# Markets and Price Fluctuations in the Irish Rural Economy, 1785-1913

[1]
**Liam Kennedy** (School of History, Queen's University, Belfast)
**Peter Solar** (Vesalius College, Vrije Universiteit, Brussel)
18/05/2011 12:00h.

A preliminary draft

## Introduction:

How might one characterise the Irish economy at the end of the 18th century? This was a predominantly rural economy and society in which property rights were well established though not always readily enforced, market relationships were widely diffused, and the rent nexus structured social relationships in the countryside. Land was the primary means of production and urbanisation was limited. While there was a varied range of occupations in trades, food processing, petty manufacturing and distribution, the bulk of the population drew its livelihood from owning, renting or working the land. Access to land was vital to the existence of landlords, middlemen, tenant farmers, cottiers and labourers – the various strata that constituted the rural social hierarchy. Proto-industry was firmly established, particularly in relation to the production of linen textiles in the northern counties of the island, linking rurally-based handicraft industry to regional and overseas markets. Indeed at the close of the 18th century, the value of linen goods exported exceeded that of agricultural produce.[1] The older-established and more urban-based woollen industry, located in the southern counties of the island, catered mainly for the home market. It provided thousands of households with the means of making a living, and had done so for generations. The spectre of the Industrial Revolution, in the form of low-cost mechanised production of cotton and woollen goods, and all the competitive pressures this implied for handicraft industry on the Irish side of the Irish Sea, was only beginning to take shape. So, when the Union of Britain and Ireland was being hammered out in 1800, it is fair to say that this was a society in which production for the market was extensive and in which the foreign trade sector was highly developed.

This picture of a society suffused in market relationships needs to be heavily qualified. In fact in the 1960s two economists, Patrick Lynch and John Vaizey, proposed a radically different image of the Irish economy. Ireland was a country

"with two economies, one capitalist and the other subsistence". [2] The modern or capitalist sector had these properties: production for the market, often for export; monetised exchanges; and more advanced techniques, including the use of capital goods in production. The subsistence sector, by contrast, engaged in little production for the market, household or neighbourhood self-sufficiency was the norm, techniques of production were primitive, and money transactions were virtually unknown. Few economic ties linked these two types of economy. They also inhabited different spaces, not only metaphorically but literally. The modern economy, in the main, was situated in the principal towns scattered along the eastern coastline. Included with these were their hinterlands, though it was supposed that only "a day's cart-journey from any town the use of money was rare".[3] The subsistence sector occupied most of the land area of Ireland and was particularly deeply entrenched in the western half of the island.

This resonates with treatments of dualism in contemporary developing countries. Thirwall, for instance, believes that "it is not unusual for geographical, social and technological dualism to occur together, with each type of dualism tending to reinforce the other."[4] But few if any historians nowadays subscribe to this simple dichotomy of economic conditions on the island of Ireland.[5] Yet the stark formulation directs us to important and distinctive features of the Irish rural economy that have major implications for the functioning of markets, the impact of harvest failures and the economic welfare of social groups occupying different positions within the class structure. It is the case that at the base of rural society relatively little money changed hands. Cottiers and agricultural labourers bartered labour services with local farmers in exchange for a cabin and access to gardens on which to produce subsistence, mainly potatoes. These exchanges were calculated by reference to market rates and at the end of the season the labourer, including possibly other members of the household, might have accumulated a small cash surplus which was then paid by the farmer, who in turn was a tenant producing a food surplus for the market and paying rent to his landlord in cash. Thus, although not much money changed hands, the transactions were conditioned by market experiences of rents and wages. As one ascended the social hierarchy (see Table 1), the use of money was increasingly common and the web of market transactions more dense. Thus, as Mokyr has pointed out, there is some residual validity in the notion of a dual economy but it needs to be re-formulated more carefully, taking account of social class positions and regional variations.[6]

Table 1. The Social Class Structure in rural Ireland, circa 1845

| | Number of Households |
|---|---|
| Landlords | 10,000 |
| Rich Farmers | 50,000 |
| Comfortable Farmers | 100,000 |
| Middling & Smaller Farmers | 250,000 |
| Poor Peasants | 300,000 |
| Cottiers, Labourers | 1,000,000 |

Source: Ó Gráda (1994).

## Markets, Prices and Vulnerability

In addition to potatoes, Ireland produced three major cereal foods, that is, in descending order of acreage, oats, wheat and barley. In terms of human food, oats and oatmeal were by far the most important. This was particularly so in the northern counties of Ireland where oats and potatoes, with the addition of some milk, formed the backbone of the popular diet.[7] This would suggest a high degree of insurance against food failure, as poor potato and grain harvests were unlikely to go hand in hand.[8] This spreading of risk probably operated effectively enough for the second half of the 18th century, but by the early 19th century the rural poor, already massively swollen by rapid population growth, were largely or almost exclusively dependent on the potato crop. This served to undermine the food security of millions of cottiers and labourers. The massive population growth experienced between 1750 and the eve of the Great Famine of 1846-50 pushed the poorer classes in the countryside in the direction of

increasingly heavy dependence on the miracle food of the potato. The potato blight of the 1840s would reveal that the risk associated with potato cultivation had been underpriced. But rather like medical insurance and the AIDS epidemic of the later twentieth century, how can markets price the risk of an, as yet, unknown risk factor? In the case of the Irish catastrophe, in which 15% or so of the population was swept away by hunger and famine-related diseases, ringing the alarm bells would have required an omniscient market regulator, armed with perfect foresight (or 20th century historiographical writings).

The next section of this paper considers the volatility of Irish agricultural prices, and how this evolved between 1785 and 1913. Twelve different commodities are considered.

## Price Volatility

There are various ways to measure the volatility of prices. Two approaches are presented in this paper. The first, and the one preferred here is to calculate the standard deviation of the natural logarithm of the ratio of the price of the commodity in year t+1to the price in year t, over the time span in question.[9] Thus, for the first subperiod, for wheat for example, we are speaking of the standard deviation of the natural logs of the price ratio of wheat in successive years, starting in 1785 and ending in 1815. This index of price volatility for different food commodities in each of five time periods is presented in Table 2. Prices are for harvest or production years rather than calendar years. An alternative measure is to to use the co-efficient of variation and to compare changes in the value of the coefficient over time. We make use of this measure also and the results, relating to the period 1785-1914, divided into the same five sub-periods, are presented in the Appendix to the paper.

So far as possible, we have endeavoured to capture the price of a single *quality* of foodstuff through time. On the whole we are confident we have achieved this goal but of course where we have not succeeded this will introduce artificial price volatility into the price data. It is important, therefore, to examine a range of foodstuffs to view the consistency of the findings across different commodities and time periods. It should be noted also that climatic and environmental shocks may vary between time periods, thereby introducing non-comparable price variations between time periods. The supreme example in the Irish case is the Great Famine of the later 1840s, which was precipitated by

massive and repeated destructions of the potato crop due to the intrusion of a new potato disease, *phytophora infestans*. While of interest in its own right, we have excluded the Famine period from the scope of this long range view of price fluctuations in the Irish agricultural economy.

The price data are collected from newspaper reports relating to the Belfast market in the north east of Ireland and the Waterford market in the south east of the island. These are both port towns and there is a distance of some 270 kilometres between the two.[10] The London prices are from recent work by Peter Solar and Jan Tore Klovland.[11] The bulk of Irish agricultural trade was with Britain, even before the Act of Union, hence the relevance of the British connection in economic as in other matters.[12]

The results on price volatility the English market (London), the North of Ireland market (Waterford) and the South of Ireland market (Waterford) are presented in Table 2.

Table 2. An Index of Price Volatility on the London, Belfast and Waterford markets, 1785-1913.

| | | **1785-1815** | **1815-1844** | **1851-1873** | **1873-1896** | **1896-1913** |
|---|---|---|---|---|---|---|
| WHEAT | London | 0.3054 | 0.1798 | 0.2138 | 0.1610 | 0.1060 |
| WHEAT | Waterford | 0.2337 | 0.2055 | 0.1854 | 0.1390 | 0.1162 |
| WHEAT | Belfast | 0.2718 | 0.2240 | 0.1983 | 0.1223 | 0.1431 |
| | | | | | | |
| FLOUR | London | | | | | |
| FLOUR | Waterford | 0.2939 | 0.1874 | 0.1667 | 0.1422 | 0.1537 |
| FLOUR | Belfast | 0.2423 | 0.2030 | 0.1794 | 0.1458 | 0.1613 |
| | | | | | | |
| OATS | London | 0.2551 | 0.1613 | 0.1494 | 0.1041 | 0.1236 |
| OATS | Waterford | 0.2648 | 0.2497 | 0.1318 | 0.1514 | 0.1033 |
| OATS | Belfast | 0.2822 | 0.2603 | 0.1269 | 0.1002 | 0.0811 |
| | | | | | | |
| OATMEAL | London | 0.3066 | 0.2790 | 0.1354 | 0.1028 | 0.0747 |
| OATMEAL | Waterford | 0.3255 | 0.2262 | 0.1197 | | |
| OATMEAL | Belfast | 0.3066 | 0.2790 | 0.1354 | 0.1028 | 0.0747 |
| | | | | | | |
| BARLEY | London | 0.2668 | 0.1952 | 0.1259 | 0.0884 | 0.0854 |
| BARLEY | Waterford | 0.2835 | 0.2374 | 0.1359 | 0.0993 | |
| BARLEY | Belfast | 0.3004 | 0.2178 | 0.1435 | 0.0680 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| POTATO | London | | 0.2392 | 0.3151 | 0.2751 | 0.2910 |
| POTATO | Waterford | 0.5018 | 0.3986 | 0.2738 | 0.3596 | 0.3154 |
| POTATO | Belfast | 0.5103 | 0.5080 | 0.2844 | 0.4496 | 0.3951 |
| | | | | | | |
| BUTTER | London | 0.1298 | 0.1466 | 0.0865 | 0.1056 | 0.0829 |
| BUTTER | Waterford | 0.1304 | 0.1290 | 0.0687 | 0.0741 | 0.0675 |
| BUTTER | Belfast | 0.1250 | 0.1281 | 0.0752 | 0.0902 | 0.0505 |
| | | | | | | |
| BEEF | London | 0.090 | 0.086 | 0.059 | 0.047 | 0.038 |
| BEEF | Waterford | 0.127 | 0.131 | 0.072 | 0.101 | |
| BEEF | Belfast | 0.123 | 0.108 | 0.067 | 0.069 | 0.088 |
| | | | | | | |
| MUTTON | London | 0.1011 | 0.1136 | 0.0786 | 0.0685 | 0.0393 |
| MUTTON | Waterford | 0.1170 | 0.1388 | 0.0740 | 0.1164 | |
| MUTTON | Belfast | 0.0678 | 0.0816 | 0.0625 | 0.0553 | 0.0697 |
| | | | | | | |
| PIGMEAT | London | 0.1416 | 0.1345 | 0.1019 | 0.0932 | 0.1342 |
| PIGMEAT | Waterford | 0.2559 | 0.2021 | 0.1018 | 0.1005 | 0.1160 |
| PIGMEAT | Belfast | 0.2330 | 0.2199 | 0.1394 | 0.0885 | 0.1011 |
| | | | | | | |
| EGG | London | | | | | |
| EGG | Waterford | | | 0.0813 | 0.1027 | 0.0751 |
| EGG | Belfast | | 0.1101 | 0.1446 | 0.0808 | 0.0626 |
| | | | | | | |
| MAIZE | London | | | | | |
| MAIZE | Waterford | | | 0.1465 | 0.1334 | 0.1125 |
| MAIZE | Belfast | | | 0.1303 | 0.1449 | |

*Source*: calculated from data contained in Kennedy & Solar (2007) and Solar & Tore Clovland (2011).

The findings show a remarkable degree of consistency both in the direction of change over time and in the experience of different commodities. As economic theory and economic history would suggest, price variance tends to be less on a large metropolitan market, in view of its diverse sources of supply. Thus the price variance on the London market tended to be lower that that experienced in the Irish regional markets of Belfast and Waterford, though of course there were a few exceptions in particular time periods (oats for example in the periods 1851-73 and again in 1896-1913). Even in the final time period, when the first phase of globalisation was reaching its apogee during the Kondratiev upswing

of 1896-1913, price fluctuations on the London market were generally less than in the Irish regional markets.

What was happening to price variance over time is perhaps of greater interest. Had much of Ireland been a large, marketless backwater at the end of the 18th century, one might well expect severe fluctuations in food prices from time to time. As Lynch and Vaizey put it (though the point is of more relevance to genuinely subsistence economies with tiny market sectors): "These subsistence conditions were always threatened by the risk of bad harvests: when famines occurred the precariousness of a non-monetary economy which was normally unnoticed became apparent with startling rapidity."[13]

Starting with the opening period, which was dominated by the French wars and wartime inflation, three points may be made with reference to Table 1. First, to echo an earlier observation: with the significant exception of wheat prices, price volatility was greater in the Irish as compared to the London markets. Second, price fluctuations in the Belfast and Waterford markets were broadly similar, suggesting at least indirectly that markets along the eastern coastline of Ireland were fairly well integrated, even in this early time period. Third, the levels of price volatility are not radically different as between the three centres (at least as measured by our index of price volatility).[14] Again this suggests a high degree of market integration, not just between the north and south of Ireland but between eastern Ireland and Britain as well. In other words, even before the Union of 1801the prices for Irish export commodities were being driven by British prices and British consumer demand. Situated next door to the industrializing and urbanising society that was Britain at the end of the 18th century, Ireland served as a subsidiary granary for its larger neighbour, as well as a source of livestock products.

The early to mid-19th century saw important developments in transport, which should have had the effect of eroding price differentials between different markets within Ireland, and between Ireland and Britain. The canal system, particularly the Royal and Grand canals, and their offshoots, which served central and southern Ireland, brought geographically disparate markets into closer contact. It is more difficult to speak of productivity improvements to the road system, though there must have been some improvements as networks of horse-drawn coaches, the famous Bianconi coaches being the exemplar, criss-

crossed the countryside.[15]The impact of railways was primarily in the next or the mid-Victorian period, though the origins of the Irish rail system go back to the 1830s. But steam power already mattered greatly in one area of transport, as steam ships linked Irish to British ports from the 1820s onwards. Transport improvements overland within Britain complemented these developments, serving to increase market integration within the British and Irish isles.

Is this reflected in the measures of price volatility? Reassuringly, it is. The majority of changes in the index as between the first (1785-1815) and second periods (1896-1913) – twenty three out of the thirty possible changes noted in Table 3 – shows a diminution in the value of the index. Where the index has increased in value, as for butter and mutton, the change is slight.

Table 3. Change in the Index of Price Volatility for commodities at London, Waterford and Belfast: the number of commodities showing an increase or decrease, and the total number of cases.

| | between 1785-1815 and 1815-1845 | between 1815-1845 and 1851-73 | between 1851-73 and 1873-1896 | between 1873-1896 and 1896-1913 |
|---|---|---|---|---|
| Decline | 23 | 27 | 22 | 22 |
| Increase | 7 | 6 | 11 | 10 |
| Total | 30 | 33 | 33 | 32 |

Source: derived from Table 2 above.

One might well expect a continuing trend towards a compression in price variation in the third time period, that of 1851-1873. Railways were now coming in to their own, while market and transport facilities were improving. The repeal of the Corn Laws by the Westminster parliament in 1846 exposed British and Irish farmers more fully to international competition. Falling transport costs, on European and trans-Atlantic routes produced ever more competitive market conditions over wider trading areas, it might be argued.[16] It is, therefore, a shade embarrassing to find that that most internationally traded

of commodities,wheat, does not fit the picture (see row one of Table 2). Further compounding the sense of surprise, is the fact that this is so in relation to the London market which was one of Europe's great wheat markets. The reason for this contrary finding is not obvious, though it may have to do with quality differences that are invisible to later historians of wheat prices. It is all the more anomalous in that the variability of wheat prices, at least as captured by our measure, moves in the expected direction in the two regional centres of Belfast and Waterford. This anomaly, and some others notwithstanding, the broad direction of change is as predicted for the period 1851-73.

In the final two periods, those of 1873-96 and 1896-1913, the trend in values of the index is broadly downwards. Inevitably there are some contrary observations, though not of any great magnitude. Looking across the period as a whole, from just before the French Revolution to the eve of the First World War, the general conclusion must be that price volatility decreased for all commodities, in all markets, over this long time span. As between the opening period of 1785-1913 and the closing period of 1896-1913, the median decline in the value of the index of volatility across all the price series was a striking 51%. The number of price series for which this could be computed was 24, drawing on all three market locations. The more muted behaviour of prices in the final period was especially pronounced for livestock as compared to cereal products, for reasons which are not immediately apparent.

The decline in the index for the different price series was virtually the same for the two regional markets, with Waterford experiencing a median decline of 49% and Belfast a median decline of 47%. The decline in the index over time for London was higher still at 58% but it is the similarity in the course of change in the three markets, rather than the small differences, that impresses. Placing these findings in economic context, we conclude that the British market largely shaped the price patterns of traded commodities before the repeal of the Corn Laws and the dismantling of agricultural protectionism. Thereafter, the international economy was the primary determinant as an increasingly globalised world economy, underpinned by innovations in transport and reflected in high levels of international trade (despite a partial retreat into agricultural protectionism in the later 19$^{th}$ century), enlarged the geographical boundaries of the various markets, and increased the diversity of climatic conditions within the supplying regions. This process of market integration, along with declines in transaction costs other than transport costs, served to

constrain (though not eliminate) price fluctuations arising from supply shocks affecting some but not all parts of the system.

## Price volatility along other dimensions

We might take these arguments a stage further and consider the likely behaviour of prices under the contrasting conditions of market-oriented production and subsistence- oriented production. While continuing to abjure the heresy of a dual economy for Ireland, at least in our period[17], the Irish price materials offer useful clues as to likely outcomes. In the Irish case we have two quintessential subsistence products, those of potatoes and peat (turf). To these might be added an intermediate good, hay, which was also only weakly marketed. All three share the unfavourable characteristic of being bulky and of relatively low value, and hence were used primarily in self-provisioning. On theoretical grounds one might expect subsistence products, defined as those for which only a small proportion of output is ever sold, to exhibit greater price volatility than heavily marketed goods. The demand for food, [18] and possibly fuel as well, is usually held to be inelastic, hence supply shocks produce disproportionate impacts on prices, making for price instability even under conditions of unchanging demand. As most food crops are affected by variations in climate and disease, and typically are produced only once or twice in the year rather than continuously under controlled conditions, supply shocks are inevitable.[19]

In the case of subsistence goods, however, there are additional forces making for price instability. To take one scenario, after a bad harvest the overall deficiency in the subsistence good gives rise to a disproportionate decline in the *marketed* surplus. This is because the producers of subsistence goods, in an attempt to maintain habitual levels of consumption, are likely to retain more of their now reduced harvest for self-provisioning.[20] A much diminished supply reaching the market inevitably drives up prices. After a bumper harvest, by contrast, the disproportionately large *market* supply – what is available after the usual subsistence needs have been met – serves to heavily depress prices. On top of that, subsistence goods with a large volume to value ratio, such as potatoes and peat, have limited market areas, thus the possibility of averaging supplies over surplus and deficit areas is less readily available. An internationally traded commodity, like wheat for example, stands in stark contrast.

Perhaps we can attempt to predict price volatility, not only by reference to the subsistence-oriented and the market-oriented distinction but also by reference to other economic properties. The following is a typology based on *a priori* reasoning, which is then tested by reference to Irish price data. We would suggest the following groupings:

- Subsistence goods
- Unprocessed cereals
- Processed cereals
- Processed livestock products
- Manufactured goods.

Of course there will be all kinds of individual exceptions. The typology simply attempts to capture distinctive clusters of price behaviour that are broadly observable. In terms of this hierarchy, subsistence goods should show the greatest price volatility (unless there are possibilities of low cost storage, which is usually not the case), while basic manufactured goods should show the least. Processed cereals such as oatmeal and flour occupy an intermediate position because the cost structure of the final product includes not only the cost of raw cereals but also returns to labour and capital which tend to be fairly stable in the short and medium term. Indeed in the case of labour, nominal wages can remain constant over long periods of time.[21] Similarly processed livestock products such as butter, beef and mutton also have a more complicated cost structure than potatoes or cereals, and thus more muted price variations are to be expected. Finally, manufactured goods are likely to exhibit the least price volatility because the production process is continuous, so allowing adjustments to output levels in line with market demand. The cost structure is also complex, with some stable or relatively stable elements contained therein. Needless to say, there will be exceptions, for example industrial goods subject to the whims of fashion, are not likely to fit this general picture. In addition, the labour element may not be all that stable in some subperiods, as for instance in the case of prolonged strikes that radically disturb supply.

We can test these propositions by reference to Irish price data. In Table 3 we present the evidence on price volatility, arranged according to the typology outlined above. The summary measure on the right hand side of the table is the average of the price volatility indices for the particular group of commodities. The average chosen is the median, so as to minimise the impact of extreme values. Each row shows the index of volatility for the commodities making up

each of the five groups within a specified time period. As in Table 2 earlier, the long time span is divided into five subperiods, beginning with the years 1785-1815.

Table 4. The Index of Price Volatility, arranged by five commodity groups.

**Group 1: Subsistence crops**

| | Potatoes | Hay | Peat | median |
|---|---|---|---|---|
| 1785-1815 | 0.5018 | | 0.3319 | 0.4168 |
| 1815-1844 | 0.3986 | 0.3142 | 0.2675 | 0.3142 |
| 1851-1873 | 0.2738 | 0.2885 | 0.2850 | 0.2850 |
| 1873-1896 | 0.3596 | 0.3101 | 0.1732 | 0.3101 |
| 1896-1913 | 0.3154 | 0.1830 | 0.0794 | 0.1830 |

**Group 2: cereals**

| | Wheat | Oats | Barley | Maize | median |
|---|---|---|---|---|---|
| 1785-1815 | 0.2337 | 0.2648 | 0.2835 | | 0.2648 |
| 1815-1844 | 0.2055 | 0.2497 | 0.2374 | | 0.2374 |
| 1851-1873 | 0.1854 | 0.1318 | 0.1359 | 0.1465 | 0.1412 |
| 1873-1896 | 0.1390 | 0.1514 | 0.0993 | 0.1334 | 0.1362 |
| 1896-1913 | 0.1162 | 0.1033 | | 0.1125 | 0.1125 |

**Group 3: processed cereals**

| | Flour | Oatmeal | median |
|---|---|---|---|
| 1785-1815 | 0.2939 | 0.3255 | 0.3097 |
| 1815-1844 | 0.1874 | 0.2262 | 0.2068 |
| 1851-1873 | 0.1667 | 0.1197 | 0.1432 |
| 1873-1896 | 0.1422 | | 0.1422 |
| 1896-1913 | 0.1537 | | 0.1537 |

**Group 4: processed livestock products**

| | Butter | Beef | Mutton | Pig meat | median |
|---|---|---|---|---|---|
| 1785-1815 | 0.1304 | 0.127 | 0.1170 | 0.2559 | 0.1286 |
| 1815-1844 | 0.1290 | 0.131 | 0.1388 | 0.2021 | 0.1348 |
| 1851-1873 | 0.0687 | 0.072 | 0.0740 | 0.1018 | 0.0729 |
| 1873-1896 | 0.0741 | 0.101 | 0.1164 | 0.1005 | 0.1006 |
| 1896-1913 | 0.0675 | | | 0.1160 | 0.0918 |

**Group 5: industrial products**

| | Coal | median |
|---|---|---|
| 1785-1815 | 0.1361 | 0.1361 |
| 1815-1844 | 0.1025 | 0.1025 |
| 1851-1873 | 0.2000 | 0.2000 |
| 1873-1896 | 0.1695 | 0.1695 |
| 1896-1913 | 0.1310 | 0.1310 |

*Sources*: the food prices are from Kennedy & Solar (2007); the peat prices are from the Franciscan Account Books, Galway and the *Belfast Newsletter*.

What of the findings? There is little doubt that the subsistence category of goods (Group 1 in Table 4) shows high levels of price instability until the late 19th century and there is indeed a strong contrast with the price behaviour of heavily market-oriented goods, as originally supposed. Potatoes are the outstanding example of this. The internal differences within the subsistence category are worthy of some note also. Hay is not perhaps the best example of a subsistence crop, being more of an intermediate product in farming (though an end product in urban markets), but peat is undeniably a subsistence crop, enjoying only limited local markets.[22] That it displays less price volatility than potatoes may be down to a number of factors. Unlike potatoes which could not be carried over from one season to the next, the storage of turf was possible, even if only practised to a limited extent as storage carries its own costs. Peat is not a crop, and hence a store of seeds does not have to be carried over from one season to the next. But most importantly perhaps, by the later 19th century, coal had penetrated all but the most remote areas of Ireland. One might expect the presence of an industrial substitute to moderate fluctuations in the price of a non-marketed or weakly marketed good. If so the later behaviour of peat prices seems to be a case in point. In the final subperiod the price volatility of potatoes was still high – there was no close market substitute – whereas the volatility of peat prices was remarkably low.[23]

It is somewhat surprising that the price behaviour of cereals is apparently not very different from that of processed cereals. To some extent the two categories are not directly comparable, as we have evidence for four types of cereals but only two types of processed cereals. If we confine the comparison to wheat and oats on the one hand, and flour and oatmeal on the other, then the expected result comes through, though hardly very decisively. We have yet to include bread in the processed cereals category, which should add an interesting

dimension, though it has to be borne in mind also that bread prices were controlled in the early years of our period.

As anticipated, processed livestock products, in this case butter, beef, mutton, pig meat, all show low levels of price volatility. Our one industrial product, coal prices in Belfast, is at the lower end of the price volatility spectrum but not as low as for the Group 4 products. Clearly a wider range of manufactured and industrial goods is needed to test the proposed typology more closely, though the coal price series is suggestive.

## Covariance of the Prices of Stape Foodstuffs

Although by the early nineteenth century an important share of the Irish population came to depend exclusively on potatoes, many in Ireland still ate both potatoes and cereals.[24] In the north of Ireland oats and potatoes were the two pillars of the diet, and oats were also eaten by farmers and others in social layers above the cottiers and landless labourers. In Irish towns both oats and wheaten bread were consumed along with potatoes. Even among the well-to-do, who in England would have eaten only bread, visitors to Ireland from the early eighteenth century onward remarked on the widespread consumption of potatoes. Of course, after the famine of the later 1840s, when the introduction of blight reduced the average yield and increased the variance of the potato crop and when the class of landless labourers had largely disappeared through death or emigration, cereals became again a a more prominent element in the diet.

The use of both potatoes and cereals for food suggests consideration of how their prices were related. Table 5 shows the correlation coefficients among potatoes, oats and wheat. First differences were used in order to eliminate the effects of the broad trends in prices.

Table 5. Correleation among staple crop prices (first differences)

| | Southern Ireland | Northern Ireland | London |
|---|---|---|---|
| Potatoes-Oats | | | |
| 1785-1844 | 0.66 | 0.83 | |
| 1808-1844 | 0.52 | | 0.65 |
| 1851-1913 | -0.06 | 0.38 | 0.01 |
| 1765-1784 | 0.53 | | |
| 1785-1814 | 0.68 | 0.85 | |
| 1815-1844 | 0.66 | 0.75 | |
| 1851-1872 | -0.07 | 0.45 | 0.05 |
| 1873-1913 | -0.07 | 0.38 | -0.03 |
| Potatoes-Wheat | | | |
| 1785-1844 | 0.68 | 0.66 | |
| 1808-1844 | 0.64 | | 0.48 |
| 1851-1913 | 0.25 | 0.13 | -0.03 |

| | | | |
|---|---|---|---|
| 1785-1814 | 0.70 | 0.68 | |
| 1815-1844 | 0.62 | 0.61 | |
| 1808-1844 | | | |
| 1851-1872 | 0.28 | 0.07 | 0.31 |
| 1873-1913 | 0.24 | 0.22 | 0.36 |
| Oats-Wheat | | | |
| 1785-1844 | 0.80 | 0.84 | |
| 1770-1844 | 0.79 | | 0.68 |
| 1851-1913 | 0.46 | 0.50 | 0.39 |
| 1770-1784 | 0.79 | | 0.34 |
| 1785-1814 | 0.82 | 0.88 | 0.68 |
| 1815-1844 | 0.79 | 0.78 | 0.72 |
| 1851-1872 | 0.72 | 0.68 | 0.55 |
| 1873-1913 | 0.17 | 0.27 | 0.11 |

Sources: see Table 1.

The correlations among the food crop prices have a number of interesting features. One is the persistently higher correlations of potato and oats prices in the north of Ireland. This may be the counterpart of the greater importance of a mixed diet in that part of Ireland. The continued use of oats in the north shows up as well in the still relatively high correlations there between potato and oats

prices in the later nineteenth century and the generally lower correlations there between potato and wheat prices in the same period.

But the most striking result of this exercise is the marked fall in the correlations between potatoes and the two cereals from before to after the Famine. The estimates for sub-periods show this was not a concealed trend. The late 1840s marked a sharp break in price behaviour. In the late eighteenth and early nineteenth centuries potato prices were significantly correlated with the prices of oats and wheat. During the second half of the nineteenth century prices were either essentially uncorrelated or showed only modest positive correlations.

What could have caused this sharp break? One possibility is the repeal of protection, which changed the U.K from a closed to an open economy as concerns agricultural products. The equally sharp drop in the correlations of prices in the London market indicates that this was not simply an Irish phenomenon. Against this interpretation can be set the somewhat different behaviour of cereal prices. The correlations of wheat and oats prices remained high through the 1850s and 1860s in all three places. If the opening of the U.K. economy detached the movements of potato prices from those of cereal prices, it is not clear why the same would not have been true among cereals. That said, it could be argued that it was not until the "grain invasion" after 1870 that supplies of wheat and oats were sufficiently independent of each other as to diminish the co-movement in their prices.

Another possible explanation is that consumption patterns among the potato-eating population of Ireland changed after the famine.[25] During and after the famine Ireland imported large quantities of Indian corn and meal. Some was fed to pigs and chickens, but much entered human consumption, particularly in years of poor potato harvests. Oats and wheat may no longer have been the main substitutes in consumption. However, there are a number of things which tell against this explanation. One is the simultaneous drop in the correlations between potato and cereal prices at London. Another is the relatively low correlation between potato and Indian corn prices in Ireland: it was only about 0.3. Finally, in post-famine Ireland there were equally large imports of wheat and flour and there is a good deal of evidence that bread was more widely consumed.

A third possibility is that the introduction of blight increased the variance of potato crops to such a degree that substitution in consumption was insufficient to keep potato prices in line with those of cereals. The blight, once introduced in 1845, remained present thereafter. Its effects on the yields depended on weather conditions and could, as shown in the late 1840s, be devastating. It is unfortunate that this last possibility cannot really be tested since there exist no quantitative time series for Irish potato output or potato yields (or, for that matter, for any crop yields) before 1847.

This last observation, as well as the mention above of the importance of substitution in consumption, is a reminder that the price movements being analyzed here are the market outcomes of both supply and demand factors. What may have been more immediately relevant to many in Ireland were harvest outcomes. If they grew both potatoes and oats, as was the case in the both the north and south of Ireland, their subsistence would have been determined in the first instance by yields. Here the use of two food crops may have helped smooth consumption. An analysis of newspaper reports on harvests in the northeast and southeast of Ireland from the late 1810s to the early 1840s suggests that there was only very weak covariation between the outcomes of potato and oats crops, with a slight tendency for them to be positively correlated in the northeast and negatively correlated in the southeast.[26]

## CONCLUSION

It is assumed on the basis of earlier work by the authors (Kennedy & Solar, 2007), that Irish markets, at least in eastern Ireland, were well-integrated from the end of the 18th century onwards, as is evidenced also by the Figure on Northern and Southern prices in the appendix to this paper. Price fluctuations, as measured by the index of volatility in this paper, further corroborate this finding for the port towns of Belfast and Waterford. In the first half of the 19thC it is apparent that the British market for foodstuffs drove prices in the neighbouring Irish economy. Good sea-links, duty-free access to the much larger British food market, and the relatively closed agricultural economy of the United Kingdom of Britain and Ireland, ensured this outcome.

The dismantling of agricultural protectionism, with the repeal of the UK's Corn Laws in 1846, served to change the conditions facing Irish food producers. Over

time, the the international economy came to exercise the decisive influence on Irish prices and hence on the prosperity, or otherwise, of Irish farmers.

One way of tracing changing market conditions and the changing trading environment is to look at changes in price volatility over time. While there are exceptions in particular subperiods that might repay further study, there is no doubt about the direction of change across a range of price series. The direction was unmistakably downwards. Price instability, and all the negative welfare implications that flowed from that, was considerably less on the eve of World War One that it had been in the years before the battle of Waterloo.

An attempt was made in this paper to create a typology of products by reference to price volatility. This requires further development and a wider range of commodities but the preliminary findings are suggestive. The apparent distinction between heavily marketed goods and subsistence goods – price volatility being much more pronounced for the latter – seems clear enough.

This in turn raises questions about the determinants of price volatility. Various influences – by no means comprehensively listed – are suggested in the paper, including market type and the role of competition, substitution possibilities, and innovation (as seen for example in the introduction of an effective antidote to potato blight). An innovation such as the development of low-cost methods of storage would also work in the direction of lowering price instability.

Finally, there is the issue of the covariance of prices. The key interest is in the major food sources, in the Irish case the two staples of potatoes and oats. In the half century or more before the repeal of the Corn Laws, potato prices and oat prices were strongly correlated. This does not necessarily mean that poor potato harvests and poor oats harvests coincided but rather that one foodstuff was substituted for the other, in the event of a significant deficiency in one or other of these staples. The relationship breaks down, however, after mid-century. In the Irish case this may be due in part to the advent of a relatively new, low-cost food alternative: maize. Indian meal was mainly fed to animals but there is no doubt it was also consumed by humans, particularly in years of dearth. But we also suggest other possibilities – and there are certainly mysteries here to be resolved. Finally, finally, it is perhaps worth emphasising the obvious: that prices are the outcome of *demand* as well as of supply conditions, in view of the tendency to focus on the more dramatic supply-side stories in the study of food prices.

## Appendix Table 1. Co-efficient of Variation for the Prices of Foodstuffs on the Waterford (Southern) market.

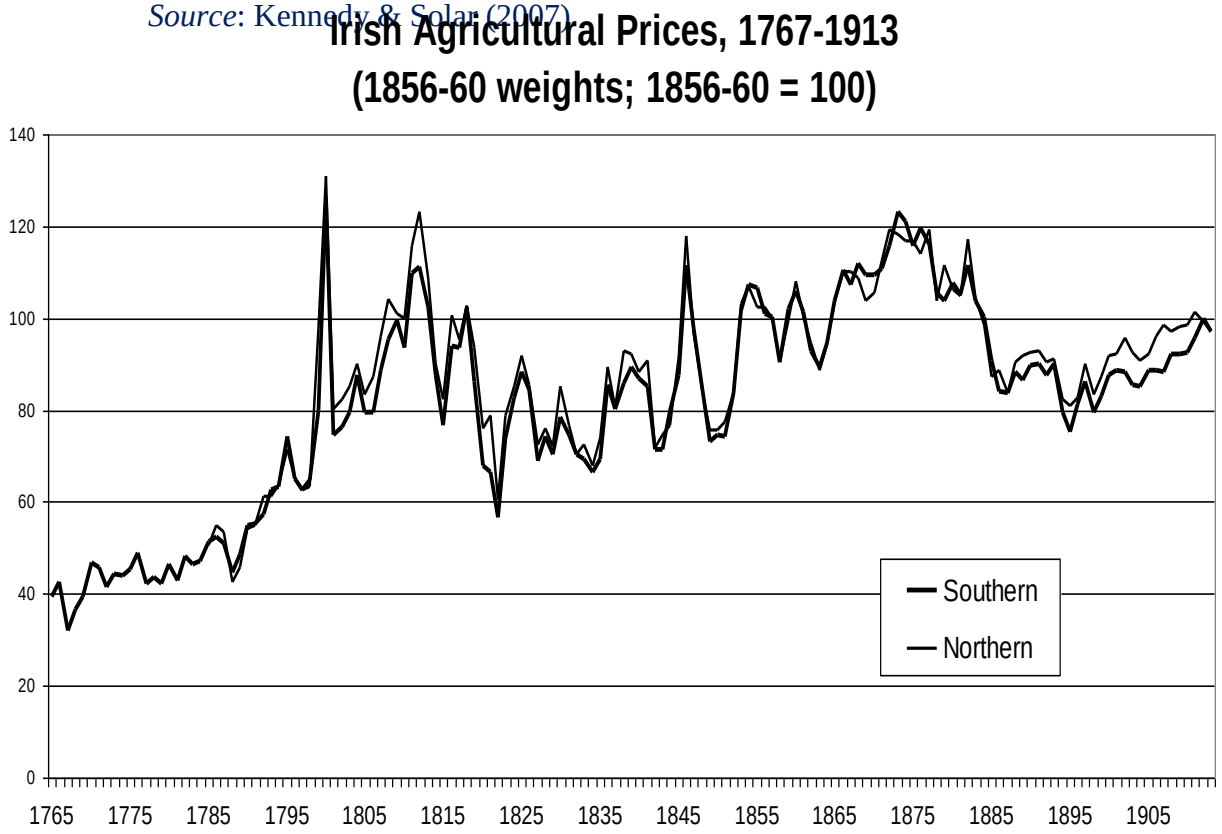
| | 1785-1815 | 1815-1845 | 1851-1873 | 1873-1896 | 1896-1913 |
|---|---|---|---|---|---|
| Wheat | 0.26 | 0.24 | 0.19 | 0.27 | 0.10 |
| Flour | 0.21 | 0.26 | 0.18 | 0.22 | 0.22 |
| Barley | 0.32 | 0.25 | 0.17 | 0.14 | 0.08 |
| Oats | 0.30 | 0.24 | 0.13 | 0.20 | 0.11 |
| Oatmeal | 0.33 | 0.21 | 0.12 | | |
| Maize | | | 0.17 | 0.21 | 0.16 |
| Potatoes | 0.59 | 0.35 | 0.22 | 0.33 | 0.21 |
| Hay | | 0.25 | 0.25 | 0.23 | 0.17 |
| Butter | 0.29 | 0.13 | 0.12 | 0.16 | 0.06 |
| Pigmeat | 0.32 | 0.21 | 0.10 | 0.14 | 0.14 |
| Offal | | 0.21 | 0.22 | 0.06 | |
| Beef | 0.17 | 0.15 | 0.21 | 0.16 | |
| Mutton | 0.24 | 0.15 | 0.16 | 0.10 | |
| Eggs | | | 0.17 | 0.09 | 0.10 |

*Source*: Kennedy & Solar (2007)

## Appendix Table 2. Co-efficient of Variation for the Prices of Foodstuffs on the Belfast (Northern) market.

| | 1785-1815 | 1815-1845 | 1851-1873 | 1873-1896 | 1896-1913 |
|---|---|---|---|---|---|
| Wheat | 0.31 | 0.22 | 0.19 | 0.22 | 0.10 |
| Oats | 0.34 | 0.24 | 0.13 | 0.13 | 0.10 |
| Oatmeal | 0.33 | 0.26 | 0.13 | 0.15 | 0.08 |
| Barley | 0.38 | 0.20 | 0.13 | 0.07 | |
| Maize | | | 0.14 | 0.18 | |
| Potatoes | 0.48 | 0.34 | 0.24 | 0.36 | 0.24 |
| Hay | | 0.23 | 0.28 | 0.24 | 0.13 |
| Butter | 0.28 | 0.14 | 0.12 | 0.14 | 0.08 |
| Beef | 0.23 | 0.09 | 0.16 | 0.10 | 0.07 |
| Mutton | 0.24 | 0.11 | 0.13 | 0.06 | 0.08 |
| Pigmeat | 0.32 | 0.22 | 0.12 | 0.13 | 0.14 |
| Bacon | | 0.16 | 0.11 | 0.10 | |
| Eggs | | 0.09 | 0.19 | 0.07 | 0.13 |

*Source*: Kennedy & Solar (2007)




Liam Kennedy (School of History, Queen's University, Belfast)

Peter Solar (Vesalius College, Vrije Universiteit, Brussel)

17/05/2011 23:22

[1] L.M. Cullen, An Economic History of Ireland since 1660 (London, 1972); Andy Bielenberg, CV
[2] Patrick Lynch & John Vaizey, Guinness's Brewery in the Irish Economy, 1759-1876 (Cambridge, 1960), p.

17.
[3] Lynch & Vaizey, p. 25.
[4] A.P. Thirlwall, *Growth and Development, with special reference to developing countries* (6th edition, London, 1999), p. 176.
[5] For an early and effective critique see Joseph J. Lee, "The dual economy in Ireland, 1800-50", in T.D. Williams, ed., *Historical studies, VIII* (Dublin, 1971), pp. 191-201.
[6] Joel Mokyr, *Why Ireland Starved* (London, 1985).
[7] Poor Law Inquiry (Ireland), British Parliamentary Papers, XXXV (1836), Appendix … K.H. Connell, *The Population History of Ireland* (Oxford, 1951).
[8] For some qualitative evidence on this issue, translated into quantitative form, see Peter Solar, "Harvest fluctuations in Pre-Famine Ireland: evidence from Belfast and Waterford newspapers", *Agricultural History Review*, 37(1989), pp. 157-65.
[9] In general terms, it is the standard deviation of $\text{Ln}(P_{t+1}/P_t)$ from year t= 1 to year n at the end of a subperiod.

[10] For a discussion of the source materials and the methodology see Kennedy and Solar (2007).
[11] Peter M. Solar and Jan Tore Klovland, "London Agricultural Prices, 1770-1913", *Economic History Review*, 64, 1 (2011), 72-87.

[12] L.M. Cullen, *Anglo-Irish Trade, 1660-1800* (Manchester, 1968).
[13] Lynch & Vaizey, p. 12.
[14] Nonetheless, the index for price volatility, while much higher in Belfast and Waterford as compared to London, was much the same for the two Irish centres.
[15] Kevin B. Nolan ed., *Travel and Transport in Ireland* (Dublin & London, 1973).
[16] Note on falling transport costs.
[17] Thequalification as to time period is important. There is at least a *prima facie* case for arguing for a dual economy in Ireland in the seventeenth century, though multiple economies might be a more appropriate image.
[18] On the inelasticity of demand for food products see Christopher Ritson, *Agricultural Economics: Principles and Policy* (London, 1977). See also Karl Gunnar Persson, *Grain Markets in Europe, 1500-1900* (Cambridge, 1999).
[19] Karl Gunnar Persson, "Price Volatility and Welfare (Conference Paper, Amsterdam).
[20] J.D. Gould, "Y.S. Brenner on Prices: A Comment", *Economic History Review*, New Series, Vol. 16, no. 2 (1963), 351-3 and also Gould, J.D. Gould, Agricultural Fluctuations and the English Economy in the Eighteenth Century", *Journal of Economic History*, Vol. 22, No. 3 (1962), 313-333.

[21] The stickiness of wages was pointed out by Adam Smith in the *Wealth of Nations*. For evidence to this effect on Irish wages see Liam Kennedy & Martin Dowling, 'Prices and Wages in Ireland, 1700-1850', *Irish Economic & Social History*, XXIV (1997), pp. 62-104.
[22] Naturally the physio-chemical properties of commodities matter. Potatoes are susceptible to weather conditions and to disease. The yield of hay, or dried grass, is primarily determined by weather conditions only.
[23] It would be interesting to explore price variation on a continous basis, rather than between extensive subperiods, because the case of potatoes offers a good test case for the impact of innovation on price instability, in this case the discovery of the Bordeaux Mixture as an antidote to potato blight and its use from the 1880s onwards in Irish and British agriculture.
[24] L.M. Cullen, *The Emergence of Modern Ireland, 1600-1900* (London: Batsford, 1981), pp. 140-171.
[25] L.A. Clarkson and E. Margaret Crawford, *Feast and Famine: A History of Food and Nutrition in Ireland, 1500-1920* (Oxford: Oxford University Press, 2001), pp. 95-101.
[26] Peter M. Solar, "Harvest Fluctuations in Pre-Famine Ireland: Evidence from Belfast and Waterford Newspapers", *Agricultural History Review*, 37 (1989), 157-165: 163-164.