Late 19th Century Denmark in an Irish Mirror:

Towards a Comparative History

Kevin H. O'Rourke

Department of Economics and IIIS, Trinity College Dublin
IRCHSS Government of Ireland Senior Fellow

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Section 1. Introduction

> Denmark is not only a smaller country than Eire but her climate is less equable, her soils are, in general, lighter and poorer, she has no coal and no water power to compensate for its absence, nor has she any iron ore or other metallic ores to serve as a basis for industrial activities. Yet, in comparison with Eire, she has a bigger population, a greater agricultural output, a more extensive industrial system, a larger foreign trade, a lower national debt, a higher national income and a better standard of living. It is the purpose of this paper to throw some light on this unusual economic paradox. (J.P. Beddy, 1943, p. 189.)

J.P. Beddy is not the only Irishman in history to have commented on the differences between the Irish and Danish economies' performances since the middle of the nineteenth century. Both countries were both largely agricultural, and both competed for the lucrative British market for breakfast goods: bacon, eggs, and, especially, butter. It was a competition which, by common consent, the Danes won hands down. Indeed, it is rare to find a historian of post-Famine Ireland who has not commented on the apparent failure of the Irish to meet the high standards set by the Danes: Cormac Ó Gráda (1977), Raymond Crotty (1966), Joseph Lee (1989) and many others have mentioned the Irish-Danish comparison, and drawn their own conclusions from it.[1] As an outsider, Barbara Solow felt able to comment that "the Irish are rightly annoyed at always having Denmark held up to them as a good example," but went on to claim that "there remains much in the history of Danish agriculture that stands as a reproach to Irish farming."[2] But perhaps the greatest tribute to the hold which Denmark has had on those interested in Ireland's economic welfare comes not from an academic but from Horace Plunkett, a leader in the field of Irish agricultural reform around the turn of the

[1] Characteristically, Ó Gráda argues against the hypothesis of Irish 'failure', but is in many ways a lone voice.

[2] Solow (1971), p. 151.

century. In 1908, he wrote that "I have always felt that Ireland a second Denmark was no bad ideal for our reformers to set before them".[3] In this ideal Plunkett was supported by no less a figure than Andrew Carnegie.[4] Outside Ireland, the author of King Solomon's Mines was so taken by the Danish experience that he travelled there extensively and reported his findings to the British public in a classic of its kind, Rural Denmark and its Lessons.[5]

It might seem odd for a book about Denmark to have a chapter largely focussing on Ireland. However, this paper will argue that there is much that can be learned about late 19th century Denmark by comparing the two countries. Such a strategy not only helps us to evaluate the scale of Denmark's economic achievements, by placing them in a comparative context; it also enables us to think more deeply about the roots of Danish success. An important motivation behind this paper is the desire to move beyond cross-country regressions in trying to explain why some countries grow more rapidly than others. Serious comparative studies of the economic growth experiences of different economies have been comparatively rare in recent years, although they were a staple of an older generation of economic historians: Mokyr's (1976) dissertation on industrialisation in Belgium and Holland remains one of the few examples of the genre within an explicitly cliometric framework. Such studies are of particular use when they focus on pairs of countries which a priori seemed to have equivalent growth potentials, but which ex post performed very differently; in this case, it may be possible to isolate the factor or factors that were particularly important in shaping the different outcomes.

Ireland is a good country with which to compare Denmark, since the two countries

[3] Cited by Ó Gráda (1977), p. 298.

[4] Ehrlich (1981), p. 272.

[5] Haggard (1913).

were in so many respects similar during the period. Not only did both have access to large markets, but in the late 19th century their major market was the same: Britain. Since Britain was an open economy at the time, any differences between the two countries' performances must be due to supply side, rather than demand side, factors. Geographically, Denmark and Ireland are Britain's two next-door neighbours, and both have northern European climates and abundant coastlines, factors generally associated with successful economic performance (Gallup *et al.* 2000). They are of similar size, with Ireland being the bigger: 20.3 m. acres as opposed to 9.6 m acres.[6] Their natural resources are also similar, in that they lack the large coal and ore deposits so often associated with growth in the late 19th century. They thus specialised in similar agricultural products. Finally, they both pursued liberal economic policies, in particular adhering to agricultural free trade throughout the late 19th century.

There were however some important differences between the two countries, lying largely if not exclusively in the political and social domains. First, and most obviously, Denmark was an independent country, with its own government, while Ireland was a part of the United Kingdom. Denmark's generally liberal policies were thus the result of Danish decisions, while Irish liberalism was a product of British decisions. Second, Denmark was an extremely homogenous society, while there were important religious and political cleavages within Ireland. Third, Irish emigration rates by far exceeded Danish ones, although Danish emigration was by no means insignificant in the late 19th century. While this was presumably largely a result of Ireland's less successful economic development, the very fact that Irish labour markets were so tightly integrated with their American counterparts had potentially important knock-on implications for the way in which its economy and society operated.

[6] Before 1921. Irish *Agricultural Statistics,* 1913, pp. 2-3; Bjørn (1988, p. 252).

It is intended that this paper will be the first step in a thorough comparison of economic growth in these two countries in the late 19th and early 20th centuries. As a first step, it is necessarily limited in its ambitions: the aim is more to set out a research agenda than to provide comprehensive answers to what are, after all, difficult questions. First, the paper will lay out some comparative data on the two countries' economies between the middle of the 19th century and the First World War. This section identifies some of the stylised facts which any comparative history of the two countries should address. The following section places both countries' economic performances within the context of the highly globalized economy of the late 19th century, and asks to what extent can the recent literature on the first great wave of globalization explain those relative performances. The bottom line is that the international economic literature is helpful in this regard, but in many ways leaves us with even more questions to answer. I next survey the existing economic history literature asking why Ireland did not do as well as Denmark (not surprisingly, there has been much less Danish interest in comparing the two countries), identify hypotheses which might help resolve the question, and where possible try to evaluate these hypotheses drawing on recent research by myself and Ingrid Henriksen. The final section will sum up, and make suggestions regarding potential directions for future research.

Section 2. Comparing Denmark and Ireland: From the Great Famine to the Great War

In this section, I will first give some basic data regarding living standards in the two countries, before going on to consider agricultural trends more closely.

Unfortunately, there are no official Irish GDP statistics available before the late 1930s, so what little we know about late 19th century trends in Irish living standards come from 2 benchmark estimates (Mokyr 1985 and Ó Gráda 1994). Mokyr's revised estimate of about

£80 m. in 1845 puts Ireland's GDP per capita at roughly 40% of Britain's; Ó Gráda's 1913 estimate of £135 m. places Ireland's relative income *per capita* at about 57% of Britain's on the eve of the Great War. We can compare these numbers with the ratio of Danish to UK (not British) income *per capita* in 1840 and 1913; but unfortunately, the latter figures depend on the methods used to compare prices in the two countries. The two best estimates available are those of Maddison (1995) and Prados (2000); these imply that Irish national income per head rose from 56 to 68 per cent of Danish GDP *per capita* between the two dates (according to the Maddison data, revised in Prados 2000, Table 9) or from 63 to 71 per cent (according to the Prados data, *ibid.*).

However, this does not imply that Ireland's late 19th century performance was superior to that of Denmark's, for one simple reason: 1840-5 was the eve of the Irish Famine, which reduced the Irish population from some 8.5 million to roughly 6.5 million in a space of just six years. Moreover, it was the poorest members of society who died; the Famine thus raised the country's average income by an unknown but presumably significant amount.[7] Until we know to what extent Irish incomes *per capita* were raised as a result of the Famine, it will be impossible to assess the relative GDP performances of these two economies from the mid-19th century onwards.

However, we do have wage data for unskilled, urban male workers in the building trades from 1870 onwards (the Irish data going back to 1830); and these have been purchasing-power-parity adjusted, meaning that they are comparable across countries (Williamson 1995). Figure 1 shows the ratio of Irish to Danish real wages; what may be surprising to some readers is that Irish wages were substantially higher than Danish wages

[7] In addition to killing the poorest members of society, the Famine also raised land-labour ratios, thus raising the income of survivors: see Ó Gráda and O'Rourke (1997).

between 1870 and the mid-1890s, with the margin in Ireland's favour ranging between 20 and 40 per cent. Figure 2 shows that these high Irish wages were achieved largely as a result of the Famine and the emigration which ensued: Irish real wages were stagnant from 1830 to the late 1840s, rose discretely in the aftermath of the Famine, and then continued to rise from the mid-1860s onwards.[8]

From the mid-1890s, however, Danish wages caught up strongly on Irish wages, and overtook them in the early 20th century; Irish wages were between 10 and 15 per cent lower than their Danish counterparts on the eve of World War I. Living standards therefore grew substantially less in Ireland than in Denmark from the 1890s onwards. Even more telling are the data showing how many people could be supported at these wage rates. In 1841, the Irish population stood at 8.2 million, while Denmark's population was a mere 1.3 million (Figure 3). Even after the famine of the late 1840s, there were still 4.5 times as many people in Ireland as in Denmark. Uniquely, however (since populations typically recover after famines: see Watkins and Menken 1985 and Ó Gráda and O'Rourke 1997), Ireland's population continued to decline, and stood at only 4.4 million in 1911; on the eve of World War I, Ireland's population was only 53% higher than Denmark's, which had grown steadily throughout the period. An economy which maintained its wages largely as a result of population decline (of which more later) was evidently not as healthy as one in which living standards could grow alongside population. It was above all the declining population (which, in the 26 counties which were later to form the Irish Republic, persisted until the 1960s) which perturbed Irish commentators, and which symbolised for them Irish

[8] Boyer *et al*. (1994) confirm this interpretation, using a small-scale CGE model of the Irish economy calibrated to 1907-8 data. They estimate that if there had been no emigration between 1851 and 1911, the real urban wage would only have been 66-81 percent of its actual 1908 level.

'failure'.

Both Ireland and Denmark were largely agricultural economies in the late 19th century. Ó Gráda (1994, p. 383) estimates that agriculture accounted for about 38% of Irish national income in 1914; the corresponding figure for Denmark was 31.8% (Johansen 1985, p. 392). Agriculture's share of the male labour force declined from 49% to 48% in Denmark between 1860 and 1911; the corresponding Irish figures were 56% (1861) and 54% (Mitchell 1976, pp. 154, 157). Figure 4 shows that while Ireland's real agricultural output was flat between the Great Famine and the Great War, Denmark's output more than quadrupled over the same period. In nominal terms, while Ireland's agricultural output had been more than four times that of Denmark in 1850, it was lower than Denmark's in 1914 (Figure 5).

Table 1 shows that this relative performance was not just due to aggregate population movements; between 1871 and 1911, real output per male agricultural worker almost quadrupled in Denmark, but rose less than 80% in Ireland. Nominal output per worker was roughly similar in the two countries in the 1870s, but Ireland was overtaken in the crucial 1880s, and by 1911 Danish output per worker was more than 50% higher than Ireland's. These different productivity performances are reflected in milk yields; milk yields in Ireland on the eve of the Great War were at most 400 gallons per cow, up from maybe 350 gallons in the mid-1850s (Solar 1989-90, p. 153): an increase of 14% over some sixty years. It was reckoned by contemporaries that they were maybe 100 gallons less in Connaught (IAOS 1914, p. 11). By contrast, Danish milk yields rose by 22% in the 15 years before 1914, by which time they stood at some 700 gallons per cow (Statistiske Meddelelser 1915, p. 42; Smith-Gordon and Staples 1917, p. 111).

What was happening to the structure of agricultural production in the two economies? Figure 6 shows that the share of crops in agricultural output was declining sharply in both

countries between 1850 and 1914, falling from 60% to 16% in Ireland, and from 46% to 7% in Denmark. This overall similarity disguises, however, a profound divergence in land use. Ireland had always devoted more land to grass than had Denmark (Table 2), but this difference intensified, with the percentage of land devoted to grass rising in Ireland, and falling in Denmark. Denmark accommodated its extra animal production by increasing the production of fodder crops from the 1880s onward (and by stall-feeding cattle with grain), a development often encouraged by reformers, but not realized, in Ireland.

Dairying was a particularly important industry in both countries, and the one on which I have worked to date: here again the story is one of a relatively strong Danish performance. Table 3 gives the evolution of cattle numbers in the two countries from 1861 onward. In 1861 there were more than three times as many cattle in Ireland as in Denmark, but in 1914 there were only slightly more than twice as many. Ireland had a comparative advantage in 'dry' cattle, with the share of milch cows falling from 45% to 32%; note that the share in Denmark also fell, from 68% to 53%.

Table 4 gives the contribution of the dairy industry to agricultural output in the two countries from 1851. The share of the industry in total Irish agricultural output was slightly over 20% from the mid-1850s to late 1870s, and slightly more than 18% thereafter. In Denmark, dairying was of roughly comparable importance (relatively speaking) in the third quarter of the century, but from the late 1870s resources were shifted into the sector, and by the early 20th century it accounted for more than 40% of Danish agricultural output. As late as the 1870s, the Irish industry dwarfed the Danish one, but again the 1880s proved a crucial turning point: it had been overtaken by the early 1890s, and was only half the size of the Danish industry on the eve of World War I. The Danish industry was producing 83,800 tons of butter annually in 1900-04; 104,400 tons in 1905-09; and 112,600 tons in 1910-14, of

which 90,000 were exported (Johansen 1985, pp. 150, 201). In 1914, Ireland produced about 66,399 metric tons of butter (O'Donovan 1940, p. 326), of which 36,222 tons were exported (Solar 1989-90, p. 160). Figure 7 shows that Irish butter exports were static throughout the late 19th century, whereas Danish exports grew explosively, with a sharp acceleration during the 1880s, during which decade Danish exports pulled ahead of Irish exports. Both Ireland and Denmark exported almost all their butter to Britain; Table 5 calculates different countries' shares of the British import market (assuming that all Irish exports went to Britain, and that all UK imports were consumed in Britain). Before 1887 the statistics include margarine imports, mostly from Holland, which were quite substantial; this implies that Ireland probably held somewhat over half the British butter market in 1860. Yet again, it had been overtaken by Denmark by 1890, and was also facing strong competition from French, Russian, and eventually Australasian butter.

Not only was Ireland losing market share; it was also getting relatively less for its butter over time. Figure 8 gives official average butter prices in the two countries from 1846; in principal these should capture not only overall movements in butter prices, but changing average qualities as well. According to the data, Irish prices were well above Danish prices in mid-century, the gap was rapidly eliminated after the mid-1870s, and average Danish prices exceeded Irish ones from the early 1880s. The gap averaged almost 15% between 1905 and 1914: 15% of the value of butter production on the eve of the Great War was equivalent to one percent of national income.

Tables 6 and 7 give some intuition as to what was the underlying source of these average price differences. The gap between average export prices realized by the two economies was 13.2%, somewhat lower than the average domestic price gap; when like is compared with like, the price gaps are even smaller. Thus, Danish creamery butter fetched

between 6.4% and 7.3% more than Irish creamery butter in Britain; this presumably reflects quality differences. The gap between creamery butter prices in the two domestic markets was 8.1%. Table 6 suggests that about half of the average price gap [(6.4+7.3)/(2*14.8)=46%] was due to Irish butter being inferior to Danish butter, within given product classes; the remaining half was due to an inferior Irish quality mix.[9]

Table 7 shows that there were substantial price gaps between different types of butter in Ireland, and between the Irish provinces.[10] Creamery butter was produced using the new cream separator technology, invented in Scandinavia in the late 1870s. Separators extracted more cream from the milk, and did so more quickly and hygienically. They diffused quickly in Denmark, and by 1914 the vast majority of butter there was being produced using the new methods. However, as late as 1907, only 37.2% of Irish butter was produced in creameries, according to a witness to the 1911 Irish Milk Commission. 50% of total output was farmers' butter, produced on farms using traditional methods; the remaining 12.7% was 'factory butter', i.e. farmers' butter which was bought up by factory owners and blended to produce a more uniform consistency. Table 7 shows that creamery butter fetched 15% more than factory butter, and 16% more than farmers' butter; the market clearly regarded traditional butter as being inferior to the modern creamery product. The big difference between the Irish and Danish dairy industries was that the Irish product mix was more old-fashioned and of lower average quality.

In addition to not producing as much butter using new creamery methods as the

[9] In principle higher transport costs between Britain and Ireland could also have been to blame, but in fact Anglo-Danish price gaps were higher than Anglo-Irish ones for most of the period.

[10] For an extensive discussion of the different types of butter, see BPP (1910).

Danes, the Irish were slower in adapting another, organizational innovation: the cooperative creamery. Employing cream separators was only financially viable when they were processing the milk from a large number of cows – 300 to 400, say – and so it clearly made sense for centralized creameries to process the milk output of several farms.[11] In principle this could be done by privately owned creameries as well as by cooperatives. Henriksen (1999) has however emphasized the efficiency advantages of the cooperative: by tying a group of farmers into only supplying one creamery, which they jointly owned, a higher average milk quality was ensured. Farmers had an incentive to provide high quality milk, and if necessary, to monitor each other; social sanctions could be applied to those farmers who underperformed, and of course their property rights in the creamery might be forfeit. By contrast, a privately owned creamery would always be on the lookout for enough milk suppliers to ensure an efficient scale of production (not having suppliers who were locked in); this would give suppliers more leverage, and might enable them to sell poorer quality milk.

The first Danish cooperative was established in 1882, although proprietary creameries had been in existence for some 10 years. Figure 9 shows that the number of Danish cooperatives increased dramatically over the next decade; by 1914 there were almost 1200 in the country, of which over a half had been established by 1890. Diffusion was almost complete by the turn of the century. Irish cooperatives started later (in 1889), their numbers jumped from 1896 (70) to 1903 (356) and continued to increase up to the War, at which stage there were 445 in existence. Thus diffusion in Ireland was slower, and the innovation was never as widespread, as a glance at maps of Ireland and Denmark early this century will confirm (Ó Gráda 1977, p. 290; Bjørn 1988, p. 373). Ireland's cooperative performance looks

[11] The average mid-sized Danish farm owned 6 to 14 cows (Henriksen 1999). The next three paragraphs draw heavily on O'Rourke (2003).

even weaker when set against the two countries' milch cow herds; by 1888 there was roughly one cooperative per 2000 milch cows in Denmark, and there was almost one cooperative per thousand milch cows by the turn of the century; in Ireland, there was only slightly more than one cooperative per 4000 milch cows by 1914 (Table 8).

Things look better if proprietary creameries are added to the total. In 1896 there were 207 private creameries in Ireland, or 279 in all; in 1906 there were 800 creameries in all, of which just 339 were cooperative. In Denmark, by contrast, cooperatives displaced private creameries during the 1890s; cooperatives accounted for 54% of all creameries in 1888, but 81% in 1894, a proportion which was to remain roughly constant until the Great War.[12] Thus there were 0.19 creameries per 1000 cows in Ireland in 1896, as opposed to roughly 1.1 per thousand in Denmark in 1894; and there were 0.53 creameries in Ireland per 100 cows in 1906, as opposed to roughly 1.18 in Denmark in 1903. Nevertheless, Ireland's total creamery density was less than half that of Denmark throughout the period, as further evidenced by the large proportion of non-creamery butter in total output; and if the arguments concerning the efficiency advantages of cooperatives are to be believed, Ireland chose the wrong type of creamery.

Does this failure to adopt new creamery techniques, and the cooperative organizational form, constitute economic failure, or was it a rational response to the circumstances in which Irish farmers found themselves? The 1880s was the crucial decade for creamery diffusion in Denmark. The fact that Denmark's agricultural productivity and butter exports overtook Ireland's in the 1880s, the fact that on average Ireland was producing lower quality butter, which was reflected in her average butter prices, and the fact that even her

[12] Based on Henriksen (1999, Table 1), except for the 1888 figure for cooperatives, which is taken from Bjørn (1988, p. 371).

premium creamery butter sold at a discount against her Danish rival, all suggest that some failure may have been involved. This is certainly how contemporaries perceived things, although in fairness our perceptions of what contemporaries thought are largely coloured by the energetic and vociferous attempts of Ireland's cooperative movement to displace traditional technologies and privately owned creameries. The timing of the decline in Ireland's relative butter prices is consistent with the argument that Danish innovation and a sluggish Irish response were responsible for Ireland's displacement in international markets. Thus, the official figures in Figure 8, which embody information about changing quality mixes, show the early 1880s as being the crucial period during which Denmark overtook Ireland.

Clearly, Denmark's economic performance was much stronger than Ireland's in the late 19th century. In the next section, I put this relative success into a comparative context.

Section 3. Ireland and Denmark in comparative context: globalization, education and growth

In recent years, several economic historians have emphasised the highly globalized nature of the late 19th century international economy, and have explored the implications of this for the performance of peripheral European economies (e.g. O'Rourke and Williamson 1997, 1999; Taylor and Williamson 1997). Both Denmark and Ireland participated fully in this globalization experience. As already mentioned, Ireland was a completely free trade economy by virtue of its membership of the United Kingdom, while Denmark distinguished itself by its refusal to impose agricultural tariffs in the wake of the European grain invasion of

the late 19th century (Kindleberger 1951, O'Rourke 1997).[13] Just as important, both countries had capital and labour markets which were tightly integrated into global factor markets. Ireland and Denmark sent emigrants abroad, mostly to the New World; while capital flowed freely into and out of both economies.

In principle, free trade, migration and capital mobility should help poor countries, such as Ireland and Denmark around 1870, catch up with richer countries, such as Britain or the United States. And in fact, it is the case that the late 19th century Atlantic economy was distinguished by a general convergence of poor countries on the core (Williamson 1995, O'Rourke and Williamson 1999, Chapter 2). Figure 10 shows real wages in five peripheral European economies (the three Scandinavian economies, plus Ireland and Italy), where these are expressed as percentages of the real wage in the leading European economy of the day, Britain. In all five cases, the wages caught up on British wages, and in two (Denmark and Sweden) they actually overshot them. Figure 11 replicates the exercise, this time expressing real wages in the five countries as percentages of US real wages, and once again the picture that emerges is one of convergence.

This is important in evaluating Denmark's success *vis à vis* Ireland: Ireland was by no means a basket case economy by the 1870s. Its living standards were high by the standards of the time, and even more important, they were growing rapidly; more rapidly even than living standards in the two leading economies of the day. This was on the face of it no mean achievement; and makes Denmark's performance seem all the more impressive.

All five countries in Figures 10 and 11 were heavily involved with the international economy. Norway, Italy and above all Ireland sent vast numbers of emigrants to the

[13] On the other hand, it should be noted that Denmark did impose tariffs on manufactured products, something which is not always appreciated: see Bairoch (1989).

Americas, with Irish and Norwegian emigration rates of 142 per thousand and 95 per thousand per decade during the 1880s; Italian migration started later, but exceeded 100 per thousand during the 1900s, which is exactly when Italian real wages started to converge on Britain. Swedish and Danish emigration rates were more modest, but still significant, with emigration rates of 70 and 39 per thousand during the 1880s (Hatton and Williamson 1998, Table 2.1). Furthermore, Sweden and Norway received important capital inflows, while Norway pursued a relatively liberal trade policy.

It turns out (O'Rourke and Williamson 1997) that globalization can explain a large fraction of these countries' convergence on Britain and the US. This is exactly what simple trade theory predicts, although it turns out that there are a few surprises along the way. Table 9 gives a decomposition of each country's convergence on either Britain (Panel A) or the US (Panel B) into those portions that can be explained by three dimensions of globalization (mass migration, capital flows, and trade), as well as by cross-country differences in schooling.[14] In all cases, the entries in the table give the percentage of the relevant country's observed convergence, on either Britain or the US, that can be explained by the relevant variable. Thus, for example, the first entry of Panel A says that between 5 and 8 per cent of Denmark's convergence on Britain can be explained by its superior levels of schooling.

The table contains several main messages. *First*, schooling accounted for only a small share of these countries' convergence on Britain and the US, simply because even though the

[14] The numbers for the globalization variables come by (a) estimating the impact of migration or capital flows on local labour or capital supplies, and then estimating the impact of these factor shocks on real wages; or (b) estimating the impact of commodity market integration on domestic goods prices, and then simulating the impact of these price shocks on real wages. The estimates for the schooling variable are derived by estimating growth regressions for real wages, and then using the estimated schooling coefficients to calculate the growth differentials which arose from differences in educational levels.

Scandinavians in particular were well-educated, so were the British and the Americans. *Second*, trade-induced price shocks accounted for very little of the convergence either. *Third*, Ireland and Italy's convergence on the core was almost entirely due to emigration, which reduced their labour forces by 45 and 39 per cent respectively between 1870 and 1910, and which raised their real wages by 32 and 28 per cent during that period (O'Rourke and Williamson 1999, Table 14.2). Migration accounted for a smaller but still significant share of Scandinavian convergence, particularly on the United States (where immigration lowered real wages) and particularly for Norway. *Fourth*, capital flows also facilitated Scandinavian real wage convergence on the core, particularly on Britain (where capital exports lowered real wages), and particularly in the case of Sweden. The surprising fact is that capital probably flowed out of Ireland and Italy, thus lowering real wages there, when simple theory suggests that it should have flowed into those economies in search of cheap labour. Sadly for peripheral economies then and now, this prediction did not and does not hold; in the late 19th century it flowed towards resource-abundant countries in the New World (which was already rich) or in the Old (i.e. Scandinavia and Russia). Finally, note the large residuals for the Scandinavians, and in particular for Denmark: over a half of Danish convergence on Britain cannot be explained by globalization and/or schooling, and was thus due to superior technological progress; while between 13 and 40 per cent of Denmark's convergence on the US is similarly unexplained by these exercises. The fact that such a large share of Denmark's convergence cannot be explained by factors which do a good job of explaining convergence elsewhere further highlights the unique nature of Danish success.

Denmark and Ireland are thus alike, in that a large share of their convergence on the core economies of the late 19th century can be explained by globalization. However, there are very important differences. In the Irish case, convergence was almost entirely due to

emigration: Irish wages caught up with British and US wages because there were fewer people at home (a shift up the labour demand curve), not because of rapid capital accumulation or technological progress (an outward shift in the labour demand curve). Emigration also played a role in Danish convergence, but Denmark was able to attract capital from overseas,[15] and enjoyed relatively rapid technological progress; and these factors helped her to not only converge on British real wages, but actually to overtake them.

To make matters more precise, Danish real wages (and thus the living standards of ordinary workers) grew at some 2.6 per cent per annum between 1870 and 1913, while Irish real wages grew at only 1.8 per cent per annum: the growth gap which we would like to explain thus amounted to some 0.8 per cent per annum. But adding emigration into the equation does not help in explaining this difference, since nearly 0.7 percentage points of the Irish growth rate can be explained by emigration, but only 0.2 percentage points of Danish growth: without emigration, the growth gap would have been 1.3 per cent (= 0.8 + 0.7 - 0.2) per annum, not 0.8 per cent. On the other hand, the growth regressions suggest that superior education could indeed help in explaining Denmark's superior performance; but this is simply based on average correlations across a group of countries.

There are thus several new questions which have to be asked. Why did Ireland, like Italy, rely so heavily on emigration to advance its living standards? Why was Denmark able to attract capital from overseas when Ireland was not, despite the fact that Denmark did not enjoy the natural resources which helped attract capital to Sweden (iron ore) and Norway (timber)? Why is the residual for Denmark so impressively large in Table 9? If education helps explain the difference between Danish and Irish performance, then precisely through

[15] Which boosted her capital stock by some 16 per cent between 1870 and 1910: O'Rourke and Williamson (1999, Table 12.3).

what mechanisms did education matter? In many respects, it seems as though a broader comparative perspective has made the Irish-Danish comparison more puzzling, rather than less so; and made the Danish achievement of very rapid living standards growth without the advantages of either mass emigration or large natural resource endowments seem even more impressive.

Section 4. Explanations

Why was Denmark's late 19th century performance so successful? Maybe reviewing the literature on why Ireland failed to keep pace with her can yield some insight into the question.

4.1. Rational actor/comparative advantage arguments

4.1.1. Cow density

One difference between Ireland and Denmark, which was emphasised by Cormac Ó Gráda (1977), is that Ireland had almost twice as many acres per cow as did Denmark. "Creamery viability demanded a minimum milk supply: in areas where that milk supply implied a catchment area too large for many individual farmers to consider switching techniques, it seems reasonable to expect few if any creameries. For small herds, or for herds located some miles from a creamery, the overhead cost incurred by the farmer in bringing milk to the creamery might be prohibitive, and there might then have been no demand for the new technique" (Ó Gráda 1977, p. 292). Ó Gráda found that the number of cooperative creameries in each county or poor law union in 1913 was well explained by cow density, milch cow numbers (a scale variable), and population (representing the demand for non-butter uses of milk, i.e. liquid milk). In areas such as Limerick, which most resembled Denmark,

creameries (both private and cooperative) were widely diffused; they had "spread as far as was viable in the Irish context by the 1910's" (p. 299).

In O'Rourke (2004), I test Ó Gráda's assertion by exploring whether the diffusion of cooperative and private creameries across counties in 1906 could be explained solely by the economic variables he suggests, or if other, non-economic, factors were also important. The bottom line is that while his economic variables had the expected impact on creamery numbers, so did a number of other factors, a matter to which I will return below.

4.1.2. Climate

It has also been argued that Ireland's relatively favourable climate retarded Irish agricultural development. Ireland's mild winters, and the yearlong availability of grazing, made it possible for farmers to leave their cattle outside all year round; in Denmark this was impossible. Thus Danish farmers had to invest in stalls for their animals; this in turn favoured stall feeding and tillage (especially root crop) production, the collection of dung, and dairying as opposed to beef production. Irish cattle were bred for beef far more than for milk, and were indeed often exported 'on the hoof', as is still the case today. Thus Irish animal husbandry was as labour-extensive as possible.

Stall-feeding also implied a yearlong supply of milk, and therefore a yearlong supply of Danish butter. By contrast, in 1909 Irish creameries produced just 22% of their annual output in the six months January-April and November-December; fully 45% of annual output came in the three months June, July and August.[16] IAOS (Irish Agricultural Organisation Society, the official body representing and promoting cooperation in Ireland) annual reports

[16] BPP (1913), p. 174.

are full of complaints about the impact that this had on the movement's ability to market its butter in Britain; the claim was that not only did this mean that Irish butter only sold during the summer, when prices were substantially lower, but that, having lost their position on the British market during the winter months, creameries were forced to 'bribe' their way back into the market in May or June, by offering their product at a discount.

Beddy makes this climatic argument most forcefully, and since his is the only Irish work with the express purpose of comparing Irish and Danish economic development, it is worth quoting him at some length. He says that Denmark's "rainfall and general climatic conditions did not point the way to grazing," and goes on to write that her agricultural policy

> involves the growing of large quantities of cereals and forage crops for animal fodder which is supplemented by imported feeding-stuffs of high protein content...Climatic conditions are such that animals must be housed for a comparatively large part of the year and hence extensive farm buildings are required not only for this purpose but for the storage of fodder. This constant care of livestock is associated with that regular, as opposed to seasonal, production of livestock products which is so important a feature of marketing...
>
> Eire, on the other hand, with her heavier soils, her milder winters and her ample rainfall, adopted a system of animal husbandry based upon grass...Unlike Denmark, our selection had not the same element of compulsion. While our choice was not open to Denmark, hers was not closed to us. Our system...involved pure grazing for livestock export and seasonal-- and hence restricted-- production of livestock products partially for export at the most highly competitive period of the year to markets with which our dealings had not the advantage of regularity. There resulted less employment, less activity on the land, fewer farm buildings and less farming capital. From the strict economic standpoint it no doubt represented our natural contribution to the international division of labour in a world of Free Trade; from the social standpoint, however, its effects have been in many respects deplorable.[17]

While Beddy elsewhere mentions co-operation and education as being important determinants of Danish economic progress, he concludes that emphasis on these factors may "distract attention from what has been stressed in this paper as the fundamental explanation of the differences between Eire and Denmark in economic prosperity and social welfare.

[17] Beddy (1943), pp. 196-97.

Primarily, and indeed, paradoxically, it is our climatic advantages which are the cause of our relative economic and social disadvantages..."[18]

How is one to evaluate these claims? In a world without imperfections, the addition of an extra constraint (e.g. an unfavourable climate making certain agricultural systems impossible) cannot lead to greater economic welfare. The Beddy argument therefore must rely on some imperfection(s). For example, maybe the path which Denmark embarked on turned out ex post to be more technologically progressive than the extensive grazing path which Ireland followed. Thus what might have appeared the better option in the short run turned out, unexpectedly, to be the worse option in the long run. The logic here would be similar to that in Young (1991), in which a country switching to free trade may gain in the short run for the usual static reasons, but lose in the long run. That would occur if the good in which the country specialized (and into whose production the country was subsequently locked in) was less technologically progressive than the country's import good. Alternatively, if technological innovation responds positively to bottlenecks and the severity of binding constraints (Landes 1969, Porter 1990) then an extra constraint can indeed benefit a country. Specific technological innovations, whose primary purpose was to cope with Danish climatic conditions, may have raised the productivity of Danish agriculture.

However, these arguments would rely on the new technologies not being easily transferable to Ireland. In fact, there was no technical obstacle to specific innovations such as separators and cooperatives being transferred to Ireland, as is shown by the fact that both innovations were introduced there; if the argument reduces to one stating that new

[18] Beddy (1943), p. 208. Crotty (1966, pp. 69-70), makes a very similar argument to account for the differences in the Danish and Irish agricultural systems; moreover, he appeals to this climatic argument to bolster the argument for which he is best known, which has to do with the effects of peasant proprietorship on the market for land: see Section 4.2.

technologies were not diffused rapidly enough within Ireland, it merely restates the basic question underlying this paper, which is why Ireland did not grow as rapidly as Denmark.

4.1.3. Seasonal price gaps[19]

It should be noted that the standard English-language history of Danish agriculture primarily attributes the Danish system of winter dairying, not to the Danish climate, but to historical chance: "...during the formative period of specialized dairy farming, butter prices during the winter months were so much higher than summer prices that it paid well to develop winter dairying. This fitted in so well with the system of farming that it paid to retain high winter production even after increased supplies from the southern hemisphere changed considerably the seasonal variation in butter prices."[20] Of course, if winter butter prices were higher in Ireland too, then Irish farmers should also have had an incentive to develop winter dairying.

Is it the case that prices fluctuated more in Denmark than in Ireland, at the stage when crucial decisions were being made about long run dairying strategies? Table 10, taken from Henriksen and O'Rourke (2003), gives an average price seasonality index for a variety of butter grades in Ireland, London and Denmark for two subperiods: 1870-1895 and 1895-1914. Price seasonality was lower in the later period (with winter premia ranging between 21 and 33%, depending on the grade of butter involved) than in the former one (when they had ranged between 27 and 43%). Declines in the winter premium of around 10 percentage points appear to have been commonplace. Looking in greater detail at what happened to price

[19] This section draws on Henriksen and O'Rourke (2003).

[20] Jensen (1937), p. 328.

seasonality over time, Henriksen and O'Rourke find that while price seasonality declined from the mid-1890s, it actually increased during the 1870s and early 1880s. For example, Copenhagen winter premia were slightly below 20% in 1870; they lay between about 28 and 38% between 1880 and 1895; and fluctuated widely around a 20% average in the years leading up to World War I.

These new price data allow us to reach several conclusions regarding the Jensen argument. First, winter price premia were no higher in Denmark than elsewhere during this period, and indeed this is what you would expect in a well-integrated international market. It is not the case that Danish farmers faced a price incentive to develop winter dairying that did not exist elsewhere. The Jensen hypothesis on it own will not do, therefore, in explaining the different path taken by Danish farmers. Second, however, there was a sharp increase in the winter premium precisely at the time that the Danes began to develop an intensive dairying sector, based on winter production and cooperative creameries. The incentive to develop winter dairying was indeed at its highest when Danish agriculture moved in that direction. While the incentive on its own was not sufficient (since it also existed in Ireland and presumably elsewhere in Europe), Jensen may be right in his assertion that price incentives were important in the Danish case, and that they presented Danish farmers with a moment of opportunity that was seized with both hands.

Third, it is not the case that the incentive to develop winter dairying had vanished by the time that Irish cooperative creameries started to emerge around 1890, since the winter premium only began to fall significantly in the mid-1890s. Again, the difference between Denmark and elsewhere seems, at least initially, to have involved different responses to the same price incentives, not different incentives. However, it is true that by the early 20th century the incentive to develop winter dairying was indeed much lower than it had been in

the early 1880s.

4.2. Land tenure arguments

The most common arguments traditionally advanced to explain Irish economic backwardness in the nineteenth century have to do with land tenure arrangements. The traditional claim was that the landlord-tenant system which prevailed in the decades after the Famine discouraged investment in agriculture: absentee landlords did not invest, while tenants feared that if they invested, the benefit would be appropriated by landlords raising their rent. A series of reforms, starting with the (half-hearted) Land Act of 1870, ensued, culminating in the transfer of ownership to the Irish peasant. By the early twentieth century, the major impediment to the development of Irish agriculture was gone.[21]

The problem with this traditional view is that Irish landlords did not rackrent or capriciously evict in the years prior to 1870, as would have had to have been the case for tenant investment to have been discouraged. Solow (1971) showed this convincingly, and went on the counter-offensive: not only were the land reforms of the late 19th century based on a mistaken analysis of landlord tenant relations, but they actually hurt Irish agriculture. The 1870 Land Act made landlords compensate tenants for (1) eviction (unless the eviction was for non-payment of rent), and (2) the value of any improvements the tenants had made to their holding. Solow claims that one effect of (2) was to cut off landlord investment, as landlords were afraid that tenants might claim compensation for investments the landlords had funded. Thus the Act reduced investment in Irish agriculture at precisely the time when globalization, and developments in Denmark and elsewhere, made such investment

[21] See Armstrong (1989) for a readable account of the traditional view.

essential.[22] However, Ó Gráda's (1975) figures on landlord investment between 1850 and 1875 cast doubt on this assertion.

Crotty (1966) also argues that 1870 marked a downturn in the fortunes of Irish agriculture, but for different reasons than Solow's. Contemporaries agued that making peasants owners of their land would increase the efficiency of Irish agriculture; Crotty argues the opposite. According to him, peasant proprietorship is a fundamentally inefficient institution for the simple reason that it does not embody the equivalent of an effective market for corporate control. A landlord might have ejected a lazy or inefficient tenant, but a peasant proprietor will not eject himself (nor will he sell the land for a good price to a better farmer: there must be a strong non-economic motive for staying on the land for this argument to work). The gradual move towards tenant right during the three decades from 1870 progressively eroded the competitive market for land; farmers became increasingly old, conservative and inefficient.

In Denmark peasant proprietorship was given a boost by the government during the 'period of reform' from 1784-1807, and the transition to that institution proceeded throughout the nineteenth century. Already by 1835 there were 41,695 peasant proprietors in Denmark, as opposed to 24,795 tenant farmers.[23] If Crotty is right, therefore, then Danish agriculture should have been less efficient than Irish agriculture, *ceteris paribus*. Crotty salvages the 'land market hypothesis' by appealing to the climatic differences between the two countries: an inefficient Irish farmer could adopt an extensive farming system which involved little pecuniary loss compared with an intensive farming system; the lazy Danish farmer had no

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[22] Solow (1971), pp. 86, 198.

[23] Jensen (1937), pp. 125-26.

such option, and was thus forced out of business.[24]

So much for speculation; is there evidence that can be brought to bear on the issue? In research reported elsewhere (O'Rourke 2004) I find that the counties with higher levels of owner-occupancy in 1906 had greater numbers of creameries, *ceteris paribus*, than counties in which more farmers were still tenants. While this is hardly a direct measure of farmer efficiency, on the face of it this finding is consistent with the traditional view that tenancy was bad for progress, and inconsistent with both Solow and Crotty.

However, the fact that owner-occupancy was beneficial does not necessarily imply that the *process* of land reform was costless. For example, Solow emphasizes that one effect of the turmoil over property rights in land was that enormous effort and resources went, literally, into rent-seeking activities. The effect of the 1870 Act was, she writes, "a signal to both sides to "look to their rights" and gird for further battle. But the real problem in Ireland was not the division of a given pie, but the provision of a larger one..."[25] She is even harsher about the effects of the rent-fixing 1881 Act:

> Incentives to adjust the economy in the face of new international conditions were to some extent paralysed. There is no need to take too seriously landlord contentions that everybody rushed to court and neglected his farming, but if tenants could increase income more by litigation than by changing agricultural techniques, they would certainly do so. If valuers were swayed by appearances, a premium was even put on worse farming, and consequent dilapidation. "They calculate on getting the reduction, and put an exaggerated value on what it is going to do for them", a land agent told the Cairns Commission..."They look to some political machinery or result to give them that which should come from their own industry?" asked Lord Tyrone. "Yes" was the reply.
>
> Not alone from their industry, but from intelligent economic policy, too. But with the tenants of Ireland crowding into court, no one was thinking about agricultural education, credit and marketing programs, improved cropping, selective breeding, and, in general, ways of assisting

[24] Crotty (1966), pp. 94-96.

[25] Solow (1971), p. 88.

tenants to adjust to changed economic conditions.[26]

This analysis makes sense in the context of Baumol (1990), which argues that talent will be allocated to where it earns the highest return, and that consequently it is important to ensure that the returns to entrepreneurial behaviour are higher than the rewards to rent-seeking, criminality, or other potentially remunerative activities. Horace Plunkett took the argument one step further, by asserting that this emphasis on government policy, itself a byproduct of earlier harmful policies, led to a weakening of the national moral fibre: "...we in Ireland have yet to free ourselves from one of the worst legacies of past misgovernment, the belief that any legislation or any legislature can provide an escape from the physical and mental toil imposed through our first parents upon all nations for all time."[27]

While the above arguments seem difficult to test, there was also widespread violence associated with the 'Land War', as well as boycotts and similar tactics.[28] This must surely have retarded economic development in parts of rural Ireland, at least to some extent. In O'Rourke (2004) I test for a relationship between landlord-tenant agreement (as proxied by the percentage of rent reductions under the terms of the 1881 Land Act which had been mutually agreed by the two parties) and a history of Land War violence (as measured by agrarian outrages during 1880-82 per 10,000 of population) and the number of creameries per county. As might have been expected, landlord-tenant agreement was associated with more creameries, and land war violence with fewer creameries; but these effects were statistically insignificant at conventional levels. However, there was a very strong positive link between

[26] Solow (1971), pp. 165-66.

[27] Plunkett (1982), p. 61.

[28] For an entertaining account of the land war in Kerry in the 1880s, see Grousset (1986).

landlord-tenant agreement and the propensity to cooperate (as measured by the share of cooperatives in total creamery numbers). While it might seem that trust between the farmers themselves should have been the crucial factor in determining the success of agricultural cooperation, it seems that poor landlord-tenant relations hampered progress in this area. One reason for this may have been that the cooperative movement was inter-denominational; in which case it may have been viewed with greater suspicion by the majority Catholic population in regions where inter-communal tensions were higher.

4.3. Politics and nationalism

Following on from the last point, the argument has been made that the unsettled political condition of Ireland during much of the period 1870-1930 profoundly retarded economic development there. The land war and nationalist politics were inseparably intertwined, as the landlord class the tenants were seeking to dispossess were viewed by many as the representatives of British rule in Ireland. The second and third decades of the 20th century also saw widespread violence, connected with the Irish War of Independence and the ensuing Civil War. "If the Irish sacrificed economic progress on the altar of Irish nationalism, who can say it was the wrong choice?", asks Solow in the concluding sentence of her book.[29] Why might the struggle for independence have involved such a sacrifice?

One can think of at least five reasons. The first has already been mentioned: violence cannot have helped the economy. The empirical question then becomes, to what *extent* did violence hurt the economy. To this end one might attempt estimates of the material damage done to infrastructure as a result of violence, or look for evidence of risk premiums being

[29] Solow (1971), p. 204.

demanded by investors in Ireland.[30] However, the period from roughly 1900 to 1914 was an unusually tranquil one; once the Land Wars had been settled, the country was at peace, and thus this factor cannot have been important, at least in the years leading up to the Great War.

A second, extremely Danish, argument was put forward by a Danish observer of Ireland during the 1920s, Jørgen Pedersen (1926). His argument was that the Irish had little respect for the law under British rule, as the law involved was British law. This phenomenon, if it existed, may be referred to as the 'Playboy effect', after Christy Mahon of Synge's play, who achieved fame and fortune in a remote Irish village by claiming to have killed his father. Pedersen went on to speculate that with independence, the Irish might become more law-abiding, which would benefit the economy. This sort of argument might make sense in the context of a world where imperfections (e.g. the existence of collective action problems) make government legislation necessary. Note however that many of the agricultural reforms which made Denmark prosperous arose spontaneously out of the private sector, without the need for government action. Thus, the first cooperative contract was drawn up by a farmer, rather than a civil servant or intellectual, and cooperative creameries spread from the bottom up; while the 'Lur' butter brand, which started out as a certificate of national origin and became a guarantee of quality as well, was voluntarily adopted by 98% of Danish farmers before the Government stepped in to legislate for the remaining 2 per cent (O'Rourke 2003). If government involvement was more important in Ireland (and indeed cooperative reform was more 'top down' there than in Denmark), this would raise a series of questions about the different social contexts in the two countries, and once again push back key questions one stage further, rather than answering them.

[30] Ó Gráda (1994) has done this and has not found them.

Third, in line with the argument of the previous section, and with Baumol (1990), the 'national struggle' may have diverted talent from economically productive activities, hence lowering Ireland's growth rate. An instructive case is that of Horace Plunkett, the leader of the Irish cooperative movement, committed to the ideal of interdenominational cooperation to solve Ireland's economic problems.

Although Plunkett himself felt that politics played far too important a role in Irish life, he took a seat in Parliament in 1892 as a unionist candidate for south Dublin. His willingness to ally himself with nationalists to pursue his economic agenda lost him unionist support, and cost him his seat in 1900; while his 1904 book, Ireland in the New Century, with its attacks on the influence of the Roman Catholic Church and the tactics of the Nationalist party, its advocacy of the union and its comments on the defects of the Irish personality, alienated many nationalists. The failure of unionists to advance a positive Irish program led to Plunkett's conversion to Home Rule in 1911, but he was not sufficiently radical for many nationalists. In 1919 he proposed that Ireland be a self-governing dominion (not a republic) within the Empire: for this he was attacked by all sides.[31]

Thus it was that Plunkett, who felt that "politics are by no means the most useful, or indeed the most edifying, of a nation's activities"[32] became diverted from what he saw as the greatest Irish issue of the day (the economy) into a personally damaging involvement in constitutional politics. Not only did this distract his attentions away from the economy; it earned him many enemies, which did not help his cooperative movement. Plunkett was appointed to the Irish Senate in 1922, the first year of Irish independence. The following year

[31] West (1986), p. 184.

[32] Cited in West (1986), p. 21.

his house was burnt down by Republicans, Plunkett resigned his Senate seat, and the founder of the Irish cooperative movement emigrated to England, where he spent the rest of his life.[33]

Fourth, as indicated above, politics introduced a divisiveness into public life which could make it difficult for collective action to be effectively embarked upon. On one famous occasion, R.A. Anderson, an associate of Plunkett's, was prevented from addressing a local meeting on the subject of cooperation, when a local solicitor discovered that the cooperative movement was apolitical and non-denominational. The solicitor informed Anderson that cooperation "would not suit Rathkeale. "Rathkeale," said he pompously, "is a Nationalist town-- Nationalist to the backbone-- and every pound of butter made in this Creamery must be made on nationalist principles, or it shan't be made at all." This sentiment was applauded loudly and the proceedings terminated."[34]

Finally, it was claimed by reformers that the cooperative movement and other attempts to improve Irish living standards were viewed with suspicion by some Nationalists, not just because many leaders of these movements were of the wrong religion or political persuasion, but because if the attempts were successful, this might undermine the demand for Independence. "It had been enough to see the powerful lever of the land agitations weakened by agrarian legislation. To improve the position of the people further was to destroy Home Rule utterly" (Smith-Gordon and Staples 1917, 47). The IAOS frequently complained that they had to contend, not just with the vested interests of traders, but with a hostile Nationalist Press, and the opposition of local politicians.

Once again, many of these arguments seem difficult to test empirically. However, as

[33] West, op. cit.

[34] Cited in Plunkett (1982), pp. 190-91.

mentioned earlier O'Rourke (2004) does find that land war violence was negatively associated with cooperation. This is consistent with the notion that trust was important for the sort of horizontal cooperation that made creamery cooperatives work; and that religious and/or political divisions could undermine this trust. More generally, Denmark was a country without ethnic or religious cleavages, at peace with itself. The Irish comparison makes it clear that these were probably important ingredients in the Danish success story.

4.4. Education

As Section 3 noted, there is a significant cross-country correlation between education and the growth in urban real wages during the late 19th century, and it is well known that such a correlation can also be found for other measures of economic performance, such as GDP per capita growth, both then and now. In turn, several authors have speculated that the mechanism by which education matters for growth is that it constrains the ability of countries to adopt best practice technology (Abramovitz 1986; Barro 1991; Easterlin 1981). Might relative Danish success during the late 19th century simply be a reflection of her relatively high levels of education?

Certainly, several commentators have claimed that Irish peasant farmers were too conservative, suspicious, poorly-educated or ignorant to adopt cooperation and the milk separator. Smith-Gordon and Staples (1917, pp. 47-48), the former an employee of the IAOS, wrote in 1917 that "the most serious obstacle to the co-operative movement was and remains the conservatism of the Irish farmer. Many projects which would have brought great benefit to the country have been abandoned because the lords of the soil were suspicious, or did not understand", an opinion with which Liam Kennedy (1976, p. 177) concurs. Even when they did establish creameries, they were often reluctant to invest adequately in them:

It seems absurd to some farmers to sanction the payment of a salary to a skilled Manager (of the creamery) in excess of their own incomes. This is one of the chief short-comings in productive co-operation, and it is this that gives the proprietor his chance. His business instinct shows him plainly that a good man is worth a good wage, and hence it is that some of the very best men the movement has produced have been tempted to leave it for situations outside, where their brains and skill will be adequately rewarded. The Co-operative Creamery Manager is too often driven by circumstances to become a "rolling stone"...He seldom is provided with an adequate residence and his wages are frequently cut down during the winter months, though he has been obliged to compress more than a year's work, done at high pressure, into the summer months (IAOS 1904, p. 16).

Similarly, the Irish farmer's refusal to engage in winter dairying was often decried as an example of self-defeating conservatism, although the counterargument was just as often heard that it would not be worth the farmer's while. The IAOS continually brought up this issue in its annual reports, variously suggesting that more root crops, or higher milk yields, or greater use of agricultural machinery were what was required to solve the problem. Whatever the cause of this failure, it was important for the creamery sector's ability to market its output in Britain, as noted above.

How did education in Denmark and Ireland compare at this time? Denmark was clearly a more educated society than Ireland in the 19th century. Compulsory education, for 3 days a week between the ages of 7 and 14, was introduced in Denmark as early as 1814; in 1849 compulsory education was extended to cover a 6-day week. Although there are comparatively few data to support the claim, it seems clear that near universal literacy had been achieved in Denmark, certainly by the middle of the century, and probably a lot earlier. In 1859-60, only 3% of military recruits in Denmark were completely illiterate, while 9% could read but not write.[35]

By contrast, in Ireland only 74% of bridegrooms could write their names as late as

[35] Cipolla (1969), p. 14.

1880.[36] In 1841, 53% of the Irish population over the age of 5 could neither read nor write; the figure fell to 46.8% in 1851, 38.7% in 1861, 33.4% in 1871, 25.2% in 1881, 18.4% in 1891, 13.7% in 1901, and 11.9% in 1911.[37] While a successful national elementary school system had been established in Ireland in 1831, education was made compulsory only in 1892 (1898 for rural areas). Ireland was clearly less literate than Denmark; it is however important to note that Ireland was not a backward society educationally for the time. Mokyr and Ó Gráda show that this was true even for the pre-Famine period, and conclude that pre-Famine Ireland "was something of an 'impoverished sophisticate', in the sense that its literacy level was probably higher than its income level would indicate."[38] In 1900, literacy in Ireland was higher than in Italy and Austria, insignificantly higher than literacy in Belgium, and insignificantly lower than literacy in France.[39]

However, there were large regional variations in literacy within Ireland; the proportion of the population aged 9 years and over which could neither read nor write in 1911 ranged from 3.4% in County Dublin to 20.6% in County Donegal. One might think that this would help explain the diffusion of creameries across counties; but O'Rourke (2004) finds no evidence that literacy mattered for creamery numbers. It may well be that educational levels were a key difference between the two countries at this time, but more research would be needed in order to sustain such a hypothesis.

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[36] Flora *et al.* (1987), Vol. 1, p. 82. Army recruit data and bridegroom data are fairly comparable for other countries at the time: see Flora *et al.*

[37] Flora *et al.* (1987), p. 72; 1911 Census, *General Report*, p. lii.

[38] Mokyr and Ó Gráda (1988), p. 226.

[39] Flora *et al.*, *ibid*. Irish literacy was less than Belgian literacy in 1870/71 (64.1% of the population 10 and over could read and write in Ireland, compared with 69.4% in Belgium); Ireland had caught up by 1880/81.

Section 5. Conclusions: Denmark in the Irish mirror

Why did Ireland see its living standards, output and productivity grow less rapidly than those of Denmark, and why did it rely so heavily on depopulation in order to achieve what income increases it enjoyed? How did Denmark manage to enjoy such rapid real wage growth in the absence of mass emigration, and how did it manage to attract significant capital inflows without the lure of abundant natural resources? Why was Danish performance in key sectors such as dairying so much more impressive than Ireland's, when the two countries were so similar in so many respects? A broader comparative perspective only serves to further highlight the extraordinarily successful nature of late 19th century Danish economic development; what can explain it?

These are big questions, which no one paper can hope to answer. This article has reviewed evidence which suggests that rational actor arguments based on different comparative advantages can indeed help to explain why Ireland adopted a less intensive, less high-value-added approach to dairying, and indeed to farming in general, than did Denmark. The fact that cow density was lower in Ireland than in Denmark probably did influence the spread of cooperative creameries in Ireland; although an obvious counterargument in principle is that the number of cows per acre was not necessarily fixed, and that it could have been increased, had the demand from the creameries been there. Other differences in the economic circumstances facing Danish and Irish farmers, which have not been sufficiently explored by the literature, concern factor prices. Figure 1 showed that Irish wages were actually higher than their Danish counterparts until the mid-1890s or so; might this have prompted Irish farmers to chose a less intensive route than the Danes? If so, then Ireland's high emigration rates, which did so much to raise Irish living standards, might have indirectly led to a less technologically progressive agricultural environment.

Another argument is that capital may have been relatively abundant in Denmark; a Danish expert visiting Ireland in 1909 argued that

> For the Irish butter exports to be tolerably distributed over the year the present system will have to be revolutionized. The calving is timed in the spring for the sake of raising the young calves. Should this be changed byres will have to be built and feed stuffs imported.... Purchase of feeds and building of byres requires big outlays and, in addition to that, the whole working of the farm must be changed from permanent grass to arable land. The Irish farmer lacks the funds for making this transformation and unlike the Danish farmer he does not reckon the manure to be of value. Since he owes the whole purchase sum of his farm no money can be raised unless the government will lend it to him. And the crux of the matter is, I suppose, whether butter is more profitable than beef. A change towards whole year butter production necessitates the growing of roots [beets] and these plants take, besides some experience, more labour.[40]

It is unlikely that capital was scarcer during this period in the United Kingdom, of which Ireland was a member, than it was in Denmark; after all, Britain was the world's foremost capital exporter of the time, and the available evidence suggests that Ireland was exporting capital as well (O'Rourke and Williamson 1999, Chapter 11). It is possible, though, that capital markets may not have worked sufficiently well to channel investment funds to Irish farmers. Credit cooperatives never really took off in Ireland as they had done in Germany (Guinnane 1994); while in Denmark small local savings banks to a large extent fulfilled the same task as credit cooperatives elsewhere, supplying credit to people with little or no security for loans.[41] Besides, the cooperative creameries in Denmark in some instances granted credit for the purchase of feed stuffs (Henriksen and O'Rourke 2003). Furthermore, the transfer of land from landlords to farmers was taking place in Ireland at this time, whereas in Denmark land reform had taken place much earlier: in addition to occupying peoples' energies and fuelling agrarian unrest, this may have locked up farmers' capital in the purchase

[40] Schou (1910), p. 266.
[41] Guinnane and Henriksen (1998) p. 52-54.

of their own land, as the above quotation suggests, when it might have been more usefully employed in various productive investments, including facilities for stall feeding.[42]

However, it is a key conclusion of this paper that not all of Denmark's relative success during this period was due to different comparative advantages. For example, the price incentives which, Jensen argued, prompted Danish farmers to adopt winter dairying existed elsewhere; what differed was the ability of societies to respond positively to these incentives. Future research could profitably focus on three spheres in which conditions may have favoured Denmark: politics, culture and the legal system.

As mentioned earlier, O'Rourke (2004) shows that owner occupancy and landlord-tenant agreement were positively associated with the diffusion of cooperative creameries within Ireland, suggesting that political factors were important in hindering the spread of new agricultural technologies there. Denmark was a politically stable, homogenous society, whereas Ireland was divided both culturally and politically. Conflict over property rights, and the national question, may well have been important obstacles to progress there, even though the end results (e.g. owner-occupancy) may have been desirable in themselves. Denmark was not only religiously and ethnically homogenous; it was relatively economically homogenous, with a large, well-educated class of peasant proprietors. Indeed, this egalitarianism persists today within the workplace, with important implications for the way Danish industry functions (Kristensen 2004). Homogeneity in Denmark not only meant the absence of conflict; it also facilitated the rapid transmission of organisational and technological innovation. It is notable that the one region of Denmark (eastern Hjørring) where cooperatives were less widespread was also characterised by a slightly different cultural and/or political

[42] More useful, that it, for total agricultural output, but not necessarily for individual farmers' incomes. On the Irish Land Wars, see also Solow (1971) and Guinnane and Miller (1997).

environment than the rest of the country, with more support for evangelical Lutheranism and the conservative party (Henriksen 1999). Whether this indicates that mainstream Danish society was particularly receptive to cooperation, or whether instead it was the homogeneity of society that was crucial in diffusing cooperatives, remains to be seen.

More speculatively, cultural factors may have made cooperation easier to achieve in Denmark. Guinnane (1994) argues that an unwillingness to sanction neighbours who were making a poor use of the cooperative's funds was one reason why credit cooperatives spread less rapidly in Ireland than in Germany, where such an unwillingness was apparently absent. Creamery cooperatives also relied on sanctions to maintain a high quality milk supply, and Henriksen and Hviid (2002) show that Danish creameries did indeed impose heavy sanctions on members whose milk threatened the quality of the creamery's butter. Might Irish culture have made this kind of strategy more difficult? Remarkably, 82 percent of creameries in largely Protestant Ulster were cooperative in 1906 (roughly the same proportion as in Protestant Denmark); whereas in the overwhelmingly Catholic rest of the island just 28 percent of creameries were cooperative (O'Rourke 2004). Is there some feature of Catholic culture that makes economic cooperation more difficult than in Protestant societies?[43] Several authors (e.g. Putnam 1993; La Porta *et al.* 1997) have recently argued that hierarchical religions, such as Catholicism or Islam, inhibit the development of trust and social capital, and on the face of it the discrepancy between Ulster and the other three Irish provinces, and between Denmark and Ireland as a whole, is consistent with such arguments. On the other hand, the difference between Catholics and Protestants in 19th century Ireland had as much to do with political and national identity as it was religious; and the correlations in the data

[43] For recent contributions on the possible effects of culture on economic performance, see Greif (1994), Putnam (1993) and Temin (1997).

between Catholicism, agrarian violence and landlord-tenant agreement are very strong. Moreover, Ulster was much more industrialised than the rest of the island. More detailed historical work is therefore necessary if we want to fully understand the difference in the propensity to cooperate between Protestant Ulster and the Catholic rest of the country: it could have to do with Weberian cultural factors, or it could have to do with other (political or economic) differences between the two communities.

A final set of speculations concerns the role of law and the state. As residents of a common law country, Irish cooperatives may have been hampered by a legal tradition which took a dim view of restraints of trade. Thus, attempts to introduce a 'binding rule' which would have tied cooperative members into only supplying the creamery of which they were members ran into repeated legal difficulties in Ireland, while such rules posed no problem within the Danish legal system (Henriksen and Hviid 2002). Finally, a key difference between Ireland and Denmark was, as stated at the outset, that Denmark was an independent state. While Danish agricultural reforms were largely initiated by the private sector, the state may have played an important supporting role, for example by funding institutions as the Agricultural University which carried out important research into the links between winter stall-feeding and productivity (Henriksen and O'Rourke 2003). The obvious strategy to evaluate such an argument would be to look at the development of Irish agriculture between independence in 1922 and the shift to protectionism in 1932; but such an investigation belongs in another paper.

References

Abramovitz, M. (1986), "Catching Up, Forging Ahead, and Falling Behind," **Journal of Economic History** 46: 385-406.

Anderson, R.A. (1935), **With Horace Plunkett in Ireland** (London: Macmillan).

Armstrong, D. (1989), **An Economic History of Agriculture in Northern Ireland 1850-1900** (Long Hanborough, Plunkett Foundation for Co-operative Studies).

Bairoch, P. (1989), "European Trade Policy, 1815-1914," in **The Cambridge Economic History of Europe**, vol. III, edited by P. Mathias and S. Pollard (Cambridge: Cambridge University Press).

Barro, R. J. (1991), "Economic Growth in a Cross Section of Countries," **Journal of Political Economy** 106: 407-43.

Baumol, W. (1990), "Entrepreneurship: Productive, Unproductive, and Destructive," **Journal of Political Economy** 98: 893-921.

Beddy, J.P. (1943), "A Comparison of the Principal Economic Features of Eire and Denmark", **Journal of the Statistical and Social Inquiry Society of Ireland** 1943: 189-220.

Bjørn, C. (ed.) (1988), **Det Danske Landbrugs Historie III: 1810-1914** (Copenhagen: Landbohistorisk Selskab).

Boyer, G.R., T.J. Hatton and K.H. O'Rourke (1994), "Emigration and Economic Growth in Ireland, 1850-1914," in **Migration and the International Labor Market, 1850-1939**, edited by T.J. Hatton and J.G. Williamson (London: Routledge).

B.P.P. (1910), **Report of the Departmental Committee on the Irish Butter Industry**, Cd. 5092, British Parliamentary Papers.

B.P.P. (1913), **First Report of the Irish Milk Commission**, Cd. 6683, British Parliamentary Papers.

Cipolla, C. (1969), **Literacy and Development in the West** (London: Penguin).

Crotty, R. (1966), **Irish Agricultural Production: Its Volume and Structure** (Cork: Cork University Press).

Easterlin, R. A. (1981), "Why Isn't the Whole World Developed?," **Journal of Economic History** 41: 1-19.

Ehrlich, C. (1981), "Horace Plunkett and Agricultural Reform," in **Irish Population, Economy and Society**, edited by J.M. Goldstrom and L.A. Clarkson (Oxford: Clarendon Press).

Flora, P., F. Kraus and W. Pfenning (1987), **State, Economy and Society in Western Europe 1815-1975: A Data Handbook, Vol. I, The Growth of Mass Democracies and Welfare States** (Chicago: St. James Press).

Gallup, J., A. Mellinger and J.D. Sachs (2000), "Climate, Coastal Proximity, and Development," in **Oxford Handbook of Economic Geography**, edited by G.L. Clark, M.P. Feldman and M.S. Gertler (Oxford: Oxford University Press).

Greif, A. (1994), "Cultural Beliefs and the Organization of Society: A Historical and Theoretical Reflection on Collectivist and Individualist Societies," **Journal of Political Economy** 102: 912-50.

Grousset, P. (1986), **Ireland's Disease: the English in Ireland 1887** (Belfast: Blackstaff Press).

Guinnane, T.G. (1994), "A Failed Institutional Transplant: Raiffeisen's Credit Cooperatives in Ireland, 1894-1914," **Explorations in Economic History** 31: 38-61.

Guinnane, T.W. and I. Henriksen (1998) "Why Danish Credit Cooperatives Were so Unimportant," **Scandinavian Economic History Review** 46: 32-54.

Guinnane, T.W. and R.I. Miller (1997), "The Limits to Land Reform: The Land Acts in Ireland, 1870-1909," **Economic Development and Cultural Change** 45: 591-612.

Haggard, H.R. (1913), **Rural Denmark and its Lessons** (London: Longman, Green and Co.).

Hatton, T.J. and J.G. Williamson (1998), **The Age of Mass Migration: Causes and Economic Impact** (Oxford: Oxford University Press).

Henriksen, I. (1999), "Avoiding Lock-in: Co-operative Creameries in Denmark, 1882-1903," **European Review of Economic History**, 3: 57-78.

Henriksen, I. and K.H. O'Rourke (2003), "Incentives, Technology and the Shift to Year-Round Dairying in Late 19th Century Denmark," mimeo.

Henriksen, I. and M. Hviid (2002), "Legal Institutions and Performance: Monitoring Agreements in the Early Danish Dairy Sector," paper presented at the ISNIE conference, Boston.

IAOS (various years), **Annual Reports of the Irish Agricultural Organisation Society, Ltd.** (Dublin).

Jensen, E. (1937), **Danish Agriculture** (Copenhagen: J.H. Schultz Forlag).

Johansen, H.C., 1985, **Danmarks Historie, Bind 9, Danish Historical Statistics 1814-1980** (Copenhagen: Gyldendal).

Kennedy, L. (1976), "The Decline of the Cork Butter Market: A Comment," **Studia Hibernica** 16: 175-177.

Kindleberger, C. P. (1951), "Group Behavior and International Trade," **Journal of Political Economy** 59: 30-46.

Kristensen, P.H. (2004), "Danish Production Systems – Reproduction and Transformation in the Age of the Said Coming of a New Age," paper presented at **State of Denmark** conference.

Landes, D. (1969), **The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present** (Cambridge: Cambridge University Press).

La Porta, R., F. Lopez-de-Silanes, A. Shleifer and R.W. Vishny (1997), "Trust in Large Organizations," **American Economic Review Papers and Proceedings** 87: 333-338.

Lee, J.J. (1989), **Ireland 1912-1985: Politics and Society** (Cambridge: Cambridge University Press).

Maddison, A. (1995), **Monitoring the World Economy 1820-1992** (Paris: OECD Development Centre Studies).

Mitchell, B. (1976), **European Historical Statistics 1750-1970**, (New York: Columbia University Press).

Mitchell, B.R. (1988), **British Historical Statistics** (Cambridge: Cambridge University Press).

Mokyr, J. (1976), **Industrialization in the Low Countries**, (New Haven: Yale University Press).

Mokyr, J. (1985), **Why Ireland Starved: a Quantitative and Analytical History of the Irish Economy, 1800-1850** (London: George Allen & Unwin).

Mokyr, J. and C. Ó Gráda (1988), "Poor and Getting Poorer? Living Standards in Ireland Before the famine," **Economic History Review** 41: 209-235.

Nüchel Thomsen and B. Thomas (1966), **Dansk-Engelsk Samhandel: Et Historisk Rids 1661-1963** (Århus: Universitetsforlaget i Århus).

O'Donovan, J. (1940), **The Economic History of Live Stock in Ireland** (Cork: Cork University Press).

Ó Gráda, C. (1975), "The Investment Behaviour of Irish Landlords 1850-75: Some Preliminary Findings," **Agricultural History Review** 23:139-155.

Ó Gráda, C. (1977), "The Beginnings of the Irish Creamery System, 1880-1914," **Economic History Review** 30: 284-305.

Ó Gráda, C. (1994), **Ireland 1780-1939: A New Economic History** (Oxford: Oxford University Press).

Ó Gráda, C. and K.H. O'Rourke (1997), "Migration as Disaster Relief: Lessons from the Great Irish Famine," **European Review of Economic History** 1: 3-25.

O'Rourke, K.H. (1997), "The European Grain Invasion, 1870-1913," **Journal of Economic History** 57 (December): 775-801.

O'Rourke, K.H. (2004), "Social Cohesion, Culture and Economic Behaviour: Evidence from the Creameries," mimeo, Trinity College Dublin.

O'Rourke, K. H. and J. G. Williamson (1997), "Around the European Periphery 1870-1913: Globalization, Schooling and Growth," **European Review of Economic History** 1: 153-91.

O'Rourke, K.H. and J.G. Williamson (1999), **Globalization and History: The Evolution of a Nineteenth Century Atlantic Economy** (Cambridge, Mass.: MIT Press).

Pedersen, J. (1926), "Irland som Danmarks Konkurrent Paa det Engelske Marked," **Nationaløkonomiske Tidsskrift** 423-438.

Plunkett, H. (1982), **Ireland in the New Century** (Blackrock, Co. Dublin: Irish Academic Press).

Porter, M. (1990), **The Competitive Advantage of Nations** (New York: Free Press).

Prados, L. de la Escosura (2000), "International Comparisons of Real Product, 1820-1990: An Alternative Data Set," **Explorations in Economic History** 37: 1-41.

Putnam, R.D. with R. Leonardi and R.Y. Nanetti (1993), **Making Democracy Work : Civic Traditions in Modern Italy** (Princeton, N.J. : Princeton University Press).

Schou, R. (1910), "Landbrugsforhold i Irland og Storbritannien," **Tidsskrift for Landøkonomi** 258-267.

Solar, P.M. (1989-90), "The Irish Butter Trade in the Nineteenth Century: New Estimates and Their Implications," **Studia Hibernica** 25: 134-161.

Solow, B (1971), **The Land Question and the Irish Economy, 1870-1903** (Cambridge Mass.: Harvard University Press).

Smith-Gordon, L. and L.C. Staples (1917), **Rural Reconstruction in Ireland: A Record of Co-operative Organisation** (London: P. S. King and Son).

Statistiske Meddelelser (1915), **Mejeribruget i Danmark i 1914** (4. Rk. 49 bd. 1 h.: Copenhagen).

Taylor, A.M., and J.G. Williamson (1997) "Convergence in the Age of Mass Migration," **European Review of Economic History** 1: 27-63.

Temin, P. (1997), "Is it Kosher to Talk About Culture?" **Journal of Economic History** 57: 267-87.

Turner, M. (1996), **After the Famine: Irish Agriculture, 1850-1914** (Cambridge: Cambridge University Press).

Watkins, S.C. and J. Menken (1985), "Famines in Historical Perspective," **Population and Development Review** 11: 647-76.

West, T. (1986), **Horace Plunkett: Co-operation and Politics, An Irish Biography** (Washington D.C.: Catholic University of America Press).

Williamson, J.G. (1995), "The Evolution of Global Labor Markets Since 1830: Background Evidence and Hypotheses," **Explorations in Economic History** 32: 141-96.

Young, A. (1991), "Learning By Doing and the Dynamic Effects of International Trade", **Quarterly Journal of Economics** 106: 369-405.

Table 1. Agricultural output per capita, 1871-1911

Year	Real output/male agricultural worker		Nominal output/male agricultural worker	
	Denmark 1871=100	Ireland 1871=100	Denmark pounds	Ireland pounds
1871	100	100	41.9	42.6
1881	94	105	40.6	45.0
1891	110	110	49.1	45.4
1901	239	138	73.6	51.4
1911	388	178	106.0	68.2

Sources: index numbers taken from Turner (1996), p. 159. Nominal output per capita figures calculated from Turner (1996), p. 108, Johansen (1985, pp. 153-155), Mitchell (1976, pp. 154, 157) and Mitchell (1988, p. 108). Danish figures converted to pounds at the gold standard exchange rate of 18.16 kroner per pound.

Table 2. Distribution of agricultural land

(Percent)

Denmark				
Year	Cereal	Potato	Other root	Grass
1861	45.5	1.4	0.1	53
1866	46.0	1.6	0.1	52.3
1871	45.9	1.8	0.3	52.1
1876	46.0	1.7	0.4	51.9
1881	45.2	1.7	0.7	52.4
1888	45.5	2.0	2.0	50.5
1896	45.1	2.0	3.3	49.7
1907	42.0	2.0	9.3	46.8
1912	43.8	2.3	11.0	43.0
Ireland				
Year	Cereal	Potato	Other root	Grass
1861	18.0	7.3	2.8	71.8
1866	15.7	6.8	2.8	74.8
1871	14.5	6.7	2.9	75.8
1876	12.6	5.6	3.1	78.7
1881	12.6	5.6	2.7	79.1
1888	11.2	5.3	2.9	80.6
1896	9.8	4.6	2.9	82.6
1907	9.3	4.0	2.8	83.8
1912	9.1	4.1	2.9	83.9

Source: Jensen (1937, p. 389); Johansen (1985, pp. 129-133); Mitchell (1988, pp. 190-91); Turner (1996, Appendix 1).

Table 3. Cattle numbers, 1861-1914

	Ireland			Denmark		
Year	Cattle	Cows	% cows	Cattle	Cows	% cows
1861	3472	1545	44.5	1121	758	67.6
1866	3746	1483	39.6	1194	812	68.0
1871	3976	1546	38.9	1239	808	65.2
1876	4117	1533	37.2	1348	898	66.6
1881	3957	1392	35.2	1470	899	61.2
1888	4099	1385	33.8	1460	954	65.3
1893	4464	1441	32.3	1696	1011	59.6
1898	4487	1431	31.9	1745	1067	61.1
1903	4664	1495	32.1	1840	1089	59.2
1909	4700	1549	33.0	2254	1282	56.9
1914	5052	1639	32.4	2463	1310	53.2

Source: Turner (1996, Appendix 1); Jensen (1937, p. 393).

Table 4. Butter and milk production, 1850-1914

	Ireland		Denmark	
Year	Million pounds	Share of output (percent)	Million pounds	Share of output (percent)
1850-54	5.1	15.3	1.4	16.1
1855-59	8.6	21.6	2.0	17.8
1860-64	7.6	21.3	1.9	18.2
1865-69	8.9	22.6	2.7	18.0
1870-74	10.0	23.0	3.5	19.4
1875-79	9.3	21.3	4.3	23.9
1880-84	7.4	18.7	5.3	27.7
1885-89	6.2	18.0	5.9	33.4
1890-94	7.0	19.1	8.2	37.2
1895-99	6.6	18.6	9.1	39.9
1900-04	7.3	18.3	12.2	42.1
1905-09	8.1	18.8	14.9	41.6
1910-14	8.8	18.1	16.9	37.1

Source: Turner (1996, pp. 108, 116); Johansen (1985, pp. 153-155).

Note: Irish figures are for butter production, Danish figures are for milk and milk products.

Table 5. Shares of British butter market, 1860-1914

(Percent)

	1860	1870	1881	1885	1890	1895	1900	1905	1910	1914
Ireland	46.6	38.3	24.5	20.7	22.0	19.3	16.8	12.1	11.9	15.2
Denmark	0.6	6.8	10.3	12.5	31.7	33.2	36.6	34.5	35.2	37.2
France	6.3	15.4	18.3	14.9	20.2	13.0	7.9	7.4	7.4	5.8
Russia	0.0	0.0	0.2	0.5	0.3	3.7	5.2	9.8	11.9	13.1
Netherlands	20.8	21.7	27.5	35.7	6.0	5.5	7.0	4.4	3.1	3.9
Belgium	5.1	4.5	1.8	2.0	1.4	0.7	1.9	1.1	0.0	0.0
Sweden	0.0	0.5	2.4	4.2	8.6	8.9	4.8	4.0	7.0	5.8
Germany	8.9	8.6	4.0	4.8	4.0	3.2	0.9	0.1	0.1	0.0
USA	5.2	0.9	6.4	2.6	3.3	1.9	1.4	1.8	0.0	0.2
Australia	0.0	0.2	0.5	0.0	1.6	7.4	8.7	9.7	13.6	9.3
New Zealand	0.0	0.0	0.0	0.0	0.0	1.5	4.0	6.4	7.4	7.6
Other	6.4	3.1	3.9	2.0	0.9	1.7	4.8	8.6	2.4	1.8
Sum (cwt.'000s)	1572	1878	2712	3026	2599	3503	4062	4719	4908	4697

Source: Solar (1989-90, pp. 159-60); Nüchel Thomsen and Thomas (1966, p. 152); Ó Gráda (1977, p. 206); *Agricultural Statistics, 1914*. Note: before 1887 the figures include margarine imports.

Table 6. Butter prices, 1905-1914
(s. per cwt.)

Price	Official		Creamery		UK 1st quality		UK 2nd quality		Average export	
Year	IRL	DK	IRL	DK	IRL	DK	IRL	DK	IRL	DK
1905	99.5	110.8	102.1	110.1	109.5	115.0	106.0	112.5	99.5	109.0
1906	101.5	114.1	103.8	114.1	111.5	119.0	108.5	116.0	101.5	114.0
1907	98.0	114.1	101.8	110.8	108.5	114.5	106.0	112.0	98.0	110.4
1908	107.1	113.0	109.2	117.0	116.5	122.0	113.5	119.0	107.1	115.2
1909	100.8	116.4	104.8	114.0	112.0	118.5	108.0	116.5	100.8	113.1
1910	102.6	109.7	106.8	113.2	112.0	120.0	109.0	117.5	102.6	115.4
1911	106.7	127.6	112.9	119.3	119.0	125.0	115.5	123.0	106.7	120.4
1912	106.8	123.1	113.5	123.8	119.0	130.0	116.0	127.5	106.8	125.5
1913	103.0	124.2	110.3	122.4	117.0	127.0	113.5	124.5	103.0	123.1
1914	108.5	134.3	114.8	122.9	122.5	130.5	118.5	127.0	108.5	125.1
Average	103.4	118.7	108.0	116.8	114.8	122.2	111.5	119.6	102.9	117.1
DK-IRL (%)	14.8		8.1		6.4		7.3		13.2	

Sources: Irish and UK Agricultural Statistics (various years); Report on the Trade in Imports and Exports in Irish Ports (various years); Statistisk Aarbog (various years); Jensen (1937, pp. 373-4).

Table 7. Butter prices in Ireland, 1905-14
(s. per cwt.)

Year	Ireland	Leinster	Munster	Ulster	Connaught	Creamery	Factory	Farmers
1905	99.5	100.4	99.5	94.9	95.9	102.1	94.8	89.9
1906	101.5	98.4	101.8	95.5	91.9	103.8	88.7	89.8
1907	98.0	94.1	98.3	91.3	88.5	101.8	85.0	86.1
1908	107.1	103.4	107.3	101.3	100.3	109.2	97.8	98.4
1909	100.8	98.3	100.9	97.6	94.3	104.8	90.1	89.6
1910	102.6	100.8	102.9	97.8	93.8	106.8	94.5	94.0
1911	106.7	103.4	107.1	96.4	104.1	112.9	95.4	95.0
1912	106.8	109.0	107.0	104.9	96.1	113.5	98.8	98.0
1913	103.0	108.5	102.8	100.3	94.5	110.3	95.4	92.9
1914	108.5	114.0	108.3	100.8	107.3	114.8	99.3	99.8
Average	103.4	103.0	103.6	98.1	96.7	108.0	94.0	93.3

Source: Irish Agricultural Statistics (various years).

Table 8. Cooperative creameries per 1000 milch cows, 1888-1914

Year	Ireland	Denmark
1888	0.000	0.585
1893	0.021	0.849
1898	0.095	0.949
1903	0.238	0.989
1909	0.245	0.907
1914	0.272	0.892

Source: creamery totals from IAOS Annual Reports, Bjørn (1988, p. 371), Statistiske Meddelelser (1915, p. 9), Henriksen (1999, Table 1). Cow totals: see Table 3.

Table 9. The Sources of Catch-Up and Fall Back Around The European Periphery, 1870–1910
(in percent)

	Schooling	Mass Migration	Capital Flows	Trade	Residual
A. How Much of Real Wage Convergence (or Divergence) on Britain Explained?					
Denmark	5-8	3.9- 5.7	30.0	> 3.9	< 52.4-57.2
Norway	5-6	8.9-20.0	35.1	> 4.4	< 34.5-46.6
Sweden	4-5	2.9- 8.4	43.0	3.1	40.5-47.0
Italy	0	64.8-67.8	positive	positive?	<32.2-35.2
Ireland	0	83.6-86.9	small positive	0?	<13.1-16.4
B. How Much of Real Wage Convergence (or Divergence) on America Explained?					
Denmark	0-9	31.9-49.2	16.3	>12.1	< 13.4-39.7
Norway	0-9	40.6-67.7	20.0	>13.9	< 0- 25.5
Sweden	0-8	24.6-41.4	34.0	9.4	7.2-32.0
Italy	0	all	0?	0?	0
Ireland	0-5	all	0	0	0

Source: O'Rourke and Williamson (1999, Table 14.4).

Table 10. Seasonal price gaps, 1870-1895 and 1895-1914

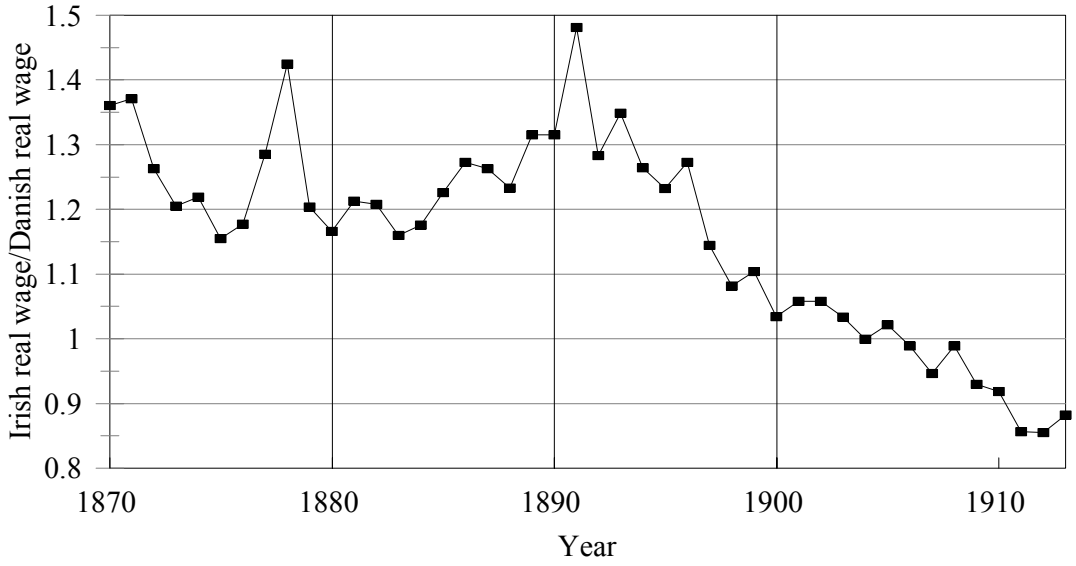
100*(Maximum-Minimum)/Average

	1870-1895	1895-1914
Cork 1sts	37.3	32.8
Cork 2nds	43.2	31.0
Cork 3rds	38.0	28.4
Dublin cools, 1sts	34.5	25.4
Dublin cools, 2nds	34.1	24.4
Dublin cools, 3rds	30.6	22.0
Dublin, Irish creameries	31.7	21.0
London, Danish	27.4	22.0
London, Friesland	36.5	27.7
Copenhagen, highest price	28.9	23.7

Source: Henriksen and O'Rourke (2003). Cork, Dublin, London and Copenhagen refer to the markets in which the prices were quoted.

Figure 1. Relative real wages

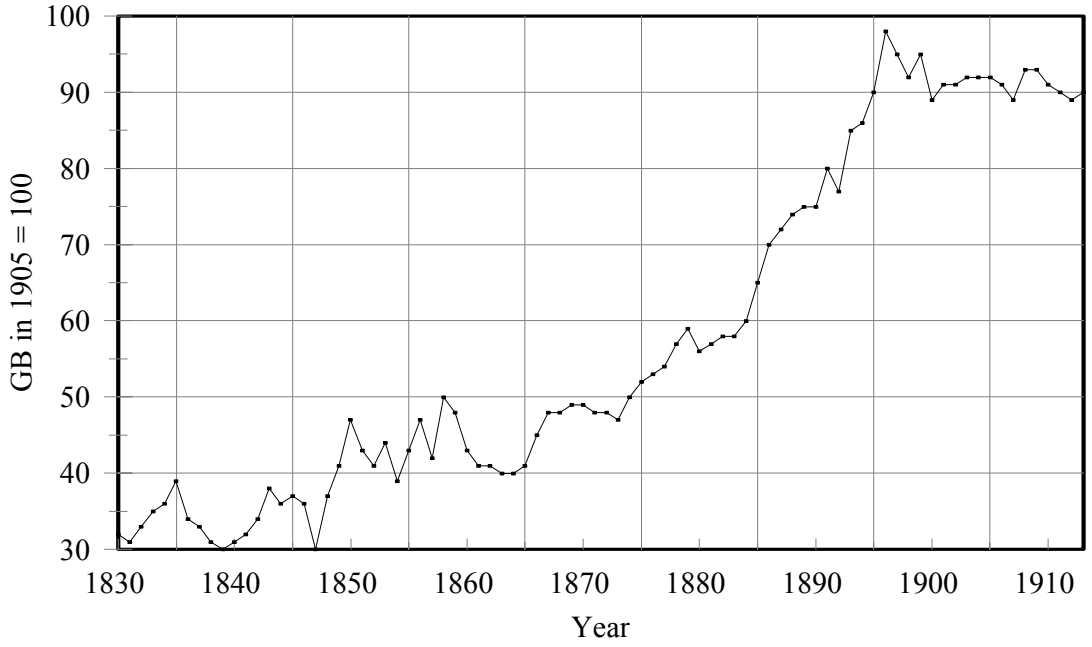
Irish/Danish real wage, 1870-1913



Source: Williamson (1995), amended in O'Rourke and Williamson (1997).

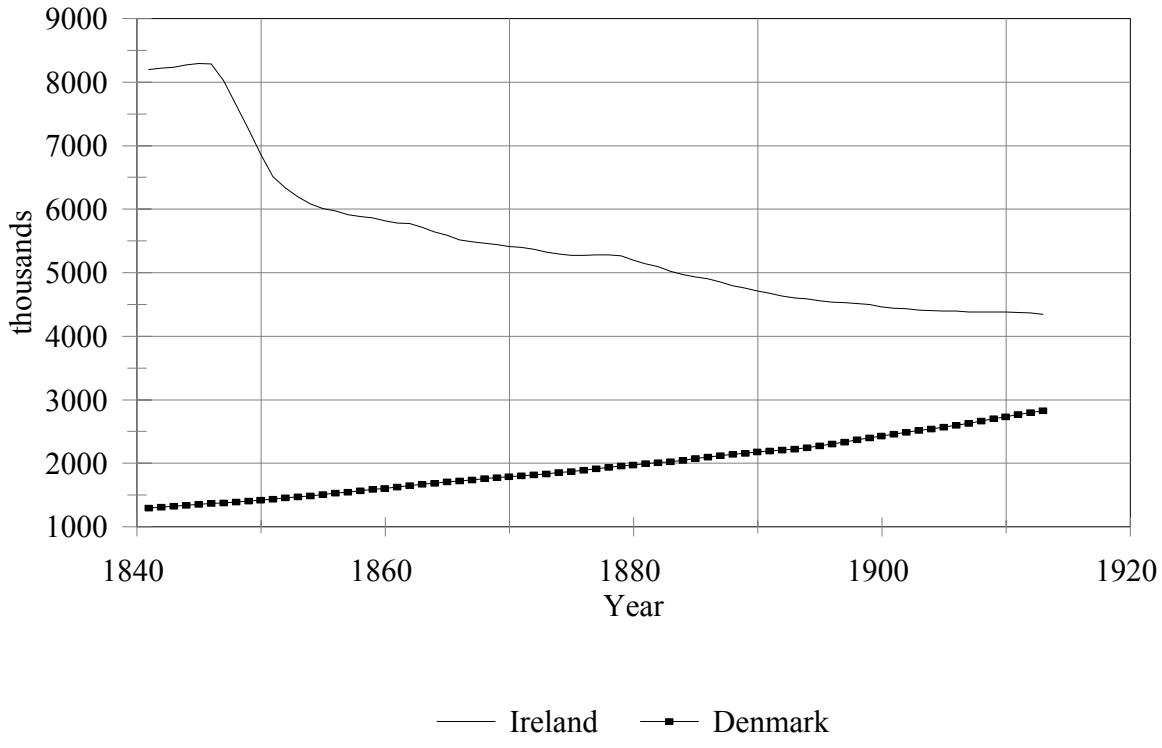
Figure 2. Irish urban real wages

1870-1913



Source: Williamson (1995), amended in O'Rourke and Williamson (1997).

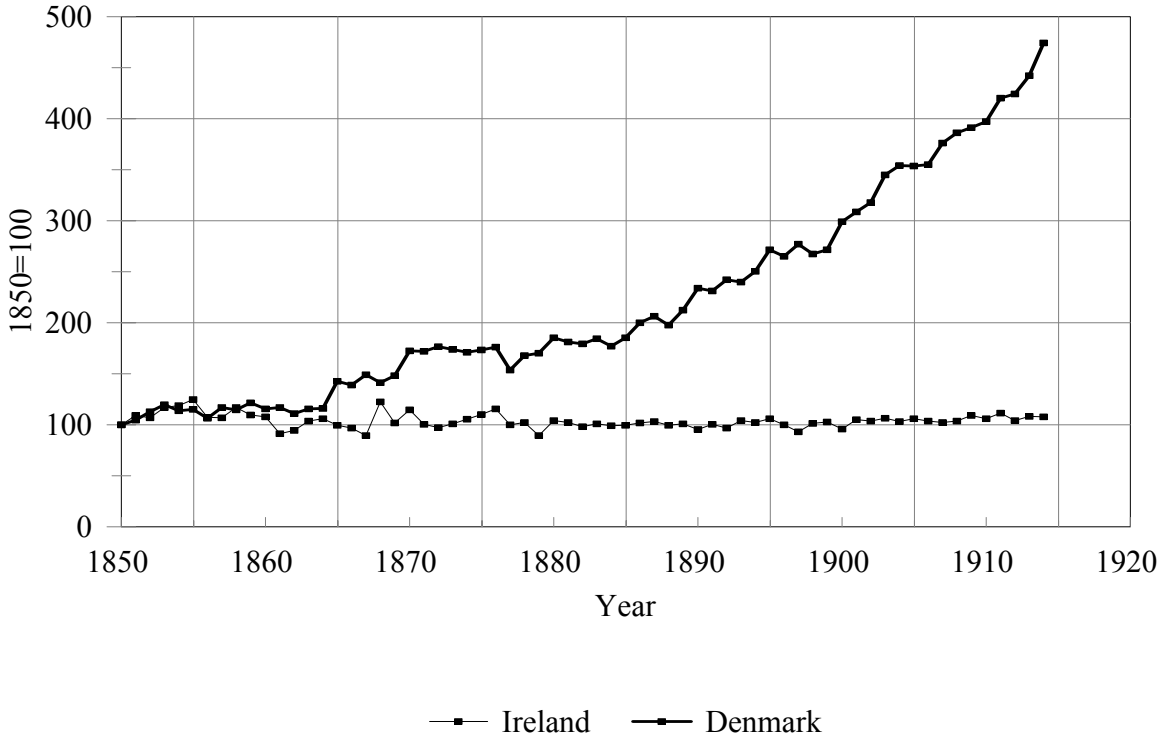
Figure 3. Population, 1841-1913



Source: Johansen (1985), Mitchell (1988).

Figure 4. Real agricultural output

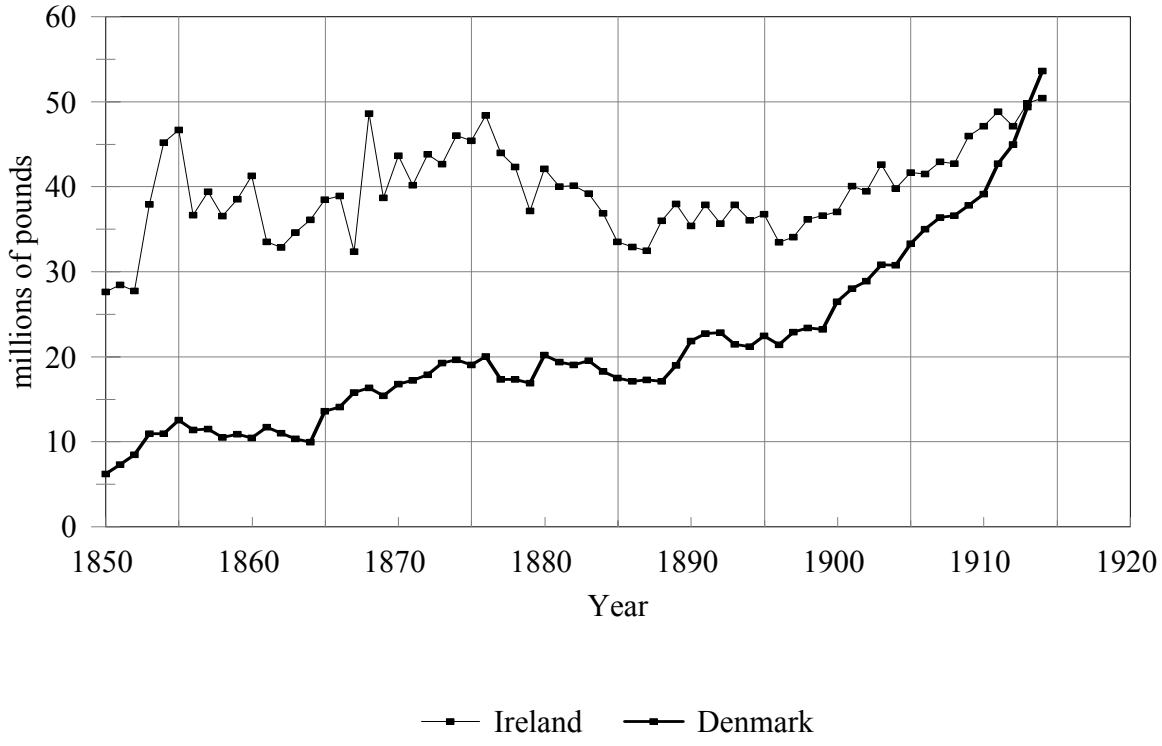
Ireland & Denmark, 1850-1914



Sources: Turner (1996), Hansen (1984).

Figure 5. Nominal agricultural output

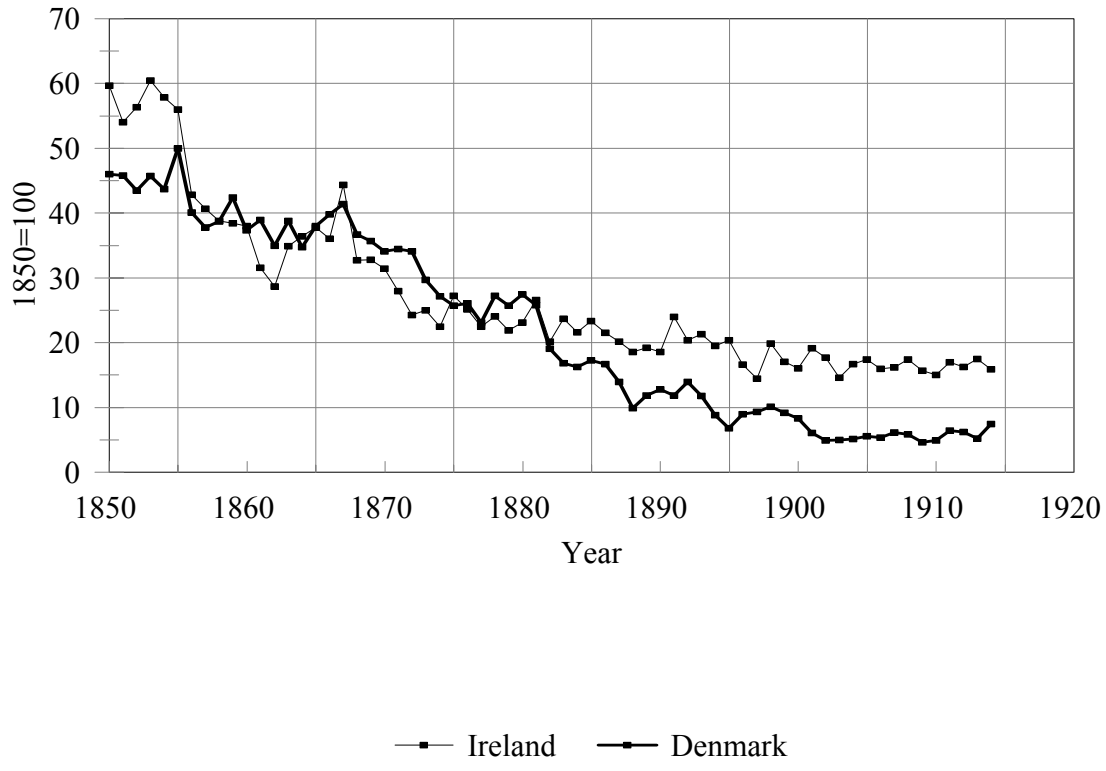
Ireland & Denmark, 1850-1914



Sources: Turner (1996), Hansen (1984).

Figure 6. Crops' share of ag. output

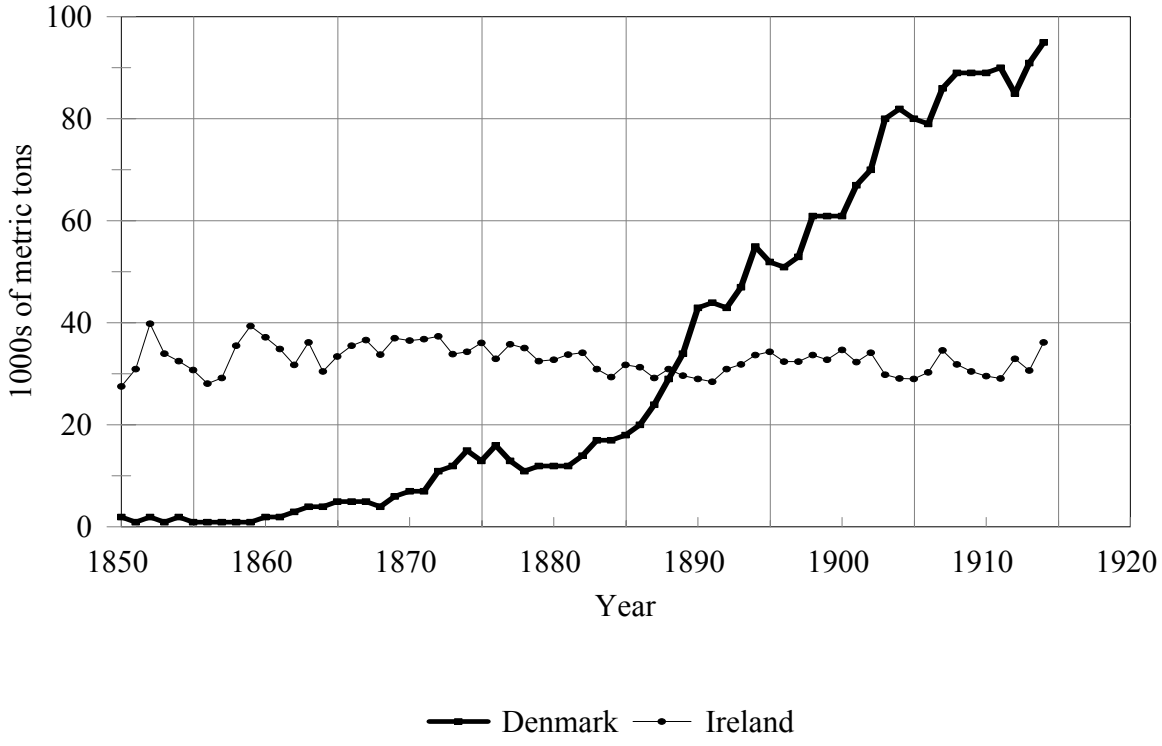
Ireland & Denmark, 1850-1914



Sources: Turner (1996), Hansen (1984).

Figure 7. Butter exports

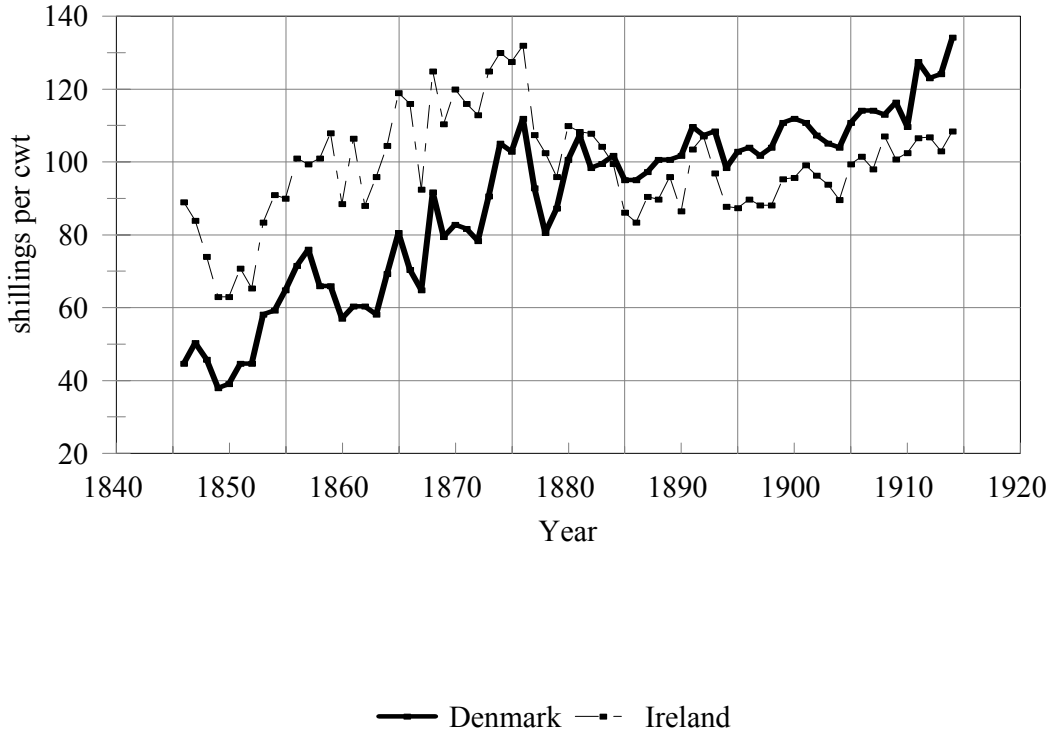
Ireland and Denmark, 1850-1914



Sources: Johansen (1985), Solar (1989-90).

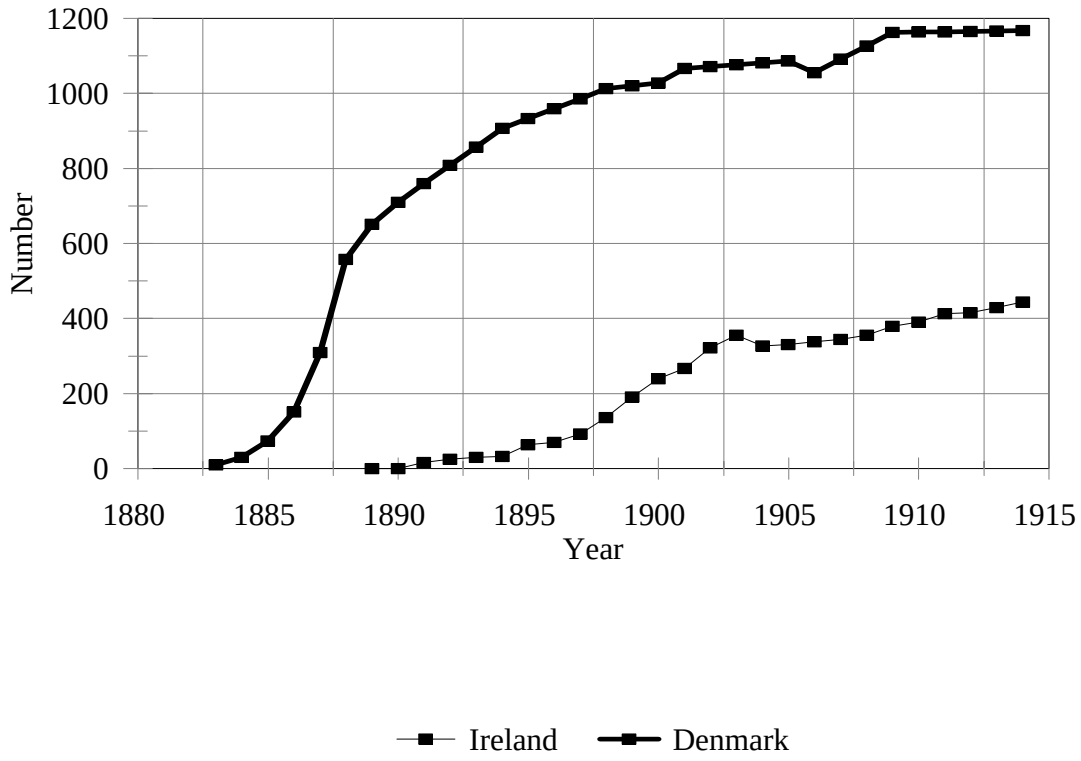
Figure 8. Official butter prices

Ireland and Denmark 1846-1914



Source: O'Rourke (1999).

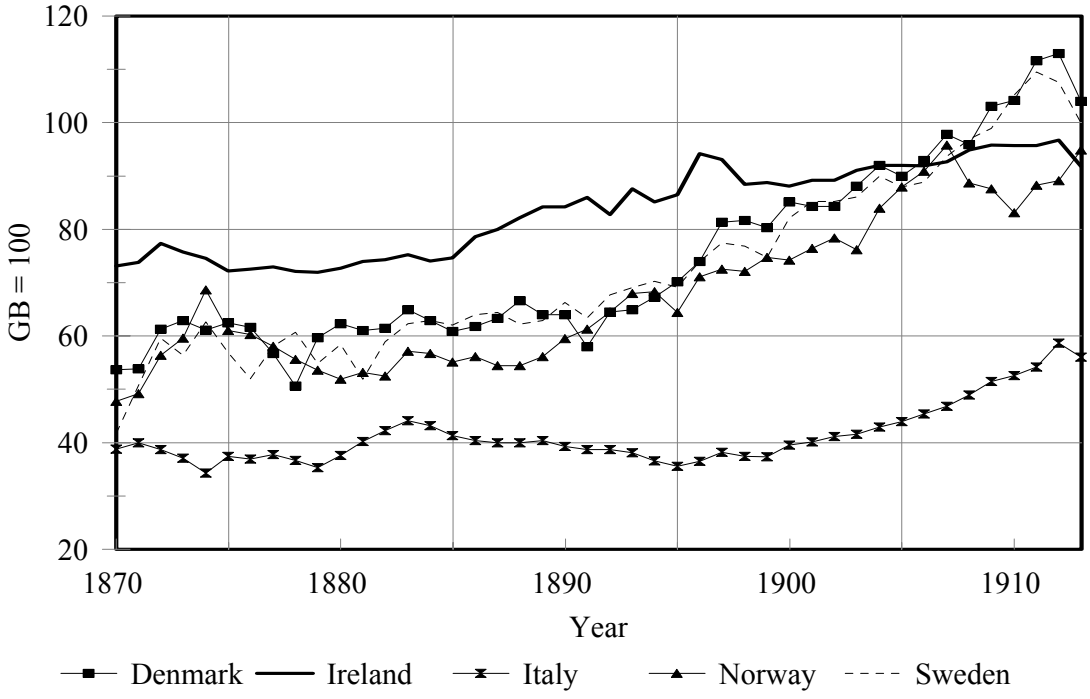
Figure 9. Cooperative creameries
1882-1914



Source: IAOS Annual Reports; Danish data kindly provided by Ingrid Henriksen.

Figure 10. Wages relative to Britain

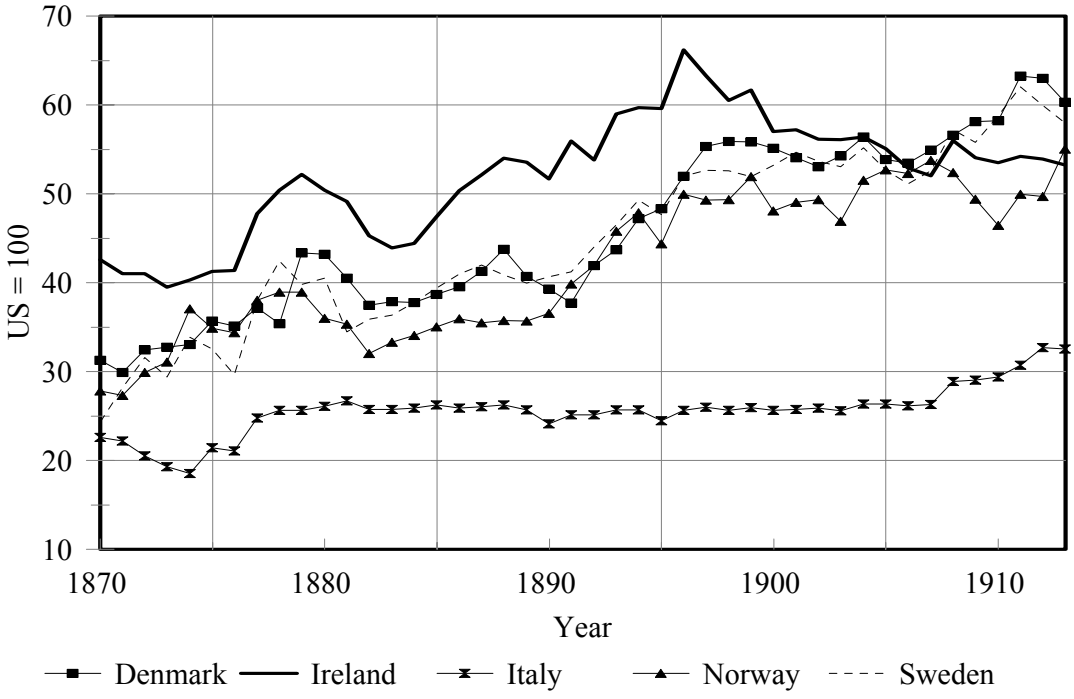
1870-1913



Source: Williamson (1995), amended in O'Rourke and Williamson (1997).

Figure 11. Wages relative to the US

1870-1913



Source: Williamson (1995), amended in O'Rourke and Williamson (1997).