Commodity prices and International Inflation, 1851-1913

Stefan Gerlach
EFG Bank and CEPR

Rebecca Stuart
Université de Neuchâtel
and
Queen's University Belfast

30 October 2023

Abstract

This paper uses annual data to study the impact of commodity prices on consumer prices in 15 economies from 1851 to 1913. We calculate a simple measure of the common component of commodity prices which co-moves with the international business cycle and Granger causes consumer price inflation. Commodity prices are significant in standard inflation equations estimated by OLS in 14 of 15 economies. Estimating these equations using real shipping costs as an instrument suggests that commodity price movements associated with shifts in demand arising from international business cycles have a particularly large impact on inflation.

Keywords: Commodity prices, Gold standard, international inflation, business cycle.
JEL Number: E31, F40, N10

Declaration of interest: none

We are very much indebted to the editor and referee for a number of helpful suggestions, and to Sakari Heikkinen for data for Finland, to Vincent Geloso for help splicing together a series on prices in Canada, and to Lars Jonung and Juha Tarkka for help finding data sources. We are grateful to Daniel Kaufmann and participants at the Economic History Society annual conference 2022 for helpful comments.

Contact information : Rebecca Stuart (corresponding author), email: rebecca.j.stuart@gmail.com, website: rebeccastuart.net, address: Université de Neuchâtel, Institut de recherches économiques, Rue A.-L. Breguet 2, CH-2000, Neuchâtel, Switzerland

1. Introduction

This paper studies the impact of commodity prices on consumer prices in 15 economies in the period 1851-1913. To our knowledge, the role of commodity prices as a driver of fluctuations in inflation before 1913 has not previously been studied in the literature.

Existing studies on commodity prices from a historical perspective generally focus on the question of whether commodity markets were integrated internationally.[1] For instance, Klovland (2005) examined integration in Britain and German commodity markets over the period 1850-1913. Studying prices in both markets for 39 different commodities, he found that absolute price variability generally decreased over the period, indicating that markets became more integrated. Jacks (2005) examines the integration of commodity markets in the Americas and Europe, using commodity prices for the period 1800-1913. Studying 10 countries and focusing on the intra- and international integration of markets, he argues that there were dramatic increases in market integration in the first half of the century.

Other researchers have studied the long run cycles in commodity prices. For instance, Erten and Ocampo (2013) decompose commodity prices using filtering techniques to obtain low frequency cycles over the period since the mid-nineteenth century. Jacks (2019) carries out a similar analysis, using a band pass filter to obtain long-, short- and medium-run cycles in commodity prices since 1900. The author finds that historical episodes of mass industrialization and urbanization often interact with supply constraints to generate above-trend real commodity prices in markets such as energy, metals, and minerals for several years at a time. However, these demand shocks are usually offset by a supply response as

[1] See also Findlay and O'Rourke (2001) for an overview of the literature.

formerly dormant exploration and extraction activities take off, and induced technological change takes hold, to reduce supply constraints and eventually bring prices back to trend.

In this paper we focus on a third question, the role of commodity prices in the international transmission of inflation. Since Klovland (2005) and Jacks (2005) demonstrated that international commodity markets were integrated, it seems likely that commodity price increases would have impacted on import prices across the world.[2] This will lead to a positive correlation of inflation in individual economies. Indeed, the lack of literature on the historic relationship is somewhat surprising since the interaction between commodity prices and consumer prices in recent data is well studied in the literature.

We use annual data on UK commodity prices in sterling and consumer prices in local currency in 15 economies to study this question. In this period many exchange rates were fixed and, perhaps unsurprisingly, we find that our results are not sensitive to whether changes in the exchange rate are included in the econometric analysis. We first discuss our commodity price data and calculate a common component intended to capture broad commodity price movements. One issue with historical consumer price series is that often wholesale prices are used as proxies for retail prices. We therefore restrict our analysis to eleven metals and industrial products that we believe would neither enter the consumer basket, nor be used as proxies for items in the consumer basket.

We find that the common component of these eleven commodity prices co-moves with industrial production in the UK and US and with a measure of the cost of shipping, which is often seen as a good measure of the state of the international business cycle in this period.

---

[2] It is also well established that capital flowed freely across international borders. See for instance Obstfeld and Taylor (2005).

This supports the view that changes in commodity prices largely reflect swings in the international business cycle. Moreover, we find that commodity prices Granger cause inflation but that the converse is not true.

Eliminating any commodities that might be used as proxies for consumer goods makes finding co-movement between changes in commodity and consumer prices less likely. To see this, Cavallo (2008) notes that oil prices can affect consumer prices directly through prices of motor fuels and home heating products, and indirectly by raising the cost of production and transportation of goods that households consume. Since we exclude all commodities that might be used as proxies in the consumer basket, we exclude the direct channel identified by Cavallo, making our test for the relationship between commodity prices and consumer prices between 1851 and 1913 more stringent.

Nevertheless, we find that the subset of commodity prices, either as a group or individually, are highly significant in standard reduced-form inflation equations estimated by OLS for 14 of the 15 economies in our sample. We re-estimate these equations using real shipping costs as an instrument for commodity prices leads to numerically larger but, not surprisingly, also less significant parameter estimates. While Hausmann tests indicate that the IV and OLS estimates differ in a few cases, the IV estimates are numerically larger than the OLS estimates so often for the 15 economies that the hypothesis that the IV estimates are just as likely to smaller or larger than the OLS estimates must be rejected.

This paper is connected to studies of more recent data in which fluctuations in commodity prices play an important role in the inflation process. Since the oil crises of the 1970s, the importance of oil prices for consumer price inflation has been the focus of many studies (see, for instance, Darby (1982), Beckerman and Jenkinson (1986), Bomberger and Makinen

(1993), Adams and Ichino (1995)). Choi et al., (2018) and De Gregorio et al. (2007) both study the transmission of oil prices to consumer inflation since the 1970s using data from several countries and find that the impact of oil price shocks has declined over time. This is attributed to more credible monetary policy, less reliance on energy imports, and less reliance on oil per unit of GDP. Furlong and Igenito (1996) find that the leading indicator properties of non-oil commodity prices for inflation also declined since the 1970s. They propose several potential explanations for this finding, including a reduction in commodities' share of overall output, less use of commodities for inflation hedging, an offsetting response from monetary policy and a change in the mix of shocks affecting inflation over time.[3]

This paper is also related to literature which identifies demand and supply shocks in global commodity markets.[4] One theme in this research is that common movements in commodity prices can be interpreted as reflecting shifts in the demand for commodities caused by swings in the global business cycle.

An early study was conducted by Pindyck and Rotemberg (1990), who examine the role of macroeconomic variables in explaining the co-movements of seven commodity prices. They find important roles for inflation, industrial production, a basket of exchange rates, 3-month Treasury bills, M1 money supply and stock prices in explaining co-movements in

---

[3] In addition, the role of commodities as an inflation hedge in investment portfolios has been studied in the finance literature by, for instance, Gorton and Rouwenhorst (2006), Gorton et al., (2007), Cao et al., (2010) and Crawford et al., (2006). These papers consider whether the positive correlation between inflation and commodity prices can be exploited to hedge against the negative correlation usually observed between inflation and other portfolio assets such as stocks and bonds. Zaremba et al., (2019) apply wavelet analysis to commodity prices and inflation data from the United Kingdom for the years 1265 through 2017, and find robust inflation hedging properties of agricultural, energy, and industrial commodities for the 4- to 8-year horizon over most of the sample period.

[4] See for instance, Byrne et al., (2013), Chen et al., (2014), and West and Wong (2014).

commodity prices. More recently, Alquist et al., (2020), employ a factor-based identification strategy to understand the drivers of a set of 40 commodities using monthly data over the period 1957 to 2013. They identify a common factor, which loads positively on all commodities and reflects movements in commodity prices arising from general equilibrium effects. This factor accounts for 60-70 per cent of the variance of the commodity prices in the study. Delle et al., (2021) also extract factors, this time from a cross-section of 64 commodities. They find that most of the fluctuations in commodity prices are explained by a single global factor, which is closely related to fluctuations in global economic activity. Interestingly, they find that the importance of this factor increased over the period that they study (1980-2020), and particularly since the early 2000s.

Other studies have focused on narrower sets of commodities. For instance, over the period from 1840 to 2010, Stuermer (2017) shows that metal commodity demand is strongly linked to industrialization, specifically, manufacturing output. A series of papers by Kilian and others (Kilian (2009), Kilian and Murphy (2014), Kilian and Baumeister (2014)) study the impact of various supply and demand shocks to oil prices.[5] For instance, Kilian and Murphy (2014) argue that the oil price surge during the period 2003–2008 was caused by unexpected increases in world oil consumption driven by the global business cycle. Kilian (2009) and Stuermer (2018) show that cycles in commodity prices, such as crude oil and metals are mainly driven by global demand shocks.

These papers typically identify two or more shocks. For instance, Stuermer (2018) identifies a global business cycle driven demand shock, a supply shock and a third shock which he

[5] See Baumeister and Hamilton (2019) for a critique of the methodology used in these papers.

refers to as "other demand shocks" which are any residual shocks uncorrelated with the first two shocks. In this paper, we are primarily interested in the role of demand shocks arising from the global business cycle, and for simplicity will refer to other shocks as "supply shocks".

Relatedly, there are several studies measuring real activity in the period covered here, that is, before official national accounts were compiled. A key finding of this literature is that commodity prices are endogenous to the global business cycle. Burns and Mitchell's (1946) seminal attempt to date business cycles in the US and UK still underlie NBER chronologies today. More recent efforts by Miron and Romer (1990) and Davis (2006) for the US and Klovland (1998) for the UK have sought to improve on earlier efforts. Measures such as these draw on several data sources, but Klovland (2003) shows that shipping freight rates match extremely well with business cycle chronologies and commodity prices.[6] We will draw on this work to understand better the role of supply and demand shocks in our results.

The rest of the paper is organised as follows. In the next section we turn to the data, calculate a measure of the common movement in commodity prices, and relate it to a measure of global business cycles. In Section 3 we focus on the relationship between commodity prices and inflation. We first estimate the inflation equations with OLS, implicitly making no distinction between changes in commodity prices caused by demand and supply factors, before re-estimating them with Instrumental Variables (IV). Section 4

---

[6] Various measures of freight rates are also available from Isserlis (1938), North (1958) and Harley (1988).

presents our results at the commodity level and focussing on a subset of commodities. Section 5 concludes.

2. The data

2.1 Consumer and commodity price data

The data on consumer price inflation used in this study are drawn from a variety of sources, which are discussed in detail in Gerlach and Stuart (2023). Table 1 provides the sources and descriptive statistics of the various measures of inflation used here. The median and average annual inflation rates are around 0.4%, respectively and the interquartile range and the standard deviation of inflation are around 5%. Interestingly, the behaviour of inflation in this period is broadly similar across countries, and no country is an obvious outlier.

Our commodity price data are sourced from a series of papers written by Augustus Sauerbeck (1886, 1893, 1908 and 1917).[7] Sauerbeck (1886) first compiled data on commodities in sterling in the United Kingdom for the period from 1846 to 1885, while subsequent publications added additional years of data to the original series. The data were collected directly from private firms, as well as publications such as *The Economist*, and are generally for average prices during the year.

In total, Sauerbeck collected 43 data series for the period 1850-1913.[8] In several instances, Sauerbeck included the prices for two or more varieties of a product, for instance, "prime"

[7] The 1917 publication is technically written by an anonymous editor of the Statist but is referred to as being "in continuation of Mr A. Sauerbeck's figures". As such, for simplicity we refer to this as Sauerbeck (1917).
[8] Sauerbeck provides price levels for each series. Rates of change are calculated as log differences.

beef and “middling” beef or “merino wool” and “English wool”. We follow Sauerbeck in taking the simple average of series such as these to obtain overall categories, such as ”beef” and “wool”.[9] This reduces the number of time series to 33.

Table 2 shows the median, mean, interquartile range and standard deviation of annual percentage changes of the price series. Sauerbeck groups the data into six categories: corn or grains; meat and animal products; sugar, tea and coffee; minerals; textiles and sundry materials. While most commodity prices increased over the sample period, it is evident that some commodity prices declined. In particular, the prices of grains such as wheat, barley, maize and potatoes all fell over the sample period. In addition, some consumer goods declined in price over the period. Products such as sugar and tea had experienced an increase in demand in the early part of the century as income growth enabled more consumers to afford them. However, in the second half of the century, expanding production led to an overall decline in their prices. Other products fell out of favour over the course of the sample period. Tallow is an example: as alternative products for making candles became available, tallow was less in demand.

Table 2 also shows that there are large differences in the variance of price changes between commodities. In particular, the prices of the grains and textiles categories – crops for which fickle weather can affect harvests – had the highest variance, while prices of meat and animal products – farm products that were much less dependent on the weather – had the lowest variance.

[9] The exception is pig iron and iron bar prices, which we do not combine, as we find that pig iron prices are particularly important in our later analysis.

Sauerbeck discusses some weaknesses in his data. As with all price data, changes in quality over time are difficult to capture. Moreover, he notes that prices of some commodities such as sugar, coffee and flax, must be considered as only approximately showing the course of prices, although "the greatest pains have been taken to maintain their standard as near as possible" (Sauerbeck (1886, p. 632)). However, one significant advantage of using these data is that they reflect commodities that were considered important at the time.[10] Sauerbeck (1886) notes that except for wine, spirits and tobacco, for which reliable information could not be found, all commodities selected are those in which a substantial amount of trade took place. This suggests that this dataset identifies the commodities most likely to affect consumer prices.

2.2 Wholesale and retail prices

Kaufmann (2020) identifies several reasons why price levels and therefore inflation rates may be measured with error.[11] Of particular relevance is the fact that wholesale prices are sometimes used as a proxy for missing retail prices in historical price indices, which he argues was the case in the US in the period from 1774 to 1851, that is, before the period studied here.

However, an investigation of the UK price series suggests that this may be a serious problem. For the period under review, UK cost of living is measured by an index compiled

[10] In contrast, for instance, Jacks (2019) uses a sample of commodity prices based on production in the US in 2011. It is more difficult to see how some of these commodities would co-move with inflation in the nineteenth century. For instance, petroleum prices first appear in Sauerbeck's data in 1873, presumably because petroleum was not commonly used prior to this.

[11] These include the use of data from major cities to represent the economy more broadly, relatively narrow baskets of retail goods, limited coverage of services and often missing data on rents and housing, and the interpolation of some prices when data are collected at too low frequency.

by Feinstein (1998) for the period 1770-1882, spliced together with another index compiled by Feinstein (1991) for the period 1882-1914.[12] In the absence of retail prices, Feinstein uses wholesale prices for several series. Specifically, he uses Sauerbeck's commodity prices as proxies for the retail prices of flour (in combination with another series for the period 1846-1870), pork and bacon (1850-1870), potatoes (1846-1870) and tallow (as a proxy for candles, 1860-1870).[13] Overall, these four items make up just over 20% of the index during the period that all are used (1860-1870).[14] More generally, it is likely that in several countries wholesale prices are used to proxy retail prices, at least for earlier parts of the sample. For instance, Kaufmann (2019) notes that Swiss CPI data uses wholesale prices as proxies during the period under review.

We therefore select a set of commodity prices which we believe could not be used as a proxy for any retail prices. In the first instance, we exclude all series that could be used to proxy for food prices. This includes Sauerbeck's "grains", "meat and animal products" and "sugar, tea and coffee" categories. In addition, we exclude most of the "textiles" category, as these could perhaps be used to proxy for the price of clothing. We also exclude coal from the "minerals" category since that might be used to proxy for heating costs. Finally, we remove several "sundries" including tallow, palm oil and olive oil since these may have been used for lighting.

---

[12] Less detail is available on the Feinstein (1991) series. However, the author notes: "For years in which retail prices were not available, wholesale prices (Sauerbeck 1886) or average import values were used. The main items for which this was necessary were meat (beef, mutton and pork), eggs and cheese, in each case for the years before 1886; and potatoes, for all years from 1870."

[13] See Appendix to Feinstein (1995) for details.

[14] Based on 1858/62 base year weights. See Table 1 in Feinstein (1998).

We are left with eleven commodity prices: five metals (copper, lead, pig iron, iron bars and tin), timber[15], linseed, hides, leather, indigo and jute. Jute is included in Sauerbeck's "textile" category. As an exceptionally strong material, it was used for sacking, ropes, and similar products, rather than clothing.[16] Indigo, was primarily used as a textile dye, and while it may have been used in the production of clothing, indigo prices would be a poor proxy for retail clothing prices.[17] Finally, linseed oil was used as a resin and a varnish, and later for making linoleum.

2.3 Commodity prices

In Table 3, we show the pairwise correlations of percentage changes of the prices for these eleven commodities and the other commodities that we exclude because they may impact directly on inflation. The bottom row shows the average pairwise correlation for each of the eleven commodities. The prices of three metals (pig iron, iron bars and lead) as well as leather and timber, have the highest overall correlations with the other commodity prices (average correlation coefficients of 0.2-0.3). Indigo has the lowest average correlation at just 0.01, while the price of jute also has a low average correlation at 0.10.

Some of the highest correlations are between metal prices, in particular, pig iron, iron bars, lead and tin, and textiles prices, in particular, hemp, silk and wool. Metals and timber prices are also generally highly correlated with coal prices, and to a lesser extent with the prices

---

[15] Timber was a construction material and some price indices proxy housing with a construction cost index. One example is the US series for 1860-1880, where construction costs are calculated based on the price of pine boards, bricks and labour (Lebergott (1964, pp. 348-349)). However, we consider this to be such a small potential part of a consumer price index that we include timber in our analysis. Moreover, removing timber prices from our set of commodity prices does not significantly affect the overall results.

[16] It appears that jute was used in India (where it is primarily produced) as a textile for clothing, however, there is no evidence of this being the case in any of the countries studied here.

[17] See Alden (1965) for a discussion of indigo production during this period.

of some of the grains and meat and animal products. Indigo prices have negative correlations with the prices of several of the meat and animal products and textiles, however, its overall highest pairwise correlations are with silk and butter prices. Perhaps unsurprisingly, jute prices are relatively highly positively correlated with other textile prices, but negatively correlated with the prices of many of the grains. Linseed prices also have relatively high correlations with textile prices and particularly low correlations with meat and animal product prices.

2.4 A single measure of commodity prices

To explore whether world commodity prices impact on consumer prices, we must summarise the behaviour of commodity price inflation in a single series. However, it is unclear what weighting might be given to each commodity, especially as production and use would vary across the fifteen economies in our sample.[18] We therefore follow Ciccarelli and Mojon (2010) and Gerlach and Stuart (2023) and consider four measures of the common component of commodity price changes: the cross-sectional average, the cross-sectional median, the first principal component and a single factor from a factor model of the nine commodity prices.[19] Overall, these measures move similarly, with correlations between 0.87 and 0.97 (see Figure 1).

There is therefore no obvious reason to choose between measures on empirical grounds. However, the mean is a poor measure of the central tendency of a distribution if that is asymmetric. To explore the potential importance of this, we compute the cross-sectional

[18] See Jacks (2019) for a discussion of calculating historical weighted indices.
[19] For a discussion of the differences between principal components analysis and factor analysis, see Mardia, Kent and Bibby (2003).

skew of the commodity prices for each year in the sample. While the mean of the cross-sectional skew over the full period 1851-1913 is 0.05, which suggests that the distribution is symmetric, looking at the distribution for individual years we note that it ranges from -2.2 in 1903 to 2.7 in 1888. Overall, it appears that in a given year one or a few commodities experience price changes far below or above the other commodities. We therefore follow Gerlach and Stuart (2023) and select the cross-sectional median, which is robust to outliers, as our measure of the common component of commodity prices.

2.5 Commodity prices and the business cycle

An important theme in the literature is that commodity prices co-move strongly with the state of the business cycle, reflecting the importance of demand factors. Figure 2 presents our measure of commodity price inflation and growth in industrial production in the US and the UK from Crafts et al., (1989) and Davis (2004), respectively.[20] The correlation between commodity price inflation and industrial production in both the UK and the US is almost identical: the correlation coefficients are 0.43 and 0.44, respectively. The shaded areas in Figure 2 show the period of recession in the UK and US, based on Klovland (1998) and Davis (2006), respectively. While the relationship is not perfect, it is clear that commodity prices tend to fall during downturns and rise during expansions.

The US and UK were the most important economies of the time and business cycles in these countries reflect, at least to some extent, global business cycles. However, a broader measure of the business cycle that better captures its international dimension is preferable

[20] Broadberry et al., (2015) compile industrial production data for the period 1850 to 1870, however, this lines up well with the data from Crafts et al., (1995). We use the latter since it is available for the entire sample period.

since we study inflation in 15 different economies. As discussed previously, Klovland (2003) shows that shipping rates capture well movements in the business cycle. While shipping rates capture costs of transporting goods to and from specific pairs of ports, since ships can be transferred from one route to another or be sold, shipping is international in nature. Moreover, we measure freight rates using the median of rates from several sources (Klovland (2003), North (1958) and Harley (1988)) and deflate them using the UK GDP deflator. The freight rates are included in Figure 3 along with our measure of commodity price inflation. The positive relationship between freight rates and commodity prices is evident and the relationship is stronger than with industrial production in either the UK or the US (0.51). Overall, it seems there relatively strong co-movement between commodity prices and this measure of the business cycle.

Finally, it is interesting to consider the impact of banking and exchange rate crises on commodity prices. We use the composite crisis index of Reinhart and Rogoff (2009), which is available for the entire sample period that we study.[21] That index counts the number of crises across 18 advanced economies in every year. Reinhart and Rogoff identify five types of crises (banking, currency, default (domestic and external) and inflation), and note that an economy can experience several crises at the same time. The index is included in Figure 3 (dashed line). Evidently, there is an inverse relationship between the two variables. Indeed, the correlation coefficient is negative (-0.23), suggesting that crises tend to push down commodity prices.

---

[21] An alternative measure of crises is Bordo et al., (2002), which includes data on all 15 economies, however, it only begins in 1880. Another source, the Jorda-Schularick-Taylor Macrohistory database, begins in 1870, but only has data on 13 of our economies.

3. Commodity prices and inflation

We next turn to the relationship of commodity prices with inflation in the 15 economies that we study. Figure 4 shows the median international inflation rate alongside the median commodity price inflation. Commodity prices are more volatile than consumer prices, but the two series move together as evidence by a correlation coefficient of 0.54.

During the period, the Gold Standard became the dominant monetary regime across the countries that we study. Britain was already on the Gold Standard in 1851, and Australia and Canada adopted it in 1852 and 1854, respectively. The remaining countries moved to gold (either de facto or de jure) in the 1870s, with the exception of Austria-Hungary which did so in 1892.[22] The literature has identified patterns of prices in the longer run during this period (see, for instance, Eichengreen and McLean (1994), Barro (1979) and Rockoff (1984)). Here we use the swings in inflation identified in Bordo and Filardo (2005) to discuss the movements of consumer and commodity prices over the period. Specifically, they split this period in three sub-samples.

In the first period, gold discoveries in California and in Australia in the late 1840s and early 1850s resulted in rising prices. The average of the median in consumer price inflation was 1.14% per year over the period 1850 to 1872. During the same period annual commodity price inflation averaged 1.63%.

The second period identified runs from 1873 to 1896. During this period, demand for Gold increased sharply as countries – including those in our sample – joined the Gold Standard

---

[22] See https://eh.net/encyclopedia/gold-standard/ for details.

and built reserves. This increased the price of gold relative to other goods and resulted in generally falling consumer prices during the period. In particular, the average annual change in the median inflation rate was -0.85%. The effect was even stronger on commodity prices, which declined on average by -2.21% per year during this period.

Gold discoveries again define the final sub-sample, with prices generally rising again from 1897 until the First World War. Here again, the greater variance in commodity prices is evident: while median inflation increased by 1.39% on average during this period, commodity prices increased by 2.22%. Overall, while the magnitudes vary, the broad swings in prices during this period are reflected in both consumer and commodity prices.

To understand the dynamic interactions in the data, as a first step we look at the joint behaviour of the median growth rate of the commodity prices and the 15 inflation rates.

3.1 Granger causality

We start by computing Granger causality tests.

The results in Table 4 show that in 2 of 15 cases, we can reject the hypothesis that inflation does not Granger cause commodity prices when using a p-level of 5%. However, the likelihood that we would reject this hypothesis twice in 15 tests if it were true is 13%. Thus, there is little evidence that inflation Granger causes commodity prices.

Conversely, in 11 of 15 cases we can reject the hypothesis that commodity prices do not Granger cause inflation. The likelihood of rejecting the hypothesis that many times if it were true is almost zero. Overall, we conclude that there is plenty of evidence that commodity prices Granger cause inflation.

3.2 OLS results

We next use OLS to regress inflation in country i on the lagged inflation rate and the median of the growth rate of the subset of commodities identified above. Letting $\pi_{i,t}$ denote domestic inflation, $\pi_{c,t}$ our commodity price variable and $\varepsilon_{i,t}$ the residual, we have that:

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_i \pi_{c,t} + \varepsilon_{i,t} \qquad (1)$$

This is a reduced-form relationship because the relationship between domestic inflation and the rate of change of commodity prices is likely to depend on why commodity prices change. For instance, an increase in commodity prices that is due to a global business cycle boom and associated increase in the demand for all commodities might raise domestic inflation by more than an increase in commodity prices that is due to a supply contraction that affect one or a few commodities. We return to this issue further below.

The results are presented in Table 5. We find that the parameter on the lagged inflation rate is significant at the 5% level in six cases and at the 10% level in one additional case. The average of the estimated parameter is 0.26, indicating some persistence of shocks to inflation.

Turning to the parameter on commodity prices, we note that it is significant at the 5% level in all cases except for Australia. This result is striking when one recalls that these are primarily industrial goods which are unlikely to be included in the consumer basket, and which thus are unlikely to have any direct channel through which they can impact consumer prices. The estimated coefficients range between 0.09 in France and 0.60 in Switzerland, and are 0.26 on average, suggesting that over a quarter of any change in commodity prices passes through to inflation within a year. The proportion of inflation explained by the model ranges from 8% in Australia to 48% in the US and is 24% on average.

3.3 Exchange rates

The data used above are for commodity prices in pounds Sterling in UK markets. Since consumer price inflation is measured in national currency units, the question of what consequences exchange rate changes might have for our results arises. Therefore, we next extend the analysis using data on the exchange rate against pound Sterling. In total, we have data for the full sample period for 11 of the economies in our sample.[23]

Most of the countries in our sample were on the gold standard from the 1870s, and often were on silver and bimetallism standards before.[24] As a result, the exchange rates generally evolve as step functions whereby there are long periods of exchange rate stability with, typically, one devaluation during the sample period.[25] This suggests that the exchange rate is unlikely to play an important role in the inflation process.

Re-estimating equation (1) but adding the percentage change in the exchange rate as a regressor confirms this hypothesis. In the interest of brevity, the results are not tabulated here, however, we find that the exchange rate is significant in six countries, but that the parameter is small, typically around 0.4.[26] The estimates of the parameter on the change of commodity prices, γ_i, are broadly unchanged by the inclusion of the change in the exchange rate, indeed the correlation between these estimates of γ_i and those in Table 5 is in excess

---

[23] Data for Canada, Finland and Iceland were not available for the full sample and so are not included here. The UK is not included for obvious reasons. Data on ten of the exchange rates were obtained from the Clio infra project (https://clio-infra.eu/Indicators/ExchangeRatestoUKPound.html), while the eleventh, Norway, was obtained from Eitrheim et al., (2004).

[24] Indeed, floating exchange rates were considered a "radical departure from fiscal and monetary stability" and viewed with disfavour (Bordo (2003, p. 5)).

[25] Thus, in log first-difference form, the exchange rate change is typically "small" with one very large outlier, making the series look much like a dummy variable.

[26] The exception is Australia, where the parameter estimate is in excess of two.

of 0.9. In what follows we therefore present results with the exchange rate omitted from the regressions.

3.4 IV estimates

Our review of the literature led to the conclusion that broad commodity price movements are largely due to shifts in the demand for commodities resulting from swings in the international business cycle. It is a plausible hypothesis that commodity price increases are transmitted more strongly to inflation if they occur during a global boom and affect the demand for all commodities than if they occur because of supply factors that are more likely to be commodity specific. To explore this issue, it is necessary to distinguish between demand and supply induced changes in commodity prices.

As noted above, the second conclusion we drew from the literature is that the state of the international business cycle during this period can be captured by the cost of shipping. To assess whether supply- and demand-induced movements in commodity prices have the same impact on inflation we can compare the reduced-form OLS estimates above that make no distinction between supply and demand factors with IV estimates obtained by using shipping costs as an instrument for commodity prices. If demand-induced increases in commodity prices have greater impact on inflation than supply-induced price changes, then we would expect the IV estimates of γ_i to be larger than the OLS estimates.

Of course, that argument requires freight costs to be a "strong" instrument. Regressing our commodity price variables on real freight costs yields an F-statistic of 21.2, which suggests that that is the case (Staiger and Stock (1997)).

The results from IV estimates of equation (1) are presented in Table 6.[27] Interestingly, the average parameter on the commodity variable is 0.35 when IV is used in contrast to 0.26 when the equation is estimated by OLS. The parameter estimates range from 0.01 in the US to 0.84 in Switzerland. Efficiency is always an issue when IV is used. Nevertheless, the parameter is significant at the 5% level in nine of 15 cases and at the 10% level in a further two. These results are compatible with the idea that demand-driven swings of commodity prices are reflected more strongly in inflation in the economies we study.

Next, we turn to the question whether the differences between the OLS and IV estimates are statistically significant. The pooled OLS estimate of the impact on commodity prices is 0.26 with a standard error of 0.09 and the pooled IV estimate 0.35 with a standard error of 0.18. These are not statistically different. We therefore compute Hausman tests for endogeneity bias.[28]

The last row of Table 6 shows that the differences between the OLS and IV estimates are significantly different in three cases when using a 5% significance level and in a further two cases when using a 10% significance level. While these results may seem disappointing, they only consider the results for one economy at the time. Looking at the OLS estimates in Table 5 and the IV estimates in Table 6, it is notable that the latter are larger than the former in 11 of 15 cases, the probability of which is 5.9% if the expected value of the OLS and IV estimates are in truth equal.[29]

---

[27] We use the lagged dependent variable as an instrument in addition to the freight variable.
[28] See Section 15-5 in Wooldridge (2020).
[29] The probability of it being larger in exactly 11 of 15 cases is 4.2%.

We conclude that IV parameter estimates are generally larger than the average OLS estimates, which make no distinction between supply and demand factors. This suggests that commodity price increases due to demand factors are transmitted more strongly to inflation than price increases induced by supply contractions.

4. Results for individual commodities

Next, we turn to responses of inflation to individual commodity prices, following the approach taken above. That is, we estimate the following equation with OLS and IV for the subset of commodity prices, $\pi_{j,t}$, for iron bars, lead, pig iron and timber, which shipping costs, the instrument, is "strong":

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_{i,j} \pi_{j,t} + \varepsilon_t \qquad (2)$$

Detailed results are available in Tables A1-8 in the Appendix. In the interest of brevity, here we focus on their general pattern of the estimates of $\gamma_{i,j}$ and disregard how they vary between economies by looking at the pooled OLS and IV estimates of γ_i in Table 7.

Interestingly, in all cases the pooled IV estimate is larger than the pooled OLS estimate. As noted above, when prices for all commodities are used, the IV estimate is larger than the OLS estimate for 11 of the 15 economies. Looking at Tables A1-8 in the Appendix, this is also the case when prices for timber are used. Furthermore, when prices for iron bars, lead, pig iron are used, the IV estimate of the parameter is greater than the OLS estimate in 12 of 15 cases. If there was no endogeneity bias, the probability of the IV estimates being greater than the OLS in 11 or more of 15 cases is 5.9%. It is 1.8% in case of 12 of 15 estimates.[30] Overall, it appears that simultaneity bias is present and that movements in commodity prices that are due to demand shocks have greater impact on inflation that those due to supply shocks.[31]

5. Conclusions

In this paper we studied the interaction of changes in consumer and commodity prices in 15 countries using annual data for the period 1851-1913. While in modern economies, fluctuations in commodity prices, in particular oil prices, have played a key role in triggering fluctuations in inflation, we demonstrate that such co-movements were also present in the period we study, reflecting the integration of international commodity markets. Thus, increases in commodity prices impacted on import prices across the world, leading to a positive correlation of inflation in individual economies.

We identify a subset of commodity prices from Sauerbeck that are unlikely to enter directly, or as proxy, in the CPI basket. We first calculated a component that represents broad commodity price movements to test whether this co-moved with inflation in our 15 countries.

[30] In addition, looking at the p-values for the Hausman tests, it is notable that the hypothesis of no endogeneity bias is rejected at a 10% or higher significance level in the cases of Belgium, Denmark, France, Germany, the Netherlands and the UK, and once in the case of Sweden. These results suggest that endogeneity is present.

[31] As is shown in Table A1-A8 in the appendix, in about one third of the cases the Hausman tests reject the hypothesis the OLS and IV estimates are the same. This is not surprising, given that the IV estimates are quite imprecise.

Our econometric analysis leads to several important conclusions. First, the common component of commodity prices co-moves with industrial production in the UK and US and with a measure of the cost of shipping, which is often seen as a good measure of the state of the international business cycle in this period. This supports the view that changes in commodity prices largely reflect swings in the international business cycle that impact on the demand for commodities.

Second, we find that commodity prices Granger cause inflation but that the converse is not true. This is also compatible with the notion that commodity prices have import effects on inflation before 1913.

Third, commodity prices, either as a group or individually, are also highly significant in standard inflation equations estimated by OLS for the 15 economies in our sample. Re-estimating these equations using real shipping costs as an instrument for commodity prices to capture the importance of demand shocks caused by swings in the international business cycle leads to numerically larger but, not surprisingly, also less significant parameter estimates.

Fourth, and perhaps most importantly, real shipping costs are a “strong” instrument for commodity prices. While Hausman tests for individual economies suggest that the IV estimates are always significantly larger than OLS estimates, the IV estimates are numerically larger than the OLS estimates so often for the 15 economies that the hypothesis that the IV estimates are just as likely to be smaller or larger than the OLS estimates must be rejected. This suggests that commodity price increases caused by international demand shifts were transmitted to national inflation rates more strongly than supply shocks.

References

Abildgren, Kim (2009) "Consumer Prices in Denmark, 1502-2007," Working paper 60, Danmarks Nationalbank.

Adams, F. Gerard and Yazukazu Ichino (1995), "Commodity prices and inflation: A forward-looking price model", *Journal of Policy Modelling*, 17(4), 397-426.

Alden, Dauril. (1965) "The Growth and Decline of Indigo Production in Colonial Brazil: A Study in Comparative Economic History", *Journal of Economic History*, 25(1), 35-60.

Alquist, R., S. Bhattarai and O. Coibion (2019), "Commodity-Price Comovement and Global Real Activity", *Journal of Monetary Economics*, 112, 41-56.

Barro, R.J. (1979) "Money and the Price Level under the Gold Standard", *The Economic Journal*, 89(353), 13-33.

Baumeister, C. and J.D. Hamilton (2019), "Structural Interpretation of Vector Autoregressions with Incomplete Identification: Revisiting the Role of Oil Supply and Demand Shocks", *American Economic Review*, 109, 1873-1910.

Beckerman, Wilfred and Tim Jenkinson (1986), "What Stopped the Inflation? Unemployment or Commodity Prices?", *The Economic Journal*, 96(381), 39-54.

Bertram, Gordon W. and Michael B. Percy (1979), "Real Wage Trends in Canada, 1900-26: Some Provisional Estimates," *Canadian Journal of Economics*, 12, 299-312.

Blackett, O.W. (1923), "Pig Iron and Scrap Prices during Business Cycles", *The Review of Economics and Statistics*, 5(4), 272-278.

Bomberger, William A. and Gail E. Makinen (1993), "Commodity prices and inflation: A forward-looking price model", *Journal of Money, Credit and Banking*, 25(4), 854-861.

Bordo, Michael D., Barry Eichengreen, Daniela Klingebiel and Maria Soledad Martinez Peria (2002), "Financial Crises Database for Bordo et. al. "Is the Crisis Problem Growing More Severe?", Excel data file, https://rucore.libraries.rutgers.edu/rutgers-lib/41466/

Broadberry, Stephen, Bruce M.S. Campbell, Alexander Klein, Mark Overton and Bas van Leeuwen (2015), British Economic Growth, 1270-1870, Cambridge: Cambridge University Press.

Bureau of Statistics (1902), Movement of Prices, 1840-1901: From Sauerbeck's tables, London Economist, Reports of the US Senate and Department of Labour and Statistics, Treasury Department.

Burns, Arthur F. and Wesley C. Mitchell (1946), Measuring Business Cycles, NBER.

Calomiris, Charles and R. Glenn Hubbard (1989), "Price Flexibility, Credit Availability, and Economic Fluctuations: Evidence from the United States, 1894-1909", *Quarterly Journal of Economics*, 104, 429-452.

Cao, Bolong, Shamila Jayasuriya and William Shambora, (2010), "Holding a commodity futures index fund in a globally diversified portfolio: A placebo effect?", Economics Bulletin, 30(3), 1842-1851.

Cavallo, Michele (2008), "Oil prices and inflation", FRBSF Economic Letter, 2008(13).

Choi, Sangyup, Davide Furceri, Prakash Loungani, Saurabh Mishra and Marcos Poplawski-Ribeiro (2018), "Oil prices and inflation dynamics: Evidence from advanced and developing economies", *Journal of International Money and Finance*, 82, 71-96.

Ciccarelli, Matteo and Benoît Mojon (2010), "Global Inflation," *Review of Economics and Statistics*, 92, 524-535.

Crafts, N.F.R, S.J. Leybourne and T.C. Mills (1989), "Trends and Cycles in British Industrial Production, 1700-1913", *Journal of the Royal Statistical Society*, Series A, 152(1), 43-60.

Crawford, George, Jim Kyung-Soo Liew and Andrew Marks (2013), "Spot commodities as inflation protection", *The Journal of Wealth Management*, 16 (3) 87-111.

Darby, Michael R. (1982), "The Price of Oil and World Inflation and Recession", *American Economic Review*, 72(4), 738-751.

Davis, Joseph H. (2004), "An annual index of US industrial production, 1790-1915", *Quarterly Journal of Economics*, 119(4), 1177-1215.

Davis, Joseph H. (2006), "An Improved Annual Chronology of U.S. Business Cycles since the 1790s", *Journal of Economic History*, 66(1), 103-121.

De Gregorio, José, Oscar Landerretche, Christopher Neilson, Christian Broda and Roberto Rigobon (2007), "Another Pass-through Bites the Dust? Oil Prices and Inflation", *Economía*, 7(2), 155-208.

Delle Chiaie, S., L. Ferrara and D. Giannone (2022), "Common factors of Commodity Prices", *Journal of Applied Econometrics*, 37(3), 461-476.

Edvinsson, Rodey and Johan Söderberg (2010), "The evolution of Swedish consumer prices 1290–2008," in Historical Monetary and Financial Statistics for Sweden: Exchange rates, prices, and wages, 1277–2008, edited by Edvinsson, Tor Jacobson, and Daniel Waldenström, Sveriges Riksbank.

Eichengreen, B. and I.W. McLean (1994), "The supply of gold under the pre-1914 gold standard", *Economic History Review*, XLVII, 288-309.

Eitrheim, Ø., J.T. Klovland and J.F. Qvigstad (eds.), (2004), Historical Monetary Statistics for Norway 1819-2003 (pp.289-328). Norges Bank Occasional Papers No. 35.Erten Bilge and

Jose Antonio Ocampo(2013), "Super cycles of commodity prices since the mid-nineteenth century", *World Development*, 44(C):14–30

Esmeralda Ballesteros (1997), "Una estimación del coste de la vida en España. 1861-1936 Revista de Historia Económica," XV, 2: 363-95 Downloaded from http://www.iisg.nl/hpw/barquin1.php.

Federal Reserve Economic Data (FRED), "Consumer Price Index in the United Kingdom," https://fred.stlouisfed.org/series/CPIUKA

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

Feinstein, Charles H. (1995), "Changes in nominal wages, the cost of living and real wages in the United Kingdom over two centuries, 1780-1990" in Scholliers, P. and V. Zamagni (eds), Labour's reward: real wages and economic change in 19th and 20th century Europe, Edward Elgar, England.

Feinstein, Charles H. (1991), "A new look at the cost of living, 1870-1914" in Foreman-Peck, James (ed), New Perspectives on the late Victorian Economy, Cambridge University Press, Great Britain.

Findlay, Ronald and Kevin H. O'Rourke (2001), "Commodity market integration, 1500–2000", NBER Working Paper 8579.

Furlong, Fred and Robert Igenito (1996), "Commodity prices and inflation", FRBSF Economic Review, 1996(2), 27-47.

Geloso, Vincent (2019), "A price index for Canada, 1688 to 1850," *Canadian Journal of Economics*, 52, 526–560.

Geloso, Vincent and Michael Hinton (2020), "Improving deflators or estimating Canadian economic growth, 1870–1900," *Research in Economic History*, 36, 125–150.

Gerlach, Stefan and Rebecca Stuart (2023), "International Co-movements of Inflation, 1851-1913", *Oxford Economic Papers*, forthcoming.

Gorton, Gary (1988), "Banking panics and business cycles", *Oxford Economic Papers*, 40, 751-781.

Gorton, Gary and K. Geert Rouwenhorst (2006), "Facts and fantasies about commodity futures", *Financial Analysts Journal*, 62, 47–68.

Gorton, Gary, Fumio Hayashi, and K Geert Rouwenhorst (2007), "The Fundamentals of Commodity Futures Returns," NBER Working Paper 13249.

Grytten, Ola H. "A Consumer Price Index for Norway, 1516-2003," in Historical Monetary Statistics for Norway 1819–2003," in Eitrheim, Øyvind , Jan T. Klovland and Jan F. Qvigstad (eds.), Historical Monetary Statistics for Norway 1819–2003, Occasional Papers 35, Norges Bank.

Harley, C.K. (1988), "Ocean Freight Rates and Productivity, 1740-1913: The Primacy of Mechanical Invention Reaffirmed", *Journal of Economic History*, 48, 851-876.

Heikkinen, Sakari (1997), "Labour and the Market. Workers, Wages and Living Standards in Finland, 1850-1913". Commentationes Scientiarium Socialium 51, Helsinki.

Historical Statistics of Switzerland HSSO, 2012. Table H.17. hsso.ch/2012/h/17

Isserlis, L. (1938), "Tramp Shipping Cargoes, and Freights", *Journal of the Royal Statistical Society*, 101, 53-134.

Jacks, David (2005), "Intra- and international commodity market integration in the Atlantic economy, 1800–1913", *Explorations in Economic History*, 42, 381-413.

Jacks, David (2019), "From boom to bust: a typology of real commodity prices in the long run", *Cliometrica*, 13, 201-220.

Jacobs, Alfred and Hans Richter (1935), Die Grosshandelspreise in Deutschland von 1792 bis 1934, Hanseatische Verlagsanstalt Hamburg, Berlin.

Kaufmann, Daniel (2020), "Is deflation costly after all? The perils of erroneous historical classifications," *Journal of Applied Econometrics*, 35, 614-628.

Kaufmann, Daniel (2019), "Nominal stability over two centuries", *Swiss Journal of Economics and Statistics*, 155, 1-23.

Kilian, L. (2009), "Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market", *American Economic Review*, 99, 1053-69.

Kilian, L. and D.P. Murphy (2014), "The Role of Inventories and Speculative Trading in the Global Market for Crude Oil", *Journal of Applied Econometrics*, 29, 454-478.

Klovland, J. T. (1993), "Zooming in on Sauerbeck: Monthly Wholesale Prices in Britain 1845–1890", *Explorations in Economic History*, 30, 195-228.

Klovland, J. T. (1998), "A Reassessment of the United Kingdom Business Cycle Chronology 1850–1914", in Dick, T. J. O. (ed.), Business Cycles Since 1820: New International Perspectives From Historical Evidence, 49–90, Edward Elgar, Cheltenham.

Klovland, J. T. (2003), "Business Cycles, Commodity Prices, and Shipping Freight Rates: Some Evidence from the pre-WWI period", SNF Report No. 48/02.

Klovland, J. T. (2005), "Commodity market integration: Evidence from Britain and Germany", *European Review of Economic History*, 9, 163-197.

Lebergott, Stanley (1964), Manpower in Economic Growth: The American record since 1800, McGraw-Hill, New York.

Macauley, Frederick R. (1938), The movements of interest rates, bond yields and stock prices in the United States since 1856, NBER, New York.

Mardia, K. V., J. T. Kent and J. M. Libby (2003), Multivariate Analysis, Academic Press, San Diego.

McLean, Ian W. (1997), "Consumer prices and expenditure patterns in Australia 1850-1914", *Australian Economic History Review*, 39, 1-28.

Miron, Jeffrey A. and Christina D. Romer (1990), "A new monthly industrial production index, 1884-1940", *Journal of Economic History*, 50(2), 321-337.

Mitchell, B. R. (2003), International Historical Statistics: Europe 1750 – 2000, Palgrave Macmillan, 5TH ed.

Mühlpeck, Vera, Roman Sandgruber and Hannelore Woitek (1979), "Index der Verbraucherpreise 1800–1914 (Index of consumer prices, 1800–1914)", in Österreichisches Statistisches Zentralamt, Geschichte und Ergebnisse der zentralen amtlichen Statistik in Österreich 1829–1979, Beiträge zur österreichischen Statistik, Vienna.

Naknoi, Kanda, (2008), "Tariffs and the Expansion of the American Pig Iron Industry, 1870-1940", Purdue University Economics Working Papers 1214, Purdue University, Department of Economics.

North, Douglas (1958), "Ocean Freight Rates and Economic Development, 1750-1913", *Journal of Economic History*, 18, 537-555.

Obstfeld, Maurice and Alan M. Taylor (2005), Global Capital Markets: Integration, Crisis, and Growth, Cambridge University Press, Cambridge.

Pindyck, R. and J. Rotemberg (1990), "The Excess Co-movement of Commodity Prices", *Economic Journal*, 100, 1173–89.

Reinhart, Carmen M. and Kenneth S. Rogoff (2009), This Time It's Different: Eight Centuries of Financial Folly, Princeton: Princeton University Press.

Rockoff, H. (1984) "Some Evidence on the Real Price of Gold, Its Costs of Production, and Commodity Prices", in M.D. Bordo and A. Schwartz, eds., A Retrospective on the Classical Gold Standard, 1821-1931, 613-650, University of Chicago Press.

Sauerbeck, Augustus (1886), "Prices of Commodities and the Precious Metals", *Journal of the Statistical Society of London*, 49(3), 581-648.

Sauerbeck, Augustus (1893), "Prices of Commodities During the Last Seven Years", *Journal of the Statistical Society of London*, 56(2), 215-254.

Sauerbeck, Augustus (1908), "Prices of Commodities in 1907", *Journal of the Statistical Society of London*, 71(1), 132-146.

Sauerbeck, Augustus (1917), "Wholesale Prices of Commodities in 1916", *Journal of the Statistical Society of London*, 80(2), 289-309.

Staiger, D., and J.H. Stock (1997), "Instrumental Variables Regression with Weak Instruments", *Econometrica*, 65(3), 557-586.

Studer, Roman and Pascal Schuppli (2008), "Deflating Swiss Prices over the Past Five Centuries", *Historical Methods*, Summer 2008, 41(3), 137-153.

Stuermer, M. (2017), "Industrialization and the Demand for Mineral Commodities", *Journal of International Money and Finance*, 76, 16–27.

Stuermer, M. (2018), "150 Years of Boom and Bust: What Drives Mineral Commodity Prices?", *Macroeconomic Dynamics*, 22, 702–717.

Wonnacott, Thomas H., and Ronald J. Wonnacott (1977), Introductory Statistics for Business and Economics, Second ed., John Wiley & Sons, New York.

Zaremba, Adam, Zaghum Umar and Mateusz Mikutowski (2019), "Inflation hedging with commodities: A wavelet analysis of seven centuries worth of data", *Economics Letters*, 181, 90-94.

Zarnowitz, Victor (1987), "The Regularity of Business Cycles", NBER Working Paper No. 2381.

Table 1: Descriptive statistics of inflation, 1851-1913

	Median	Mean	Interquartile range	Standard deviation	Source
Australia	-0.31	0.12	6.79	9.13	McLean (1999), W6-series used
Austria	0.56	0.69	3.86	3.55	Mühlpeck, et al., (1979)
Belgium	0.00	0.20	6.26	5.17	Mitchell (2003)
Canada	0.42	0.01	6.22	7.22	Various, see notes
Denmark	0.52	0.34	3.37	3.21	Abildgren (2009)
Finland	0.32	0.56	8.05	6.46	Heikkinen (1997)
France	0.00	0.40	1.10	1.62	Mitchell (2003)
Germany	1.29	1.61	5.59	6.61	Mitchell (2003)
Iceland	1.07	0.77	3.06	4.03	BIS , www.bis.org
Netherlands	-0.23	0.12	4.90	3.95	Arthur van Riel, http://iisg.nl/hpw/brannex.php
Norway	0.66	0.65	5.45	3.90	Grytten (2004)
Sweden	0.54	0.70	5.78	5.05	Edvinsson and Söderberg (2010)
Switzerland	0.72	0.56	6.97	8.11	Studer and Schuppli (2008) Historical Statistics of Switzerland (2012)
UK	0.00	0.23	3.30	3.54	FRED, fred.stlouisfed.org
US	0.00	0.38	3.39	5.24	www.measuringworth.com

Notes: The Canadian CPI series was constructed as follows. For the period 1800-1870, the data stem from Geloso (2019), for 1870-1900 from Geloso and Hinton (2020), from 1901-1909 from series K33 in Historical Statistics of Canada (https://www150.statcan.gc.ca/n1/pub/11-516-x/sectionk/4057753-eng.htm) and for 1910-1913 from column 1 in Table 1 in Bertram and Percy (1979).

Table 2: Descriptive statistics of percentage changes in commodity prices, 1851-1913

	Median	Mean	Interquartile range	Standard deviation	Sauerbeck's groupings
Wheat	1.18	-0.29	13.21	12.86	Corn
Flour	0.00	-0.31	15.43	11.82	Corn
Barley	-1.31	0.24	11.56	9.31	Corn
Oats	0.00	0.23	12.70	8.74	Corn
Maize	0.00	-0.26	17.66	12.90	Corn
Potatoes	0.00	-0.14	26.66	21.05	Corn
Rice	1.38	-0.06	15.15	10.97	Corn
Beef	0.00	0.72	8.49	6.16	Meat etc
Mutton	1.08	0.63	10.15	7.60	Meat etc
Pork	-1.90	0.45	13.43	9.81	Meat etc
Bacon	0.00	0.72	9.15	8.29	Meat etc
Butter	1.07	0.58	6.94	5.53	Meat etc
Sugar	2.51	-1.40	15.25	12.90	Sugar etc
Coffee	-1.33	0.37	16.29	11.89	Sugar etc
Tea	-1.26	-1.05	9.40	9.58	Sugar etc
Pig iron	0.00	0.64	12.16	13.81	Minerals
Iron bars	0.00	0.45	13.54	13.16	Minerals
Copper	-1.32	-0.21	13.01	15.43	Minerals
Tin	2.27	1.51	17.50	14.29	Minerals
Lead	0.00	0.11	12.89	11.04	Minerals
Coal	-0.62	0.65	9.88	10.85	Minerals
Cotton	-0.80	0.06	22.71	18.22	Textiles
Flax	-1.80	-0.13	15.56	10.92	Textiles
Hemp	0.00	0.15	12.66	12.01	Textiles
Jute	-1.00	0.81	21.09	14.13	Textiles
Wool	-2.13	0.18	16.07	10.51	Textiles
Silk	0.00	-0.87	11.82	12.32	Textiles
Hides	0.00	1.46	12.87	9.82	Sundries
Leather	0.00	1.02	5.96	7.48	Sundries
Tallow	0.00	-0.12	10.98	9.90	Sundries
Oil	0.00	0.23	9.67	7.94	Sundries
Linseed	0.00	-0.23	13.69	11.86	Sundries
Indigo	-1.08	-1.04	11.88	11.59	Sundries
Timber	0.00	-0.03	10.93	7.73	Sundries

Table 3: Correlation of percentage changes in prices of 11 included commodities with the remaining commodities, 1851-1913

Excluded commodities		Included commodities										
		Copper	Pig iron	Iron bars	Lead	Tin	Indigo	Hides	Leather	Jute	Linseed	Timber
Corn	Wheat	0.11	0.29	0.16	0.25	0.02	0.07	0.22	0.21	-0.05	0.16	0.23
	Flour	0.15	0.28	0.21	0.27	-0.01	0.09	0.18	0.20	-0.04	0.11	0.30
	Barley	0.21	0.25	0.11	0.21	0.08	0.06	0.22	0.26	0.06	0.14	0.21
	Oats	0.02	0.11	0.05	0.15	-0.03	0.04	0.09	0.15	-0.11	0.25	0.27
	Maize	0.14	0.02	-0.02	0.05	0.02	0.16	0.11	0.11	-0.12	0.22	0.02
	Potatoes	0.10	0.31	0.24	0.24	0.05	0.04	0.14	0.33	-0.04	0.07	0.10
	Rice	0.29	0.32	0.22	0.29	0.13	0.08	0.02	0.25	0.31	0.25	0.35
Meat and animal products	Beef	0.26	0.33	0.38	0.22	0.16	0.04	0.15	0.27	-0.03	0.19	0.26
	Mutton	0.28	0.32	0.44	0.39	0.23	-0.08	0.15	0.31	0.15	0.03	0.27
	Pork	-0.00	0.13	0.19	0.13	0.11	0.10	0.13	0.35	0.07	0.14	0.34
	Bacon	0.04	0.28	0.30	0.19	0.05	0.04	0.20	0.37	0.04	0.13	0.46
	Butter	0.07	0.04	0.12	0.09	0.10	0.29	0.18	0.15	0.19	0.06	0.22
Sugar etc	Sugar	0.11	0.17	0.25	0.12	0.21	0.05	0.18	0.23	0.15	0.20	0.09
	Coffee	0.06	0.36	0.28	0.21	0.13	-0.05	0.23	0.29	0.23	0.16	0.08
	Tea	0.06	0.27	0.24	0.33	0.21	-0.02	0.28	0.56	0.04	0.11	-0.03
Minerals	Coal	0.26	0.72	0.72	0.49	0.27	-0.14	0.23	0.32	0.06	0.31	0.38
Textiles	Cotton	0.14	0.26	0.34	0.15	0.19	-0.08	0.06	0.11	0.31	0.25	0.11
	Flax	-0.02	0.07	0.04	0.08	0.06	-0.17	-0.05	-0.05	0.07	0.25	0.24
	Hemp	0.25	0.48	0.42	0.31	0.37	-0.31	0.19	0.21	0.27	0.22	0.31
	Wool	0.41	0.56	0.55	0.47	0.37	-0.05	0.57	0.47	0.31	0.04	0.25
	Silk	0.24	0.26	0.26	0.38	0.40	0.10	0.25	0.31	0.27	0.03	0.12
Sundries	Tallow	0.26	0.20	0.22	0.14	0.12	0.12	0.26	0.43	0.06	0.19	0.27
	Oil	0.27	0.31	0.27	0.30	0.16	0.15	0.29	0.43	0.20	0.34	0.23
Average pairwise correlation		0.15	0.25	0.24	0.22	0.14	0.02	0.17	0.25	0.10	0.15	0.20

Table 4: p-values for Granger causality tests, 1852-1913

	Inflation does not cause commodity prices	Commodity prices do not cause inflation
Australia	0.59	0.00
Austria	0.03	0.14
Belgium	0.44	0.00
Canada	0.87	0.00
Denmark	0.22	0.00
Finland	0.80	0.01
France	0.73	0.04
Germany	0.03	0.04
Iceland	0.69	0.00
Netherlands	0.71	0.00
Norway	0.17	0.00
Sweden	0.26	0.01
Switzerland	0.80	0.14
UK	0.17	0.08
US	0.26	0.69

Notes: 1 lag

Table 5
OLS estimates, 1851-1913

Inflation regressed on a constant, lagged inflation and the median percentage change of commodity prices

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_i \pi_{c,t} + \varepsilon_{i,t}$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.124	0.498	0.091	-0.244	0.109	0.374	0.342	0.757	0.730	0.038	0.361	0.343	0.267	0.114	0.129
SE	1.139	0.427	0.626	0.821	0.342	0.785	0.199	0.742	0.513	0.451	0.403	0.562	0.899	0.345	0.494
p-value	0.913	0.249	0.885	0.768	0.752	0.635	0.091*	0.312	0.160	0.933	0.374	0.544	0.768	0.743	0.795
Lagged inflation	0.189	0.110	0.193	0.193	0.471	0.183	0.092	0.331	-0.023	0.377	0.310	0.308	0.102	0.313	0.676
SE	0.125	0.127	0.122	0.115	0.106	0.121	0.120	0.117	0.126	0.115	0.103	0.110	0.112	0.097	0.094
p-value	0.134	0.392	0.118	0.098*	0.000**	0.137	0.444	0.006**	0.856	0.002**	0.004**	0.007**	0.365	0.002**	0.000**
Commodity prices	0.263	0.184	0.237	0.433	0.163	0.292	0.090	0.228	0.164	0.145	0.301	0.314	0.599	0.289	0.160
SE	0.167	0.066	0.092	0.122	0.050	0.115	0.029	0.114	0.074	0.067	0.059	0.082	0.133	0.051	0.073
p-value	0.122	0.008**	0.012**	0.001**	0.002**	0.014**	0.003**	0.049**	0.032**	0.035**	0.000**	0.000**	0.000**	0.000**	0.032
R-sq.	0.075	0.167	0.137	0.227	0.334	0.137	0.158	0.240	0.076	0.233	0.387	0.282	0.278	0.435	0.477

Notes: “SE” refers to robust standard errors, */** denotes significance at the 10%/5% level.

Table 6
Two-stage least squares estimates, 1851-1913

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_i \pi_{c,t} + \varepsilon_{i,t}$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.170	0.509	-0.004	-0.184	0.062	0.392	0.336	0.884	0.698	-0.029	0.339	0.283	0.207	0.071	0.185
SE	1.149	0.431	0.681	0.839	0.364	0.789	0.203	0.839	0.525	0.493	0.409	0.591	0.925	0.368	0.515
p-value	0.883	0.243	0.995	0.827	0.866	0.621	0.104	0.296	0.189	0.954	0.410	0.634	0.823	0.847	0.720
Lagged inflation	0.190	0.062	0.185	0.215	0.478	0.188	0.076	0.162	-0.032	0.319	0.304	0.300	0.072	0.295	0.659
SE	0.125	0.160	0.132	0.120	0.113	0.123	0.124	0.155	0.129	0.130	0.104	0.116	0.119	0.104	0.099
p-value	0.135	0.702	0.168	0.077*	0.000**	0.130	0.541	0.300	0.802	0.017**	0.005**	0.012**	0.548	0.006**	0.000**
Commodity prices	0.124	0.251	0.534	0.254	0.299	0.230	0.131	0.683	0.280	0.370	0.378	0.511	0.835	0.431	0.006
SE	0.329	0.150	0.191	0.242	0.101	0.220	0.056	0.253	0.149	0.140	0.115	0.165	0.275	0.105	0.149
p-value	0.707	0.100*	0.007**	0.298	0.005**	0.301	0.023**	0.009**	0.065*	0.011**	0.002**	0.003**	0.004**	0.000**	0.965
R-sq.	0.064	0.153	-0.015	0.199	0.251	0.133	0.129	0.035	0.038	0.087	0.369	0.211	0.240	0.361	0.438
Hausman, p-value	0.627	0.618	0.048	0.384	0.097	0.742	0.393	0.018	0.357	0.039	0.437	0.146	0.313	0.093	0.218
F-stat, IV	21.241														

Notes: "SE" refers to robust standard errors, */** denotes significance at the 10%/5% level.

Table 7:

Pooled estimates of the impact of commodity prices on inflation

	Iron bars		Lead		Pig iron		Timber	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Pooled estimate	0.11	0.193	0.10	0.17	0.13	0.22	0.19	0.28
Pooled SE	0.05	0.101	0.06	0.09	0.04	0.11	0.08	0.14

Figure 1: Summary measures of percentage changes in eleven commodity prices, normalized data, 1851-1913

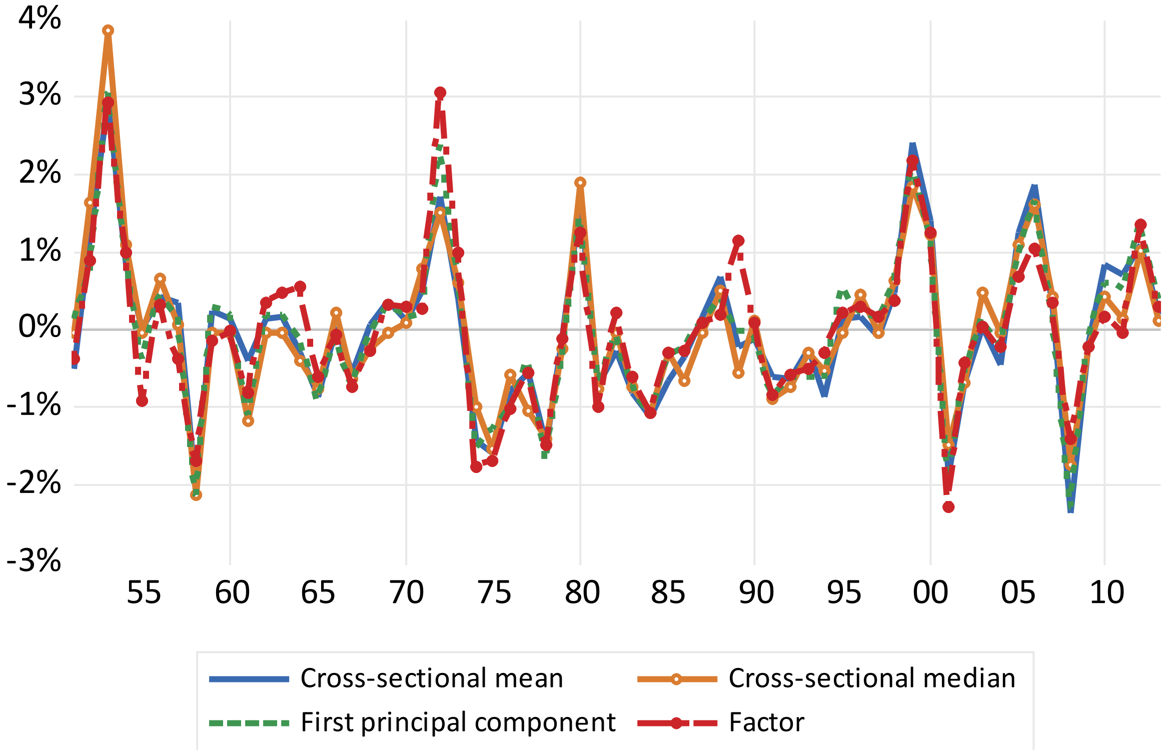
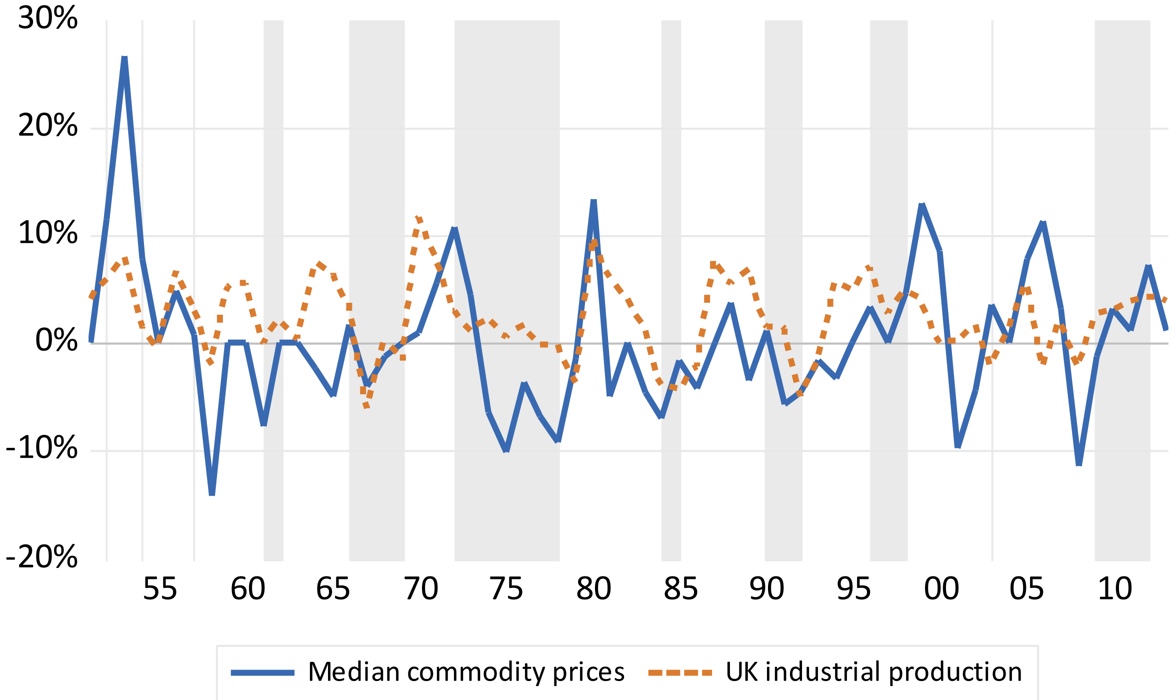


Figure 2: Median percentage change of commodity price (eleven commodities), freights rates and industrial production and business cycle chronology in (a) the UK and (b) the US, 1851-1913

(a) UK



(b) US

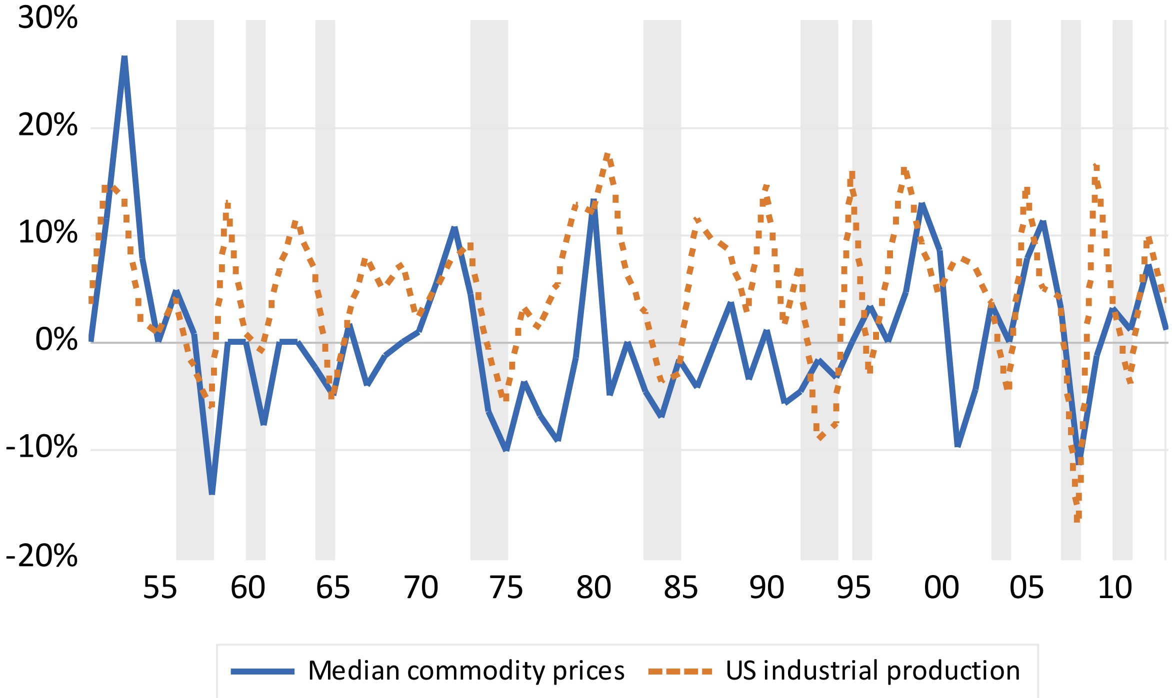


Figure 3: Median percentage change of commodity price (eleven commodities), percentage of 15 countries experiencing a crisis, and composite crisis index (RHS), 1851-1913

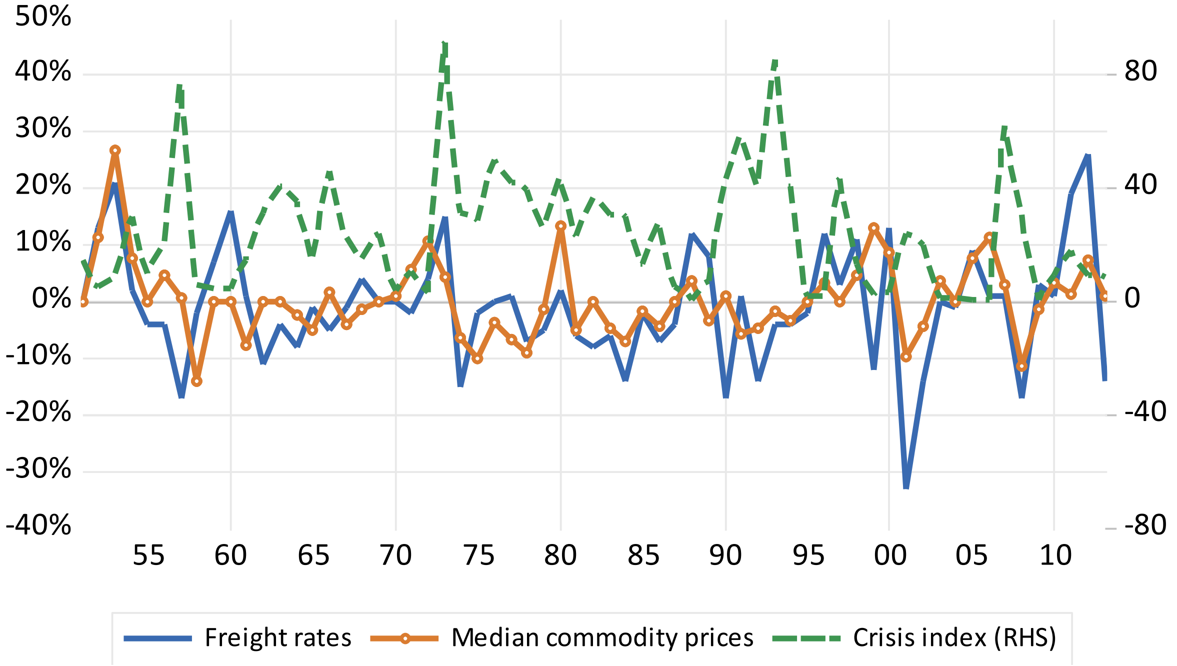
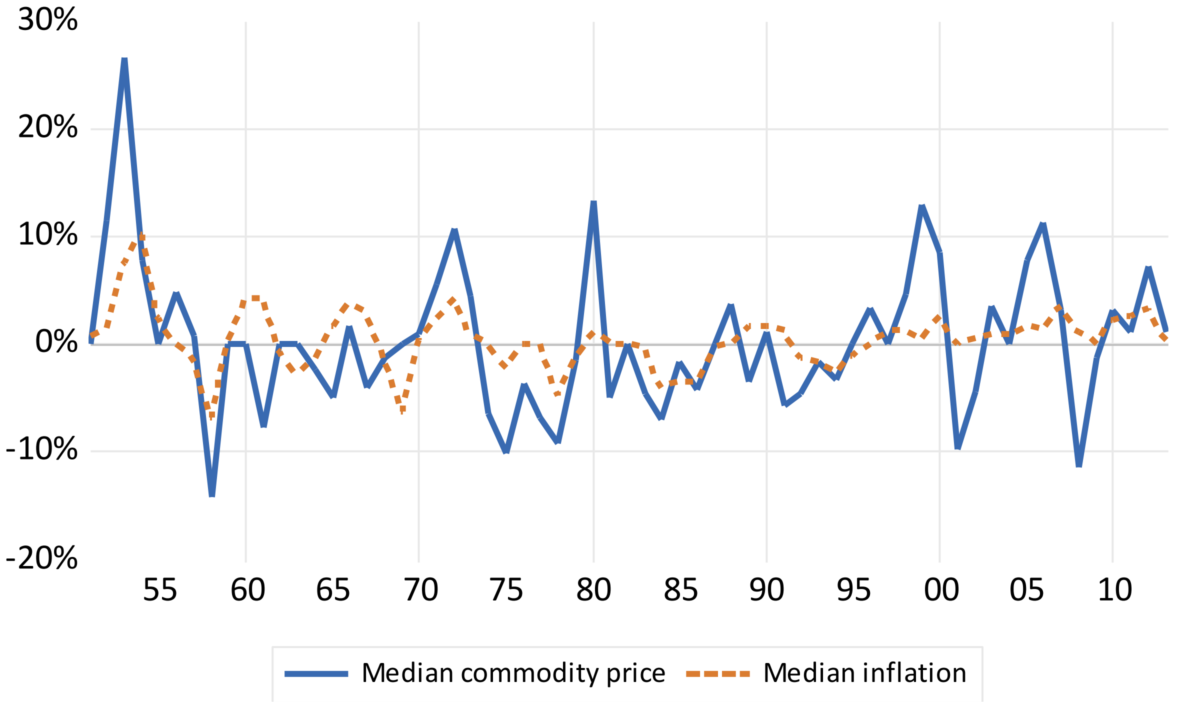


Figure 4 Median percentage change of commodity price (eleven commodities) and median inflation rate (15 countries), 1851-1913



Appendix Table A1:

Iron bars

OLS estimates, 1851-1913

Inflation regressed on a constant, lagged inflation and the percentage change of iron bar prices

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_{i,j}\pi_{j,t} + \varepsilon_t$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.159	0.487	0.103	-0.220	0.114	0.397	0.353	0.685	0.752	0.060	0.380	0.384	0.289	0.131	0.140
SE	1.152	0.421	0.637	0.823	0.354	0.800	0.213	0.751	0.527	0.464	0.445	0.606	0.903	0.380	0.488
p-value	0.891	0.252	0.872	0.791	0.749	0.622	0.103	0.366	0.159	0.897	0.397	0.528	0.750	0.731	0.776
Lagged inflation	0.214	0.133	0.230	0.248	0.512	0.198	0.114	0.392	-0.016	0.413	0.344	0.321	0.118	0.372	0.651
SE	0.128	0.121	0.125	0.114	0.112	0.123	0.128	0.111	0.129	0.117	0.113	0.119	0.112	0.107	0.093
p-value	0.101	0.280	0.070*	0.033**	0.000**	0.115	0.377	0.001**	0.903	0.001**	0.004**	0.009**	0.298	0.001**	0.000**
Commodity prices	0.090	0.102	0.103	0.219	0.066	0.119	0.019	0.088	0.049	0.040	0.111	0.097	0.305	0.117	0.093
SE	0.089	0.033	0.049	0.063	0.027	0.061	0.016	0.056	0.039	0.035	0.033	0.046	0.069	0.029	0.037
p-value	0.318	0.003**	0.038**	0.001**	0.018**	0.054*	0.222	0.122	0.223	0.266	0.002**	0.037**	0.000**	0.000**	0.015**
R-sq.	0.053	0.191	0.107	0.223	0.284	0.102	0.041	0.221	0.025	0.189	0.250	0.167	0.272	0.313	0.489

Notes: "SE" refers to robust standard errors, */** denotes significance at the 10%/5% level.

Appendix Table A2:

Iron bars

Two-stage least squares estimates, 1851-1913

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_{i,j} \pi_{j,t} + \varepsilon_t$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.172	0.492	-0.024	-0.175	0.026	0.394	0.341	0.659	0.705	-0.028	0.322	0.283	0.227	0.060	0.186
SE	1.156	0.424	0.726	0.838	0.405	0.802	0.232	0.881	0.558	0.542	0.477	0.685	0.939	0.434	0.513
p-value	0.882	0.250	0.974	0.835	0.948	0.626	0.147	0.457	0.211	0.959	0.503	0.681	0.810	0.890	0.718
Lagged inflation	0.208	0.103	0.289	0.248	0.597	0.197	0.075	0.320	-0.029	0.407	0.352	0.323	0.088	0.395	0.658
SE	0.135	0.142	0.145	0.116	0.135	0.124	0.141	0.135	0.137	0.137	0.121	0.134	0.119	0.123	0.098
p-value	0.128	0.471	0.050**	0.036**	0.000**	0.117	0.598	0.021**	0.830	0.004**	0.005**	0.019**	0.464	0.002**	0.000**
Commodity prices	0.068	0.129	0.304	0.137	0.178	0.126	0.071	0.352	0.152	0.202	0.208	0.280	0.451	0.237	0.003
SE	0.181	0.076	0.116	0.131	0.067	0.123	0.035	0.138	0.086	0.084	0.074	0.105	0.151	0.068	0.079
p-value	0.709	0.094*	0.011**	0.298	0.010**	0.309	0.046**	0.013**	0.082*	0.020**	0.006**	0.010**	0.004**	0.001**	0.965
R-sq.	0.052	0.181	-0.150	0.200	0.079	0.102	-0.133	-0.073	-0.089	-0.104	0.144	-0.060	0.217	0.112	0.439
Hausman, p-value	0.891	0.689	0.024	0.472	0.031	0.953	0.064	0.009	0.147	0.009	0.108	0.023	0.255	0.020	0.176
F-stat, IV	18.6131														

Notes: “SE” refers to robust standard errors, */** denotes significance at the 10%/5% level..

Appendix Table A3:

Lead

OLS estimates, 1851-1913

Inflation regressed on a constant, lagged inflation and the percentage change of lead prices

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_{i,j} \pi_{j,t} + \varepsilon_t$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.194	0.497	0.147	-0.122	0.133	0.445	0.352	0.716	0.764	0.072	0.432	0.399	0.396	0.174	0.175
SE	1.151	0.443	0.643	0.883	0.351	0.817	0.212	0.756	0.528	0.461	0.448	0.579	1.001	0.393	0.505
p-value	0.867	0.267	0.820	0.890	0.707	0.588	0.102	0.347	0.153	0.877	0.338	0.494	0.694	0.658	0.730
Lagged inflation	0.187	0.182	0.214	0.241	0.522	0.203	0.131	0.394	-0.008	0.415	0.322	0.337	0.162	0.375	0.664
SE	0.126	0.127	0.126	0.122	0.112	0.126	0.127	0.112	0.129	0.116	0.114	0.114	0.123	0.111	0.096
p-value	0.143	0.159	0.093*	0.054*	0.000**	0.113	0.308	0.001**	0.948	0.001**	0.007**	0.004**	0.193	0.001**	0.000**
Commodity prices	0.107	0.070	0.103	0.134	0.086	0.083	0.026	0.088	0.055	0.059	0.127	0.167	0.198	0.121	0.064
SE	0.104	0.041	0.058	0.080	0.032	0.074	0.019	0.067	0.047	0.042	0.040	0.052	0.091	0.036	0.046
p-value	0.307	0.092*	0.082*	0.099*	0.010*	0.263	0.176	0.196	0.249	0.166	0.003**	0.002**	0.033**	0.001**	0.167
R-sq.	0.054	0.103	0.088	0.104	0.297	0.064	0.047	0.211	0.023	0.199	0.240	0.236	0.105	0.268	0.453

Notes: "SE" refers to robust standard errors, */** denotes significance at the 10%/5% level.

Appendix Table A4:

Lead

Two-stage least squares estimates, 1851-1913

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_{i,j} \pi_{j,t} + \varepsilon_t$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.201	0.514	0.113	-0.121	0.105	0.441	0.344	0.777	0.749	0.051	0.426	0.377	0.373	0.154	0.187
SE	1.153	0.448	0.687	0.883	0.366	0.818	0.220	0.828	0.542	0.495	0.457	0.594	1.042	0.415	0.513
p-value	0.862	0.255	0.870	0.892	0.776	0.592	0.123	0.352	0.172	0.918	0.355	0.528	0.722	0.712	0.716
Lagged inflation	0.189	0.147	0.237	0.241	0.574	0.201	0.134	0.333	-0.007	0.417	0.316	0.346	0.145	0.396	0.659
SE	0.126	0.136	0.134	0.122	0.12	0.126	0.132	0.125	0.132	0.125	0.117	0.117	0.129	0.118	0.098
p-value	0.141	0.285	0.083	0.054	0	0.117	0.315	0.01	0.958	0.002	0.009	0.004	0.264	0.001	0.000**
Commodity prices	0.062*	0.111	0.271	0.125	0.160	0.115	0.065*	0.319	0.138	0.185	0.188	0.257	0.400	0.216	0.003
SE	0.164	0.069	0.098	0.126	0.055	0.115	0.030	0.117	0.076	0.07	0.064	0.084	0.149	0.059	0.073
p-value	0.709	0.112	0.008**	0.325	0.005**	0.320	0.036**	0.008**	0.074*	0.011**	0.005**	0.003**	0.009**	0.001**	0.965
R-sq.	0.05	0.089	-0.039	0.104	0.235	0.061	-0.026	0.053	-0.029	0.075	0.21	0.197	0.03	0.18	0.436
Hausman, p-value	0.720	0.460	0.017	0.925	0.073	0.721	0.079	0.004	0.145	0.012	0.208	0.157	0.067	0.028	0.277
F-stat, IV	40.772														

Notes: "SE" refers to robust standard errors, */** denotes significance at the 10%/5% level.

Appendix Table A5:

Pig iron

OLS estimates, 1851-1913

Inflation regressed on a constant, lagged inflation and the percentage change of pig iron prices

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_{i,j} \pi_{j,t} + \varepsilon_t$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.091	0.455	0.051	-0.294	0.114	0.365	0.361	0.696	0.718	0.042	0.312	0.357	0.215	0.118	0.110
SE	1.135	0.413	0.613	0.798	0.357	0.795	0.211	0.741	0.512	0.459	0.413	0.599	0.847	0.373	0.488
p-value	0.937	0.275	0.934	0.714	0.751	0.648	0.092*	0.352	0.166	0.928	0.454	0.553	0.800	0.752	0.822
Lagged inflation	0.221	0.133	0.215	0.219	0.476	0.186	0.071	0.360	-0.026	0.386	0.368	0.312	0.049	0.285	0.672
SE	0.125	0.118	0.119	0.111	0.111	0.123	0.131	0.112	0.125	0.117	0.105	0.117	0.107	0.106	0.093
p-value	0.083*	0.264	0.076*	0.052*	0.000**	0.134	0.593	0.002**	0.839	0.002**	0.001**	0.010**	0.649	0.009**	0.000**
Commodity prices	0.144	0.107	0.138	0.238	0.058	0.127	0.025	0.110	0.084	0.054	0.141	0.106	0.346	0.120	0.089
SE	0.083	0.031	0.044	0.058	0.026	0.058	0.015	0.054	0.037	0.034	0.030	0.043	0.063	0.027	0.035
p-value	0.090*	0.001**	0.003**	0.000**	0.029**	0.031**	0.112	0.046**	0.026**	0.117	0.000**	0.017**	0.000**	0.000**	0.014**
R-sq.	0.083	0.221	0.175	0.270	0.275	0.116	0.058	0.242	0.081	0.206	0.356	0.185	0.360	0.340	0.490

Notes: “SE” refers to robust standard errors, */** denotes significance at the 10%/5% level.

Appendix Table A6:

Pig iron

Two-stage least squares estimates, 1851-1913

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_{i,j} \pi_{j,t} + \varepsilon_t$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.148	0.451	-0.111	-0.224	0.001	0.357	0.368	0.703	0.660	-0.085	0.224	0.202	0.111	0.024	0.184
SE	1.151	0.419	0.709	0.820	0.428	0.800	0.231	0.910	0.538	0.552	0.450	0.707	0.908	0.448	0.517
p-value	0.898	0.286	0.876	0.785	0.998	0.657	0.116	0.443	0.225	0.879	0.620	0.776	0.904	0.957	0.723
Lagged inflation	0.206	0.095	0.236	0.229	0.508	0.185	-0.053	0.209	-0.042	0.295	0.389	0.299	-0.019	0.212	0.659
SE	0.132	0.143	0.137	0.114	0.133	0.125	0.165	0.158	0.132	0.147	0.115	0.138	0.128	0.132	0.098
p-value	0.123	0.511	0.090*	0.048**	0.000**	0.144	0.747	0.191	0.751	0.050**	0.001**	0.034**	0.885	0.114	0.000**
Commodity prices	0.075	0.145	0.330	0.153	0.185	0.138	0.078	0.406	0.169	0.223	0.233	0.308	0.525	0.257	0.004
SE	0.199	0.084	0.122	0.141	0.073	0.134	0.038	0.164	0.092	0.094	0.077	0.119	0.169	0.076	0.089
p-value	0.706	0.090*	0.009**	0.285	0.014**	0.306	0.046**	0.016**	0.070*	0.021**	0.004**	0.012**	0.003**	0.001**	0.965
R-sq.	0.072	0.200	-0.085	0.243	-0.021	0.116	-0.131	-0.145	-0.004	-0.132	0.251	-0.119	0.273	0.057	0.439
Hausman, p-value	0.707	0.625	0.047	0.501	0.022	0.929	0.090	0.014	0.286	0.016	0.159	0.026	0.222	0.015	0.273
F-stat, IV	12.761														

Notes: "SE" refers to robust standard errors, */** denotes significance at the 10%/5% level.

Appendix Table A7:

Timber

OLS estimates, 1851-1913

Inflation regressed on a constant, lagged inflation and the percentage change of timber prices

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_{i,j} \pi_{j,t} + \varepsilon_t$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.246	0.554	0.203	-0.058	0.170	0.495	0.359	0.862	0.794	0.103	0.469	0.474	0.528	0.226	0.205
SE	1.141	0.442	0.628	0.870	0.359	0.792	0.214	0.707	0.526	0.451	0.424	0.596	0.958	0.391	0.500
p-value	0.830	0.215	0.748	0.947	0.638	0.534	0.099*	0.228	0.137	0.820	0.273	0.429	0.584	0.567	0.684
Lagged inflation	0.205	0.145	0.198	0.220	0.499	0.209	0.133	0.344	-0.016	0.410	0.362	0.316	0.114	0.371	0.668
SE	0.125	0.131	0.122	0.121	0.113	0.122	0.128	0.106	0.129	0.114	0.108	0.117	0.120	0.111	0.095
p-value	0.108	0.271	0.111	0.075*	0.000**	0.092*	0.305	0.002**	0.903	0.001**	0.001**	0.009**	0.345	0.001**	0.000**
Commodity prices	0.214	0.120	0.203	0.247	0.094	0.235	0.023	0.299	0.090	0.125	0.233	0.198	0.413	0.177	0.118
SE	0.150	0.061	0.082	0.114	0.047	0.103	0.027	0.091	0.068	0.059	0.055	0.077	0.127	0.051	0.065
p-value	0.158	0.052*	0.016**	0.035**	0.052*	0.026**	0.407	0.002**	0.190	0.038**	0.000**	0.013**	0.002**	0.001**	0.075*
R-sq.	0.069	0.118	0.130	0.131	0.262	0.121	0.028	0.313	0.029	0.231	0.319	0.193	0.180	0.272	0.464

Notes: “SE” refers to robust standard errors, */** denotes significance at the 10%/5% level.

Appendix Table A8:

Timber

Two-stage least squares estimates, 1851-1913

$$\pi_{i,t} = \alpha_i + \beta_i \pi_{i,t-1} + \gamma_{i,j} \pi_{j,t} + \varepsilon_t$$

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Iceland	Netherlands	Norway	Sweden	Switzerland	UK	US
Constant	0.227	0.608	0.242	-0.066	0.178	0.487	0.367	0.990	0.824	0.134	0.477	0.513	0.596	0.250	0.188
SE	1.147	0.454	0.668	0.872	0.393	0.794	0.231	0.747	0.544	0.483	0.431	0.633	0.993	0.428	0.512
p-value	0.844	0.185	0.718	0.940	0.653	0.541	0.117	0.190	0.135	0.783	0.273	0.421	0.551	0.561	0.714
Lagged inflation	0.197	0.086	0.196	0.224	0.564	0.209	0.148	0.290	-0.025	0.404	0.370	0.313	0.073	0.392	0.659
SE	0.127	0.156	0.130	0.123	0.128	0.122	0.138	0.117	0.133	0.122	0.110	0.124	0.128	0.121	0.098
p-value	0.126	0.585	0.137	0.072*	0.000**	0.093*	0.290	0.016**	0.850	0.002**	0.001**	0.014**	0.568	0.002**	0.000**
Commodity prices	0.100	0.195	0.431	0.203	0.256	0.188	0.106	0.525	0.224	0.299	0.308	0.412	0.670	0.349	0.005
SE	0.265	0.121	0.152	0.202	0.095	0.181	0.052	0.172	0.124	0.111	0.099	0.143	0.237	0.099	0.118
p-value	0.708	0.111	0.006**	0.319	0.009**	0.305	0.045**	0.003**	0.075*	0.009**	0.003**	0.006**	0.006**	0.001**	0.965
R-sq.	0.060	0.095	0.017	0.129	0.115	0.118	-0.126	0.242	-0.036	0.118	0.298	0.088	0.123	0.131	0.437
Hausman, p-value	0.605	0.469	0.051	0.793	0.023	0.754	0.035	0.098	0.175	0.042	0.356	0.053	0.181	0.020	0.240
F-stat, IV	28.270														

Notes: “SE” refers to robust standard errors, */** denotes significance at the 10%/5% level.