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240 years of Swedish terms of trade – structure, volatility, and connection to economic growth

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Abstract
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Keywords: International trade, Terms of trade, Export concentration, Volatility, Economic growth

JEL: F14, N73, N74

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240 years of Swedish terms of trade – structure, volatility, and connection to economic growth

ABSTRACT

In this paper we present new foreign trade- and price data to analyze Swedish terms of trade in the very long run, from 1780 to 2018. We examine what influenced the trend in the terms of trade in the long run, particularly in how it related to the general trade structure. We also analyze the volatility of the terms of trade, and discuss how it might have affected economic growth in Sweden. The index improved slowly but substantially over the century from 1850 to 1950, which was likely connected to another poignant trend, a steadily increasing share of manufactures and finished goods in the export basket. In comparative perspective, Sweden had more industrial exports and lower export concentration than most of the rest of the European periphery, as well as much lower terms of trade volatility. We find that the growth trend and low volatility of Swedish terms of trade was positively connected with economic growth, but only really so from about 1850 to 1913. During this period the development of the terms of trade was particularly connected to increasing investment in new industries. The years from 1914 to 1960 were on the other hand characterized by high volatility in the terms of trade, and was still connected to high growth rates, such as during the interwar period. Hence, we conclude that while low volatility was connected to the onset of Swedish industrialization, it was also possible to maintain high growth rates during periods of high terms of trade volatility.

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Introduction

The Terms of Trade is on the surface a simple index, measuring export prices over import prices, but it hides more complexity as an indicator of economic matters. It reflects the economic conditions of a country, such as the production structure, price movements, real wages, and economic policies. At the same time, it may well be a driver of economic development and growth, through enabling price stability and promoting investments in new industries. Positive developments in the terms of trade have been shown to be a key factor in moving capital and labor from agricultural sectors to industrial production. On the other hand, countries who are producing and exporting primary products may experience de-industrialization and Dutch disease problems as a result of positive movements in the terms of trade (Williamson, 2011). Studying terms of trade can hence be a central instrument to understanding the economic development of countries in the long run. Macroeconomic instability, seen for instance in the volatility of the terms of trade, has been shown to have very large effects on economic growth (Cariolle, 2012).

In this paper we use data on foreign trade and prices to analyze the Swedish terms of trade in the very long run, from 1780 to 2018. This makes our series on export- and import-structure, export- and import price indices, and the terms of trade, some of the longest run to have ever been published. Other than presenting new terms of trade and price-series, we have also calculated new long-run series for real export and import, export concentration, and the share of primary products and manufactures in total exports. We begin our series in 1780 because of available trade- and price data starting this year (Häggqvist, 2015), and end in 2018 because this was the end-year of the published OECD-series by the time of writing.[1] This period includes Sweden's shift from a country in the poor periphery of the world to a country with one of the highest living standards in the world. Because of the long time period of our study, we are able to probe several facets of the terms of trade which have been deemed to be important for understanding economic development, namely the trend, the growth rate, and volatility of the series, as well as the impact of external shocks (oftentimes because of large-scale warfare). Particularly the two latter factors have been criticized in several modern economic studies on the topic, as their time scope have often been too short to fully distinguish volatility from secular trends (Blattman et al, 2004). There are a few short-term studies of the Swedish terms of trade, such as Schön (2015) between 1800 and 1830 and Södersten (1959) between 1871 and 1903. Sweden was also included in some of the longer-term cross-country studies on the terms of

[1] It would likely be possible to extend this series back to 1738, using data underlying Edvinsson & Gad (2018). The trade- and price data would be of sufficiently good quality and disaggregation to create fairly similar terms of trade series to those presented here.

trade, such as Blattman et al. (2004; 2007) between 1870 and 1939 and Chilosi et al. (2003) between 1800 and 1913. Our study is the first to put together foreign trade and price data for such a long period of time, and connecting the trend and volatility of the terms of trade to economic growth during such different eras of international trade and economic development, including three periods of global large-scale wars (the Napoleonic Wars, and the two world wars).

In this paper we ask three basic questions:

- How did the Swedish terms of trade develop in the long-run and how volatile and sensitive to shocks was it?
- What can explain the development of the terms of trade? Particularly, how does it relate to the long-run Swedish export- and import-structure?
- How has the trend and volatility of the terms of trade impacted economic growth in Sweden in the long run?

We find that the terms of trade had a secular positive growth during the second half of the nineteenth century and the first half of the twentieth century, and that volatility was generally very low relative to comparable countries. There were notable shocks to the terms of trade during all three large-scale wars during the period which all caused the index to drop. The index followed an increasingly industrialized export sector, with the share of manufactures and finished goods rising markedly from about 1870 to 1940. Sweden went from being a primary products exporter to an industrial powerhouse, and as expected the terms of trade followed. We argue that this development should have had positive effects on Swedish economic growth. Improvements in the terms of trade and low volatility developed alongside increasing capital imports and investments, foreign and domestic, which spurred industrial growth and economic development.

Terms of trade and economic growth

The impact of the terms of trade has varied over time and across countries, depending on for instance factor endowment and economic structure, income levels and purchasing power (Kehoe & Ruhl, 2007; Froot, 1995). This is in turn linked to a number of factors such as technology (Grossman & Helpman, 1995), human capital levels (Owen, 2011), and institutions and policy (Anderson & Yotov, 2011). In this sense, the terms of trade reflects the economic

conditions of a country, but at the same it may well be a driver of economic development and growth, or the lack thereof. Singer (1950) argued in his classical paper that technological development would increase the demand for manufactures more than it would for raw materials and food. Particularly food demand would only increase to a small degree when income rises, because of the lower income elasticity of demand, while technological progress could even decrease the demand for raw materials because of more efficient production.[2] This development would also decrease the value of such traded goods, because of relatively decreasing prices. Following this, and contemporary similar writings by Prebisch (1950), the Prebisch-Singer hypothesis postulates that the terms of trade of primary-product producers will deteriorate in the long-run, while that for manufacture-based economies will improve. This hypothesis has basically been confirmed by later research – raw materials decreased in value by about 75 percent relative to manufactures between 1862 and 1999 (Cashin & McDermott, 2002). From 1900–1904 to 1996–2000 the relative decline was found for all commodities except for beef (135 percent cumulative increase), lamb (400 percent), timber (208 percent), and tobacco (100 percent) (Ocampo & Parra, 2003). However, this was mainly a twentieth century phenomenon; during the nineteenth century the relative price of raw materials actually rose (Hadass & Williamson, 2003). As a result, primary-products exporting countries largely experienced a terms of trade boom before World War I (hereafter, WWI), although the experience was not uniform across these economies (Williamson, 2008; 2011). According to the so-called Harberger-Laursen-Metzler hypothesis, when the terms of trade decrease, net exports and investments decline since a fall in the purchasing power of exports reduces income and thus the incentives to consume and save (invest) (Harberger, 1950). Times of temporary terms of trade declines, even if the decline is short-lived, are commonly followed by current account deficits (Murphy, 1992).

A number of economic-historic studies have related the trend and volatility of the terms of trade index to economic growth and possible underdevelopment. Blattman et al. (2004; 2007, later replicated in Williamson, 2008; 2011) studied 35 countries in the rich core and the poor periphery between 1870 and 1939 (excluding the years between 1910 and 1919). Chilosi et al. (2023) extended this sample with new trade- and price-data[3] to include 133 countries

[2] A variant of Engel's Law, stating that as individuals' income grow they will spend more on food in absolute terms, but not relative to total expenditure, and less in percentage terms than growth in income.
[3] Based on the *Federico-Tena World Trade Historical Database*, see Federico & Tena-Junguito, 2016; 2019.

("the whole world") between 1850 and 1913.[4] As mentioned above, one key aspect of the economic-historical literature on terms of trade and economic growth concerns the issue of volatility, where it has since long been stipulated that poor countries experience more macroeconomic instability than rich, and that this is negative for economic development. In the first of these empirical studies, it was shown that a secular increase in the terms of trade combined with low volatility was positive for growth in the rich core (among whom a majority were exporters of manufactures) during the nineteenth century. The reverse can be said for countries in the poor periphery who generally exported raw material and food (primary products), where volatility in the terms of trade was much higher, and probably kept growth rates down (Williamson, 2008; 2011). An increasing terms of trade in countries, which mainly produce, and export raw materials and food will be negative because primary products tend to have higher price volatility themselves, increasing insecurity and in a further step deterring investment. Any projects eventually invested in tend to be "low risk – low reward.", especially in less developed countries. (Blattman et al, 2004; Williamson, 2011). According to for instance Findlay (1980), such structural differences has left less developed countries more sensitive (vulnerable) to terms of trade shocks. Such shocks have frequently followed in times of large-scale wars, and the larger and more lasting shocks, the worse economic impact for the country. Improvements in the terms of trade will hence be negative for primary exporters, "periphery economies", but positive for manufacture exporters, "center economies" (Hadass & Williamson, 2003). A further characteristic of these "periphery economies" was a high export concentration, where one or two commodities made up the large majority of total exports, which only served to worsen price- and income volatility (Williamson, 2011). The connection between type of production and/or export and volatility is also present when analyzing price movements themselves in the very long run. Jacks et al. (2011) found that since 1720 primary products (or "commodities") showed consistently higher price volatility than manufactures. They also argue that periods of de-globalization and major wars aggravated volatility, meaning that globalization forces and market integration should have cushioned volatility. For countries richly endowed with natural resources and dependent on export revenue, high export concentration has been connected to high terms of trade volatility, which leads to unstable state finances and low public investment in infrastructure and education, itself negative for economic growth (Poelhekke & van der Ploeg, 2007). Chilosi et al. (2023) rather show that average volatility in periphery countries compared to the core was only slightly higher, 22.6 percent compared to 17.4 percent. There were

[4] The article analyses terms of trade from 1800, but the sample is significantly smaller before 1850. It includes twelve countries (or "polities) between 1800 and 1822, 23 between 1823 and 1829, and 50 from 1830 (Chilosi et al., 2023, p. 99).

notable differences within these broad groups; terms of trade volatility was for instance almost twice as high in North America than in the European core (Chilosi et al., 2023, figure 4, p. 105). The authors further find that in general export prices were the prime cause of volatility, but challenge the conventional statements about it being connected to dependence on primary products (raw materials and food) exports and de-industrialization factors. Instead, the era of lower volatility, towards the end of the nineteenth century, was concurrent with price spikes not being as pronounced as previously during the century. Chilosi et al. conclude that the trend in the terms of trade was not a cause of underdevelopment in the poor periphery, and that likely primary exports also stood to gain from trade.

We can hence sketch out a couple of hypotheses based on previous research:

- *H1:* A secular growth in the terms of trade will have a positive impact on economic growth, unless the country is a primary producer and exporter, through promoting investment and boosting production.
- *H2:* High and increasing volatility in the terms of trade will hamper economic growth, mainly as it deters the inflow of capital (foreign investment).
- *H3:* A sudden shock to the terms of trade (such as in times of war) will be negative for economic growth.

Methodology and data

The *net barter terms of trade* (NBTT) is defined as the ratio of export prices to import prices. Both price indices are weighted by the share of the respective commodity or sectors value of total trade. When the index increases, it usually means that export prices are increasing more than import prices (or export prices are increasing while import prices are stagnant), and when the index falls the reverse is often true. When calculating the terms of trade, it is preferable to use actual noted export- and import prices in the country studied, but when import prices are not available or reliable we have a "worst case scenario", in the words of Jeffrey Williamson (2008), where we instead have to use for instance an index of British or American export prices (because of their historical dominance on the world trading market) to denote a country's

import price index.[5] In this case, the terms of trade would only vary with the export price index between countries, since the import price index would not be country-specific (nor weighted on the country's specific import-shares). This was the case in the work by Blattman et al (2004; 2007) and Williamson (2008; 2011). Fortunately, here we are working with a "best case scenario" where we have been able to work with actual import prices and trade shares throughout the long period in question.

Before we move on to the construction of the index itself, it is worth noting that other series on the Swedish terms of trade have been published previously. Sweden is included in the studies by Blattman et al (2004; 2007), replicated in Williamson (2008; 2011), which have employed series that were developed by Kuznets (1967). Kuznets' series for Sweden was constructed from the foreign trade data in Johansson (1967), which was one of the first proper works on Swedish historical national accounts. However, we have not been able to obtain the annual time-series from either previously mentioned publication, so it has not been possible to compare it with our series here.[6] Sweden is also included in Chilosi et al. (2023), but by the time of writing (October 2023) no country-by-country series therefrom has been published.

Our terms of trade index has been put together from various sources. The methodology differs somewhat depending on the time period but follows a common aim of trying to cover as much of total foreign trade as possible. From 1780 to 1829, data is taken from Häggqvist (2015), which calculated the index from primary price material to construct export- and import price indices and export- and import values and shares.[7] This is because the available unit values of foreign trade statistics of the time were not fully reliable, particularly on the import side, where commodities were notably undervalued compared to estimated market prices (Vallerö, 1969). From 1830 to 1870, the index has been calculated from data in Schön (2015), whose method of using primary price data was imitated by Häggqvist (2015). From 1871 to 1904 we have employed the already calculated terms of trade index in Södersten (1959), which was based on the unit values in the foreign trade statistics. Here, as for the period following 1904, the problem of undervalued import figures is present, but not at all as severe as during the late eighteenth and early nineteenth centuries. In other words, the unit values reflect market prices much

[5] Obviously, this presents a problem if the country's import mix does not match well with the British or American export mix.
[6] The data underlying Blattman et al (2004; 2007) is available, but simply does not report the terms of trade series for Sweden. See comparisons between Sweden and some other countries in the empirical section.
[7] Export data therein has been complemented with textile exports from Edvinsson & Gad (2018) for 1780–1799 and from Schön (2015) for 1800–1830.

closer than they did a century earlier. From 1905 to 1970, we calculated unit values for the largest sectors and commodities of exports and imports by dividing the value of those goods with the weight/volume in the official foreign trade statistics.[8] Lastly, from 1971 to 2018, the index has been connected to the official OECD series on the terms of trade.[9] The complete index from 1780 to 2018 has been linked together so as to not create mismatches where we have changed sources/method. Finally, the whole index has been rebased with 1914 as the base year. The sources and methods employed are summarized in table 1 below.

	Source	Price data	Price type	Detail level	Our input
1780-1829	Häggqvist (2015)	Primary	Market prices	Commodity	Calculated
1830-1870	Schön (2015)	Primary	Market prices	Sector	Calculated
1871-1903	Södersten (1959)	Secondary	Unit values	Commodity/sector	Employed
1904-1970	Statistical yearbook	Secondary	Unit values	Commodity/sector	Calculated
1971-2018	OECD	Secondary	Unit values	Sector	Employed

Table 1. Sources and methods employed.

As can also be seen in table 1 above, because of the increased complexity of foreign trade over time, we have generally moved from using data on the commodity level to the sectoral level. This will become even more apparent when we present the export- and import baskets in the following sections.

Terms of trade in Sweden, 1780–2018

In this section, we present the development of our terms of trade index as well as the underlying structure of Swedish foreign trade during the entire 240 year period. The general trends of export- and import-prices will also be discussed. We also make some comparisons between the terms of trade in Sweden compared to other countries in the "European periphery", where data is available. In the following sub-section, we calculate and analyze the volatility of the terms of trade and connect it to GDP growth rates.

Figure 1 below presents our terms of trade index for the entire period, from 1780 to 2018. A few things are evident in the general development. First, a clear upward trend occurred for more than a century, from about 1830 to 1960 when the index peaks and then levels out, and even decreases during the 1970s

[8] *Statistical Yearbook of Sweden* (*Statistisk årsbok för Sverige*), various issues. The data therein is a summary of the official series for foreign trade (*SOS Handel*).
[9] The OECD data only include the calculated terms of trade series. Hence, from 1971 onwards we do not have any proper export- and import price indices as we have for the rest of the period.

and 1990s. The long-run positive development of the terms of trade took place simultaneously with large structural changes in Swedish foreign trade, as we shall see in greater detail below. Second, each instance of large-scale warfare induced large shocks to the terms of trade. Here, the Napoleonic Wars caused the single largest fall in the index, with about 70 percentage points from 1803 to 1813. The terms of trade had improved slowly during the 1780s and 1790s, but with the escalation of large-scale warfare on several fronts, economic warfare, and increasing transport costs, things would quickly change. Arguably, the single largest culprit was the blockades between England and France, which caused prices of the most important import commodities to skyrocket – sugar, coffee, tobacco, wine, and raw textiles increased by as much four times during the height of the war (Häggqvist, 2015, pp. 70–71). Relative prices of textiles, rye, and wheat, compared to iron, increased sharply during the blockade years as well, but fell as sharply once peace was resumed after 1815 (O'Rourke, 2006, figure 7, p. 139). This experience was not unique to Sweden, but occurred also in large parts of continental Europe, for instance in France, Germany, and Holland. Import-levels were very high during some of the war-years, particularly in Gothenburg who received the brunt of the British exports that were temporarily diverted to Sweden. The largest part of this increase were colonial goods mainly destined for re-export to the European continent. Heckscher (2006 [1922], pp. 264–265) connected these developments to increasing welfare. However, he stressed the importance of temporary increases in re-export flows, rather than the effects of the falling terms of trade. We then see similar developments in the terms of trade during the following large-scale global wars, the two world wars of the twentieth century. As the general Swedish economic experience of WWI was one of two halves, with increasing exports during the first part of the war, but decreasing during its intensification and final states, so developed the terms of trade (Hedberg, 2016). It first increased rapidly from 1914 to 1916 and then dropped sharply in 1917 and 1918 when warfare intensified. The experience of sharply increasing import prices was replicated here, but compared to the Napoleonic Wars, export prices also went up notably (see appendix, figure A.1.). A combination of warfare, trade blockades, and increasing transport costs were again proximate causes of the price increases (Findlay and O'Rourke, 2007, pp. 430–433). Globally, price gaps seemed to increase with distance, and were dramatic for instance with cotton between Liverpool and New Orleans, and wheat between London and Calcutta (Hynes et al., 2012, figure 4, p. 134). Absolute prices increased sharply on foodstuffs such as beans, butter, and fish, but also on tobacco, coffee, and spirits, as well as textiles and iron (Blattman et al, 2004; Federico and Tena-Junguito, 2016). In Sweden, prices on typical imports such as tobacco, sugar, coffee, tea, cocoa, and spirits went up by two to three times during the war years, particularly in 1917 and 1918. Global developments were not the sole cause of the price hikes, but some domestic tariffs on imports were also increased during the war, such as those on beef, malt, spirits, and paperboard

(Hedberg and Häggqvist, 2019).[10] During World War II (hereafter, WWII), the sharpest drop occurred in the beginning of the war, when the index fell by about 60 percent from 1939 to 1941. It then picked up rapidly during the second half of the war. Arguably, the effects of WWII were harsher on Swedish trade than it had been during WWI, with Sweden now being cut off from the Atlantic market almost completely. Large drops in both exports and imports followed from the outbreak of the war and blockades until 1941, but levels continued to fall until 1945 (Hedberg and Karlsson, 2015). The experience during WWII stands out also in the sense that prices on Swedish exports increased somewhat more rapidly than import prices (see appendix figure A.1.) Based on the unit values from the foreign trade statistics, prices increased sharply on staples such as butter and meat, but also on timber and pulp. Among import commodities, rationed goods such as coffee and sugar rose sharply in price, but also wool and hemp. Across the tumultuous period 1914–45, the Swedish terms of trade did grow on average two percent per year (see table 2), but as can be suspected from figure 1, and will be discussed later, volatility was generally high during this time, and certainly more so during the wars than during peacetime. Smaller European wars of the nineteenth century also impacted Swedish foreign trade, seen for instance in a significant surge in export volumes during the Crimean War (1853–1856) and the Franco-Prussian War (1870–1871) (Hedberg & Karlsson, 2015). However, it doesn't seem to have had any larger effect on the terms of trade, but rather we can only observe minor movements. During the Crimean War the terms of trade improved only very modestly, about six percentage points. One proximate reason was that price spikes occurred not only with imports, but there were similar spikes with some of the major exports, such as grains and timber, which increased about 50 percent during the war-years (Jörberg, 1972). Rather, we see a clear spike in the index in peacetime following the Franco-Prussian War, from 1872 to 1874. In total then, there seems to be some support for the connection between the size of wars and the movements in the terms of trade.[11]

[10] However, because most tariffs were specific, most of them fell measured as ad valorem when prices went up.
[11] A similar point is made in Jacks et al. (2011) on price volatility.

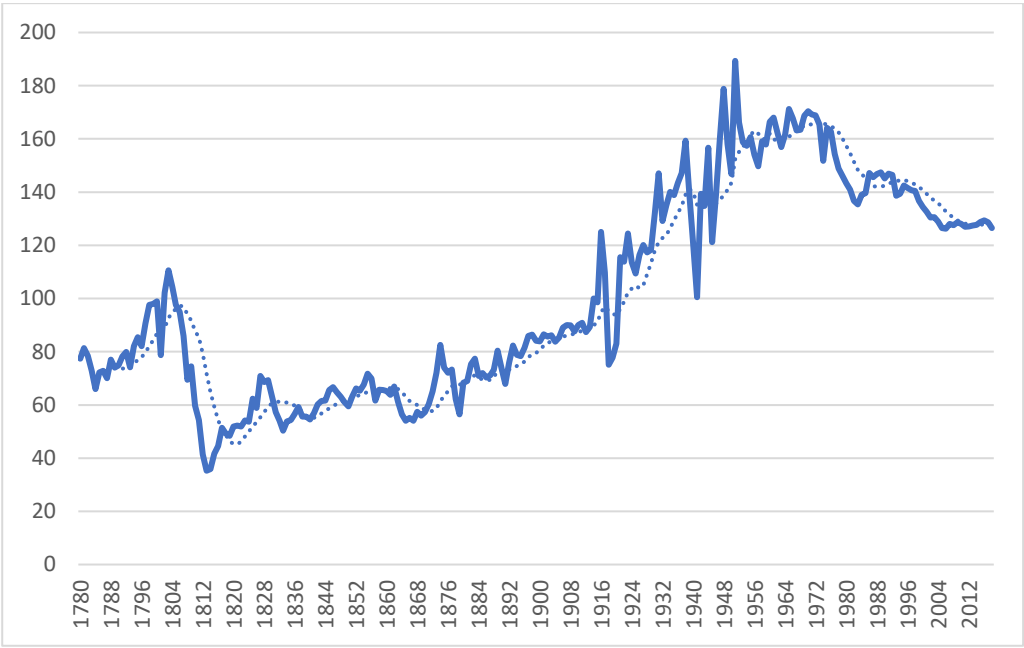

Figure 1. Terms of trade, 1780–2018. 1914=100.
Source: see method section.
Note: Full line=annual values. Dotted line=10-year moving average.

Period	Average annual change (%)	Period of major war
1780–1830	0,2	Yes
1831–1870	-0,1	No
1871–1913	1,3	No
1914–1945	2,0	Yes
1946–1970	1,7	No
1971–2018	-0,6	No

Table 2. Terms of trade growth rates across selected time periods.
Source: see table 1.

The development of the terms of trade index is often connected not only to price movements, but also to the general trade structure of the country. A high concentration of exports on a small number of commodities, particularly in raw material and food, can for instance be very negative for economic growth when combined with a rise in the terms of trade (Williamson, 2011). We will discuss these connected matters in the following. As can be seen in figure 2 and table 3 below there were large changes to the Swedish export sector over this long period. Iron was very dominant during the first half century, with bar iron being the single largest export commodity, making up on average 60

percent of the total. The metal sector as a total would remain large though, because over time bar iron was switched out for export of machinery and vehicles, iron works, and iron ore. During the second half of the nineteenth century agricultural exports (oats most of all) grew in importance, but rapidly dwindled after the turn of the century. During the industrialization phase forestry goods, battens and other sawn wood, became the largest among the export sectors. Export concentration, as can be seen in figure A.5 in the appendix, increased rapidly after the Napoleonic Wars when bar iron made up over 70 percent of total exports. Between the middle of the 1830s and the 1870s exports diversified greatly and were more evenly spread among a larger number of goods.[12]

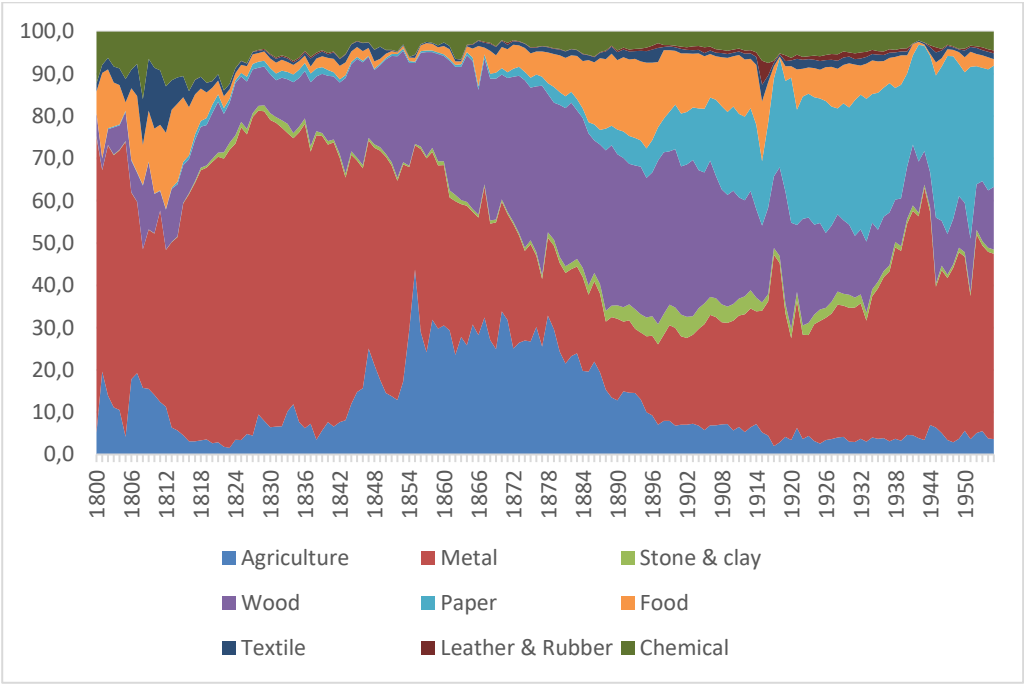

Figure 2. Export by sector, 1800–1955, share of total.
Source: Schön, 2015, table VIIb.

[12] We do not have complete information on import concentration, as it tends to be a lot more aggregated than the export statistics, but suffice to say that it was generally markedly lower than export concentration, particularly so during the first half century of the period. However, import concentration tended to increase during times of war – as it did so during the height of the Napoleonic Wars, the end of WWI, and the beginning of WWII.

	Bar iron	**Herring**	**Battens**	**Iron manufact**	**Copper**
1780-1830	60	9	5	4	3
	Bar iron	**Battens**	**Grains**	**Copper**	**Timber**
1831-1870	58	12	11	5	2
	Battens	**Bar iron**	**Grains**	**Butter**	**Wood works**
1871-1903	32	9	9	8	7
	Battens	**Pulp**	**Paper**	**Iron ore**	**Iron works**
1904-1939	25	22	11	10	7
	Pulp	**Paper**	**Battens**	**Iron ore**	**Iron works**
1940-1970	27	14	14	13	10

Table 3. Export by largest commodities, percent of total export (average per period)
Source: Häggqvist, 2015; *BiSOS F; SOS Handel*.

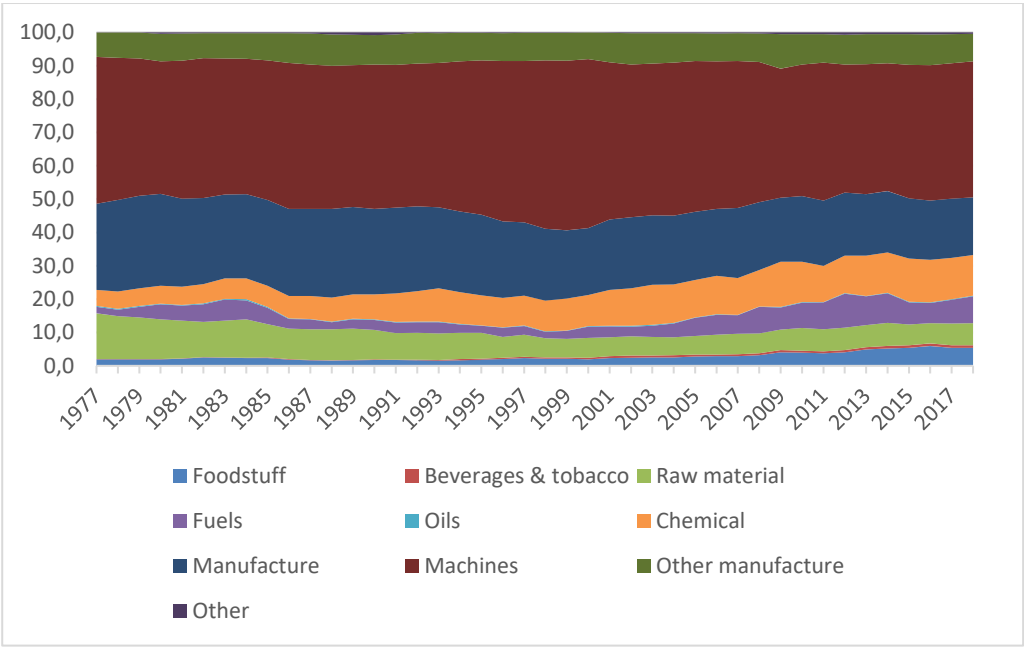

Figure 3. Export by SITC classification, 1977–2018, share of total
Source: *Statistics Sweden*.

Figure 4 below depicts the share of exports made up by manufactured goods.[13] The export basket was clearly dominated by raw materials during the

[13] The composition naturally changes somewhat over time, but we have attempted to keep it as stringent as possible.

eighteenth and nineteenth centuries, with a slight exception during the Napoleonic Wars when textile exports boomed.[14] The share of manufactures was below ten percent before the 1870s when it more than tripled in a short space of time. This upward trend then continued all the way up until the 1920s when levels plateaued at slightly below 50 percent. The manufactures which increased the most before WWI were wood works such as matches and pulp, paper, and machinery. At the same time raw materials such as bar iron and most of all grains decreased in relative importance. As can be seen in table 3 pulp, paper, iron works, and machinery then came to dominate the export sector during the first half of the twentieth century. As seen in figure 3 above, machinery and general manufactures, including pulp and paper, although they have decreased in relative size, has made up more than half of total exports during the modern era.[15] In general, the terms of trade has followed the steady upward trend in manufacture exports, a correlation which is to be expected based on previous research. The industrialization of the export sector follows the general trend of the Swedish industrialization process. Furthermore, the share of manufacture exports fluctuated wildly during the 1930s, 1940s, and 1950s when the terms of trade also fluctuated. There are some stark differences between our measure of primary exports and imports relative to the share of manufactures/finished goods, compared to the numbers in the Federico-Tena-Junguito world trade database (Federico and Tena-Junguito, 2016). In the appendix, figure A.6. these differences become evident. Our series of the share of primary exports (the inverse of figure 4 below) follows a rather steady and slow industrialization process, while the export series from Federico and Tena-Junguito displays two very sharp drops. There, the share of primary products in the export basket drop from 56 to 26 percent in only one year, from 1906 to 1907, and then again from 36 percent in 1915 to 15 percent in 1917. This drop during WWI is present also in our data, based on primary sources, but stretched out over more years. The 1906–1907 break in the series is not, and we have not been able to find anything resembling it in either the primary sources on Swedish foreign trade data, or in any reproduction (Johansson, 1967, and Schön, 2015, for instance).[16] Furthermore, the import series display clear differences between the Federico and Tena-Junguito one, and the one we have used from Schön (2015, table VIIc). These

[14] However, there is the possibility that this category also included items such as raw cotton, raw hemp, and raw silk during the war, hence overestimating somewhat the bump in the share of manufactures.

[15] Forestry in general, and pulp and paper particularly, lost out to international competitors (Canada and Finland) already in the 1960s and 1970s and its share of total export had been cut by more than half during these decades (Karlsson, 2012, pp. 71–74). During the 1990s it went down further to about five percent of total exports (Statistics Sweden).

[16] Furthermore, the number for the share of primary products in total exports in Blattman et al., (2007, table 2, p. 162) for 1870 (91 percent) is much closer to our series (94 percent) than that in Federico and Tena-Junguito, 2016, (71 percent).

differences may be because of different definitions of manufactures and primary products, since the differences are quite large, but we have not been able to get to the bottom of these differences.[17]

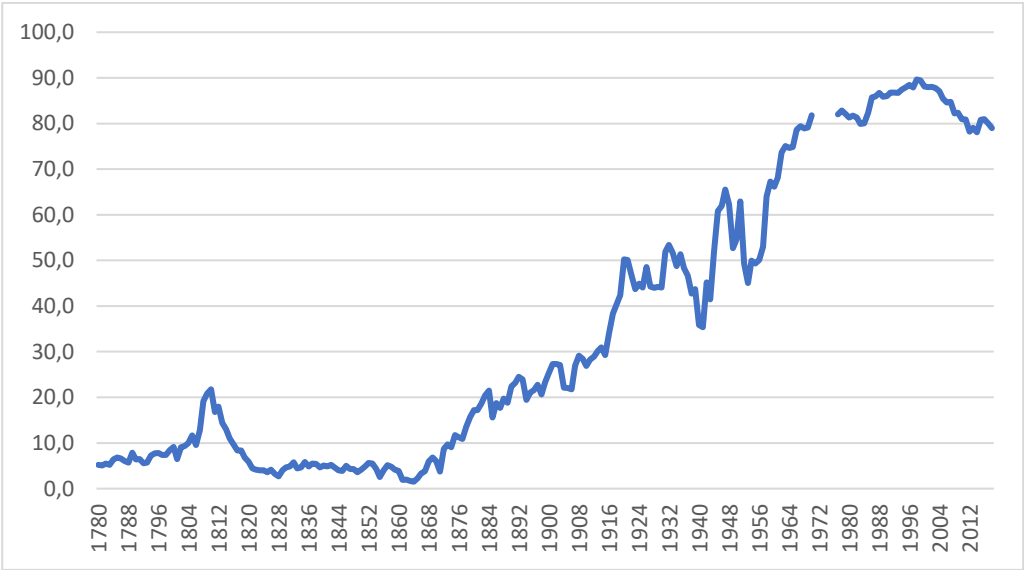

Figure 4. The share of manufactures in total merchandise exports, 1780–2018. Source: see table 2 and figure 3.

In general, the import sector experienced slower change than the export sector, although seen over the whole period it has also changed structure to a large degree (see figure 5 and figure 6 below). Agricultural imports, grains most of all, were dominant during the beginning of the nineteenth century, but decreased slowly all up until present days. Food imports such as sugar, coffee, and alcohol were also important during the nineteenth century, but imports of foreign foodstuffs as share of total imports declined during the twentieth century. Instead Sweden has slowly moved toward importing more industrial goods, or manufactures, within metallurgy, machinery, and chemical industries. The structure of foreign trade has hence followed the general world trend, where international trade in the modern era is more within industry, than between different industries (Findlay & O'Rourke, 2007, ch 9). To put it another way, in the long run Sweden has moved from being a primary exporter

[17] As far as we have been able to gather from the annotation in the Federico-Tena-Junguito world trade database, the Swedish export and import figures have been taken from SCB, 1972, table 4.2, on aggregate trade from 1871, Mitchell (2003) from 1830 to 1870, which were then extrapolated back to 1800 using total trade from Schön and Krantz, 2012, table III. However, we do not know from where and on which basis Federico and Tena-Junguito have defined and calculated primary exports and imports for Sweden.

and an importer of both raw materials and finished goods, to mostly trading in manufactures.

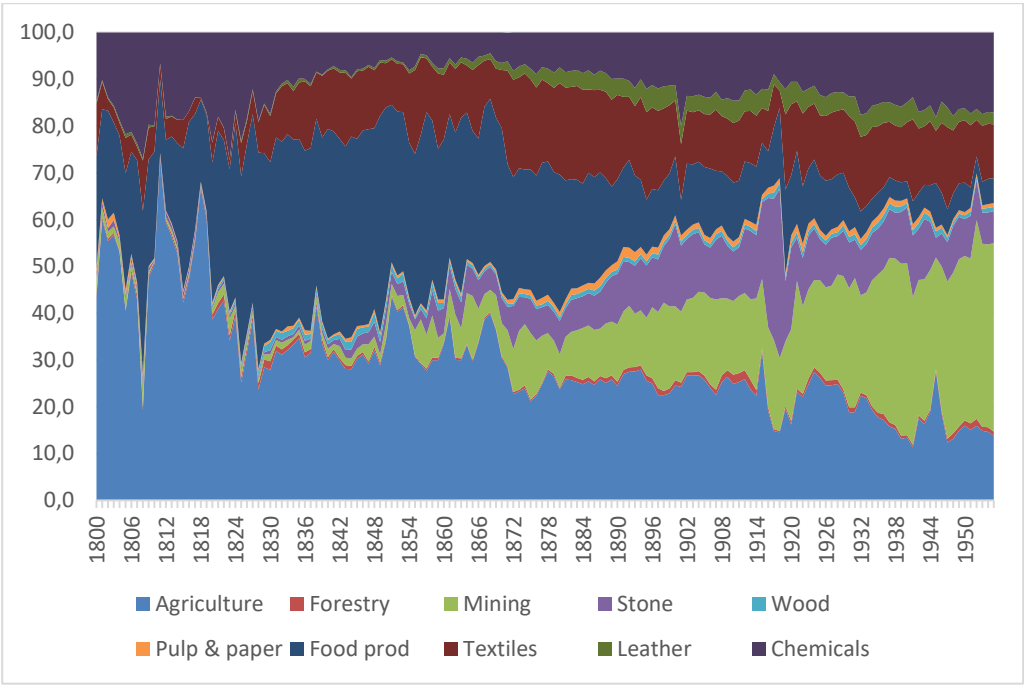

Figure 5. Import by sector, 1800–1955, share of total.
Source: Schön, 2015, table VIIc.

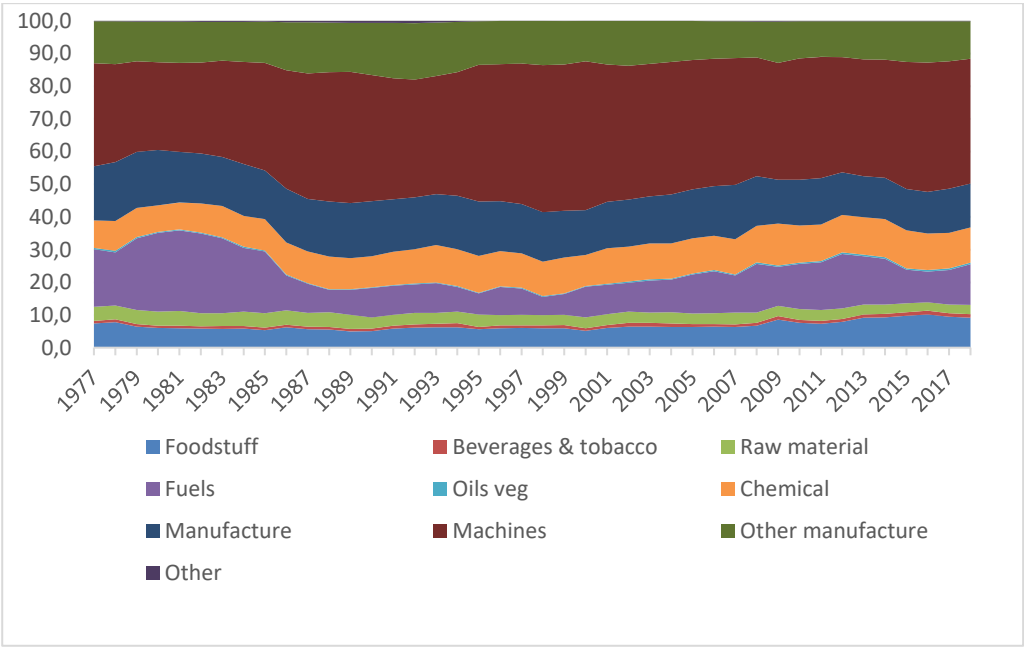

Figure 6. Import by SITC classification, 1977–2018, share of total.
Source: *Statistics Sweden*.

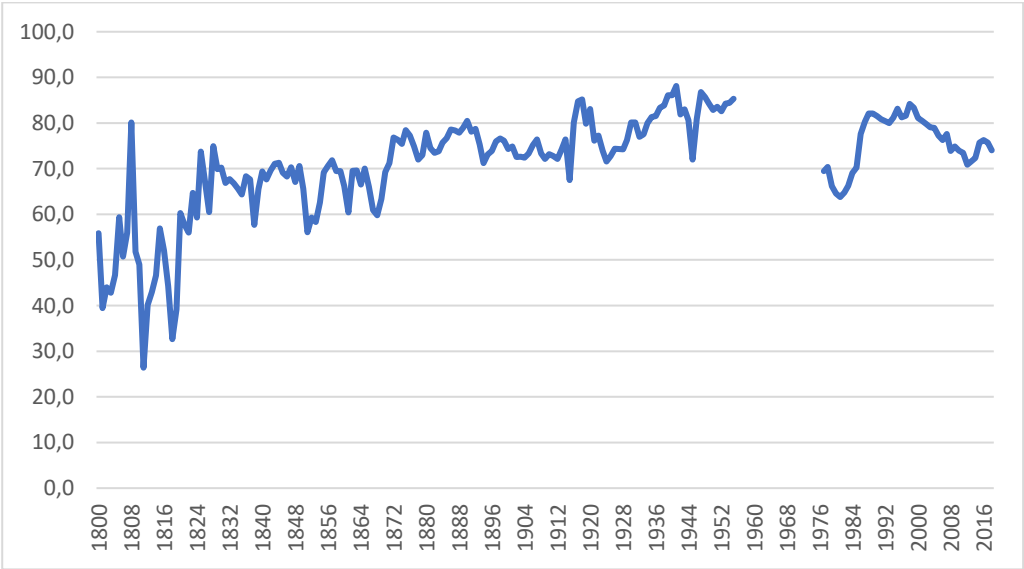

Figure 7. The share of manufactures in merchandise imports, 1800–2018.
Source: See figure 5 and figure 6.

In the appendix (figures A.2., A.3., and A.4.) we present series on long-run real export and import, and compare our series to those in the Swedish Historical National Accounts (SHNA). For most of the period the series move

similarly (between 1830 and 1870 this makes sense since we use Schön's price data), but there is some divergence during the interwar period and WWII. There our export-figures display lower levels than the SHNA-series, while the inverse is true with imports.

Terms of trade and trade structure in Sweden compared to other countries

How does the development of the Swedish terms of trade compare to that of other countries? Here we will make use of what data is available, which will limit the comparisons to mostly between 1865 and 1939, based on data from Blattman et al. (2004). The results of that are summarized in figure 8 below. The Swedish terms of trade generally moved in conjuncture with the rest of the European periphery[18] (Denmark, Norway, Greece, Portugal, and Spain), but most closely resembled that of the Scandinavian neighbors before 1914. During WWI there was some divergence, with quickly rising terms of trade in Greece and Norway, but rather the contrary in Sweden and Denmark. In relation to the Great Depression, there were severe fluctuations and dips in the index in most of the European periphery, while in Sweden there were rather slow improvements. This could be a result of the construction of the series, as the Blattman et al. series uses either a British export index or American export index as proxy for import indices for all countries, which did not decrease as much as the weighted Swedish import index we use here.

[18] This term and division of countries is adopted from Blattman et al., 2007, and Williamson, 2011. Therein, the European periphery also includes Russia and Serbia, not included here.

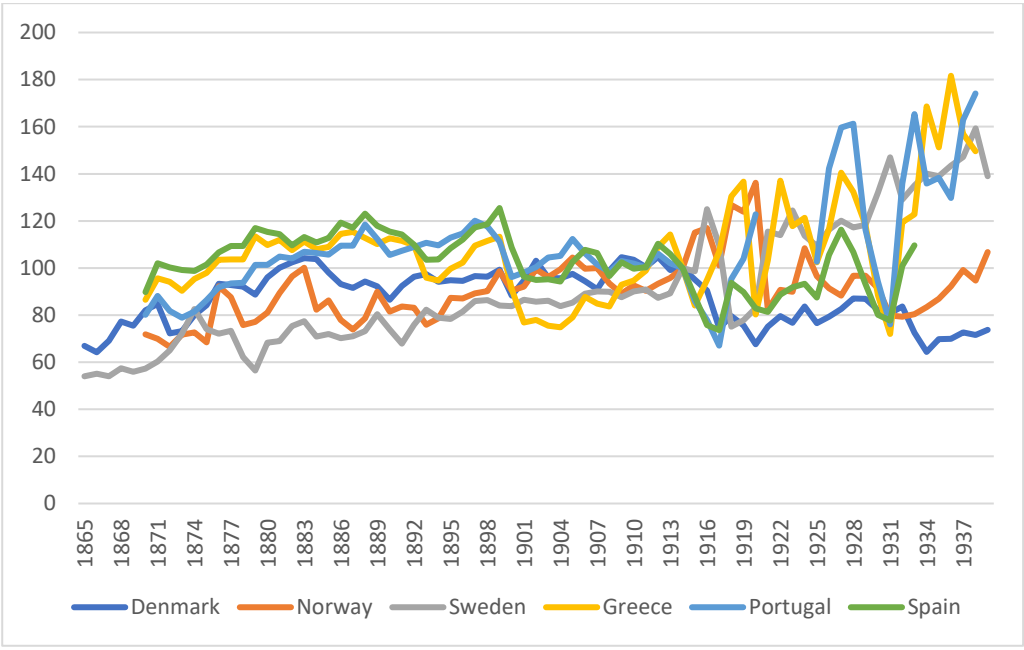

Figure 8. Terms of trade in Sweden compared to other countries in the European periphery. 1914=100.
Source: this paper, and Blattman et al., 2004.

Plausibly, the Swedish terms of trade experienced less volatility compared to the rest of the European periphery, as a result of having more industrial exports, and fairly low concentration of exports (see table 2). In Blattman et al. (2007, table 2, p. 162) Sweden had about half the volatility of the rest of the European periphery, and even slightly lower than Germany and the UK in the economic core. The share of primary exports and export concentration was also fairly low in Spain, who had the second lowest terms of trade volatility in the European periphery. Food and raw material exporters such as Greece (fruits, olive oils, and lead) and Portugal (wine, cork, and fish) seem to have experienced heavy fluctuations during certain periods. Possibly then, Swedish industrialization that spread into the export sector decreased trade instability, and made the terms of trade less volatile. Following Jacks et al. (2011) we should expect globalization and market integration to be positively connected to decreased volatility. There is some evidence of that here, as exports as share of total GDP (as a measure of openness to trade) increased (albeit slightly) during the first wave of globalization, and decreased during the interwar period.

	Primary exports (%)			Exp concentration (%)			Exp/GDP (%)		
	1870	1900	1938	1880	1900	1938	1870	1900	1938
Denmark	93	95	76	48	63		16	21	20
Norway	99	86	60	62	51		14	15	13
Sweden	96	75	57	48	45	40	15	17	15
Greece	100	96	97	73	64		15	18	18
Portugal	95	84	92	60	45		4	3	5
Spain	88	74	76	46	26		6	12	4
Average	95	85	76	56	49		12	14	13

Table 4. Export structure in the European periphery.
Source: Sweden: this paper. Primary exports and exports/GDP: Federico and Tena-Junguito, 2016. Export concentration: *Statistical abstract of foreign countries.*
Note: Export concentration measures the share of the two large commodities out of total exports.[19]

Terms of trade volatility and economic growth in Sweden

The volatility of the Swedish terms of trade was comparatively low during most of the examined period, with exception for during the Napoleonic Wars, and the two world wars, as well as during the turmoil of the inter-war years. When analyzing volatility, we have followed Blattman et al. (2004) and Williamson (2008) and have employed a Hodrick-Prescott filter in order to identify the trend and cyclical component of the terms of trade series.[20] The volatility of the series was then measured as the decadal standard deviation of departures from this trend during different time periods. As can be seen in figure 9 below, the three major wars constituted significant external shocks to the Swedish terms of trade, as witnessed by the three distinct peaks in volatility during the war years 1803–1815, 1914–1918 and 1939–1945. Following the Napoleonic Wars, the volatility of the terms of trade quickly returned to

[19] Note further that our figures on export concentration are consistently lower than those in Williamson (2011, table 4.2, p. 52). We believe this to be a result of an incorrect summation of total exports in the data underlying Blattman et al. (2007), as far as we can gather following Mitchell (2003). For instance, for Norway, only fish, milk, and wood products make up "total" exports, while in the full data (from *Statistical abstract of foreign countries*) these three categories make up only 57 percent of total exports. The case is even worse for Cuba, where in Williamson sugar and tobacco are shown to make up 100 percent of all exports, while in reality they make up 90 percent. Cuba also exported fruits and nuts, spirits, hides, iron ore, and wood products, for instance.
[20] However, note that Chilosi et al. (2023) preferred a regression-based approach, an OLS panel fixed effects model, when measuring terms of trade volatility trends. See also Cariolle (2012) on other possible ways of measuring macroeconomic volatility.

relatively low levels, whereas it remained elevated between WWI and WWII, and only decreased slowly during the early post-WWII period. The century-long period between 1816 and 1913 stands out as the only period when fast and steady growth in the terms of trade was coupled with low volatility. While the growth in the terms of trade trend accelerated somewhat over the ensuing half century, it was also followed by significantly higher volatility. The falling trend in the terms of trade from the early 1970s was, conversely, accompanied by a marked decrease in volatility. Seen over the whole period, the average volatility of the terms of trade series was +/- 7.4 percent. If we exclude the major war years this figure drops to +/- 6 percent. Between 1816–1913 and 1960–2018 the average volatility was only +/- 4.4 and 3.7 percent respectively, while between 1914 and 1959 it averaged +/- 15.2 percent.

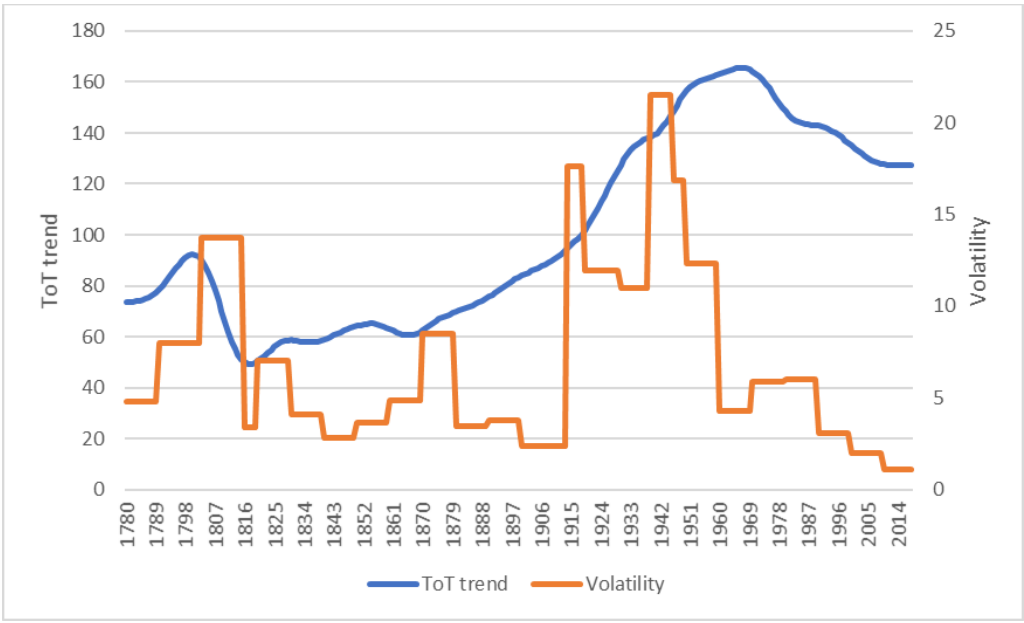

Figure 9. Trend and decadal volatility of the Swedish terms of trade, 1780–2018.
Source: See method section.

According to Blattman et al. (2004), Hadass and Williamson (2003), and Williamson (2008, 2011), we should expect growth in the terms of trade trend to be correlated with growth in real GDP per capita, at least from the mid-1860s, when the share of manufactures in Swedish exports began to rise. We should furthermore expect that this correlation would be stronger for periods with low volatility in the terms of trade. These expectations seem, in fact, to be corroborated by our data. In figure 9 below we have plotted ten-year average growth rates in the terms of trade trend against ten-year average growth rates in real GDP per capita. For the full period 1780–2009 the correlation is positive, but

rather weak (r = 0.29). If we remove the years of the Napoleonic Wars (1803–1815), which appear as an outlier in the lower left corner of figure 10, the correlation weakens even further (r = 0.23). But if we instead focus on the long nineteenth century period between 1816 and 1913, which was characterized by fast and steady growth in the terms of trade trend combined with low volatility, the correlation becomes much stronger (r = 0.58). If we only look at the period from 1870 to 1913, when the share of manufactures in the Swedish export basket started to rise, the correlation becomes quite strong (r = 0.71). By contrast, if we instead look at the period between 1914 and 1959, which was also characterized by fast growth in the terms of trade trend, but accompanied by much higher volatility, the correlation coefficient drops down to 0.33.

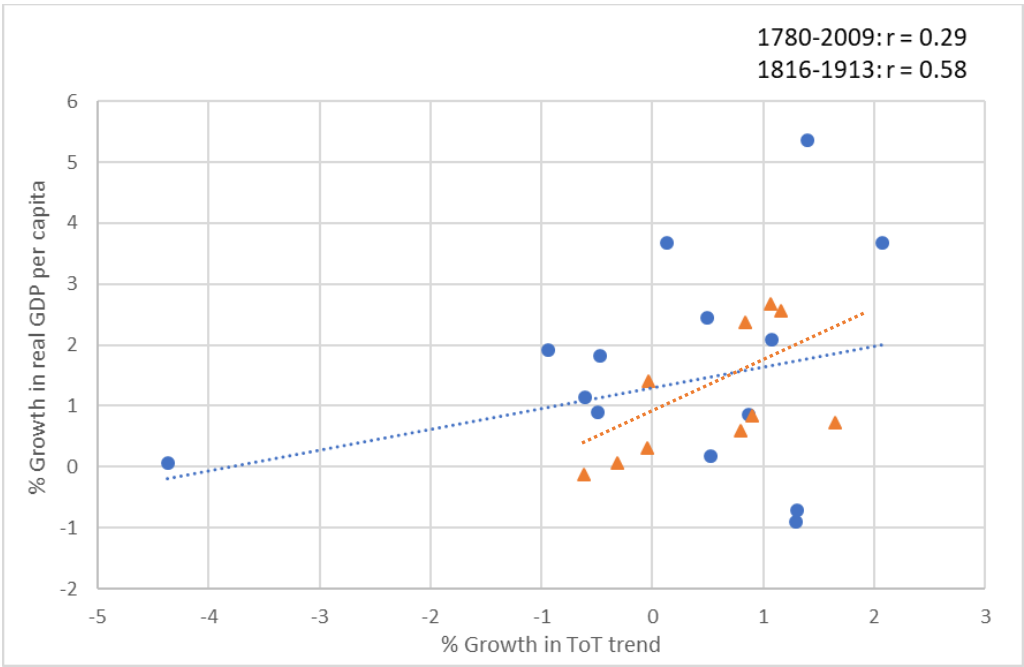

Figure 10. Correlation between terms of trade growth and growth in real GDP per capita, 1780–2009.
Source: Terms of trade: see method section. GDP: Schön and Krantz, 2012, table I.
Note: The orange dotted regression line is for the period 1816–1913, while the blue dotted line is for the full period 1780–2009.

If the development of the terms of trade did indeed support economic growth in Sweden during the nineteenth and early twentieth century, the underlying mechanism was most likely an increase in investments, prompted both by the secular improvement in the terms of trade – which would have raised the value

of output and hence the returns to investment in the export sector, and by the low volatility of the terms of trade, which would have stimulated foreign investment in Sweden. Capital imports fluctuated during the 1850s and 1860s, but never exceeded 50 million SEK per annum (about 5–6 percent of GDP). This changed during the 1870s and 1880s when the overall level increased, reaching almost 100 million SEK per annum at its height. Capital imports then dropped during the 1890s only to skyrocket to about 150 million SEK right after the turn of the century (Schön, 1989, p. 236). The large volume of capital imports was integral to economic growth and structural transformation as they "were channeled into the creation of new industries and investments in new technologies, such as paper and pulp, steel production, and electrical production, distribution and equipment, thereby laying the foundation for a transformation and industrial breakthrough in the decades before the First World War" (Lobell, 2016, p. 106).

Conclusions

In this paper we have drawn together data on Swedish foreign trade and prices during 240 years to analyze the terms of trade. We show a century long secular increase in the terms of trade index, from about 1816 to 1913, which was connected to large changes in the Swedish foreign trade structure. Exports became increasingly industrialized, and so did imports, but at a slower rate. This period was also characterized by low volatility in the index, something which is typically stated as positive for economic growth. Compared to the rest of the European periphery from 1870 to 1938, Sweden generally had a lower share of primary products in total exports, had relatively low export concentration, and was quite open to trade, which likely also caused the terms of trade volatility to be markedly lower than in the rest of this group of countries.

In line with previous research, we find that that growth rates were positively connected with low terms of trade volatility during this period, probably through the mechanism of promoting investments, which were largely funneled to new industries and innovation. The period 1914 to 1960 rather saw high volatility in the terms of trade, the highest we can report for the entire period. The two world wars caused large shocks to the secular terms of trade trend, and also caused high volatility, but volatility was also high and sustained during the interwar period, compared to other periods of peace. One problem for the "low terms of trade volatility promotes investment" thesis here is that even during periods of high volatility, such as during the 1910s, investments in electricity, power plants, and motors and machinery for industrial production increased (Schön, 2010, p. 236). The interwar period also saw high and quite sustained growth rates, on average 3.4 percent per annum from 1922 to 1939, while terms of trade was highly volatile. Hence, we find some support for the idea that increasing terms of trade with low volatility was positive for Swedish economic growth, but it seems it can only be said to hold for

the pre-WWI period. More research is needed on the connection between the terms of trade and the possible channels to economic growth, such as the structure of domestic and foreign investment, and whether there could have been other terms of trade forces at play in Swedish industrialization, for instance in moving labor and capital from agriculture to industry.

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Appendix

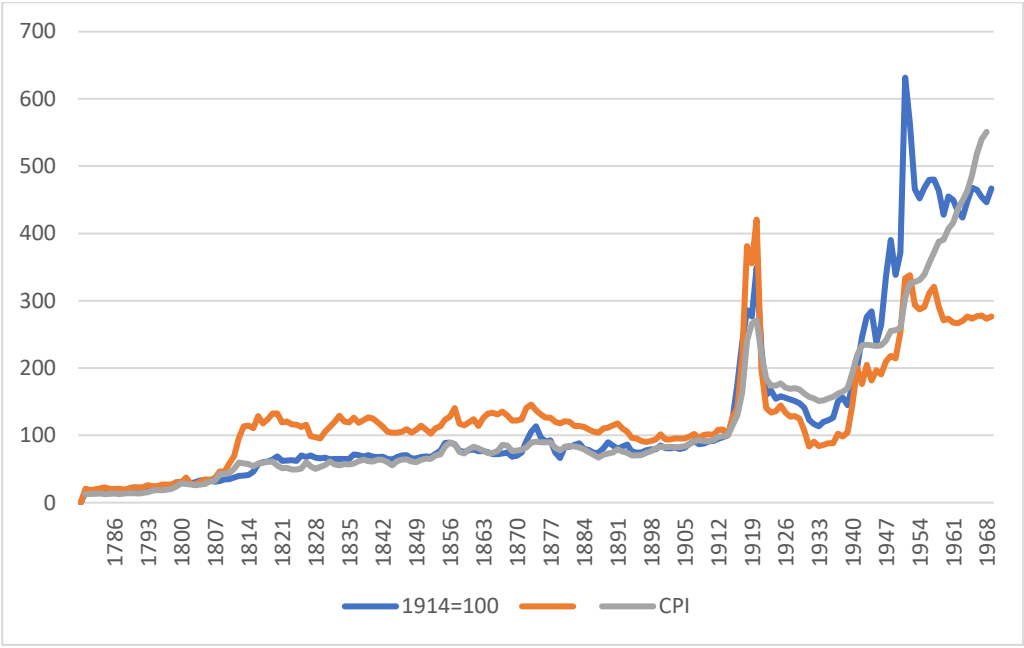

Figure A.1. Export- and import price indices compared to the consumer price index, 1780-1970. 1914=100.
Source: see table 2. CPI: Edvinsson & Söderberg, 2007.
Note: Export- and import price indices are trade-weighted.

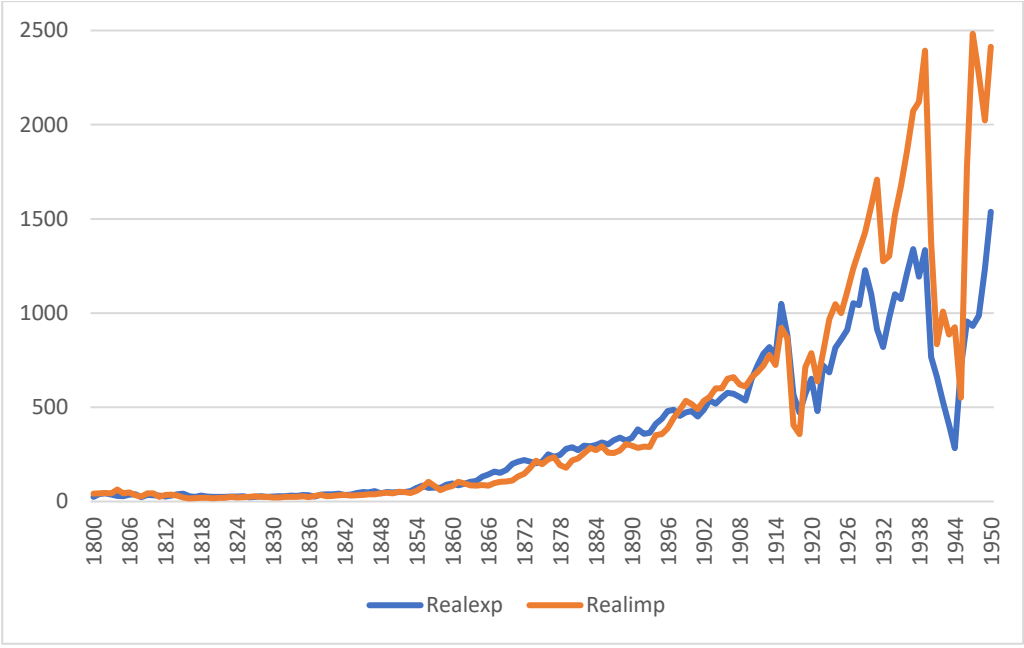

Figure A.2. Real export and real import, in million SEK, 1800–1950.
Source: export and import in current figures: Schön, table VIIa. Deflated with trade weighted export and import indices from figure A.1.

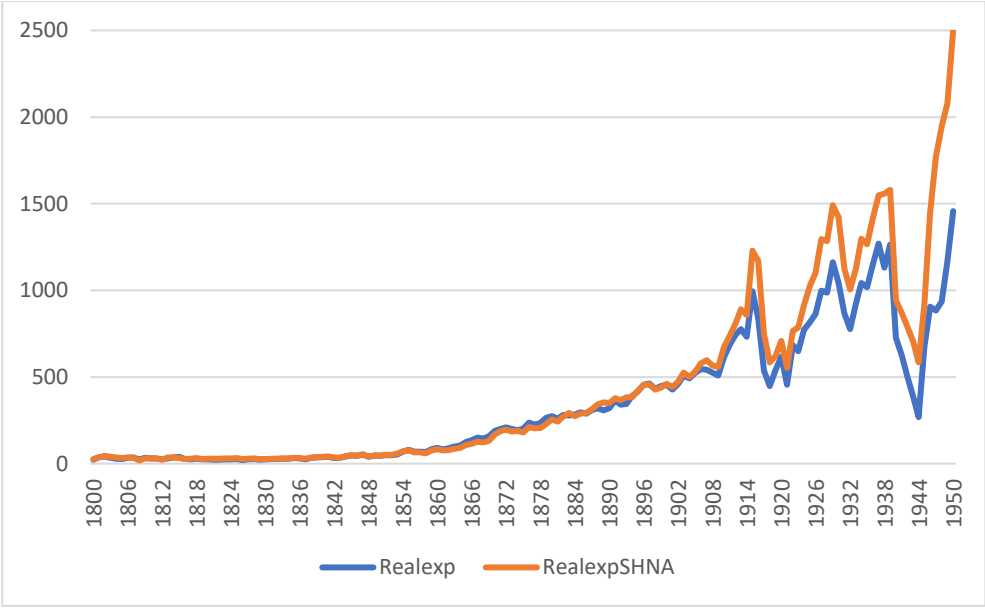

Figure A.3. Real export here compared to real export in the *Swedish Historical National Accounts (SHNA)*, 1800–1950.

Source: this paper and Schön & Krantz, 2012 (deflator), and Schön, 2015 (export).
Note: 1912=100, but in *SHNA* 1910-12=100.

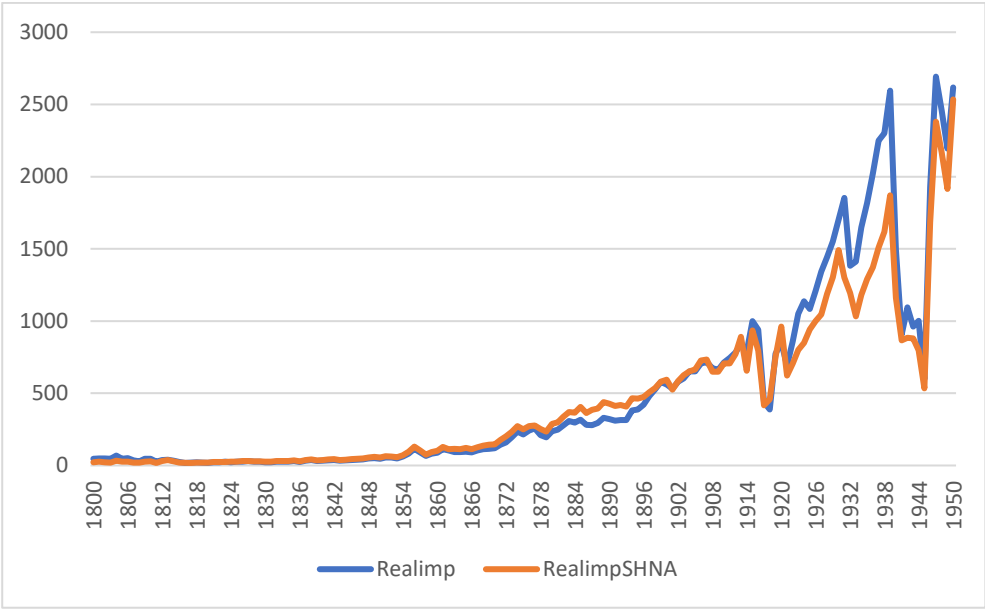

Figure A.4. Real import here compared to real import in the *Swedish Historical National Accounts (SHNA)*, 1800–1950.
Source: this paper and Schön & Krantz, 2012 (deflator), and Schön, 2015 (import).
Note: 1912=100, but in SHNA 1910-12=100.

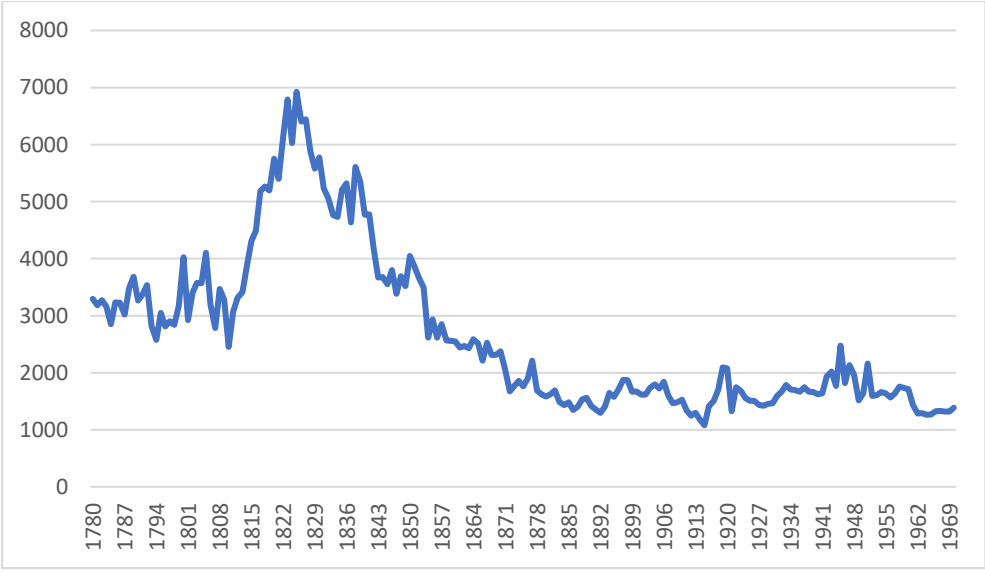

Figure A.5. Export concentration measured as a Herfindahl-Hirschman Index (HHI).
Source: see table 2.

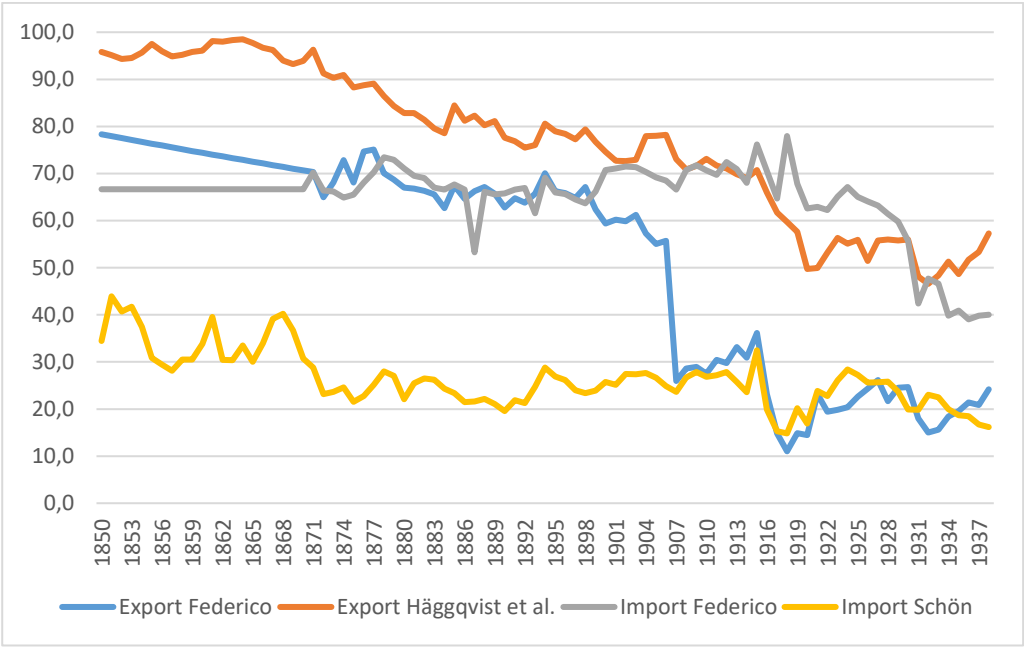

Figure A.6. The share of primary products in Swedish foreign trade, from different sources, 1850–1938.
Source: Federico and Tena-Junguito, 2016. Export: authors' calculations based on *BiSOS F*, and *Statistisk årsbok*. Import: Schön, 2015, table VIIc.
Note: in our definition of "primary products" the export of semi-finished iron such as bolt iron and sheet iron is not included, but is rather defined as manufactures/finished goods.