because changing the calculation method of average prices could affect the likelihood of ports opening to trade. This in turn meant the Corn Returns were subject to widespread public scrutiny and frequent consideration was given to refining them (for example, *The Morning Chronicle*, 8 March 1853, p. 3).

Even after the Government ceased regulating domestic grain prices – at Corn Law repeal in 1846 – the Corn Returns continued to play an important economic role. Traditionally, farmers paid a ten per cent tithe on output to the Church of England. But both sides recognised that taxes on marginal product discouraged farmers from raising output; and tithe collection, with its necessarily invasive inquisition into production of each farmer, made the clergy very unpopular (Evans 1976, pp. 128-32). Hence, the 1836 Tithe Commutation Act introduced a "corn rent". That is, farmers agreed to pay the Church each year the money equivalent of a fixed number of bushels of each grain type (see, for example, Pyne 1837). This eliminated disincentive effects of taxation because farmers collected every extra unit of output; but it also meant that in high price years, when farmers had high incomes, the Church received higher tax revenues. Evans (1993, p. 17) reports that 93 per cent of tithes were commuted by 1852 – around half agreed voluntarily between titheholders and landholders and half imposed by tithe commissioners (see also Kain 1995, p. 13). Studd (1889, p. 13) says commutation was "practically complete" by 1889. Tax rates per notional bushel were set according to official price series from the Corn Returns,

averaged over the preceding seven years (Vamplew 1981, p. 115; Giffen 1879, pp. 714-5). Recall that the Corn Returns include only domestic grain in their calculations. This was ideal because both farmers and Church wanted corn rents to reflect prices that farmers were actually receiving for their output. In fact, much of the analysis of the Corn Returns in the late nineteenth century (such as Parliamentary enquiries of the 1870s) was prompted by farmers and Church leaders trying to improve their economic position by revising Corn Return reporting methods (British Government 1870, 1878-9a, 1878-9b).

So the Corn Returns were produced by a peculiar set of circumstances – the desire to regulate taxation or international trade by reference to market prices of domestically produced goods. Hence the Corn Returns generated a peculiar data source. They give us prices of only those agricultural goods traded internationally (i.e. grain products) – but prices based solely on the part of the market *not* traded internationally (i.e. grain produced and traded domestically).[3] In some ways this generates a very clean data set: for example, there is no quality variation over time due to increased import penetration. In other ways this makes the data of limited use: for example, the Corn Returns do not give us average prices of grains actually consumed, because imports are excluded. Whether or not the peculiarities of the data are a benefit or a hindrance overall, we certainly need to be aware of them when undertaking any economic analysis.

## 2. Data accuracy

We can distinguish four stages in production of the Corn Returns. First, local Inspectors gathered data, calculated averages for their towns, and forwarded the information to the Receiver of Corn Returns. Second, the Receiver inspected the data for accuracy and computed county averages (in the early period), before sending the results to the publisher. Third, the printer set the relevant *London Gazette* page and

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[3] Imported grain traded in the same physical markets as domestic grain; the largest market – Mark Lane, in London – traded both domestic grain and a wide array of foreign grains, as evidenced by price quotations reported in contemporary newspapers. But traders were required to make returns of trades in British produce only (even if they also traded in foreign produce).

published it. Fourth, we transcribed data into machine-readable format and checked it. Database accuracy is determined by errors introduced at each stage of production.

## 2.1    Local Inspectors

The 1770 Act required JPs for each county to monitor wheat, barley, oat and bean prices in a number of market towns (10 George III, cap. 39). The JP had to appoint a resident Inspector of Corn Returns for each monitored town; and, for every return provided, these Inspectors were paid from the county rate (this being a local land tax used to finance local expenditures such as road repair, and of which the salary costs of Inspectors of Corn Returns would have been a miniscule proportion). The JP was also to provide an official Measure of one Winchester bushel of eight gallons, so the returns could be made in standard units (shillings and pence per Winchester Bushel). As of 13 July 1827, returns were made in shillings and pence per Imperial bushel (3.2 per cent larger than the Winchester bushel). Once Inspectors had collected these returns, they sent them to the Receiver at the Treasury, who published the results in the *London Gazette*, the official Government newspaper.

The 1791 Act over-hauled the machinery for price collection, making it more rigorous in several important respects. First, the Act stipulated the monitored towns in each county (31 George III, cap. 30, § 45 and 61). Second, for each town the local JP had to choose grain Inspectors who were "qualified persons" but not themselves engaged in the grain trade; millers, maltsters, and various other professions were explicitly excluded (31 George III, cap. 30, § 47). Third, every grain factor in each town had to make a return every Monday to the local Inspector, detailing his entire trade during the week and giving total quantity traded at each price. The return was made under oath and penalty for non-compliance was £10 per week; in 2010 values, this was somewhere between £938 (based on changes in the retail price index) and £11 900 (based on changes in average earnings) (31 George III, cap. 30, § 50; value comparisons based on the eh.net application, "How much is that?"). Fourth, once they received the grain factors' returns, the Inspectors forwarded this information to the Receiver every Tuesday. Again, the return was made under oath and penalty for non-compliance was £10 per week (31 George III, cap. 30, § 51). Inspectors were paid five shillings (£0.25) per return, more if the duties were particularly onerous (31 George III, cap. 30, § 71).

Despite stringent requirements in the 1791 Act, doubts were expressed about performance of local Inspectors, both by contemporaries and later researchers (Vamplew 1980a). Parliament thus tightened up the system still further in later years. For example, JPs were given greater discretion in 1820 in setting payments per return, to ensure they could find suitably qualified candidates; Inspectors were given the power to inspect trade books of corn factors (evidence of William Fearnside, Mark Lane corn dealer: British Government 1834, p. 115); and in 1842 the duties were transferred to local Excisemen, who worked directly for the Inland Revenue Department of central government (Vamplew 1980a, p. 6). Even in the face of these efforts to ensure full compliance, throughout the whole period two features of the data suggest that there was substantial under-reporting of trade.

First, several Inspectors returned "None Sold" almost every week – including some Inspectors in large towns, such as Macclesfield and Stockport, where it is hard to believe that there was genuinely never any trade. In fact, this type of omission is not really a problem: *de facto*, the Macclesfield and Stockport grain markets were not monitored and can be excluded from the sample. This does not noticeably reduce density or geographical distribution of coverage.

Second, some towns furnishing regular returns often seem to have had very low levels of trade. For example, the major port and market town of Bristol – with forty corn factors – reports weekly wheat trade of only around 240 bushels. This is an incredibly low figure, bearing in mind that wheat was the staple food grain and most wheat was traded off the farm into towns.[4] All the major market towns of the kingdom were monitored; so, overall, we might expect to see almost the entire wheat crop of the kingdom passing through monitored markets. In fact, we observe trade volumes equal to only around 25 per cent of total domestic output (Fairlie 1969, p. 96 and

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[4] Collins, 'Why wheat?'. Petersen, *Bread*, chapter 7, especially pp. 190-204, suggests that wheat was the staple for 63 per cent English and Welsh consumers in 1770, rising to perhaps 80 per cent by 1801 and 90 per cent by 1841.

appendix 2).[5] What happened to the rest, and is there a systematic difference between grain that we observe and the rest?

First, note that we would expect to see only *net* output traded in the market. Caird suggests yields of 27 bushels per acre and seeding rates around 2.5 bushels per acre (Caird 1852, p. 522); so around 10 per cent of total output was retained for seed (as we discuss in more detail below). Grain was also retained for on-farm consumption. Brunt and Meidell (2012) show that around 10 per cent of the population resided on farms in 1801 (including farmers and their families and farm servants, but not agricultural labourers – who presumably bought their wheat through the market as flour). If people on farms ate like the rest of the population, then roughly another 10 per cent of wheat would be retained on the farm and not enter the market. Around 6.5 per cent of output was "tail corn" (low-quality grain that was not traded, which discuss in more detail below). So around 25 per cent of total output would have been retained on-farm – perhaps more before 1801, when the farm population was proportionately larger and yields were lower (so seed consumed a higher proportion of total output). Nonetheless, we observe only around 25 per cent of total output being traded – rather than 75 per cent – and we must ask why.

The gloomiest interpretation is that grain factors or Inspectors were lackadaisical and bothered to return only some portion of total trade. A more benign interpretation is that a great deal of grain was traded outside the market, and hence would not appear in the returns. This could occur for perfectly innocent reasons, as discussed by Fay (1926, pp. 151-2). For example, we know that nineteenth century grain merchants sometimes bought grain "on the stalk" (i.e. before harvesting); such transactions would not have been recorded in the monitored markets.[6] Similarly, some

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[5] Fairlie does not discuss the quantities of barley and oats in the returns, but in 1884 (the first year of the agricultural census for which relevant output data are available), the proportions of total output traded in the returns are 31 per cent and 32 per cent respectively.

[6] Buying "on the stalk" was known legally as engrossing and was outlawed until 1772, although it may still have occurred before then; see Gras (1967, pp. 130-2). Farmers selling on the stalk may have received a lower price; this would reflect both cost of credit being extended by the grain merchant and partial insurance being offered (merchants paid per acre, with only minor *ex post* adjustments in cases

bakers and millers bought directly from farmers without going through monitored grain markets (evidence of Alexander Craig; British Government 1834, p. 266). Also, markets were not open every day and it is likely that factors were active on non-market days; perhaps these transactions were omitted from the return given to the Inspector (evidence of William Fearnside and Alexander Craig; British Government 1834, pp. 115, 266). Moreover, factors resident in one town but undertaking their business in another – such as Manchester factors who traded mainly with Wakefield – may not have been asked to make a return (Scola 1992, p. 7). Finally, traders might have failed to register trades for nefarious reasons that were unrelated to grain quality or price. Scola (1992, p. 158) notes that Manchester traders tried (unsuccessfully) to trade outside the market to avoid paying market tolls. From the perspective of obtaining a representative sample of prices, these practices are unproblematic because it is likely that monitored and non-monitored grains were identical and probably traded at the same price. The economist Robert Giffen (1879, p. 711) argued that accurate estimates of true prices could be secured by sampling as little as 20 per cent of total grain traded; the Corn Returns certainly represent more than 20 per cent of the total, so we need not worry on that account.

Consider one final point. There was some suspicion that grain factors attempted to manipulate the returns (Vamplew 1980a, 5). Factors could conceivably do this because some towns had very little trade, so a factor could substantially alter the average price by selling a large parcel of grain at an inflated price. This would obviously be of great concern to us: it would suggest that some of the prices that we observe are not true market prices, just a fiction. Vamplew notes that, under the Act of 1815, if domestic prices rose above the strike price then foreign grain would be admitted tariff-free for several months – so grain factors could import lots of cheap foreign grain and make a large profit until market prices were driven down to the world price. Hence there might be both a means and an incentive to inflate average prices.

There are four major objections to this argument. First, there is no hard evidence that this ever actually occurred – such as a public scandal or a court case – it was just rumoured that it might do so. Second, not all prices were used to calculate

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where the harvest was unexpectedly high or low). There is no reason to suppose that the grain itself was systematically different to grain that traded in the market.

national averages that were used to regulate imports, so in some markets there would have been no incentive to manipulate the price. Third, manipulating market prices were not so easy. The averages include only those transactions in which grain physically changed hands; factors could include transactions in their returns only once the grain was delivered. In that sense all the transactions that we observe are *bôna fide*, and not just paper transactions (evidence of William Fearnside; British Government 1834, pp. 114). Fourth, whilst some factors may have wanted to import cheap foreign grain, those holding British grain definitely did *not* want to allow imports that would drive down prices of the assets they were holding. How important were domestic holdings? The level of imports climbed over the period from around nothing in 1770 to around 43 per cent of domestic consumption in 1851 (Mitchell and Deane 1962, p. 98; 1851 output estimate from Caird 1852, p. 522); the 1846 repeal of the Corn Laws led immediately to a five-fold increase in imports, so imports were probably only around 8 per cent of consumption before 1846. Thus the vast majority of grain factors had their money invested in domestic grain, rather than foreign grain, before 1846. If there were any manipulation then it seems more likely that holders of British grain would be working to exclude imports by artificially *reducing* the averages (i.e. selling under-priced parcels of grain in small markets). No one ever suggested that this occurred.

## 2.2  *Receiver of Corn Returns*

Returns up to 30 September 1820 reported average prices for each county (but see appendix 4 on London); figure 2 shows the first published return. No national average was published until 1790. The Receiver could publish the average county price in a particular week only if he received price data from at least two thirds of towns monitored in that county (31 George III, cap. 30, § 67). Now we must ask, what exactly do we mean here by an "average price"? Vamplew (1980a, pp. 3-4) criticizes the Returns for being based on simple averages. This is only partially true.

*Figure 2.*

Prices in each market were calculated as *weighted* averages (i.e. total value of trade divided by total volume of trade). Through most of 1796, *Bell's Weekly Messenger* reported the official average wheat price for the Mark Lane grain market

in London, as well as a breakdown of the quantities traded at each price. Hence we could verify that weighted averages had indeed been used in calculating the official average price for that market. How were the county averages calculated at this time – a weighted average of each of the market prices in the county, or a simple average of each of the market prices? We do not know. Official sources do not tell us and we have found no breakdown that would allow us to infer the method.

*Figure 3.*

The averaging procedure finally becomes clear in 1820. Figure 3 shows an excerpt of a data table published for 8 March 1823. The table took up two entire pages of the *London Gazette* and here we produce the top and bottom of the second page (the grey band showing where we omit towns between Cowbridge and Basingstoke). Individual town prices are not reported, although it is easy to calculate them: the town second from bottom is Southampton, where 10 quarters sold for exactly £20, implying a price of 40 shillings per quarter (60 pence per bushel). Since each town reports total quantity traded and total value of trade, any price calculated from these data is automatically a weighted average. Average price per quarter reported at the foot of the table is 43 shillings and two pence (64.75 pence per bushel), obtained by summing the value of all trades from all towns and dividing by the corresponding quantity traded. (A simple average of the 150 prices would give 65.7 pence per bushel). This is thus a *weighted* average of the individual town's prices, rather than a simple average.

But Vamplew is correct in that these market prices were then aggregated by *simple* averaging to determine county prices, and again by simple averaging to generate District and national prices (31 George III, cap. 30, § 52).[7] However, contrary to Vamplew's assertion, the difference between weighted average prices and simple average prices is small: calculating both for 1821-23, as graphed in figure 4, gives a correlation of 0.985. Note also that trade-weighted averages (proposed by Vamplew) would not necessarily be better than simple averages. Only a quarter of wheat output was traded in monitored markets and we do not know what happened to the rest; some large towns reported puzzlingly little trade (such as Bristol), so weighting by volume might not give those prices due influence in the average.

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[7] Although average prices were published for each county, importation was determined by average prices of 12 "districts", each comprising three or four English counties (31 George III, cap. 30, § 54).

Alternatively, we could weight town prices by population – obviously relevant if, for example, we were interested in changes in the population's cost of living.

*Figure 4.*

Simple averaging is used also in tables of the British Parliamentary Papers. An extreme example is in BPP (1881), vol. 83, 720-725, where the average price reported for Middlesex is 47 shillings and 2 pence per quarter. This is a simple average of the London price (45 shillings) and the Uxbridge price (49 shillings and 5 pence) – even though the relative quantities were wildly different (58 255 and 2 854 quarters respectively). The weighted average would have been only 45 shillings and 2 pence.

Increased professionalization locally was matched centrally. Town returns were published from 1820, rather than county averages. We then get direct evidence that each return was checked before publication, since some returns are withheld as being an "Incorrect Return". We do not know how incoming data were checked and mistakes discovered; and we cannot be sure that all mistakes were eradicated, since the underlying data are lost. But some indication of accuracy levels is given by the later period, when prices were reported in shillings and pence to three decimal places. For example, on 2 January 1835 the average wheat price was reported as 40 shillings and 1.087 pence per quarter. This involves summing 150 quantities in quarters and bushels to get the quantity of 76 915⅜ quarters; and 150 prices to obtain a total value of trade of £154 179, 3 shillings, 1 penny. Using the underlying data, we calculate the price to be exactly the same. On the other hand there are occasional inconsistencies: the national average barley price of 45 shillings reported for 8 August 1801 is lower than all of the relevant county prices except Norfolk (our average is 72 shillings) and likely to be a printing error.

In statistical terms, occasional random errors are not problematic. More worrying is the possibility of systematic errors, particularly those introduced for nefarious purposes. Inspectors carefully investigated any allegations of fictitious trades – possibly undertaken to influence the averages – and any trades not demonstrably *bôna fide* were excluded (Jacob 1824, 1825).

From October 1820 to June 1821, the published format of prices changed: for inland counties, only average prices were published; for maritime counties (including London), quantities and prices were published at town level. From August 1821 onwards, data on quantity traded and its value were published at town level.

From 1822 to 1842, William Jacob was Receiver of Corn Returns. Jacob was an absolute expert on the grain trade (Goodwin 1892, pp. 122-3). He started out as a London merchant before becoming an MP; he travelled widely in Europe, collecting huge amounts of evidence on the international grain trade and writing about it prolifically (Jacob 1814, 1826, 1828b). He provided much of the evidence considered by Parliamentary Committees when the Corn Laws were reformed. The machinery could not have been run by a more suitable candidate. Jacob's successors were equally competent. Robert Giffen stands out, becoming Comptroller of Corn Returns in 1876. The Returns' accuracy was questioned in the 1870s because they indicated a decline in domestic production. Numerous weaknesses of the Returns were discussed, notably various provincial markets persisting in using local measures for trade (then converted into Imperial units). This undermined confidence in the data. Giffen's exhaustive investigation of measurement issues concluded (Giffen 1879, p. 717) that in the worst-case scenario – where proper conversions had not been made – the Returns over-estimated the true average wheat price by 1.25 per cent. Several previous Parliamentary enquiries had reached the same conclusion (see, for example, comparisons of regional ('customary') measures and standard measures in British Government 1834, pp. 54-6).

## 2.3    Publisher

The final link in the information chain is the publisher. However accurately the Receiver calculated the averages, everything comes to nought if the publisher failed to render accurate figures. Here we are fortunate because the Returns were not at the mercy of a commercial newspaper.

Returns were published in the official Government newspaper, the *London Gazette*, which started in the seventeenth century and remains in print. Its purpose is to convey official information accurately: it did not have to meet commercial profit targets, and did not hurry into print with up-to-the-minute news. It carried official reports on military engagements (numerous up to 1815); and official appointments (civil and military). It also carried much commercial and numerical information – about banks, bankruptcies, government procurement contracts, auctions of imported exotic items (tea and such like). Initially the Returns were published with a two-week delay (returns for the week ending Saturday 5 January 1771 appeared in print on Saturday 19 January 1771). The process accelerated during May 1772, the delay

falling to one week for English returns (returns for the week ending Saturday 23 May 1772 appeared in print on Saturday 30 May 1772).[8] Returns for Wales and Scotland continued with a two-week delay until 6 June 1789, when they were synchronised once again with English returns. Scottish data publication ceased after 1820.

On one occasion (20 November 1824) the *London Gazette* published an Erratum, noting that figures for three towns were rendered incorrectly in an earlier week and giving correct figures. This strongly suggests that published figures were checked and corrected where necessary. In sum, available evidence suggests that the *London Gazette* provided a faithful reproduction of figures provided by the Receiver.

## 2.4 *Work of the researcher.*

Entering data from paper copies posed various challenges, owing to the scale of the task, the variable (often poor) print quality and numerous changes in format. Nonetheless, we are confident that we achieved a high level of accuracy. Appendix 5 outlines our approach.

## 3. Data biases

The data could be biased in three ways: in geographical coverage (certain regions, or types of regions, over- or under-represented); in temporal coverage (certain years, or periods within each year, over- or under-represented); in the quality of grains traded (high- or low-quality grains more likely to be traded). These biases need not be inherent in the system – they might arise from the way the system operated. In particular, missing observations are not randomly distributed and we need to consider their impact also on data representativeness.

## 3.1 *Geographical coverage*

We desire a fairly complete geographical coverage. First, we need to know what was happening to market prices in every region to link them to other economic data (to gauge the price effects of local transport and financial structures, and so on). Second,

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[8] This acceleration occurred in two stages. The delay for English returns was initially cut to 10 days by bringing forward publication of the Returns to the Tuesday edition of the Gazette. The delay was then cut by another three days by bringing forward the publication of the Returns to the Saturday edition once again.

grain production was spread quite evenly across the country, especially before 1840, so we need to monitor every region to know what was happening to aggregate grain production. Uniformity was driven partly by high transport costs making it efficient to produce bulky grain products locally, even if the local climate was poorly suited; and it was driven partly by the organic nature of farming, which required mixed crop and animal production.[9]

What statistic captures completeness of geographical coverage? Suppose that all farmers lived within commuting distance of a monitored town (close enough that it was economic for them to sell their produce there); then we could say that geographical coverage was excellent. Suppose that no farmers lived within commuting distance; then we would say that the geographical coverage was awful. So let us estimate what percentage of farmers lived within commuting distance of a monitored town and see how close we get to our ideal of 100 per cent.

Table 1 reports number of monitored towns per 1 000 square miles in each county in each period. At first glance, the numbers seem rather small – two towns per 1 000 square miles does not sound like dense coverage. However, take a town and drew around it a circle with a radius of 12.6 miles; the catchment area within the circle will be 500 square miles. So a density of two towns per 1 000 square miles implies that (roughly speaking) everyone lived within 12.6 miles of a monitored town. Note that the average farmer in 1770 took his wheat 7.5 miles to market; given the standard deviation of 5 miles, we know that 84 per cent of farmers travelled 12.6 miles or less (Brunt 2007, p. 360). In the vast majority of counties in the vast majority of years (except 1821-8), the density of coverage was higher than two towns per 1 000

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[9] To see that grain production was spread fairly evenly, consider the 1867 county agricultural returns. For each county, calculate the proportion of land under each crop (as a percentage of crop land or as a percentage of total agriculture land). Take the coefficient of variation of these county percentages, which tells you how variable they are. A perfectly evenly distributed crop has a coefficient of variation of zero; an unevenly distributed crop, such as hops, has a coefficient of 360. The coefficient for wheat (as a percentage of either arable land or total agricultural land) was 27 or 47; the coefficient for grain crops as a whole was 13 or 34. These are a lot closer to zero than to 360; they are also a closer to zero than the coefficients for the non-grain crops, which average 69 or 76.

square miles; therefore it is likely that the monitored towns provided market outlets for in excess of 84 per cent of farmers. This is close to our ideal of 100 per cent.

*Table 1.*

Vamplew suggests that prices were not collected for all areas until 1781 (Vamplew 1980a, p. 2). This is incorrect, as figure 1 shows. Confusion may arise partly from the fact that prices were collected both from maritime counties (used to determine the importation of corn) and from inland counties. Maritime town are listed in 31 George III cap. 30. § 47 and inland counties are listed in 31 George III cap. 30. § 62, where it states that the prices are to be collected "for the Information and Benefit of His Majesty's Subjects". Collection details are the same in both cases. Moreover, prices from Essex, Kent and Sussex (then called the first maritime district) were excluded from the average used to regulate imports.

Between October 1820 and June 1821, the presentation format changed: county averages continued to be reported for inland counties and Essex, Kent and Sussex; for the remaining 139 towns, data were provided separately on quantity of trade, value of trade and average price. From June 1821 data on inland counties – comprising 28.8 per cent of the national land area – were no longer collected at all, thus significantly skewing geographical coverage. In July 1821, the presentation format changed again and data were published for 149 towns in coastal counties (including Essex, Kent and Sussex); in March 1823, the format changed again and Cardiff was added, bringing the total to 150 towns.

Coverage improved significantly, 1828-42, as many Welsh towns were removed and numerous towns in inland counties added instead. Only four counties were then entirely unrepresented (Herefordshire, Shropshire, Staffordshire and Rutland), comprising only 6.7 per cent of English and Welsh land area and 5.4 per cent of population (British Government 1867; Census Returns 1831, 1841; Mitchell and Deane 1862, pp. 8, 20).

Returns were most comprehensive 1842-64: all counties were represented amongst the 290 towns. The list was again reduced to 150 towns, 1864-83, with geographical coverage almost exactly the same as 1828-42 (only one or two towns differed). The situation then improved again, 1883-1914, with town numbers increasing slightly and coverage becoming more even (similar to 1771-1820).

Thus geographical coverage was generally good, 1770-1914. Over 135 years, returns were made for all counties in 94 years and all but four counties in another 34 years. Only 1821-8 was really deficient, when there was no inland county coverage.

### 3.2 *Temporal coverage*

Temporal coverage is very extensive and consistent. Returns were published weekly throughout every year, 1770-1914. Trade volumes varied little through the year for wheat – slightly more for oats – because much grain was stored on the farm and released gradually onto the market. Markham (1676, pp. 69-72, 86-7, 92-3) describes how farmers could best store grain in stacks in the yard and in special on-farm granaries; Jacob (1828a, pp. 284-9) notes that much less grain was being stored by farmers in 1827 than was traditional, owing to credit shortages. But barley was different. The market was active soon after the harvest in the autumn/winter, with maltsters keen to secure the best quality barley for beer production; then very little was traded over the spring/summer (Forsyth 1823, pp. 1-2). Figure 5 illustrates these patterns. Vamplew notes that annual average prices are simple averages of 52 (sometimes 53) weekly prices, suggesting this does not much matter. But we see from figure 5 that very little barley was traded March to August – so prices from this half of the year are not indicative of prices for which most barley sold. Furthermore, the seasonal sales pattern changes slightly for all crops.

*Figure 5.*

### 3.3 *Grain quality*

Grain quality varies greatly. Milling a parcel of grain produces several different types of flour, ranked according to fineness. Take a bushel each of high- and low-quality grain and mill them into flour. Low-quality grain produces fewer ounces of flour in total, and a higher proportion of coarse flour – which made lower value bread because consumers required a price discount to persuade them to eat brown bread (British Government 1797-8, p. 101 and appendix 6, p. 414; British Government 1834, p. 485). The value of a bushel of grain is determined by the value of the bread produced; so lower quality grain (producing a lower value of bread) sells for a lower price per bushel (British Government 1834, 251). For each grain type, there was a quality

differential between British and foreign produce, and considerable quality variation within the domestic product. This affects grain price data in four important ways.

First, there was a British-foreign grain price differential. The Corn Returns report domestic prices of domestically-produced grain only: foreign grain was specifically excluded. Imported grain was typically lower quality and traded at lower prices. Charles Pratt's grain purchase book shows that, for similar quantities of grain purchased on the same day in the same market, British grain traded at a 6.4 per cent premium (based on multiple pairs of purchases – British and foreign – occurring at various dates) (British Government 1797-8, p. 113). Import prices from other sources, such as *Bell's Weekly Messenger*, almost invariably show imports trading at a lower price per bushel. Thus the Returns over-estimate average prices of grain actually consumed in Britain. Moreover, since imports were rising as a proportion of consumption (Mitchell and Dean 1962), the strength of this effect was rising over time (i.e. there was growing divergence between average prices in the Returns and average prices of grain consumed). We noted above that imports climbed from nothing in 1770 to around 43 per cent of domestic consumption in 1851; the climb continued thereafter to around 77 per cent of consumption by 1914. This caveat could prove important, for example, if grain prices were used to calculate long run changes in the cost of living. Given good data on quantities and prices of imported grain, controlling for this effect would be straightforward. However, no one appears to have done so in the literature to date.

Second, regional variation in quality would affect local grain price levels (Fay 1924, 216). For example, Lincolnshire farmers grew the wheat variety 'Rivetts' – highly suited to the Lincolnshire climate and having high yields per acre but selling for lower prices per bushel because it was not good for bread-making, being suited instead to biscuits (Percival 1934, pp. 69-73). Such variation generates grain price differentials between regions, even with perfectly efficient markets and zero transport costs. Currently, the absence of systematic data on regional wheat varieties before 1914 makes it difficult to control for this effect.

Third, grain quality varied markedly year-on-year, significantly affecting the average price level from year to year. However, this is not apparent from the raw data owing to a confounding effect. Bad weather generates a harvest of low quality *and* small quantity. Low grain quality puts downward pressure on prices; but small quantity puts upward pressure on prices (being an adverse supply shock). Since

demand for grain was very inelastic (being the staple food product) the quantity effect on price outweighs the quality effect. But an important implication is that using time-series data to estimate elasticity of demand will generate over-estimates of the elasticity – because we under-estimate price increases in years of dearth, owing to the confounding effect of lower quality. Persson (1999, p. 49) notes that economic historical interpretation is very sensitive to price elasticity of demand estimates: an elasticity of -0.5 implies that a five per cent harvest reduction triggers a 10 per cent price increase, whereas an estimate of -0.1 implies that a one per cent harvest reduction triggers a 10 per cent price increase. Failure to control for annual quality fluctuations could move elasticity estimates some way from -0.5 towards -0.1.[10] As far as we know, no one has controlled for this effect, not even Persson (1999, pp. 52-4). This issue is important because food demand models, employing price elasticities, have been used to estimate output back into the eighteenth century (Allen 1999; Crafts 1985). Note further that we need to control for year-on-year variations in flour quality when estimating bread output based on grain output. Given good data available on grain quality effects on bread making, it would be possible to control for these effects (Percival 1934, pp. 69-73).

Fourth, grain quality can affect the *cycle* of grain prices within the year. Some low-quality grain is produced every year in every locality. This "tail corn" constituted perhaps 6.5 per cent of total grain output.[11] Low-quality grain bushels had the same

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[10] Let us adjust wheat prices to reflect quality changes. A high wheat price implies that grain quality has fallen by perhaps ten per cent (suppose, for simplicity, that bushel weight has declined from 60lbs in an average year to 54lbs). Now reflate the wheat price to what it would have been if wheat had remained of average quality (i.e. reflate observed price by ten per cent). Do the opposite for low price years. Now prices fluctuate by more in response to a given set of quantities. Elasticity of demand is defined as percentage change in quantity demanded over percentage change in price. Percentage change in price (the denominator) has become ten per cent larger, so the fraction (elasticity) has become ten per cent smaller. Then estimated elasticity will fall from (say) 0.5 to 0.45.

[11] In the first 30 years of Rothamsted experiments (1844-73), tail corn constituted 5.3 per cent of grain (by weight) on the plot dunged at the rate of 14 tons per acre, and 7.7 per cent on the plot never dunged. Presumably, national average dunging rates fell somewhere between those two extremes for

volume as high-quality (by construction). Occupying the same amount of waggon space means it cost the same to send them to market — but low-quality grain had a lower value per bushel. Therefore sending low-quality grain to market was less profitable and we systematically observe trade in high-quality grain. Low-quality grain was kept on the farm for feeding farm servants or fattening animals (Ellis 1744, p. 129). However, suppose that prices were unexpectedly high later in the year. Then it would be profitable to send to market low-quality grain that had been expected to be consumed on-farm. Then low-quality grains systematically come onto the market later in the year, putting downward pressure on the upswing in prices and leading us to under-estimate it.

Note one further point. It was often not worth sending low-quality grain to market, moving average prices upwards. But the *best* quality grain did not go to market, either. It was used as seed and traded directly between farmers[12] at a premium of around 11 per cent (Winter 1798, p. 131). Since it would never go via a grain factor and enter the Returns, this moved averages prices downwards.

Overall, grain quality variation was substantial and fluid over time. It must be considered carefully when using the Corn Returns or other grain prices, lest we draw erroneous or inaccurate conclusions.

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most of the period considered here, so we take the average of 6.5 per cent as a rough guide. Lawes and Gilbert, 'On the continuous growth'; 'Reports'.

[12] Ellis, *Agriculture*, 109-110 describes mid-eighteenth century farmers selecting the plumpest kernels for seed; he notes also in *Chiltern and Vale*, 339-40, that farmers traded seed directly between each other to obtain the highest quality; the same is noted in Trowell, *Farmer's instructor*, 9. Maxey talked in 1601 of high yields derived from "well-dunged land sown with choicely picked seed"; Marshall talked in 1788 of keeping the best ears and using them to build a special stock of seed; the processes of "mass selection" of the best ears was advocated as early as Roman times; and "pedigree selection" (called in-breeding nowadays) was practised in the nineteenth century. See Percival, *Wheat*, 43, 75, 83-4.

*3.4    Missing observations.*

Very few observations are missing, 1770-1820 – wheat data being 99.7 per cent complete, for example. Switching from county to town reporting raised the proportion of missing observations – wheat being about 90 per cent complete, for example. However, more than 90 per cent of missing price observations arise from no trade (and hence no price existing). Appendix 6 offers detailed examination of the missing price pattern (by crop, time period and geographical location). Overall, we believe that missing observations do not devalue or bias the data in any way.

### 4. Data description

Consider four main data characteristics: long run price movements; changes in relative prices between grains; short period price patterns; regional price variation.

Figure 6 graphs the wheat price, 1770-1820: the black line is the weekly national average price (simple mean of all counties); grey lines show the highest and lowest county prices each week to demonstrate price range. Evidently, all county prices move together over time – not surprisingly, since they are affected by common shocks (supply shocks from the weather and demand shocks from wars and such like). These long run price movements are well known; annual Return averages reproduced in the Parliamentary Papers have been widely used by researchers.

*Figure 6.*

Figure 7 graphs each grain price, relative to wheat, 1770-1820. Despite short term fluctuations, there is no long run relative price trend. Although people have analysed other agricultural price relatives (Overton 1996, pp. 115-6, 199-202), we have seen no consideration of long run relative grain price. One implication of constant relative prices is that long run movements of minor grains track wheat prices, so long run graphs for barley, etc. look similar to figure 6.

*Figure 7.*

### 5. Conclusions

The Corn Returns are the most important data source on British grain markets, 1770-1914. They probably constitute the largest single body of data on the British economy

before 1914. We have examined weaknesses and potential biases of the Returns in considerable detail and evaluated them as a source of economic information. Overall, they are very good data. They are high-quality – based on extensive underlying returns, processed by a competent and thorough administration. They have broad and fairly even geographical coverage of England and Wales (less for Scotland). They have excellent temporal coverage, being both long run and frequent (weekly).

However, some issues must be considered when drawing inferences from these – and other – grain price data. Economic time series have three characteristics: level, trend and fluctuation. Do the Returns accurately reflect these characteristics of English grain prices? First, the positive correlation of harvest quality and quantity means that price fluctuations are underestimated, owing to confounding changes in grain quality. This leads to systematic over-estimation of elasticities of demand. Bushel weight data could control for this, although it has not been done in the literature. Second, massive increases in the consumption share of imported wheat – and its lower price, compared to English wheat – means that the Returns are not a good guide to changes in the average consumption price. The Returns series should be combined with import data to track accurately cost of living changes;  this does not seem to have been done in the literature. Third, change in measurement units (from Winchester to Imperial) creates a three per cent price step in mid-1827, which requires the level of the series being recalculated.

With appropriate handling, the Corn Returns can provide a firm basis for economic analysis and help us to better understand British and international economic development during industrialization.

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**Figures and Tables**

Figure 1. *Graph of percentage of data in the London Gazette that are missing for wheat, 1770-1820*
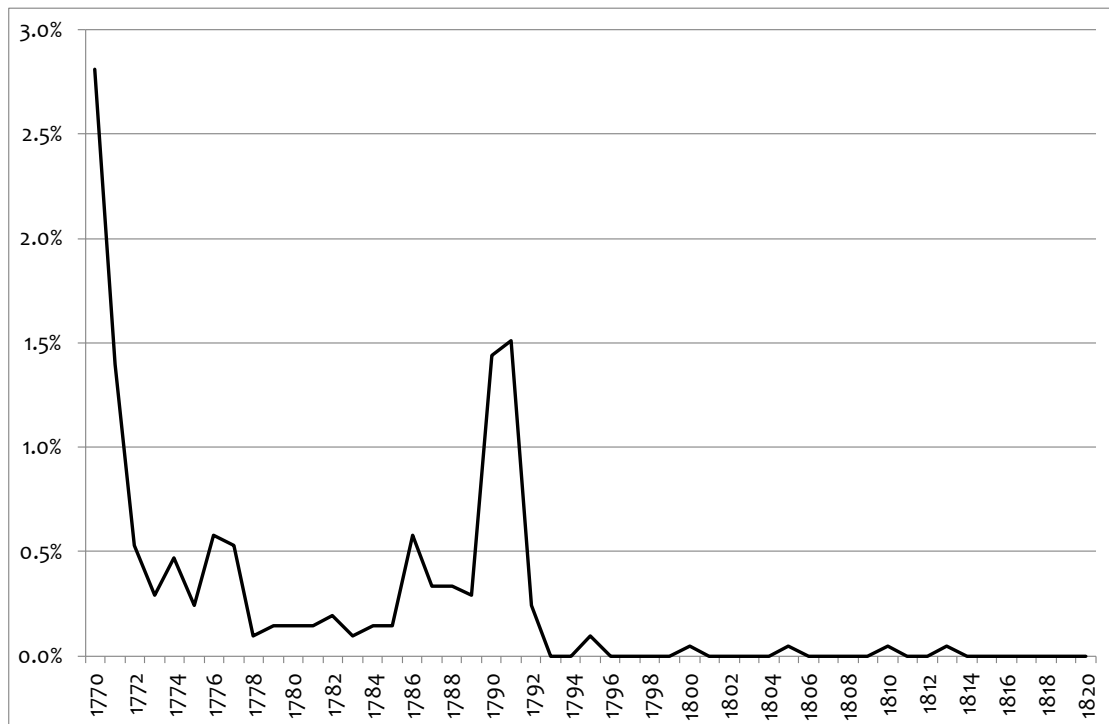
# AVERAGE PRICES of CORN,

From November 5, to November 10, 1770.

By the Standard WINCHESTER Bushel.

|  | Wheat. | | Rye. | | Barley. | | Oats. | | Beans. | |
|---|---|---|---|---|---|---|---|---|---|---|
|  | s. | d. | s. | d. | s. | d. | s. | d. | s. | d. |
| London, | 5 | 0 | 3 | 6 | 2 | 9 | 2 | 2 | 3 | 0 |

### COUNTIES INLAND.

|  | Wheat. | | Rye. | | Barley. | | Oats. | | Beans. | |
|---|---|---|---|---|---|---|---|---|---|---|
| Middlefex, | 5 | 7 | — | | 2 | 9 | 2 | 3 | 2 | 9 |
| Surry, | 5 | 3 | 3 | 4 | 2 | 10 | 2 | 4 | 3 | 4 |
| Hertford, | 4 | 10 | — | | 2 | 7 | 2 | 1 | 3 | 7 |
| Bedford, | 4 | 8 | 2 | 1 | 2 | 8 | 2 | 1 | 3 | — |
| Cambridge, | 4 | 10 | 2 | 11 | 2 | 10 | 2 | 2 | 3 | 1 |
| Huntingdon, | 4 | 3 | — | | 2 | 4 | 1 | 9 | 2 | 6 |
| Northampton, | 5 | 3 | 3 | 5 | 3 | 1 | 2 | 1 | 3 | 8 |
| Rutland, | 5 | 2 | 3 | 9 | 3 | 4 | 2 | 1 | 2 | 10 |
| Leicefter, | 5 | 8 | 4 | — | 3 | 7 | 2 | 3 | 3 | 8 |
| Nottingham, | 5 | 5 | 3 | 10 | 3 | 3 | 1 | 10 | 3 | 7 |
| Derby, | 5 | 7 | — | | 3 | 6 | 2 | 2 | 3 | 11 |
| Stafford, | 6 | — | 4 | 5 | 3 | 5 | 2 | 2 | 4 | 2 |
| Shropfhire, | No Returns yet made. | | | | | | | | | |
| Hereford, | 5 | 6 | 3 | 10 | 2 | 5 | 1 | 7 | 2 | 9 |
| Worcefter, | 5 | 11 | 3 | 5 | 3 | 4 | 2 | 5 | 3 | 11 |
| Warwick, | 5 | 11 | — | | 3 | 7 | 2 | 3 | 3 | 8 |
| Gloucefter, | 5 | 10 | — | | 2 | 11 | 1 | 10 | 3 | — |
| Wiltfhire, | 5 | 7 | 3 | 10 | 2 | 8 | 2 | 1 | 3 | 6 |
| Berks, | 5 | 6 | 4 | — | 2 | 6 | 2 | 2 | 2 | 11 |
| Oxford, | 5 | 4 | 3 | 10 | 2 | 8 | 2 | 2 | 3 | 5 |
| Bucks, | 5 | 1 | — | | 2 | 9 | 2 | 1 | 2 | 10 |

### COUNTIES upon the COAST.

|  | Wheat. | | Rye. | | Barley. | | Oats. | | Beans. | |
|---|---|---|---|---|---|---|---|---|---|---|
| Effex, | 4 | 5 | 3 | 4 | 2 | 8 | 2 | 1 | 2 | 9 |
| Suffolk, | No Returns yet made. | | | | | | | | | |
| Norfolk, | 4 | 9 | 3 | — | 2 | 4 | 1 | 10 | 2 | 5 |
| Lincoln, | 5 | 5 | 4 | — | 3 | 2 | 2 | — | 3 | 3 |
| York, | 5 | 4 | 3 | 7 | 2 | 9 | 1 | 10 | 3 | 5 |
| Durham, | 5 | — | 3 | 7 | 3 | — | 1 | 8 | 4 | 1 |
| Northumberland, | 4 | 5 | 3 | 6 | 2 | 4 | 2 | — | 3 | 10 |
| Cumberland, | 4 | 10 | 3 | 5 | 2 | 9 | 1 | 11 | 3 | 11 |
| Wefmorland, | 5 | 5 | 4 | — | 3 | 1 | 1 | 11 | 3 | 10 |
| Lancafhire, | 5 | 2 | — | | 2 | 10 | 1 | 10 | 3 | 6 |
| Chefhire, | 5 | 7 | 4 | 3 | 3 | 3 | 1 | 9 | — | |
| Monmouth, | No Returns yet made. | | | | | | | | | |
| Somerfet, | 5 | 10 | — | | 2 | 7 | 1 | 9 | 3 | — |
| Devon, | 5 | 6 | — | | 2 | 5 | 1 | 6 | 3 | — |
| Cornwall, | 5 | 3 | — | | 2 | 6 | 1 | 3 | — | |
| Dorfet, | 5 | 7 | — | | 2 | 9 | 1 | 11 | 3 | 8 |
| Hampfhire, | 5 | 2 | — | | 2 | 6 | 2 | 3 | 3 | 11 |
| Suffex, | 4 | 8 | — | | 2 | 7 | 2 | 5 | 3 | 3 |
| Kent, | 5 | 1 | 3 | 4 | 2 | 8 | 2 | — | 2 | 6 |

### WALES.

|  | Wheat. | | Rye. | | Barley. | | Oats. | | Beans. | |
|---|---|---|---|---|---|---|---|---|---|---|
| North Wales, | 5 | 3 | 4 | — | 2 | 8 | 1 | 6 | — | |
| South Wales, | 5 | 2 | 3 | 9 | 2 | 9 | 1 | 3 | 3 | 5 |

### GENERAL AVERAGE

|  | Wheat. | | Rye. | | Barley. | | Oats. | | Beans. | |
|---|---|---|---|---|---|---|---|---|---|---|
| per Winchefter Bufhel, - - | 5 | 3 | 3 | 9 | 2 | 10 | 1 | 10 | 3 | 4 |
| per Quarter of 8 Bufhels, - | 42 | — | 30 | — | 22 | 8 | 14 | 8 | 26 | 8 |

SCOTLAND. Returns from thence not compleat.

Publifhed by Authority of Parliament,

William Cooke.

Figure 2. *Sample of printed return from the London Gazette, November 1770*

28

| Received in the Week ended 8th March 1823. | WHEAT. | | BARLEY. | | OATS. | | |
|---|---|---|---|---|---|---|---|
| Markets. | Quantities. | Price. | Quantities. | Price. | Quantities. | Price. | |
| | Qrs. Bs | £. s. d | Qrs. Bs | £. s. d | Qrs. Bs | £. s. d | C |
| Chester ........ | 103 4 | 231 16 0 | Incorrect. | | 69 4 | 59 16 8 | |
| Nantwich ...... | 136 6 | 300 17 2 | 35 7 | 56 15 4 | 21 3 | 19 5 0 | |
| Middlewich .... | 158 1 | 337 6 8 | — | — | 68 3 | 59 16 6 | |
| Four Lane Ends | 155 2 | 376 6 10 | 39 1 | 52 16 0 | 43 6 | 42 0 1 | |
| Holywell ...... | 69 5 | 145 12 4 | 121 5 | 180 5 4 | 53 1 | 47 19 6 | |
| Mold .......... | 25 3 | 53 18 7 | 17 2 | 21 9 0 | — | — | |
| Denbigh ...... | 210 5 | 433 15 0 | 39 3 | 48 5 0 | — | — | |
| Wrexham ...... | 145 0 | 343 3 4 | 139 2 | 208 17 6 | 142 4 | 171 0 0 | |
| Llanrwst ...... | 8 6 | 21 8 0 | — | — | 6 7 | 6 0 0 | |
| Ruthin ........ | 85 2 | 204 11 5 | 27 7 | 39 2 9 | — | — | |
| Beaumaris...... | — | — | 14 0 | 16 9 6 | 33 0 | 26 3 6 | |
| Llannerchymedd | — | — | 48 0 | 55 4 0 | 528 0 | 347 12 0 | |
| Llangefin ...... | — | — | — | — | 272 0 | 187 3 0 | |
| Carnarvon...... | 37 0 | 98 0 0 | 58 0 | 67 13 6 | — | — | |
| Pwllheli ...... | 6 0 | 12 6 0 | 62 0 | 74 18 0 | — | — | |
| Conway........ | 11 0 | 25 0 0 | 37 4 | 44 10 0 | 2 3 | 1 15 0 | |
| Bala .......... | 18 2 | 46 16 10 | — | — | 3 6 | 3 .0 0 | |
| Corwen ........ | 2 6 | 6 6 0 | 8 3 | 11 12 4 | 8 6 | 7 8 0 | |
| Dolgelly........ | 11 0 | 27 8 2 | — | — | — | — | |
| Cardigan ...... | — | — | 24 3 | 24 7 6 | 290 1 | 170 7 2 | |
| Lampeter ...... | None Sold. | | — | — | — | — | |
| Aberystwyth .... | 35 4 | 74 5 1 | 55 7 | 65 1 9 | 132 6 | 89 10 9 | |
| Pembroke ...... | None Sold. | | — | — | — | — | |
| Fishguard ...... | 15 3 | 30 4 9 | 63 3 | 72 9 3 | — | — | |
| Haverfordwest .. | 33 3 | 54 7 3 | 247 4 | 288 14 11 | 202 6 | 135 18 1 | |
| Carmarthen .... | 44 6 | 79 13 11 | 81 5 | 90 9 3 | 466 0 | 307 8 10 | |
| Llandilo ...... | 12 0 | 31 2 0 | — | — | — | — | |
| Kidwelly ...... | 3 4 | 7 0 0 | 3 1 | 3 15 0 | 84 3 | 56 5 0 | |
| Swansea ...... | 21 4 | 51 12 0 | 69 0 | 82 16 0 | 57 4 | 42 3 4 | |
| Neath ........ | Incorrect Return. | | — | — | — | — | |
| Cowbridge...... | 5 0 | 13 0 0 | 2 6 | 3 7 10 | — | — | |
| Basingstoke .... | 126 4 | 285 18 0 | 51 0 | 81 5 0 | 20 0 | 18 0 0 | |
| Fareham ...... | 63 7 | 149 5 9 | 74 4 | 106 0 0 | — | — | |
| Havant ........ | 38 3 | 80 11 | 54 0 | 74 3 0 | 7 0 | 6 6 0 | |
| Newport ...... | 126 0 | 274 14 0 | 78 4 | 109 6 0 | — | — | |
| Ringwood ...... | 120 0 | 291 0 0 | 99 0 | 131 8 3 | — | — | |
| Southampton.... | 10 0 | 20 0 0 | 20 0 | 27 0 0 | 17 0 | 17 17 0 | |
| Portsmouth .... | 61 4 | 124 17 | 281 0 | 334 14 6 | 20 0 | 20 0 0 | |
| GENERAL AVERAGE which governs Importation ...... | — | 0 43 4 | — | 0 30 0 | — | 0 19 8 | |

*Published by Authority of Parliament,*

Figure 3. Sample of printed return from the London Gazette, March 1823

Figure 4. *Different average prices of wheat*
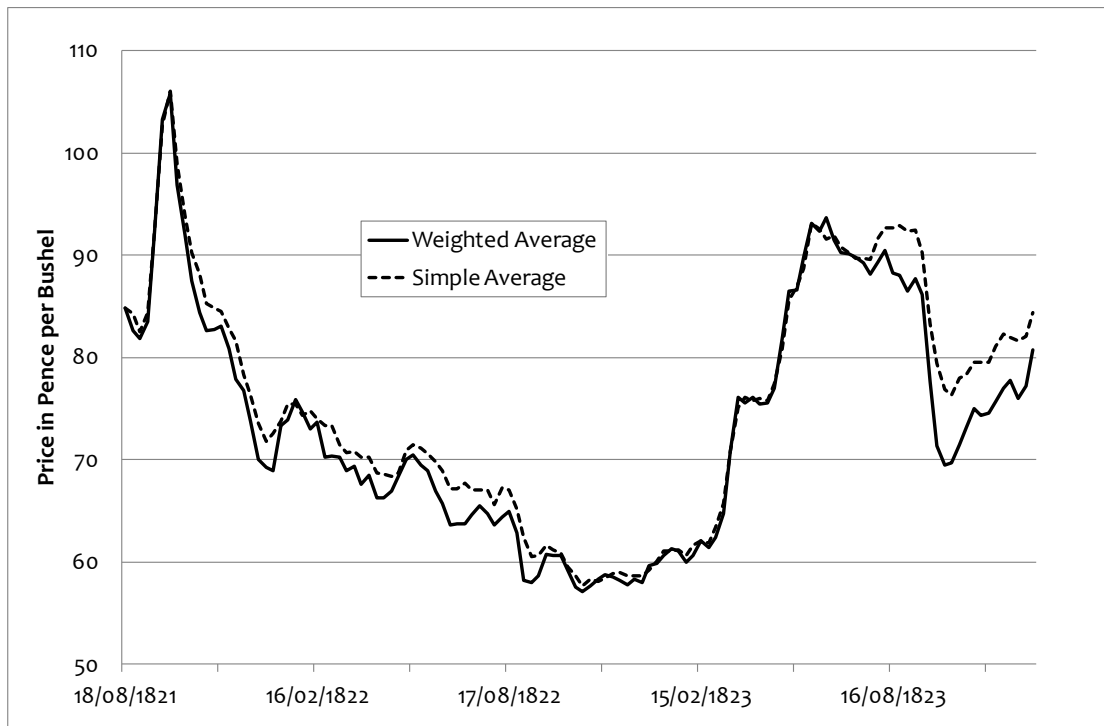


Figure 5. *Seasonal pattern of sales*
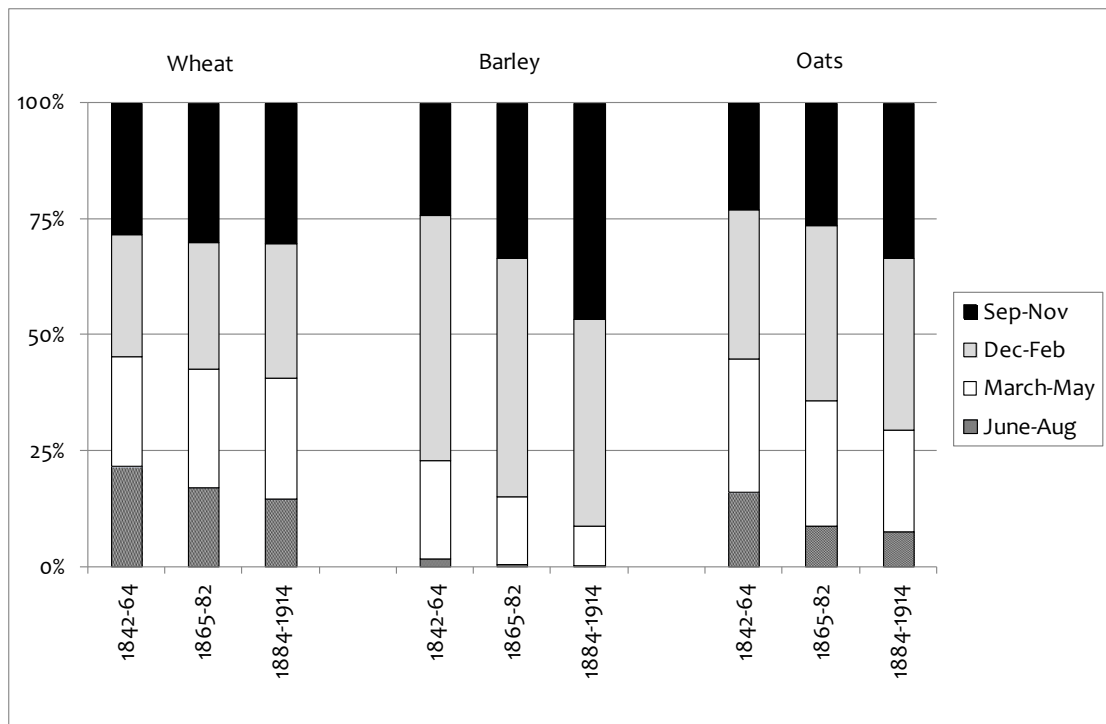
Figure 6. *The long run price of wheat*
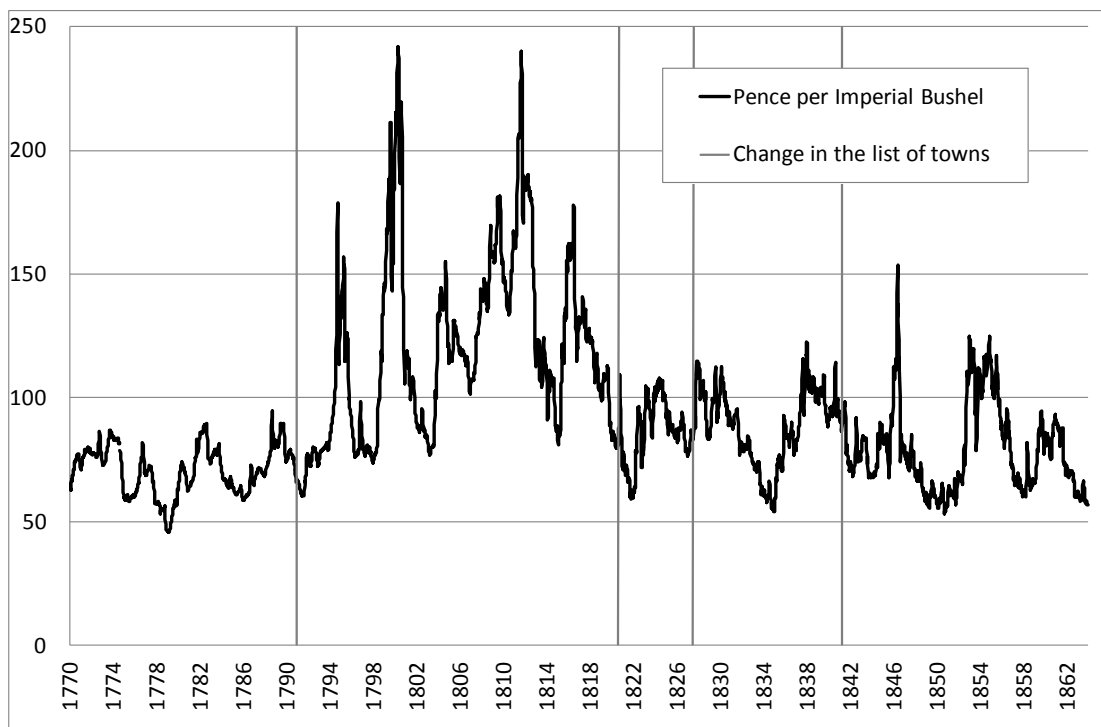


Figure 7. *Relative prices of wheat, barley, oats and beans, 1770-1820*
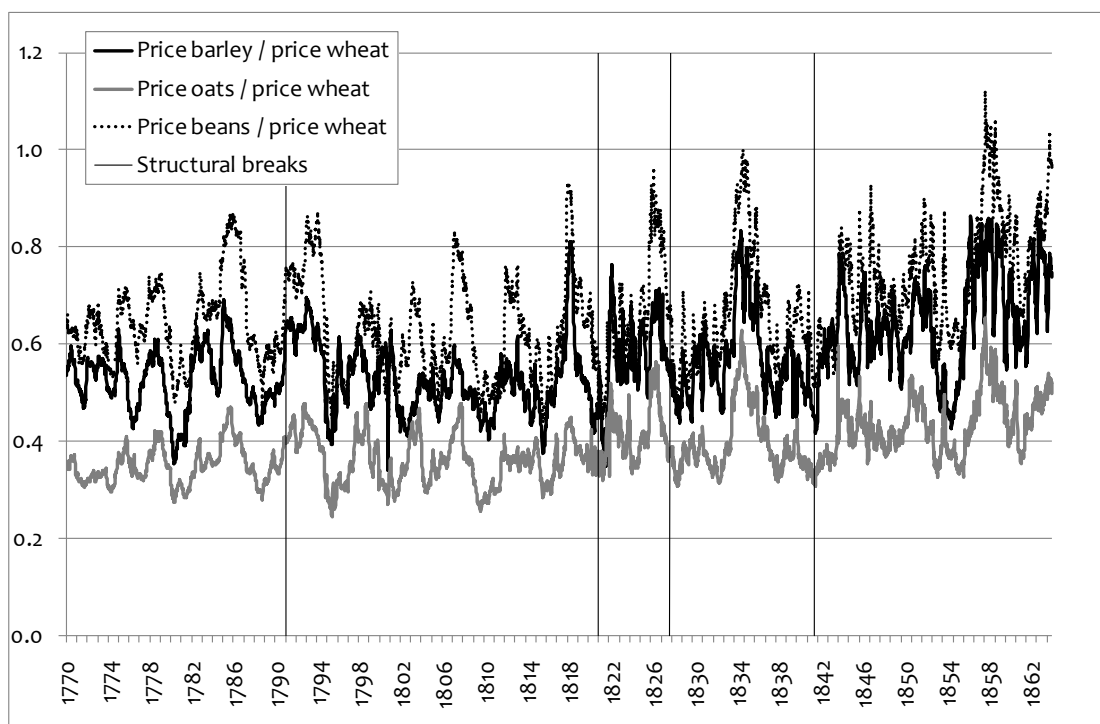
Table 1. *Monitored towns per 1 000 square miles*

| County | 1791-1820 | 1821-1828 | 1828-1842 | 1842-1864 | 1864-1883 | 1883-1890 | 1890-1900 | 1900-1912 |
|---|---|---|---|---|---|---|---|---|
| Bedfordshire | 6.5 | 0.0 | 2.2 | 6.5 | 2.2 | 4.3 | 4.3 | 4.3 |
| Berkshire | 4.3 | 0.0 | 2.8 | 8.5 | 2.8 | 8.5 | 8.5 | 7.1 |
| Buckinghamshire | 4.1 | 0.0 | 1.4 | 5.5 | 1.4 | 2.7 | 2.7 | 2.7 |
| Cambridgeshire | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Cheshire | 3.6 | 3.6 | 3.6 | 6.3 | 3.6 | 0.9 | 0.9 | 0.9 |
| Cornwall | 4.4 | 4.4 | 4.4 | 7.3 | 5.1 | 2.2 | 2.2 | 2.2 |
| Cumberland | 2.6 | 2.6 | 3.2 | 5.1 | 3.2 | 1.9 | 1.9 | 1.9 |
| Derbyshire | 2.9 | 0.0 | 1.0 | 1.9 | 1.0 | 1.9 | 1.0 | 1.0 |
| Devonshire | 2.3 | 2.3 | 2.3 | 3.5 | 2.3 | 2.3 | 3.5 | 3.1 |
| Dorsetshire | 6.1 | 6.1 | 6.1 | 7.1 | 6.1 | 5.1 | 5.1 | 5.1 |
| Durham | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 4.1 | 4.1 | 4.1 |
| Essex | 1.8 | 1.8 | 1.8 | 3.6 | 0.6 | 3.6 | 3.0 | 3.0 |
| Gloucestershire | 4.0 | 4.0 | 4.0 | 7.2 | 4.0 | 2.4 | 3.2 | 3.2 |
| Hampshire | 5.4 | 5.4 | 5.4 | 6.0 | 5.4 | 4.2 | 4.2 | 4.2 |
| Herefordshire | 3.6 | 0.0 | 0.0 | 3.6 | 0.0 | 1.2 | 2.4 | 2.4 |
| Hertfordshire | 4.9 | 0.0 | 3.3 | 9.8 | 3.3 | 6.5 | 6.5 | 6.5 |
| Huntingdonshire | 8.4 | 0.0 | 2.8 | 5.6 | 2.8 | 8.4 | 8.4 | 5.6 |
| Kent | 1.8 | 1.8 | 1.8 | 4.3 | 2.5 | 4.3 | 4.3 | 3.7 |
| Lancashire | 4.2 | 4.2 | 4.2 | 5.8 | 4.2 | 2.6 | 2.1 | 2.1 |
| Leicestershire | 3.7 | 0.0 | 1.2 | 5.0 | 1.2 | 3.7 | 3.7 | 3.7 |
| Lincolnshire | 2.9 | 2.9 | 2.9 | 6.5 | 2.9 | 3.2 | 3.2 | 3.2 |
| Middlesex | 10.7 | 0.0 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 |
| Monmouthshire | 6.9 | 6.9 | 6.9 | 8.7 | 6.9 | 5.2 | 5.2 | 5.2 |
| Norfolk | 5.7 | 5.7 | 5.7 | 6.1 | 5.7 | 4.7 | 4.7 | 4.7 |
| Northamptonshire | 3.0 | 0.0 | 1.0 | 5.1 | 1.0 | 3.0 | 4.1 | 3.0 |
| Northumberland | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 1.5 | 1.5 | 1.5 |
| Nottinghamshire | 3.6 | 0.0 | 2.4 | 4.9 | 2.4 | 4.9 | 6.1 | 6.1 |
| Oxfordshire | 4.1 | 0.0 | 1.4 | 6.8 | 1.4 | 4.1 | 4.1 | 4.1 |
| Rutland | 13.4 | 0.0 | 0.0 | 6.7 | 0.0 | 6.7 | 6.7 | 6.7 |
| Shropshire | 2.3 | 0.0 | 0.0 | 5.4 | 0.0 | 2.3 | 3.9 | 3.9 |
| Somersetshire | 3.7 | 3.7 | 3.7 | 6.1 | 3.7 | 3.7 | 3.7 | 3.7 |
| Staffordshire | 2.6 | 0.0 | 0.0 | 7.9 | 0.0 | 1.8 | 2.6 | 2.6 |
| Suffolk | 6.1 | 6.1 | 6.1 | 6.8 | 6.1 | 7.4 | 8.8 | 8.8 |
| Surrey | 4.0 | 0.0 | 1.3 | 5.3 | 1.3 | 6.7 | 6.7 | 6.7 |
| Sussex | 2.0 | 2.0 | 2.0 | 6.8 | 2.0 | 3.4 | 4.1 | 4.1 |
| Warwickshire | 3.4 | 0.0 | 2.3 | 4.5 | 2.3 | 4.5 | 4.5 | 4.5 |
| Westmoreland | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 | 1.3 | 1.3 | 1.3 |
| Wiltshire | 2.2 | 0.0 | 0.7 | 4.4 | 0.7 | 3.7 | 3.0 | 3.0 |
| Worcestershire | 4.1 | 0.0 | 1.4 | 6.8 | 1.4 | 1.4 | 2.7 | 2.7 |
| Yorkshire | 1.7 | 1.2 | 1.7 | 4.0 | 1.7 | 3.5 | 3.2 | 3.2 |
| London | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| North Wales | 5.5 | 4.8 | 1.0 | 2.9 | 1.0 | 1.3 | 1.6 | 1.6 |
| South Wales | 3.6 | 2.7 | 0.7 | 1.8 | 0.7 | 1.1 | 1.1 | 0.9 |

## Appendix 1. Market towns reported in the *London Gazette*

Table A1 reports the number of towns monitored for the Corn Returns in each period. Multiple lines for the same Act, and the same number of towns, indicate a change in the reporting format and/or revision to the town list. Table A2 reports the full list of towns in each period.

Table A1. *Corn Returns data*

| Period: | | | Number of towns | Data published | Parliamentary Act / Order of Council |
|---|---|---|---|---|---|
| | From | To | | | |
| 1 | 10/11/1770 | 9/10/1790 | unknown | Prices: forty English counties, North and South Wales, London | 10 Geo. III, cap. 39 |
| 2 | 16/10/1790 | 15/6/1793 | 211(a) | Prices: forty English counties, twelve Welsh counties, London, national average | 31 Geo. III, cap. 30 |
| 3 | 22/6/1793 | 30/9/1820 | 210(b) | Prices: forty English counties, twelve Welsh counties, national average | |
| 4 | 7/10/1820 | 17/2/1821 | 210 | Prices and quantities: 139 towns (incl London). Prices: 25 inland counties, national average | 1 and 2 Geo. IV, cap. 87 |
| 5 | 24/2/1821 | 31/3/1821 | 210 | Prices and quantities: 210 towns. Prices: 25 inland counties, national average | |
| 6 | 7/4/1821 | 23/6/1821 | 210 | Prices and quantities: 210 towns. Prices: 25 inland counties, national average | |
| 7 | 30/6/1821 | 7/7/1821 | 210 | Prices and quantities: 210 towns. Prices: 25 inland counties, national average | |
| 8 | 14/7/1821 | 11/8/1821 | 139 | Town prices and quantities; national average price | |
| 9 | 18/8/1821 | 16/2/1822 | 148 | Town prices and quantities; national average price | |
| 10 | 23/2/822 | 2/3/1822 | 149 | Town prices and quantities; national average price | |
| 11 | 9/3/1822 | 8/6/1822 | 149 | Town prices and quantities; national average price | |
| 12 | 15/6/1822 | 4/7/1828 | 150(c) | Town prices and quantities; national average price | |
| | *On 13/7/1827, units change from Winchester to Imperial* | | | | 7 and 8 Geo. IV, cap. 87 |
| 13 | 11/7/1828 | 22/4/1842 | 150 | Town prices and quantities; national average price | 9 Geo. IV, cap. 60 |
| 14 | 29/4/1842 | 31/12/1864 | 290 | Town prices and quantities; national average price | 5 Vic. cap. 14 |
| 15 | 7/1/1865 | 7/4/1883 | 150 | National average price; total quantity | 27 and 28 Vic., cap. 87 |
| 16 | 14/4/1883 | 5/4/1890 | 187 | Town prices; national average price; total quantity | 45 and 46 Vic., cap. 37 (OC 14/2/1883) |
| 17 | 12/4/1890 | 31/12/1900 | 196 | Town prices; national average price; total quantity | 45 and 46 Vic., cap. 37 (OC 12/3/1890) |
| 18 | 1/1/1901 | 31/12/1912 | 190 | Town prices; national average price; total quantity | 45 and 46 Vic., cap. 37 (OC 26/11/1900) |
| 19 | 1/1/1913 | 31/12/1914 | 173 | Town prices; national average price; total quantity | 45 and 46 Vic., cap. 37 (OC 11/10/1912) |

Notes. (a) It is commonly suggested that returns for 1791-1820 are based on 210 English and Welsh towns (for example, BPP 1890-91, vol. 65, 165). But the Act makes no mention of London – for which data were definitely collected and reported in the *London Gazette*, until mid-1793 (data for London can also be obtained from other publications, such as *Bell's Weekly Messenger* until 5 September 1815). So there were actually 211 towns to 1815. (b) Prices and quantities at town level are available for the maritime counties for 1819 in BPP 1820, vol. 2, 164-202. From this we know that four of the original towns listed in 31 George III c.30 had been changed by then (Tymawr, Llangollen, Lyme Regis and Gosport had been replaced by Llanrwst, Ruthin, Shaston and Havant). We are unable to tell whether any of the towns from inland counties were replaced during this time. (c) From 14 June 1823 the table in which the data were published changed from two- to four-page format, but the list of towns remained the same. (d) The Act of 45 and 46 Victoria, cap. 37 enacted that: "Weekly returns of the purchases of British corn should be made under the direction of the Board of Trade in manner provided by this Act from such towns, not less than 150 and not more than 200 in number, as may from time to time be fixed by Her Majesty in Council, and the average price of British corn shall be from time to time ascertained from those returns, and published by the Board of Trade in manner provided by this Act". See BPP 1888, vol. 10, 140. Therefore OC=Order in Council, in the above table.

Table A2. *Towns monitored under the Corn Laws* (periods 2 to 19; Chapman county codes).

| C'ty | Town | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|------|------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
| AGY | Amlwch | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |  |  |
| AGY | Beaumaris | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |
| AGY | Llangefni |  |  |  |  |  |  |  |  |  | ■ | ■ |  | ■ |  |  | ■ | ■ | ■ |
| AGY | Llanerchymedd | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |
| BDF | Bedford | ■ | ■ |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| BDF | Leighton Buzzard |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| BDF | Luton |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ | ■ |
| BDF | Potton | ■ | ■ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BDF | Woburn | ■ | ■ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BRK | Abingdon |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ | ■ |
| BRK | Didcot |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ | ■ |  |  |
| BRK | Hungerford |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ |
| BRK | Maidenhead |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| BRK | Newbury | ■ | ■ |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ | ■ |
| BRK | Reading | ■ | ■ |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| BRK | Wallingford |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ | ■ |
| BRK | Windsor | ■ | ■ |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ |  |  |  |  |
| BRE | Brecon | ■ | ■ |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ |  |
| BRE | Builth | ■ | ■ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BKM | Aylesbury | ■ | ■ |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| BKM | Buckingham |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| BKM | High Wycombe | ■ | ■ |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| BKM | Newport Pagnell | ■ | ■ |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ | ■ |
| CAM | Cambridge | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| CAM | Ely | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| CAM | Wisbech | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| CGN | Aberystwyth | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |
| CGN | Cardigan | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  | ■ | ■ | ■ |  |
| CGN | Lampeter | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |
| CMN | Carmarthen | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |
| CMN | Kidwelly | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |
| CMN | Llandeilo | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  | ■ |  |  |  |  |  |
| CAE | Bangor |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| CAE | Caernarfon | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| CAE | Conwy | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |
| CAE | Pwllheli | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |
| CHS | Chester | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| CHS | Congleton |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| CHS | Four Lane Ends |  |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |
| CHS | Macclesfield | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| CHS | Middlewich |  |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHS | Nantwich | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| CHS | Stockport | ■ | ■ | ■ | ■ | ■ | | | | | | | | | ■ | | | | |
| CHS | Tarporley | | | | | | | | | | | | | | | ■ | | | |
| CON | Bodmin | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| CON | Callington | | | | | | | | | | | | | | ■ | | | | |
| CON | Falmouth | | | | | | | | | | | | | | ■ | | | | |
| CON | Helston | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| CON | Launceston | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| CON | Liskeard | | | | | | | | | | | | | | ■ | | ■ | ■ | |
| CON | Penzance | | | | | | | | | | | | | | | ■ | | | |
| CON | Redruth | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| CON | St Austell | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| CON | St Columb | | | | | | | | | | | | | | ■ | | | | |
| CON | Truro | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| CON | Wadebridge | | | | | | | | | | | | | | | | ■ | ■ | ■ |
| CUL | Carlisle | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| CUL | Cockermouth | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |
| CUL | Egremont | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| CUL | Maryport | | | | | | | | | | | | | | ■ | | | | |
| CUL | Penrith | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| CUL | Whitehaven | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| CUL | Wigton | | | | | | | | | | | | | | ■ | | | | |
| CUL | Workington | | | | | | | | | | | | | | ■ | | | | |
| DEN | Denbigh | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DEN | Llangollen | ■ | | | | | | | | | | | | | | | | | |
| DEN | Llanrwst | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| DEN | Ruthin | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| DEN | Tymawr | ■ | | | | | | | | | | | | | | | | | |
| DEN | Wrexham | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DBY | Ashburn | ■ | ■ | | | | | | | | | | | | | | | | |
| DBY | Chesterfield | ■ | ■ | | | | | | | | | | | | ■ | | ■ | | |
| DBY | Derby | ■ | ■ | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DEV | Barnstaple | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DEV | Exeter | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DEV | Honiton | | | | | | | | | | | | | | ■ | | ■ | | |
| DEV | Kingsbridge | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DEV | Newton Abbot | | | | | | | | | | | | | | | | ■ | ■ | ■ |
| DEV | Okehampton | | | | | | | | | | | | | | ■ | | ■ | ■ | ■ |
| DEV | Plymouth | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DEV | Tavistock | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| DEV | Tiverton | | | | | | | | | | | | | | ■ | | ■ | ■ | ■ |
| DEV | Totnes | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DOR | Blandford Forum | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DOR | Bridport | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DOR | Dorchester | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DOR | Lyme Regis | ■ | | | | | | | | | | | | | | | | | |
| DOR | Poole | | | | | | | | | | | | | | ■ | | | | |
| DOR | Shaftesbury | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| DOR | Sherborne | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| DOR | Wareham | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DOR | Wimborne | | | | | | | | | | | | | | | | ■ | ■ | ■ |
| DUR | Barnard Castle | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| DUR | Bishop Auckland | | | | | | | | | | | | | | | | ■ | ■ | |
| DUR | Darlington | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DUR | Durham | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| DUR | Stockton | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DUR | Sunderland | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DUR | Wolsingham | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| ESS | Braintree | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ |
| ESS | Chelmsford | ■ | ■ | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

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| ESS | Chipping Ongar | | | | | | | | | | | | ■ | | | | | |
| ESS | Colchester | ■ | ■ | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| ESS | Maldon | | | | | | | | | | | | | ■ | | | | |
| ESS | Romford | ■ | ■ | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| ESS | Saffron Walden | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ | |
| FLN | Holywell | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| FLN | Mold | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | | |
| GLA | Cardiff | | | | | | | | | | | ■ | ■ | | ■ | ■ | ■ | ■ | |
| GLA | Cowbridge | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | | |
| GLA | Neath | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| GLA | Swansea | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | | |
| GLS | Cheltenham | | | | | | | | | | | | ■ | | | ■ | ■ | ■ | |
| GLS | Cirencester | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | |
| GLS | Dursley | | | | | | | | | | | | ■ | | | | | | |
| GLS | Gloucester | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | |
| GLS | Northleach | | | | | | | | | | | | ■ | | | | | | |
| GLS | Stow-on-the-Wold | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| GLS | Stroud | | | | | | | | | | | | ■ | | | | | | |
| GLS | Tetbury | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| GLS | Tewkesbury | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| HAM | Andover | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | |
| HAM | Basingstoke | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | |
| HAM | Christchurch | | | | | | | | | | | | ■ | | | | | | |
| HAM | Fareham | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | |
| HAM | Gosport | ■ | | | | | | | | | | | | | | | | | |
| HAM | Havant | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| HAM | Newport (HAM) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | |
| HAM | Portsmouth | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | |
| HAM | Ringwood | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | | |
| HAM | Southampton | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | |
| HAM | Winchester | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | |
| HEF | Hereford | ■ | ■ | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ | |
| HEF | Kington | | | | | | | | | | | | ■ | | | | | | |
| HEF | Leominster | ■ | ■ | | | | | | | | | | ■ | | | | | | |
| HEF | Ross-on-Wye | ■ | ■ | | | | | | | | | | | | | ■ | ■ | ■ | |
| HRT | Bishop's Stortford | ■ | ■ | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ | |
| HRT | Hemel Hempstead | | | | | | | | | | | | ■ | | | | | | |
| HRT | Hertford | ■ | ■ | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| HRT | Hitchin | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ | |
| HRT | Royston | ■ | ■ | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| HRT | St Albans | | | | | | | | | | | | ■ | | | | | | |
| HUN | Huntingdon | ■ | ■ | | | | | | | | | ■ | ■ | ■ | ■ | ■ | | | |
| HUN | St Ives | ■ | ■ | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ | |
| HUN | St Neots | ■ | ■ | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ | |
| KEN | Ashford | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ | |
| KEN | Canterbury | ■ | ■ | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| KEN | Chatham & Rochester | | | | | | | | | | | | ■ | | | | | | |
| KEN | Dartford | ■ | ■ | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| KEN | Dover | | | | | | | | | | | | ■ | | | | | | |
| KEN | Gravesend | | | | | | | | | | | | ■ | | | | | | |
| KEN | Maidstone | ■ | ■ | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| KEN | Rochester | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | |
| KEN | Sandwich | | | | | | | | | | | | | | | ■ | ■ | ■ | |
| KEN | Tenterden | | | | | | | | | | | | | ■ | | | | | |
| KEN | Tonbridge | | | | | | | | | | | | | ■ | ■ | ■ | | | |
| LAN | Blackburn | | | | | | | | | | | | ■ | | | | | | |
| LAN | Bolton | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| LAN | Bury | | | | | | | | | | | | ■ | | | | | | |
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| LAN | Liverpool | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| LAN | Manchester | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| LAN | Ormskirk | ■ | ■ | | | | | | | | | | | | | | | | |
| LAN | Preston | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| LAN | Rochdale | | | | | | | | | | | | ■ | | | | | | |
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| LEI | Ashby-de-la-Zouch | ■ | ■ | | | | | | | | | | | | | | | | |
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| LEI | Leicester | ■ | ■ | | | | | | | | | ■ | ■ | | | ■ | ■ | ■ | ■ |
| LEI | Loughborough | | | | | | | | | | | | ■ | | | ■ | ■ | ■ | ■ |
| LEI | Lutterworth | | | | | | | | | | | | ■ | | | | | | |
| LEI | Melton Mowbray | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| LIN | Alford | | | | | | | | | | | | ■ | | | | | | |
| LIN | Barton-upon-Humber | | | | | | | | | | | | ■ | | | | | | |
| LIN | Boston | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| LIN | Bourne | | | | | | | | | | | | ■ | | | | | | |
| LIN | (Glandford) Brigg | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| LIN | Caistor | | | | | | | | | | | | ■ | | | | | | |
| LIN | Gainsborough | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ |
| LIN | Grantham | | | | | | | | | | | | ■ | | | ■ | ■ | ■ | ■ |
| LIN | Grimsby | | | | | | | | | | | | ■ | | | | | | |
| LIN | Holbeach | | | | | | | | | | | | ■ | | | | | | |
| LIN | Horncastle | | | | | | | | | | | | ■ | | | | | | |
| LIN | Lincoln | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| LIN | Long Sutton | | | | | | | | | | | | ■ | | | | | | |
| LIN | Louth | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| LIN | Market Rasen | | | | | | | | | | | | ■ | | | | | | |
| LIN | Sleaford | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| LIN | Spalding | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| LIN | Stamford | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| LND | London | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| MER | Bala | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| MER | Corwen | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | | |
| MER | Dolgellau | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| MDX | Brentford | ■ | ■ | | | | | | | | | | | | | | | | |
| MDX | Staines | ■ | ■ | | | | | | | | | | | | | | | | |
| MDX | Uxbridge | ■ | ■ | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| MON | Abergavenny | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | ■ |
| MON | Chepstow | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| MON | Monmouth | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| MON | Newport (MON) | | | | | | | | | | | | ■ | | | ■ | ■ | ■ | ■ |
| MON | Pontypool | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| MGY | Montgomery | ■ | ■ | | | | | | | | | | | | ■ | | | | |
| MGY | Newtown | | | | | | | | | | | | ■ | | | | | | |
| MGY | Pool | ■ | ■ | | | | | | | | | | | | | | | | |
| MGY | Welshpool | | | | | | | | | | | | ■ | | | | ■ | ■ | ■ |
| NFK | Aylsham | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| NFK | Diss | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NFK | East Dereham | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NFK | Fakenham | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NFK | Harleston | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
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| NFK | (King's) Lynn | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NFK | North Walsham | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NFK | Norwich | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NFK | Swaffham | | | | | | | | | | | | ■ | | | | | | |
| NFK | Thetford | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| NFK | Walsingham | ■ | ■ | ■ | | | | | | | | | | | | | | | |

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| NFK | Watton | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NFK | Wymondham | ■ | ■ | ■ | ■ | | | | | | | | | | | | | |
| NFK | (Great) Yarmouth | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NTH | Daventry | | | | | | | | | | | | ■ | | ■ | | | |
| NTH | Kettering | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| NTH | Northampton | ■ | ■ | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NTH | Peterborough | ■ | ■ | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| NTH | Wellingborough | ■ | ■ | | | | | | | | | | ■ | | | | | |
| NBL | Alnwick | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NBL | Belford | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| NBL | Berwick-upon-Tweed | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NBL | Hexham | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| NBL | Morpeth | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| NBL | Newcastle upon Tyne | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NTT | Mansfield | ■ | ■ | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| NTT | Newark-on-Trent | ■ | ■ | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NTT | Nottingham | ■ | ■ | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NTT | Retford | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| NTT | Worksop | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| OXF | Banbury | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| OXF | Bicester | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| OXF | Burford | ■ | ■ | | | | | | | | | | | | | | | |
| OXF | Chipping Norton | | | | | | | | | | | | ■ | | | | | |
| OXF | Henley-on-Thames | ■ | ■ | | | | | | | | | | ■ | | | | | |
| OXF | Oxford | ■ | ■ | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| OXF | Witney | | | | | | | | | | | | ■ | | | | | |
| PEM | Fishguard | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | |
| PEM | Haverfordwest | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| PEM | Pembroke | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | |
| RAD | Knighton | ■ | ■ | | | | | | | | | | ■ | | | | | |
| RAD | Presteigne | ■ | ■ | | | | | | | | | | | | | | | |
| RUT | Oakham | ■ | ■ | | | | | | | | | | ■ | | ■ | ■ | ■ | |
| RUT | Uppingham | ■ | ■ | | | | | | | | | | | | | | | |
| SAL | Bridgnorth | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| SAL | Ludlow | ■ | ■ | | | | | | | | | | ■ | | | ■ | ■ | |
| SAL | Market Drayton | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| SAL | Newport (SAL) | | | | | | | | | | | | ■ | | | | | |
| SAL | Oswestry | | | | | | | | | | | | ■ | | | ■ | ■ | ■ |
| SAL | Shrewsbury | ■ | ■ | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| SAL | Wellington (SAL) | | | | | | | | | | | | ■ | | | | | |
| SAL | Wenlock | | | | | | | | | | | | ■ | | | | | |
| SAL | Whitchurch | ■ | ■ | | | | | | | | | | ■ | | | | | |
| SOM | Bath | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| SOM | Bridgewater | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SOM | Bristol | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SOM | Chard | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| SOM | Frome | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| SOM | Shepton Mallet | | | | | | | | | | | | ■ | | | | | |
| SOM | Somerton | | | | | | | | | | | | ■ | | | | | |
| SOM | Taunton | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SOM | Wellington (SOM) | ■ | ■ | | | | | | | | | | ■ | | | | | |
| SOM | Wells | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| SOM | Wiveliscombe | | | | | | | | | | | | ■ | | | | | |
| SOM | Yeovil | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| STS | Burton upon Trent | ■ | ■ | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| STS | Lichfield | | | | | | | | | | | | ■ | | | | | |
| STS | Newcastle-under-Lyme | ■ | ■ | | | | | | | | | | ■ | | | | | |
| STS | Stafford | ■ | ■ | | | | | | | | | | ■ | | | ■ | ■ | ■ |
| STS | Stone | | | | | | | | | | | | ■ | | | | | |
| STS | Uttoxeter | | | | | | | | | | | | ■ | | | | | |

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| STS | Walsall | | | | | | | | | | | | | ■ | | | | | |
| STS | Wolverhampton | | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| SFK | Beccles | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SFK | Bungay | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SFK | Bury St Edmunds | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SFK | Eye | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| SFK | Framlingham | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| SFK | Hadleigh | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SFK | Halesworth | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| SFK | Haverhill | | | | | | | | | | | | | | | | ■ | ■ | ■ |
| SFK | Ipswich | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SFK | Lowestoft | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| SFK | Newmarket | | | | | | | | | | | | | ■ | | | | | |
| SFK | Saxmundham | | | | | | | | | | | | | | | | ■ | ■ | ■ |
| SFK | Stowmarket | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SFK | Sudbury | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SFK | Woodbridge | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SRY | Croydon | ■ | ■ | | | | | | | | | | | ■ | | ■ | ■ | ■ | |
| SRY | Dorking | | | | | | | | | | | | | ■ | | | | | |
| SRY | Farnham | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| SRY | Guildford | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SRY | Kingston-on-Thames | ■ | ■ | | | | | | | | | | | ■ | | ■ | ■ | ■ | |
| SRY | Redhill | | | | | | | | | | | | | | | | | ■ | ■ |
| SRY | Reigate | ■ | ■ | | | | | | | | | | | | | ■ | ■ | | |
| SSX | Arundel | | | | | | | | | | | | | ■ | | | | | |
| SSX | Battle | | | | | | | | | | | | | ■ | | | | | |
| SSX | Brighton | | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| SSX | Chichester | ■ | ■ | | | | | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ |
| SSX | East Grinstead | | | | | | | | | | | | | ■ | | | | | |
| SSX | Hastings | | | | | | | | | | | | | ■ | | | | | |
| SSX | Hayward's Heath | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| SSX | Horsham | | | | | | | | | | | | | | | ■ | ■ | ■ | |
| SSX | Lewes | ■ | ■ | | | | | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ |
| SSX | Midhurst | | | | | | | | | | | | | ■ | | | | | |
| SSX | Pulborough | | | | | | | | | | | | | | | | ■ | ■ | |
| SSX | Rye | ■ | ■ | | | | | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | | | | |
| SSX | Shoreham | | | | | | | | | | | | | ■ | | | | | |
| WAR | Birmingham | ■ | ■ | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| WAR | Coventry | ■ | ■ | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| WAR | Rugby | | | | | | | | | | | | | | ■ | | | | |
| WAR | Stratford-upon-Avon | | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| WAR | Warwick | ■ | ■ | | | | | | | | | | | ■ | | | ■ | ■ | ■ |
| WES | Appleby-in-Westmorland | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| WES | Burton | ■ | ■ | | | | | | | | | | | | | | | | |
| WES | Kendal | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| WIL | Chippenham | | | | | | | | | | | | | ■ | | | | | |
| WIL | Devizes | ■ | ■ | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| WIL | Marlborough | ■ | ■ | | | | | | | | | | | | ■ | | | | |
| WIL | Salisbury | ■ | ■ | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| WIL | Swindon | | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| WIL | Trowbridge | | | | | | | | | | | | | ■ | | | | | |
| WIL | Warminster | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| WOR | Bromsgrove | | | | | | | | | | | | | ■ | | | | | |
| WOR | Evesham | ■ | ■ | | | | | | | | | | | ■ | | | ■ | ■ | ■ |
| WOR | Kidderminster | ■ | ■ | | | | | | | | | | | ■ | | | | | |
| WOR | Stourbridge | | | | | | | | | | | | | ■ | | | | | |
| WOR | Worcester | ■ | ■ | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| YKS | Barnsley | | | | | | | | | | | | | ■ | | | | | |
| YKS | Bedale | | | | | | | | | | | | | ■ | | ■ | ■ | ■ | ■ |
| YKS | Beverley | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

| County | Town |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YKS | Bradford |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| YKS | Bridlington | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  | ■ | ■ | ■ | ■ |
| YKS | Doncaster | ■ | ■ |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ | ■ |
| YKS | Driffield |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ |
| YKS | Easingwold |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ |  |  |
| YKS | Goole |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ |  |
| YKS | Halifax | ■ | ■ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| YKS | Howden | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |
| YKS | Hull | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| YKS | Knaresborough |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ | ■ |
| YKS | Leeds | ■ | ■ |  |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ |
| YKS | Malton | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |
| YKS | Northallerton |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ |
| YKS | Otley |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| YKS | Penistone |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |
| YKS | Pickering |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| YKS | Pontefract |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ |
| YKS | Richmond |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| YKS | Ripon |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ | ■ |
| YKS | Rotherham |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| YKS | Scarborough |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ |
| YKS | Selby |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ |  |  | ■ |
| YKS | Sheffield |  |  |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ |  |
| YKS | Skipton |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| YKS | Snaith |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |
| YKS | Thirsk |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  | ■ | ■ | ■ | ■ |
| YKS | Thorne |  |  |  |  |  |  |  |  |  |  |  |  | ■ |  |  |  |  |  |
| YKS | Wakefield |  |  |  |  |  |  |  |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| YKS | Whitby | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |
| YKS | York | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

### Appendix 2. Nomenclature

Town nomenclature is erratic in the *London Gazette*. Two particular issues arise.

First, spelling is inconsistent and sometimes incorrect. Occasionally this is a pure printing error (such as 19 May 1821, Stamford and Spalding appearing as "Spamford" and Stalindg"). Inconsistent spelling is more problematic. For example, initially returns are reported for the town of T*u*nbridge in Kent; latterly this changes to T*o*nbridge. There is no T*u*nbridge in Kent – but there is *Tunbridge Wells* and there is *Tonbridge*, so this is ambiguous. Given the spelling change to T*o*nbridge, it seems likely that the early returns were actually gathered from T*o*nbridge and we have assumed this throughout.

Second, some town names changed. For example, initially returns are reported for the town of Glanford Brigg in Lincolnshire (also spelt Glandford Briggs and Glandford Bridge!); latterly this changes to Brigg. These names definitely refer to the same town throughout because we can identify the location on Moule's and Pigot's contemporary maps. Cann in Dorset changed more radically, becoming known as

Shaston St Rumbold (an area on the periphery of the town of Salisbury, itself sometimes known as Shaston).

To eliminate ambiguities, we adopted modern names and spellings for all towns, 1770-1914, as used by the Ordnance Survey. Except for Brigg and Cann, modern spellings are close to the original returns and anyone using our data will find it straightforward to match up the lists of towns that we report and the lists reported in the *London Gazette*.

MOULE, T. (1836). *Moule's English counties*. London: George Virtue.

ORDNANCE SURVEY (1999). *Ordnance Survey gazetteer of the British Isles*. 4th edition. London: HMSO.

PIGOT, J. (1840). *Pigot & Co.'s Brtish Atlas*. London: Pigot & Co.


### Appendix 3. Bristol

In the eighteenth and early nineteenth centuries Bristol was an important commercial city with a thriving grain market, lying astride the Somersetshire-Gloucestershire border. Was Bristol included in Somersetshire or Gloucestershire for purposes of computing county average grain prices, 1770-1820? A town-level breakdown for 1819 was given in response to a Parliamentary enquiry (BPP 1820, vol. 2, "Appendix to the report from Select Committee on petitions relating to agricultural distress", p. 164). This enabled us to calculate county averages under the assumptions that: a) Bristol was in Somersetshire; and b) Bristol was in Gloucestershire. Comparing these calculations to the printed county returns establishes that Bristol was in Somersetshire.


### Appendix 4. London

Remarkably, London is the only town for which average prices were not continuously reported in the Returns, disappearing from the *London Gazette* after 8 June 1793 and reappearing on 7 October 1820. This is problematic, given the importance of London in the British economy.

Prices in Mark Lane – the London grain market – were reported weekly in *The Times* from 5 January 1796 to 5 September 1815 and we use those. The same data

were reported in other newspapers, although not with equal consistency and accuracy; hence we prefer *The Times* whenever possible. As well as reporting prices this week, they reported changes from last week – allowing us to calculate prices in the occasional weeks when data were (inexplicably) not printed. Data missing from *The Times* were filled using *Bell's Weekly Messenger*. (We verified that – when both newspapers report Mark Lane prices – the reported prices were the same in both publications. This gave us confidence in taking prices from *Bell's Weekly Messenger* when *The Times* failed to report.) We used *The Sun*, 12 March 1793-23 December 1794; and *The General Evening Post*, 29 December 1794-28 December 1795.

London price data are totally missing, 12 September 1815-30 September 1820. (Prices reported for 'London' in *The Times*, 1 September 1817-18 December 1820, turn out to be the national average price, not the London price.) Although this is almost unbelievable, we checked very many contemporary newspapers and nowhere found weekly data for Mark Lane in that period.

### Appendix 5. The researcher

Entering data from paper copies posed various problems, especially from 10 November 1770 (when publication began) to 8 March 1823. The *London Gazette* is available in various libraries, or on microfilm, but it is inconvenient to transcribe the data *in situ* and our data were mostly transcribed from photocopies. Very faint printing or considerable bleed-through from the next page were problematic. Figure 1 provides an example of the hard copy quality; the publisher used a very small type, tiring to read for prolonged periods. These data had to be transcribed manually, which was painfully slow but extremely accurate. We randomly double-checked two weeks (after the checking process described below) and found data entry to be 100 per cent accurate.

Publication quality improved on 15 March 1823. Pages became less cluttered because regional sub-totals were suppressed, allowing the use of a larger font. Returns for 150 towns were spread over four whole pages; from 29 April 1842, returns for 290 towns were spread over eight whole pages. Printing and paper quality were much higher and there were no legibility problems. We used a variety of procedures to enter these data, including manual typing and scanning with Optical Character Recognition (OCR) software. Scanning was less accurate than typing but much faster (averaging 5

000 digits entered per hour, including data management tasks, rather than 2 000 digits per hour). We randomly double-checked two weeks (after the checking process described below) and found data entry to be 97 per cent accurate. Inaccuracies arise because the OCR software sometimes misrecognises digits, usually if the printing is blotchy or the paper flecked. Typical errors are numerals 3 or 6 being mistaken for numeral 8.

Following raw data entry, we undertook various checks to attempt to eliminate transcription errors.

First, published data up to 1820 are simply prices per bushel in shillings and pence. Graphing the data for each year for each county allowed us to pinpoint suspicious price jumps. Notably, errors in entering shillings lead to price jumps of 12, 24 or 36 pence; with average wheat prices to 1820 of 100 pence per bushel, weekly jumps of 12 or 24 pence stood out. Hence any transcription errors that we failed to notice probably come from the pence column and are therefore likely to be small.

Second, published data after 1820 report total value and total quantity of each grain traded in each town. Most of the data were scanned from photocopies that were very dark (sometimes illegible) along the edge bound into the spine of the volumes; for every page for every week we checked columns closest to the spine to ensure correct scanning. We also checked the page ordering (sometimes pages were bound together in the wrong order, something not always apparent at first glance). Average unit prices were then calculated, dividing total value traded by total quantity traded. We wrote a programme highlighting highest and lowest prices each week for each type of grain; these were typically erroneous and had to be corrected.

Obviously, we desire 100 per cent accuracy in data transcription, and could achieve it if all data were entered manually and checked graphically. However, the increased accuracy would not justify the additional cost. An alternative way of conceptualizing the problem is choosing between entering 100 per cent of the data with 97 per cent accuracy and entering 40 per cent with 100 per cent accuracy. It seems clear that precision of our estimates (for example, using regression techniques) will be higher if we collect 100 per cent with 97 per cent accuracy. Hence we believe the data collection process was optimized to steer the best course between two pitfalls.

**Appendix 6. Missing observations.**

Consider first the period after 7 October 1820, when returns for individual towns were published (not just county averages). Price observations can be missing for four reasons, and the cause of each missing observation is described according to the following system.

First, it could be that no Inspector was appointed for a particular market. This occurred very rarely, recorded in the *London Gazette* as 'No Inspector'. In 1820-5, the only towns without an Inspector were Swansea (20-27 April 1822) and Kidwelly (17 November 1821-30 March 1822).

Second, the Inspector might fail to send a return, recorded as 'No Return'.

Third, the Inspector might send an incorrect return . From 1821 onwards, a wholly incorrect return was recorded as 'Incorrect Return'; for just one or two crops, 'Incorrect' was entered for that particular column or columns. Use of 'Incorrect' for individual crops begins on 8 September 1821. Before that, we observe only 'Incorrect Return'. Presumably, before 8 September 1821 the Receiver discarded the whole return if even one crop was incorrect; this was perhaps unnecessarily harsh, so policy changed. The policy change impact is clear from table 2: a discrete drop of 80 per cent between 1821 and 1822 in the number of missing observations due to 'Incorrect Return'. This is because 'Incorrect Return' generates five missing price observations (wheat, barley, oats, beans and peas), whereas 'Incorrect' generates only one missing price observation. It is not clear how the Comptroller knew that the return was incorrect – probably it was internally inconsistent (volume traded multiplied by price per unit did not equal value traded). For one week only, the legend 'Irregular Return' is employed (23 December 1820). It is not clear how this differed from 'Incorrect Return', so we treat them the same way.

Fourth, no trade might occur, recorded as 'None Sold' or, when just one or two crops, a dash in that particular column or columns ' – '. When there was no trade then we enter a zero for the quantity. But, in the absence of trade, we do not observe a price and hence we have a missing price observation. In early 1821, the legend 'None Brought for Sale' was employed (for example, 31 March 1821). Presumably, the use of 'None Sold' then indicated a situation where grain was brought for sale but there were no buyers. However, this distinction was soon dropped and only 'None Sold' appeared thereafter; we treat the two cases in the same way.

Our grain price spread sheets do not describe why particular prices observations are missing. But we may wish to know why price data are typically missing – whether it was due to no trade or poor reporting – and an additional spread sheet records this fact. For 1820-22, table A3 shows the number of prices missing for each crop in each year owing to: no trade; something 'Incorrect' in the return; or having 'No Return'. The vast majority of missing observations arise from no trade: in the first period – immediately following the drastic change in the town list, when things were probably less well organized than usual – 82 per cent of missing observations were due to no trade; this rose to 94 per cent in the second period. It was more common for minor crops prices to be missing; zero trade was more likely for a minor crop in any particular week.

Table A3. *Breakdown of missing observations by crop and by cause, 1820-2*

| Grain | Cause of missing price | 7 October 1820-11 August 1821 139 towns × 45 weeks = 6255 observations per grain | 18 August 1821-29 December 1822 148 towns × 20 weeks = 2960 observations per grain |
|---|---|---|---|
| Wheat | No sale | 422 (7%) | 237 (8%) |
| | No return | 130 (2%) | 51 (2%) |
| | Incorrect | 510 (8%) | 67 (2%) |
| Barley | No sale | 2026 (32%) | 1045 (35%) |
| | No return | 130 (2%) | 51 (2%) |
| | Incorrect | 510 (8%) | 51 (2%) |
| Oats | No sale | 2476 (40%) | 1281 (43%) |
| | No return | 130 (2%) | 51 (2%) |
| | Incorrect | 510 (8%) | 35 (1%) |
| Beans | No sale | 4483 (72%) | 2179 (74%) |
| | No return | 130 (2%) | 51 (2%) |
| | Incorrect | 510 (8%) | 24 (1%) |
| Peas | No sale | 4981 (80%) | 2445 (83%) |
| | No return | 130 (2%) | 51 (2%) |
| | Incorrect | 510 (8%) | 25 (1%) |

Notes. Prices were collected from 210 towns, 7 October 1820-7 July 1821, but published for only 139 towns (remaining towns published as county averages and not counted in this table).

Now consider the geographical pattern of missing observations. Table A4 shows that there are very few missing observations for wheat in major markets; the vast majority of missing observations were concentrated in a very small number of towns. Some towns had minimal trade. Lampeter reported no trade for the entire period 1822-28; other remote Welsh towns also had little trade (for example, Beaumaris reported trade in wheat in only nine weeks of 1824, with a total trade of 120 quarters). Fortunately, the only *major* town that did not have much trade was Southampton, perhaps because most trade occurred in nearby Portsmouth. Systematic data analysis for these towns is probably not worthwhile and they are simply best ignored. More importantly, variation in weekly quantity totals is probably affected by

occasional missing returns from large markets that usually report. For example, Hull produced no return on 11 August 1821; around that time, Hull accounted for two per cent of total trade in the 139 reporting towns. Omitting Hull is unlikely to substantially affect the average reported price because, although it is a large market, the price there was similar to prices in the rest of the county. (Obviously, in the extreme case where the price in Hull was exactly the same as the average, then omission would have no effect at all.) However, omission has a much larger impact on reported total quantity traded, which Fairlie used to estimate total grain output.

Table A4. *Geographical distribution of missing prices*

| 7 October 1820-11 August 1821 | 45 weeks | 18 August 1821-29 December 1821 | 20 weeks |
|---|---|---|---|
| Denbigh | 18 | Beccles | 14 |
| Watton | 18 | Cirencester | 12 |
| Cirencester | 16 | Manchester | 9 |
| Kidwelly | 11 | Kidwelly | 8 |
| York | 11 | Swansea | 8 |
| Aylesham | 9 | Sunderland | 6 |
| Chard | 9 | Fareham | 4 |
| Lynn | 9 | Redruth | 4 |
| Ringwood | 9 | Tetbury | 4 |
| St. Austle | 9 | Bala | 3 |
| Wells | 9 | Louth | 3 |
| Wisbeach | 9 | Pontipool | 3 |
| Towns missing 8 observations | 7 | Towns missing 2 observations | 8 |
| Towns missing 7 observations | 6 | Towns missing 1 observation | 30 |
| Towns missing 6 observations | 10 | Towns missing no observation | 98 |
| Towns missing 5 observations | 10 | | |
| Towns missing 4 observations | 12 | | |
| Towns missing 3 observations | 17 | | |
| Towns missing 2 observations | 24 | | |
| Towns missing 1 observation | 18 | | |
| Towns missing no observation | 27 | | |

Notes. Small changes in town lists mean that the column total for 1820-21 exceeds total number of towns monitored in that period. To August 1821, many towns have missing/incorrect observations. Thereafter most missing/incorrect observations result from no returns from Beccles, Cirencester and Manchester. Some returning officers appear to have consistently made incorrect returns .

Finally, up to 30 September 1820, grain prices were published as county averages. Causes of missing price observations were not revealed. The Receiver would not publish a county average if fewer than two thirds of Inspectors made a return. Returns from various Inspectors within a county could be missing for a variety of reasons, so it may not be straightforward to reveal why a price observation was missing. The frequency of each type of missing observation after 1820 suggests the most likely explanation for missing observations before 1820 is simply 'None Sold'. Table A5 reports how much data we have for each crop for English and Welsh counties (as a percentage of the total possible amount of data, given the number of

counties and weeks, 1770-1820). Notice that beans are noticeably lower than the rest. Bean prices are basically never reported in Wales, Cornwall, Devon, Derbyshire and Cheshire, probably because very few beans were produced in those counties. The 1867 agricultural census reports vanishingly small acreages of beans in Wales, Cornwall and Devon; and very small acreages in Derbyshire and Cheshire. Hence there was probably virtually no trade in beans in those counties. By contrast, bean prices are reported almost every week in the other counties.

Table A5. *Reporting rates for grain price data, 1770-1820*

|        | 40 English counties | 2 Welsh regions |
|--------|---------------------|-----------------|
| Wheat  | 99.7                | 93.0            |
| Barley | 93.1                | 92.6            |
| Oats   | 97.2                | 88.0            |
| Beans  | 79.0                | 15.7            |

One further point is worth noting. Publishing county averages up to 1820, even if one third of towns did not report, could generate measurement error owing to a non-constant sample of towns. There is no way to further illuminate this issue.

The proportion of price data missing from the Returns is very low and heavily concentrated in a few remote towns, such as Lampeter. We can afford to exclude those towns from our analysis (regional coverage being adequate due to complete returns for nearby towns). Hence there is no problem at all with missing observations. Pea and bean coverage is less satisfactory but – given that the vast majority of missing observations occur because there is no trade, and therefore no price – we do not feel that this weakens the data set.