

Consumer Price Indices for the Scandinavian Countries 1815-1913

Ola Honningdal Grytten

Department of Economics

Norwegian School of Economics and business Administration

Helleveien 30

NO-5045 Bergen

Tel: + 47 55 95 93 45

Email: ola.grytten@nhh.no

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Abstract

The present article examines consumer price development in the three Scandinavian countries, Denmark, Norway and Sweden, 1815-1913. A consumer price index (CPI) is constructed for Norway. It is based on consumer prices for up to nine consumption groups and 47 commodities in 40 Norwegian cities and towns. With only a few exceptions, the price data are culled from the Ingvar Wedervang Archive on prices and Wages kept at the Norwegian School of Economics and Business Administration in Bergen.

The CPI for Norway is compared to corresponding CPIs for Denmark and Sweden. We trace high conformity in price waves between the countries. This can partly be explained by their imports of similar commodities, and partly by their heavy dependence on agriculture, where similar climatic fluctuations gave conformity in price movements for primary products. Finally, the significant correlation of prices gives an indication of surprisingly high integration of the inter-Scandinavian markets.

Theme

This article examines the development of consumer prices in the Scandinavian countries Denmark, Norway and Sweden from the post Napoleonic era to the Second World War. Reliable cost of living indices for Denmark and Sweden exist from 1815 and 1830 respectively. However, no reliable consumer price index (CPI) exists for Norway until the last decades of the nineteenth century. Thus, the aim of this article is to establish a Norwegian CPI, which is comparable with existing indices for Denmark and Sweden. The article also seeks to map similarities and differences in consumer price developments between the three countries.

A new CPI for Norway 1819-1871 is constructed on the basis of monthly and quarterly price registrations of 47 representative products in Norwegian towns and cities back to 1830. For the years previous to 1830 the CPI is constructed on the basis of 15 representative products with price observations from major cities. Most data are derived from an archive of prices and wages, namely Professor Ingvar Wedervang's Historical Archive on Prices and Wages, now kept at the Norwegian School of Economics and Business Administration.

On the basis of the new CPI we conclude that the development of consumer prices was quite similar in the Scandinavian countries, in particular from 1850 onwards. Towards the end of the period, inflation was moderately higher in Sweden than in Denmark and Norway. This can be explained by the rapid industrialisation and the high relative growth rate in Sweden during the last decades under examination.

Background

The "official" Norwegian CPI published by Statistics Norway covers the years from 1901 onwards (NOS 1978, pp. 518-519). Originally it was a cost of living index monitored by the Statistical Office of Kristiania. Until 1916 it covered Oslo only, and the number of products was limited. From 1916 till 1919 the Ministry of Social Affairs constructed a cost of living index for the major cities. Their job was taken over by Statistics Norway in 1919. In addition to its historical CPI Statistics Norway estimated implicit deflators for their historical national accounts. The work included a deflator for private consumption for 1865-1920 (NOS 1968, pp. 352-353).

As for earlier periods, a "non-official" historical cost of living index has been calculated for working class families in Oslo for 1850-1910 (Ramstad 1983, pp. 158-238). Jan Ramstad, a former scholar at the Norwegian School of Economics and Business Administration, constructed this latter index in 1982. His index is fairly well

based on historical price data 1870-1910, but lacks empirical foundation for several years earlier than 1870. Ramstad also lacks empirical evidence for the budget weights in his Laspeyre index. He adopted weights based on a 1912/1913-budget survey. The weights were based on the reported consumption of the lowest income group in the study. Despite its wide range, the index does not include house rents. Equally, travel and cultural activities of negligible proportions, were left out. Nevertheless, Ramstad's sample of 55 products represented 77 per cent of total consumption expenditures for working class families (Statistical Office of Kristiania 1915).

Ramstad used price data from the Wedervang Archive. The 55 commodities were divided into ten consumption groups. Price indices were computed for every product and consumption group. They were summed up according to their weights and a general cost of living index was constructed. For some years, in particular the first two decades of the period covered by the index, price data were lacking. Lacunas were closed by interpolations, extrapolations and alternative price data.

A significant problem with Ramstad's index is his use of interpolations. For the 1850s and 1860s they were made on a weak basis. Ramstad assumed decreasing prices in 1851, when they did in fact increase. Another problem is that Ramstad's data are taken from Oslo only. The regional patterns of both prices and consumption differed significantly. Thirdly, the consumption pattern of food did change a lot between 1850 and 1912/1913, contrary to Ramstad's assumptions. Despite shortcomings for the years 1850-1870, his index from 1870 onwards, gives a fairly reliable picture of the price development.

Preliminary estimates

Jon Petter Holter at the Central Bank of Norway has constructed a preliminary CPI for Norway 1835-1865 (Holter 1996). His index includes eight products, i.e. four types of grain, potatoes and three types of meat. They are annual prices for grain and potatoes published by Statistics Norway, and market prices on beef, mutton and pork reported for 1835, 1845, 1855 and 1865 in Oslo (Christiania). To arrive at annual figures, Holter used linear interpolation.

Holter interpolated budget weights. They were partly based on assumptions, partly on empirical sources. To arrive at reliable weights, he assumed that the consumption of grain and potatoes was mirrored in the usage of land. His weights for meat were based on estimated weights of the winter cattle stock. Finally, he assumed that crops accounted for 70 per cent of consumption, and meat 30 per cent.

There are problems with Holter's series. In the first place, there are shortcomings in his estimates, in respect of price data, weights and methodology. The price data for grain are wholesale and not consumer prices. Another problem is that they reflect prices on domestically produced crops only, when a significant portion of the grain consumed was imported (Hodne 1975, pp. 149-152). A more serious problem is that the prices used by Holter are adjusted for exchange rate fluctuations from the par value of the speciedaler (NOS 1915, pp. 2-3). For the period 1835-1842, when the daler was weak, prices were corrected significantly. Hence, they do not mirror nominal price fluctuations. The prices for meat cover the capital only. In addition, they are taken for four years only (NOS 1969, p. 530). The linear interpolations to arrive at annual prices, neglect significant price variations.

Secondly, the estimated budget weights applied are based on area instead of consumption. Wheat and rye used for food were basically imported, while oats and barley, the main crops, were used mainly as animal fodder. To give meat weights in line with stock is hardly reliable. Additionally, the relative shares of cattle stock consumption to agrarian consumption lack any empirical founding. Fish is not included at all. Thirdly, the linear interpolation method gives a misleading picture of annual prices.

Establishing a consumer price index for Norway 1819-1871

The challenge left by Holter is taken up in this article. A new CPI for Norway is constructed for 1819-1871. The new index is calculated according to the Laspeyre formula. This means that annual price movements are weighted by the commodities' share of household consumption in the base year. Price data are compiled from the Wedervang Archive. Information on consumption expenditure is taken from research carried out by scholars in economic history along with surveys taken by the central administration and Statistics Norway.

Method

Constructing a CPI, we need consumer prices for representative products and their relative weights in an aggregated index. The standard method for computing a CPI is the Laspeyre approach. According to this method the price of each product should have a constant weight. This weight will be each product's share of consumer expenditures in the base year. Our CPI is constructed stepwise. Price data on each

item is collected from all over the country. Annual average prices are calculated. Micro indices (P_M) for all items (i) are then constructed according to equation (1):

$$(1) \quad P_M^i = p_t^i / p_0^i$$

The next step is to construct price indices for consumption groups. Based on consumer expenditure surveys, the different items from the micro index are summed up (?). They are weighted according to their relative share of total expenditures within their consumption group. According to the Laspeyre approach the weights of the base year applies for every year included in the indices. This is shown in equation (2), where c denotes consumption group:

$$(2) \quad P_L^c = (p_t^i q_0^i) / (p_0^i q_0^i)$$

Finally, to reach at a general CPI, the sub-indices for the consumption groups are aggregated. Consumption groups are given weights according to their share of total consumption in the base year. Thus, we apply the aggregated Laspeyre formula as shown in equation (3):

$$(3) \quad P_L = (p_t^c q_0^c) / (p_0^c q_0^c)$$

P_L denotes the Laspeyre price index as the sum (?) of prices (p) in year (t) multiplied by their quantity (q) in the base year (0), divided by the sum of the corresponding prices in the base year multiplied by their quantity in that year.

Price data

The bulk of the price data in the new CPI is taken from Professor Ingvar Wedervang's Archive on Wages and Prices. The archive contains data for the years between 1830 and 1920, but there is still fairly well coverage back to 1819. For the period 1819-1920 it is possible to find consistent annual prices on several items. Some prices even stretch back to the 17th and 18th century.

Most of the historical wage and price data of the Wedervang Archive were collected from a variety of sources. The aim was to examine historical data to be able to explain and forecast business cycles. As it turned out, the archive was seldom used

until the 1970s when staff at the Norwegian School of Economics and Business Administration again took up research. This resulted in a number of publications on prices and wages, basically for the latter part of the nineteenth century.¹ In the 1980s and 1990s the archive hosted international research on the standard of living.²

Most price data collected by Wedervang's staff were taken from official records, institutions, private business archives and price courants. In most cases the prices cover several decades. They were collected monthly, quarterly, annually, or randomly in various towns and cities. Some price series report similar products, which enable us to cross check the data. Data are reported on disaggregated and aggregated levels in respect of time and location. In some cases market and wholesale prices are reported along with import prices and export prices. Scholars with first hand knowledge of the archive, conclude that the reliability of the price data is very good (Minde and Ramstad 1986, pp. 100-112).

Commodities and consumption groups

We have been able to establish consistent price series for 15 commodities representing five consumption groups 1819-1830, and 47 commodities representing nine consumption groups 1830-1871. All prices, with an exception for tobacco (Hodne 1978, p. 218), are taken from the Wedervang Archive. Supported by surveys we conclude that from 1830 onwards, the consumption groups in the new price index cover 90 per cent of private consumption, and about half of that for the earlier years 1819-1830 (Minde 1983, pp. 47-51; Grytten and Minde 1998, pp. 52-54). Some products within the established consumption groups are missing, among them rent. Nevertheless, prices on wood give a fairly good indication of long-term development of rental prices, since they mirror prices on material for building and construction. In fact, some archival files do not in fact differentiate between wood for building and construction and wood for fuel.

¹ Several studies with different focus were finished (Gjølberg 1974, Ramstad 1982, Lønningdal 1984, Minde and Ramstad 1986, pp. 90-121).

² This work was basically carried out by two groups of economic historians. During the second half of the 1980s a project on international maritime wages was overseen by two maritime historians, Lewis R. Fischer, Memorial University of Newfoundland and Helge W. Nordvik, Norwegian School of Economics and Business Administration: (Fischer and Nordvik 1988). As part of a European and later a Nordic project Fritz Hodne, at the Norwegian School of Economics and Business Administration, and associates produced new research based on the archive (Hodne, Grytten and Alme 1995, pp. 61-75; Minde and Grytten 1997, pp. 61-82).

Prices 1819-1830

Private archives of merchant houses kept in the Wedervang Archive are important sources for consumer prices prior to 1830. We use price data from merchant houses located in 13 towns and cities.³ Occasionally we include prices from institutions.⁴ For most years we have observations from six to 15 sources. The typical number of annual observations for an item is between 40 and 120.

In addition to the merchant prices, the Wedervang Archive also holds a significant number of price data on fish products 1818-1830.⁵ The Norwegian Inspector of Fisheries during the last part of the 19th and first part of the 20th century, Fredrik Meltzer Wallem, collected these. They include exports, wholesale and consumer prices. Most prices are taken from Norwegian ports, in particular from the most important fishing port, Bergen. There are detailed prices for cod, coalfish, clipfish and stockfish. The prices stem from fish markets, bourses, public records and merchant archives. They were collected monthly, some more frequently, some randomly. The bulk was collected on a regular basis. A problem with the fish prices up till 1842, is that they are adjusted for exchange rate fluctuations from the par silver value of the Norwegian currency. We have readjusted these back to nominal prices by using exchange rate notations of the *speciedaler*.⁶ Thus, we reach at valid and reliable nominal prices 1819-1830.

Prices 1830-1871

Most price data for 1830-1871 are taken from series collected by local civil servants. A major source is "Market prices in Norwegian towns".⁷ Prices on 15 products were collected quarterly by the magistrates' office in 40 towns and cities all over the country. The commodities reported were rye, wheat, barley, oat, potatoes, peas, linen, 14 of these were consumption items.

Data exist for all items every year, except for wool. However, the lacunas are filled with data from other sources in the Wedervang Archive.⁸ The data were collected in the middle of the first month of every quarter. They have been summed

³ The Wedervang Archive, files W 051, W 210 and W 217.

⁴ W 217.

⁵ The Wedervang Archive, file W 397.

⁶ These are exchange rate quotations from Christiania Bourse compiled by Jan Tore Klovland, the Norwegian School of Economics and Business Administration, Bergen.

⁷ The Wedervang Archive, file W 272.

⁸ The Wedervang Archive, files W 139, W 269, W 271 and W 383.

up and annual averages are calculated for each item in every town and city. Thereafter, annual national averages are computed.

The data are valid and reliable for our purpose. In the first place they report consumer prices. Secondly, they are taken from all major towns and cities. Thirdly, they are reported quarterly. Fourthly, they were collected by the town magistrate offices, assembled and assessed by county, and finally by departmental civil servants. The data were collected in pursuance of a departmental circular from January 1816, instructing the local public servants how and where the prices should be collected.⁹ In the Wedervang Archive annual transcripts exist for 1832-1871.

Another important source in the Wedervang Archive is a file on "Market prices on retail goods", in which monthly prices of 24 items are reported.¹⁰ 23 of these items were consumption goods. Most data cover the years 1830-1913.

Price data were reported consistently for the four major cities in Norway, Oslo, Bergen, Trondheim and Stavanger. More sporadic notations are taken from smaller towns. The prices reported were normally taken from market places. These were in principle recorded monthly. Local civil servants or bourse officials kept the records. The coverage of the data is good, and the series are consistent and reliable.¹¹

Price courants make up a third important source.¹² The relevant courants we have traced in the Wedervang Archive are prices reported in the listings for Bergen and Oslo. Observations are also found for five additional cities. Prices on a variety of products are reported. They cover various time spans. However, the bulk of the data starts in 1830 or 1861 and ends in the early nineteen hundreds. We have compiled prices for a majority of consumption items.

Prices were normally recorded monthly. Most observations for Bergen and Oslo are consistent over time. As for the other cities, the price courants are more sporadic. Hence, these prices are used to fill in gaps and to establish prices for consumer goods not covered by other sources in the Wedervang Archive. The markets in Bergen and Oslo were meeting points for traders from all over the country, and thus, the prices were representative for larger parts of the country.

A fourth important source is the file "Retail and market place prices" from Oslo. They were collected monthly 1848-1919. We also utilise price data for Oslo

⁹ Circular from 4th Department dated January 20th 1816 to all executive county public servants, kept at the Wedervang Archive, W 272.

¹⁰ The Wedervang Archive, file W 269.

¹¹ W 269

¹² The Wedervang Archive, files W 271, W 383.

from other files in the Wedervang Archive.¹³ These additional data serve to close gaps. To a limited extent they give additional price series. We use prices on vegetable oil, beer, vinegar, refined sugar, rice, wheat flour, eggs, milk, cream, grouse, beef, veal, mutton, pork, cod and firewood. The Public Office of Measures and Weight in the capital collected the data. They were taken on a monthly basis. Some prices from other cities and towns are also included in parts of the material. The price series are considered among the most reliable in the archive (Minde and Ramstad 1986, p. 102).

Fifthly, the bulk of our consumer prices on fish from 1830 onwards, are taken from two files.¹⁴ One reports retail prices on fish and fish products from merchant archives in five major ports.¹⁵ This file also contains price data for 1819-1830 as described above. The second file contains data collected by the earlier mentioned Norwegian Fishery Inspector, Fredrik Meltzer Wallem.¹⁶ Wallem compiled almost all available fish prices from 1818 onwards. Series were given as wholesale, exports and consumer prices. The bulk of Wallem's data are taken from Western and Northern Norway. Bergen, the central port for the fish industry at the time, was his most important source.

In conclusion, the data enable us to construct valid and reliable price series for herring, cod, coalfish, stockfish and clipfish annually 1830-1871. Most price observations are taken monthly, some even weekly. In her examination of Wallem's price data, Camilla Brautaset concludes they are reliable (Brautaset 2002, pp. 63-71).

Readjusting for exchange rate fluctuations

In the 19th century prices were often adjusted for exchange rate fluctuations from the par value. In this context, this applies to the years 1819-1842. To correct for this, we have to readjust the price observations back to their nominal values. To do so we use exchange rate notations for the *speciedaler*. In the period 1819-1842 the market value of the *speciedaler* fluctuated below the official par value. Hence, the price observations in need of corrections are readjusted with this factor. More precisely, they are inflated with the difference between the market rate and the par value.

¹³ The Wedervang Archive, files W 128, W 139, W 206, W 220, W 275, W 276, W 383 and W 396.

¹⁴ The Wedervang Archive, files W 051 and W 397.

¹⁵ W 051.

¹⁶ W 397.

Base years

According to the Laspeyre approach, the weights in the index should be based on their share of total consumption in the base year. We then need to choose a representative base year. Next, we find weights for commodities and consumption groups.

For the period 1830-1871 we aim at finding a representative base year towards the middle of the period, i.e. around 1850. In the years previous to 1850, both the international and the domestic economy was marked by turbulence, due to revolutionary and counter-revolutionary waves over continental Europe. As for the years after 1850, the economy was affected by the Crimean War. Thus, 1850 seems to be the most representative year for the period 1830-1871.

As for the period 1819-1830, it is more difficult to establish a representative year. The Norwegian economy suffered a post-war recession, foreign protectionism, huge exchange rate fluctuations and institutional chaos. No year up to 1830 could be considered normal. Thus, we have chosen 1830 as the base for 1819-1830.

Weights

To establish weights, we need to know the consumption pattern of the households. In his estimates of consumption 1850-1910, Ramstad specified weights for ten groups. (Ramstad 1982, p. 492). His weights, however, cannot be taken as representative for 1819-1871. In the first place, they are based on a consumer expenditure survey of 1912/1913. Ramstad assumed the same fixed weights in 1850 adjusted by relative price differences 1850-1910. He did not take into account changes in consumption that took place during the period (Grytten and Minde 1998, pp. 52-55). Secondly, Ramstad's survey accounts for Oslo only. The consumption of alcohol was significantly higher in 1850 than in 1910. Teetotalism and Puritanism replaced spirits during the 19th century, after Norwegians annually consumed close to 20 litres of pure alcohol per capita in the 1830s (Hodne and Grytten 2000, 278-281).

Kjell Bjørn Minde has examined consumer surveys from the nineteenth century (Minde 1983, p. 49). Despite occasional evidence to the contrary, it is obvious that cereals and flour were the most important products, followed by milk and dairy products, meat and colonial goods. In Statistics Norway's historical national accounts, estimates of consumption are presented for 1865. Food accounted for 46.5 per cent, beverages and tobacco 6.5, rents, lighting and heating 19.9, durable household goods and household operation 7.5, clothing and footwear 11.0, personal health care and hygiene 1.0, travelling and transportation 1.2, lodging etc. 2.0, and finally other

consumption 4.2 per cent (Bjerke 1966, p. 76). Based on the the estimates by Bjerke and Minde we arrive at reasonable weights for 1830-1871 with 1850 as base year.

The relative weights of the different consumption groups are reported in table 1. On the basis of Brautaset's work we find relative weights for each fish product (Brautaset 2002, pp. 97-114). As for meat and milk, we use product weights based on new calculations of consumption of farm products (Grytten 2003, pp. 78-89). Having established weights for 1850, we extrapolate these back to 1830. This is done by drawing on production and consumption information from established work on agriculture and fisheries and on public consumption surveys. Two authoritative sources consulted are the contemporary work by Anton Martin Schweigaard and Martin Braun Tvethe. (Schweigaard 1840, pp. 36-78 and Tvethe 1848, pp. 36-78).

Table 1. Consumption expenditure for Norway 1819-1871.

Consumption groups 1819-1871	Weight of total	
	1819-1830	1830-1871
A. Fish and fish products	0.20	0.07
B. Milk and milk products	-	0.14
C. Meat	-	0.07
D. Grain and flour	0.40	0.18
E. Vegetables	0.20	0.07
F. Colonial	0.10	0.05
G. Beverages and tobacco	0.10	0.05
H. Rent, lighting and heating	-	0.21
I. Clothing	-	0.16
A-I. Total	1.00	1.00

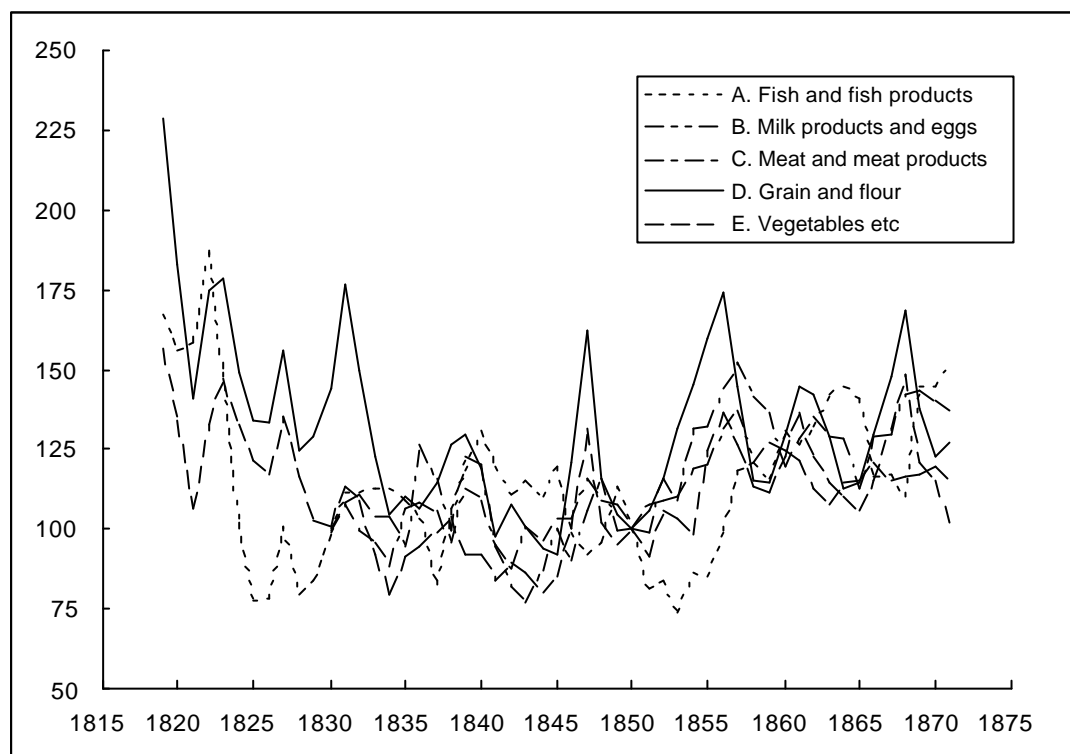
Sources, Minde (1982), p. 49, Bjerke (1966), p. 76, Ramstad (1982), p. 492, Grytten (2003), p. 78, Schweigaard (1840), pp. 36-78 and Tvethe (1848), pp. 36-78.

CPI for Norway 1819-1871

Using estimated consumer budgets in the base years, we arrive at relevant weights. This enables us to construct a CPI for Norway 1819-1871 with indices for consumption groups. Chart 1 reports sub-indices for the basic food products. The sub-indices for grain and flour and fish and fish products fluctuate more than the others, as these were more sensitive to natural fluctuations. In addition, Norway was dependent of imports of grain and flour. Thus, prices on these items were in particular high after the Napoleonic wars, when there was lack of grain in Europe, during the bad harvests in the early 1830s, during the revolutionary wave in Europe around 1848, and in the

late 1850s, as result of the Crimean War. The significant fluctuations in fish prices basically mirror the catches, but also demand.

Chart 1. CPI for Norway, sub-indices 1819-1871 (1850=100).

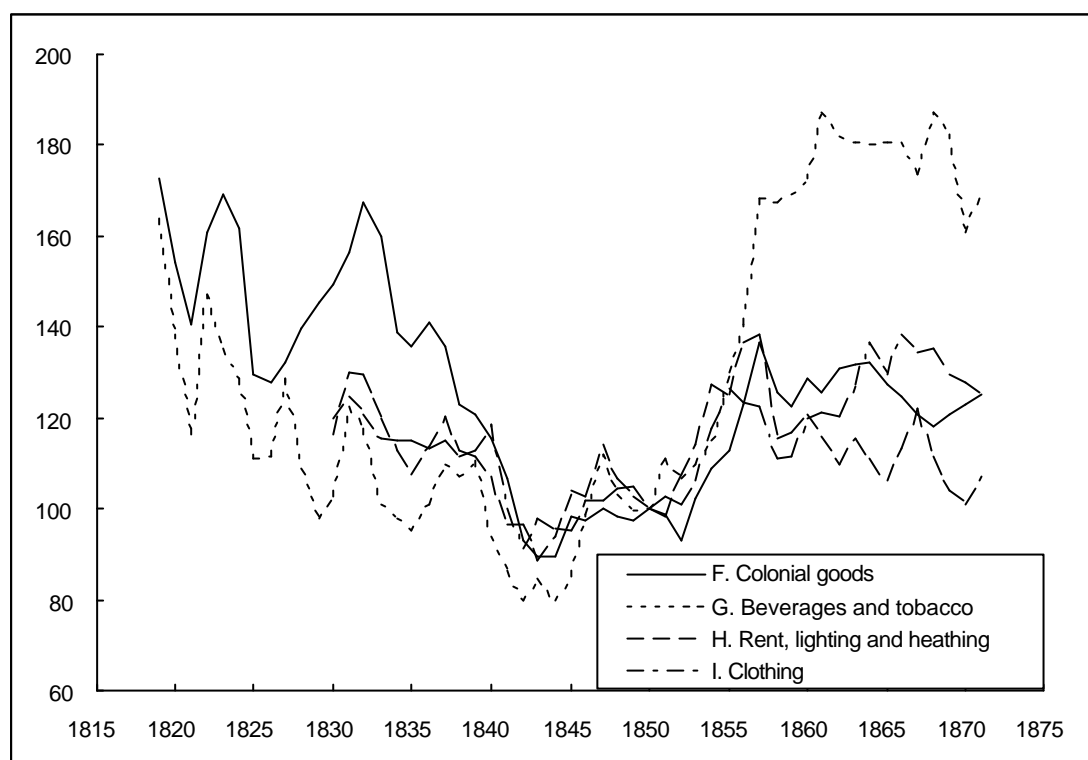


Sources, Wedervang Archive, files W 051, W 128, W 137, W 139, W 206, W 210, W 213, W 217, W 219, W 269, W 271, W 272, W 275, W 276, W 383, W 386, W 396, W 397 and Minde (1982), p. 49, Bjerke (1966), p. 76, Ramstad (1982), p. 492, Grytten (2003), p. 78, Schweigaard (1840), pp. 36-78 and Tvethe (1848), pp. 36-78.

Live stock production was less sensitive to climatic changes, and imports were marginal (NOS 1978, pp. 262-263). Thus, the sub-indices for milk and meat fluctuate less than the others.

Sub-indices for colonial goods, beverages and tobacco, renting, lighting and heating, and clothing are shown in chart 2. According to the graph prices on colonial goods were relatively high up to the late 1830s. This is best explained by the high transaction costs, including import tax, during the first decades of the nineteenth century. From the 1840s these came down followed by increasing use of colonial goods. Another special case is beverages and tobacco. From the middle of the 1840s up to the early 1860s relative prices on these items rose rapidly. Norway introduced a social policy in the 1840s with emphasis on reducing alcohol consumption. Taxes were raised, farmers were not longer freely allowed to produce alcohol on their farms. The number of licensed breweries and distilleries fell dramatically. Both the quality and supply of alcohol came under stricter control (Fuglum 1972). As result, prices rose significantly. Prices on tobacco increased significantly during the Crimean War.

Chart 2. CPI for Norway, sub-indices 1819-1871 (1850=100).

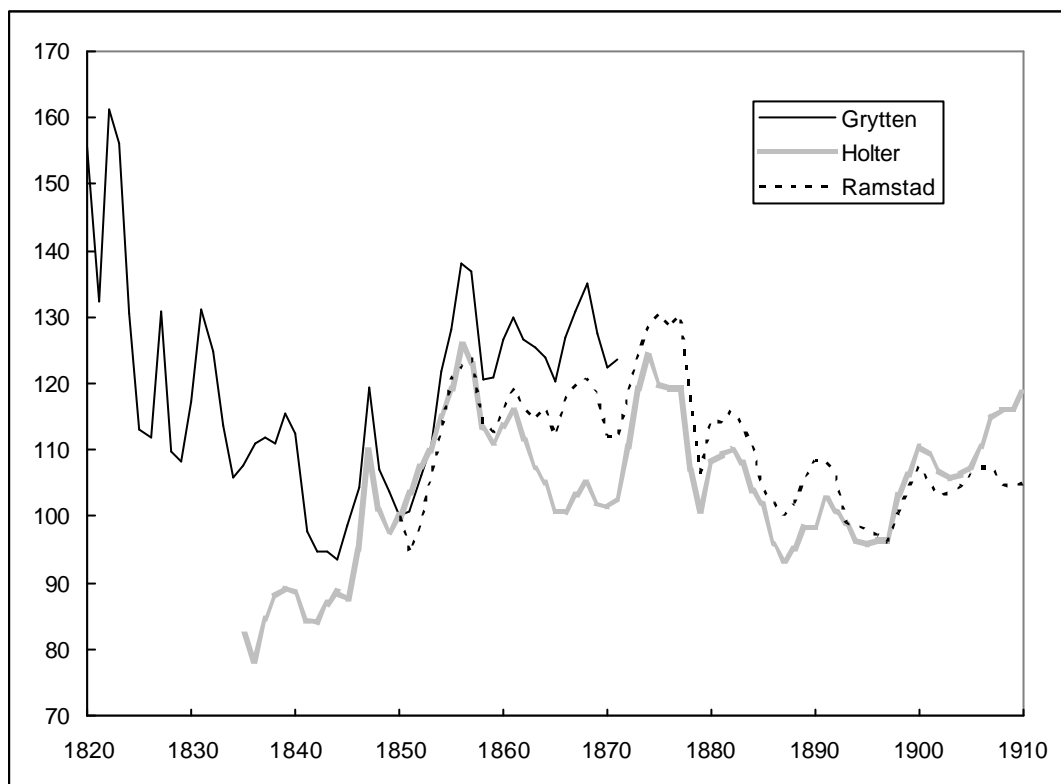


Sources, Wedervang Archive, files W 128, W 137, W 139, W 206, W 210, W 213, W 217, W 219, W 269, W 271, W 272, W 275, W 276, W 383, W 386, W 396, Hodne (1978), p. 218 and Minde (1982), p. 49, Bjerke (1966), p. 76, Ramstad (1982), p. 492, Grytten (2003), p. 78, Schweigaard (1840), pp. 36-78 and Tvethe (1848), pp. 36-78.

Finally, the new general CPI is shown in chart 3 below together with the Holter and the Ramstad index. The index by Holter is spliced with Statistics Norway's deflator for private consumption in the historical national accounts from 1865 onwards. The new index reveals that despite huge fluctuations, prices came down dramatically till 1844. During 1819-1842 prices fell almost 50 per cent. At the same time the Norwegian speciedaler appreciated by about 100 per cent. Thus, the fall in prices and the appreciation of the speciedaler was symmetric 1819-1842. From 1845 prices rose until 1856 and thereafter they stabilised.

The chart also reveals significant differences between the preliminary CPI constructed by Holter and the new index presented here. This is mainly explained by lack of data and the use of deflated price series in Holter's figures. The Ramstad index departs from the new CPI in the 1850s, due to interpolations made on a weak statistical basis.

Chart 3. CPIs for Norway, 1820-1910 (1850=100).



Sources, Wedervang Archive, files W 051, W 128, W 137, W 139, W 206, W 210, W 213, W 217, W 219, W 269, W 271, W 272, W 275, W 276, W 383, W 386, W 396, W 397, Hodne (1978), p. 218, Schweigaard (1840), pp. 36-78, Tvethe (1848), pp. 36-78, Holter (1996), p. 7 and Ramstad (1982), p. 493.

A CPI for Norway 1819-1913

In the present historical national accounts for Norway, an implicitly given price index for private consumption is reported back to 1865 (NOS 1968, pp. 352-353). Neither the price data nor the weights are documented. In fact, we do not know how the index is constructed. By comparing its implicit price index for private consumption with that for Sweden, we find a close to perfect correlation (Lindahl 1937, pp. 21-46 and Johansson 1967). We cannot exclude the possibility that the "official" CPI for Norway 1865-1900 is a revised version of a Swedish deflator for private consumption. In conclusion, we do not consider this index reliable.

We have already looked at Jan Ramstad's price index for the Norwegian capital Oslo 1850-1910. As mentioned, he included 55 items in ten consumption groups, representing 77 per cent of total consumer expenditure for low-income families. Due to dubious weights and significant lacunas in the price material, we do not consider Ramstad's index sufficiently reliable for the 1850s and 1860s. From the 1870s onwards, however, his data, also taken from the Wedervang Archive, are far

more consistent. Thus, we splice our new CPI 1819-1871 with the Ramstad index 1871-1910 in 1871.

On the basis of consumption data among working class families in the capital, the Statistical Office of Kristiania (Oslo) calculated a price index back to 1901. The weights of the different products were computed on the basis of a consumption survey of 1912/1913. The number of products included was limited, and varied significantly. The prices and weights were taken from Oslo exclusively. However, this index has been considered fairly reliable by Statistics Norway, as they have published it as "an official" standard of living index for Norway 1901-1916.

By splicing the new consumer price index 1819-1871, Ramstad's index 1871-1901, Statistical Office of Kristiania's index 1901-1913, we arrive at an annual CPI for Norway, 1819-1913. This CPI is reported in chart 4, together with CPIs for Denmark and Sweden.

CPI for Denmark 1815-1913

Svend Aage Hansen has constructed a CPI for Denmark 1815-1870. Unfortunately, Hansen did not focus on documentation of his index, but leaves us with some hints. His index is based on commodity prices Hansen collected for 79 products, of these less than 50 were consumer commodities, categorised in seven consumption groups. The prices were compiled from different sources, mostly Danish, but also some foreign sources. The Danish price data were taken mainly from Copenhagen. Hansen's CPI must be considered a semi-CPI. The price material consist of six types of prices: wholesale prices, export prices, import prices, institutional prices, foreign prices and domestic market prices to consumers, of which the first and last groups are dominant.

According to the Laspeyre approach, Hansen established fixed weights. He picked 1840 as his base year. His weights are based on estimated consumer expenditure offered in the present historical national accounts for Denmark. According to the figures in the accounts, food accounted for 51 per cent, beverages and tobacco for nine per cent, clothing and footwear 12, rent eleven, lighting and fuel seven, durable consumption commodities two, own transport and public transport one half per cent each, other consumer commodities three, and finally, other services four per cent.

Hansen did not have price data for three important groups: transport, other consumer commodities and other services. The weights in his index are reported in table 2 (Hansen 1974, pp. 245-248).

Table 2. Consumption expenditure for Denmark 1815-1913.

Consumption groups 1815-1913	Weights of total	
	1815-1870	1870-1913
Food	0.55	0.51
Beverages and tobacco	0.10	0.07
Rent	0.12	0.15
Lighting and heating	0.08	0.09
Clothing	0.13	0.15
Durable consumer goods	0.02	0.03
Total	1.00	1.00

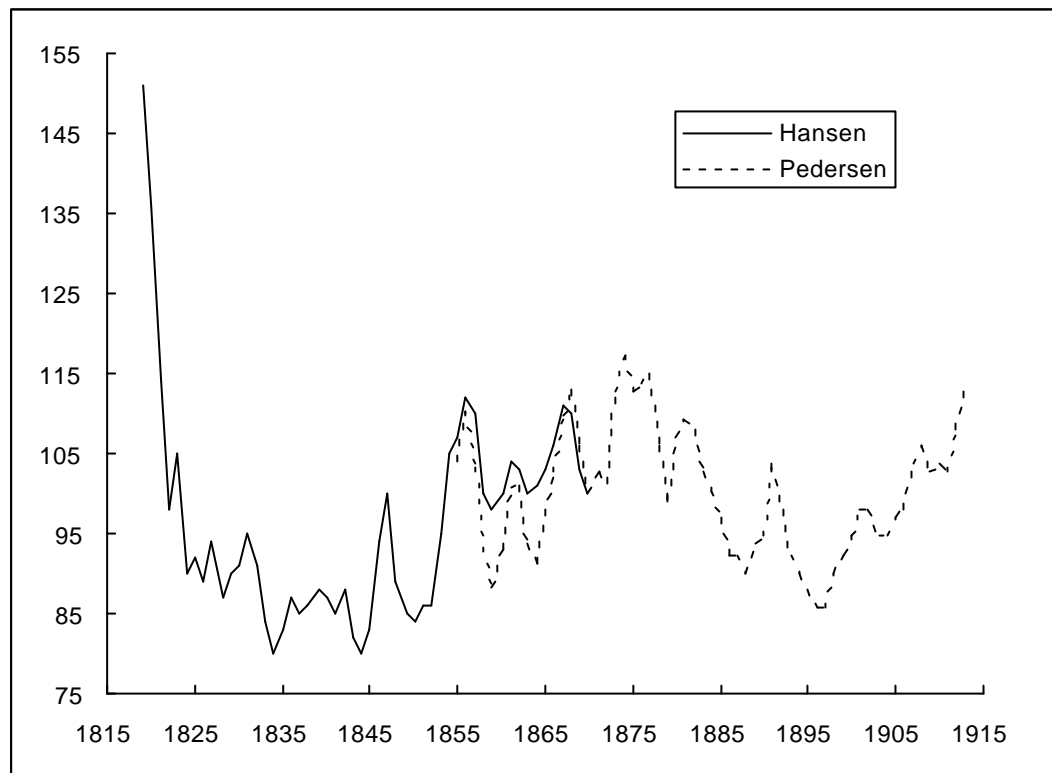
Sources, Hansen (1974), pp. 245-248 and Pedersen (1930), pp. 189-206.

In addition to the Cpi constructed by Svend Aage Hansen, Jørgen Pedersen published a Laspeyre cost of living index for Denmark for 1855-1913 (Pedersen 1930, pp. 313-314). His index is based on 18-33 products in six consumption groups, including rent. He utilised consumer, wholesale and institution prices, mainly from Varde, Odense and Aarhus.

Pedersen calculated weights based on people's actual consumption, i.e. quantity of consumed commodities. Four different consumption budgets were calculated. One for the household of unskilled workers in 1879, a second for skilled workers in 1879, a third for rural workers in 1880, and finally one for rural workers in 1897. Based on these budgets Pedersen in fact presented four different cost of living indices according to household income in the Danish provinces (Pedersen 1930, pp. 189-206).

The two cost of living indices for Denmark by Hansen and Pedersen are shown in chart 4. The main difference between the two indices 1855-1870 are higher fluctuations in Pedersen's index compared to Hansen's. By splicing the two indices in 1870 we arrive at a CPI for Denmark, covering every year 1815-1913.

Chart 4. CPIs for Denmark 1819-1913 (1870=100).



Sources, Hansen (1974), pp. 289-290 and Pedersen (1930), pp. 313-314.

CPI for Sweden 1830-1913

Despite Lennart Jørberg's impressive work on Swedish prices 1732-1914 (Jørberg 1972), no CPI for Sweden stretches beyond 1830. In 1933 Gunnar Myrdal published a well-documented cost of living index for Sweden 1830-1913, which was spliced with Sven Bouvin's cost of living index up to 1931 (Myrdal 1933, pp. 115-191). Myrdal's index can be characterised as a semi-wholesale index, since it is mainly based on consumer and wholesale prices (Ljungberg 1990, pp. 16). It includes 40 commodities with the addition of clothing and housing. Prices on clothing were mainly taken from institutions, most often as contract prices. A number of products are represented, though most of them are not reported regularly. Prices on housing were not found, but estimated indirectly by way of different sources on rent and building materials, land costs, and building costs.

Myrdal reported 12 consumption groups: grain and peas; meal and groats; potatoes, beef, veal and mutton; pig-meat; dairy-produce and eggs, fish, groceries, fuel, lighting, clothing, and finally, housing.

The bulk of the prices are collected from most regions of Sweden, barring a few exceptions. Thus, they are mostly national prices, relating to Sweden as a whole.

The index is calculated by a Laspeyre approach with unchanged approximate weighing of budget quantities. Most prices are retail prices, but some are institutional, wholesale or even contract prices.

Two different budget periods are used to arrive at relevant weights. One budget is based on consumption expenditure estimates of the twenty-year period 1841-1860, a second is estimated for the twenty-year period 1881-1900. One final cost of living index is computed with fixed weights from 1841-1860 as the base. This index covers the period 1830-1880. The second final index is calculated with fixed weights 1881-1900 as the base. This index covers the entire period 1830-1913.

On the basis of budget surveys Myrdal concluded with the following weights for the first budget period: Foodstuffs 65.0 per cent, fuel 2.5, lighting 1.0, clothing 10.0, housing 7.5, and others (not included) 14.0. For the second budget period his weights were: Foodstuffs 55.0 per cent, fuel 3.0, lighting 1.5, clothing 12.0, housing, 10.0 and others (not included) 18.5 (Myrdal 1933, p. 138).

After having subtracted consumer products not included in Myrdal's research we arrive at the following weights for the major consumption groups (table 3):

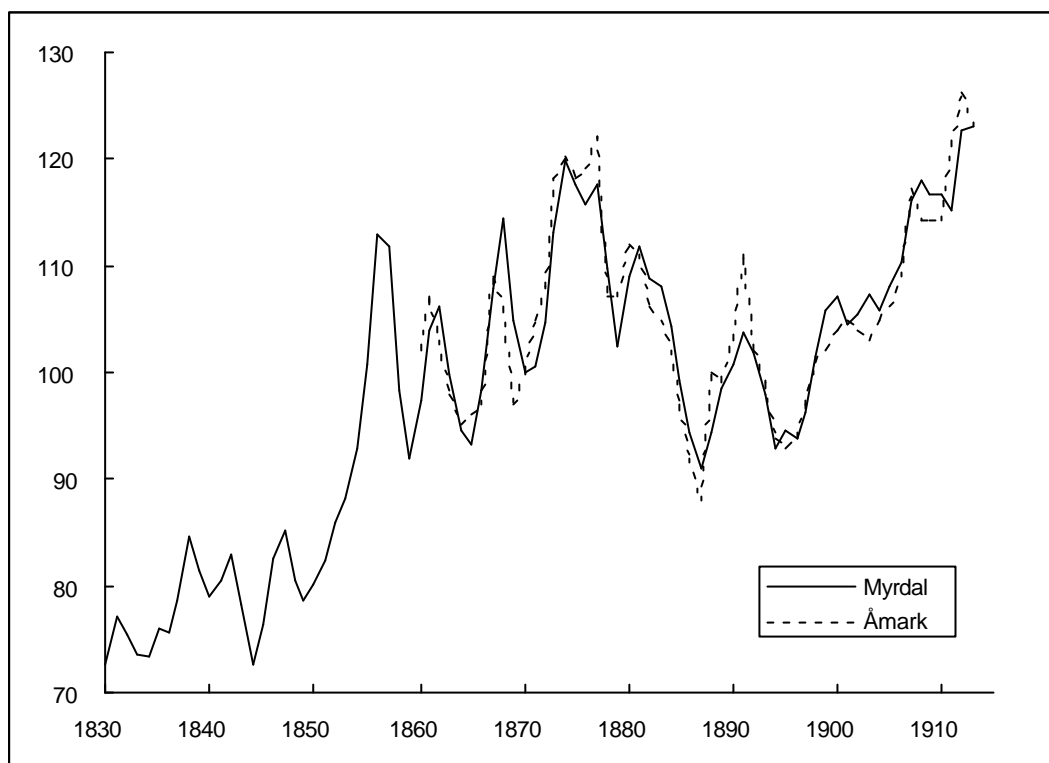
Table 3. Consumption expenditure for Sweden 1830-1913.

Consumption groups 1830-1913	Weight of total	
	1830-1880	1880-1913
A. Foodstuffs	0.75	0.67
B. Fuel	0.03	0.04
C. Lighting	0.01	0.02
D. Clothing	0.12	0.15
E. Housing	0.09	0.12
A-E. Total	1.00	1.00

Source, Myrdal (1933), p. 138.

By splicing the two indices in 1880 we obtain a reliable cost of living index for Sweden 1830-1913. The spliced index by Myrdal is compared to Karl Aarmark's index for foodstuffs for 1860-1913. This was first published in 1921 as part of a general all-purpose wholesale price index for Sweden. The prices used for constructing his index are mainly averages for the whole country. They were wholesale appraisal prices, normally registered during or after harvest. They stayed fixed until next harvest. Thus, we can expect them to stay lower and move ahead of consumer prices. (Aarmark 1921b, p. 166-168).

Chart 5. CPIs for Sweden 1830-1913 (1870=100).



Source, Myrdal (1933), pp. 197-199 and Aamark (1921a), p. 147.

The two indices show remarkably close conformity for most years. Admittedly, up to the 1890s, Aamark's index, as expected, often moves a year ahead of Myrdal's.

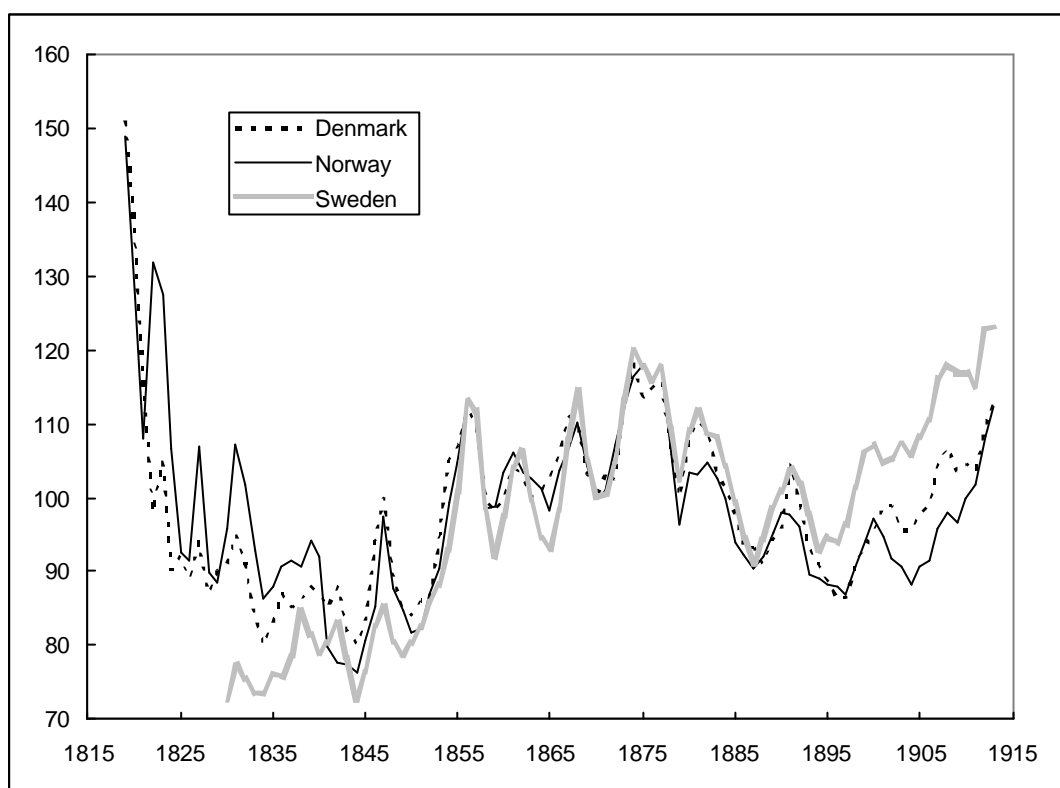
CPIs for the Scandinavian countries

We then reach at CPIs for Denmark from 1815 onwards, Norway from 1819 onwards, and Sweden from 1830 onwards. Prices from all three countries are mainly retail or market prices, though the Danish and Swedish data contain more wholesale and institutional prices than the Norwegian series. The price data to a large extent cover similar products.

According to chart 6, conformity is high, in particular for the period 1845-1900. It seems highest for Denmark and Norway. Despite annual fluctuations, the long-term prices for Denmark and Norway 1830-1910 stayed remarkably stable. In Sweden the general trend was one of moderate inflation. Three long waves are discernible. Denmark and Norway had significant deflation until the middle of the 1840s, and thereafter inflation to the middle of the 1870s. Thereafter, they experienced deflation to the mid-1890s, and inflation thereafter. As for Sweden, we trace the same waves from the middle of the 1840s. However, according to the

Swedish CPI, Sweden, unlike Denmark and Norway, did not have strong deflation in the first half of the 1830s.

Chart 6. CPIs for Denmark, Norway and Sweden (1870=100).

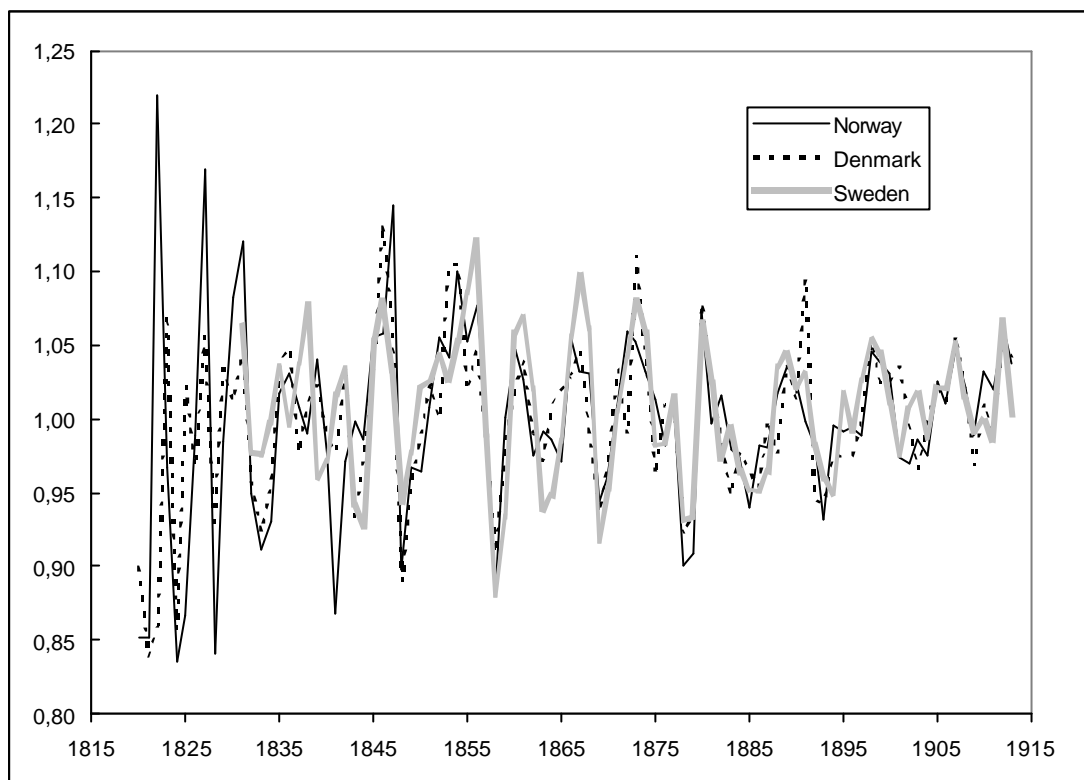


Sources: Denmark: Hansen (1974), pp. 289-290 and Pedersen (1930), p. 313-314. Norway: W 051, W 128, W 137, W 139, W 206, W 210, W 213, W 217, W 219, W 269, W 271, W 272, W 275, W 276, W 383, W 386, W 396, W 397 and Hodne (1978), p. 218. Sweden: Myrdal (1933), pp. 197-199.

Chart 7 reports annual fluctuations in the Scandinavian CPIs. The chart reveals an impressive conformity in annual price fluctuations. This to a large extent may be explained by the fact that farm output depended on climatic conditions, which were very much the same annually in the three countries. Another explanation is the three countries' dependency on imports of colonial goods, foodstuffs and semi-processed and processed manufacturing goods. A third explanation is that the openness of the three Scandinavian countries must have motivated market integration. The fact that prices correlated the most during their era of free trade 1850-1890 supports this view.

The trend towards smaller annual price movements indicates more stable markets, due to increase of trade and less dependency on domestically produced agricultural products and fish.

Chart 7. Annual fluctuations in CPIs for Denmark, Norway and Sweden.



Sources: Denmark: Hansen (1974), pp. 289-290 and Pedersen (1930), p. 313-314. Norway: W 051, W 128, W 137, W 139, W 206, W 210, W 213, W 217, W 219, W 269, W 271, W 272, W 275, W 276, W 383, W 386, W 396, W 397 and Hodne (1978), p. 218. Sweden: Myrdal (1933), pp. 197-199.

Table 4 reports correlation matrices. The first matrix gives correlation coefficients of CPI numbers (v). The second matrix reports annual changes (Δ) in consumer prices. The last matrix reports correlation coefficients of annual directions (d), i.e. to which degree the annual prices were moving in the same direction annually. The table reveals high annual correlations, in particular for the period after 1830. The conformity was highest for Denmark and Norway and lowest for Norway and Sweden. For the years 1830-1842 Danish and Norwegian prices came significantly down due to deflationary monetary policy. Sweden ran a less tight monetary policy during these years, and experienced moderate inflation. For the last decades of the nineteenth century onwards till 1913 the national differences can be explained by the rapid industrialisation in Sweden. This also made economic progress and growth more rapid, and inflation higher. Norway was hit harder than the other Nordic countries during the long depression in the 1870s and 1880s, and later by a domestic depression 1900-1905. Thus, prices fell sharply from the mid-1870s to the mid-1890s, and then again 1900-1905. In Denmark prices also fell significantly during the long depression, but only marginally in the early 1900s.

Table 4. Correlation matrices. CPIs for Denmark, Norway and Sweden.

	D 1819-1913	D 1830-1913	N 1819-1913	N 1830-1913	S 1830-1913
Corr(v)					
D 1819-1913	1.0000	-	0.8504	-	-
D 1830-1913	-	1.0000	-	0.8920	0.8535
N 1819-1913	0.8504	-	1.0000	-	-
N 1830-1913	-	0.8920	-	1.0000	0.6891
S 1830-1913	-	0.8535	-	0.6891	1.0000
Corr(?)					
D 1819-1913	1.0000	-	0.5767	-	-
D 1830-1913	-	1.0000	-	0.7420	0.7068
N 1819-1913	0.5767	-	1.0000	-	-
N 1830-1913	-	0.7420	-	1.0000	0.6772
S 1830-1913	-	0.7068	-	0.6772	1.0000
Corr(d)					
D 1819-1913	1.0000	-	0.7872	-	-
D 1830-1913	-	1.0000	-	0.8072	0.8072
N 1819-1913	0.7872	-	1.0000	-	-
N 1830-1913	-	0.8072	-	1.0000	0.7831
S 1830-1913	-	0.8072	-	0.7831	1.0000

Conclusions

Until now there has not been a consistent price index for Norway prior to the 1870s. Filling the gap, the present article offers a new CPI for Norway 1819-1871. This price index is based on market price data from Norwegian towns and cities compiled from the Wedervang Archive at the Norwegian School of Economics and Business Administration.

We have been able to construct price indices for 15 consumer commodities 1819-1830 and 47 items 1830-1871. The commodities have been classified by consumption groups. For the period 1819-1830 we have established five consumption groups, and for the period 1830-1871 we have established nine. These groups represent about 90 per cent of average household consumption in 1850, and about half of that in 1830.

The index and its corresponding sub-indices have been constructed according to the Laspeyre formula. This means that we have constructed consumption expenditure weights for two base years: 1830, covering the period 1819-1830 and 1850, covering the period 1830-1871. Weights are given for consumption groups and commodities within these groups. The new CPI for Norway 1819-1871 has been

spliced in 1871 with a cost of living index constructed by Jan Ramstad. The spliced index provides an annual CPI for Norway 1819-1913.

The article also gives a presentation of Gunnar Myrdal's cost of living index for Sweden and a spliced index for Denmark, constructed by Svend Aage Hansen 1815-1870 and Jørgen Pedersen 1870-1913. Finally, the CPIs for the three Scandinavian countries are compared. It is concluded that they have high conformity, in particular the Danish and the Norwegian. We can also trace clear short-term and long-term waves in prices. The conformity of prices reflects the dependency of climatic conditions to output in the primary sector along with surprisingly high inter-Scandinavian market integration.

Table 5. CPI for Norway 1819-1871 with sub-indices (1850=100).

	A. Fish	B. Milk	C. Meat	D. Grain	E. Vegetables	F. Beverages	G. Colonial	H. Rent	I. Clothing	J. General
1819	167.0			228.5	156.1	172.4	164.0			182.5
1820	155.2			183.1	134.5	154.2	138.3			155.5
1821	158.6			140.8	105.9	140.8	116.8			132.4
1822	187.1			174.5	132.5	161.1	147.1			161.4
1823	148.6			178.6	146.6	169.3	135.4			156.1
1824	101.3			148.6	132.8	161.8	128.4			130.6
1825	77.5			134.0	121.9	129.8	111.2			113.2
1826	78.3			133.6	116.8	128.0	111.5			112.0
1827	100.7			155.2	135.0	132.5	128.6			130.8
1828	79.7			124.8	116.5	139.4	108.8			110.0
1829	83.7			129.3	102.3	145.7	97.8			108.3
1830	99.0	99.5	100.2	143.8	101.0	149.3	102.6	116.8	120.1	117.2
1831	111.0	107.3	108.2	176.0	113.4	156.5	122.5	130.2	124.8	131.2
1832	111.1	99.4	110.2	149.3	109.2	167.8	117.8	129.6	120.7	124.7
1833	112.5	95.9	103.9	122.1	92.0	159.9	101.3	119.8	115.7	113.7
1834	113.0	88.1	103.8	104.4	79.3	138.9	97.9	112.7	115.1	105.8
1835	109.1	105.8	94.0	109.6	91.2	135.6	95.1	107.7	114.8	107.7
1836	103.0	108.2	125.7	106.3	94.6	141.2	101.2	113.8	113.2	111.0
1837	82.4	105.3	116.0	114.2	98.6	135.8	110.0	120.2	114.9	112.0
1838	106.4	95.8	99.4	126.3	104.2	123.0	107.2	112.8	111.8	110.9
1839	117.9	113.0	122.4	129.5	91.9	121.2	110.6	111.4	112.7	115.4
1840	130.6	108.7	120.0	118.6	91.9	115.2	94.0	107.3	118.8	112.5
1841	119.7	94.8	94.5	97.3	83.6	106.8	86.3	96.9	100.3	97.7
1842	110.4	87.7	81.8	107.3	89.1	93.0	80.0	97.0	91.1	94.9
1843	114.9	100.9	76.5	100.9	86.4	89.7	84.5	88.4	97.8	94.7
1844	109.6	96.8	86.7	93.9	80.4	89.6	79.7	94.2	95.8	93.4
1845	119.4	103.0	100.1	92.4	84.5	98.5	85.0	103.8	95.1	98.5
1846	98.6	103.5	90.2	121.1	100.1	97.5	99.1	102.6	102.0	104.2
1847	91.9	115.9	105.3	162.1	131.1	99.9	112.1	114.4	101.9	119.3
1848	95.4	109.1	115.8	115.9	101.5	98.4	103.3	106.4	104.5	107.2
1849	113.8	107.2	99.1	104.7	94.7	97.5	99.8	102.9	105.2	103.7
1850	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1851	80.9	107.9	98.8	105.7	91.1	99.2	111.2	98.5	102.9	100.7
1852	84.0	108.9	115.6	115.5	105.7	92.9	106.4	107.9	101.3	106.2
1853	73.9	110.1	108.8	131.5	103.3	102.5	109.7	114.1	105.9	110.6
1854	86.3	118.8	130.9	145.4	98.1	108.7	115.0	127.7	117.5	121.7
1855	84.5	120.2	131.9	159.5	124.2	112.9	130.1	125.3	126.6	128.1
1856	99.5	131.5	143.5	174.3	136.5	123.4	140.8	136.9	123.5	138.1
1857	118.0	137.0	152.0	144.7	125.8	136.9	167.9	138.7	122.8	137.0
1858	120.9	120.5	141.6	115.1	113.1	126.1	167.8	115.6	111.2	120.6
1859	115.7	127.1	136.2	114.5	111.5	122.5	169.5	117.0	111.4	120.8
1860	130.2	124.7	119.2	129.6	122.5	128.8	172.4	121.1	120.0	126.5
1861	126.1	121.5	127.9	144.7	136.4	126.0	187.5	116.0	121.7	129.9
1862	131.9	112.8	135.1	142.6	122.3	130.6	182.1	109.9	120.2	126.7
1863	141.9	107.9	129.0	128.8	114.4	131.9	180.7	115.7	127.5	125.6
1864	144.1	114.4	128.0	112.7	109.6	132.3	180.1	111.3	136.8	123.9
1865	140.9	115.3	112.7	114.4	105.2	127.7	180.7	106.0	130.0	120.3
1866	116.4	121.2	129.1	129.8	115.0	124.6	180.7	113.4	138.6	126.8
1867	117.4	115.2	129.7	147.1	130.9	120.9	173.5	121.9	134.6	130.9
1868	109.6	116.2	142.6	168.4	148.5	118.3	187.4	111.5	135.3	135.0
1869	144.8	116.8	143.1	138.1	120.7	121.0	182.4	103.7	129.5	127.5
1870	144.5	119.2	139.9	122.0	114.6	123.0	160.9	101.0	128.0	122.5
1871	152.6	115.3	136.8	126.4	101.7	125.5	169.8	107.1	125.9	123.7

Sources: W 051, W 128, W 137, W 139, W 206, W 210, W 213, W 217, W 219, W 269, W 271, W 272, W 275, W 276, W 383, W 386, W 396, W 397, Hodne (1978), p. 218, Minde (1982), p. 49, Bjerke (1966), p. 76, Ramstad (1982), p. 492, Grytten (2003), p. 78, Schweigaard (1840), pp. 36-78 and Tvethe (1848), pp. 36-78.

Table 6. CPIs for Denmark, Norway and Sweden (1870=100).

Year	Denmark	Norway	Sweden	Year	Denmark	Norway	Sweden
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1815				1865	103.0	98.3	93.1
1816				1866	106.0	103.6	98.3
1817				1867	111.0	106.9	107.8
1818				1868	110.0	110.2	114.5
1819	151.0	149.0		1869	103.0	104.1	105.0
1820	136.0	127.0		1870	100.0	100.0	100.0
1821	114.0	108.1		1871	103.4	101.0	100.5
1822	98.0	131.8		1872	102.3	107.0	104.8
1823	105.0	127.5		1873	113.6	112.7	113.3
1824	90.0	106.6		1874	118.2	116.3	119.9
1825	92.0	92.4		1875	113.6	117.9	117.7
1826	89.0	91.4		1876	114.8	115.8	115.8
1827	94.0	106.8		1877	115.9	117.6	117.6
1828	87.0	89.8		1878	106.8	105.9	109.6
1829	90.0	88.4		1879	100.0	96.2	102.3
1830	91.0	95.7	72.5	1880	108.0	103.4	109.1
1831	95.0	107.2	77.1	1881	110.2	103.1	111.8
1832	91.0	101.8	75.4	1882	109.1	104.8	108.8
1833	84.0	92.9	73.6	1883	103.4	102.6	108.1
1834	80.0	86.4	73.4	1884	101.1	99.9	104.2
1835	83.0	87.9	76.0	1885	97.7	93.9	99.3
1836	87.0	90.7	75.7	1886	93.2	92.2	94.4
1837	85.0	91.5	78.6	1887	93.2	90.4	91.0
1838	86.0	90.6	84.7	1888	90.9	92.0	94.3
1839	88.0	94.2	81.3	1889	94.3	95.3	98.6
1840	87.0	91.9	79.0	1890	95.5	97.9	100.7
1841	85.0	79.8	80.3	1891	104.5	97.8	103.8
1842	88.0	77.5	83.1	1892	98.9	96.0	102.0
1843	82.0	77.3	78.3	1893	93.2	89.4	97.8
1844	80.0	76.3	72.5	1894	90.9	89.0	92.9
1845	83.0	80.5	76.4	1895	88.6	88.3	94.5
1846	94.0	85.1	82.5	1896	86.4	87.8	93.8
1847	100.0	97.4	85.2	1897	86.4	86.8	96.3
1848	89.0	87.5	80.4	1898	90.9	90.7	101.4
1849	85.0	84.7	78.6	1899	93.2	94.3	106.0
1850	84.0	81.7	80.2	1900	95.5	97.2	107.1
1851	86.0	82.3	82.3	1901	98.9	94.6	104.5
1852	86.0	86.8	85.9	1902	98.9	91.8	105.4
1853	95.0	90.3	88.2	1903	95.5	90.5	107.2
1854	105.0	99.4	92.8	1904	95.5	88.3	105.9
1855	107.0	104.6	100.8	1905	97.7	90.5	108.1
1856	112.0	112.7	113.1	1906	98.9	91.5	110.4
1857	110.0	111.8	111.8	1907	104.5	95.7	116.1
1858	100.0	98.5	98.5	1908	106.8	97.8	117.8
1859	98.0	98.7	91.9	1909	103.4	96.7	116.8
1860	100.0	103.3	97.3	1910	104.5	99.8	116.7
1861	104.0	106.1	104.1	1911	103.4	101.9	115.1
1862	103.0	103.4	106.2	1912	109.1	108.2	122.8
1863	100.0	102.5	99.7	1913	113.6	112.3	123.1
1864	101.0	101.2	94.5				

Sources: Denmark: Hansen (1974), pp. 289-290 and Pedersen 1930, p. 313-314. Norway: W 051, W 128, W 137, W 139, W 206, W 210, W 213, W 217, W 219, W 269, W 271, W 272, W 275, W 276, W 383, W 386, W 396, W 397, Hodne (1978), p. 218, Minde (1982), p. 49, Bjerke (1966), p. 76, Ramstad (1982), p. 492, Grytten (2003), p. 78, Schweigaard (1840), pp. 36-78 and Tvethe (1848), pp. 36-78. Sweden: Myrdal (1933), pp. 197-199.

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