<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>British agriculture 1860-1914</th>
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</thead>
<tbody>
<tr>
<td><strong>Authors(s)</strong></td>
<td>Ó Gráda, Cormac</td>
</tr>
<tr>
<td><strong>Publication date</strong></td>
<td>1991</td>
</tr>
<tr>
<td><strong>Series</strong></td>
<td>UCD Centre for Economic Research Working Paper Series; WP91/3</td>
</tr>
<tr>
<td><strong>Publisher</strong></td>
<td>University College Dublin. School of Economics</td>
</tr>
<tr>
<td><strong>Item record/more information</strong></td>
<td><a href="http://hdl.handle.net/10197/1481">http://hdl.handle.net/10197/1481</a></td>
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During the Industrial Revolution productivity growth in the agricultural sector was impressive (see Vol. 1, Ch. 7). That growth was founded on a combination of institutional changes (e.g. enclosure) and process innovations (such as the diffusion of fodder crops and better breeds of livestock). During the 'second agricultural revolution' (c. 1820-60), agriculture's productivity was boosted further, as farmers took advantage of artificial grasses and manures, clay-pipe drainage, and farm mechanization (Thompson, 1968). The increasingly capital-intensive 'high farming' of these decades took place largely in the context of a land tenure system which outlasted the period surveyed here: in 1914 almost nine-tenths of both holdings and cultivated area were rented by farmers from landlords (Ministry of Agriculture, Fisheries and Food, 1968).

Though firm estimates are unavailable, agricultural output may have doubled between 1800 and 1860 (Deane and Cole 1962: 170). Between 1816 and 1914, however, output failed to register any sustained increase, while agriculture's share in the gross national product of Great Britain dropped from about twenty percent to less than seven per cent (Feinstein, 1972: T4, T60). This need not signify 'decline' in any pejorative sense, since the change could have resulted simply from greater specialization in international trade. Indeed, though Britain had long been an importer of foodstuffs such as cheese from Holland and live cattle and grain from Ireland, her dependence on food imports grew rapidly after mid-century. The opening up of the vast American prairies for grain production, improvements

---

in long-distance transport technology both on land and on sea, and the
massive increase in the output of dairy products in parts of the European
Continent, were important developments for the British economy. Moreover, the
substantial rise in imports during these years - a fourfold increase in
wheat, a fivefold increase in butter imports, for example - was accompanied
by a sharp drop in the relative price of foodstuffs.

Nevertheless, the period is often regarded as one of agricultural
'decline' in a less trivial sense. As R.E. Prothero (Lord Ernle) wrote in
1912, 'Since 1862 the tide of agricultural prosperity ceased to flow; after
1874 it turned, and rapidly ebbed' (Ernle 1912: 377). Since he wrote, the
widening gap between agricultural and non-agricultural incomes has been a
recurring theme. A relative fall in landlord incomes at the time is
understandable, since (following Ricardo) rent levels might be expected to
bear the main brunt of free trade; however, similar trends in farmers' and
farm workers' incomes, if substantiated, need to be explained. The alleged
failure of British agriculture to respond to the challenge of foreign
competition and the opportunities presented by the shifting patterns of
consumer demand is the explanation most often given.

Despite auspicious beginnings it would seem that 'high farming' along
lines advocated by Alderman Mechi or the journalist James Caird was not
enough. As Kindleberger (1964: 243) put it, "it was left for Denmark, the
Netherlands and New Zealand to provide the bacon, eggs, ham and cheese in
which the British worker and middle class member chose to take such a large
proportion of their increased productivity. These countries did transform
under the pressure of British demand. The question is why it was they and not
the more strategically placed British agriculture?" By and large, the farmer
and the landlord have been given low marks for adaptability and initiative in
the mid- and late-Victorian era.
Table 7.1: The trend in agricultural output and incomes 1860–1914

<table>
<thead>
<tr>
<th>Period</th>
<th>1860/2</th>
<th>1870/2</th>
<th>1880/2</th>
<th>1890/2</th>
<th>1900/2</th>
<th>1910/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Agricultural</td>
<td>100.3</td>
<td>104.9</td>
<td>99.7</td>
<td>105.6</td>
<td>97.4</td>
<td>103.0</td>
</tr>
<tr>
<td>output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Agricultural</td>
<td>118.3</td>
<td>120.0</td>
<td>107.0</td>
<td>90.0</td>
<td>86.0</td>
<td>98.3</td>
</tr>
<tr>
<td>prices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Cost-of-</td>
<td>112</td>
<td>115.3</td>
<td>106.0</td>
<td>91.7</td>
<td>90.0</td>
<td>97.3</td>
</tr>
<tr>
<td>living</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Working</td>
<td>100</td>
<td>88.1</td>
<td>80.1</td>
<td>72.1</td>
<td>67.3</td>
<td>66.5</td>
</tr>
<tr>
<td>population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Average real</td>
<td>100</td>
<td>117.0</td>
<td>118.6</td>
<td>135.7</td>
<td>130.5</td>
<td>147.7</td>
</tr>
<tr>
<td>income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Class shares</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. landlords</td>
<td>22</td>
<td>23</td>
<td>27</td>
<td>23</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>b. workers</td>
<td>43</td>
<td>43</td>
<td>51</td>
<td>49</td>
<td>49</td>
<td>47</td>
</tr>
<tr>
<td>c. farmers</td>
<td>35</td>
<td>34</td>
<td>22</td>
<td>28</td>
<td>32</td>
<td>35</td>
</tr>
</tbody>
</table>

Sources: output, Feinstein (1972: T 118); prices, Mitchell and Deane (1962: 472–3, 343–5); labour force, Feinstein (1972, T 131), with the following adjustment: 50000 was added to Feinstein's total for 1861 to allow for seasonal labour inputs, declining by 10000 each decade; class shares from Bellerby (1968: 268), Feinstein (1972: T 60). Average real income from agriculture for 1860/2 was set equal to 100.

1. INCOME AND PRODUCTIVITY

But did rural incomes fall behind? A variety of evidence, ranging from cartoons in Punch to doleful data on bankrupt farmers, would suggest a decline even in absolute terms from the early 1870s to the end of the century. One survey, which relies heavily on such information, dwells at length on the 'deteriorating economic and social position' of the landed proprietors, and the 'falling' income of farmers, while conceding that labourers did not fare so badly (Ferry 1974: 91, 92, 126). The evidence presented to the Royal Commission on the Depressed Condition of Agricultural
Interests (1880-2), the Royal Condition on the Agricultural Depression (1894-7), and the Royal Tariff Commission (1903) is almost uniformly pessimistic. Reliable movements on the overall movement in incomes, needed to clinch the issue, are scarce, however, and not easy to construct. Table 7.1 attempts merely to provide a very approximate guide to the course of incomes adjusted for the change in the cost of living between 1861 and 1911. Since per capita income equals

\[(\text{Output in Current Price Terms}) \times (\text{Numbers Employed in Agriculture}) \times (\text{Consumer Price Index})\]

calculation of the standard-of-living index in column 5 of Table 7.1 is straightforward.

The figures imply that 1870/2-1880/2 and 1890/2-1900/2 were the most depressed decades as regards incomes. This in line with more impressionistic accounts. Besides, the former period includes 1878-81, years of dismally bad harvests and low prices, and the latter those years when agricultural prices reached their nadir. But Table 7.1 also suggests that mean income rose by almost a half over the half-century (from 100 to 148) and by about a tenth during 1870/2-1900/2. True, average real income is a somewhat elusive average, which is bound to conceal interesting variations across regions and classes. Regional differences, which have received increasing attention in recent years from historians, are discussed briefly on pp. 00-00 below. Meanwhile estimates of factor shares in agriculture in table 7.1, combined with census information on occupational structure, permit some broad generalisations on the incomes of farmers, farm workers and landed proprietors over the five decades. This tripartite division offers a useful means of presenting data. For example, the number of farmers in Britain fell from 312,000 in 1861 to 280,000 in 1911 (Orwin and Whetham 1971: 342); table
7.1, then, assumes that farmers' income rose on average by

\[
\frac{(1911 \text{ output})(\text{farmers' share})}{(1961 \text{ output})(\text{farmers' share})} = \frac{\text{number of farmers in 1911}}{\text{number of farmers in 1961}}
\]

\[
\frac{103.0}{100.3} \times \frac{35}{35} \times \frac{280000}{312000} = 1.14
\]

or by 14 percent. By the same token, since the number of landed proprietors hardly changed, their average income from the land fell by about thirty percent between 1880/2 and 1900/2, while the huge decline in the farm proletariat - from 1.4 million in 1861 to 0.9-1.0 million in 1911 - ensured those remaining on the land an average increase in incomes of over one-half.

The outcome suggests that growth in average real incomes in agriculture did not quite match that of the rest of the economy (compare Feinstein, 1972: T 118, T 131). However, a relative decline in per capita average income does not necessarily imply that resources were misallocated to agriculture; efficiency requires, in economic theory, the equalisation between sectors of the economy of marginal returns, not of average returns which are measured by average real incomes. In addition, table 7.1 suggests that there was a sharp rise in output per worker, which is often taken as a sign of increased efficiency. Labour productivity alone, however, may be a misleading guide to economic performance: the movement in total factor productivity, if it can be measured, provides a better guide overall 'progress' or 'decline'. Total factor productivity may be defined as a ratio of output to inputs, the latter weighted by their respective shares of output. As explained in ch. 00, its measurement is fraught with difficulties, both conceptual and practical. However, an increase in its size over time may be interpreted, though loosely, as a move towards greater efficiency in resource use, provided all inputs are included and properly weighted and measured. Accurate measurement
is often impossible, but the direction of the bias may be controlled.

In the present context, since agriculture is on trial for sluggish response, the input measures should, if anything, favour the null hypothesis of 'not guilty'. For this reason the indices have not been adjusted to allow for improvements in quality. The results, which are presented in table 7.2, suggest an annual productivity growth rate of 0.4 percent between 1871 and 1911 (compare Matthews, Feinstein and Odling-Smee 1982: table 8.3). While a positive growth rate may seem reassuring, in fact 0.4 percent is far from impressive. For instance, productivity growth rates up to 1 percent have been reported for Japanese and American agriculture in the pre First World War period (D. Andre, cited in Dumke 1988: 29; Kendrick 1961: 362-4). The British data are admittedly less precise, but refinement would probably reduce estimated British productivity growth. In addition the estimate for agriculture is also considerably below that for the economy as a whole over the period (see table 7.0). The result might thus be taken as evidence that this was indeed a period of 'decline' in British farming. But it does not explain the decline. There are several possible explanations, to which we now turn.
Table 7.2: Total factor productivity change in British agriculture 1871-1911

<table>
<thead>
<tr>
<th>Period</th>
<th>Inputs</th>
<th></th>
<th>Factor shares</th>
<th>Output (1870/2 = 100)</th>
<th>TFP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Land</td>
<td>Labour</td>
<td>Capital</td>
<td>Land</td>
<td>Labour</td>
</tr>
<tr>
<td>1870/2</td>
<td>100</td>
<td>100.0</td>
<td>100.0</td>
<td>23</td>
<td>63</td>
</tr>
<tr>
<td>1880/2</td>
<td>100</td>
<td>80.9</td>
<td>101.4</td>
<td>27</td>
<td>59</td>
</tr>
<tr>
<td>1890/2</td>
<td>100</td>
<td>81.8</td>
<td>114.9</td>
<td>23</td>
<td>64</td>
</tr>
<tr>
<td>1900/2</td>
<td>100</td>
<td>76.4</td>
<td>114.9</td>
<td>19</td>
<td>69</td>
</tr>
<tr>
<td>1910/2</td>
<td>100</td>
<td>75.3</td>
<td>108.3</td>
<td>18</td>
<td>69</td>
</tr>
</tbody>
</table>

Sources: Labour (col. 2) as in table 7.1; capital (col. 3), Bellerby and Boreham (1953), adjusted for use by Statist-Sauerbeck overall index in Mitchell and Deane (1962: 474-5); factor shares, Bellerby (1968: 264). For the share of labour (col. 5), the share of wages and farmers' and relatives' incentive incomes were added together.

2. The FARMER: SUPPLY RESPONSIVENESS

British farmers, landlords, and labourers have all been blamed, though not with equal conviction, for British agriculture's allegedly weak performance. Farmers and landed proprietors may have forgone income in order to remain within agriculture at a time of adversity (Bellerby, 1956). Alternatively, agriculturalists may have generated a low output simply because they shifted inadequately into those farm commodities yielding the best returns at any one time. Though the case for sluggish response, for the presumed "appalling obstinacy of the British farmer", is seldom cogently made, examples of behaviour which at first sight imply low allocative ability are numerous. R.H. Rew guessed that the refusal of livestock farmers to use the newly-developed weighbridge cost them as much as £7 million in 1888 alone (Perry 1974: 64), but this is ludicrous: £7 million was six percent of agricultural output in that dismal year, and the farmers' loss in any case was presumably somebody else's gain. In the same vein The Daily News complained in 1879 that "as to the ability of the English farmer to take out
of the hand of foreigners the trade in butter, no one doubts that they might have kept in the country most part of the £10,000,000 which was paid for imported butter in 1878". Other more mundane examples illustrate the alleged delay in switching resources to "safer and more promising openings" such as horticulture and dairying, in using the advantages of agricultural cooperation in production and marketing, and in applying cost-saving process innovations.

The list of seeming error and inertia is impressive. Nevertheless, to argue by anecdote is a gambit to be indulged in as a last resort, particularly since the documentation is not all negative, and some of it is open to different interpretations. Presumably farmer intelligence was distributed among the farm population around some average, as among the population as a whole: if so, individual examples might come from the upper or lower extremes of the distribution.

The agricultural and price statistics of the period, supported by background data on technical and institutional factors, permit a different approach. A broader focus raises its own problems, however. How slow is sluggish? "The British farmer" we are told. "does not act precipitately, but gradually alters his method over long periods of time" (Wrightson 1890: 281). Yes, but where is the dividing line between caution, impetuosity and sheer pigheadedness? A comparative approach to the problem at hand drawing on evidence from other countries, may help. But before turning to direct measures of supply response, let us examine briefly the change in the composition of agricultural output over the period.

Table 7.3 presents a picture of substantial shift in the composition of output between the 1870s and 1900s. Most notable are the decline in the relative importance of grain and the increase in milk production. Moreover, the figures conceal further shifts within these sectors. Thus during the
period both oats and barley acreages overtook that under wheat, while within
dairying butter and cheese gave way more and more to the production of liquid
milk.

The fall in the acreage under grain, which probably began before 1860
(Kain and Prince 1985: 173-4), is perhaps the best known aspect of British
agricultural transformation during this period. In retrospect the
transformation of dairying, though less emphasised by economic historians,
seems equally radical. It too took place against a background of increasing
intrusion from foreign producers, from Continental Europe at first and from
New Zealand after 1880. At a rough guess, between the 1860s and the First
World War British butter and cheese production declined by forty percent, but
liquid milk output more than quadrupled and milk consumption per capita
doubled (Taylor 1976, 1987). The rise in imports of dairy products shocked
jingoistic contemporaries, and the notion grew - and persisted - that British
dairying 'failed' in its struggle (Haggard 1911: 248-76; Kindleberger 1964:
243).

In reality, though, for most British farmers specialization in liquid
milk production made perfect sense under free trade conditions. Transport
costs and the problem of quick spoilage ensured that British producers had a
monopoly in the home market, and farmers who were suitably located could make
almost twice as much from their liquid milk, sold fresh, as from butter. Not
surprisingly it was only in remote areas, removed both from the railway
network and centres of consumption, that farmers persisted with cheese and
butter production on a large scale. By 1914 the bulk of British butter and
cheese production was confined to the south-west of England and Wales. Nearer
London and Manchester the proportion of dairy produce being sold in liquid
form reached nine-tenths, but in Wales it only slightly exceeded one half.
The regional variation reflected locational constraints rather than
differences in commercial acumen. Indeed, in the worst-endowed parts of the periphery, just as in parts of Ireland, not only were farmers in no position to get the high prices for liquid milk; the advantages of the centrifugal separator, available in theory from the 1880s, eluded them as well (Hall 1913: 325-7; Taylor 1987).

Table 7.3: Gross agricultural output of Great Britain 1870-6 and 1904-10

<table>
<thead>
<tr>
<th></th>
<th>1870-6</th>
<th>(%)</th>
<th>1904-10</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops</td>
<td>80.9</td>
<td>(41.4)</td>
<td>44.2</td>
<td>(28.5)</td>
</tr>
<tr>
<td>Animal Products</td>
<td>114.3</td>
<td>(58.6)</td>
<td>111.0</td>
<td>(71.5)</td>
</tr>
<tr>
<td>Total</td>
<td>195.2</td>
<td>(100.0)</td>
<td>155.2</td>
<td>(100.0)</td>
</tr>
</tbody>
</table>

Some individual items:

<table>
<thead>
<tr>
<th></th>
<th>1870-6</th>
<th>(%)</th>
<th>1904-10</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>26.6</td>
<td>(13.6)</td>
<td>8.4</td>
<td>(5.4)</td>
</tr>
<tr>
<td>All grains</td>
<td>49.8</td>
<td>(25.5)</td>
<td>20.1</td>
<td>(13.0)</td>
</tr>
<tr>
<td>Beef</td>
<td>34.8</td>
<td>(17.8)</td>
<td>29.4</td>
<td>(18.9)</td>
</tr>
<tr>
<td>Milk</td>
<td>27.0</td>
<td>(13.8)</td>
<td>36.5</td>
<td>(23.5)</td>
</tr>
</tbody>
</table>

Source: Ojala (1952: 210-1); Ojala's calculations for the United Kingdom have been adjusted by using (with slight corrections) the estimates for Ireland presented in Irish Agricultural Output 1908 (Dublin, 1912) and Solow (1971: 17).

Table 7.3 suggests that the British farmer of the late Victorian and Edwardian years was no exception to the rule that farmers as a group respond positively to market forces. Still, since what is at stake is an inadequate rather than a zero response to prices, a more exact notion of price responsiveness is required. We shall therefore examine the supply elasticity - the response of supply to a change in price - of one category of agricultural output, cereals, in more detail. Cereals, "the besetting temptation of British agriculture" according to Brodrick (1881: 296), were chosen because they have been the focus of much previous writing and - as we have seen above - contributed significantly to agricultural output. Reliable acreage and price data are available from the early 1870s (J.T. Coppock
1956) and can be used to obtain the supply elasticities shown below for Great Britain over the period 1874-1914:

<table>
<thead>
<tr>
<th>Crops</th>
<th>Short-run Elasticity</th>
<th>Long-run Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>0.63</td>
<td>1.11</td>
</tr>
<tr>
<td>Barley</td>
<td>0.35</td>
<td>0.76</td>
</tr>
<tr>
<td>Oats</td>
<td>0.26</td>
<td>1.63</td>
</tr>
</tbody>
</table>

Note: The structure estimated was that used by Fisher and Temin (1970). Data from Mitchell and Deane (1962: 78-9, 488-9). For a somewhat different approach, though giving similar results, see Olson and Harris (1959).

The results show, for example, that on average a 1 percent fall in the price of wheat produced a fall of 0.63 percent in output in the short run, and of 1.11 percent in the long run: if they seem 'small', they nevertheless are on a par with elasticities calculated for nineteenth century agriculture elsewhere. It seems unfair then, on this evidence to blame the British farmer for cereal 'over-production'. Indeed, because there were important cost-saving innovations in cereal production during these decades - see pp. 00 below - the response of farmers to changes in relative prices (the figures estimated here) must have been less than their response to changes in net revenue per unit output. If, as frequently suggested, cereal farmers were likely to be the least responsive group, that creates a strong presumption that response in other sections within British agriculture was 'adequate' at the time.

3. THE FARMER AND TECHNICAL CHANGE: THE REAPING MACHINE

Even if farmers were producing the right crops, perhaps they were not using the best methods, and in particular the best machinery? The mechanisation of British agriculture began before this period. Mid-century farming manuals, such as Henry Stephens' Book of the Farm or J.C. Morton's
Cyclopedia of Agriculture, contain descriptions of much of the machinery in use thirty or even fifty years later (Thompson 1968: 5-6). However, the post-1860 period saw the widespread diffusion and refinement of a few which showed earlier promise. The failures included the steam plough, the successes the threshing machine, the horse hoe, and the chaff machine (Collins 1972; Mutch, 1981). In this section we concentrate on the most documented and perhaps most important instance, the reaping machine.

The American reapers exhibited at the Crystal Palace Exhibition of 1851 were a great attraction, but British farmers were slow to adopt the new techniques at harvest time. While mechanisation of reaping in the American mid-west proceeded quite rapidly from the mid-1850s, in Britain the 1850s and 1860s saw only modest diffusion. Almost four-fifths of American small grain acreage was being cut mechanically by 1869-70, while the proportion in Great Britain was still less than half in 1874 (David 1975: 236). Was the delay simply another instance of British farmers' lethargy? The timing of the reaper's diffusion is a puzzle which still awaits an agreed explanation. A number of competing hypotheses has been put forward, but none has been generally accepted; the paucity and uncertainty of evidence on the temporal and spatial diffusion of machines and grain acreages, and on the regional differences in the wages of harvest labourers, leaves much room for argument.

It seems unlikely that either the organized hostility of agricultural labourers or the paternalism of farmers, who might have retained labourers when it was no longer strictly economic to do so, were significant factors in preventing diffusion in the second half of the nineteenth century. The most obvious explanation is that the speed of diffusion was a response to the relative costs and prices of the old and new methods. The reaper was a classic example of labour-saving machinery (Wilson 1864: 149; McConnell 1906: 237), and it has been suggested that the state of the labour market was an
important determinant of reaper diffusion. Until mid-century and later the British farm population - with considerable help, it should be added, from Irish seasonal migrants - was adequate to cope with harvest demands at low wages. Given the fixed cost involved in buying a reaper, diffusion was delayed by the relative cheapness of farm labour (Habakkuk 1962: 199).

However, the price of harvest labour relative to capital is not, by itself, sufficient to explain the speed of diffusion. Another possibility is that the smaller farmer for whom buying a reaper would have meant incurring a higher fixed cost per acre of grain, might have been less likely to adopt the new technique. This consideration has prompted the use of the concept of 'threshold acreage' (David 1975: 195-217). Income-maximizing farmers with an acreage above the threshold would buy a reaper, while others would cling to traditional methods. According to this interpretation the size distribution of farms is a crucial determinant of the spread of mechanization. Its usefulness as an explanation hinges largely, however, on whether the option of renting a machine, rather than buying outright, existed for the smaller farmer; if it did, then small size should preclude the use of a reaper.

Thirdly, it has been argued that the farming landscape in Britain was an added consideration: smaller fields, the use of open furrows for drainage, and blade-breaking stones, in practice meant an additional fixed cost element in preparing arable land for the reaper: 'Mechanisation of the corn harvest would have been a profitable undertaking on a great part of Britain's cereal acreage even at the beginning of the 1850s supposing only that the more serious among the terrain problems... could have been first removed' (David 1975: 244). In other words, the use of the machine required the use of a complementary third factor - proper terrain - whose improvement was more expensive in Britain than in America.

That does not exhaust the list of possibilities. A fourth was the change
in the productivity of reaping machines themselves over time. While harvesting techniques remained constrained by hand-tool methods, the scope for productivity increase was rather limited: as soon as cutting became what Marx called 'the mechanism of an implement', this was no longer so. Though the machines on show at the Crystal Palace had tremendous curiosity value, they were unwieldy for British use, liable to break down under British conditions, and difficult to service (Mutch 1981: 128). They were intended for the American prairies, which were flat, had few hedges and fences and whose crops were much lighter. But after 1851 refinements continued apace both in Britain and in the United States, as the patent records testify – almost three hundred reaper patents were taken out in Britain alone in 1850-70 – and competition between manufacturers was intense. Fourteen years after the Exhibition an observer could state of earlier superseded reaper models that 'they now rot in corners looking in comparison to modern reapers, like skeletons of the Mammoth and the Mastodon among recent animals'. Moreover, though the reliability and performance of the machines improved, price did not increase between 1851 and 1914. Finally, the diffusion of the reaper (and other farm machinery) may have been delayed for fear of the ensuing unemployment. Machinery introduced near the peak of the trade cycle could produce technological unemployment with a lag (Collins 1989).

Which of these interpretations best fit the available evidence? Though many instances might be cited of decent farmers retaining elderly or unproductive workers, it may be assumed that self-interest undoubtedly dominated in this sphere as elsewhere. Returning to the threshold model, there is only limited evidence for a market in reaper hiring and the informal sharing of reapers. Even if reaper hiring existed, the smaller farmer may still have been less in a position to switch techniques, since there could also have been a threshold – though a lower one – for hiring. More serious,
though, for the argument that a threshold was a constraining factor, is the objection that in mid-century most of Britain's small grains were grown on acreages exceeding the average utilisation of early reaping machines, if not their cutting capacity. The size distribution of farms is fundamental, since we are less interested in the number of farmers adopting the reaper than in the total grain acreage cut by it. David (1969: 30-1) has suggested fifty acres as the average annual use per reaper in 1850-1870, so the threshold model's main relevance is limited to grain acreages under fifty, where one would not expect to find a reaper being used. A farmer with more acres, say seventy, might be expected to use a combination of a reaper and hand labour.

The threshold model may thus help to explain the diffusion lags in Ross and Cromarty or Inverness, where the average cereal acreage was about seven in the early 1870s; it is certainly of less help in the case of the Midlands or East Anglia, where the average in mid-century probably approached fifty. Indeed, it is arguable that the model's potential coverage extends to only a quarter or even a fifth of Britain's grain acreage at the time, since the vast bulk of the crops were being grown on large farms. For example, average farm size in Hertfordshire in 1870 was eighty-one acres, but eighty-one percent of the land was on farms exceeding one hundred acres. The average size of those large holdings, in turn, was over 250 acres.

Contemporary cost comparisons of hand and machine methods - of which there are several - must be treated with care. However, a number of them, such as Jacob Wilson's careful and detailed study of the early 1860s, imply that the reaper was then a marginal proposition even in areas where harvest wages were relatively high. According to Wilson's calculations for Midlothian in Scotland the saving per acre on labour was about five shillings. But the average acreage cut in a season by Wilson's sample of 160 machines was less than fifty, and depreciation on a £30-£40 machine with a five year life -
considered usual at the time—would thus have accounted for about three shillings per acre. Nor does this take into account the extra outgoings on horses and oil associated with the new technique, items which might easily account for a few shillings per acre. Problems of terrain apart, then, Wilson's data are consistent with slow diffusion being the sensible option for Britain (Wilson 1864). The available figures therefore make the coexistence of hand-tools and machines quite plausible. Then, as emigration and urban employment tended to reduce the supply of seasonal workers in the 1860s—parliamentary returns suggest a twenty per cent rise in weekly earnings by task work in the 1860s—reapers became increasingly viable.

Improvements in the machines themselves provided an added spur. The earlier McCormick model was pulled by one horse, which also had to carry the driver, while another worker raked the cut crop from the machine as he walked alongside. The model exhibited in England in 1851 had a second seat, but was still very heavy, and tough on the horses. In the late 1850s "the attainment of a completely effective reaping machine [was] an object yet to be sought for" (Slight and Scott Burn 1858: 343). Yet within a few years several companies were producing a working model which could be operated by one man, and delivered to cut crops in sheaves. In addition, modifying the reaper was to a considerable extent a substitute for changing the landscape. Smaller and lighter machines were developed, which could more easily negotiate the furrows and enclosures which created problems for the earliest reapers. The late 1870s finally witnessed the introduction of a successful reaper-and-binder, the last word within a horse-drawn technology. By the end of our period, the cost of harvesting on all but the most intractable fields was four to six shillings per acre, while hand methods would have cost three to four times that much (Wrightson 1906: 99–106). Labour abundance considerations were no longer relevant, and the vast bulk of the grain was
mechanically harvested.

The reaper-and-binder, unlike its predecessors, would have paid even at the wage level of the 1850s. In the event, its arrival on the scene at the onset of the collapse in corn prices was a godsend to hardpressed farmers. It lessened the blow of the price slump, and limited the reduction in corn acreage, making it viable to grow wheat at thirty shillings a quarter, 'though no one will grow rich at the job' (McConnell 1906: 238). In sum, the pace of reaper diffusion is no argument against the British farmer: at an aggregate level, it would seem to have followed economic logic.

4. THE LANDOWNERS

The distribution of landed property in nineteenth century Britain was notoriously uneven. Using official data, Bateman estimated that less than 1700 'peers' and 'great landowners' owned two fifths of the total area of England and Wales in the 1870s (Brodrick 1881: 152-87). Yet relatively few people within British agriculture thought of a radical redistribution of landed wealth as a formula for radical recovery and progress. Such a plan was firmly ruled out by Gladstone at the onset of the depression: almost twenty years later a disillusioned member of the Royal Commission of 1894-7 found that body's majority report 'vigorous and uncompromising only in its defence of the existing land system' (Gladstone 1879; Channing 1897: i). There was no revolution in landed property at the time; the proportions of land under tenancy and owner-occupancy hardly changed.

Nevertheless, criticism of landlords after the middle of the century was widespread, though more restrained than in neighbouring Ireland. Landlords were charged with giving tenants no security of tenure and, on top of that, of refusing them compensation for unexhausted improvements which they had made. They were also blamed for unreasonably delaying rent reductions, and
for refusing tenants permission to convert arable land to pasture, when tillage became unremunerative. In such ways, landlords were thought to be responsible for not helping to give tenants 'a fair field' in their struggle against foreign competition.

While many examples may be found to support these criticisms, their overall importance has almost certainly been exaggerated. Initial landlord reluctance to permit the conversion of tilled fields to grass, and to reduce rent claims was normally short-lived. It would have been too much to hope that landlord expectations about future prices would adjust overnight after decades of relative price buoyancy: indeed, neither landlord nor tenant thought at the outset that the fall in prices would last. But surviving estate accounts suggest that most of the decline in 'rent received' was rather quickly reflected in the 'rent demanded' column (Rhee 1949). Even where cuts were delayed, there was usually a liberal attitude to arrears. While a small minority of landlords in the areas of the Celtic fringe - Wales and Scotland - still evicted for political reasons, such behaviour was atavistic by late nineteenth century British standards, and it was almost unheard of for a landlord to evict for non-payment of rent during a crisis year. The absence of litigation about 'tumbled-down' land, and of convincing statistical evidence, make it unlikely that landlords prevented tenants from adjusting land-use in response to the changes in relative prices.

It is true that conflicting claims about rents from interested parties, in newspapers and in oral evidence to Royal Commissions pose a problem of interpretation. What is most significant, though is the existence 'in nearly every county [of] a competition for farms' as late as the mid 1890s (Parliamentary Papers 1897: xv, 213). Such excess demand implies either very foolhardy tenants or, which seems more likely, attractive rent levels. A pro-tenant Royal Commissioner, in desperation, rationalised that 'with most
commodities, the supply tends to equal the demand: but the area of land in Great Britain is limited, and the number of land occupiers being recruited from so many sources is practically unlimited' (Parliamentary Papers 1897: ibid.). The dubious economics cannot conceal the apologetic nature of the argument.

In addition, although most tenants in Britain were on yearly tenancies by 1860, there is little evidence that lack of security in practice prevented them from improving their holdings (P.M.L. Thompson 1968: 76-7). This is because they were very rarely ejected and because systems of tenant right, formal and informal, were widespread at the time, and seem to have adjusted as economic conditions dictated. As free agents, tenants with cause for concern at lack of security could have insisted on special terms in their contracts; no evidence has been adduced for such pressure, nor, indeed, for any correlation between 'security' and tenants' outlays on the land. The replies to the questionnaire prepared by Assistant Commissioner Little for the Royal Commission of 1880-82 imply that those farmers in the south of England who complained loudest about insecurity were no more reluctant to spend considerable sums annually on lime and fertiliser than those who had tenant right written into their covenants (Parliamentary Papers 1882: v, 200-27). The same source suggests that despite legal changes, tenancies typically stayed for several decades within the same family. Finally, there is no sign that the land system materially hindered the development of fruit farming and market gardening at the time, though these involved considerable fixed outlays on the part of the tenant.

The traditional view, long associated in particular with Arthur Young and James Caird, that long leases were essential if tenants were to improve the land, therefore does not fit the facts of nineteenth century agriculture. Tenancy-at-will provided greater flexibility in the face of fluctuating
prices; indeed, the widespread use of long leases would have made adjustment during the depression itself more costly. On the other hand, whether tenancy-at-will promoted efficiency by keeping tenants on their toes is not clear, since the sanction of eviction was hardly ever applied. Individual proprietors, besides, had nothing to fear from a system such as tenant right in its English form, whereby farmers simply recouped the value of their fixed investments in the land.

In many of its aspects, therefore, landlordism did not act as a brake on agricultural adjustment during this period. The story does not end there. Landlord control of the Royal Agricultural Society (founded in 1838) has been blamed for diverting it for a time from the business of farming to that of entertaining landed peers and squires. Again, landlord economies in the area of landlord improvement have been blamed for exacerbating the crisis after the late 1870s: 'Successful adaptation... required from the landowner a certain level of expenditure, both on land and on farm buildings... [since] increased livestock numbers usually implied heavier expenditure on new buildings to house them, especially if the farmer concentrated on stall- or yard-feeding' (Goddard 1988: 64–xx; Perren 1970: 110, 111). An alternative interpretation has it that landlords, caught in a futile attempt at bailing out hard-hit tenants, were simply throwing good money after bad. This would be in the spirit of allegations about landlord investment during the decades of 'high farming' and earlier: it has been argued that much of their investment before the depression never paid and resulted in an over-capitalised agriculture (Chambers and Mingay 1966: 175–7). If indeed landowners channelled funds into agriculture which would have yielded a higher return in other sectors of the economy at the time, their action would have represented a subsidy to farmers, and reduced the flight of farmers from the land. However, a recent analysis of estate evidence suggests that at
least in the important case of under-draining landlords were well-rewarded for their considerable outlays (Phillips 1988).

The tripartite division of landlord, farmer, and labourer was associated with farms that were large by European standards (see table 7.4). The envy of European observers in an earlier era, some argued that large farms, managed by men who never got their hands dirty, made adjustment tougher and output smaller in the era under review: "England has too many farms too big for men prepared to use their hands and too small for men prepared to use their heads" (cited in Offer 1989: 107). A good deal of modern research suggests that both labour and total factor productivity is higher on smaller farms (e.g. Berry and Cline 1979). Still, this must not be taken as evidence that farming in, say, late nineteenth-century Derbyshire (where farms were small) was more efficient than in Ayrshire (where they were large). A 'survivor test' perspective on the trend in the size distribution of farms in table 7.4 suggests that most of the land (i.e. that taken up by farms in the 5-300 acre range) was on optimally sized farms between the 1880s and the 1910s (compare Grigg 1987).

<table>
<thead>
<tr>
<th>Year</th>
<th>&gt; 5</th>
<th>5-50</th>
<th>50-100</th>
<th>100-300</th>
<th>&gt; 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>1885</td>
<td>28.5</td>
<td>42.0</td>
<td>11.7</td>
<td>14.4</td>
<td>3.5</td>
</tr>
<tr>
<td>1895</td>
<td>22.7</td>
<td>43.3</td>
<td>12.8</td>
<td>15.6</td>
<td>3.6</td>
</tr>
<tr>
<td>1905</td>
<td>21.5</td>
<td>45.5</td>
<td>13.1</td>
<td>29.4</td>
<td>3.4</td>
</tr>
<tr>
<td>1915</td>
<td>21.3</td>
<td>45.5</td>
<td>13.1</td>
<td>16.2</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Source: Ministry of Agriculture, Fisheries and Food 1968: 19, 22

5. THE LABOURERS

Between 1860 and 1914, Britain's farm population dropped by about a
quarter, and the number of labourers by a third. The fall was accompanied, as already explained, by an increase in earnings of over a half over these years; it also brought a marked decline in interregional wage variations. The county data that form the basis for the calculations reported in table 7.5 indicate no sustained reduction in the regional spread of nominal wages (measured by their coefficient of variation) before the 1860s, but significant narrowing in ensuing decades.

Wage payments to labourers differed considerably between counties in mid-century, as the Scottish agricultural expert James Caird noted on his famous tour (1852: 510-9). Caird was surprised to find regular weekly wages for agricultural workers as low as seven shillings in Wiltshire and Gloucestershire, half what a labourer might earn in Lancashire or the West Riding. To some extent the gap may have been offset by the greater prevalence of task-work in the low wage areas during the summer months, but this is debatable; the semi-official returns collected in 1860 and 1870 suggest a strong positive correlation between regular wage- and task-work rates.

Caird's explanation for the phenomenon was the low mobility of rural workers, a reason supported by Clapham, though in less prosaic language: 'the men of Surrey may be pictured moving easily over their suburban sands; those of Essex, stuck beyond East London in deep clays or hidden in the folds of their north-western chalk', and so on for Buckinghamshire and Oxfordshire (Clapham 1938: 89-90). Others who took a less idyllic view of social relations in the countryside argued that the ignorance of their labourers left farmers in an enviable monopsony position, which the latter exploited to the full (see e.g. Parliamentary Papers 1893-4: xxxvi, 17).
Table 7.5: Regional wage variation 1790s-1890s

<table>
<thead>
<tr>
<th></th>
<th>1794-5</th>
<th>1833-45</th>
<th>1867-70</th>
<th>1898</th>
</tr>
</thead>
<tbody>
<tr>
<td>England and Scotland (n = 75):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>91.2</td>
<td>119.4</td>
<td>173.8</td>
<td>208.0</td>
</tr>
<tr>
<td>S</td>
<td>19.8</td>
<td>16.4</td>
<td>24.5</td>
<td>21.7</td>
</tr>
<tr>
<td>CV</td>
<td>.217</td>
<td>.137</td>
<td>.141</td>
<td>.104</td>
</tr>
<tr>
<td>England only (n = 42):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>86.4</td>
<td>104.0</td>
<td>126.6</td>
<td>180.3</td>
</tr>
<tr>
<td>S</td>
<td>11.4</td>
<td>13.6</td>
<td>15.8</td>
<td>24.8</td>
</tr>
<tr>
<td>CV</td>
<td>.132</td>
<td>.131</td>
<td>.125</td>
<td>.137</td>
</tr>
</tbody>
</table>

Source: derived from Hunt 1986: 963-6. 's' is the standard deviation, CV the coefficient of variation (i.e. 's' divided by the mean).

An alternative interpretation for this wage variation is that statistics such as Caird's reflect genuine productivity differences from county to county. This was sometimes suggested by contemporary observers, in the spirit of 'a Lancashire workman at half-a-crown (12.5p) a day is not dearer than most Welsh labourers at a shilling (5p)'. This is difficult to prove, given the variety of work carried out by farm workers. Harvest earnings arguably provide a possible clue, since the scytheman's work was similarly carried out in different areas. Reports that it cost only 7s 6d to mow an acre of wheat in the North Riding in 1860, while it cost 12s in Surrey may seem strong support for the Caird-Clapham view that there were persistent imperfections in the labour market. In fact, the story is less simple since crop yields as a rule were higher in Surrey, and thus demanded more work (David 1970; Clark, 1991). The crude test of the Caird-Clapham hypothesis suggested by table 7.5 - the comparison of day wages (measured in wheat purchasing power) and
reaping rates - suggests that much of the gap in day wages is explained in terms of productivity differences.

<table>
<thead>
<tr>
<th></th>
<th>Obs.</th>
<th>Winter wage (bu. wheat per day)</th>
<th>Reaping (bushels per man-day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. England, 1860</td>
<td>54</td>
<td>0.27</td>
<td>8.2</td>
</tr>
<tr>
<td>S. England, 1850</td>
<td>109</td>
<td>0.24</td>
<td>8.6</td>
</tr>
<tr>
<td>N. England and Scotland, 1860</td>
<td>17</td>
<td>0.34</td>
<td>12.6</td>
</tr>
<tr>
<td>N. England and Scotland, 1850</td>
<td>32</td>
<td>0.29</td>
<td>10.6</td>
</tr>
<tr>
<td>Ireland, 1860</td>
<td>20</td>
<td>0.18</td>
<td>5.6</td>
</tr>
</tbody>
</table>


In emphasising the productivity argument, Wilson Fox argued that the men of the north of England constituted 'a finer race, physically and intellectually, than the Southerner... because good feeding for generations has done much for them in body and in brain' (1903: 168-9). There is, indeed, evidence that labourers in low-wage areas in the south may have been earning less than the minimum amount needed to keep themselves and their families at full physical efficiency, even as late as the 1910s (Heath 1874: chs. 1 and 2; Rowntree and Kendall 1913). It does not follow, however, that it would have profited farmers to pay such workers more, a point sometimes urged by reformers. The farmers were probably being maximisers in paying the workers less than a 'living wage' (Pigou 1913), because the effort supplied by labour may have been inelastic with respect to the wage rate. Still, Caird's distinction between a northern high-wage and a southern low-wage area had some relevance even on the eve of the First World War (Hunt 1986).
Table 7.7: The age structure of agricultural workers

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of male agricultural workers aged over 45</th>
<th>Percentage of all males over ten years aged over 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>1871</td>
<td>31.7</td>
<td>25.6</td>
</tr>
<tr>
<td>1891</td>
<td>30.1</td>
<td>24.2</td>
</tr>
<tr>
<td>1911</td>
<td>30.7</td>
<td>28.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Median age of agricultural workers</th>
<th>Median age of all males over ten</th>
</tr>
</thead>
<tbody>
<tr>
<td>1871</td>
<td>28.6</td>
</tr>
<tr>
<td>1891</td>
<td>27.8</td>
</tr>
<tr>
<td>1911</td>
<td>28.8</td>
</tr>
</tbody>
</table>

Source: Census Reports of Great Britain

The release of labour into the industrial sector is one of agriculture's contributions to economic development. In nineteenth century Britain, though, the flight from the land gave rise to shrill complaints and polemics from interested parties. It was frequently suggested that agriculture after the depression was the refuge of aged and inferior workmen. The point is familiar in other contexts: those with initiative and drive leave, and employers must manage with a lazier, older, and duller workforce. Contemporaries such as Rider Haggard saw this trend as one of the reasons for agricultural decline: in more polemical vein, he and others argued that it represented a long-term security risk, since agricultural labourers had traditionally been the best soldiers in the realm. But those labourers who remained on the land must not be blamed for the farmers' and landlords' problems simply on the basis of anecdotal evidence from their bosses. The Census data shown in Table 7.7 lend no support, for example, to the view that the labourers were an ageing class over the period. Moreover, if the literacy of agricultural workers is a relevant input to agriculture, then British workers of the 1910s were far
better endowed with it than those of half a century earlier. The proportion of the farm labour force able to read and write force grew from about two thirds in mid-century to well over ninety-five per cent on the eve of the First World War.

Supply and demand factors both contributed to the reduction in the rural proletariat from 1.4 million in 1860 to less than a million in 1914. On the demand side the relative importance of mechanisation and the shift from tillage to pasture are difficult to gauge, because of poor data on machine diffusion and the labour requirements of machines of different vintages. Nevertheless, two labour-saving developments stand out. The reaping machine in its reaper-and-binder version saved two to three worker days per acre over traditional methods, meaning several hundred thousand harvest workers at full diffusion. Most immediately affected were Irish and urban seasonal harvesters, but the machine also undoubtedly allowed the farmers to reallocate work and therefore reduce their regular workforce (McConnell 1907: 237-9). The threshing machine, which came into its own after mid-century, may have involved even greater savings. While a man with a sail might manage six to nine bushels daily with difficulty, the contemporary threshing machine increased his output four- or fivefold (Collins 1972; Fenton 1976: 79-93). If one assumes that half the grain in Britain was still being threshed manually in 1860, then mechanisation of threshing would account for the loss of winter work for as many as two hundred thousand workers. Thus these two innovations alone could explain one half of the decline in the labour force. This finding emphasises the extraordinary labour intensity of traditional British agriculture and its handtool technology. By comparison the 'tumbling down' of arable land was less important: accepting the rule-of-thumb calculations of contemporaries, the conversion of three million acres between 1880 and 1914 could have meant one hundred thousand less jobs. However, there is no clear
correlation in the county data between decline in acreage under grain and decline in the agricultural labour force: fruit growing and dairying, which came to the rescue in some of the arable areas, could be more labour-intensive than grain-growing.

6. REGIONAL ASPECTS

The ownership of land was concentrated in very few hands throughout this period. 1688 peers owned over two-fifths of all the land in England, and concentration was greater still north of the border. Bedfordshire, divided between seventeen owners, and Sutherland, nine-tenths of which was owned by the Duke of Sutherland, stand out. Ownership was most widely spread in the home counties and East Anglia, and in north-west England, where the yeoman had survived (Rubinstein, 1986: 158; Ministry of Agriculture, Fisheries and Food, 1968: 19, 22). Farm size, too, was subject to considerable regional variation. Small farms predominated in the Highlands and Islands of Scotland, but farms over fifty acres predominated in lowland counties such as Ayr and Berwick. England and Wales were subject to regional contrasts too. Thus while farms of less than fifty acres dominated in the West Riding, Derby, or Carnarvon, well over one-half of all farms in counties such as Essex and Devon exceeded fifty acres.

Agricultural practice and specialisation differed markedly between regions and Great Britain. While comfortable farmers in the Lothians and East Anglia discussed the virtues of steam ploughing, liquid manure, or the cost of labour, one might still find in the Highlands or Western Isles of Scotland "the smaller and poorer crofters... [with] their families sitting around the fire... a while winter picking the corn from the straw and chaff", or hacking away at stony soils with caschrooms (McDonald 1972: 18). Yet such practices, even if the objects of outsiders' derision, were a sensible answer — short of
emigration - to a miserable land-labour ratio.

Farm output too was subject to marked regional variation (Overton, 1986). The southern and eastern counties, for example, were the main cereal-producing area throughout the period; the south-west had most orchards; Lancashire and Cheshire specialised most intensely in dairying. Since the price slump after the mid-1870s was confined largely, though by no means entirely, to grain prices, it is not surprising that a minority of the Royal Commissioners of 1894-7 felt obliged to point out that 'the depression has been and still is far more serious in the southern and eastern counties of the United Kingdom'. One fair indication of spatial spread is the fall in assessments of land value. In ten counties - Berkshire, Cambridge, Essex, Huntingdon, Kent, Norfolk, Northampton, Oxford, Suffolk, Wiltshire - assessments declined by over thirty per cent between 1879/80 and 1894/5, while in Cheshire and in Cornwall the decline was less than ten per cent over the same period (Parliamentary Papers 1897: xv, 10).

When wheat prices fell, farmers in the south and east reduced their acreage more slowly than elsewhere, and much of the reallocation that did take place was through 'tumbling down', i.e. disinvestment in the land, or through using it for other cereal crops. As a result the ten most depressed counties listed above accounted for thirty-one per cent of the wheat acreage in Great Britain in 1874, and forty per cent in 1913. But one should not conclude that the south-eastern farmer was simply more set in his farming ways than his northern or Scottish counterpart. We must take account of the fact that the stiff clay soils of the main corn counties were costly to switch to other uses, and that lower rainfall in the south east, while good for grain, also limited the growth of grass. Nor was the slower shift out of grain in the south and east due entirely to greater adjustment costs. Since the decline in wheat acreage was accompanied by an increase in the average
yield per acre, and by a tendency, though slight, for the dispersion in yields to narrow, it would seem that those counties which reduced acreage most were marginal wheat producers. So even if adjustment costs had been zero it is likely that acreage decline would have been less in the south-east.

Price trends and improving communications also affected the pattern of regional specialisation in livestock (Whetham 1979). Before steam navigation, most British cattle were brought to market by drovers, but the steamship and railway meant that animals could be sent direct to consumption points, quickly and without loss of condition. The change allowed some areas, previously too isolated, to concentrate on beef fattening (Perren, 1978: ch. 2). Fattening gave way to dairying in those areas where the latter was an economic proposition, as in the south of England, though less so in Scotland and Wales (Orwin and Whetham 1971: 137, 358). Pig numbers increased by about fifteen percent between the late 1860s and the First World War, but the increase was again subject to marked regional variation. The pig population grew most in dairying and potato- and fruit-growing counties, where feed was relatively cheap and increasing in supply, but decreased markedly in most of Scotland, Wales, and the English Midlands. The result was an increase in the coefficient of variation of pig numbers across counties from 0.98 in 1869/70 to 1.16 in 1909/10 - or from 0.57 to 0.71 for English counties alone. This is best interpreted as a move towards increasing specialisation by British farmers, as local markets merged into one national market.

Adjustment outside the south-east was less traumatic because soils were more adaptable. Indeed, it is likely that some mixed farming and dairying areas gained because of the decline in prices. This is because the relative fall in the cost of grain and other inputs decreased their feeding costs.

Free trade and cheaper long-distance transport paradoxically improved their competitive position. Fletcher has argued that in Lancashire milk producers...
could buy maize and oilcake for a third less at the end of the century than thirty years earlier, while the prices of their output, milk, hardly dropped at all. The same can be said for poultry and pig farmers (Fletcher 1961).

What of factor movements between regions? Though precision here is impossible, emigration from rural areas almost wiped out the natural increase: in England alone, the population of England more than doubled between 1841 and 1911, but that of rural areas rose by only 13 percent (Baines, 1985: 215-7). Farm labour accounted for much of this migration. The migration of farmers was less important. The British system of land tenure, at least in theory, encouraged an active land market and thereby mobility. A rent-maximizing landlord would let to the group of tenants—presumably a shifting group—offering the highest prospective return on his property. But in practice this did not generate much farmer mobility, particularly between regions. The post-1880 period marked the real beginning in Britain of a long-range migration of farmers within the agricultural sector. The migration was largely from the north and west to the south and east: contemporaries noted especially the influx into Essex and Suffolk from Scotland. The farmers moved largely because they were prepared to accept a lower return on their labour and capital than their southern and eastern counterparts. 'They and their families', reported Assistant Commissioner Wilson Fox to the Royal Commission of 1894-97, 'work immensely hard. The Scotch women certainly undertake work which no Suffolk woman would dream of doing', while the men 'practically take the position of working foremen or bailiffs, being up in the morning when their men arrive and occupied with work connected with the farm after they leave at night' (Parliamentary Papers 1895: xvi, 67-8).

7. FREE TRADE: AGRICULTURE AND THE CONSUMER

Before mid-century Britain's livestock sector was protected by transport
technology from intense foreign competition. Our period saw a marked rise in imports of sheep and cattle, coupled with a shift towards distant sources of supply such as Argentina and New Zealand, and towards dead meat (chilled and frozen) over live animals (see figures 1-4 and Perren 1978). The price of meat declined, but the rise in meat imports did not prompt the same clamour for protection as did that in corn.

In 1848, soon after the repeal of the Corn Laws, free trade campaigner John Bright reminded fellow-members of the House of Commons that 'the industry of this great and growing population has escaped from the pressure of that screw, which, through the medium of the Corn Laws, you had laid upon the necessaries of life' (Bright 1869: 428). Yet the relative prosperity of the 'high farming' decades, evidence that the acreage under corn held its own for a time (Kain and Prince 1985: 173-4), and especially the buoyancy of corn prices, has led some to the conclusion that Corn Law repeal was of less economic than political import. Thus Kitson Clark has argued that 'the attack on the Corn Laws should not be considered for a moment as a clear demonstration of economic truth, nor even as a passionate statement of economic opinion, but more as an outpouring of social opinion, using a symbol or a myth as a catalyst' (1951: 3). The argument may be true, but the usual evidence for it is inconclusive. It neglects the unprecedented increase in corn imports that took place during the 1850s and 1860s, a rise which the uncertainties of the 'sliding scale' and the attendant risks for corn exporters before repeal would almost certainly have made impossible. Indeed, in the decade before repeal, imports of corn accounted for only a twelfth of total consumption, while by 1869/71 they were almost half. The assertion that the price of corn would have been the same, repeal or no repeal, is therefore false. The benefit to consumers, it is true, became more visible after 1879, when corn prices began to fall markedly. By 1888/92 domestic production of
wheat had fallen to two-fifths of consumption requirements; on the eve of the First World War the proportion was slightly over one-fifth.

What, then, were the quantitative effects of free trade in corn? Supply and demand curves offer a simple method of estimating the static gains and losses to British consumers and producers of free trade in corn, and in particular wheat. The corn market before repeal can be represented as a result of a tariff imposed on the world price of corn pushed the British price up, encouraging British farmers to supply more, and (incidentally) encouraging British consumers to demand less. This was the entire point of the tariff: to enrich agriculture at the expense of the rest of the nation.

In Figure 7.5 the enrichment of agriculture is the shaded area, the rental income lost by repeal. Point A is the actual domestic output of wheat and its price after repeal. In 1888–92, for instance, it was a quantity of 7.4 million quarters (of eight bushels each) selling for about 32 shillings a quarter. Point C cannot be observed from the historical data: it is the counterfactual output and price, i.e. the output and price that would have been observed had a tariff (of eighteen shillings) brought the 1888–92 price back up to its pre-repeal level of about 50 shillings a quarter. We could estimate C if we knew the slope of the line from A to C. We do not know it, but we can make a reasonable guess (in the light of the results given above, p. 00) that it was roughly the slope corresponding to unit elasticity, i.e. that the supply curve was roughly a ray through A and the origin O. In such a case domestic output would, under a tariff, go up in proportion to the rise in price, namely, in the proportion of 50 to 32. The actual domestic output of 7.4 million quarters of wheat would therefore have been 7.4 multiplied by 50/32, or 11.6 million quarters. Now it is a simple exercise to find the area of the trapezoid: its height (18 shillings per quarter) multiplied by the average of its lengths (7.4 and 11.6 million quarters), or
(18s. per qr).\[\{(7.4)(11.6)\}/(2)\ m. qrs\] = 171 million shillings.

or £8.55 millions. This figure is some 5 per cent or so of all agricultural income in 1888–92, or well below 1 per cent of national income. What producers gained, consumers lost, at least approximately — the other large element of the consumers’ loss was the government’s revenue on this account would have been offset by lower taxes imposed on consumers at some other juncture. Curiously, the farmers’ and landlords’ campaign for an import duty of five percent in the 1890s and 1900s (Fussell, 1983) mirrored closely the implied transfer to agricultural producers prior to repeal (for corroboration, Williamson 1990).

The transfer from consumers to producers was not the only issue in commercial policy, especially in the early years of the twentieth century. The United Kingdom became increasingly dependent on food imports after repeal. While repeal itself and population growth was largely responsible for this, the role of technical developments in transport and storage should not be forgotten. Half the price reduction in American wheat was due to lower freight charges, while new cold storage and refrigeration techniques allowed the importation of frozen meat and New Zealand butter from the early 1880s on. By 1910–4 consumers relied on imports for the greater part of their bread, butter, cheese, and fruit, as well as forty per cent of their meat and a third of their eggs. Not surprisingly agricultural protectionists increasingly returned to home truths in the style of Adam Smith about defence being of more importance than opulence. They warned against the dangers of ‘a hostile combination of European nations’ starving Great Britain into submission, arguing in effect that the gains from free trade were rapidly diminishing as the probability of open conflict increased. The cost of such an insurance policy of self-sufficiency in grain, however, would have been
substantial. And the silliness of such a policy - plain to all except some farm lobbyists - was underlined by a member of parliament who pointed out that self-sufficiency for insurance amounted to assuming that Britain 'was going to be at war with all the nations of the world for ever' (Hansard 1902(CI): 1160). Government policy was to rely instead on a strong navy to meet any potential blockade, and on the substitution possibilities within the economy itself to increase domestic food supplies in the short run, if necessary. This policy was vindicated when war came in 1914 (Offer 1989: part 3).

8. CONCLUSION

By 1914, Great Britain relied on imports for more than half its food. Its agricultural labour force, which peaked in 1861 or thereabouts, declined almost continuously after then, as did agriculture's share in GNP. No other country experienced such a transformation during the nineteenth century. The change was naturally not without some trauma: for farmers who relied on cereals for most of their income, these were trying decades. For them there was indeed a 'Great Depression' in terms of farm incomes, though for others the picture was much less bleak. Moreover, British agriculture performed badly in the face of foreign competition, judged at least by its very slow total factor productivity growth. We have suggested that slow responses within agriculture itself were less to blame for 'decline', than the gradualness with which the farm population reconciled itself to a reduction in numbers. Between 1860 and 1914 the number of farmers dropped by ten per cent, but all this drop occurred before 1881. Evidently for every farmer who died or moved out of agriculture, there was a son - or a Scotsman - to replace him. Contemporaries argued that many farmers 'were dipped to deep to move', while others remained on in the hope of getting 'a reasonable amount
of their capital back' (Bellerby 1956: 65). A more important reason surely is that the psychic income element in British farming was large, and stemmed the outward flow before the First World War. A more substantial fall in the farm population would undoubtedly have meant lower domestic agricultural output, and probably some of the most marginal land going out of cultivation. On the other land, it would have meant a more efficient use of resources, and therefore a higher productivity growth over the period.

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Wheat Imports (1000 cwt.)
1840-1913

The Relative Price of Wheat
1840-1913

Figure 7.1
British Cattle Imports
1865/9-1910/3

British Beef Imports
1880/5-1910/3
Figure 7.4

The effects of free trade in corn