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A Tentative Estimate

Krantz, Olle

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PO Box 117
221 00 Lund
+46 46-222 00 00

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Olle Krantz

DEPARTMENT OF ECONOMIC HISTORY, LUND UNIVERSITY

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Postal address: P.O. Box 7083, S-220 07 Lund, Sweden
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Swedish GDP 1300-1560: A Tentative Estimate[1]

Olle Krantz

Abstract

This study presents a reconstruction of historical national accounts for Sweden 1300-1560. The source material for this period is very scanty and, therefore, many estimates and approximations were necessary. For agriculture the so called demand approach was used, implying utilization of price series and assumptions on price, income and cross elasticities. Furthermore, population figures had to be estimated. For the other sectors estimations of various kinds also had to be made. Nevertheless, the series for GDP and GDP per capita give a fairly reasonable picture of the economic performance. Sweden's GDP per capita in relation to some other countries is also discussed. The country seems to have been at about the same level as England. A forward glance indicates that Sweden's economy stagnated in the 18th century and became backward compared to England and Holland. It was first after some decades of the 19th century that a recovery came and a fast economic growth started.

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JEL classification: N1.

Keywords: historical national accounts, GDP, demand approach, deflating.

Olle Krantz: Department of Geography and Economic History, Umeå University, Sweden.

Email: olle.krantz@umu.se

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[1] This study was planned as a continuation of Lennart Schön's and my work on Swedish historical national accounts of which an updated version was published in November 2015. However, regrettably, Schön passed away in the early 2016.

Introduction

In previous studies of historical national accounts for Sweden[2] time series were constructed back to 1560.[3] This is in line with international research where very long-run series have been calculated for a number of countries.[4] Thereby, new insights have been gained on central historical questions, for instance the Great Divergence, i.e. the shift in which Western countries advanced ahead of Eastern countries during the early modern period. Thus, it is appropriate to try to extend the Swedish series backwards to correspond to the international data, hence the present attempt to estimate Swedish GDP further back in time.

This is the first attempt to reconstruct historical national accounts for Sweden for this period and a great problem is that the supply of data, particularly for the early part, is very limited. Data are missing for long periods to the extent that they exist at all; for several items figures are totally lacking. This means, among other things, that many guesstimates and even guesswork have been made. An effect thereof is that short-time fluctuations in the resulting series are extremely uncertain. Secular changes are, however, less unreliable and so is the level of the series, for instance GDP per capita, even if, needless to say, there are margins of error.

In the earlier reconstructions of Swedish historical national accounts[5] seven sectors were discerned: (1) Agriculture with ancillaries; (2) manufacturing industry and handicrafts; (3) building and construction; (4) transport and communication; (5) private services; (6) public services; and (7) housing services. For the early part of the period, i.e. before 1800, due to data shortage, output in some of these sectors was partly estimated with the help of data from other sectors and certain indicators. This is so also for the present period where, for instance, various kinds of services are not specified.

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2 In this context Sweden is defined as the country within the borders of today.
3 Schön and Krantz (2012, 2015).
4 See for instance Fouquet and Broadberry (2015).
5 Schön and Krantz (2012, 2015).

Population

An essential variable in historical national accounts is population. Alas, data for Sweden for the period under review are only available for a few years. Since it is desirable to obtain a series comprising all years, approximations for extended times are required. Unfortunately, this means, among other things, that fluctuations of various length of population are almost impossible to study.

In the revised estimate of Swedish National Accounts from 1560 onwards[6], published in 2015, new population figures were used for the time span before 1749, i.e. when the official Swedish population statistics began. This was an improvement compared to the earlier estimate where Andersson Palm's figures (2000, 2001), the only ones existing at the time, were used. These, however, implied too high population growth. Therefore, a new series for 1620-1749 presented by Edvinsson (2014), was employed in the new GDP estimate. Population figures for the missing years, 1560-1620, were estimated with the help of extrapolation backwards of the ratio between the new and the old figures.

Before 1560 there are two estimates for the whole country, i.e. Sweden excluding the Finnish part,[7] however only for a few years[8]. These are complemented to include the regions later added to Sweden, namely the counties of Skåne, Blekinge, Halland, Bohuslän and Jämtland, to gain comparability to the country of today. For part of the country there is one estimate worth mentioning i.e. Sidén's which comprises of population estimates for Stockholm and a selection of other towns around Lake Mälaren. [9]

In his estimation, Andersson Palm used the number of parishes in the area corresponding to Sweden of today, which was 2385[10] in the early 14th century. He assumed every parish to comprise around 100 households[11] each consisting of 4-5 persons; he calculated with 4.5. The numbers were based on both Swedish and international studies. With these points of departure he estimated the Swedish population just before 1350 to be 1100000. After that year, a number of epidemics ravaged, the worst being the Black Death. To assess the effect on population caused by the epidemics, Palm used data for certain regions and arrived at a decrease of around 70 percent to 1413, when the number was set to 347000. After that,

6 Schön and Krantz (2015), p 4f.
7 Finland and Sweden were united in one realm until 1809.
8 Andersson Palm (2001) and Myrdal (2011).
9 Sidén (2002).
10 Myrdal (2010) p 19.
11 He called it "the 100-rule".

population began to increase, and in 1571 the population was estimated to be 639000, an estimation based on data emanating from the so called Älvsborg's lösen.[12]

Andersson Palm's figures have been questioned by Myrdal. For instance, the assumption that all parishes consisted of 100 households is uncertain. The parishes had different size, further demonstrated by the size of their churches, and it is questionable whether the average size was 100 in a sparsely populated country like Sweden. The sources for the assumption concerning household size are also uncertain. [13] Another weakness is the assumed population decrease of 70 percent to 1413, primarily attributed to the Black Death. This is higher than the decrease estimated in other European countries as indicated by table 1.

Table 1. Population of European countries 1300 and 1400 (thousand)

	1300	*1400*	*Decline % 1300-1400*
Scandinavia	2500	1400	44
England (Wales)	4500	2700	40
Scotland	1000	700	30
Ireland	1400	700	50
Netherlands	800	600	25
Belgium	1400	1200	14
France	16000	12000	25
Italy	12500	8000	36
Spain	5500	4500	19
Portugal	1300	1050	19
Switzerland	800	500	37
Austria (Czech., Hung.)	10000	9000	10
Germany	13000	8000	38
Poland	2000	1500	25
Balkans	6000	5000	17
Russia (European)	15000	11000	27
EUROPE	93700	67850	28
EUROPE (without Russia)	78700	56850	28

Source: Malanima (2012).

Thus, Myrdal's estimate of the population size during some years in the Middle Ages differs from Andersson Palm's. Myrdal maintained the decline of the population to be 40-50

[12] Andersson Palm 2000, p 28. The so called Älvsborg's lösen was a substantial ransom that Sweden had to pay to Denmark after a war in order to regain an important fortress conquered by the Danes. To pay the ransom, a special tax was imposed. The records from this taxation are highly detailed and can be used e.g. for population estimates.

[13] Myrdal (2003), p 245 and (2010), p 29f.

percent[14], which, actually, is closer to the figures in table 1 than Andersson Palm's,[15] even if the decrease in most countries was still lower.[16] The estimate is built on certain indicators, for instance devastation of farms in general in the country and the number of farms in registers from monasteries. Myrdal also gave figures for some years for Sweden within the borders of today, i.e. excluding Finland. They are shown in table 2.

Table 2. Estimates of Sweden's population 1000 – 1720

Year	*Population (1000)*	*Annual growth per cent*
1000	300 – 450	
		0.2 – 0.3
1350	900	
		-1.3 – -1.2
1450	450 – 500	
		0.3
1520	600	
		0.6
1600	1000	
		0.3
1720	1400	

Source: Myrdal (2011), p 77.

According to Schön and Krantz (2015) the population was 856000 and 987000 respectively 1560 and 1600. This implies an annual growth of 0.4 per cent and for 1520-1560 it was 0.9 per cent, i.e. practically the same change 1520-1600 as in Myrdal's data. Thus, the increase of population seems to have been comparatively high in the 16th century, especially the first half. Without further research, it is difficult to determine whether this is realistic or not; it may, however, have to do with a late recovery from earlier hard times. Nevertheless, it is accepted here.

On the basis of these data an annual series could be computed by extrapolation for 1300-1350, and interpolations for 1350-1450, 1450-1520 and 1520-1560. However, this series does not capture fluctuations of various length, especially due to the Black Death. Therefore a complement will be tried here. In his book on the Black Death, Myrdal (2003) constructed a timeline for the Middle Ages, characterizing shorter phases from 1350 onwards.[17] However,

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[14] Myrdal (2003).

[15] Actually the figures for Scandinavia in table 1 emanate from Myrdal's works.

[16] A comparison with Denmark can also be made. Kaergård (2003), p 38, reports from Scharling (1885) that the country had 1000000 inhabitants 1240 and 650000 1360, i.e. a decrease with 35 per cent. However, there was certainly an increase up to the 1350s which means that the decrease due to the Black Death was greater than 35 per cent, at a guess 50-60.

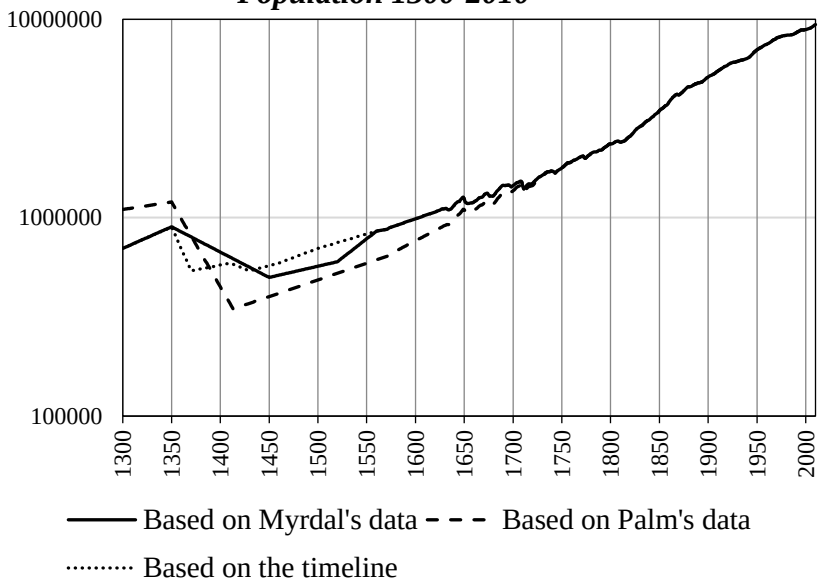
[17] Myrdal (2003), p 248 ff.

practically no quantitative data are given by Myrdal, but on the basis of the given characteristics some conjectures are made here. In the time span 1300-1350 the annual increase is taken to have been 0.5 per cent. A longer period, say from the year 1000 was probably characterized by acceleration so that the 0.2-0.3 per cent shown in table 2 is an average. Thus, it is assumed to be slower in the 11th and 12th centuries than later. The timeline and its characteristics together with the assumed figures are as follows

> **1350-1370**: Sweden was stricken by three severe epidemics and was ravaged as hard as the rest of Europe.
>
> *Assumption*: The population decreased from 900000 to 540000, i.e. with 40 per cent or 2.5 per cent yearly.
>
> **1370-1410**: There were no major epidemics and the society reorganized under disputes and sometimes destructive conflicts on resource distribution of various kinds.
>
> *Assumption*: The population increased from 540000 to 590000 i.e. around 0.2 per cent a year.
>
> **1410-1430**: New epidemics broke out. The population declined and destabilization and desertion of farms increased. The use of the farms became more extensive than before.
>
> *Assumption*: The population decreased from 590000 to 540000 or around 0.4 per cent a year.
>
> **1430-1460**: There were still epidemics but less severe and more local. Reclamation of earlier deserted farms was common and the standard of living increased.
>
> *Assumption*: The population recovered from 540000 to 590000 i.e. an increase of c. 0.3 per cent a year.
>
> **1460-1500**: There were certain minor epidemics, but both the population and the economic activity increased.
>
> *Assumption*: The population grew from 590000 to 700000 i.e. around 0.4 per cent annually.
>
> **1500-1520 and onwards**: During this period, and especially after the peace in the beginning of the 1520s, population grew steadily. Still, the population did not reach the same level in 1520 as during the high Middle Ages.
>
> *Assumption*: The annual increase to 1520 resulted in 750000, i.e. 0.3% per year, and then to 1600 when the population was slightly below 10000000, i.e. an increase of around 0.4 per cent a year.

These assumptions give the population estimates which are shown in figure 1.

Figure 1. Three Estimates of the Swedish Population 1300-2010



Source: See text

Production

Agriculture

As far as known, no time series for agricultural output exist for the period under review, neither for Sweden as a whole, nor for parts of the country. Therefore, an indirect method is employed, the so called demand approach, widely used for estimates of this kind.[18] The model departs from an estimation of the per capita consumption of agricultural products, which then, together with trade figures, is used as an indicator of agricultural output. However, foreign trade figures cannot be taken into account in the present work since no figures are available.

The model is based on assumptions on positive income elasticity, negative price elasticity to agricultural products, and a weak positive cross elasticity to industrial products. Furthermore, the price and wage series are in real terms, i.e. deflated by a consumer price index. As in the estimate for the period after 1560,[19] the elasticities are assumed to be the same as those used by Malanima (2011). Expressed as the rate of variation, the following model is applied where q is consumption per capita of agricultural products:[20]

---

18 See e.g. Fouquet and Broadberry (2015).

19 Krantz and Schön (2012, 2015).

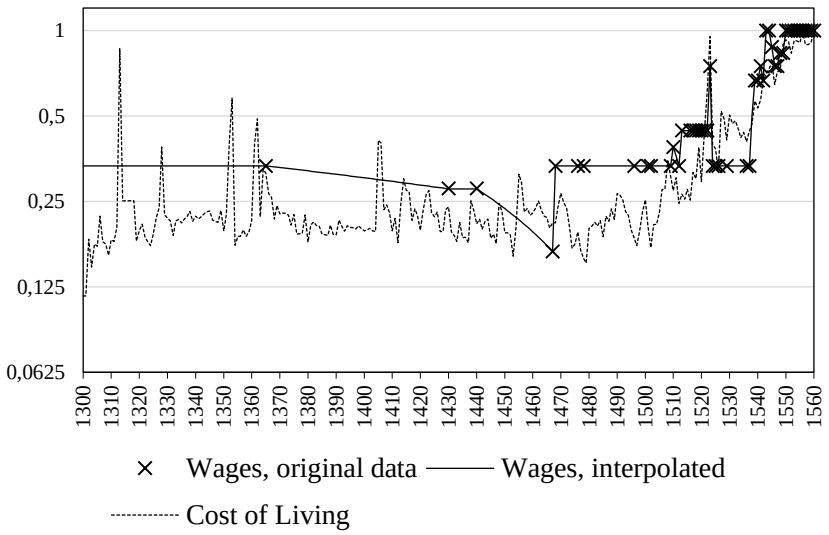
20 In a recently published article Edvinsson (2016) scrutinizes the demand approach in general. Among other things he questions assumptions on elasticities. However, to make the present estimates comparable with those in Schön and Krantz (2012, 2015) the same elasticities were used.

q= 0.4*d(wages)-0.5*d(agricultural prices)+0.1*d(industrial prices)

For the Middle Ages, only scattered information is available on wages and prices.

Wages: The data refer to daily wages of unskilled labourers in Stockholm.[21] It is, of course, not at all certain that these data are representative for the whole country, let alone for agricultural workers, but due to lack of other data they are used. Furthermore, for a large number of years, data are missing, which means that interpolation and extrapolation had to be made. The figures are shown in figure 2 where available data are marked with crosses. In the first 150 years there are only three with wage figures. Then they are more frequent but far from complete. Data indicate only minute variations up to the beginning of the sixteenth century. This is in line with the assertion that day wages in current prices were more or less constant during the Middle Ages.[22] In figure 2, the cost of living index is included in order to illustrate price fluctuations, which were great in contrast to the wages. However, in the sixteenth century a great volatility in the wage series started, albeit not as sharp as in the cost of living series and, moreover, the rise of the cost of living index was steeper than that of the

Figure 2. Daily wages and Cost of Living 1300-1560, 1560=1



Source: See text

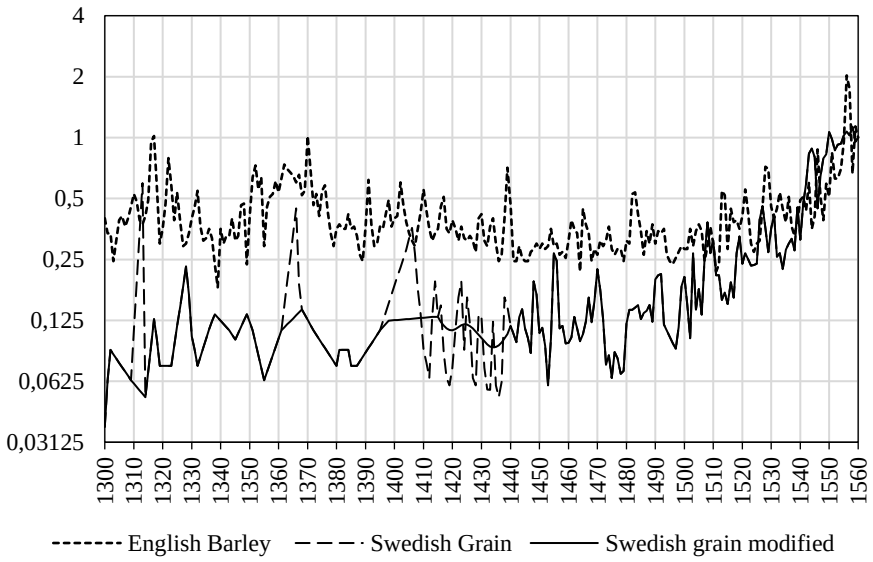
wages. This meant lower real wages than before. According to Söderberg, this situation was due to war and civil unrest, which led to a decline in welfare and basic living conditions.[23] It

[21] Söderberg (2010).
[22] See e.g. Franzén and Söderberg (2006), p 195.
[23] Söderberg (2010), p 459.

is, however, probable that the rise of prices as well as wages was also a result of the silver bullion inflow from the New World influencing all of Europe.

Agricultural prices: Price information for a few items exist which is possible to use, namely *grain* i.e. barley and oats (usually half of each), *rye* and *butter*.[24] Thereby, both vegetable and animal food could be included. Nevertheless, the prices follow each other rather closely. Therefore, and since they are most frequent, grain prices were chosen to represent agricultural prices. Because there are lacunas, interpolation and extrapolation had to be employed. The resulting annual series is volatile, more so than for instance the English series presented by Clark (2004). This is demonstrated in figure 3 where a comparison is made between the English series for barley and the Swedish series. The volatility in the latter is problematic and it is possible that the data could be questioned especially in the early part of the period when the basic data are scattered and many interpolations were made. Therefore, when used in the estimate based on the demand approach the most marked changes have been smoothed as seen in figure 3.

Figure 3. Comparison between English and Swedish grain prices 1300-1560, 1560=1



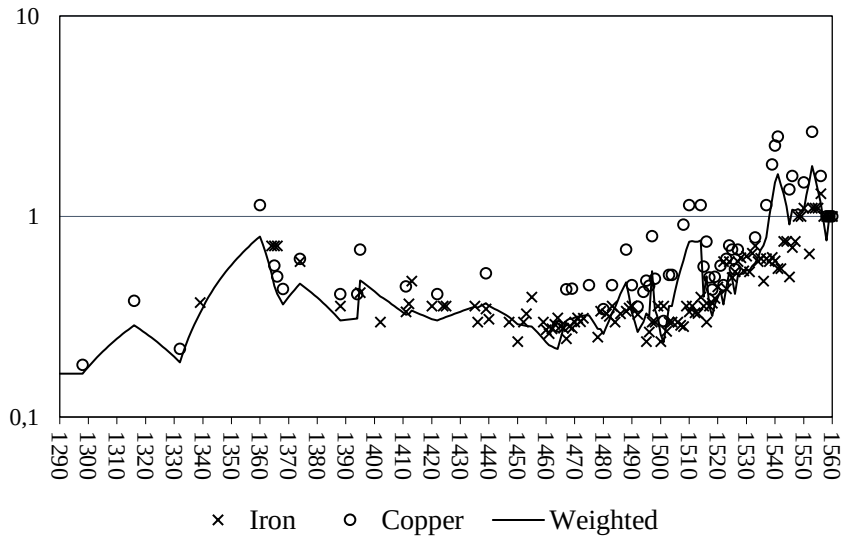
Source: Clark (2004), see also text.

Industrial prices: Copper and iron prices are available.[25] They are combined with the weights 6–1, which were also used also in estimates for later periods. As in the other cases, there is a

[24] Edvinsson and Söderberg (2010).
[25] Edvinsson and Söderberg (2010).

lack of data for certain years and, therefore, interpolation and extrapolation had to be made. This is displayed in figure 4.

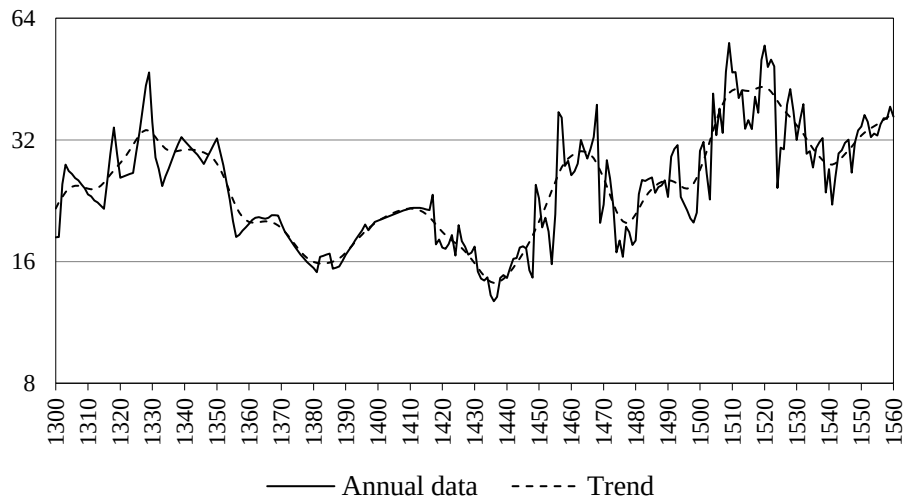
Figure 4. Metal prices 1290-1560, Index 1560=1



Source: See text

With these data, a time series with changes in consumption per person is computed, which is also assumed to represent agricultural output. When linked to the existing figure for 1560[26] and multiplied by the population data described above, total output is obtained. The series is plotted in figure 5. Needless to say, it is tentative due the aforementioned data difficulties.

Figure 5. Agricultural output 1300-1560, constant prices



Note: The trend is represented by the Hodrick-Prescott filter (λ=100).
Source: See text

[26] Schön and Krantz (2015).

Edvinsson (2016) has made an estimate of per capita agricultural demand back to the middle ages using another method than the one employed here. He presented the result in a diagram (p 212) and there it appears that the profile of the curve, i.e. a relatively high level in the late 15th and early 16th centuries and then a steep downward slope up to 1560, is similar to that of GDP per capita in the present estimate. Hence, the Edvinsson (2016) estimate can be seen as supporting the present one. Furthermore, gave evidence on this performance from previous research.

Industry

There are some data for manufacturing industry and handicrafts. Metal production, comprising the iron and copper industries, can be dealt with even if the datasets are far from complete. For two other subindustries, food and textile, estimations have been made. Thereafter, these three branches have been weighted together, utilizing weights employed for the later periods by Schön and Krantz (2012, 2015). The resulting series, which is taken to represent total industrial output, is shown in figure 6.

Metal industry:

I r o n o u t p u t: As in Schön and Krantz (2012,2015), an estimate made by Krantz and Olsson[27] is used here. This series starts in 1368 and, therefore, figures for the period 1300-1368 remains to be estimated. In principle, the same method as for the later period is utilized. Thus, data for production for domestic use and export respectively have to be found. As before, information from Hallén (2003) is employed to arrive at figures for domestic use. Hallén (2003) estimated the possession of iron in a number of years, and, for the sake of comparison, gave a figure for a period around the year 1000, taken from a thesis in archaeology.[28] At that time, the possession was estimated to be around 50 kg of iron per farm.[29] For the year 1750, 160 kg was taken as an average for middle-sized farms in Sweden.[30] It is assumed that the possession of iron per farm increased with the same percentage annually over the period 1000-1750 and, furthermore, it is assumed that the number of farms grew at the same rate as population.[31] Thereby, a crude indicator of the

[27] See e.g. Olsson (2007).
[28] Hansson (1989).
[29] Hallén (2003), p. 194.
[30] Hallén (2003), p. 160.
[31] On population, see above.

change of total iron possession in agriculture in the country is arrived at. By assuming that this also captures production of iron for domestic use annually, an indicator of the amount of iron produced is arrived at. In the estimate by Krantz and Olsson (2007) export figures for scattered years back to 1368 were collected from various sources, leaving figures for the period before 1368 to be found. Alas, no export figures exist but it is known from various studies that Sweden was an iron exporter also in this period.[32] Hence, it is assumed that the percentage of export in total production was the same as in the years after 1368, i.e. around 11 percent. Thereby, a series for the whole period could be estimated.

C o p p e r o u t p u t: Falu Coppermine totally dominated Swedish copper production from the start of the mining. However, when this occurred is uncertain. Some sources suggest a time point before the year 1000. Nevertheless, it is clear that mining was important in the fourteenth century.[33] As mentioned in Schön and Krantz (2012), Lindroth (1955) published

Table 3. Copper production in the Falu mine 1540-1570, skp.

	Total	*Private*	*State*		*Total*	*Private*	*State*
1540	**350**	**308**	42	1556	**655**	**524**	131
1541	**600**	**528**	72	1557	596	441	155
1542	**608**	**535**	73	1558	**619**	**458**	161
1543	**633**	**557**	76	1559	**738**	**546**	192
1544	**558**	**491**	67	1560	**892**	**660**	232
1545	**608**	**535**	73	1561	**796**	**581**	215
1546	899	796	103	1562	**776**	**551**	225
1547	**760**	**668**	92	1563	**1123**	**786**	337
1548	760	663	97	1564	**1197**	**814**	383
1549	**761**	**672**	89	1565	**1376**	**922**	454
1550	445	398	47	1566	**1456**	**961**	495
1551	**282**	**249**	33	1567	**1926**	**1252**	674
1552	317	276	41	1568	1476	938	538
1553	326	278	48	1569	1306	842	464
1554	**727**	**638**	89	1570	1150	616	534
1555	**727**	**618**	109				

Note 1: The two kinds of production are *Bergsmansbruk* and *Kronobruk.* They have been translated here as *Private* and *State* production.
Note 2: 1 skp (skeppund) = 136 kg (stapelstadsvikt), there are a number of different definitions.
Note 3: Missing figures estimated by interpolating the state shares. These figures are printed in bold.
Source: Lindroth (1955), p 389.

[32] See e.g. Heckscher (1954), p 42 ff.
[33] For the history of Falu Coppermine see e.g. Söderberg (1932), Lindroth (1955) and Boethius (1966).

data for the output of Falu Coppermine from 1540 onwards, however not entirely complete. The figures up to 1570 are reproduced in table 3 together with estimates for missing entries.

There is no complete series of output data before 1540, only estimates for certain years. An early and thorough attempt was made by Söderberg (1932), who also reported some earlier guesstimates, or what he called fancies. One is found in a publication from 1879 where it was claimed that the annual production in 1250-99 was c. 1600 centner, i.e. 400 skp, and another one in 1300-99, 4000 centner, i.e. 1000 skp. A guesstimate made in 1908 was 560 skp a year in the 14th century.[34] Söderberg's own estimate was based on a kind of charges ("avrad"), and resulted in 450-500 skp a year in 1347. He emphasized the uncertainty of this but argued that it seemed reasonable. Furthermore, he noted that "strangely enough" the production was of the same size as in the middle of the 16th century (see table 3 above). However, production varied a great deal 1540-1560. For instance, in the early 1550s it was small due to "particularly great water flow problems" and actually it was in these years that output according to Söderberg was the same or even lower than in the fourteenth century. Apart from these problems, production was larger. Also the fourteenth and fifteenth centuries saw major fluctuations in the production. [35]

Furthermore, Söderberg gave some information on the copper export to Lübeck. This export mainly emanated from the production at Falun, and represented "a great share of its output". The following figures on the export from Swedish harbors were presented (skp):

1492 more than 2275 from 15 April
1493 more than 2897,5
1494 more than 1840,5
1495 435
1496 168 to 1 July

The decline during 1495-1496 was due to a combination of bad times for shipping and a war with Russia, while 1492-1494 were seen as "more than normally good for trade". As a consequence, Söderberg suggests that these figures should be reduced by 10 per cent. Thus, an average of 2350 skp was arrived at. Other Swedish copper mines, in the first hand Garpenberg and Åtvidaberg could together possibly have produced half of the output of Falu Coppermine at most. Thus the conclusion was that this should have been c. 2000 skp in the early 1490s. According to Söderberg, this production could, however, have been maintained

[34] Söderberg (1932), s 115, n 3.
[35] Söderberg (1932) s 154ff.

only for a few decades. He also assumed that production during the first half of the fifteenth century was between that for the late fourteenth century and the mid-16th century, in other words around 500 skp. Thereafter, production grew to the level of the 1490s, but was later interrupted by a complicated caving-in of the mine in the next decade.[36]

These conjectures were questioned by Boëthius (1966) who found Söderberg's output estimate for the fourteenth century being too low. Among other things, taxation was not assessed correctly. Production had to be higher for the actual wellbeing of the mine owners to be realized.[37] Therefore, Boëthius made a new estimate on the basis of sources concerning export and taxes. The outcome of these considerations was that the production in the 1360s was around 1500 skp, i.e. around three times higher than Söderberg's figure. The magnitude could have been about the same for a number of years to come, or, rather, it could be considered as a "reasonable average".[38]

This survey gives the following annual production data (skp):

Early 1300s	1000
1360s – c. 1400	1500
1490s	2000

The data do not, alas, give information about short-time fluctuations, which were great according to the authors mentioned. For want of detailed data, it is assumed that production grew from 1000 in the year 1300 to 1500 in 1360. This quantity was then maintained to the year 1400 from which it grew to 2000 in around the year 1500. Then, in 1506, in connection with a great collapse of the mine, it went down to half that quantity. The assumption is made on the basis of Söderbergs estimate that production went down from 350-400 skp in the officially owned part of the mine to 250-300.[39] Then, from the quantity of 750, it changed over the years to 600 in 1539. Thereafter, the production figures are those in table 1 above.

M e t a l o u t p u t: The time series for iron and copper thus estimated are combined with the help of price data for 1560 obtained from Edvinsson and Söderberg (2010).[40] The resulting dataset is found in figure 6.

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36 Söderberg (1932), p 157ff.
37 Boëthius (1966), pp 86ff.
38 Boëthius (1966), p 157.
39 Söderberg (1932), p 157.
40 For iron the price per skp is 20 mark and for copper 78.4, the latter arrived at by interpolation between 1558 and 1563 for which price data are available.

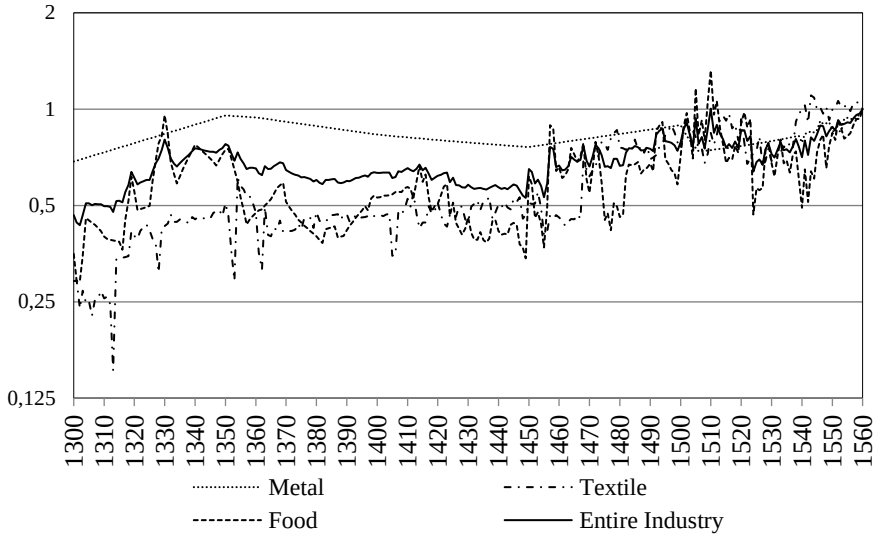
Food industry:

As for the period 1560-1800 it was assumed that food production follows that of agricultural output because inputs emanate mainly from agriculture. The production figures are shown in figure 6.

Textile industry:

Here, as with agriculture, a demand function approach has been used. It is the same technique as in Broadberry et al (2015).[41] There, cloth is treated but here, due to the data problems, the estimate comprises the whole textile industry. The same income elasticity as in Broadberry et al (2015) is assumed, i.e. 0.5. Then, wage data are needed preferably from the textile industry. However, no such wages were found for Sweden and, therefore, the wages used above for agriculture are also applied here. Textile production per capita 1560 according to Schön and Krantz (2012, 2015) together with the population figures estimated above was also used. The resulting series is assumed to represent both textile consumption and output since no foreign trade data are accessible. The textile production thus estimated is shown in figure 6.

Figure 6. Industrial output 1300-1560, 1560=1



Source: See text

Building and construction

There are no data for building and construction for the present period – actually, data problems are great up to the 20th century. Thus, it is necessary to find surrogate data. One possibility, which is tried here, is to use information on building of castles, fortresses, manors,

[41] Broadberry et al (2015), p 65ff.

very big farms and the like and assume that the resulting series is representative for the sector's activity. In order to collect such data the following records were utilized: Kjellberg, (ed.) *Slott och herresäten i Sverige* in 18 volumes, Bedoire, Fredric *Svenska slott och herrgårdar: en historisk reseguide* and http://www.slottsguiden.info/slott.asp. Furthermore, *Nationalencyklopedin* and *Wikipedia* were employed as complement. Thereby 368 items were identified for the period. Most probably, these do not encompass all that were built but, nevertheless, they provide a useful picture of the changes over time.

In very many of the cases it was impossible to determine the exact year when construction started. Therefore, approximations had to be used:

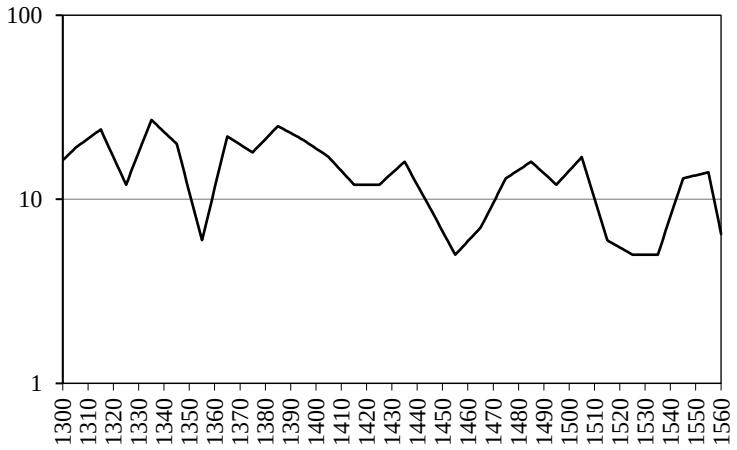
A When no other building year than for example "in the fourteenth century" the cases were summed up for every century and distributed equally over the period.

B When it was said for instance "in the end of the thirteenth century" or "in the beginning…" building was supposed to have started in the last two or the first two decades, respectively.

C Sometimes the building year was not given but instead the year or period when the edifice was first mentioned in the sources. This year was supposed also to be the building year.

Due to all uncertainty, the building years were set to decades and the representative year in the middle. Then interpolations were made between the representative years and, thus, a series with annual figures was arrived at. Needless to say, all these procedures make the series uncertain but it does not seem totally unacceptable. It is displayed in figure 7.

Figure 7. Building of castles and other large structures 1300-1560



Source: See text.

Transport

It is assumed that the output series for agriculture and industry, respectively, can be combined to form a time series for this sector. The weights are 2-1.

Services

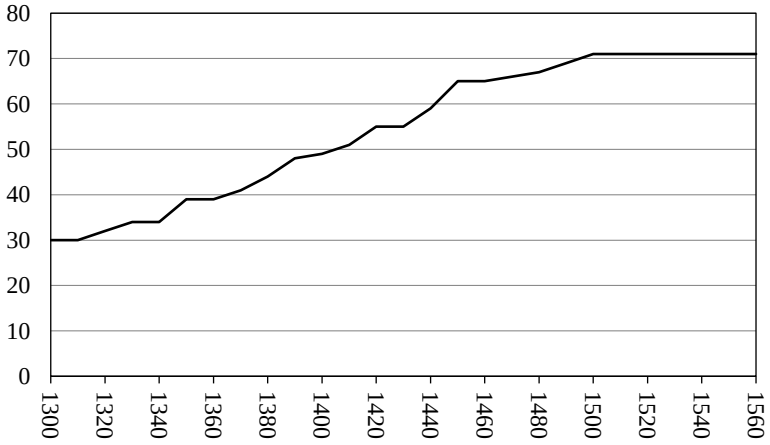
Due to dearth of data it is necessary to find indicators that can be taken to show changes in output. It is of course desirable to have some figures for private and public services as well as housing, but this is probably impossible. Presumably, private services were to a large extent performed within the household at the countryside and a little more professionally in the few existing, mostly small, towns. The towns may also have been places for much of the public services. Consequently, the number of towns and their size, i.e. the number of inhabitants, is important. The urbanization rate, that is urban population as a share of the total population, could be a good indicator. However, no population data for all towns exist and, as mentioned above, population figures for the whole country are to a great extent missing. Therefore, the number of towns and the few available figures on the number of inhabitants may form crude indicators.

The number of towns[42] 1300-1560 is illustrated in figure 8. A large number, 30 i.e. 42 per cent of all towns founded before 1560, originated from the pre-1300 period, most of them from the expansive 13th century. Then there was a rather smooth increase up to the beginning of the sixteenth century when there were just over 70 towns. The number of people living in towns is, as mentioned earlier, also of interest. Some data are available in a paper with population estimates for Stockholm and a number of other towns around Lake Mälaren.[43] For Stockholm, figures for some scattered years are also given in a report from the statistical office.[44] In figure 9 this information is displayed, and interpolations have been made in order to arrive at yearly figures. It seems clear that the data from the statistical office are more uncertain than the other two datasets, especially in the sixteenth century with a remarkable decrease in the first two decades. Therefore, the other time series concerning Stockholm appears to be more realistic, but the question remains concerning whether the time series is representative for all towns in the country or not. Compared to the series for the other towns around Mälaren, there are differences in the fourteenth century. A decrease is seen for the

42 Data are taken from Orrling (2001), p 363f..
43 Sidén (2002).
44 *Befolkningen i Stockholm 1252-2005* (2005).

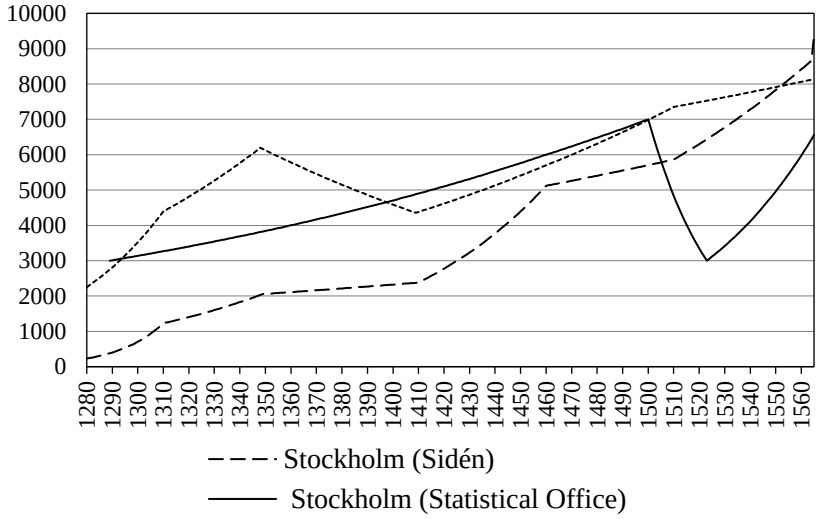
latter during the period of the Black Death but not for Stockholm. Furthermore, the increase is slower in the fifteenth and sixteenth centuries for the other towns and this is similar to the changes in the number of towns in figure 8. Consequently, population in the other towns around Lake Mälaren is taken to indicate the output of the service sector.

Figure 8. The number of towns in Sweden 1300-1560



Source: See text

Figure 9. Population in Stockholm and other towns around lake Mälaren 1280- 1565



Source: See text

It is possible to find some support for the tendencies shown by this series. Part of the service output was performed by religious institutions. Similar to parish formation and building of

churches[45] these activities were high in the thirteenth century when most of the Swedish parishes, which then lasted for several hundred years, were established. The religious activities, i.e. the service output, probably followed the aforementioned changes mirrored by the town indicator described above. Another indicator in the religious sphere is the number of monasteries. In Sweden 40-50 were established in the Middle Ages, 29 of these in the 13th century alone.[46] The data are shown in table 4 where the years of establishment and close-down are given. More or less the same picture as for churches is shown and it provides support for the indicator chosen for services.

Table 4. Monasteries in Sweden 1300-1520.

1300	29	**1384**	32	**1450**	37	**1498**	41
1335	30	**1400**	33	**1475**	38	**1504**	40
1345	31	**1440**	34	**1479**	39	**1507**	41
				1486	40	**1520**	42

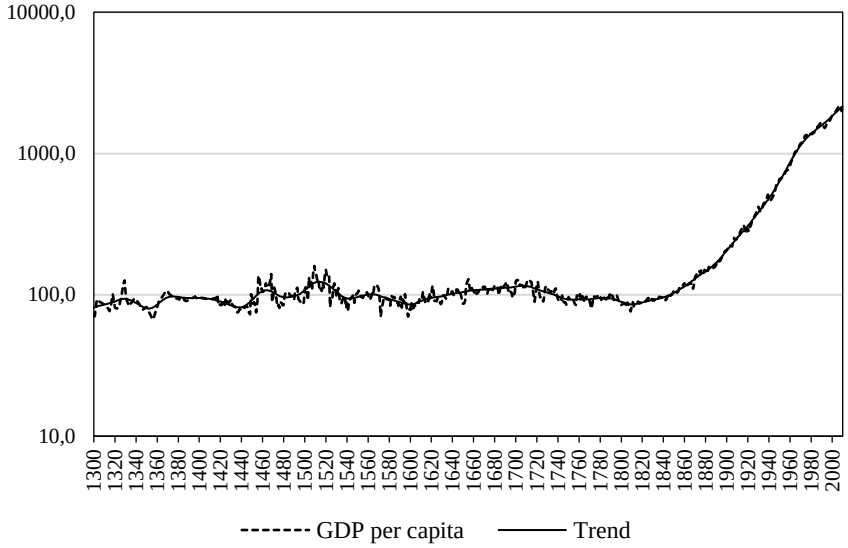
Source: Berntson (2003), Ch. 2.

GDP and GDP per capita

In linking the time series 1300-1560 to those from 1560 onwards in Schön and Krantz (2015), the 1800 price level is used and the series for GDP and GDP per capita are shown in the appendix. Due to, among other things, the very long periods for which population data were interpolated or extrapolated, it is of course necessary to be careful when using a series for GDP per capita. Nevertheless, in figure 10 it is used to get an idea of the very long-run changes, i.e. 1300-2010. Even if uncertain, the performance does not seem wholly unlikely. It should be added that the provisional population figures for 1300-1560 are also used in the estimate of GDP, and this of course contributes to make it tentative.

45 On this, see Dahlberg (2008).
46 Berntson (2003).

Figure 10. GDP per capita 1300-2010, 1560=100



Note: The trend is represented by the Hodrick-Prescott filter (λ = 1600).
Source: See text.

GDP per capita showed an upward tendency in the first half of the 14th century. Then, in the first hand as a result of the epidemics, particularly the Black Death, there was stagnation and even decline. Total output was, thus, not sufficient for the fewer people to get a larger supply per capita on average than before. This had probably to do with the disorganization due to the great mortality. After about one hundred years, growth became positive again which went on for roughly another hundred years, however with interruptions, for instance in the early sixteenth century. Thereafter, the last decades of the sixteenth century saw a downward tendency before an expansion started in the seventeenth century.

By and large, the tendencies sketched coincide with descriptions of long-term economic change given in previous historical studies. Boëthius (1966), for instance, noticed that after the Viking Age (c. 800-1050), which was characterized by a major general expansion in combination with far-flung trade voyages, a period of isolation and retardation followed. In the 13th century a new expansive period commenced, stimulated by international trade, in particular involving the Germans and the Hansa. Among other things, the trade with copper from Falu coppermine and iron from various parts of Sweden thrived.[47] Roughly the same description is found in a textbook by Johan Söderberg on the economic history of the Middle

[47] Boethius (1966), pp 73f.

Ages. The early medieval period, i.e. up to around 1200 was not very expansive, albeit distinguished by a certain agricultural evolution.[48]

Thereafter came the high medieval period, 1200-1350, characterized by expansion, particularly of the towns and the mining industry.[49] In the following period, i.e. the late Middle Ages, 1350-c.1520, the so called long European Agrarian Crises dominated even though positive changes occurred, for instance new types of handicrafts and certain mass production.[50] This was also a period with a number of epidemics, 1350, 1359-60, 1368-69, 1413, 1421-22, 1439-40, 1455, 1464-65 and 1495, the first one being the Black Death, which, together with the two following, was the most severe.[51] Then, in the 16th century, according to Eli Heckscher, the reign of Gustavus Vasa,[52] was "the Age of Bliss in Swedish history". [53] This is to a certain extent visible in changes of GDP per capita. A downward trend was broken and economic growth predominated up to the 1560s, when again a downward tendency began, which was broken by the expansive 17th century.[54]

An international comparison

According to received wisdom Sweden, "a peripheral economy of medieval Europe"[55], was a poor country internationally seen in the Middle Ages. Franzén and Söderberg (2006) conclude for instance that Sweden had comparatively low grain prices (in silver) and that a low price level indicates that an economy is relatively undeveloped. Sweden was clearly more so than North-West Europe but less than the Polish area. Thus, Sweden had "a very low welfare".[56]

Performing an international comparison, Foquet and Broadberry (2015) used the per capita GDP series for, among others, Italy, Holland, England and Sweden in a comparison of growth

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48 The economic stagnation in this period is discussed in an interesting way by Franzén (2015).

49 It can be noted that Jonsson (2002) found that coin finds in Sweden showed a yearly increase of 1.5-1.6 per cent 1196-1354, "which could be seen as a corresponding increase of the economy (GDP)." (Translated here) These figures could be compared with the increase according to the present construction which was around 1.3 per cent.

50 Söderberg (1996), p 216.

51 Myrdal (2003), pp 243 ff.

52 Gustavus Vasa was king 1523-1560.

53 Heckscher (1954), p 78. However, it is possible that Heckscher's judgement is slightly exaggerated. The economic policy in the period was energetic which probably boosted economic growth. If this also meant increased welfare is uncertain since various measures could have been negative for ordinary people. Besides, Heckscher's dictum should perhaps be somewhat modified when taking into account the real wages mentioned above. They were actually lower than before in the first half of the 16th century, at times much lower.

54 The economic development from the 1560s onwards is discussed in Schön and Krantz (2012).

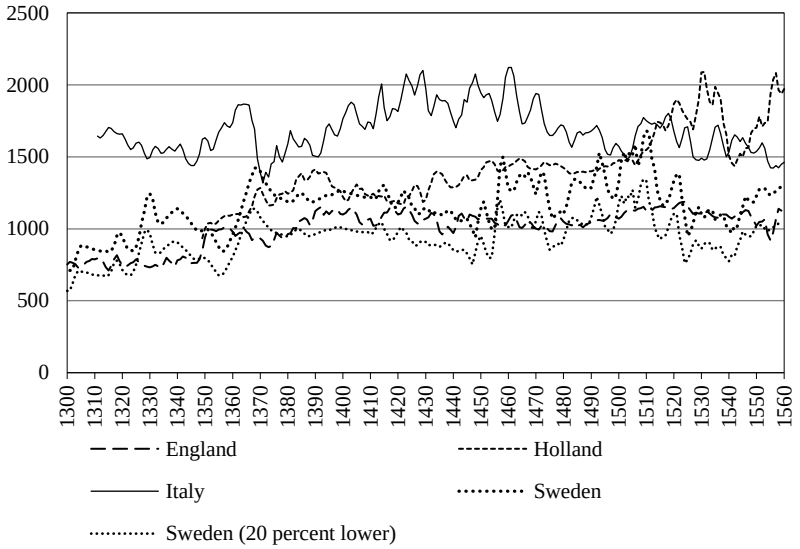
55 Söderberg (2007), Prices and Economic Change, p 149.

56 Franzén and Söderberg (2006), p 212.

and levels 1300-1800, or parts of this period depending on supply of data. For Sweden, figures from Schön and Krantz (2012) from 1560 onwards were used. Furthermore, to get a comparison of levels, the countries' GDP per capita 1990 in Geary-Khamis dollars counted backward to 1800 were utilized.

Now it is also possible to involve Sweden in a comparison for 1300-1560 and it is shown in figure 11. The English and Swedish curves are more similar as to level while those for the other two countries differ. Italy's level is clearly higher and so is Holland's, if not to the same degree. It is, however, necessary in this comparison to consider the uncertainty of the data, especially in the case of Sweden. Therefore, two curves for Sweden are plotted in figure 10, one showing the data reconstructed here and one where these data are reduced by 20 percent. Thus a margin of error is constructed but still the conjecture that Sweden was close to England is possible. After 1560, as seen in Fouquet and Broadberry (2016, figure 1, p 230), the relation between the two countries' economies varied. In the seventeenth century, especially in the first part, Sweden underwent a growth period while England stagnated, but in the latter part they came closer to each other again. Then, in the next century, a divide is evident when England's GDP per capita grew and its industrial revolution began while Sweden's economy stagnated. First after some decades in the nineteenth century Sweden

Figure 11. GDP per capita in four European countries 1300-1600. Three-year moving averages



Source: Fouquet and Broadberry (2015) and, for Sweden, see text.

experienced the start of a sustained economic growth, which successively led to a rather high GDP per head internationally seen in the 20th century.[57]

Another aspect has to do with economic growth and stagnation in the very long run. In their study of a number of European countries' GDP per capita, Fouquet and Broadberry (2015) identify four "growth episodes" before 1800. The first one is Italy's economic growth between 1350 and 1420. This episode constitutes an important reason why Italy reached a clearly higher level of GDP per capita than the other countries. The following episodes occurred in Holland in the sixteenth century and in Sweden and England in the following century. Now, with Swedish data from 1300 it can be hypothesized that a similar episode took place earlier. In the first half of the fourteenth century growth is discernible, and, as mentioned above, it seems that Sweden also experienced economic growth in the previous century. For instance, a number of towns originated from this period, actually almost half of all that were founded up to 1560, and the pattern of parishes that characterized the religious life for many centuries to come was instituted. In connection with this, a great number of churches were built. Thus, it is possible that the growth in fourteenth century before the Black Death was part of an episode that started in the century before. Maybe, this could also be seen as a formative period for the Swedish nation. Anyway, this development is in line with Fouquet and Broadberry's argument that the European economy was far from stagnant before the industrial revolution.

After this early growth episode, the Swedish economy was stagnant up to the seventeenth century at the same time as it showed a great and irregular volatility. Then, the stagnation was succeeded by the next Swedish growth episode in the seventeenth century mentioned above and discussed in Schön and Krantz (2012). This century was also characterized by a number of wars in connection with what for some reason has been called Sweden's great power era. [58] Thereafter, in the 18th century, when "Great Britain achieved modern economic growth with the coexistence of population growth and per capita growth"[59] Sweden's economy stagnated, as is also discussed in Schön and Krantz (2012).

[57] For a short analysis of the Swedish growth performance from 1560 onwards, see Krantz and Schön (2012), and for an international comparison of levels of GDP per capita in the 20th century, see e.g. Krantz (2008).
[58] Schön and Krantz (2012).
[59] Fouquet and Broadberry (2015), p 230.

A final remark

Since this is the first attempt to reconstruct Swedish historical national accounts for the Middle Ages and the there is a dearth of information a great number of approximations, guesstimates, and limitations had to be made. This makes the result provisional and it is highly desirable to improve and extend the estimations. At many places in Sweden, archival material exists that can be scrutinized and provide new information on population, production, prices, et cetera. This requires sound knowledge of the student to understand and interpret the material, but as there are economic historians with such knowledge and education, we can optimistically look forward to future findings and improvements of the series.

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http://www.slottsguiden.info/slott.asp

APPENDIX

GDP per capita 1300-1560, Constant prices Index 1560=100

1300	70.4	**1353**	73.4	**1406**	93.8	**1459**	111.0	**1512**	123.4
1301	70.5	**1354**	71.4	**1407**	93.7	**1460**	105.0	**1513**	126.6
1302	85.7	**1355**	68.3	**1408**	93.4	**1461**	106.1	**1514**	107.4
1303	92.8	**1356**	66.8	**1409**	93.1	**1462**	109.3	**1515**	110.5
1304	90.9	**1357**	69.8	**1410**	93.1	**1463**	120.5	**1516**	106.3
1305	90.1	**1358**	73.7	**1411**	93.2	**1464**	116.2	**1517**	120.9
1306	88.8	**1359**	77.5	**1412**	93.4	**1465**	112.1	**1518**	113.0
1307	88.2	**1360**	81.9	**1413**	93.9	**1466**	116.4	**1519**	140.8
1308	87.2	**1361**	86.6	**1414**	94.4	**1467**	122.4	**1520**	150.3
1309	86.2	**1362**	91.4	**1415**	94.3	**1468**	140.6	**1521**	136.2
1310	84.5	**1363**	93.8	**1416**	94.7	**1469**	89.2	**1522**	139.9
1311	84.0	**1364**	95.4	**1417**	100.5	**1470**	95.0	**1523**	135.5
1312	82.9	**1365**	97.2	**1418**	84.4	**1471**	112.6	**1524**	81.7
1313	80.8	**1366**	99.7	**1419**	86.4	**1472**	105.9	**1525**	95.2
1314	79.0	**1367**	102.6	**1420**	84.5	**1473**	96.1	**1526**	94.4
1315	76.9	**1368**	104.9	**1421**	84.7	**1474**	82.3	**1527**	112.6
1316	83.2	**1369**	106.9	**1422**	86.6	**1475**	84.9	**1528**	120.4
1317	91.8	**1370**	106.2	**1423**	90.2	**1476**	80.8	**1529**	109.6
1318	101.0	**1371**	102.9	**1424**	84.6	**1477**	88.6	**1530**	97.0
1319	90.1	**1372**	100.5	**1425**	94.8	**1478**	87.4	**1531**	104.8
1320	81.1	**1373**	99.1	**1426**	90.3	**1479**	84.0	**1532**	111.7
1321	80.4	**1374**	97.9	**1427**	89.6	**1480**	84.9	**1533**	91.9
1322	80.0	**1375**	96.8	**1428**	88.0	**1481**	98.7	**1534**	92.6
1323	80.8	**1376**	95.8	**1429**	89.5	**1482**	104.0	**1535**	87.2
1324	81.7	**1377**	95.1	**1430**	92.3	**1483**	103.2	**1536**	93.9
1325	89.0	**1378**	94.4	**1431**	85.5	**1484**	103.2	**1537**	96.4
1326	97.0	**1379**	93.7	**1432**	84.0	**1485**	103.3	**1538**	98.4
1327	107.5	**1380**	93.4	**1433**	82.5	**1486**	97.2	**1539**	80.9
1328	119.2	**1381**	92.7	**1434**	82.4	**1487**	98.4	**1540**	87.8
1329	126.8	**1382**	97.1	**1435**	77.2	**1488**	98.4	**1541**	78.8
1330	104.6	**1383**	96.9	**1436**	75.1	**1489**	99.6	**1542**	86.4
1331	92.3	**1384**	96.4	**1437**	75.3	**1490**	93.4	**1543**	94.4
1332	89.4	**1385**	96.1	**1438**	79.0	**1491**	107.1	**1544**	95.1
1333	83.4	**1386**	91.3	**1439**	79.0	**1492**	110.4	**1545**	97.7
1334	85.2	**1387**	90.8	**1440**	77.6	**1493**	112.1	**1546**	98.9
1335	86.9	**1388**	90.4	**1441**	79.4	**1494**	93.3	**1547**	87.8
1336	88.9	**1389**	91.1	**1442**	81.2	**1495**	90.7	**1548**	97.0
1337	91.0	**1390**	92.1	**1443**	80.7	**1496**	88.8	**1549**	101.5
1338	92.9	**1391**	92.8	**1444**	83.2	**1497**	86.6	**1550**	102.8
1339	94.6	**1392**	93.6	**1445**	83.1	**1498**	85.4	**1551**	107.1
1340	92.6	**1393**	94.4	**1446**	81.8	**1499**	88.1	**1552**	104.6
1341	90.7	**1394**	95.3	**1447**	75.4	**1500**	109.3	**1553**	97.0
1342	88.8	**1395**	96.0	**1448**	72.9	**1501**	113.6	**1554**	96.9

1343	86.0	**1396**	97.2	**1449**	101.3	**1502**	102.1	**1555**	95.1
1344	83.5	**1397**	94.7	**1450**	96.8	**1503**	91.8	**1556**	98.2
1345	80.7	**1398**	95.5	**1451**	86.3	**1504**	133.2	**1557**	99.9
1346	78.1	**1399**	96.2	**1452**	88.5	**1505**	113.0	**1558**	99.4
1347	79.0	**1400**	95.9	**1453**	84.3	**1506**	123.0	**1559**	104.2
1348	80.1	**1401**	95.7	**1454**	75.0	**1507**	110.9	**1560**	100.0
1349	81.1	**1402**	95.5	**1455**	89.2	**1508**	140.8		
1350	82.2	**1403**	95.1	**1456**	135.7	**1509**	159.7		
1351	79.2	**1404**	94.7	**1457**	134.1	**1510**	140.2		
1352	76.2	**1405**	94.1	**1458**	109.6	**1511**	138.3		