

The price of sugar in Sweden
Data, source & methods

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Abstract: This paper presents a new price series for sugar in Sweden, or more exactly Stockholm, in a long-term perspective (1624–1900). Prior to this, no price data has been available from Sweden for this commodity. The paper is devoted to presenting source-related and technical aspects of the price series, as well as the price series as such. Analysis of the development of prices will be conducted in other papers.

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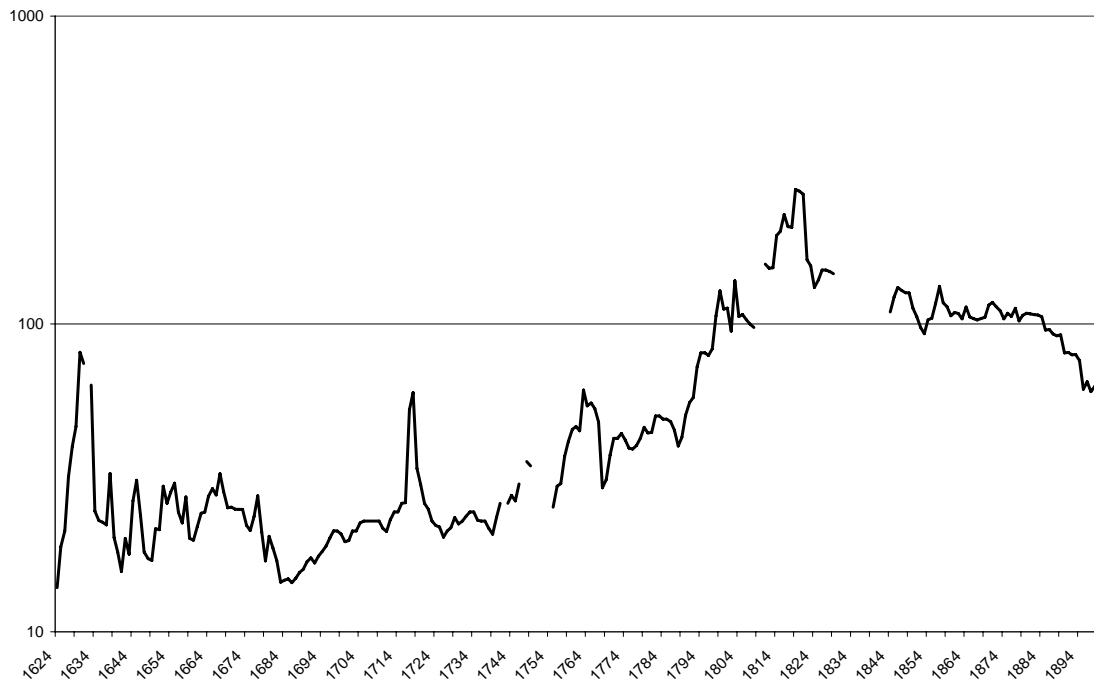
1. Introduction

This paper presents a new price series for sugar in Sweden, or more exactly Stockholm, in a long-term perspective (1624–1900). The paper is devoted to presenting source-related and technical aspects of the price series. Analysis of the development of the price of sugar is going to be conducted later on. The paper presents the source used for constructing the price series (the accounts of the Royal court of Sweden), and discusses some potential problems with the source material. The paper also tries to put the price of sugar in relation to a consumer price index, as well as to the price of three specific commodities (cereals, honey and butter), in order to analyze relative price development. The paper finally tries to create an internationally comparable price series, using both silver prices and exchange rates. All data for the graphs can be found in a specific data-file to accompany this paper.

2. The price of sugar in Sweden

In graph 1 a price series of sugar in nominal prices (formally converted to kronor and ören per kilogram, see below how this is done) is presented for the period 1624–1900.

GRAPH 1. *The nominal price of sugar in Stockholm, 1624-1900 (öre/kg, logarithmic scale)*

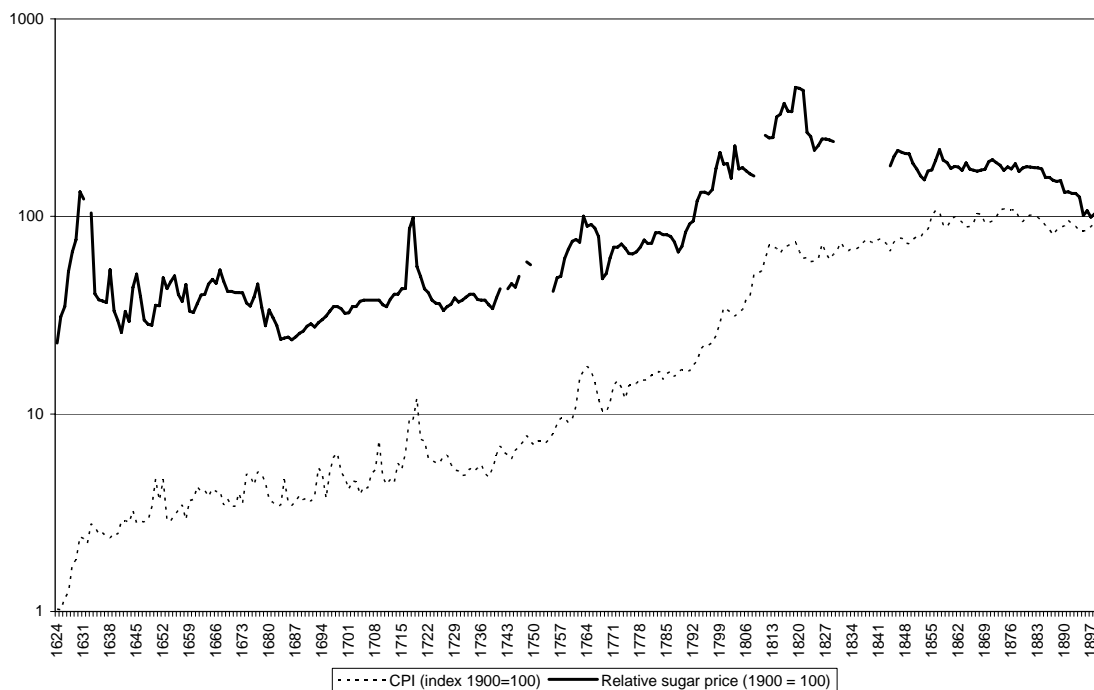


Sources: Accounts from the kitchen of Royal court of Sweden, 1624-1900. Court archive (Slottarkivet), Hovförtäringen, series I A, I B, I D & III D

As is commonly known among Swedish scholars, however, Swedish prices in general did not remain stable during this period of time. On the contrary, there is a general rise in prices for many commodities. Rodney Edvinsson and Johan Söderberg are currently striving to construct aggregated national accounts for Sweden during the period 1668–2005, which is also going to include a new consumer price index. The figures in graphs 2a & 2b are therefore based on preliminary data, generously provided by Edvinsson. In the graph, the price of sugar (relative 1900 = 100) is put in relation to the consumer price index constructed by Edvinsson & Söderberg.¹

¹ Edvinsson 2007. One might have concerns against a consumer price index constructed over such a long period of time, since a common ‘basket’ of consumer goods might change quite much over the period, and instead prefer to put the price of the commodity in question (i.e. sugar in this case) in relation to another commodity (for example cereals).

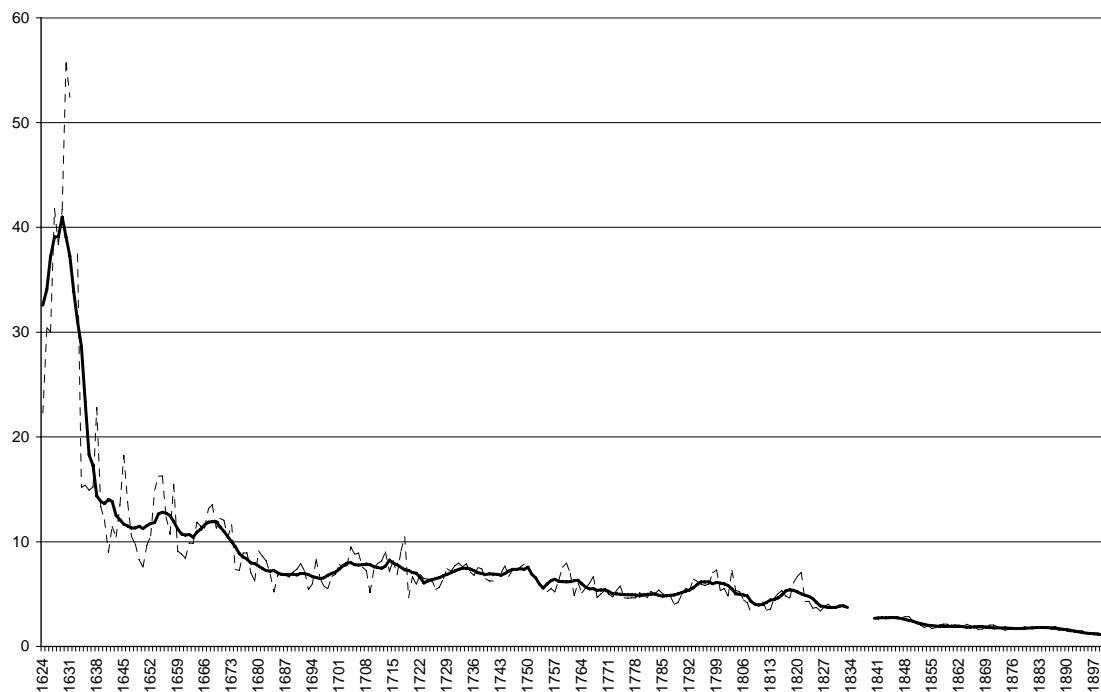
GRAPH 2A. *The relative price of sugar and the general price level, 1624-1900 (1900=100)*



Sources: price of sugar, see graph 1, consumer price index preliminary data from Rodney Edvinsson

In graph 2b the price of sugar is divided by the consumer price index, so as to give us a relative price of sugar for the period. In the graph, a 9-year moving average relative price of sugar is also included, to make it somewhat easier to discern long-term trends.

GRAPH 2B. *The price of sugar in relation to consumer price index, 1624-1900 (sugar price relative 1900=100, CPI 1900=100, individual years and 9-year moving average price)*

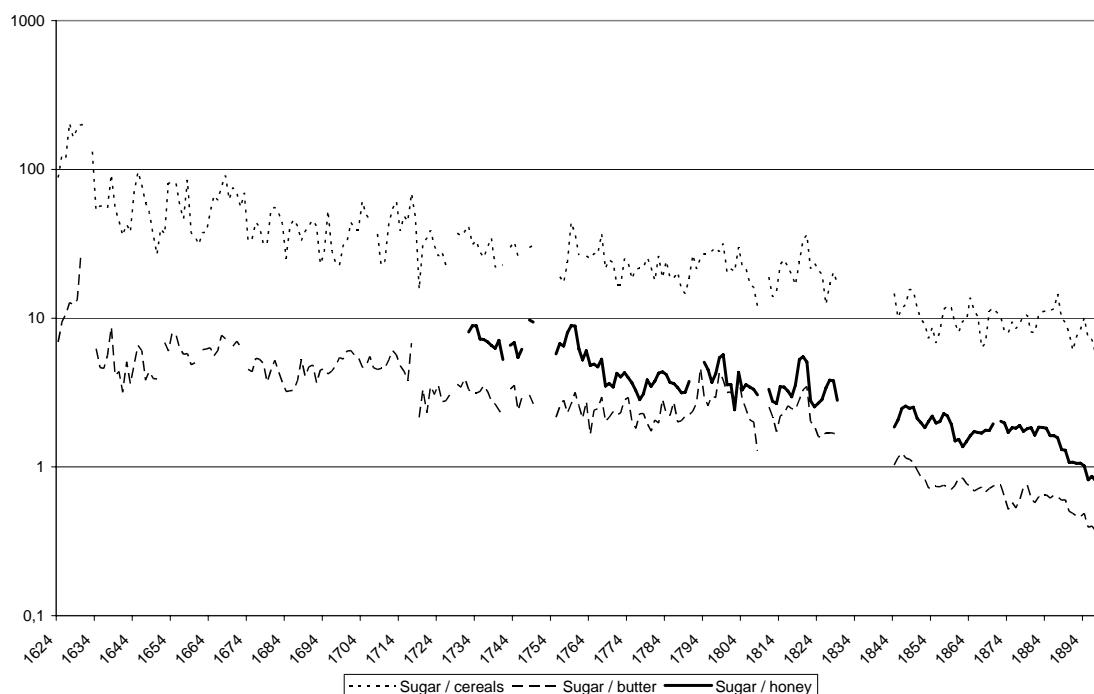


Sources: price of sugar, see graph 1, consumer price index preliminary data from Rodney Edvinsson

The price series has also been put in relation to the price of three other commodities – cereals, honey and butter. Since the price series for sugar is based on prices in Stockholm, it is put in relation to the prices only in Stockholm as well, for these other commodities (an exception is honey, where prices are not available from Stockholm, so the price from Halland is used instead). The prices have been assembled from the prices reported in Jansson & Söderberg (1991) on the one hand for the period before 1732, and Jörberg (1972) on the other hand for the period 1732–1900.² Graph 3 shows the results of this comparison.

². In the case of Jörberg's data, the price of cereals used here is constructed as an average of the prices Jörberg reports for rye and barley, to be able to compare it with the figures in Jansson & Söderberg, which apparently is an average of these two cereals.

GRAPH 3. *Price differential between sugar and other commodities in Stockholm, 1624-1900*
(logarithmic scale)



Sources: for sugar, see graph 1, other prices from Jörberg 1972 and Jansson & Söderberg 1991

2. Description of the source

The Swedish sugar price series used in this paper is constructed using the accounts from the kitchen of the Swedish Royal Court in Stockholm. The same source has been used at least by two other authors, Jansson & Söderberg, in their price history of Stockholm.³

The accounts have been kept since the 16th century, and the records are mostly intact for every single year since the first half of the 17th century (a handful of years are missing during the 18th century, and there are no remaining accounts for the years 1830–1843). The writing is mostly very clean, leaving little possibility for misinterpretation of the data. Most of the volumes of the accounts are undamaged by the ravages of time. A few of the volumes, especially volumes dating from the middle of the 18th century, have sustained some damage (e.g. mould), in some cases destroying parts of the accounts. In general, however, this is a very minor problem. The early years, the kitchen accounts only record volumes of goods consumed, but not prices. The

³ Jansson & Söderberg 1991

first accounts that also record prices of the commodities consumed (including sugar) date from 1624, as far as this author has been able to find out.

The accounts record actual purchases of sugar, even of quite small amounts (the smallest found was $\frac{1}{4}$ of a pound), taking note of both volume and price of the commodity. In almost all cases, the accounts also summarize the amount of money spent on each purchase. We thereby get a chance to double-check the figures in each case, to see if they add up. Only in very rare instances (in approximately 60 cases, i.e. half a per cent of all entries) do the price and the total cost mismatch, and in virtually all of those cases the mismatch is very small. The accounts therefore seem to be kept very carefully. In the cases where there is a mismatch in the entries, I have decided to use the amount of money spent, rather than the stated price.

In the archive, the accounts are divided into a couple of different sub-series, covering the expenses of different tables of the Royal court different years. The series used here are I A (complemented by I B for years lacking in I A) for the whole period prior to 1819, III D for the period 1819–1829 (no series covering the years 1830–1843), the series I B yet again for the years 1844–1859, and finally I D for the period 1860–1900.

Since the period of the price series is quite long, the structure of the accounts quite naturally changes somewhat over the years. Roughly, the accounts can be divided into three periods:

- the period until 1681, when the accounts are summarized weekly
- 1682 to 1818, when the accounts are summarized monthly
- 1819 and afterwards, when no weekly or monthly summaries exist.

Every year, the accounts include a number of entries of purchases of sugar – ranging from only a handful some years, to several hundred entries other years. The entries have been recorded in a database month-wise, based on what is stated in the accounts. Many years, the entries add up to what seems like the total annual consumption of sugar of the royal court (though some months might be missing any given year). For the period from 1819 to 1900, however, no weekly or monthly summaries exist, as was stated before. In order to avoid recording every single purchase of sugar in a given year, a sample of the purchases was taken during this period. The sample included any consumption of sugar during the 1st and the 15th of every month of the year (or the closest following date, if no sugar was bought that day or the day was missing in the accounts). There does not seem

to be any reason to suppose that the prices of these specific dates would be significantly different from the prices on any other date of the month.

In total the database includes 18072 entries of purchases during a period of 276 years, thus an average of approximately 65 individual entries of sugar per year, or roughly 5 per month on average, giving us a rather solid amount of price data.

3. Probable time lag in source

The records are not entirely clear as to exactly *when* in time these purchases are made. For sure, the accounts record dates along with the prices, but it is not clear whether these dates refer to when the sugar was purchased from a supplier, or whether they refer to when the sugar is consumed in court (thus a system of accounting with internal charges within the Royal court). An initial impression might be that the records do show actual purchases made at the time recorded in the accounts. The prices normally vary slightly over a single year, as would be expected if this was so. For some years, however, the prices are remarkably stable – sometimes even for the duration of an entire year. One interpretation of this might be that there is a long-term contract between the court and the supplier. I have found such an example in the Danish court accounts, but none in Sweden.

However, another, and more likely, interpretation is that the records show the consumption of the court, but not when the sugar was actually purchased from a producer or retailer. This conclusion is supported by the fact that the accounts, for a handful of years during the late 18th century, include both the bills from suppliers and the consumption within the court. From the suppliers' bills for these years, it is evident that a large amount of sugar was being bought from the external suppliers a few times a year, and apparently stored in the royal pantry until consumed. At the time of consumption, this is recorded in the accounts at the price paid when the sugar was purchased, which might have been several weeks or even months ago. This interpretation would also explain the fact that the prices for some years are totally or virtually stable for long periods of time – the sugar was then perhaps purchased from an external supplier at one time only.

It is not known whether these handfuls of years, where we have this double set of accounts, are divergent compared to the whole period for which we have remaining

accounts. It does however seem probable that the second interpretation holds true at least for quite a large number of years. This has some consequences for the price series. We ought then to expect a certain time lag between an expected real price change, and when the same price change shows up in the accounts of the Royal kitchen. Let us take a hypothetical example. Say that sugar is bought in January of a certain year, at a price of 20 öre per pound. The volume purchased is large enough to last until May the same year so no more sugar is actually bought from suppliers for a couple of months. If the suppliers' price falls in February to 18 öre per pound, then this decrease in price is not recorded in the accounts of the Royal kitchen until the next actual purchase, perhaps in April. In the meantime, the accounts show the internal pricing of the royal pantry, i.e. 20 öre per pound. The length of such a time lag would naturally depend on how long the sugar is stored in the royal pantry. From the few years of "double accounting" (i.e. both supply and consumption), it seems as if a larger supply of sugar could last a couple of months at most. The time lag would thus not necessarily have a large impact upon an annual price index, but would make it highly problematic to try to analyze price variations within a single year.

The conclusion drawn is thus that the accounts can be used for an analysis of yearly prices, keeping in mind that there might be something of a time lag even at this scale (though this problem is probably negligible). It would however be quite problematic to use the price series to try to discern price changes within any single year.

4. Different sorts of sugar

Sugar start to appear regularly in the accounts of the Swedish court already during the 16th century. The accounts often, but not always, specify of what sort the sugar was. The most common sorts were canary sugar (*canarie*), loaf sugar (*toppsocker*), fine sugar (*fint socker*), refined sugar (*reffinad* or *raffinad*) and melis (*melis*). More unusual variants are for example powdered sugar (*pudersocker*, later in time called *strösocker*), coarse sugar (*grovt socker*), candy sugar (*kandisocker*) or cake sugar (*kaksocker*). Sugar, without any specification (henceforth called plain sugar), is however the most common in the accounts.

No single variety can be found all throughout the long period of time in this study. The most common variety found in the source is the plain, unspecified variety. Still, as

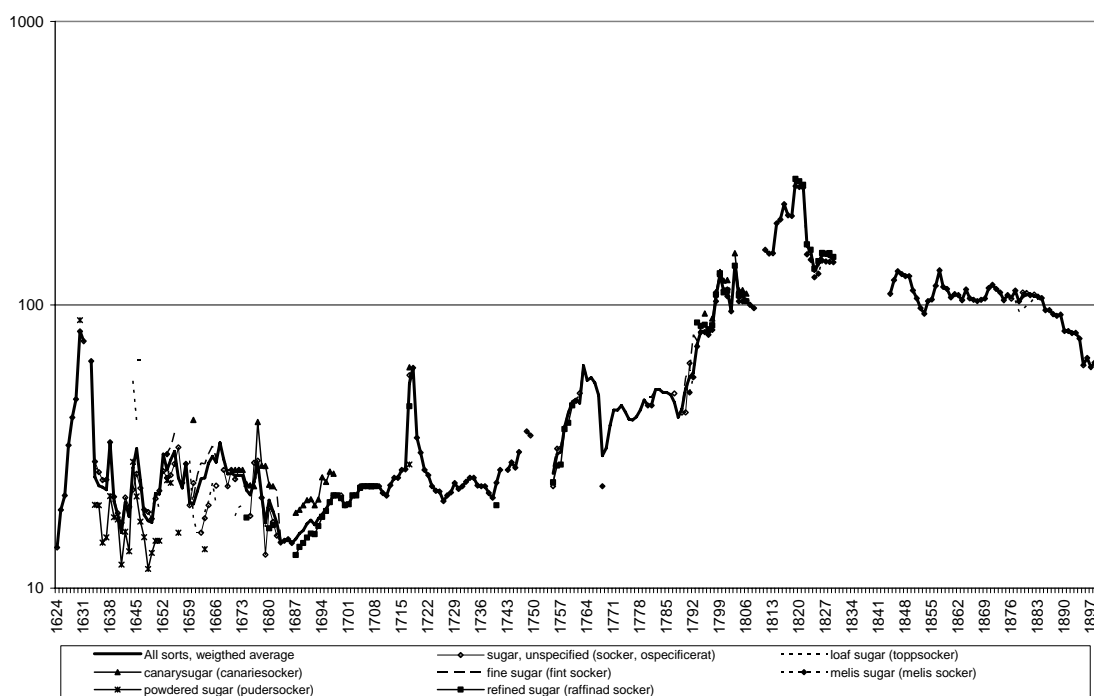
even this variety is not to be found for the whole period of time, it seems necessary to construct a price series using at least a couple of the sorts of sugar named in the source. Fortunately, many of them do not seem to have been different in reality, but might actually have been different names for the same sort of sugar (for example does plain, refined and fine sugar seem to be interchangeable terms at most times).

The price series constructed here includes *all* the common sorts of sugar. In reality, only six varieties have any significant effect at all upon the price – plain, refined, loaf, fine, melis and canary sugar – the other varieties are so marginal that their effects are negligible in practice. All the common sorts of sugar are included in the index in order to get it as complete as possible. An alternative would have been to exclude both for example “melis” and “canary” sugar as well, computing the index only with all the more average-priced forms of sugar. This would lead to a somewhat more fragmented price series, but would have had very little effect upon the other years. The nominal prices for the individual sorts of sugar are also included in the accompanying data-file.

The prices series is a weighed average price, and the weight of each entry is determined by the volume of the purchase. In practice, this is calculated by summing up the volumes purchased, and the amount of money spent on the purchases, annually – then dividing the latter by the former to get an average price for each year.

The chosen method could however theoretically lead to a problem. If the Swedish court's kitchen for some reason start buying sugar of a higher (or lower) quality than before, that alone would have an impact upon the weighted average price, even if the prices of each sort remain the same. In reality, this does not seem to have been a problem. An overwhelming majority of the entries concern sugar of what I would call average grade, e.g. refined or plain sugar, which makes the prices of these varieties the most important for the weighted average. Only for the odd year during the whole period does some of the non-average qualities account for a significant part of the purchases. The difference in price between the different varieties of sugar is furthermore very small, as can be seen in graph 4.

GRAPH 4. *Price of the most common varieties of sugar in the Swedish Royal accounts, with a weighted average, 1624-1900 (öre/kg, logarithmic scale)*



Sources: see graph 1

As can be seen in the graph, it is most often hard even to discern the different varieties from each other, except during some of the early decades of the 17th century, an indication of how small the price difference between the different sorts really was. The weighted average price follows the price of average quality sugar almost perfectly. The weighted average does therefore seem to be a very good measure of the price of sugar of average quality, such as refined sugar.

The prices are also very highly correlated with each other, as can be seen in tables 1–3 in the appendix. Most importantly, the constructed price series (called ‘allsorts’ in the tables) does have a very high correlation with the prices for all the common varieties – fine sugar, refined sugar and plain sugar (between 98 and 100 per cent correlation, at all times statistically significant at 1 per cent confidence level). During later periods (tables 2–3) ‘allsorts’ also has a very high correlation with the prices of finer varieties, such as canary sugar, as well.

The difference in prices between different varieties of sugar is the biggest during the 17th century. At this time, both fine sugar and canary sugar demand a somewhat higher

price than for example loaf sugar, refined sugar or plain sugar. In appendix table 4, therefore, only prices from the years 1624–1699 are included. As can be seen in the table, the price series (‘allsorts’) is still correlated at statistically significant levels with the price of all the common varieties of sugar, but not as highly correlated as was seen for the later periods.

Looking more closely at table 4, in comparison with tables 1–3, does suggest that a quality improvement is taking place over time, having an effect upon the standard for what is considered plain sugar. During the 17th century, what I call plain sugar (i.e. what in the source material is sugar of an unspecified sort) is highly correlated with less refined varieties of sugar, such as coarse sugar or loaf sugar, but less correlated with fine sugar and hardly correlated at all with canary sugar. During later centuries, however, the price of plain sugar is highly correlated with the price of these finer varieties of sugar as well. I interpret this as evidence of a process of quality improvement, whereby the price of what is considered sugar of “normal” or average quality (and thus not labelled more specifically in the accounts) over time converges with the price of sugar of better quality.

Since the quality of plain sugar is not totally homogenous over time, one alternative would then be to exclude plain, unspecified sugar from the price series. This would eventually lead to a very fragmented series, with far too many gaps to be of much use. This conclusion does then also strengthen the case for including the finer varieties in the constructed price series. Otherwise, any price series including plain sugar as well would conceal that there had been improvements in quality during the period in question.

5. Calculating a long-term price series

Two well-known problems of Swedish price history are the quite large number of different currencies in circulation, both at one and the same time, and the changes in currency over time. In order to take these factors into account, I have converted the currencies stated in the original source into kronor/ören following the lead of Jörberg.⁴ In summary, this means the following:

⁴ Jörberg 1972, vol 1, chapter IV. In his preliminary data, Edvinsson has also added some adjustments for the extraordinary years of 1716–1719, when the Swedish currency experienced many changes.

Until 1776, price of sugar in the accounts of the Royal court are continuously stated in silver daler and silver öre (1 silver daler = 32 silver öre). From 1777, prices are instead recorded in riksdalers and shillings (1 rdr = 48 shillings). According to Jörberg, 1 rdr specie equalled 6 old silver daler. In practice, therefore, all prices need to be converted first into dalers or riksdalers and pre-1776 prices have to be divided by 6 in order to relate them to those after 1776 – in this way obtaining a highly formal relationship, as Jörberg puts it.

It is however not clear whether the riksdaler recorded in the accounts refer to riksdaler specie or riksdaler riksgälds (exchequer notes), introduced in 1789. Since the latter soon became the common currency for normal trade, it is assumed that that was the currency used. From its introduction, there was a steady depreciation in the value of the riksdaler riksgälds. This was given a fixed value in 1803, when the riksdaler was devalued, so that 1 rdr banco was equal to 1.5 rdr rgs. This devaluation is taken into account when computing the price series.

Officially from 1855 (but in the accounts of the Royal court in practice only since 1858) the name of riksdaler banco is changed into riksdaler riksmünt (1 rdr rmt = 100 öre). Rdr rmt is finally renamed krona in 1873.

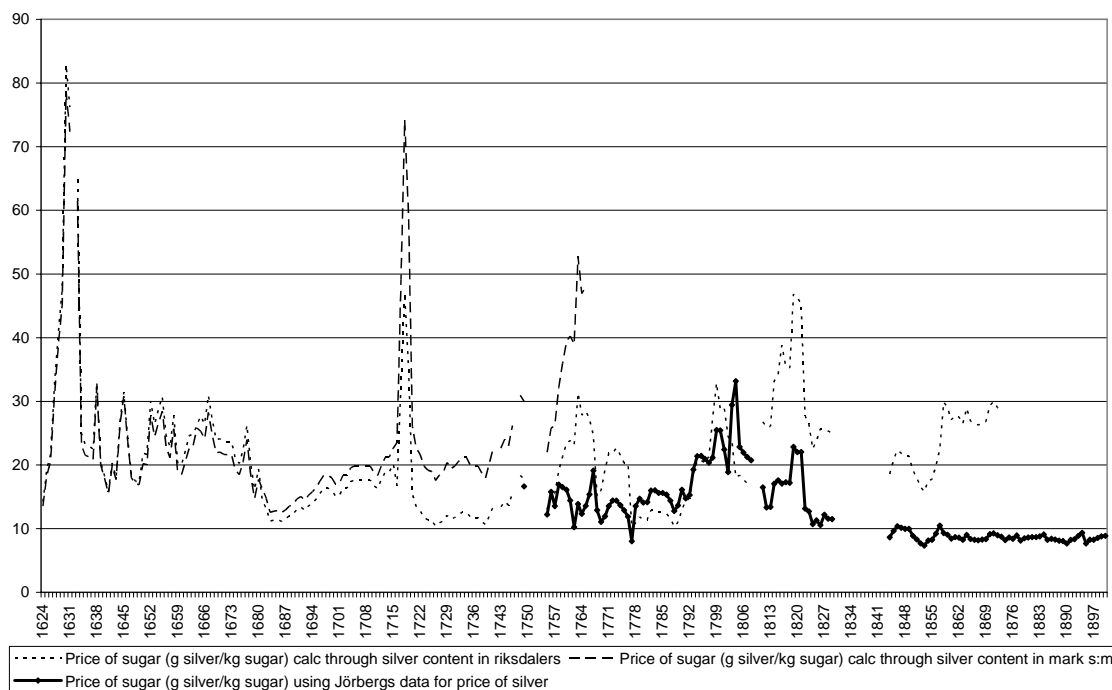
6. Calculating an internationally comparable price of sugar

There are two possible ways of making the Swedish prices internationally comparable – either by converting them into silver prices, or converting the Swedish prices using exchange rates into some other currency (e.g. pound sterling). Calculating the silver price in Sweden is quite complicated. There are two possible ways to go about it: either by calculating the silver price through the official silver content in the currency in question, or by calculating the silver price through the price of silver on the Swedish market. The latter is, so far, only possible from 1749, using data in Jörberg's price history. The first method will henceforth be denoted silver-price_{coins}, the second method henceforth silver-price_{Jörberg}, so as not to confuse the two. The former is theoretically possible for a much longer period of time, since the official silver content in Swedish coins is known since the 15th century.

The two methods of calculating the silver-price of sugar do however yield quite different results, as can be seen in graph 5. There are two different problems in the calculations. The first is that the metallic content in and the official exchange rates

between different Swedish currencies (riksdalers, skilling, mark, dalers, ören) were not very closely correlated. The official exchange rates between them changed somewhat over time, even though the official metallic content of silver did not change as much. This is of major importance since the currency used for the purchases in the source, the silver daler, in reality was a coin made of copper, despite its name.⁵ We therefore have to convert those prices into either silver marks or riksdalers, both of whom are coins made of silver, to be able to find out the silver-price_{coins} of sugar. Converting them using the official rates of exchange yields quite different results, however, as can be seen in graph 5 – the trends are quite the same, but the silver-price_{coins} is much higher from the 18th century onwards if we calculate it using the silver content in silver marks instead of using the silver content in riksdalers.

GRAPH 5. *Price of sugar (g silver/kg sugar) in Sweden, calculated in different ways*



Sources: nominal price of silver, see graph 1. Silver content in coins from Wallroth 1918. Price data for silver from Jörberg 1973

A second problem is that the commodity price of silver as such changes, even though neither the official value of, nor silver content in, coins changes. The silver-price_{Jörberg} of

⁵ See Wallroth 1918

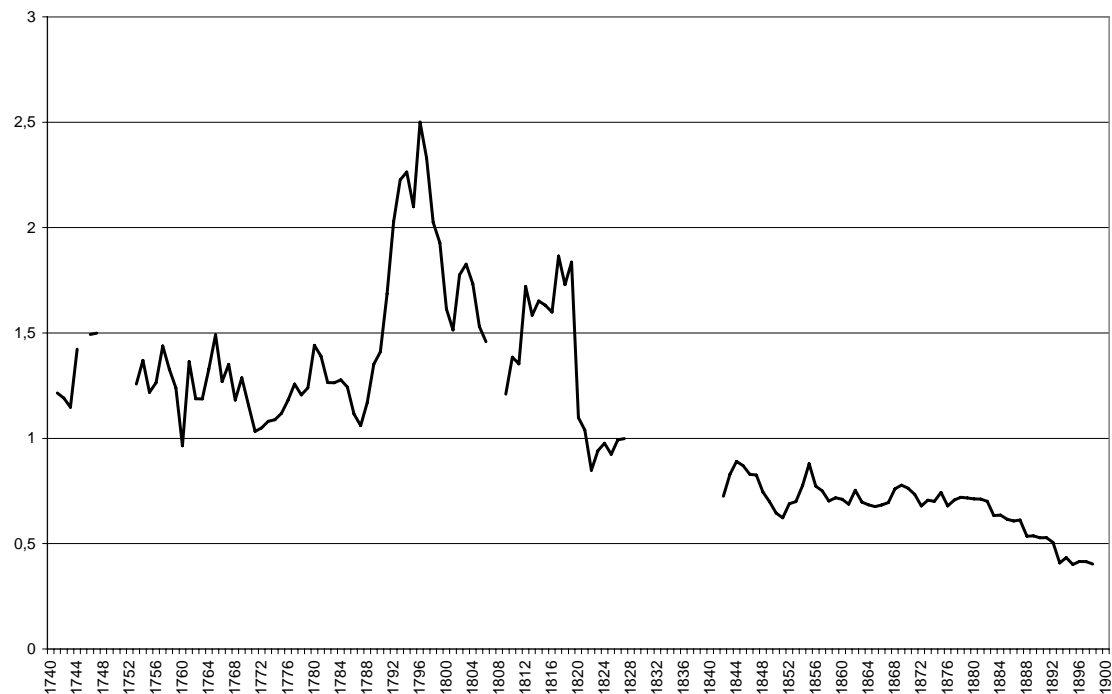
sugar does therefore differ significantly from the silver-price_{coins}, as can be seen in the graph 5. Silver-price_{Jörberg} does, for example, not rise in response to the Seven Years' War between France and Great Britain (1756–63), in contrast to silver-price_{coins}. While the silver-price_{coins} does rise quite a bit during the Continental Blockade, furthermore, the silver-price_{Jörberg} instead falls – and keeps on falling during the first half of the 19th century at the same time as silver-price_{coins} remains at a much higher level.

The choice of method for calculating the silver price of a commodity will therefore have an impact upon what the price trend will look like. This paper uses the silver-price_{Jörberg} as long as it is possible, since this takes into account the fact that silver is also a commodity traded on the market, and not only a monetary measure. Furthermore, the silver-price_{Jörberg} does seem to be better correlated with the price of sugar converted into foreign currencies using recorded exchange rates. Both price series are however included in the data-file accompanying the paper.

An alternative way of comparing the price of sugar in Sweden to the price in other countries is to convert the Swedish currency into foreign ones using recorded exchange rates. This is possible from the 1740s onward, using recorded data on exchange rates published by Sweden's central bank (*Sveriges Riksbank*).⁶ Graphs 6a and 6b show the prices on the three markets, the price on the Swedish market converted into British pounds or Dutch gulden per kilogram, respectively.

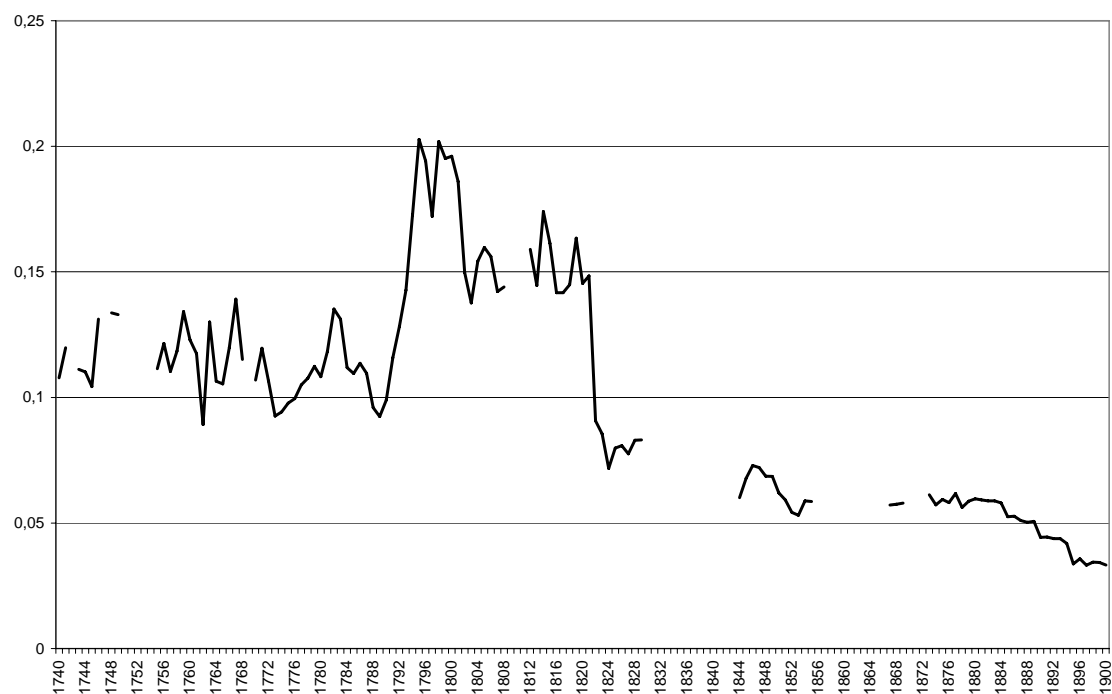
⁶ Sveriges Riksbank 1931, pp 140–165

GRAPH 6A. *The price of sugar in Sweden, 1740-1900 (Dutch guilders/kg)*



Sources: Swedish nominal prices see graph 1, exchange-rates from Sveriges Riksbank 1931

GRAPH 6B. *The price of sugar in Sweden, 1740-1900 (£/kg)*



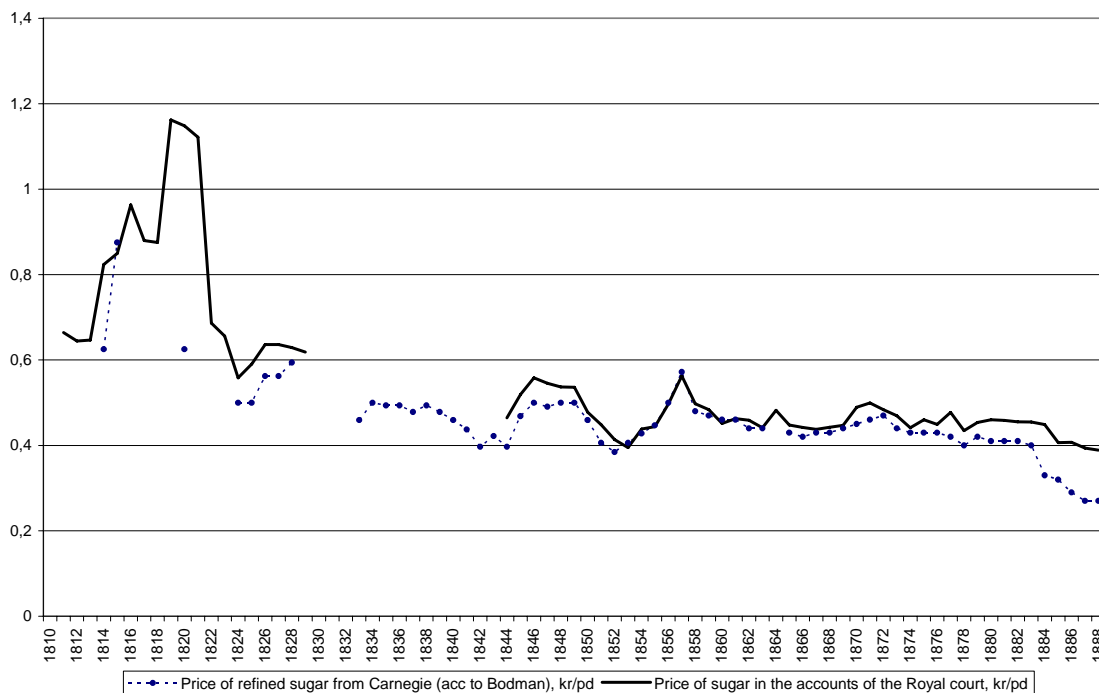
Sources: Swedish nominal prices see graph 1, exchange-rates from Sveriges Riksbank 1931.

7. Generalizability of the price series

It is not immediately possible to assume that the price index constructed from the Swedish court is equivalent to a “national” price for sugar. First of all, prices most probably varied at least somewhat across the country. Imports of refined sorts of sugar received high tariffs or were at times prohibited altogether, concentrating supply to a few refiners. The Swedish refineries were initially concentrated in Stockholm, and even later on remained confined to but a handful of other cities as well. Since the prices recorded in the accounts of the Swedish court’s kitchen are from Stockholm, they may be lower than what a national average price would have been.

Secondly, the royal court must be considered an atypical consumer for many reasons, even compared to other consumers in Stockholm. The royal court probably consumed quite large amounts of sugar, compared to other potential consumers. The court might therefore theoretically have received some kind of wholesale rebate, making the prices lower than a ‘normal’ market price. This is tested in graph 7, where the price series constructed is compared to the price of sugar stated officially by the Carnegie refinery, in their annual report to the Swedish Board of Trade.⁷

GRAPH 7. *Comparison of prices of sugar in the Royal court accounts and from Carnegie refinery (kr/lb)*



⁷ Bodman 1934, table on p 223

Sources: price of sugar in royal accounts see graph 1, price of sugar from Carnegie see Bodman 1934

As can be seen in the graph, the prices do in general seem to be very well correlated (the correlation is also statistically significant at the 1 per cent confidence level), despite the fact that the prices are from different cities (Stockholm and Gothenburg, respectively). There are two possible outliers to this correlation – the first during the last years of the Napoleonic wars (but in this case we only have data from the Carnegie refinery for one single year, so it is not possible to draw that many conclusions), the second during the very last years shown in the graph. In the later case, prices seem to drop faster for the refinery than for the consumers at the Royal court – but as can be seen elsewhere, in graph 1, the prices would start to drop for the latter as well during the years to come.

Another reason why the Court price might differ from a normal market price, is because the royal court held non-market power, and thus theoretically could influence the market price. There is therefore a theoretical possibility that suppliers might have given the court lower prices for example in return for political favours or as a consequence of the king wielding power against individual suppliers. I do however not see any reason to believe that any such influence changed very significantly over time, why this won't have a significant effect on the price trend over a range of years. So long as it is the price trend over time that we are mainly interested in (rather than the absolute price any given year), these factors will not therefore be of a major problem.

If the influence of political power did change, however, it seems reasonable to assume that it did decrease over time, in long-term perspective (since the potential for its influence was, for example, more common with chartered monopolies during the 17th century than later on), so that a market price of sugar probably was even higher than the price paid by the royal court during the early part of the period. If so, the price series would understate any trend towards decreasing prices of sugar.

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TABLE 1 *Correlations in price between different sorts of sugar, period 1(-1776)*

| | | allsorts | loaf | processed | canary | fine | coarse | cake | melis | powdered | refined | unspec |
|-----------|-----------------|----------|------------|-----------|------------|----------|----------|------------|-------|----------|------------|----------|
| Allsorts | Pearson Corr. | 1 | ,510(*) | .(a) | ,898(**) | ,990(**) | ,994(**) | ,946 | ,903 | ,808(*) | ,980(**) | ,978(**) |
| | Sig. (2-tailed) | | ,013 | . | ,000 | ,000 | ,000 | ,054 | ,282 | ,015 | ,000 | ,000 |
| | N | 120 | 23 | 1 | 25 | 49 | 8 | 4 | 3 | 8 | 33 | 78 |
| Loaf | Pearson Corr. | ,510(*) | 1 | .(a) | ,280 | ,784(**) | .(a) | .(a) | .(a) | ,242 | -1,000(**) | ,510(*) |
| | Sig. (2-tailed) | | ,013 | . | ,433 | ,002 | . | . | . | ,601 | . | ,026 |
| | N | 23 | 23 | 1 | 10 | 13 | 0 | 1 | 1 | 7 | 2 | 19 |
| Processed | Pearson Corr. | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) |
| | Sig. (2-tailed) | | . | . | . | . | . | . | . | . | . | . |
| | N | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| Canary | Pearson Corr. | ,898(**) | ,280 | .(a) | 1 | -,045 | .(a) | -1,000(**) | .(a) | .(a) | ,979(**) | ,891(**) |
| | Sig. (2-tailed) | | ,000 | . | ,924 | . | . | . | . | . | ,000 | ,000 |
| | N | 25 | 10 | 0 | 25 | 7 | 0 | 2 | 0 | 1 | 16 | 12 |
| fine | Pearson Corr. | ,990(**) | ,784(**) | .(a) | -,045 | 1 | ,988(**) | .(a) | ,964 | ,915 | ,988(**) | ,846(**) |
| | Sig. (2-tailed) | | ,000 | . | ,924 | . | ,000 | ,000 | ,170 | ,265 | ,000 | ,000 |
| | N | 49 | 13 | 1 | 7 | 49 | 8 | 3 | 3 | 3 | 11 | 24 |
| coarse | Pearson Corr. | ,994(**) | .(a) | .(a) | .(a) | ,988(**) | 1 | .(a) | .(a) | .(a) | ,998(*) | ,989(**) |
| | Sig. (2-tailed) | | ,000 | . | . | ,000 | . | . | . | . | ,041 | ,001 |
| | N | 8 | 0 | 0 | 0 | 8 | 8 | 0 | 0 | 0 | 3 | 5 |
| cake | Pearson Corr. | ,946 | .(a) | .(a) | -1,000(**) | .(a) | .(a) | 1 | .(a) | .(a) | .(a) | ,918 |
| | Sig. (2-tailed) | | ,054 | . | . | ,000 | . | . | . | . | . | ,260 |
| | N | 4 | 1 | 0 | 2 | 3 | 0 | 4 | 0 | 0 | 1 | 3 |
| melis | Pearson Corr. | ,903 | .(a) | .(a) | .(a) | ,964 | .(a) | .(a) | 1 | .(a) | .(a) | .(a) |
| | Sig. (2-tailed) | | ,282 | . | . | ,170 | . | . | . | . | . | . |
| | N | 3 | 1 | 1 | 0 | 3 | 0 | 0 | 3 | 1 | 0 | 1 |
| powdered | Pearson Corr. | ,808(*) | ,242 | .(a) | .(a) | ,915 | .(a) | .(a) | .(a) | 1 | .(a) | ,746(*) |
| | Sig. (2-tailed) | | ,015 | . | . | ,265 | . | . | . | . | . | ,034 |
| | N | 8 | 7 | 1 | 1 | 3 | 0 | 0 | 1 | 8 | 1 | 8 |
| Refined | Pearson Corr. | ,980(**) | -1,000(**) | .(a) | ,979(**) | ,988(**) | ,998(*) | .(a) | .(a) | .(a) | 1 | ,986(**) |
| | Sig. (2-tailed) | | ,000 | . | ,000 | ,000 | ,041 | . | . | . | . | ,000 |
| | N | 33 | 2 | 0 | 16 | 11 | 3 | 1 | 0 | 1 | 33 | 10 |
| Unspec | Pearson Corr. | ,978(**) | ,510(*) | .(a) | ,891(**) | ,846(**) | ,989(**) | ,918 | .(a) | ,746(*) | ,986(**) | 1 |
| | Sig. (2-tailed) | | ,000 | . | ,000 | ,000 | ,001 | ,260 | . | ,034 | ,000 | . |
| | N | 78 | 19 | 1 | 12 | 24 | 5 | 3 | 1 | 8 | 10 | 78 |

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). a Cannot be computed because at least one of the variables is constant.

TABLE 2 *Correlations in price between different sorts of sugar, period 2(1777-1857)*

| | | allsorts | refined | canary | fine | lump | melis | unspec | powdered |
|----------|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------|
| Allsorts | Pearson | 1 | ,996(* *) | ,982(* *) | ,969(* *) | 1,000(**) | ,998(* *) | ,996(* *) | ,453 |
| | Correlation | | ,000 | ,000 | ,000 | . | ,000 | ,000 | ,259 |
| | Sig. (2-tailed) | | | | | | | | |
| | N | 52 | 20 | 13 | 21 | 2 | 22 | 23 | 8 |
| Refined | Pearson | ,996(* *) | 1 | ,987(* *) | -,546 | 1,000(**) | ,993(* *) | ,967(* *) | .(a) |
| | Correlation | ,000 | | ,000 | ,454 | . | ,000 | ,002 | . |
| | Sig. (2-tailed) | | | | | | | | |
| | N | 20 | 23 | 10 | 4 | 2 | 19 | 6 | 2 |
| Canary | Pearson | ,982(* *) | ,987(* *) | 1 | ,926 | 1,000(**) | ,987(* *) | ,984(* *) | -,229 |
| | Correlation | ,000 | ,000 | | ,074 | . | ,000 | ,016 | ,711 |
| | Sig. (2-tailed) | | | | | | | | |
| | N | 13 | 10 | 15 | 4 | 2 | 8 | 4 | 5 |
| Fine | Pearson | ,969(* *) | -,546 | ,926 | 1 | ,954(* *) | ,878(* *) | ,949(* *) | .(a) |
| | Correlation | ,000 | ,454 | ,074 | | ,046 | ,002 | ,014 | . |
| | Sig. (2-tailed) | | | | | | | | |
| | N | 21 | 4 | 4 | 27 | 4 | 9 | 5 | 1 |
| Lump | Pearson | 1,000(**) | 1,000(**) | 1,000(**) | ,954(* *) | 1 | ,974 | .(a) | .(a) |
| | Correlation | . | . | . | ,046 | | ,146 | . | . |
| | Sig. (2-tailed) | | | | | | | | |
| | N | 2 | 2 | 2 | 4 | 7 | 3 | 1 | 1 |
| Melis | Pearson | ,998(* *) | ,993(* *) | ,987(* *) | ,878(* *) | ,974 | 1 | ,993(* *) | .(a) |
| | Correlation | ,000 | ,000 | ,000 | ,002 | ,146 | | ,001 | . |
| | Sig. (2-tailed) | | | | | | | | |
| | N | 22 | 19 | 8 | 9 | 3 | 26 | 5 | 1 |
| Unspec | Pearson | ,996(* *) | ,967(* *) | ,984(* *) | ,949(* *) | .(a) | ,993(* *) | 1 | ,516 |
| | Correlation | ,000 | ,002 | ,016 | ,014 | . | ,001 | | ,373 |
| | Sig. (2-tailed) | | | | | | | | |
| | N | 23 | 6 | 4 | 5 | 1 | 5 | 24 | 5 |
| Powdered | Pearson | ,453 | .(a) | -,229 | .(a) | .(a) | .(a) | ,516 | 1 |
| | Correlation | ,259 | . | ,711 | . | . | . | ,373 | |
| | Sig. (2-tailed) | | | | | | | | |
| | N | 8 | 2 | 5 | 1 | 1 | 1 | 5 | 8 |

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). a Cannot be computed because at least one of the variables is constant.

TABLE 3 *Correlations in price between different sorts of sugar, period 3(1858-)*

| | | allsorts | loaf | flour | farin | powdered | unspec |
|----------|---------------------|----------|------|-------|-------|----------|----------|
| allsorts | Pearson Correlation | 1 | ,484 | ,640 | .(a) | ,960(**) | ,999(**) |
| | Sig. (2-tailed) | | ,224 | ,360 | . | ,000 | ,000 |
| | N | 43 | 8 | 4 | 1 | 19 | 43 |
| loaf | Pearson Correlation | ,484 | 1 | ,472 | .(a) | ,421 | ,236 |
| | Sig. (2-tailed) | ,224 | | ,528 | . | ,347 | ,574 |
| | N | 8 | 8 | 4 | 0 | 7 | 8 |
| flour | Pearson Correlation | ,640 | ,472 | 1 | .(a) | ,030 | ,561 |
| | Sig. (2-tailed) | ,360 | ,528 | | . | ,970 | ,439 |
| | N | 4 | 4 | 4 | 0 | 4 | 4 |
| farin | Pearson Correlation | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) |
| | Sig. (2-tailed) | . | . | . | . | . | . |
| | N | 1 | 0 | 0 | 1 | 0 | 1 |
| powdered | Pearson Correlation | ,960(**) | ,421 | ,030 | .(a) | 1 | ,952(**) |
| | Sig. (2-tailed) | ,000 | ,347 | ,970 | . | | ,000 |
| | N | 19 | 7 | 4 | 0 | 19 | 19 |
| unspec | Pearson Correlation | ,999(**) | ,236 | ,561 | .(a) | ,952(**) | 1 |
| | Sig. (2-tailed) | ,000 | ,574 | ,439 | . | ,000 | |
| | N | 43 | 8 | 4 | 1 | 19 | 43 |

** Correlation is significant at the 0.01 level (2-tailed). a Cannot be computed because at least one of the variables is constant

TABLE 4 *Correlations in price between different sorts of sugar, early data (-1699)*

| | | allsorts | loaf | processed | canary | fine | coarse | cake | melis | powdered | refined | unspec |
|-----------|-----------------|-----------|------------|-----------|------------|-----------|-----------|------------|-------|----------|------------|-----------|
| allsorts | Pearson Corr. | 1 | ,510(*) | .(a) | ,599(**) | ,942(**) | 1,000(**) | ,946 | .(a) | ,870(*) | ,855(**) | ,779(**) |
| | Sig. (2-tailed) | | ,013 | . | ,003 | ,000 | . | ,054 | . | ,011 | ,000 | ,000 |
| loaf | N | 50 | 23 | 1 | 23 | 26 | 2 | 4 | 1 | 7 | 16 | 34 |
| | Pearson Corr. | ,510(*) | 1 | .(a) | ,280 | ,784(**) | .(a) | .(a) | .(a) | ,242 | -1,000(**) | ,510(*) |
| processed | Sig. (2-tailed) | ,013 | . | . | ,433 | ,002 | . | . | . | ,601 | . | ,026 |
| | N | 23 | 23 | 1 | 10 | 13 | 0 | 1 | 1 | 7 | 2 | 19 |
| canary | Pearson Corr. | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) |
| | Sig. (2-tailed) | . | . | . | . | . | . | . | . | . | . | . |
| fine | N | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| | Pearson Corr. | ,599(**) | ,280 | .(a) | 1 | -.045 | .(a) | -1,000(**) | .(a) | .(a) | ,930(**) | ,393 |
| coarse | Sig. (2-tailed) | ,003 | ,433 | . | . | ,924 | . | . | . | . | ,000 | ,231 |
| | N | 23 | 10 | 0 | 23 | 7 | 0 | 2 | 0 | 0 | 14 | 11 |
| cake | Pearson Corr. | ,942(**) | ,784(**) | .(a) | -.045 | 1 | 1,000(**) | .(a) | .(a) | ,915 | ,919(*) | ,722(**) |
| | Sig. (2-tailed) | ,000 | ,002 | . | ,924 | . | . | ,000 | . | ,265 | ,027 | ,000 |
| melis | N | 26 | 13 | 1 | 7 | 26 | 2 | 3 | 1 | 3 | 5 | 20 |
| | Pearson Corr. | 1,000(**) | .(a) | .(a) | .(a) | 1,000(**) | 1 | .(a) | .(a) | .(a) | .(a) | 1,000(**) |
| powdered | Sig. (2-tailed) | . | . | . | . | . | . | . | . | . | . | . |
| | N | 2 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 2 |
| refined | Pearson Corr. | ,946 | .(a) | .(a) | -1,000(**) | .(a) | .(a) | 1 | .(a) | .(a) | .(a) | ,918 |
| | Sig. (2-tailed) | ,054 | . | . | . | ,000 | . | . | . | . | . | ,260 |
| unspec | N | 4 | 1 | 0 | 2 | 3 | 0 | 4 | 0 | 0 | 1 | 3 |
| | Pearson Corr. | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) | .(a) |
| allsorts | Sig. (2-tailed) | . | . | . | . | . | . | . | . | . | . | . |
| | N | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 |
| loaf | Pearson Corr. | ,870(*) | ,242 | .(a) | .(a) | ,915 | .(a) | .(a) | .(a) | 1 | .(a) | ,437 |
| | Sig. (2-tailed) | ,011 | ,601 | . | . | ,265 | . | . | . | . | . | ,327 |
| processed | N | 7 | 7 | 1 | 0 | 3 | 0 | 0 | 1 | 7 | 0 | 7 |
| | Pearson Corr. | ,855(**) | -1,000(**) | .(a) | ,930(**) | ,919(*) | .(a) | .(a) | .(a) | .(a) | 1 | ,872 |
| canary | Sig. (2-tailed) | ,000 | . | . | ,000 | ,027 | . | . | . | . | . | ,128 |
| | N | 16 | 2 | 0 | 14 | 5 | 0 | 1 | 0 | 0 | 16 | 4 |
| fine | Pearson Corr. | ,779(**) | ,510(*) | .(a) | ,393 | ,722(**) | 1,000(**) | ,918 | .(a) | ,437 | ,872 | 1 |
| | Sig. (2-tailed) | ,000 | ,026 | . | ,231 | ,000 | . | ,260 | . | ,327 | ,128 | . |
| coarse | N | 34 | 19 | 1 | 11 | 20 | 2 | 3 | 1 | 7 | 4 | 34 |
| | Pearson Corr. | | | | | | | | | | | |

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). a Cannot be computed because at least one of the variables is constant.

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