<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>The economic impact of the famine in the short and long run</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Authors(s)</strong></td>
<td>O'Rourke, Kevin H.</td>
</tr>
<tr>
<td><strong>Publication date</strong></td>
<td>1993-12</td>
</tr>
<tr>
<td><strong>Series</strong></td>
<td>UCD Centre for Economic Research Working Paper Series; WP93/31</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/10197/1743">http://hdl.handle.net/10197/1743</a></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>A hard copy is available in UCD Library at GEN 330.08 IR/UNI</td>
</tr>
</tbody>
</table>
The Economic Impact of the Famine in the Short and Long Run

by

Kevin O'Rourke
Department of Economics
University College Dublin

Working Paper WP93/31

December 1993

CENTRE FOR ECONOMIC RESEARCH

UNIVERSITY COLLEGE DUBLIN

Department of Economics

BELFIELD, DUBLIN 4, IRELAND
The Economic Impact of the Famine
in the Short and Long Run

Kevin O'Rourke
Department of Economics
University College Dublin

December 1993

Paper to be presented at the AEA annual meetings, Boston, MA, 1994. I am grateful to Cormac Ó Gráda for extensive comments on an earlier draft.
The Economic Impact of the Famine in the Short and Long Run

Kevin O'Rourke

The Irish famine of 1845-49 stands out as one of the great disasters of the 19th century: the last major famine in Western European history, occurring in the backyard of the then dominant world power. Excess mortality amounted to roughly one million, or over one ninth of the population: on these scales, the disaster ranked with the Bengali famine of 1943-44. A wave of emigration was triggered which left its mark on the economies and societies of the new world.

Moreover, this famine had permanent effects. The role of the potato was radically diminished. As Table 1 shows, a half century of rising population prior to 1841 was followed by a fall in population which persisted up to the 1960s. The structure of agriculture changed dramatically (Table 2), with the share of crops falling from 55.5% before the famine, to 36.4% a decade later, to only 12.5% at the start of this century. Ireland had been a net exporter of grain until the Famine, when it became a large net importer, another permanent change (Figure 1).

'Revisionist' Irish historians, reacting to earlier, overly nationalistic writing, have on occasion tried to downplay the significance of the potato in the pre-Famine economy, and that of the Famine as a long run instrument of change. Cliometricians have in turn tended to revise the revisionists. Joel Mokyr (1981) found that the potato had an important influence on pre-Famine population trends, revisionist claims to the contrary notwithstanding.
Similarly, in an earlier paper [O'Rourke (1991a)] I argued that the Famine had a lasting impact on post-Famine Ireland, again contrary to some revisionists.

Their claim was that the international rise in animal product prices relative to cereal prices in the decades after 1845 would have produced these shifts in production anyway (and hence, since tillage was labor-intensive, and animal husbandry land-intensive, a decline in employment). In the long run, falling transport costs were bound to reduce grain prices in Europe. Relatively non-tradeable products such as milk and butter (and meat too, before the introduction of refrigerated shipping towards the end of the century) were unaffected by these trends, and indeed their prices increased as European urban consumers became more numerous and affluent. The net result was an increase in the relative price of animal products (Figure 2). Karl Marx, John Elliot Cairnes and others have claimed that these price trends on their own explain the switch from tillage to pasture, and also the decline in the Irish population.

This argument falls down for two reasons. First, animal husbandry was potato-intensive before the famine, and potato cultivation was extremely labor-intensive. More cattle would have implied more potatoes, and hence more employment. Second, agricultural prices generally were rising before 1876 (Figure 2). In a world where wages were stuck at subsistence levels (as was true in pre-Famine Ireland), the general rise in agricultural prices was a further factor leading to increased agricultural employment. Indeed, Figure 2
understates the rise in prices, since the price indices are calculated using fixed (pre-Famine) weights. Wheat prices declined sharply between the Famine and the 1870s, while oats, barley and flax prices rose. A price index incorporating flexible weights would show tillage prices rising by roughly 20% between the Famine and the mid-1870s, rather than remaining constant, as in the figure.

Surely the Famine influenced the long run evolution of the economy: the question is how?

I. The short run impact of the Famine

Potatoes were the linchpin of the pre-Famine economy. We all know about their function as a wage good; but potatoes were also fed to animals, and played a crucial role in crop rotations. A major form of saving consisted of feeding potatoes to pigs, which were sold in the summer months when the potato crop of the previous autumn had been exhausted. Blight hit Ireland in 1845, partially destroying the potato crop. The crop was completely destroyed in 1846. In consequence very few potatoes were planted in 1847, a year when the blight was absent. This encouraged more potato growing in 1848, when, however, the blight struck again. The result was that Ireland was largely without potatoes for four years. How did the economy respond?

Available agricultural statistics (Tables 3 and 4) show the collapse in potato cultivation during the famine, as well
as its gradual recovery afterwards.\textsuperscript{1} The potato acreage never
got close to its pre-Famine level, however [Bourke (1993, Ch.
11)]. Pig and poultry numbers also collapsed, and the numbers
of sheep declined, as peasants consumed their capital.
Initially the area under grains increased, as farmers
substituted away from the potato; the wheat acreage soon
started to fall back, however.

The statistics also show a continual rise in the numbers
of cattle, both during the famine and afterwards. The famine
clearly had dramatic short run effects on the Irish economy.
More interesting, maybe, is the fact that once the famine had
run its course, and the economy had settled into a new
equilibrium, the structure of the economy had changed
significantly. The potato never recovered its pre-Famine
position. By the mid-1850s, wheat production was
significantly down on pre-Famine levels, and cattle numbers
were significantly up. Table 5 gives Solar's data on
agricultural production before and after the Famine, broken
down into animal products, potatoes, and other crops, in

\textsuperscript{1} Agricultural statistics were compiled as part of the
1841 census, and were collected by the police force on an
annual basis since 1847. They must be treated with caution
for the period which interests us here, since coverage and the
general quality of the data would naturally have improved over
time. The total area under cultivation, and the numbers of
livestock, were probably underestimated early on, biasing
upwards growth rates implicit in the official statistics.
Tables 3 and 4 give the official data on land use and
livestock numbers. They have been amended in two ways. In
Table 3 the pre-Famine land use estimates are Solar's; in
Table 4 the 1841 figure for cattle has been amended to include
calves aged a year or less (not counted by the Census takers),
and to correct for the fact that 1841 represented a trough in
cattle numbers. The correction for young calves is Crotty's;
the resulting number is then multiplied by 1.1, as Solar
suggests. Otherwise the figures are unchanged.
constant (pre-Famine) prices. Relative to their pre-Famine levels, tillage output was down 21.3%, potato output was down 75%, and the volume of animal products was up 30.8%.

An obvious explanation for this would be that relative price changes caused the shifts in production. However, output movements had already largely taken place by 1854, as Cormac Ó Gráda has shown; but relative prices did not start to move strongly against tillage until 1856. If the famine was at least partly responsible, what were the mechanisms at work?

One obvious possibility, raised by Ó Gráda (1989), is that the Irish potato, which has already (mistakenly) given textbooks their example of a Giffen good, may also have provoked a classic example of the Rybczynski theorem in action. Did the fall in Ireland's labor endowment, caused by the Famine, lead to the contraction of labor-intensive tillage and the expansion of land-intensive pasture? The problem, as Ó Gráda notes, is that the ceteris paribus conditions of theory were no more present on this occasion than they ever were. Declining potato yields, and (by the late 1850s) changing relative prices, might also have led to the output movements observed.

We therefore need to ask the counterfactual question, "What would have been the impact of a declining population on the Irish economy, in the absence of other exogenous shocks?" CGE models are of course ideally suited to ask such questions. O'Rourke (1991a) constructed such a model, calibrated to pre-Famine data. There are three sectors in the model, tillage, pasture and potatoes. The outputs of the first two sectors,
cereals and animal products, are traded, and their prices are exogenous. Potatoes are non-traded. In addition the model incorporates other largely intermediate products produced by the three sectors—straw, hay, dung and manure. There are four factors of production: labor, capital, land, and 'expertise', the returns to which represent the income received by tenants in excess of their wage income. Standard competitive assumptions are made, with two exceptions (designed to capture the peculiar flavor of the pre-Famine Irish economy). Workers and farmers consume a fixed amount of potatoes per capita; and in most runs, wages are exogenous and linked to potato prices, with employment then being endogenous.

The model attempts to incorporate as many features of the real world as possible, and is thus more general than the 2x2 model of the Rybczynski theory. For example, the model incorporates a third, non-traded, sector. Whether a reduction in the endowment of labour in such a model leads to the output responses predicted by Rybczynski in the context of the 2x2 model is a purely empirical issue. Agricultural employment fell by 29% between 1841 and 1856.2 If one imposes this shock on the pre-Famine model (letting wages adjust endogenously, of course), the result is that tillage output contracts by 17%, and potato production by 15%, in line with the predictions of the theorem (see Table 6). However, pastoral products production also contracts, although only by 3%. It thus appears that the decline in population caused by the Famine

---

2 O'Rourke (1989), Table 3.1, p. 58.
can explain a lot of the decline in tillage, as well as some of the increase in the share of animal products in agricultural output. It cannot, however, on its own explain the increase in animal husbandry, nor the dramatic fall in potato production.

II. The long run impact of the Famine

In any event, the Rybczynski theorem would be incapable of answering a further question: why did the Irish population, and therefore the structure of Irish agriculture, not revert eventually to pre-Famine modes? Did the Famine in some way permanently alter the structure of the Irish economy?

As indicated earlier, potatoes were at the heart of the pre-Famine rural economy. Blight became a semi-permanent fixture until the end of the century, when effective treatments were found. Solar (1989, p. 120) estimates that net potato yields per acre after the Famine were 38% lower than before 1845. He also finds that the price of potatoes relative to cereals remained between 50% and 100% higher than its pre-Famine level through the early 1860s. It is difficult to separate empirically the exogenous fall in yields from declining labor intensity, especially since the former, by raising the price of the wage good, would have induced the latter. Nevertheless, that potato yields did permanently fall in the wake of the Famine is not in dispute.

McGregor (1984) argues that in the short run this would have led to higher wages, less employment, and a switch from tillage to pasture. This wage effect might have applied in
the very short run (a few months, say), but it is more likely that farmers were constrained by a shortage of labor as the Famine progressed (as in the previous section) rather than by an increase in the subsistence wage. Eventually workers would have shifted to cereals consumption, which would have cut the link between potatoes and wages. In the longer run, dearer potatoes would presumably also have led to less intensive agriculture, with cattle eating fewer potatoes.

CGE models are of course unsuited to examining structural change. However, they are good at disentangling the separate effects of different, but closely related shocks through counterfactual analysis. For example, one could ask "What would have been the effects on the Irish economy if potato yields had declined, and nothing else changed?". The 'yield' run in Table 6 reduces pre-Famine potato productivity by 25%, a reasonable estimate. Nominal wages are held constant, to abstract from the wage good effect mentioned above. The results are surprising, but easily explained. Pre-Famine diets were overwhelmingly potato based, and the model thus incorporates no substitution between potatoes and other goods. If farmers and their workers had continued to eat potatoes in the same amounts, potato output would only have declined a little. More resources would have had to be devoted to potato cultivation than before, outputs of other sectors would have had to contract, and overall employment would have risen. (Since potatoes were non-traded, this would have involved a multiplier effect of sorts.)

The effects on production would of course have been even
more negative if wages had risen in line with increased potato prices, as McGregor suggests. The 'wage good' run in Table 6 shows that employment would have fallen, and production in all agricultural sectors would have dropped. With the potato as wage good, reduced potato yields reduced the productivity of Irish agriculture as a whole. In the absence of other change, there would have been across the board decline.

Clearly such an outcome would have been unsustainable: something had to give. Diets certainly did: per capita consumption of potatoes fell by two fifths between the early 1840s and late 1850s. Allowing consumption per capita to fall as it actually did, and correspondingly reducing the role of potato prices in determining wages, we get the 'diet' results in Table 6. Potato production now contracts by substantially more than the decline in productivity, as expected, releasing enough resources so that tillage can expand a little. Notice that declining potato yields on their own do not seem to be able to explain the post-Famine switch from tillage to pasture. This is reasonable; so far, we are keeping pre-Famine agricultural structures intact, and merely changing potato productivity, diets and wages. The main result of this should indeed be a contraction of potato production; an expansion of tillage, similar in terms of factor proportions, would be reasonable under the circumstances.

Something more radical had to happen to produce the dramatic output shifts documented earlier, in particular the move to extensive farming mentioned above. Given estimates of what cattle and pigs were stall-fed before and after the
Famine (Table 7), we can ask, "How would the pre-Famine economy have responded if potato yields and potato consumption had fallen as they actually did, animals had been fed at their post-Famine rates, and nothing else had changed?" The results are given as 'all shocks' in Table 6. Pasture now expands dramatically, while tillage contracts. The reason is obvious enough: less intensive animal husbandry involved fewer inputs and was more profitable for land owners. (Compare the returns to land in the 'all shocks' run with those in other runs.)

Surprisingly, these three shocks (to potato yields, consumption, and animal feeding) combine to produce movements in outputs and total employment reasonably close to those actually observed (given in the last row of Table 6). The model's assumption of subsistence wages does not, however, square with the observed wage increase of 45% (see the next section). Moreover, while we do not have accurate data on other factor prices, rents probably fell over the period, presumably due to the increase in wages. To repeat, CGE models cannot by their nature be used to investigate structural change; it is the similarities between the last two rows of the table, not the differences, which are remarkable.

Extensive farming favored land owners, but led to diminished employment opportunities. The permanent nature of the blight necessitated a switch away from old farming styles.

---

3 The potato and milk estimates are based on the work of Solar; the hay and straw estimates are my own. As with the change in potato yields after the Famine, this is an area which would repay further empirical scrutiny.
The possibility that the Famine also provided farms with the opportunity for such a switch cannot be discounted; for of course, if extensive farming was their most profitable option, one must ask why they did not switch sooner. From the perspective of landlords and farmers, the Famine cleared large tracts of land of the small holdings which made large-scale grazing difficult: Table 8 gives Bourke’s estimates of how the size distribution of land holdings changed over the course of the Famine. Viewed in this light, the Famine served as a sort of speeded-up enclosure movement. While the data for the 1840s are poor, and a lot more econometric work has to be done on the post-Famine data, the degree of correlation across counties (during the 1850s) between increases in cattle numbers, declines in population, and increases in the percentage of farm holdings over 30 acres, is sufficiently strong (Figures 4-6) to keep this hypothesis firmly on the agendas of Irish economic historians.

III. The Famine and Irish labour markets

The contrast in Table 6 between the actual wage increase after the Famine, and the static wages predicted by the pre-Famine model, has already been noted. The pre-Famine economy was characterised by subsistence wages, linked to potato prices, and the model assumes this. The Famine completely altered the structure of the Irish labor market, however. By forcibly displacing so many Irish men and women it severed the ties between subsistence costs and wages, creating links between Ireland and the rest of the world which ensured that
foreign labour market conditions would have a far greater impact on Irish labour costs than the Irish potato.

All the available evidence [Williamson (1994), Boyer et al. (1994)] show Irish real wages catching up with US and British real wages after the Famine. Figures 7 and 8 show Irish real agricultural wages, plotted against alternative US unskilled urban real wage series. Moreover, those wage data which span the pre-Famine and post-Famine periods show a clear break (Figure 9): no catching up, or even falling behind, before the Famine, and strong catching up afterwards. Figure 10 plots Bowley's (1899) series for Irish agricultural wages: while the data are clearly suspect, the break around the Famine emerges clearly here too.

This makes sense. Before the Famine potential emigrants might have been constrained by a lack of money, contacts and/or information; after the Famine, relatives and friends in the US or elsewhere could make all of these available. One substantial shock was enough to send Ireland down a road leading to complete integration with world labour markets. Given hysteresis, history matters: the Famine is crucial to an understanding of subsequent Irish demographic development.

In turn, the integration of international labor markets had a substantial impact on the post-Famine Irish economy.

---

4 The Irish data are my own, as yet unpublished; the 2 US sources are Williamson and Lindert (1980, Appendix G) and David and Solar (1977), p. 59.

5 The data in Figure 9 are Williamson's (1994) data for urban, unskilled real wages.

6 Ireland is not unique in this regard: see Hatton and Williamson (1992).
Using a CGE model calibrated to post-Famine data, O'Rourke (1991b) argued that post-Famine emigration is best understood as a 'pull' phenomenon, with emigrants being lured abroad by higher wages. This contrasts with Marx's view of destitute workers being pushed off the land as a result of a switch from tillage to pasture. In a similar vein, Hatton and Williamson (1993) found that post-Famine Irish emigration was well explained by relative wages in Ireland and overseas.

What was the long run impact of emigration on Irish living standards? In the context of a standard, constant returns CGE model, Boyer et al. find, not surprisingly, that the answer depends crucially on the extent to which capital was internationally mobile. If capital was completely immobile, and there had been no post-Famine emigration, Irish per capita income would have been 13-25 percent lower in 1908 than it actually was. If capital was perfectly mobile internationally, no emigration would have meant substantial capital inflows, and per capita income would only have been 5-9 percent lower than it actually was. Increasing the range of uncertainty is the possibility that brain drains, or other malign forces, might have led to emigration actually hurting the Irish economy.

The jury is still out. And the Famine of 1845-49 is largely responsible for placing them there.
### Table 1. Population of Ireland, 1791-1901

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1791</td>
<td>4,753,000</td>
</tr>
<tr>
<td>1821</td>
<td>6,802,000</td>
</tr>
<tr>
<td>1831</td>
<td>7,767,000</td>
</tr>
<tr>
<td>1841</td>
<td>8,175,000</td>
</tr>
<tr>
<td>1851</td>
<td>6,552,000</td>
</tr>
<tr>
<td>1861</td>
<td>5,799,000</td>
</tr>
<tr>
<td>1871</td>
<td>5,412,000</td>
</tr>
<tr>
<td>1881</td>
<td>5,175,000</td>
</tr>
<tr>
<td>1891</td>
<td>4,705,000</td>
</tr>
<tr>
<td>1901</td>
<td>4,459,000</td>
</tr>
</tbody>
</table>

### Table 2. The structure of Irish agriculture, 1840-45 to 1908

(percentage shares of total output)

<table>
<thead>
<tr>
<th>Period</th>
<th>Tillage</th>
<th>Potatoes</th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1840-45</td>
<td>32.8</td>
<td>22.7</td>
<td>44.4</td>
</tr>
<tr>
<td>1856-60</td>
<td>27.4</td>
<td>9.0</td>
<td>63.7</td>
</tr>
<tr>
<td>1876</td>
<td>15.0</td>
<td>6.9</td>
<td>78.2</td>
</tr>
<tr>
<td>1908</td>
<td>8.3</td>
<td>4.2</td>
<td>87.5</td>
</tr>
</tbody>
</table>

Note: rows may not sum to 100 due to rounding.

Sources: Solar (1987), Table 9.1, p. 360; Ó Gráda (1993), Table 29, p. 154.
Table 3. Irish land use, 1840-1911

(Thousands of acres)

<table>
<thead>
<tr>
<th>Year</th>
<th>Wheat</th>
<th>Barley</th>
<th>Oats</th>
<th>Tillage</th>
<th>Potatoes</th>
<th>Pasture</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>40/45</td>
<td>600</td>
<td>200</td>
<td>2100</td>
<td>3302</td>
<td>2100</td>
<td>9398</td>
<td>14800</td>
</tr>
<tr>
<td>1847</td>
<td>744</td>
<td>333</td>
<td>2201</td>
<td>3816</td>
<td>284</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1849</td>
<td>688</td>
<td>352</td>
<td>2061</td>
<td>3684</td>
<td>719</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1850</td>
<td>605</td>
<td>321</td>
<td>2143</td>
<td>3682</td>
<td>875</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1851</td>
<td>504</td>
<td>336</td>
<td>2190</td>
<td>3745</td>
<td>869</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1856</td>
<td>529</td>
<td>189</td>
<td>2037</td>
<td>3344</td>
<td>1105</td>
<td>9545</td>
<td>15297</td>
</tr>
<tr>
<td>1861</td>
<td>401</td>
<td>202</td>
<td>1999</td>
<td>3211</td>
<td>1134</td>
<td>9534</td>
<td>15425</td>
</tr>
<tr>
<td>1871</td>
<td>244</td>
<td>223</td>
<td>1636</td>
<td>2734</td>
<td>1058</td>
<td>10071</td>
<td>15692</td>
</tr>
<tr>
<td>1881</td>
<td>154</td>
<td>211</td>
<td>1393</td>
<td>2339</td>
<td>855</td>
<td>10075</td>
<td>15270</td>
</tr>
<tr>
<td>1891</td>
<td>81</td>
<td>178</td>
<td>1215</td>
<td>2005</td>
<td>753</td>
<td>10299</td>
<td>15117</td>
</tr>
<tr>
<td>1901</td>
<td>43</td>
<td>162</td>
<td>1099</td>
<td>1817</td>
<td>635</td>
<td>10577</td>
<td>15208</td>
</tr>
<tr>
<td>1911</td>
<td>45</td>
<td>158</td>
<td>1040</td>
<td>1744</td>
<td>591</td>
<td>9847</td>
<td>14694</td>
</tr>
</tbody>
</table>

Notes: Tillage includes all crops other than grains, but excludes potatoes; pasture includes hay.


Table 4. Irish livestock numbers, 1841-1911

(Thousands)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cattle</th>
<th>Sheep</th>
<th>Pigs</th>
<th>Poultry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1841</td>
<td>2489</td>
<td>2106</td>
<td>1413</td>
<td>8459</td>
</tr>
<tr>
<td>1847</td>
<td>2591</td>
<td>2186</td>
<td>622</td>
<td>5691</td>
</tr>
<tr>
<td>1849</td>
<td>2771</td>
<td>1777</td>
<td>795</td>
<td>6328</td>
</tr>
<tr>
<td>1850</td>
<td>2918</td>
<td>1876</td>
<td>928</td>
<td>6945</td>
</tr>
<tr>
<td>1851</td>
<td>2967</td>
<td>2122</td>
<td>1085</td>
<td>7471</td>
</tr>
<tr>
<td>1856</td>
<td>3588</td>
<td>3694</td>
<td>919</td>
<td>8908</td>
</tr>
<tr>
<td>1861</td>
<td>3472</td>
<td>3556</td>
<td>1102</td>
<td>10371</td>
</tr>
<tr>
<td>1871</td>
<td>3976</td>
<td>4233</td>
<td>1621</td>
<td>11717</td>
</tr>
<tr>
<td>1881</td>
<td>3957</td>
<td>3256</td>
<td>1096</td>
<td>13972</td>
</tr>
<tr>
<td>1891</td>
<td>4449</td>
<td>4723</td>
<td>1368</td>
<td>15276</td>
</tr>
<tr>
<td>1901</td>
<td>4673</td>
<td>4379</td>
<td>1219</td>
<td>18811</td>
</tr>
<tr>
<td>1911</td>
<td>4712</td>
<td>3907</td>
<td>1415</td>
<td>25448</td>
</tr>
</tbody>
</table>

Sources: Mitchell (1988), pp. 205-206; the figure for cattle in 1841 was amended, as indicated in the text.
Table 5. Irish agricultural output before and after the Famine
(millions of 1840-45 pounds)

<table>
<thead>
<tr>
<th>Period</th>
<th>Tillage</th>
<th>Potatoes</th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1840-45</td>
<td>12.7</td>
<td>8.8</td>
<td>17.2</td>
</tr>
<tr>
<td>1856-60</td>
<td>10.0</td>
<td>2.2</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Note: tillage excludes hay (included with pasture) and potatoes.


Table 6. CGE results (percentage changes)

<table>
<thead>
<tr>
<th>Shock</th>
<th>P</th>
<th>T</th>
<th>S</th>
<th>w</th>
<th>d</th>
<th>r</th>
<th>e</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Rybczynski'</td>
<td>-3</td>
<td>-17</td>
<td>-15</td>
<td>+22</td>
<td>-13</td>
<td>-13</td>
<td>-13</td>
<td>-29</td>
</tr>
<tr>
<td>'Yield'</td>
<td>-9</td>
<td>-7</td>
<td>-10</td>
<td>0</td>
<td>-1</td>
<td>+5</td>
<td>+1</td>
<td>+9</td>
</tr>
<tr>
<td>'Wage good'</td>
<td>-11</td>
<td>-20</td>
<td>-26</td>
<td>+20</td>
<td>-15</td>
<td>-10</td>
<td>-13</td>
<td>-22</td>
</tr>
<tr>
<td>'Diet'</td>
<td>-1</td>
<td>+6</td>
<td>-42</td>
<td>+2</td>
<td>-11</td>
<td>-11</td>
<td>-13</td>
<td>-12</td>
</tr>
<tr>
<td>'All shocks'</td>
<td>+36</td>
<td>-42</td>
<td>-45</td>
<td>0</td>
<td>+23</td>
<td>-3</td>
<td>+23</td>
<td>-32</td>
</tr>
<tr>
<td>Actual</td>
<td>+31</td>
<td>-21</td>
<td>-75</td>
<td>+45</td>
<td></td>
<td></td>
<td></td>
<td>-29</td>
</tr>
</tbody>
</table>

P: pasture sector output (animal products and hay)
T: tillage sector output (crops other than potatoes and hay)
S: potatoes
w: wage
d: return to land
r: return to capital
e: return to expertise
Table 7. Cattle and pig feed before and after the Famine

<table>
<thead>
<tr>
<th>Period</th>
<th>Potatoes</th>
<th>Hay</th>
<th>Straw</th>
<th>Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1840-45</td>
<td>2910</td>
<td>1522</td>
<td>1830</td>
<td>98.7</td>
</tr>
<tr>
<td>actual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1840-45</td>
<td>1408</td>
<td>674</td>
<td>159</td>
<td>255.8</td>
</tr>
<tr>
<td>counterfactual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1840-45 counterfactual calculated by assuming that cows and pigs in 1840-45 ate as much per capita as their counterparts did in 1856-60.

Source: calculated on the basis of data in O'Rourke (1989). Figures in thousands of tons, except for milk (millions of gallons).

Table 8. Agricultural holdings in Ireland (1845-51)

<table>
<thead>
<tr>
<th>Size of holding</th>
<th>1845</th>
<th>1847</th>
<th>1851</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5 acres</td>
<td>181,950</td>
<td>139,041</td>
<td>88,083</td>
</tr>
<tr>
<td>5 to 15 acres</td>
<td>311,133</td>
<td>269,534</td>
<td>191,854</td>
</tr>
<tr>
<td>Above 15 acres</td>
<td>276,618</td>
<td>321,434</td>
<td>290,401</td>
</tr>
<tr>
<td>Total</td>
<td>769,701</td>
<td>730,009</td>
<td>570,338</td>
</tr>
</tbody>
</table>

Source: Bourke (1993), p. 79.
References


Figure 1. Irish agricultural exports
Constant (1840-45) prices, 1815=100

- Grain net exports
- Pasture exports
- Pig exports
Fig. 2 Agricultural prices 1847-1911
5-yr. moving averages (1845=100)

- Cereals and flax
- Animal products
- Pasture/Tillage
Figure 3. The model’s structure
Figure 4. Cattle numbers and population
Percentage changes, 1850-1860
Figure 5. Population and farm sizes
Percentage changes, 1850-1860
Figure 6. Cattle and farm sizes
Percentage changes, 1850-1860
Figure 7. Irish and US real wages
Williamson-Lindert, 1855-80

Irish wage ➧ US wage
Figure 8. Irish and US real wages
David-Solar, 1855-80

Index 1855=100

170
160
150
140
130
120
110
100
90
80

1855 1860 1865 1870 1875 1880

year

Irish wage  US wage
Fig. 9. Irish, British and US real wages
Urban unskilled, 1830-1913
Figure 10. Bowley's nominal wage index
1892=100