INSTITUTO FIGUEROLA
DE HISTORIA Y CIENCIAS SOCIALES
Universidad Carlos III de Madrid

Universidad Carlos III de Madrid

Working Papers in Economic History

October 2014 WP 14-06

How the Danes Discovered Britain: The International Integration of the Danish Dairy Industry Before 1880

Markus Lampe and Paul Sharp

Abstract

The success of Danish agricultural exports at the end of the nineteenth century is often attributed to the establishment of a direct trade with Britain. Previously, exports went mostly via Hamburg, but this changed with the loss of Schleswig and Holstein to Prussia in the war of 1864. After this, quantity and price data imply narrowing price gaps and thus imply gains for Danish producers. Why then did Denmark not discover the British market earlier? We show that butter markets in both countries were integrated in the eighteenth century, but through the Hamburg hub. We then demonstrate that there were sound economic reasons for this well into the nineteenth century. However, movements to establish a direct trade were afoot from the 1850s. Thus, although the war certainly gave an extra boost to the process

Keywords: Butter, dairies, Denmark, hubs, international trade, market integration.

JEL Classification: F1, L1 N5, N7, Q1

Markus Lampe: Departamento de Ciencias Sociales, and Researcher at Instituto Figuerola, Universidad Carlos III, Calle Madrid, 126, 28903 Getafe, Spain.
E-mail: markus.lampe@uc3m.es
http://www.uc3m.es/portal/page/portal/dpto_historia_economica_inst/profesorado/markus_lampe
Paul Sharp: Department of Business and Economics, University of Southern Denmark. Campusvej 55, DK-5230 Odense, Denmark.
Email: pauls@sam.sdu.dk
www.keynes.dk

Publisher:
Carlos III University of Madrid. Figuerola Institute of Social Sciences History
www.uc3m.es/if

Series:
Working Papers in Economic History
ISSN: 2341-2542

Electronic version of these working paper series available on:
http://hdl.handle.net/10016/16

How the Danes Discovered Britain: The International Integration of the Danish Dairy Industry Before 1880[1]

Markus Lampe, Universidad Carlos III Madrid

Paul Sharp, University of Southern Denmark

Abstract: The success of Danish agricultural exports at the end of the nineteenth century is often attributed to the establishment of a direct trade with Britain. Previously, exports went mostly via Hamburg, but this changed with the loss of Schleswig and Holstein to Prussia in the war of 1864. After this, quantity and price data imply narrowing price gaps and thus imply gains for Danish producers. Why then did Denmark not discover the British market earlier? We show that butter markets in both countries were integrated in the eighteenth century, but through the Hamburg hub. We then demonstrate that there were sound economic reasons for this well into the nineteenth century. However, movements to establish a direct trade were afoot from the 1850s. Thus, although the war certainly gave an extra boost to the process, the shock from the loss of the Duchies was not necessary for the future Danish success.

Keywords: Butter, dairies, Denmark, hubs, international trade, market integration

JEL codes: F1, L1, N5, N7, Q1

[1] We would like to thank Per Boje, Ingrid Henriksen, Eoin McLaughlin, and participants at seminars and conferences for their advice and suggestions. We would also like to thank Hege Hauglund for very conscientious research assistance. Markus Lampe thanks research project ECO2011-25713, funded by the Spanish Ministry of Economy and Competitiveness.

1. Introduction

A commemorative medal produced for a large exhibition of industry and art in Copenhagen in 1872 bore the words of the poet H.P. Holst: '*Hvad udad tabes, skal indad vindes'*, or 'What outside is lost, must inside be won'. With the loss of the Duchies of Schleswig and Holstein to Prussia in the Second Schleswig War of 1864, this soon became a sort of national motto for Denmark and remains a potent national symbol of strength at a time of adversity even to today. Thus, Mordhorst (2014, p. 121) quotes a speech by the then Danish Prime Minister, who, marking the centenary of the Federation of Danish Cooperatives in 1999, stated that the cooperative movement was 'part of the history of the country of Denmark, which won inwardly what we lost outwardly after the catastrophe in 1864, when we lost two-thirds of our precious country', and marking the 150th anniversary in 2014 in front of the queen and other dignitaries, the present prime minister stated[2] that

> 'Out of the defeat in 1864 grew the modern Denmark. With democracy. With a well-educated population. With equality between the sexes. Freedom for the individual. And the whole of our welfare society based on solidarity.'

In fact this idea runs through both Danish literature (Westergaard 1922, pp. 19-20) and international literature on Denmark based on it, such as the internationally influential paper by Kindleberger (1951, pp. 35-36, 40-41, 44-45). Seemingly as proof of this, within a couple of decades of 1864, the Danish economy was rapidly catching up to the world's leading economies, led by Danish agriculture, particularly dairying, which became the envy of the world.

We nuance the story about the importance of 1864 by taking the story of the important butter trade back to the eighteenth century. We gather all available information on this from before 1864, and show that in terms of direct exports to Britain, 1864 did indeed mark a sudden break. We then, however, turn to price records to demonstrate that markets were integrated between

[2] http://www.stm.dk/_p_14023.html. Retrieved 3rd October 2014.

Copenhagen and London even before this date, but via Hamburg. In fact, until the 1860s, Denmark was very dependent on this hub, particularly for exports to Britain, but then she rapidly developed her own infrastructure, in particular direct trading routes with Britain, and these were to prove to be of vital importance for the expanding agricultural exports. Of course, the 1864 war made trade via Hamburg if not impossible at least politically unacceptable – but trading directly with Britain would presumably reduce costs considerably, by cutting out the expensive Hamburg middlemen. So really the important question is why Denmark ever traded via Hamburg, and how such a sudden reorientation was possible, if it had not been before the war, despite the seemingly obvious advantages, as reflected even by the frustration of contemporaries as we demonstrate below.

The usual explanations for this often emphasize the role of the war of 1864 for stimulating a sense of national consciousness, reflected by the words of Holst, as well as promoting the importance of the direct connection with Britain, which was to become so important for the export trade.

Our answer considers the literature on service clusters and export hubs, as well as the question as to how lesser developed countries can escape path dependencies embodied in traditional trading patterns and bring home the high value added parts of their export trade. The connection between market integration and path dependency is a relevant topic in economic history. Although the market integration literature mostly focuses on determining the width and depth of markets in space, business historians have provided evidence that connecting markets and organizing foreign trade is far from trivial. Especially the fundamental problem of gaining reliable information on foreign markets and establishing functioning exchange and distribution networks has attracted wide attention. In preindustrial times, often substantial specific investments in these networks and the protection of business abroad had to be made (Greif 2000, Grafe/Gelderbloom 2010), and it took large shocks, such as wars and revolutions, to reorient existing networks (Schulte Beerbühl 2013). For nineteenth century markets in sophisticated agricultural products such as wine, where quality uncertainty and cheating prevailed, the problems of establishing reliable distribution channels abroad to overcome

information asymmetries between producers, merchants and producers abroad have been highlighted repeatedly (Simpson 2004, Stanziani 2010).[3] Under these circumstances, centers that facilitate circulation and verification of information on quality of agents and business practices in foreign countries as well as credit availability and commodity storage are at a clear advantage over peripheral trading locations. Theoretically, a simple model by Krugman (1993) demonstrates that such transportation hubs are favorable locations for industries subject to increasing returns, and that the location of a hub can be self-sustaining, thus giving a role for historical accident and subsequent path dependency.

The present paper, in this sense, examines a relevant case study in which both historical advantages of a trade hub weakened, and a considerable shock assisted overcoming existing path dependency. Thus, in our interpretation, the Second Schleswig War certainly provoked the sudden change in the historical trading relationship with Hamburg, but the story is rather more nuanced than simply being a reflection of national consciousness after 1864: Hamburg was certainly initially important, since it provided services that Denmark could not, for example expert market information, credit, and regular connections with England, the latter particularly important given the perishable nature of butter. As the first era of globalization moved on, however, the persistence of the use of the Hamburg hub became less obviously economically justifiable. At the same time as the costs of trading via Hamburg were increasing, we argue that the benefits were also decreasing. First, the costs of establishing a direct connection with England fell with the price of steam shipping and the telegraph, and with the liberalization of British trade policy. Second, the benefits of the Hamburg hub were decreasing with the abolition of the Sound Toll (which was payable by any ships entering the Sound between Helsingør in Denmark and Helsingborg in Sweden) in 1857, which made Copenhagen a more attractive port than it had been. And finally, the commercial and credit crisis in Hamburg in late 1857 also contributed to its relative loss of centrality in trade between Britain and Southern Scandinavia over the following decade or so.

[3] Ekberg and Lange (2014) argue that even in the late twentieth century individual enterprises, such as shipping companies were of crucial importance in the process of globalization, for reasons closely related to those outlined above.

We combine quantitative information such as price and trade data with an analysis of contemporary publications from German, Danish and British sources to trace the simultaneous process of the establishment of export dairies, the construction of new trade networks and steamship connections to England for direct export, and the discovery of the quality of Danish estate butter by British merchants and consumers. We observe that from the 1850s this model trickled down from a pioneering group of large estate owners, via packing firms and private creameries to medium landowners, and ultimately to the common farmer (or peasant) through the cooperative movement. As Denmark developed, the Hamburg hub became less important, and eventually the entire country became its own dairy cluster, and even started to re-export other countries' dairy produce. This capture of the high value added part of the production process was of major importance for the Danish development story.[4]

This process also provides in depth-insights into a representative case of late nineteenth-century agricultural globalization. The nineteenth century experienced the integration of national and international markets for all sorts of products, and the concomitant 'Great Specialization' between urbanized, industrialized regions and agricultural 'hinterlands' within countries, and the formation of a core-periphery model with industrialized countries, above and first of all Britain, in the center, exchanging their industrial surplus production for food and raw materials with 'peripheral', mainly agricultural economies. In a process resembling von Thünen's rings of specialization (Kopsidis 2014), the perishability of individual commodities, relative factor endowments and absolute geographical advantages marked the potential extent of this specialization. As a consequence, international trade in agricultural commodities grew at rates above 3 percent from (at least) 1850 until the First World War (Aparicio et al 2009, pp. 53-5, 61-3). In this process, diminishing growth rates of initially dominant origins and commodities, such as wheat, were at least partially offset by new countries and formerly untradeable commodities entering this process, such as fresh fruits and vegetables (Pinilla/Ayuda 2008,

[4] Some of our findings mirror Keller et al (2011, pp. 873-877), who assesses why after 1842 Hong Kong emerged as an important entrepôt for overseas imports into China, in part due to geographical location and in part because of its cluster of knowledge and contacts for penetrating the Chinese market.

2010), eggs or the subject of the present study, dairy products, thanks to their higher income-demand elasticities and technological advances in both production and transportability.

The remainder of this paper is organized as follows. In the next section, we first provide a quantitative description of the structure of Danish trade in the nineteenth century based on the available data. We also provide an econometric analysis of butter prices from London, Hamburg and Copenhagen, using error correction models and cointegration analysis to demonstrate how market integration of Denmark with Britain through Hamburg changed into direct integration with Britain. Moreover, the narrowing of the Anglo-Danish price gap we identify provides some indication of the benefits of this for the Danish economy. Then in Section 3 we provide a more qualitative approach, emphasizing the changes that were already happening in the first half of the century, and demonstrating how a number of factors came together around the 1850s and '60s which helped propel Denmark into an almost total reliance on the direct export trade to Britain. Section 4 concludes.

2. From Hamburg to the UK: The Reorientation of the Danish Butter Export Trade

2.1. Evidence from Trade Statistics

Exports of butter[5] were considered a state secret until 1820 (Drejer 1962, p. 21) and if statistics were kept, they have not been preserved, which makes it less than straightforward to trace the evolution of Danish butter exports, or any other exports before this point. The first meaningful trade statistics, the *Eksportstatistiske Tabeller* ('Export Statistical Tables') start in 1820 only, giving information on grain exports first, adding tables on butter and cheese from 1821 (Boje 1977, p. 57-60). From these series, which are preserved in the Danish National Archives and run to 1834, we can assess the total exports per product of the Danish Monarchy including the Duchies of Schleswig and Holstein (but not the free port of Altona, which is listed as a destination), henceforth 'Greater Denmark', and the distribution of export destinations. We can

[5] For a general survey of Danish trade over this period, see Thomsen and Thomas (1965).

also assess the share of each entity and the different regions of Denmark proper (the continental peninsula of Jutland and the islands of Funen, Zealand and Lolland-Falster) in the total, as well as a breakdown by customs districts. Unfortunately, however, it is not possible to know the destinations of exports for each of the constituent parts of 'Greater Denmark', although it is the reorientation of trade by the Kingdom, i.e. Denmark proper, which interests us here.

Nevertheless, for the whole of 'Greater Denmark' we can see a clear pattern in this early period, as illustrated in Table 1. More than 70 percent of all butter exports went to Hamburg and the adjacent Danish free port of Altona (which is today a district of Hamburg), and together with the Baltic Hanseatic port of Lübeck more than 75 percent went to port cities. For the rest, we can see an increasing share of direct exports to England and Scotland, and a decreasing share of exports to Norway, which had been ruled by the King of Denmark until 1814.

Table 1: Butter export destinations (%) and total exports (tønder of 112 kg) for Denmark and the Duchies of Schleswig and Holstein, 1821-34

Abstract	Altona	Hamburg	Lübeck	Other Germany	Britain	Norway	Sweden	Other	Total
1821-4	23.0	50.4	6.7	10.2	0.8	7.9	0.1	0.9	42,782
1825-9	22.5	49.2	3.5	9.5	6.4	7.8	0.1	1.0	51,863
1830-4	27.5	44.3	3.4	8.0	9.1	4.9	0.0	2.8	48,682
1821-34	24.4	47.8	4.4	9.2	5.7	6.8	0.1	1.6	48,132

Source: *Eksportstatistiske Tabeller* 1821-1834.

Note: 'Other Germany' includes returns for 'Germany', Bremen, Hannover, Mecklenburg, Oldenburg (incl. Eutin), Prussia and the ports of Rostock, Stettin, Stralsund and Wismar; it does not include Helgoland and destinations given as 'North Sea' or 'Baltic'.

However, as Figure 1 shows, the exports of butter from Denmark proper accounted for a relatively small fraction of total exports from 'Greater Denmark' in this period, i.e. 28.8 percent on average. More importantly, Danish economic historians (especially Boje 1977, pp. 66-72)

have highlighted that the distribution of export destinations was probably somewhat different for the Kingdom of Denmark than for the Duchies. In the former the importance of the traditional market of Norway was much higher than in the aggregate, and Altona would have taken a larger share than Hamburg, although much of the latter was simply passing through the Danish free port to the Hanseatic City.

Figure 1: Total exports of butter from 'Greater Denmark', 1821-1834

Sources: 'Exports Denmark and Duchies' as Table 1; 'Exports from DK': Boje (1977, p. 316). 1 tønde of butter = 112kg.

This can be confirmed for the period 1838 to 1852[6] when we have, from the first published Danish trade statistics, an overview of the destinations of butter exports for Denmark proper, which we have aggregated in the same way as before in Table 2.[7] For the period before the First Schleswig War (1848-51) 38.4 percent of exports went to Norway, and another 44.8 percent to Altona, while the shares of Hamburg and Germany are much smaller than for 'Greater Denmark' in Table 1. 'Other destinations' are also slightly more important, among which the Danish possessions of Iceland, Greenland and the Faroe Islands dominate alongside the Danish West Indies. The shares of Lübeck and of direct exports to Britain are similar to the Denmark and Duchies aggregate before the war.

Table 2: Shares of exports of butter from Denmark by destination (in %) and total exports (in tønder), 1838-52

	Altona	Hamburg	Lübeck	Other Germany	Britain	Norway and Sweden	Other	Total
1838-42	47.2	0.6	3.5	0.3	13.7	31.1	3.6	16,941
1843-47	42.4	0.4	0.9	0.3	5.4	45.7	4.9	11,589
1848-51	12.0	5.0	8.6	0.5	21.2	47.6	5.2	13,659
1852	21.9	0.7	2.5	1.3	11.3	60.0	2.5	21,351
1838-52	34.5	1.7	3.9	0.4	12.8	42.3	4.4	14,576

Source: *Statistisk Tabelværk*. Altona includes the small neighboring port of Wandsbek. 1 tønde of butter = 112kg.

During the First Schleswig War (1848-51), we observe increasing direct exports to both the Hanseatic Towns of Hamburg and Lübeck, but especially to Britain and Norway. In part, this seems to reflect the reversal of a former trend away from butter exports to Britain (sometimes linked to the repeal of the British Corn Laws which fostered grain exports, see Boje 1977, pp.

[6] For 1835-37 trade statistics are partially missing and partially published in a periodical called *Handels- og Industri-Tidende*. The format of the available data is similar to that of the *Eksportstatistiske Tabeller* and no important shifts in trade can be observed, so we omitted these years in the tables.

[7] Sweden and Norway have been added up since they are reported jointly in the trade statistics for 1844 to 1847. However, the share of Sweden in 1838-1843 and 1848-52 in total exports is only marginal, on average 0.25 percent, with a maximum of 0.36 percent in 1852.

62-68). At the same time, the importance of Altona shows a marked decline. Note that there is no overall decline in the volume of butter exports from Denmark during the war. The notable trade diversion from Altona towards Norway, Britain, Hamburg and Lübeck might be an effect of the war that cut trade routes to Altona and though the Duchies, and it might also reflect some of the efforts to establish direct trade connections to Britain described below. However, already for 1852, we see a marked reorientation back towards Altona (again taking 21.9 percent of exports) and a reduction in the British share to 11.3 percent,[8] while the share of exports to Norway is still rising.

Unfortunately, it is difficult to assess whether these changes and reversals persisted, since in 1853 the Danish government ceased to publish accounts of the destinations of the exports from the different parts of 'Greater Denmark'. Thus, destinations are given in the trade statistics only for the sum of Denmark and the Duchies until 1861 and for Denmark and Schleswig (excluding Holstein and Lauenburg) for 1862 and 1863.

Of course, after the Second Schleswig War and the loss of the Duchies in 1864, Danish trade statistics and their accounts of destinations of exports refer to Denmark only. For the first years after the war (1864-68), we observe an almost complete reorientation of trade, with more than two thirds of butter exports going to Britain, with a much reduced orientation towards Norway and a clear loss of importance of both Altona (now probably included under 'Duchies'), Hamburg and Lübeck. Also, and importantly, total exports doubled between 1848-52 and 1864-67, and from there continued to increase at a fast pace. These patterns were to remain and be reinforced after the 1880s, until finally in 1900 around 90 percent of Danish butter exports would go to Britain.

[8] From 1851 to 1852, however, export volumes increase a lot, so that the absolute volume exported to Britain in 1852 is just 2.5 percent below the 1851 volume (but 29 percent below the 1850 wartime maximum).

Table 3: Shares of exports of butter from Denmark by destination (in %) and total exports (in tønder), 1865-72

	Duchies	Altona	Hamburg	Lübeck	Other Germany	Britain	Norway and Sweden	Other	Total
1864	7.7	-	1.4	0.9	0.0	64.2	23.2	3.6	39,939
1865-67	11.9	-	0.7	0.7	0.1	64.0	20.5	3.3	42,805
1868-72	9.7	-	0.1	0.3	0.1	81.9	6.8	1.4	62,487
1873-77	8.3	-	0.3	0.5	0.2	83.7	6.2	0.7	123,081
1878-81	7.2	-	0.4	0.4	0.0	84.8	6.4	0.8	106,898
1864-81	9.0	-	0.4	0.5	0.1	79.1	9.7	1.5	84,421

Source: *Statistisk Tabelværk*. Altona is now included in the Duchies, which refer to Schleswig, Holstein and Lauenburg. 1864 refers to the 1864/65 fiscal year (after the war). 1 tønde of butter = 112kg.

This leaves the important question of what happened between 1852 and 1864. Was the Danish reorientation a gradual process already starting with the First Schleswig War, or were trade patterns reversed again towards Altona and indirect exports via Hamburg? There are three ways to assess this, none of them perfect. The first is to look at the distribution of the exports of Denmark and the Duchies during this period, to see if there is a more general trend towards Britain. Then, we can also look at British import statistics to see if Denmark is gaining a larger share. And finally, we can look at the import and export statistics of Hamburg.[9]

[9] Note that the fourth option - looking at Altona's trade statistics - is impossible, since comprehensive trade or shipping statistics are missing for this period. However, in previous work it has been found that Altona was something like a 'junior partner' to Hamburg in its export activities, and it thus turned out to be a reasonable assumption that its flows mimic more or less those of Hamburg – there was no customs border between them. See Lampe (2008, note 64, p. 146) for references.

Table 4: Shares of exports of butter from Denmark and the Duchies by destination (in %) and total exports (in tønder), 1838-62

	Altona	Hamburg	Lübeck	Other Germany	Britain	Norway	Sweden	Other	Total
1838-42	22.5	54.7	1.8	0.6	8.2	7.6	0.1	4.5	75,064
1843-47	27.9	56.4	1.9	1.1	1.3	8.1	-	2.8	72,054
1848-51	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1852	17.7	83.2	4.4	1.8	5.1	26.1	0.2	2.0	52,680
1853-57	16.4	64.7	2.1	0.3	4.7	9.7	0.3	1.7	75,187
1858-62	13.3	65.6	2.0	0.8	6.0	10.8	0.7	0.8	76,420

Source: *Statistisk Tabelværk*. Altona includes the neighboring small port of Wandsbek. 'Other Germany' after 1852 also includes the Duchy of Lauenburg. In 1843-47 Sweden is included under Norway. 1 tønde of butter = 112kg.

While data for the period of the 1848-51 war is missing for 'Greater Denmark', Table 4 suggests that no important changes in trade patterns can be discerned before 1863. At most, we can see the increasing trend of exports to Norway (especially in 1852), probably from Denmark, and a shift from trading via Altona to trading via Hamburg. The share of direct exports to Britain in 1858-62 is no larger than in 1838-42. However, it might be possible that an increased share of exports from the Duchies to and via Hamburg concealed a different trend from the Kingdom of Denmark regarding direct exports to Britain.

To shed light on this possibility, Table 5 offers a breakdown of British import statistics by origin, while Table 6 gives the quantities of butter imported into Britain from the relevant destinations, comparing them to the volumes reported in the corresponding export statistics.

Table 5: Shares of imports of butter into the United Kingdom by origin (in %) and total imports (in 1000 cwt), 1823-97

	Denmark	Hamburg; Schleswig-Holstein	Germany (other)	Holland and Belgium	France	Other Foreign	Total imports
1823-27	1.6	-	26.2	72.0	0.0	0.2	194
1828-32	5.7	-	22.3	71.5	0.0	0.4	143
1833-37	5.3	-	19.8	74.7	0.0	0.2	188
1838-42	5.4	-	27.7	64.8	0.1	2.0	235
1843-45	0.6	-	16.7	77.8	0.1	4.9	197
1845-46	0.9	20.7	6.3	66.8	0.0	5.2	286
1848-51	2.4	14.5	4.8	73.9	0.4	4.0	315
1852	1.5	16.0	1.3	80.1	0.8	0.3	285
1853-57	2.2	16.5	3.1	68.8	6.3	3.0	442
1858-62	1.6	12.4	1.0	52.1	10.8	22.0	735
1863-64	5.1	13.3	1.6	38.6	14.6	26.8	1,021
1865-67	6.3	10.6	0.1	37.8	37.0	8.2	1,130
1868-70	7.7	13.1	0.0	40.0	31.1	6.8	1,172
1871-72	12.9	-	12.0	33.3	27.0	14.8	1,236
1873-77	13.8	-	7.7	27.7	38.4	12.3	1,533
1878-82	13.6	-	5.5	37.2	25.2	18.5	2,077
1883-87	20.5	-	6.9	35.4	22.9	14.3	2,054
1888-92	38.5	-	6.3	9.6	26.3	19.2	1,989
1893-97	41.2	-	4.3	8.3	16.4	29.7	2,797

Source: BPP (1830), pp. 2-3 (1823-29), *Tables of the revenue, population, commerce, &c. of the United Kingdom and its dependencies (1830-1840, 1851-52)*; BPP (1854-55), p. 7 (1841-1850); *Annual Statement of the Trade and Navigation of the United Kingdom* (1853-1897). 1854 interpolated between 1853 and 1855.

Notes: Years from 1875-85 corrected for margarine imports (Lampe and Sharp 2014). Before 1846, until 1858, Hamburg is listed under Hanse Towns, which theoretically also include Bremen and Lübeck. While Lübeck is never listed, Hanse Towns have been split into Hamburg and Bremen according to average shares in the total in 1858-62. Schleswig and Holstein are only listed from 1864 to 1870, when they make up a tiny fraction of the Hamburg and Schleswig-Holstein total (2%). 'Other Germany' is 'all of Germany' before 1846 and after 1870, and includes Prussia, Mecklenburg-Schwerin, Hannover, Bremen, Oldenburg and Kniphusen between 1847 and 1869. Note that totals do not include imports from Ireland, which was part of the UK. 1 cwt (Imperial hundredweight) = 50.802345 kg.

Table 6: Total imports of Butter from Denmark and Germany to the UK (in 1000 cwt), 1823-72

	Imports to UK from				Exports to UK from		
	Denmark	Hamburg	Schleswig-Holstein	Germany (other)	Denmark	'Greater Denmark'	Hamburg
1823-27	3.6			55.3		4.4	
1828-32	8.0			31.4		8.9	
1833-37	9.7			41.0		13.2	
1838-42	13.0			65.5	5.6	15.0	
1843-45	1.2			34.3	1.4	2.3	
1845-46	1.9	50.0		35.2	1.0		49.1
1848-51	7.4	45.8		15.2	6.7		58.1
1852	4.3	45.8		3.7	5.8		59.5
1853-57	9.9	73.1		13.6		8.9	92.2
1858-62	13.8	90.1		9.0		12.5	
1863-64	52.7	133.2	4.5	15.6	55.1		
1865-67	71.1	116.2	3.2	1.6	65.7		
1868-70	103.4	153.9	2.0	0.9	102.6		
1871-72	157.2			149.5	151.5		

Sources: See Tables 1 and 2 for Denmark, Table 5 for Britain and Table 7 for Hamburg.

Notes: See Table 5. Schleswig-Holstein: Not listed in 1863 and 1868, average refers to years with data only (no zero values included). Exports to Britain from Denmark: 1863-4 is 1864 value only. Exports to Britain from Hamburg: no data for 1849 and from 1857, averages refer to years with data only. 1 cwt (Imperial hundredweight) = 50.802345 kg.

As much as the sketchy data allows, we can see that trade statistics are relatively coherent between the different countries when it comes to assessing levels and trends in the international butter trade. Thus, from Tables 5 and 6 we see that quantities and shares of direct Danish exports to Britain decrease in the years 1843/4 to 1846/7 and increase during the First Schleswig War, to decline afterwards. If we believe the British statistics, in the period from 1853 to 1862, direct exports from Denmark were gradually increasing in absolute terms, although their growth was smaller than that of overall British butter imports before 1863. Already during the Second War, however, direct exports to Britain increased strongly, gaining even more pace afterwards and especially in the early 1870s, when butter became Denmark's most important export item and British butter imports from Denmark become larger than those of all sorts of

German butter for the first time. After about 1880 they accelerated again when the cooperative movement took off and the dairy export industry developed fully.

It remains however difficult to assess how much of Danish butter was actually traded to Britain via Altona and Hamburg in the period before 1864 due to the lack of trade statistics for Altona. We can, however, have a look at the sources of Hamburg's imports since 1850 and check whether at least the assumption that there was substantial exchange between the Hanse City and its smaller Danish neighbor is correct.[10] Furthermore, since it is unlikely that much butter was produced in Hamburg itself we can assume that – apart from consumption by its inhabitants – the structure of the sources of Hamburg's butter imports resembles quite closely the proximate (Altona, Lübeck) and ultimate countries of origin of the butter that was exported from Hamburg to Britain.

[10] There are import statistics for 1845-1848 in a volume published in 1850, but these refer to seaward imports of a selected number of goods only, among which butter is not listed (but it is listed as an export item, hence the data in Table 6).

Table 7: The sources of Hamburg's imports, 1850-72 (%) and total imports (in Zentner of 50kg)

	Denmark by sea	From and via Altona	From and via Lübeck	Duchies (exc. Altona)	other Germany possibly Duchies	other Germany not Duchies	Other	Total imports
1850-51	1.6	40.6	8.1	0.0	28.2	20.1	1.3	159,669
1852	0.0	55.6	1.7	0.0	25.7	16.7	0.3	142,436
1853-57	0.1	53.0	2.3	0.0	17.3	26.8	0.5	169,035
1858-62	0.0	38.8	3.9	0.0	17.7	35.1	4.5	136,917
1863-64	0.0	46.9	1.9	0.0	14.1	27.8	9.3	164,492
1865-67	0.0	41.9	7.6	1.0	13.5	34.2	1.7	168,644
1868-70	0.0	38.0	21.5	0.6	11.7	26.8	1.4	221,434
1871-72	0.0	41.5	31.9	0.0	13.2	9.7	3.6	239,977

Sources: Tabellarische Übersichten des Hamburgischen Handels 1850-71.

Note: Data for 1864 not entered; corresponding averages refer to years with data only. 'From and via Altona' comprises items 'from and via Altona' and 'Altona-Kiel railway'; 'From and via Lübeck' comprises items 'from and via Lübeck', 'Lübeck by cartload', 'Lübeck by railway' and 'Lübeck-Hamburg railway'; 'Duchies (exc. Altona)' refers to 'Holstein by Lübeck-Hamburg railway' (listed from 1865 only, before probably included under Lübeck); 'Other Germany possibly Duchies' refers to places North and East of Hamburg, i.e., Harburg and Lüneburg as well as 'Lower Elbe' and unidentified landward imports 'by cartload'. 'Other Germany not Duchies' refers to places and routes which do not require crossing Schleswig or Holstein, i.e., Upper Elbe, Hamburg-Berlin railway, East Frisia, Oldenburg, Bremen and the Weser River and Prussian ports at the Baltic Sea. The high share of 'Other' in the 1860s is due to a short-lived increase in butter imports from the United States.

We see that effectively on average around 46 percent of Hamburg's butter imports arrived from or via Altona, and almost another 20 percent arrives from places or routes which might originate in the Duchies. Direct imports from Denmark are negligible, except for the war year of 1850, where they account for 3.2 percent of imports.

Unfortunately, the practice of crediting overland imports with the railroad, waterway or river port from where or on which they were consigned makes it impossible to trace the sources of imports any further. It is, however, very likely that much of the butter exported from Denmark to Altona given in Table 2 ended up in Hamburg. From there, more than 75 percent of all

seaward exports were shipped to Britain in the period 1845-56 for which we have export data.[11]

Table 8: Destinations of Hamburg's seaward exports, 1845-56/1873 (%) and total seaward exports (in Danish tønder)

	Britain	Iberia	America	Other	Total
1845	69.0	21.7	7.5	1.9	29,977
1846	75.8	14.4	8.4	1.4	26,695
1847	81.9	11.7	4.8	1.7	41,020
1848	79.1	14.7	5.7	0.5	25,616
…					
1850	79.5	11.8	7.0	1.7	30,073
1851	86.0	7.0	7.0	0.0	32,952
1852	80.4	11.0	8.3	0.3	30,815
1853	85.6	6.7	7.1	0.7	36,561
1854	87.7	5.7	4.7	1.8	42,895
1855	86.1	3.8	6.8	3.2	47,160
1856	89.4	3.5	5.4	1.7	49,337
…					
1873	85.8	0.6	7.2	6.3	64,634

Sources: See Table 7.

This exhaustive look at the available information on trade flows between Denmark, the Duchies, Hamburg and the UK presents a picture which is consistent with the traditional story of Danish trade. There was indeed a sudden shift after 1864, and butter exports before this date largely went through Hamburg.

[11] When rudimentary export data becomes available in 1873, the share of exports to Britain is 85.8 percent.

2.2. Evidence from the Eighteenth and Nineteenth Century Price Statistics: Testing for Market Integration

We turn now to the evidence from prices, which are commonly used to investigate the extent of integration between distant markets (see for example the survey by Federico 2012). One advantage of so doing is that relatively consistent price series are available for long periods not covered by the trade statistics. Also, by looking for cointegrating relationships between the available series, we expect to be able to identify integration between Denmark and the UK for periods before direct trade was taking place. Specifically, we hope to uncover the links between Denmark, Hamburg, and the UK, with integration from Denmark to the UK via Hamburg in the early period, and directly after 1864. Moreover, due to the Law of One Price, price gaps can be interpreted as giving some indication of the extent of transportation and transaction costs between locations. However, our analyses should be treated with caution, in particular in as much as they might be affected by changes over time in the composition of the goods to which the prices refer, for example relative quality changes.

We divide our data into three periods, determined to some extent by the available annual data. Our first period is from 1748 to 1800. Our Danish prices are the July 1 prices (or closest available) for Funen butter in Copenhagen taken from Friis and Glamann (1958, pp. 261-78), who originally gathered these prices from the Copenhagen Price-Current. For Britain, we use Clark's homogenized series from different sources (Clark 2004). For Hamburg we use the prices collected by Gerhard, Kaufhold and Engel (2001, pp. 56-57) from the Hamburg Price-Current, which refer mainly to Holstein butter.[12]

Our second period runs from 1831-60. For Britain we use Klovland and Solar's butter price series, which refers to Limerick and Waterford butter in London. For Denmark, we use *Københavns Torvepriser* ('Copenhagen Market prices') as reported by Drejer (1925-33, p. 323). Our Hamburg prices are from Jakobs and Richter (1935), who report indices of prices from the Hamburg commodity exchange. We have converted them back into prices by benchmarking

[12] These are in Hamburg small tons of 108.45408 kg.

them to the 1904 Hamburg average top quotation given by Fick (1907, p. 21). Merchant Fick is Jacobs and Richter's original source.

For the analysis we perform below, we soon discovered that the years 1861-64 were very noisy and had a large impact on the estimation results. This is consistent with there being a structural break at this time – which the history suggests there should be – although this also means that we are unable to analyze the two periods in one estimation, since the model we employ assumes constant parameters. We discuss this more below, but for now it should be noted that the short time periods employed mean that we have relatively few observations, and thus the results should be considered merely indicative. Clearly, more frequent data would solve this problem, but none are available.

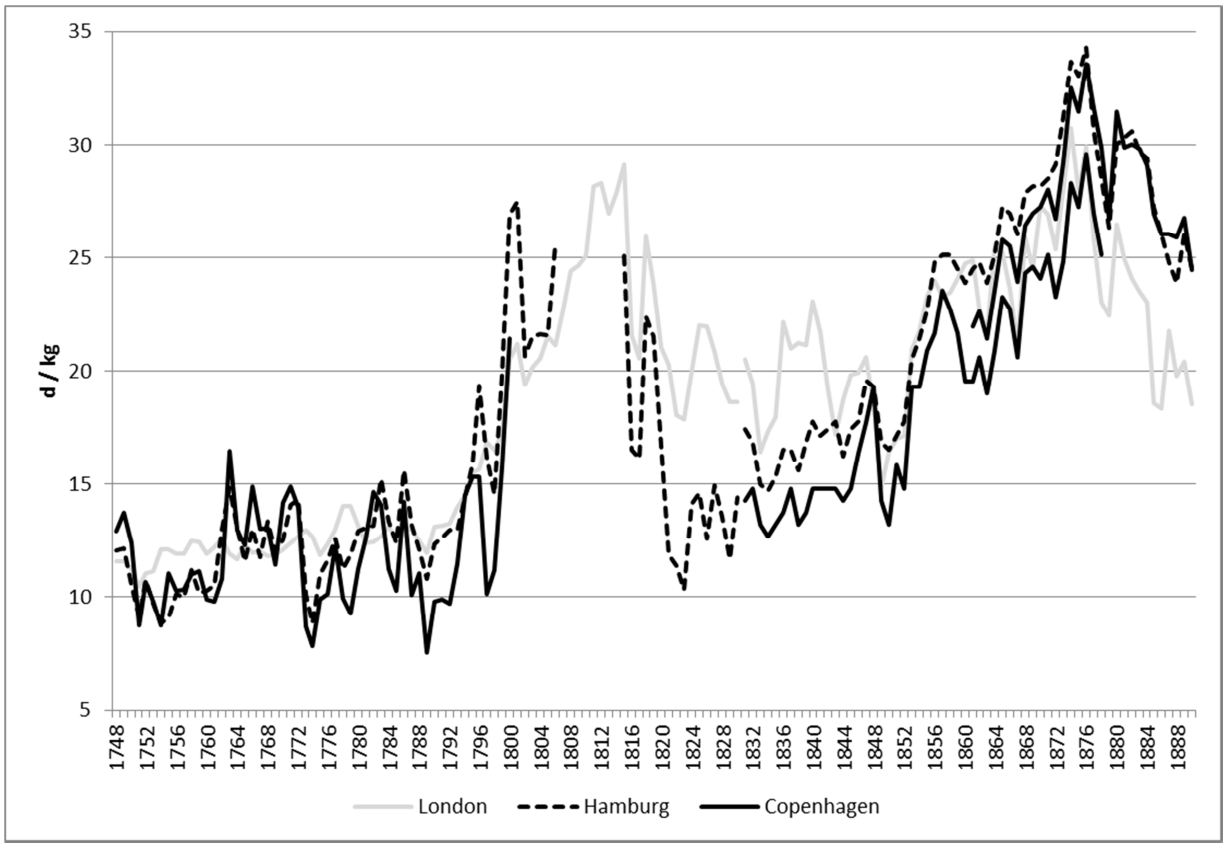
We thus choose to start our last period in 1865, the year after the Duchies were lost to Prussia. Thus, our final period covers the years 1865-90. For this we also use the Klovland and Solar (2011) data for Britain, and Jakob and Richter (1935) for Hamburg, but since Drejer's data only runs until 1878, we use a different price series, which is not available before 1860[13]. This is the quotation for best estate butter reported in the Danish newspaper *Berlingske Tidende* (taken from Drejer 1925-33, p. 326), until 1878 and then from 1879 the prices for prima/highest export butter (Finest/Prima Manor) in the Copenhagen Brokers' Current[14] (averages of first quotation in June, August, October and December, following the averaging practice of Klovland and Solar 2011). The latter quotation simply replaced the former as the reference for Danish butter prices (Hollmann 1906, p. 11), and both connect smoothly. We always use the highest price if a range is given.

All prices have been converted into British pence per kg using mint parities (18.16 Danish kroner per pound and 20.43 German marks per pound) for the nineteenth century, after ensuring that exchange rates were stable over the long run. For the eighteenth century we use the exchange rates between Danish and British currency from Friis and Glamann (1958, pp. 78-

[13] Nevertheless, for the overlapping periods of 1860-78 the correlation in levels between both series is 0.983, and in first differences it is 0.973. In all years, the sign of change (increase/decrease) is the same for both series.
[14] These data were kindly provided by Ingrid Henriksen, see Henriksen and O'Rourke (2005).

103)[15] and between Hamburg and British currency from Denzel (2010), pp. 191-94, 207-213. The series are illustrated in Figure 2.

Figure 2: Prices of Butter in Denmark, Hamburg and London, 1748-1890



Sources: See text.

Since the British and the Danish series do not strictly refer to the same product (only in the very late 1870s did Danish butter become regularly quoted in the London Provisions Market reports), looking at the absolute price gaps is not fully informative (see also Lampe and Sharp 2014). Nevertheless, clearly the prices are following the same general trends. To test this we

[15] In accordance with the butter prices, we used the first July rate or closest available.

turn to a more formal analysis and estimate simple multivariate error correction models using the annual prices for the periods described above. Our econometric approach is inspired by the market integration literature (see for example Ejrnæs and Persson 2000, 2010).

For the periods 1748-1800 and 1831-60, we estimate the following vector error correction model by maximum likelihood using PcGive 13[16]:

$$\begin{pmatrix} \Delta p_t^1 \\ \Delta p_t^2 \\ \Delta p_t^3 \end{pmatrix} = \begin{pmatrix} \alpha^1 & 0 \\ 0 & \alpha^2 \end{pmatrix} \begin{pmatrix} 1 - \beta^a p_{t-1}^2 - t - \lambda \\ 1 - \beta^b p_{t-1}^3 - t - \lambda \end{pmatrix} + \begin{pmatrix} \varepsilon_t^1 \\ \varepsilon_t^2 \\ \varepsilon_t^3 \end{pmatrix} \quad (1)$$

where p_t^1, p_t^2, and p_t^3 are the logarithms to the prices of Copenhagen, Hamburg, and London butter respectively, α^1 and α^2 describe the speed of adjustment (error correction) to the cointegrating relationships $(1 - \beta^a p_{t-1}^2 - t - \lambda)$ and $(1 - \beta^b p_{t-1}^3 - t - \lambda)$, the β-coefficients give the elasticities, *t* is a trend, and λ is a constant. The residuals ε_t^1, ε_t^2, and ε_t^3 are assumed to be iid. normally distributed (the misspecification tests are reported in the appendix). In each case we included two lags, which were the minimum found necessary to avoid autocorrelation in the residuals. The results are given in Table 9. Here we have also reported the Johansen test for cointegration (H_0: *r* = 1 or 2), which suggested in both cases most strongly a rank of 2, and we thus allow for the less restrictive assumption of two cointegrating relationships[17]. The error correction (adjustment) coefficient, α, must be negative and significant to indicate error correction (i.e. that one variable adjusts to the other). β describes the equilibrium relationship and is expected to be negative (meaning a positive relationship).

[16] Doornik and Hendry (2009)

[17] This is thus also a rejection of the possibility of any of the series being stationary. Thus cointegration is the appropriate methodology.

Table 9: Error Correction Estimates, 1748-1800 and 1831-60

	(1a) – 1748-1800			(1b) – 1831-60		
	Danish (Funen in Cph) [P_1]			Danish (Copenhagen) [P_1]		
	Hamburg [P_2]			Hamburg [P_2]		
	London (Clark) [P_3]			London (K&S) [P_3]		
	ΔP_1	ΔP_2	ΔP_3	ΔP_1	ΔP_2	ΔP_3
α_a	-1.01***	0	0	-1.05***	0	0
	(0.16)	-	-	(0.22)	-	-
α_b	0	-0.57***	0	0	-0.59***	0
	-	(0.09)	-	-	(0.11)	-
	[a] (Hamburg → Denmark)	[b] (London → Hamburg)		[a] (Hamburg → Denmark)	[b] (London → Hamburg)	
β	-0.60***	-0.93***		-0.79***	-0.56***	
	(0.13)	(0.28)		(0.12)	(0.09)	
Constant	-0.43***	-0.00		0.01	0.09	
	(0.12)	(0.28)		(0.10)	(0.13)	
Trend	0.00	-0.00**		-0.00**	-0.01***	
	(0.00)	(0.00)		(0.00)	(0.00)	
Log-likelihood	304.32			206.33		
H_0: r=1 (p-value)	0.126			0.738		
H_0: r=2 (p-value)	0.632			0.862		
Test of restrictions (p-value)	0.50			0.28		
N	51			28		

Standard errors in parentheses; *** significant at 1%; ** significant at 5%; * significant at 10%

The alpha coefficients indicate the speed of adjustment of one price to the other. Thus, since we expect to find that London prices are exogenous – i.e. that Britain is in macroeconomic terms a 'large' economy, whereas Hamburg and Copenhagen are (relatively) 'small' – this motivates the imposition of the zeroes on the last row of the alpha matrix, which describes how London prices adjust to the other prices. We also expect the London price to be determining the Hamburg price, which in turn should be determining the Copenhagen price, and this

motivates the other zero restrictions (Hamburg prices should not be adjusting to Copenhagen prices, and Copenhagen prices should not adjust directly to London prices).

Thus, α^1 measures the speed of adjustment of Copenhagen prices (p_t^1) to changes in Hamburg prices (p_t^2) with the long-run relationship described by the elasticity β^a, and α^2 measures the speed of adjustment of Hamburg prices (p_t^2) to changes in London prices (p_t^3) with the long-run relationship described by the elasticity β^b. Since we impose over-identifying restrictions, we also get a test of these, which accepts the restrictions.[18] The (Granger) causality thus runs as expected, from London to Hamburg and then from Hamburg to Copenhagen. Moreover, the coefficients are strikingly similar in both periods, which suggests strongly to us that trade from Denmark went to England via Hamburg, as the literature suggests.

Finally, we estimate the following by maximum likelihood for the period 1865-90:

$$\begin{pmatrix} \Delta p_t^1 \\ \Delta p_t^2 \\ \Delta p_t^3 \end{pmatrix} = \begin{pmatrix} \alpha^1 & 0 \\ 0 & \alpha^2 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} 1 - \beta^a p_{t-1}^3 - t - \lambda \\ 1 - \beta^b p_{t-1}^3 - t - \lambda \end{pmatrix} + \begin{pmatrix} \varepsilon_t^1 \\ \varepsilon_t^2 \\ \varepsilon_t^3 \end{pmatrix} \qquad (2)$$

where p_t^1, p_t^2, and p_t^3 are as above, α^1 and α^2 again describe the speed of adjustment to the cointegrating relationships $(1 - \beta^a p_{t-1}^3 - t - \lambda)$ and $(1 - \beta^b p_{t-1}^3 - t - \lambda)$, the β-coefficients give the elasticities, and other parameters are defined as above. We again included two lags. Note that the difference is that in the first equation we now have p_{t-1}^3 rather than p_{t-1}^2.

The results are given in Table 10. Here we have also reported the Johansen test for cointegration, which suggested in both cases most strongly a rank of 2, and we thus allow for the less restrictive assumption of two cointegrating relationships.

[18] 'Test of restrictions (p-value)' in the table.

Table 10: Error Correction Estimates, 1865-90

	(2)		
	Danish (Estate) [P_1]		
	Hamburg [P_2]		
	London (K&S) [P_3]		
	ΔP_1	ΔP_2	ΔP_3
α_a	-0.55***	0	0
	(0.09)	-	-
α_b	0	-0.80***	0
	-	(0.11)	-
	[a] (London → Denmark)	[b] (London → Hamburg)	
β	-1.06***	-0.86***	
	(0.12)	(0.09)	
Constant	0.58**	0.01	
	(0.25)	(0.18)	
Trend	-0.00***	-0.00***	
	(0.00)	(0.00)	
Log-likelihood	199.88		
H_0: r=1 (p-value)	0.113		
H_0: r=2 (p-value)	0.542		
Test of restrictions (p-value)	0.57		
N	24		

Standard errors in parentheses; *** significant at 1%; ** significant at 5%; * significant at 10%

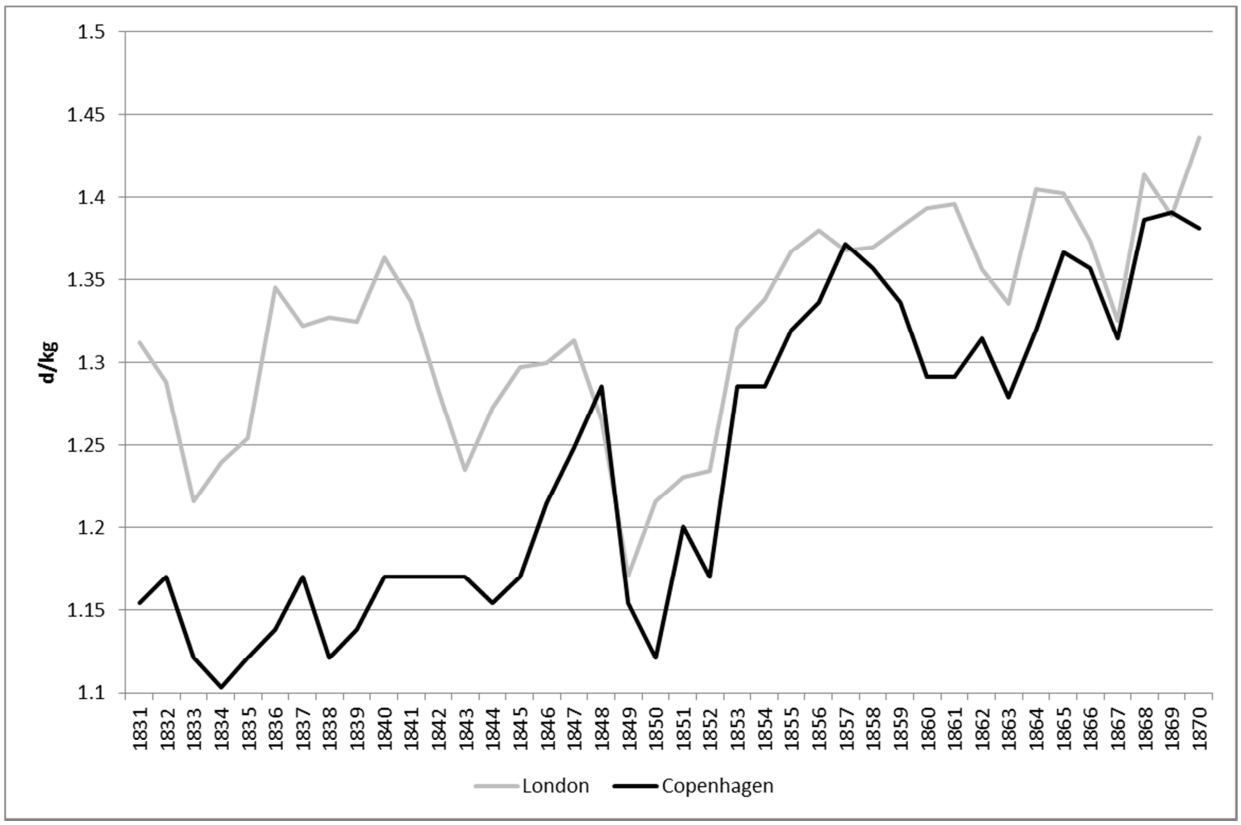
The interpretation follows that above. For equation (2), we again expect to find that London prices are exogenous, which motivates the imposition of the zeroes on the last row of the alpha matrix. Now, however, we also expect London prices to be determining both the Hamburg and Copenhagen prices, since the direct link from Copenhagen to Hamburg has been severed, and this motivates the other zero restrictions: α^1 then measures the speed of adjustment of Copenhagen prices (p_t^1) to changes in London prices (p_t^3) with the long-run relationship described by the elasticity β^a, and α^2 measures the speed of adjustment of Hamburg prices

(p_t^2) to changes in London prices (p_t^3) with the long-run relationship described by the elasticity β^b. Since we impose over-identifying restrictions, we also get a test of these, which accepts the restrictions. The (Granger) causality runs again as we expect: London is now determining both Hamburg and Copenhagen prices directly.

We can test more formally for the hypothesized structural break around 1864 by imposing the model for the previous period, where London drives Hamburg, which in turn drives Copenhagen (equation 1), on the post-1864 years. This hypothesis is strongly rejected with a p-value of 0.008, implying that these data cannot support the causal structure of the previous model.

Note the large constant in the first relationship in (2), suggesting that Danish butter by this time enjoyed a significant premium over the Irish butter we compare it to in London. Otherwise, we cannot glean much information from the constant terms due to changing price series for the same city and/or changing qualities over longer time periods. Thus, for example, since due to transportation costs and the Law of One Price Danish butter must have sold for more in London than it did in Copenhagen, if we were comparing like with like the constant in the first relationship of (2) would have been negative. So to explore this issue more fully, we illustrate two consistent price series for Copenhagen and London for the period 1831-70 in Figure 3.

Figure 3: Copenhagen Market Prices and Irish Prices in London for Butter, 1831-70



Sources: Drejer (1925-33) and Klovland and Solar (2011).

Although the prices follow similar short run fluctuations, consistent with there being market integration over the whole period, there is a clear break in the gap between London and Copenhagen prices before and after the early 1860s. Between 1856 and 1860, butter was on average 2.1 d/kg cheaper in London than in Copenhagen, while in 1865-9 the difference decreased to 1.0 d/kg. As a proportion of the London butter price, this meant a decrease in the price gap from 8.5 percent to 4.0 percent. Note that since we are not comparing like with like, the decline of the price gap by more than 50 percent is rather more informative than the

absolute values.[19] We do not find it reasonable, given the shaky data, to attempt to calculate deadweight losses in the style of Federico (2008) and Federico and Sharp (2013). Nevertheless, the potential savings from such a massive fall in the price gap, when accumulated over years and decades, would no doubt be huge.

All in all, we feel that the available information from both quantities and prices strongly supports the story that Danish markets were initially integrated with Britain through Hamburg prior to 1864, but integrated directly subsequently. Having demonstrated this, we now proceed to attempt to answer the two main questions posed in the introduction: Why did Denmark initially trade through Hamburg? And what changed and when?

3. Making Historical Sense of the Data

3.1. Discovering Britain via Altona and Hamburg: Danish Dairy Exports before 1850

To understand the developments underlying the quantitative evidence presented above on trade volumes and market integration, it is necessary to gain insights into three aspects of the trade in question: supply of dairy products, especially butter, in Denmark, demand for these products in Britain and the services of buying, transporting, financing and distribution between both points. Before turning to the link between Britain and Denmark, and the dependency on the Altona/Hamburg hub, we therefore look briefly at the demand in Britain and the early development of the Danish dairy industry.

The Industrial Revolution had a huge impact on the demand for foodstuffs in Britain, and thus also on the demand for butter. On the one hand, between 1760 and around 1840, the population of Britain (excluding Ireland) grew from about 5.7 to 14.9 million, at an annual rate of about 1.2 percent (Wrigley 2004, p. 64). Most of this population growth fueled the increasing urbanization rate of the country and especially the growth of the industrial centers in Northern

[19] In fact, as previously noted in the discussion of the constant term in equation (3), our price series for estate butter from 1860 in 1865-9 exceeds the London price for the mentioned Irish butter on average by 12 percent.

England. On the other hand, real wages grew very little over this same period (see Voth 2004, 271-273, Allen 2009).[20] After 1840, population growth continued, but also important improvements in living standards are observed, which led to an increased demand for luxury fats, like those contained in butter, both due to the increased number of consumers and an increasing per capita demand.[21] This, in turn, led to a long-term increase in both absolute and relative prices (in comparison to other foodstuffs like grains) of butter and related dairy products in Britain.

Table 11: Duties on Danish Produce 1825-97

	Butter	Cheese	Beef	Pork	Live oxen and bulls
1825-42	£1 / cwt	10.5s. / cwt	Prohibited*	Prohibited*	Prohibited
1842-46	£1 / cwt	10.5s. / cwt	8s. / cwt	8s. / cwt Bacon & ham: 14s. / cwt	£1 / head
1846-53	10s. / cwt	5s. / cwt	Free	Free	Free
1853-60	5s. / cwt	2.5s. / cwt	Free	Free	Free
1860-97	Free	Free	Free	Free	Free

[20] There are substantial differences in the estimates of wage gains between so-called 'optimists' (like Lindert and Williamson 1983) and 'pessimists' (most prominently Feinstein 1998), mostly driven by the composition of the cost-of-living index and the individual price series used to deflate wages. According to Allen's (2007) corrected Feinstein real wage index, the increase was 20.4 percent between 1770 and 1840, corresponding to 0.25 percent per year.

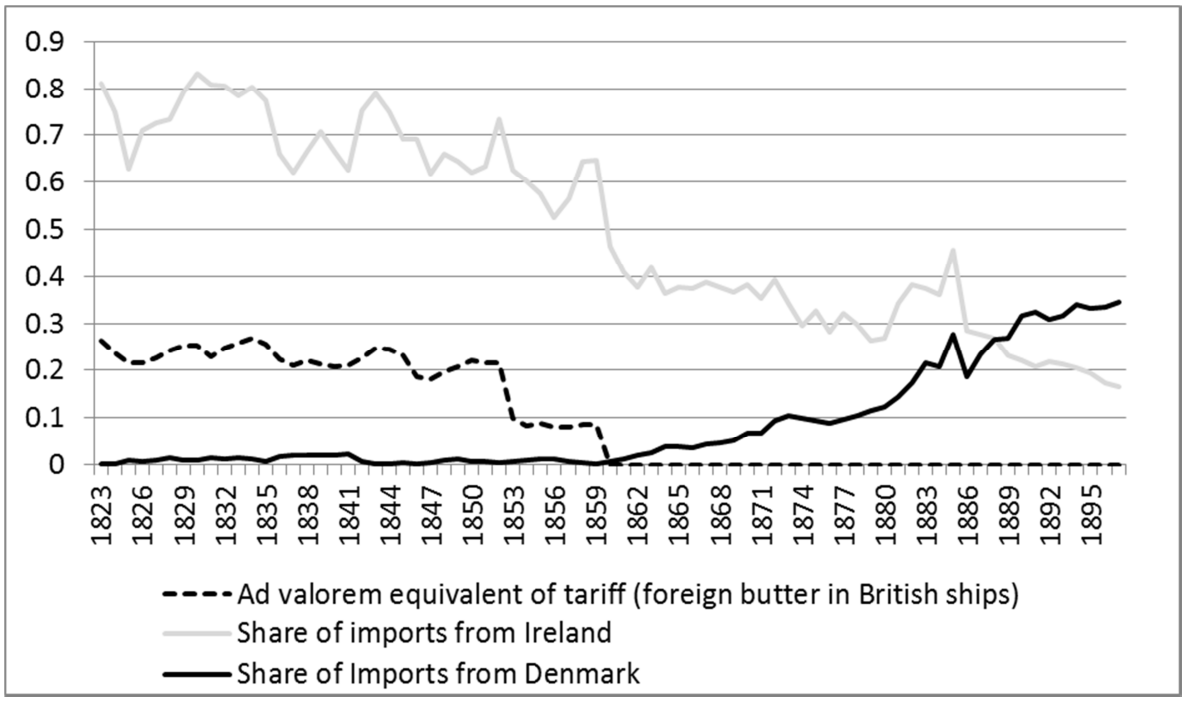
[21] See the introduction of Lampe and Sharp (2014).

* Prohibition lifted for heavily salted beef and pork from 1827.

Source: BPP (1897).

As illustrated in Table 11, this price trend was reinforced by relatively high specific tariffs for butter and related products in Britain, £1 per hundredweight between 1825 and 1846, reduced to 10 shillings in 1846, 5 shillings in 1853 and finally abolished in 1860. In ad valorem terms, this was equivalent to a 20-25 percent tariff before 1846, based on Clark's butter prices described above, falling to 8-9 percent just before the repeal of the butter tariff. As a consequence of this relatively high tariff rate, the British market was largely reserved for Irish produce, which originated within the United Kingdom and was therefore duty-free. As can be seen in Figure 4, its share was above 60 percent in all years until 1854, in many years even higher than 75 percent. As we have already seen in section 2.1, Danish produce (identified as such in the trade statistics) played virtually no role until the mid-1860s. But remember that this graph does not account for trade via Altona/Hamburg.

Figure 4: Shares of imports to Britain from Denmark and Ireland, and ad valorem equivalents of the British tariff on foreign butter, 1823-97



Sources: BPP (1897) (tariff duties), Clark (2004) (prices), data underlying Table 5 and Lampe and Sharp (2014) (trade shares).

As with the repeal of the Corn Laws, the sequence of reductions in the butter duties after 1846 can probably be seen as a consequence of the increase in demand for butter, especially in the growing industrial centers, and an increase in prices due to the protection of producers who could not cope with the increasing demand. Hence, at least in part, the opening of the British market after 1846 and the related access to its burgeoning demand, should explain the

relatively low exports of Danish produce there before, even if the real numbers were disguised by the trade via Hamburg.[22]

On the other side of the North Sea, we find a Kingdom of Denmark that after the Napoleonic Wars – including the Gunboat War against Britain, with the Bombardment of Copenhagen by the Royal Navy in 1807 – lived through a severe economic, agricultural and commercial crisis (Hansen 1984, pp. 100-121).

Denmark had a long history of cattle exports, mainly from Jutland to Holland on the famous Ox Road connecting Viborg via Flensburg to Hamburg. This trade was important since the sixteenth century, and came to be dominated by Dutch traders from the second half of the seventeenth century (Petersen 1970, p. 84). Its importance was gradually reduced at the end of the eighteenth century, however, due to the protectionist policies of the Dutch and Danish authorities, as well as serious outbreaks of cattle plague (Appel 1924-32, pp. 250-69, Hünniger 2010, p. 79). From then, the Danish oxen trade became more centered on the Duchies of Schleswig and Holstein, but cattle raising and fattening seems to have shown a declining trend into the 1800s (Appel 1924-32, pp. 270-71, 284, Graugaard 2006).

Thus, in the 1700s, dairying was not an important activity in Danish agriculture and Danish estates were still reluctant to follow the conversion to dairying underway in the Netherlands by then (Appel 1924-32, pp. 279-80; Petersen 1970, pp. 84-85). We observe, however, a steady increase in the interest in dairy production over the eighteenth century (Appel 1924-32, pp. 284).[23] On the islands of Zealand, Funen and Langeland, apparently butter production was important on some estates, but only very occasionally export-oriented, with a focus on the Copenhagen market. The only trade in butter at this time was imports from Holland to

[22] See Schmidt (1870), p. 530, for a near-contemporary Danish account on the importance of the reductions in the British butter duties.

[23] For example, an early report on the already advanced Schleswig/Holstein dairy sector was translated into Danish from German in 1757 'Underretning om Hollænderierne udi Hertugdømmerne Slesvig og Holsteen' in the periodical 'Oeconomisk Journal' (Appel 1924-32, p. 281).

Copenhagen, and in the late eighteenth century occasional imports from Britain (Bredkjær 1924-32, p. 565; Drejer 1962, pp. 20-21, citing Pontoppidan 1760).[24]

The growing interest in dairying in Denmark over the second half of the eighteenth century can be seen as the spreading of a trend from the Duchies of Schleswig and Holstein together with a general agricultural reform movement towards convertible husbandry since the 1750s, led by eminent political figures and estate owners like Adam Gottlob Moltke, Andreas Peter Bernstorff and Christian Ditlev Reventlow (Dombernowski 1988, pp. 215, 312, 320). Moltke and Bernstorff were nobles from Mecklenburg and Hannover, respectively, and part of a larger group of northern German nobles in the service of the Danish king who also acquired agricultural estates in Denmark. They were salient figures in spreading the wider trend of what Danish historian Carsten Porskrog Rasmussen (2010) has called 'innovative feudalism' into Denmark proper: the development of the convertible husbandry system of *Koppelwirtschaft* on large landed estates in the former Danish Duchies of Schleswig and Holstein and in Mecklenburg over the seventeenth and eighteenth century. It introduced a new crop rotation system that gave rise to very large herds already in the early 1700s in Schleswig, including cool milk cellars, and specialized dairy equipment and staff. These estates quickly adopted a much stronger market orientation than peasant producers (Rasmussen 2010). These dairy units were called *Holländereien* (*hollanderies*) and were originally run by the members of a fairly large group of specialized early seventeenth century immigrants from the Netherlands, where dairying had already achieved high standards. Over the course of the eighteenth century, the denomination of origin of these specialists evolved into a generic name for expert dairy workers (Davids 1996, p. 148-49).

During the late eighteenth and early nineteenth centuries, this pioneering Holstein system of dairying spread into Denmark proper, and at the same time was more and more developed towards a focus on continuous exports in the Duchies. In the 1840s, the prominent German

[24] The most notable exception was apparently the production of Thybo cheese in the small town of Thy in northwestern Jutland, which was exported to England (Drejer 1962, pp. 20-21).

travel writer Johann Georg Kohl observed that export production of butter, very much adapted to the English market in product characteristics and packaging, had emerged after the Napoleonic Wars (since about 1820) in the Duchies and was already spreading towards Northern Jutland and the islands of Denmark. Given that the focus on butter and exports to England is commonly understood to have taken off only after 1864, Kohl's observations are particularly interesting. Even his predictions about the future ring partly true: at a time when dairying in Denmark proper was a far from dominant agricultural activity, he predicted that Denmark and the Duchies would eventually integrate as a land 'not of milk and honey, but of milk and butter.'[25]

Thus, Kohl gives a clear impression that there was already a focus on the English market from a very early date, especially in Holstein. Writing in 1846, he also gives some idea of developments before this date; he sees the trade connections with England as decisive, and he dates them as having started 'about 25 years ago'. This he saw as promoting quality improvements in the butter of Holstein, so that it could compete with Irish and Dutch butter, and these innovations he noted were spreading rapidly to Jutland and the islands of Denmark, largely through the hiring of (female) dairy workers from the Duchies. Already at this time, he noted that in northern Jutland many farms had switched from oxen-raising to dairying. He stressed that important articles on dairying from the Duchies were reprinted all over Denmark, and, as suggested in the quote above, he predicted that Denmark would eventually converge on the Duchies (Kohl 1846, pp. 58-60).

Kohl also argued that the improvements in production and hygiene implemented through the Holstein system of dairying were explicitly to satisfy English tastes, the English being a 'peculiar people who want everything according to their mind and according to whose command and impulse in our national economies of Continental Europe more things are being reformed and changed than we generally notice.' As an example he cites that even the firkins used for transporting the butter had to conform to Irish standards and mimicked their size and shape,

[25] At that time, as we have seen, Denmark proper was still very much centered on cattle fattening in Jutland and the export of grains to England in particular.

although certain larger estates added their own mark to the firkins, and already had a 'very good' reputation in Britain (Kohl 1846, pp. 63-69).[26]

As an interim conclusion, we see that the Danish dairy industry was only in its beginnings until the 1840s, and can largely be seen as an extension of the Schleswig and Holstein dairy sector which was focused on supplying both to Hamburg and via Hamburg to the growing British market, where, despite the butter tariff and Irish dominance, high quality butter from other countries of origin started being imported in increasing quantities. Within this context, Danish butter was mostly consumed in Denmark or exported to Norway, but occasionally made its way onto the British market from Jutland by land or via Kiel (or Lübeck) to Hamburg, from where the best qualities were then exported to England as Prima Kiel.[27]

Accounts looking back at this period from the late nineteenth and early twentieth centuries stress that some Danish estates already produced high-quality 'Holstein/Kiel butter' by the 1840s (Hollmann 1906, p.3). For example, the president of the Royal Agricultural Society of Denmark, Edward Tesdorpf (born in Hamburg in 1817), recalled in 1887 that he acquired the estate of Orupgaard on the island of Falster in 1840 and started to export butter to Hamburg soon afterwards, assisted by his father, who was a merchant. He also noticed that his butter was mixed with Holstein and Schleswig butter at that time, entering the marketing channels for that produce (Rützou 1887, 293). For this early period, butter traders mostly made long term contracts buying the whole production for fixed prices, distinguishing between summer and winter produce (Rützou 1887, 283-4). Danish merchant houses, especially the provincial merchants Boje (1977) studied for the period 1815-1847, showed some concentration among a selected group of traders on certain commodities, mostly grains, but without the emergence of fully specialized grocers (Boje 1977, pp. 96-100). He discusses the cases of individual merchants, among which probably that of Samuel Cohn from Ringkøbing in Jutland, whose exports were

[26] However, and in line with later observations on Danish produce (Henriksen et al 2012), he remarks that the cheese produced was meager, thin and tasteless, but the pork, produced from whey and buttermilk, was of good quality (Kohl 1846, pp. 69-71). The British travel writer Laing (1852) gives similar observations from his travels to Denmark proper and the Duchies a few years later.

[27] Direct exports from Denmark were only very occasional, using sailing ships (Schmidt 1870, 530, 532; Rützou 1887, 283, 293).

concentrated on butter (53.7 percent), wool (22.7 percent) and hides and skins (18.7 percent) (Boje 1977, p. 96), is most interesting for us. Cohn had important business contacts in Amsterdam, where most of his wool went to, and in Altona, on which much of his other trade, including butter, was centered. Both in Amsterdam and Altona, larger merchant houses, Siepmann Peltersen and C.H. Donner, respectively, were acting as his commission agents and effectively financing his export trade. C.H. Donner was the only Altona-based merchant house among the leading Hamburg merchant bankers, its owner Conrad Hinrich Donner being a banker and private friend of Danish king Christian VIII (Böhme 1968, p. 80; Marchtaler 1959). These merchants then acted as wholesale traders and re-exporters to their counterparts on other markets, and provided Cohn with the commodities he imported into Denmark (Boje 1977, pp. 88-95), from the Netherlands this was mostly tobacco, while from Altona/Hamburg he got all sorts of industrial and colonial goods, especially tobacco, coffee and sugar, and manufactured commodities like cotton yarn, clothes and (linen) canvas (Boje 1977, p. 119). The Danish shipping firm A. Berthelsen served as the link between Cohn and the foreign markets (Boje 1977, pp. 88-95). Within Denmark, Cohn was a large merchant who obtained his export commodities from a series of local merchants (Boje 1977, 142-46), producers and peddlers (known as *prangere*), who bought up local peasant production and mixed it to make transportation into the market towns profitable (Boje 1977, 155-60).

Thus, in total, for the export of Danish butter to Britain we would observe at least six or seven middlemen between producer and consumer (see also Hollmann 1906) - this might help explain the large price differentials between butter in London and Copenhagen we observed above, and thus motivates the return to one of our central questions, as to what explains this trade via Altona and Hamburg. Of course, between Danish locations and Altona, also costs of physical transport occurred. The main routes Danish butter would have taken would be through the Baltic Sea or via the North Sea. Through the Baltic Sea, exports were mainly by ship to Kiel, and from there to Hamburg via the Eider Canal or overland on streets; in 1844, the first railway in Greater Denmark was opened between Kiel and Altona. On the North Sea direct shipping from ports in Western Jutland would be the main choice. As to the relative use of these means, relatively little can be said due to the absence of trade statistics for the free port of Altona.

However, a glimpse is given in a pamphlet by J. Eduard Weber (1853) that contains a collection of Altona shipping and trade statistics for 1852. Among these, the reception of a total of 3,858 tons (about 287 metric tons), 10400 'packages', 7 barrels and 9 collies of butter is mentioned (Weber 1853, app. 2, p. IV). Of the tons, two thirds entered by sea, and one third via the Altona-Kiel railway.[28] In a different table (p. 41), the seaward transport from Danish ports into Altona of butter, 30 ships with a total load of 286.5 *Last*, is mentioned. Of this total load, 211 (73.6 percent) had arrived from Denmark proper and most of the rest from Schleswig. After 'diverse commodities', butter was in quantity terms the most salient import from Denmark proper via sea, twice as large as imports of barley. While it is difficult to extract precise weights from these numbers, it seems that Danish butter exports to Altona in 1852 were mostly by ship, but railway also might have transported a substantial share.[29]

Apart from the integration of top Danish produce into Holstein butter distribution chains, Hamburg's relatively beneficial financial and economic situation after the Napoleonic Wars needs to be considered. Like Copenhagen and the Danish economy and financial sector, it had been hit severely by the Continental Blockade, but contrary to the Danish experience, British merchants relatively quickly invested in the city when trade recovered after the war in order to reestablish this main access point for Northern and Central European markets via the Elbe River. At this time, both Copenhagen and Danish provincial merchants became dependent on credit and financing from Hamburg's merchant bankers to the extent that the new Danish currency, the Rigsbankdaler, which emerged from state bankruptcy and currency crisis in 1813, was pegged to Hamburg's mark banco. Thus, according to the classic account by Svend Aage Hansen (1984, p. 112-16), in common with the example of Samuel Cohn given above, the

[28]Of the 'packages', 99 percent entered by train either from Kiel (74%) or on the Berlin-Hamburg railway (25&%) that connected Altona to Mecklenburg and the Prussian capital.

[29] In 1852, according to the data in table 2, Denmark exported 4670 tønder of butter to Altona. The mentioned 211 Last (as Hamburg Commerzlast) would be equivalent to 4064 tønder of 112 kg after deducting 13 percent tara. This would represent 87 percent of Danish exports to Altona. The seaward imports of butter (total) in the other table, c. 2563 tønder, are clearly below that; if 84.5 percent of them were from Denmark proper, they would represent 46 percent of Danish exports to Altona. The total weight of the railway traffic to Altona in butter is difficult to determine due to the different measures, and the share of Danish butter on the Kiel-Altona railway is unknown, as is the share of Danish butter in ships or carts arriving from Schleswig or Holstein.

triangular relationship Denmark-Hamburg/Altona-Britain in the Danish export trade is confirmed on an aggregate scale. In addition to that, the Danish merchant fleet and shipping activity and capacity, particularly for Copenhagen, had declined very much as a consequence of the Napoleonic Wars.[30] From a shipping point of view, contemporaries also stressed the pernicious effects of the Sound Toll on the development of the port of Copenhagen, Denmark's most important port, which gave an additional advantage to the Hamburg/Altona hub on the North Sea (C.K. Hansen 1956, pp. 9-10).

Summing up, in a time of economic crisis in Denmark, from which the country only slowly recovered over the 1820s and 1830s, Hamburg and the adjacent Holstein free port of Altona provided the services of a hub that offered regular shipping connections, finance and volume of transactions with Britain in a period when, due to the protection of both grain markets (through the Corn Laws) and butter markets, access to the British market was relatively uncertain and costly. The Danish dairy industry was slowly developing, at an increasing pace, during this period, but the overall production and quality and quantities available for export before the 1840s did not allow for the specialization of merchants and the organization of direct shipping to England and Scotland.

As noted above, however, this situation seems to have changed gradually, when the tariffs on grains and butter were lowered and import prohibitions on live cattle were lifted from the mid-1840s. At this time, the Danish economy was also recovering, the currency had stabilized, credit constraints were overcome and the spread of modern dairying was underway. In this context, the Danish merchant fleet and its direct shipping to and from England increased at a rapid rate. At first, in the 1830s, this mostly involved exports of Danish grain, especially barley, and imports of coal from Britain (Møller 1998, pp. 63-65).[31] When the British writer Laing (1852) traveled

[30] The most important activity was probably apart from internal trade the import of sugar from the Danish West Indies (C.K. Hansen 1956, pp. 9-10).

[31] Trade to England in quantitative terms evolved from the low level of 224 *læster* in 1828 to 6,865 *læster* in 1857 (Møller 1998, p. 59).

around the Duchies and into Denmark proper in 1851, he noted how steamships from Glasgow united the Duchies and the Kingdom, so that, for example, 'the passage from Kiel to Copenhagen, which was formerly a voyage of six or seven days, is now performed regularly in twelve hours' and that 'Steam power has made the most disjointed kingdom in Europe the most compact' (Laing 1852, p. 291).

As we have seen above, the First Schleswig War of 1848-51, which blocked the connection to Altona and much of the internal transport integration highlighted by Laing, inaugurated further initiatives for direct trade to Britain, among which direct trade with England in live cattle from Jutland was a main concern that now found backing by the Danish government. Previously, the lifting of the British cattle import ban in 1842 had already produced occasional direct trade, for example when the English steamer *Tønning* collected 100 steers for London (Møller 1998, p. 93), and increased general interest in the matter, which however surpassed the scope for sustained private initiative in those years (see Poulsen 1851a,b), in part due to a transportation infrastructure that was still in development in this relatively sparsely populated part of Denmark.[32] In the 1848-51 period the Danish government helped to establish a steamship connection between Hjerting (near Esbjerg in Southwest Jutland) and London (Bredkjær 1924-32, p. 566; Drejer 1962, p. 26). In the following years until 1855, the steamship *Jylland* connected several points on the Jutland peninsula to London. However, the initiative was stopped in 1855 and the steamship sold off afterwards. The main problems seem to have been the difficulty of loading cattle without specialized harbor facilities, the lack of cargo for the return voyage from London, and possibly adaption costs to British demand and distribution structures. The government therefore decided to leave the business to private entrepreneurs.[33]

---

[32] For example, the main export point in the 1850s, Tønning in Southwest Schleswig, was only connected to the railway network in 1854 (Møller 1998, p. 93).

[33] Bredkjær (1924-32), p. 566; Lassen (1883), 384-5. Apparently, the steamship finished its life as a post steamer in Korsør (Møller 1998, p. 94).

Although it is unclear if this steamship connection ever served to transport butter, the above discussion shows that by the late 1840s, the technical and organizational possibilities to establish direct trade with Britain were in place. However, our trade data above suggest that at this point in time the sudden reorientation experienced during the war had entailed transaction costs that were higher than those involved by the continued use of the Altona/Hamburg hub. Thus, we observe a certain return to the old pattern in the immediate postwar years. However, the underlying developments of Danish production, shipping and trading continued and, as we will see below, only a few years later, in the late 1850s, new, private initiatives surfaced that would establish the basis for a more sustained and successful second reorientation towards direct trade with Britain which was accelerated, but certainly not initiated, by the Second Schleswig War.

3.2. The Emergence, Development, and Take Off of the Direct Trade with Britain from the 1850s

As noted above, the Second Schleswig War of 1864, when the Duchies, including Altona, were lost to Denmark, is seen as a defining moment in Danish history. In fact, a popular Danish children's song recounts the death of a soldier in the war of 1864, and Danish commentators even today emphasize the importance of the war to the Danish psyche. Related to this, the traditional account of the rise of the Danish dairy industry focuses very much on the visible rise in exports after 1864.

The common story is thus very much one of a sudden break and reorientation with a rise of the dairy industry and its exports from almost zero to a considerable size over the next two decades. The standard textbook account by Svend Aage Hansen (1984, p. 187) attributes the breakthrough of Danish exports of butter and pork in the 1860s to the expansion of transportation facilities, of particular importance to be the decision in 1868 to establish a major harbor in Esbjerg on the west coast of Jutland explicitly to obviate the need to ship through Altona and Hamburg.

We argue, however, that a number of events coincided and cumulated over a longer period before and after 1864, which were to make the Hamburg trade less attractive and favored the establishment of the direct trade. The visible outcome was the opening of new direct steamship routes and the increasing involvement of both Danish and British merchants, who substituted for the services previously provided by those in Hamburg. This fits with the observation that Esbjerg harbor was only to open fully in 1874. Besides the continuing growth and professionalization of the Danish dairy industry and the continued growth in incomes and demand on the British market stressed above, we see three major contributing factors that enabled private initiative to become more effective over the course of the 1850s and 1860s.

First, the Sound Toll, which for centuries had been a mainstay of Danish government finances, was capitalized and abolished in 1857 after pressure from the United States. This instantly made access to Copenhagen less expensive for ships sailing from the North Sea and through the Kattegat, thus changing its attractiveness relative to Hamburg for exports to Britain (C.K. Hansen 1956, p. 10). This reinforced the increase in trade and transportation between England and Scotland and the Baltic, and the role of Copenhagen as a stop off point. In 1857 three steamers (the *L.N. Hvidt*, *Thor*, and *Odin*) were circulating between England (Grimsby) and the Baltic, taking coal and other cargo from Britain and products from the Baltic Sea, as well as passengers (emigrants) for Cornelius Peter August Koch's 'General Danish Steamship Company' of Copenhagen (see Vestberg 1933, pp. 22-23), one of the constituent companies of the later shipping giant DFDS (Møller 1998, p. 94). Other initiatives were in preparation, for example C.K. Hansen's negotiations with the the Leith Hull & Hamborg Steam Packet Co for a regular connection to Leith in Scotland, which failed in the beginning, but were successful in the early 1860s, after the Scottish company changed hands to James Currie in 1862 (C.K. Hansen, p. 24).

Second, as we can be seen be seen above, the British import tariffs on butter and other agricultural and livestock commodities fell considerably during the 1850s and were finally abolished in 1860.

Third, the commercial and credit crisis of 1857 had hit Hamburg and Altona merchant bankers particularly hard. After spreading through the US and to London during that year it arrived in

Hamburg, the trade and finance hub between London, the German hinterland, Denmark and Sweden in November 1857 (Ahrens 1978, pp. 6-8; Böhme 1968, pp. 88-89). In Hamburg, due to the lack of public paper money, a partly dubious chain of bills of exchange had let to a strong increase in credit and money in circulation that suffered a sudden stop in liquidity and interbank transactions when the crisis arrived. Several private and public-private joint incentives to guarantee bills of exchange and stabilize the central merchant banking houses failed (Ahrens 1978, pp. 10-22; Böhme 1968, pp. 86-98), before a loan of 100 million Mark banco in silver from the Vienna Staatsbank, provided via the Austrian government, was used to back and recapitalize five key merchant houses, among them C.H. Donner of Altona (Böhme 1968, pp. 94, 99-101; Ahrens 1978, pp. 22-26). Although the crisis was mostly solved by late December 1857, international trust in the Hamburg currency for transaction and the functioning of the Hamburg credit market was considerably reduced and in consequence, Hamburg lost a large part of its role as trading and financial hub to London (Böhme 1968, pp. 102-104). As Danish connections with the UK increased, merchants could thus increasingly look to London for services which had previously been provided by Hamburg.

Fourth, other trading costs were of course also falling as the first era of globalization proceeded. In particular, the telegraph made information much more readily available. In the Danish case, the first international connection was to Hamburg/Altona and opened in 1854. In 1855 Denmark was connected to Norway and in 1860 to England. This reduced information costs considerably and freed the flow of information from the flow of physical transport, whose density was still higher in Hamburg than in anywhere in Denmark in the 1860s. Moreover, we have already emphasized the importance of steam shipping, which was gradually replacing sail technology over this period. As is also apparent from the quote by Laing above, steam shipping offered advantages in terms of cost and reliability particularly, early on, over shorter routes (Harley 1971, Horby and Nilsson 1980).

The emergence of the Danish export trade was observed by contemporaries like the British Vice-Consul in Copenhagen, Rainals, who summarized the situation in a report in 1860. He described how ‘Denmark cannot lay claim to be considered a commercial country as the term is

usually understood.' Tellingly, however, he noted that Denmark was well positioned to enjoy a trade with England, and suggested making a harbor for direct export to England, thus avoiding the Hamburg middlemen (Rainals 1860, p. 273-274), a point also made by another contemporary British commentator, Wilson (1867, pp. 81-2). At the same time, Rainals' report clearly shows that despite increased production and domestic consumption[34], the vast majority of Danish dairy produce still needed to aspire to higher quality to be ready for exportation. He stressed the 'inferior quality' of most peasant produce and described their butter as 'execrably bad… strongly salted with the commonest salt, whilst in its preparation so little regard is paid to the proper extraction of the whey or even to cleanliness that it appears strange that such produce can find a sale'. Other foreign observers like the Italian, Pietrocòla-Rossetti, and the Frenchman, Tisserand, both writing in the mid-1860s, noted similar things, also stressing that Denmark consumed and produced much butter (Tisserand 1865, pp. 15-16), and that there was 'very good milk and excellent butter' available (Pietrocòla-Rossetti 1864, p. 256).

A group of Danish merchants, shipping entrepreneurs and estate owners focused on producing high quality butter, like the aforementioned Edward Tesdorpf, and worked simultaneously and sometimes jointly on the improvement, marketability and export of Danish butter, thereby providing the incentives for quality improvement of the vast majority of the butter produced and the possibility to earn profits by selling the butter outside Denmark, reducing transaction costs and the number of middlemen and their share in the value added. Here we mention a few of the most important.

Philip Wulff Heymann (1837-1893)[35], who later cofounded the Tuborg brewery in 1873, started his business career with a firm selling butter to Britain a couple of years after its foundation in 1858. In 1864 he was the first to pack butter in cans for export, and in 1866 he cofounded

[34] He notes that the consumption of butter in Denmark is 'extremely large, amounting on an average to from 28 to 30 lbs per head per annum so that greater importance is attached to quantity than to quality'. Only the higher classes and foreign importers got to enjoy good quality produce and that 'the same rule applies to cattle: the worst are sent to provincial towns, the better to Copenhagen, the next best to Hamburg, and the best to England'.

[35] See his biography by Pedersen et al (2005).

Københavns Svineslagteri (Copenhagen's Pig Slaughterhouse) (Meyer 1916). His butter export firm was path-breaking for exports to the UK, and primarily supplied canned butter to troops. He was followed by J. Ankerstjerne in Randers and Hans Broge in Aarhus and these merchants were key in promoting the sort of quality improvements in dairying which later were to allow the cooperative movement such a successful entrance to the market in the 1880s (Hansen 1984, p. 190). Hans Broge was particularly involved in promoting butter exhibitions in Danish provincial towns, including the first exhibition of winter butter (Dybdahl 1946, p. 73). He was also, together with the estate owner Valentiner of the Gjeddesdal estate near Copenhagen – another early producer of quality butter[36] – an enthusiastic promoter of the establishment of centralized *fællesmejerier* (proprietary creameries) in every village to promote uniform quality butter production and packing to raise the quality of peasant butter beyond the taste and smell described by Vice-Consul Rainals above (Dybdahl 1946, p. 87; Andresen 1992, p. 15).

Another pioneering merchant in Denmark was Gunni Busck, Jr. (see Hertel 1889, pp. 264-5), who entered the tinned butter trade in the early 1870s and established the *Scandinavian Preserved Butter Company* in 1874, exporting canned butter primarily to troops (Brix 1924, p. 22). He founded the first private creamery in Denmark, Slagelse Mejeri, in 1875, and he also helped found the Copenhagen Milk Supply *Københavns mælkeforsyning* in 1877 (Brix 1924, pp. 24-7).

Finally, another important figure in this story of increasing Danish competence in foreign trade and shipping was the merchant Christian Kjellerup Hansen, who had started his own trading company in 1856 and first dealt with salt and coal for British steamships on their return voyage from the Baltic (C.K. Hansen 1856, p. 15), but with the increasing shipping activity soon expanded into trade with Danish and Swedish agricultural produce (grains, flour, feedstuffs, sprits and butter) to the same ships he provided coal to (C.K. Hansen 1956, p. 17, 20).

[36] Heinrich Christian Valentiner (born in Schwensby near Flensburg in Schleswig in 1767) had acquired Gjeddesdal in 1822, being another part of the movement of farmers from the Duchies into Denmark. His son Adolph took over the estate after his death in 1831 and introduced modern dairying. Under him and his son Heinrich Nicolai, owner of the estate since 1866, Gjeddesdal became a model and experimental estate and a pioneer in the introduction of many innovations in dairying (Andresen 1992).

As we have seen before, in 1859 C.K. Hansen tried unsuccessfully to establish a regular steamship connection between Copenhagen and Leith in Scotland. Also, in 1859, he acquired the steamship 'El Ole', built in Newcastle, to establish a regular steamship connection to that port. However, this initiative also seems to have been unsuccessful, since he tried to sell the ship soon afterwards, and then it was mostly used between Copenhagen and Northern Zealand. (C.K. Hansen 1956, p. 18, 37). In 1863, just before the Second Schleswig War, he finally reached agreement with the James Currie and Co steamship company for a connection to Leith and in the same year he also established the first regular steamship connection to Newcastle and in 1872 to Hull (C.K. Hansen, p. 18).[37] The new routes from Copenhagen to Leith, negotiated by Hansen personally, started on July 15, 1863 from Leith. The trips were made by two steamships, *Snowdoun* and *Gnome*, and were announced in the Danish press every day (C.K. Hansen, pp. 22-26, 35).

Based on this account, it is difficult to argue that the war was the only reason for the refocus away from Hamburg. The loss of the Duchies did, however, reinforce the interest in the direct connection to Britain among Danish farmers (Bech 1865) and brought back to memory the experiences with the connection from Jutland in the early 1850s (Boye 1865). Thus, in the spring of 1865, C.K. Hansen and Tesdorpf as president of the Royal Agricultural Society negotiated rates for transporting live cattle, and this trade started in 1864 (C.K. Hansen, p. 27). In summer 1865, Aarhus was included in the routes, and in 1867 also Nyborg in the East of Funen was a destination for some time (C.K. Hansen, p. 24).

Part of the mythology surrounding 1864 appears to be due to the fact that in later years, and in the classical historical accounts on the establishment of direct trade to England, Tesdorpf and the Royal Agricultural Society took and received large credit for the establishment of the steamship route, although their main contribution was simply negotiating the possibility of live

[37] During the 1864 war, he was required to transport troops for the Danish government, for which he chartered steamships from Thos. Wilson and Sons in Hull (C.K. Hansen, p. 18, 24).

cattle exports.[38] Via its periodical publication, the *Tidskrift for Landøkonomi*, the Royal Agricultural Society promoted the new connection among estate owners (see Tesdorpf 1865) and sent observers with the steamship on every single voyage until the fall of 1866, who wrote short reports for the journal on the voyage and market conditions in Leith (Westring 1866). When Tesdorpf announced the conditions at a meeting in spring 1865, he stressed that this new connection presented a general change for Danish agriculture in which the large farmers should forge ahead, although they might have to suffer initially from the considerable sunk costs of market exploration involved (Tesdorpf 1865, p. 234). The discussion that followed at the meeting in this account (ibid., pp. 244-50) shows the increased awareness among the leading Danish farmers and agricultural experts about the link between the quality and exportability of produce to the British market.

In the late 1860s, weekly market reports from Leith and other destinations in Britain continued to be transmitted by Hansen's company and were published in the leading newspapers *Berlingske Tidende* and *Dagstelegrafen* (C.K. Hansen, p. 27). The weekly agricultural periodical *Ugeskrift for Landmænd* also published regular market reports from Leith into the 1870s. As a consequence, already in 1870, export merchants had an important presence on the Copenhagen market and demanded high quality butter - and not only for the aforementioned trade in tinned butter (Schmidt 1870, pp. 533-535). By 1870, the focus on direct butter exports to Britain had also rapidly spread to Jutland and to Odense on Funen, where a Scottish merchant had established a business, and to Lolland-Falster, i.e. the whole Kingdom of Denmark (Schmidt 1870, pp. 535-6). Most of the exports continued to go to Scotland and

[38] See for example Rützou (1887), pp. 283-4; Lassen (1883), p. 386; Bredkjær (1924-32), pp. 567-8. Lassen also gives detailed accounts of the numbers of different animals transported (horses, bulls, cows, calves, sheep, pigs, 1865-67, 1874-1882, pp. 389-90, 395), the size of the ships, voyage durations, and new routes established by the original company (J. Currie of Leith) and others to Hull, Newcastle and other destinations from both Copenhagen and ports in other parts of the country like Aalborg, Aarhus and Esbjerg. For 1865, he also mentions the total butter transported (p. 389). In 1870, Danish steamers also went with cattle and grain in London (Møller et al 1998, p. 92).

Northern England, but in winter the London market was also taken advantage of, since Ireland and the Netherlands produced little butter during those months – a clear indication of the early spread of winter production of quality butter in Denmark (Schmidt 1870, pp. 531-2), which was later one of the factors which allowed Denmark to forge ahead of other producers (Henriksen and O'Rourke 2005). These early developments meant that Danish butter was already well known in the UK, long before the cooperatives came onto the scene to exploit this in the 1880s (Dybdahl 1946, p. 100).

Finally, we might ask what became of the Duchies, which had been the early leaders in the development of modern dairying in Denmark. According to Hansen (1994), they then became part of the protected German market, where they did not have to compete with the world and did not develop as fast. In many respects, however, they seem to have developed in parallel with Denmark, although new innovations now flowed south rather than north. Dairy consultants were hired from Denmark, and the first cooperative creamery was founded in 1884, just two years after the first opened in Denmark.

4. Conclusion

As well as quantifying as far as possible what we can know about the early Danish trade in butter, the aim of this paper was to answer two key questions. First, why Denmark exported via Hamburg, despite the significant cost from the middlemen involved, and second, why and how this changed, so that the direct trade with England was established. This example demonstrates the potential benefits of escaping traditional trading patterns and bringing home the high value added part of the export trade for developing countries, but it also provides a warning: path dependency can make the costs of such a shift very high indeed, and in the present case it was only war which meant that the decisive leap was taken. The policy implication might then be that foreign aid could be directed towards establishing adequate credit and trading institutions and facilities in developing countries, even though this might be at the expense of developed world hubs and clusters. While investments in transport and port infrastructure might seem most important at first sight, we expect the real relevance to lie in developing domestic

capacities for direct market discovery and the facilitation of contacts and networks that enable the dissemination of relevant information on specific demand in foreign markets and to establish first-hand contacts between domestic producers and distributors with potential foreign importers.

We have disputed the traditional story of how Denmark saw new horizons after 1864, and have demonstrated that, although there was indeed a decisive shift in the pattern of trade after this date, the origins go back somewhat further. The importance of the British market was already established from the early nineteenth century, and markets were integrated even before this. Modern dairy practices were spreading into Denmark proper already in the 1840s, making more and more Danish butter suitable for export. Initially this trade went primarily through the Hamburg hub because it paid to do so. Changes in the viability of the port of Copenhagen, UK tariff policy, and falling transportation costs began to change this already in the 1850s, and direct steamship connections with Britain began to be established from this time. Certainly the war helped provide an extra stimulus to these developments, but it seems that they were already well underway in any case. This might be a blow to the Danish national story, but a positive view might be that it was the hard work and vision of many 'great Danes', and not sudden soul-searching after defeat in war, which brought about the transformation of the economy which was to lead to the rapid and successful development of Denmark.

References

Ahrens, Gerhard (1978). 'Die Überwindung der hamburgischen Wirtschaftskrise von 1857 im Spannungsfeld von Privatinitiative und Staatsintervention,' *Zeitschrift des Vereins für Hamburgische Geschichte* 64 (1978), pp. 1-29.

Allen, R.C. (2007). 'Pessimism Preserved: Real Wages in the British Industrial Revolution,' University of Oxford Department of Economics Working Paper 314.

Allen, R.C. (2009). 'Engels' pause: Technical change, capital accumulation, and inequality in the British industrial revolution,' *Explorations in Economic History* 46 (4), pp. 418-35.

Andresen, C.E. (1992). *Valentinerne på Gjeddesdal 1822-1927: et kapitel af dansk landbrugs historie.* Hæfte nr. 35 i series "Bidrag til Greve kommunes historie". Greve, Denmark: Greve Lokalhistoriske Forening.

Annual Statement of the Trade and Navigation of the United Kingdom with Foreign Countries and British Possessions in the Year [1853-1897], London: HMSO, 1855-1898.

Aparicio, G.; Pinilla, V.; Serrano, R. (2009). 'Europe and the international agricultural and food trade, 1870-2000', in: P. Lains and V. Pinilla (eds.), *Agriculture and Economic Development in Europe since 1870*, London: Routledge 2009, pp. 52-75.

Appel, A. (1925-32). 'Kvægets historie' in K. Hansen (ed.). *Det danske landbrugs historie, 3. bind.* Copenhagen: G.E.C. Gads Forlag.

Bech, A.W. (1865). 'Sorø Amts landøkonomiske Selskab,' *Ugeskrift for Landmænd* 1865/I, pp. 161-169.

Böhme, Helmut (1968). 'Wirtschaftskrise, merchant baners und Verfassungsreform. Zur Bedeutung der Weltwirtschaftskrise von 1857 in Hamburg (mit einem Aktenanhang),' *Zeitschrift des Vereins für Hamburgische Geschichte* 54 (1968), pp. 77-128.

Boje, Per (1977). *Danske provinskøbmænds vareomsætning og kapitalforhold 1815-1847*. Aarhus: Universitetsforlaget.

Boye, G. (1865). 'Om Handelsforbindelsen med England og Skotland,' *Ugeskrift for Landmænd* 1865/I, pp. 257-262.

BPP (1830). *Cheese, butter, and eggs. An account of the quantity of cheese, butter, and eggs, imported during each of the last seven years; the rates of duty on each; the total annual produce of such duties; the countries whence the butter, cheese, and eggs, were imported; specifying the quantities brought from each.* London: HMSO.

BPP (1854-55). *Tables showing the trade of the United Kingdom with different foreign countries and British possessions, in each of the ten years from 1841 to 1850.* London: HMSO.

BPP (1897). *Customs Tariffs of the United Kingdom 1800 to 1897*. London: HMSO.

Bredkjær, N. 'Kvægets historie.' in K. Hansen (ed.). *Det danske landbrugs historie, 3. bind.* Copenhagen: G.E.C. Gads Forlag.

Brix, H. (1924). The Scandinavian Preserved Butter Company Busck Jun. & Co. A/S 1874-1924: En oversig over selskabets virksomhed gennem 50 år. Copenhagen: J. Jørgsensen & Co.

C.K. Hansen (firm) (1956). *C.K. Hansen gennem hundrede år*, Copenhagen: C.K. Hansen.

Christensen, D.C. (1996). Det moderne projekt: Teknik & kultur i Danmark-Norge 1750-(1814)-1850. Copenhagen: Gyldendal.

Clark, Gregory (2004). 'The price history of English agriculture, 1500-1914', *Research in Economic History* 22, 41-124. (data file deposited at http://www.econ.ucdavis.edu/faculty/gclark/data.html, last accessed 8 August 2013).

Davids, Georg (1996). 'Holländer und Holländereien.', in: Helmut Ottenjann and Karl-Heinz Ziessow (eds.), *Die Milch. Geschichte und Zukunft eines Lebensmittels*. Cloppenburg: Museumsdorf Cloppenburg, pp. 147-157.

Denzel, Markus (2010). *Handbook of World Exchange Rates, 1590-1914*. Farnham, Surrey: Ashgate.

Dombernowski, Lotte (1988). 'ca. 1720-1810,' in: Claus Bjørn (ed.), *Det danske landbrugs historie II. 1536-1810*. Odense: Landbohistorisk Selskab.

Doornik, J.A. and D.F. Hendry (2009). *PcGive 13*. London: Timberlake Consultants Ltd.

Drejer, A.A. (1925-33), 'Mejeribruget' in *Det Danske Landbrugs Historie, Fjerde Bind,* Copenhagen.

Drejer, A.A. (1962). *Den historiske baggrund for nutidens mejeribrug.* Copenhagen: Særtryk af 'Dansk Mejeribrug'.

Dybdahl, V. (1946). Hans Broge og det jyske Landbrug. *Historie/Jyske Samlinger* 5:8, pp. 57-134.

Ekberg, E., and Lange, E. (2014). 'Business history and economic globalization,' *Business History* 56(1), pp. 101-115.

Eksportstatistiske Tabeller 1820-1834. Danish National Archive, Generaltoldkammeret, Toldkammerkancelli og Sekretariat.

Ejrnæs, M. and K.G. Persson (2000). 'Market Integration and Transport Costs in France 1825-1903: A Threshold Error Correction Approach to the Law of One Price'. *Explorations in Economic History* 37:1, pp. 149-73.

Ejrnæs, M. and K.G. Persson (2010). 'The gains from improved market efficiency: trade before and after the transatlantic telegraph'. *European Review of Economic History* 14, pp. 361-381.

Federico, G. (2008). 'The first European grain invasion: a study in the integration of the European market, 1750–1870'. *European University Institute working paper*, HEC no. 2008/01.

Federico, G. (2012). 'How much do we know about market integration in Europe?' *Economic History Review* 65:2, pp. 470-497.

Federico, G. and P. Sharp (2013). 'The cost of railroad regulation: the disintegration of American agricultural markets in the interwar period.' *Economic History Review* 66:4, pp. 1017-1038.

Feinstein, Charles H. (1998). 'Pessimism Perpetuated: Real Wages and the Standard of Living in Britain during and after the Industrial Revolution,' *Journal of Economic History* 58 (3), pp. 625-658.

Fick, A.F.C. (1907). *Der Hamburger Buttermarkt bis 1907*. Hamburg: J.D. Hollmann.

Friis, Astrid, and Glamann, Kristof (1958). *A History of Prices and Wages in Denmark, 1660-1800, Vol. I*. London: Longmans, Green & Co.

Gerhard, Hans-Jürgen, Karl Heinrich Kaufhold and Alexander Engel (2001). *Preise im vor- und frühindustriellen Deutschland: Nahrungsmittel, Getränke, Gewürze, Rohstoffe und Gewerbeprodukte*. Stuttgart: Franz Steiner Verlag.

Grafe, R., and Gelderbloom, O., 'The Rise and Fall of Merchant Guilds: Re-thinking the Comparative Study of Commercial Institutions in Pre-Modern Europe,' *Journal of Interdisciplinary History* XL(4), pp. 477-511.

Graugaard, E. (2006). *Nordvestjyske bønder som kreaturhandlere i Nordsørummet: studie i netværket omkring en regional kultur- og driftsform o. 1788-1914.* Odense: Syddansk Universitetsforlag.

Greif, A. (2000). 'The Fundamental Problem of Exchange: A Research Agenda in Historical Institutional Analysis', European Review of Economic History 4, pp. 251-284.

Hansen, S.A. (1984). *Økonomisk vækst i Danmark. Bind I: 1720-1914.* Copenhagen: Akademisk Forlag.

Hansen, H.S. (1994). *Det Sønderjyske Landbrugshistorie 1830-1993.* Aabenraa: Historisk Samfund for Sønderjylland og Fælleslandboforeningen for Nordslesvig.

Harley, C.K. (1971). 'The Shift from Sailing Ships to Steamships 1850-1890: A Study in Technological Change and its Diffusion'. In D.N. McCloskey (ed.), *Essays on a Mature Economy: Britain after 1840*. Princeton, New Jersey: Princeton University Press.

Henriksen, I. and O'Rourke, K.H. (2005). 'Incentives, technology, and the shift to year-round dairying in late nineteenth-century Denmark', *Economic History Review* LVIII, pp. 520-45.

Hertel, H. (1889). 'Busck, Gunni, f. 1840, Grosserer', in C.F. Bricka (ed.), Dansk Biografisk Lexikon, tillige omfattende Norge for Tidsrummet 1537-1814, vol. III, Copenhagen: Gyldendalske Boghandels Forlag (F. Hegel & Søn), pp. 264-65

Hollmann, Max (1906). "Die Entwicklung des Butterhandels und der Butternotierung in Dänemark", in: Max Hollmann, Dr. Hailer and Julius Frost, *Der Butterhandel in Dänemark, Frankreich und den Niederlanden* (= Berichte über Land- und Forstwirtschaft im Auslande, 13), Berlin: Deutsche Landwirtschafts-Gesellschaft/Paul Parey, pp. 1-31.

Hornby, O. and C. Nilsson (1980). 'The transition from sail to steam in the Danish merchant fleet, 1865–1910'. *Scandinavian Economic History Review* 28:2, pp. 109-134.

Hünniger, D. (2010). 'Policing Epizootics.' in K. Brown and D. Gilfoyle (eds.). *Healing the Herds: Disease, Livestock Economies, and the Globalization of Veterinary Medicine*. Athens, Ohio: Ohio University Press, pp. 76-91.

Jakobs, Alfred, and Richter, Hans (1935). *Die Großhandelspreise in Deutschland von 1792 bis 1934* (= Sonderhefte des Instituts für Konjunkturforschung 37), Berlin/Hamburg: Hanseatische Verlagsanstalt.

Jenkins, H. M. (1876). 'Report on the agriculture of the kingdom of Denmark, with a note on the farming of the Duchies of Schleswig and Holstein.'

Jenkins, H.M. (1882). 'Report on the Agriculture of Denmark.' BPP.

Jensen, S.P. (1998). 'Kobbelbrug, kløver og kulturjord.' *Bol og By* 1, pp. 36-59.

Jensen, S.P. (2007). Fra stilstand til vækst: Studier i dansk landbrugs udvikling fra 1682 til 1914. Auning, Denmark: Landbohistorisk Selskab.

Keller, Wolfgang, Li, Ben, and Shiue, Carol H. (2011), 'China's Foreign Trade: Perspectives from the Past 150 Years', *The World Economy* 34(6), 853-892.

Kindleberger, C.P. (1951). 'Group Behavior and International Trade.' *Journal of Political Economy* 59:1, pp. 30-46.

Klovland, Jan Tore, and Solar, Peter M. (2011), 'New series for agricultural prices in London, 1770–1914', *Economic History Review* 64, 72-87.

Kohl, J.G. (1846). Reisen in Dänemark und den Herzogthümern Schleswig und Holstein, Volume 1. F.A. Brockhaus.

Kopsidis, M. (2014). 'Bäuerliche Landwirtschaft und Agrarwachstum: Südosteuropa 1870-1940 im Licht moderner Entwicklungsheorie', *Jahrbuch für Wirtschaftsgeschichte*, 2014/1, pp. 65-92.

Krugman, P. (1993). 'The hub effect: or, threeness in interregional trade.' In W.J. Ethier, E. Helpman, and J.P. Neary (eds.) (1993). *Theory, policy and dynamics in international trade: Essays in honor of Ronald W. Jones.* Cambridge: Cambridge University Press, pp. 29-37.

Laing, S. (1852). Observations on the social and political State of Denmark, and the duchies of Sleswick and Holstein in 1851: being the third series of the Notes of a traveller on the social and political state of the European people. Longman, Brown, Green, and Longmans.

Lampe, M., and Sharp, P. (2014). 'Greasing the Wheels of Rural Transformation? Margarine and the Competition for the British Butter Market,' *Economic History Review* (forthcoming).

Lassen, K.C. (1883). 'Udviklingen af Dampskibstrafikken fra Danmark til Storbritannien. ' TfL 5:2 (1883), pp. 384-419.

Lindert, Peter H. and Jeffrey G. Williamson (1983). 'English Workers' Living Standards during the Industrial Revolution: A New Look', *Economic History Review* 36 (1), pp. 1-25.

Marchtaler, Hildegard von (1959). 'Donner, Conrad Hinrich,' *Neue Deutsche Biographie* 4, p. 73; online version: http://www.deutsche-biographie.de/pnd135707099.html.

Mordhorst, Mads (2014). 'Arla and Danish national identity – business history as cultural history,' *Business History* 56 (1), pp. 116-133.

Meyer, K. (1916). De forenede Bryggerier 1891-1916: bidrag til bryggeriernes historie i anledning af 25-års dagen for selskabets stiftelse. Levison.

Møller, A.M. (1998). *Dansk søfarts historie vol. 4, 1814-1870: Med korn og kul*. Copenhagen: Gyldendal.

Møller, A.M., H. Dethlefsen, and H.C. Johansen (1998). *Dansk søfarts historie vol. 5, 1870-1920: Sejl og damp.* Copenhagen: Gyldendal.

Pedersen, J. (1999). *Teknologisk udvikling i maskinindustrien: Burmeister & Wain 1875-1939*. Lyngby: Polyteknisk Forlag.

Pedersen, K., J. Strandskov and P. Sørensen (2005). *Philip W. Heyman.* Copenhagen: Systime Akademic/ Gyldendal.

Petersen, L. (1979). 'The Danish cattle trade during the sixteenth and seventeenth centuries,' *Scandinavian Economic History Review* 18 (1), pp. 69-85.

Pietrocòla-Rossetti, T. (1864). 'Condizioni politiche e statistiche sulla Danimarca.' *Rivista Contemporanea Nazionale Italiana*, Nuova serie, Volume Trigesimosesto Anno XII.

Pinilla, V.; Ayuda, M.-I. (2010). 'Taking advantage of globalization? Spain and the building of the international market in Mediterranean horticultural products, 1850-1935', *European Review of Economic History* 14, pp. 239-274.

Poulsen, C.M. (1851a). *Om Vigtigheden af Jyllands Handelsforbindelse med England*. Copenhagen: Berlingske Bogtrykkeri.

Poulsen, C.M. (1851b). *Behandlingen af de jydske Producter for det engelske Marked, medeelte i et Brev fra London, Decbr. 1850*. Copenhagen: Berlingske Bogtrykkeri.

Rainals, H. (1860). 'Report upon the Past and Present State of the Agriculture of the Danish Monarchy; its Products, with Comparative Tables of Exports.' *Journal of the Royal Agricultural Society of England* 21, pp. 267-328.

Rasmussen, C.P. (2010). 'Innovative Feudalism: The development of dairy farming and Koppelwirtschaft on manors in Schleswig-Holstein in the seventeenth and eighteenth centuries.' *Agricultural History Review* 58:2, pp. 172-190.

Rützou, Poul (1887). 'Smørmarderne i Cork og Kjøbenhavn.' TfL 5:6 (1887), pp. 273-300.

Schmidt, Urban (1870). 'Nogle Bemærkninger om Smørproduktionen og Smørhandelen.' *Tidskrift for Landøkonomie* [1870], 529-536.

Schulte Beerbühl, M. (2013). 'Trading with the enemy. Clandestine networks during the Napoleonic Wars', *Quaderni storici* 143, pp. 541-565.

Simpson, S. (2004). 'Selling to reluctant drinkers: the British wine market, 1860–1914,' *Economic History Review* 57(1), pp. 80-108.

Stanziani, A. (2010). 'Economic Information on International Markets: French Strategies in the Italian Mirror (Nineteenth-Early Twentieth Centuries),' *Enterprise & Society* 11(1), pp. 26-64.

Statistisk Tabelværk. Danmarks vareindførsel og -udførsel (1838-81). Copenhagen: Bianco Lunos et. al. (various issues).

Tabellarische Übersichten des Hamburgischen Handels [1850-1872]. Hamburg: Kümpel, 1851-73.

Tables of the revenue, population, commerce, &c. of the United Kingdom and its dependencies. Compiled from official returns. [Years 1820-1840, 1851-52]. London: HMSO, 1835-1843, 1854.

Testdorpf, E. (1865). 'Om Afsætningsforholdne i England og Skotland,' Ugeskrift for Landmænd 1865/I, pp. 233-39, 244-50.

Thomsen, B.N. and B. Thomas (1965). *Dansk-engelsk samhandel : Et historisk rids 1661-1963.* Aarhus: Universitetsforlaget.

Tisserand, E. (1865). Études économiques sur le Danemark, le Holstein et le Slesvig. Paris: Victor Masson et Fils.

Vestberg, Jens (1933). 'Koch, Cornelius Peter August, 1816-92', in: Engelstoft, P. (ed.). *Dansk Biografisk Leksikon.* Second edition, vol. 13. Copenhagen: J.H. Schultz Forlag, pp. 22-23.

Voth, H.-J. (2004). 'Living standards and the urban environment.' in: R. Floud and P. Johnson (eds.), The Cambridge Economic History of Modern Britain. Vol I: Industrialization, 1700-1860. Cambridge: Cambridge University Press, pp. 268-294.

Weber, J. E. (1853). *Altona – Nicht Hamburg-Altona. Zur Würdigung der commerziellen Selbständigkeit und Bedeutung Altona's neben Hamburg*. Hamburg: Voigt.

Westergaard, H. (1922). 'Economic Development in Denmark: Before and During the World War'. Oxford: Clarendon Press.

Westring (1866). 'Kreaturudførselen til England. 26 November 1866,' Ugeskrift for Landmænd 1866/II, pp. 355-56.

Wilson, J. (1867). 'Report on the Agricultural Exhibition at Aarhus (Denmark)'. BPP.

Wrigley, E.A. (2004). 'British population during the 'long' eighteenth century, 1680-1840,' in: R. Floud and P. Johnson (eds.), The Cambridge Economic History of Modern Britain. Vol I: Industrialization, 1700-1860. Cambridge: Cambridge University Press, pp. 57-95.

Appendix – Specification Tests

(1a)

```
Single-equation diagnostics using reduced-form residuals:

CPH-Funen  : Normality test:  Chi^2(2) =  1.3044 [0.5209]

CPH-Funen   : Portmanteau( 6):  Chi^2(4)  =   2.4015 [0.6624]

Hamburg   : Normality test:  Chi^2(2) =  2.0565 [0.3576]

Hamburg     : Portmanteau( 6):  Chi^2(4)  =   1.2052 [0.8772]

LON_C    : Normality test:  Chi^2(2) =  1.5943 [0.4506]

LON_C       : Portmanteau( 6):  Chi^2(4)  =   3.1716 [0.5295]

Vector Normality test:  Chi^2(6) =  6.3652 [0.3835]

Vector Portmanteau( 6):  Chi^2(36) =   39.357 [0.3220]
```

(1b)

```
Single-equation diagnostics using reduced-form residuals:

CPH-Torve  : Normality test:  Chi^2(2) = 0.44942 [0.7987]

CPH-Torve  : Portmanteau( 6): Chi^2(4) =  3.3951 [0.4940]

Hamburg   : Normality test:  Chi^2(2) = 0.67712 [0.7128]

Hamburg   : Portmanteau( 6): Chi^2(4) =  1.5920 [0.8102]

LON_K&S   : Normality test:  Chi^2(2) =0.0088090 [0.9956]

LON_K&S   : Portmanteau( 6): Chi^2(4) =  6.0240 [0.1974]

Vector Normality test:  Chi^2(6) =  1.9288 [0.9261]

Vector Portmanteau( 6): Chi^2(36) =  49.829 [0.0624]
```

(2)

```
Single-equation diagnostics using reduced-form residuals:

CPH-Estate : Normality test:  Chi^2(2) = 0.95876 [0.6192]

CPH-Estate : Portmanteau( 6): Chi^2(4) =  8.7922 [0.0665]

Hamburg   : Normality test:  Chi^2(2) = 0.26397 [0.8764]

Hamburg   : Portmanteau( 6): Chi^2(4) =  7.0115 [0.1353]

LON_K&S   : Normality test:  Chi^2(2) = 0.38474 [0.8250]

LON_K&S   : Portmanteau( 6): Chi^2(4) =  2.6718 [0.6142]

Vector Normality test:  Chi^2(6) =  8.8382 [0.1829]

Vector Portmanteau( 6): Chi^2(36) =  43.418 [0.1846]
```