UNIVERSITÉ DE NEUCHÂTEL

Institut de recherches économiques

Commodity Prices and Global Inflation, 1851-1913

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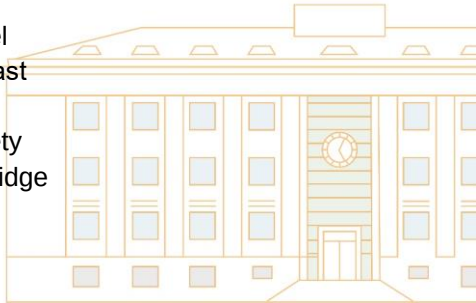


Background

- Commodities – particularly oil prices – are viewed as playing a key role in triggering fluctuations in inflation today.
- What was the situation in the past?
- We know that commodities prices were integrated during this period.
  - Klovland (2005), Jacks (2005), Findlay and O'Rourke (2001).
- There are also several studies on long-run cycles in commodity prices using filtering to identify short- and long-run cycles in the data.
  - Erten and Ocampo (2013), Jacks (2019).
- We are interested in a different question: the role of commodity prices in the international transmission of inflation.
- With commodities traded internationally, increases in their prices will impact on import prices across the world, leading to a positive correlation of inflation in individual economies.

Data sources – consumer prices, 15 countries

	Median	Mean	Interquartile range	Standard deviation	Source
Australia	1.29	1.31	5.05	4.91	McLean (1999), W6-series used
Austria	0.00	0.18	6.78	4.68	Mühlpeck, et al., (1979)
Belgium	0.00	0.33	1.10	1.40	Mitchell (2003)
Canada	0.00	0.19	2.55	2.64	Various, see text
Denmark	0.72	0.67	6.07	6.64	Abildgren (2009)
Finland	0.00	0.47	3.41	5.22	Heikkinen (1997)
France	0.54	0.67	5.79	4.25	Mitchell (2003)
Germany	0.80	0.55	5.09	3.23	Mitchell (2003)
Iceland	1.07	0.73	2.92	3.49	BIS , www.bis.org
Netherlands	1.07	0.73	2.92	3.49	Arthur van Riel, http://iisg.nl/hpw/brannex.php
Norway	0.56	0.55	7.85	5.83	Grytten (2004)
Sweden	0.72	0.20	3.23	2.37	Edvinsson and Söderberg (2010)
Switzerland	-0.08	0.12	4.63	3.19	Studer and Schuppli (2008), Historical Statistics of Switzerland (2012)
UK	0.12	-0.31	6.74	5.69	FRED, fred.stlouisfed.org
US	0.56	0.49	3.38	3.07	www.measuringworth.com

Data – commodity prices

- Commodity prices data collected from a series of papers by Augustus Sauerbeck.
  - 1886, 1893, 1908, 1916.
  - Contemporary data collection ensures these were the relevant commodities of the day.
  - Data on 44 commodities over the period 1850-1913. Six categories:
    - Corn or grains
      - Wheat, flour, barley, oats, maize, potatoes
    - Meat and animal products
      - Beef, mutton, pork, bacon, butter
    - Sugar, tea and coffee
    - Minerals
      - Pig iron, iron bars, copper, tin, lead, coal
    - Textiles
      - Cotton, flax, hemp, jute, wool, silk
    - Sundry materials
      - Linseed, timber, indigo, hides, leather, tallow, oil

Consumer prices and commodities

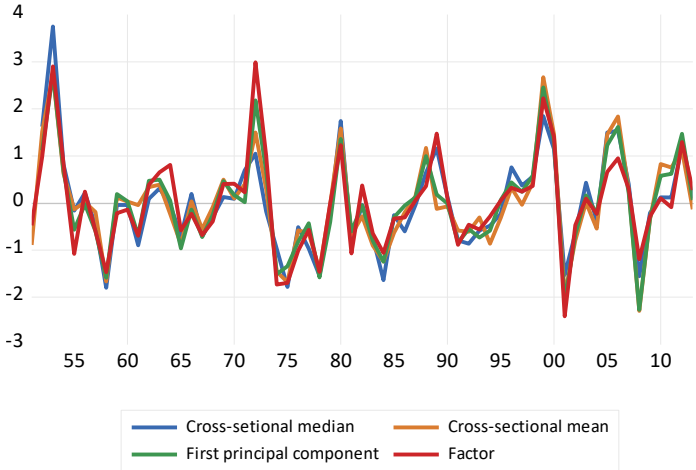
- Kaufmann (2020): several sources of measurement error in historical consumer price series.
  - Wholesale prices are sometimes used as a proxy for missing retail prices.
- UK consumer price data are from Feinstein (1998) for the period 1770-1882, spliced together with Feinstein (1991) for the period 1882-1914.
- Uses wholesale prices for several series to proxy for:
  - Flour (in combination with another series for the period 1846-1870)
  - Pork and bacon (1850-1870)
  - Potatoes (1846-1870)
  - Tallow (as a proxy for candles, 1860-1870).
- Make up over 20% of the index during the period that all four are used (1860-1870).

Selecting commodities

- We remove all the commodities which we think could be used to proxy for retail prices.
- 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.
- By excluding the direct channel identified by Cavallo, our test for the relationship between commodity prices and consumer prices between 1851 and 1913 is much more stringent.
- We select 9 commodities which would not proxy any good in a consumer basket:
  - Pig iron, Iron bars, Lead, Tin, Copper, Timber, Linseed, Jute, Indigo

A single measure of ‘commodity prices’

- Calculating a weighted index has many difficulties (Jacks (2019)).
- Follow Ciccerelli and Mojon (2010), and consider several measures:
  - cross-sectional average
  - cross-sectional median
  - first principal component
  - single factor from a factor model.



Median of commodity prices

- In any year, one or a few commodities experience price changes far below or above the other commodities.
- The cross-sectional median is more robust to outliers than the mean.
- Use the median of these commodity prices in regressions for all 15 countries:

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

where $\pi_{i,t}$ is domestic inflation and $\pi_{c,t}$ is median commodity price inflation.

- Using commodity prices denominated in Sterling.
  - Including % change in exchange rate against £ for 11 of the 15 countries has no material effect on the result.

Results: Inflation regressed on a constant, lagged inflation and the median of commodity prices, 1851-1913

	AUS	AUT	BEL	CAN	DNK	FIN	FRA	GER	ICE	NLD	NOR	SWE	CHE	UK	US
Constant	0.129	0.503	0.093	-0.223	0.111	0.386	0.344	0.751	0.739	0.037	0.362	0.359	0.293	0.124	0.144
	(1.08)	(0.42)	(0.60)	(0.79)	(0.33)	(0.76)	(0.19)	(0.71)	(0.51)	(0.42)	(0.40)	(0.56)	(0.88)	(0.34)	(0.44)
	[0.12]	[1.20]	[0.16]	[-0.28]	[0.33]	[0.51]	[1.82]	[1.06]	[1.44]	[0.09]	[0.91]	[0.64]	[0.33]	[0.36]	[0.33]
Lagged inflation	0.195	0.114	0.214	0.206	0.492	0.191	0.105	0.339	-0.024	0.389	0.342	0.316	0.115	0.342	0.663
	(0.14)	(0.13)	(0.09)*	(0.15)	(0.11)**	(0.13)	(0.13)	(0.12)**	(0.09)	(0.16)*	(0.10)**	(0.08)**	(0.15)	(0.10)**	(0.20)**
	[1.43]	[0.85]	[2.47]*	[1.36]	[4.31]**	[1.48]	[0.80]	[2.84]**	[-0.28]	[2.37]*	[3.45]**	[3.88]**	[0.77]	[3.39]**	[3.28]**
Commodity Prices	0.266	0.169	0.230	0.400	0.146	0.260	0.075	0.223	0.150	0.157	0.260	0.267	0.535	0.255	0.136
	(0.12)*	(0.05)**	(0.08)**	(0.08)**	(0.06)*	(0.10)**	(0.03)*	(0.08)**	(0.06)*	(0.05)**	(0.07)**	(0.06)**	(0.12)**	(0.06)**	(0.06)*
	[2.13]*	[3.53]**	[3.02]**	[4.93]**	[2.31]*	[2.72]**	[2.63]*	[2.78]**	[2.39]*	[3.19]**	[3.73]**	[4.23]**	[4.32]**	[3.96]**	[2.28]*
Observations	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62
R-squared:	0.08	0.17	0.15	0.24	0.33	0.14	0.14	0.25	0.08	0.26	0.36	0.26	0.28	0.42	0.47
F-statistic:	2.74	6.18	5.29	9.14	14.55	4.61	4.77	9.93	2.50	10.40	16.80	10.43	11.20	21.58	26.49

Notes: robust standard errors in parenthesis, t-statistic in in parenthesis, */** denotes significance at the 5%/1% level. AUS = Australia, AUT = Austria-Hungary, BEL = Belgium, CAN = Canada, DNK = Denmark, FIN = Finland, FRA = France, GER = Germany, ICE = Iceland, NLD = Netherlands, NOR = Norway, SWE = Sweden, CHE = Switzerland, UK = United Kingdom, US = United States.

Which commodities are most important?

- We use three different methods:
  - Regressions including each commodity in turn.
  - LASSO
  - Search algorithm.

- Regressions including each commodity in turn.
  - Pig iron and timber most frequently significant, pig iron highest average r-squared.
- Are UK prices important? Tariffs and transport costs may lead to a wedge between prices in different countries.
  - Collect German (Jacobs and Richter (1935)) and US pig iron prices (Bureau of Statistics (1902)) in local currency.
  - Find little change in the results.

Search algorithm

- Include a constant, the lagged inflation rate and all nine commodity prices.
- Sequentially drop the least significant until all remaining regressors are significant.
- With each deletion from the model, all the previously added variables are checked against a stopping criterion, and possibly removed.
  - One problem with using this search algorithm is that the t-statistics or p-values lose their meaning. Searching over multiple regressors dramatically increases the likelihood that an irrelevant variable will spuriously appear significant.
    - If the p-value is 0.05, the likelihood that 1 of 9 regressors will be significant is 29.9%.
    - We use a p-value of 0.01 in which case this probability is 8.3%.
- Overall, we find that pig iron is generally most important commodity in most countries.

Search algorithm results

	Austria	Belgium	Canada	France	Germany	Norway	Sweden	Switzerland	UK
Constant	0.455	0.232	-0.294	0.395	0.862	0.363	0.399	0.215	0.118
	(0.41)	(0.57)	(0.76)	(0.20)	(0.66)	(0.38)	(0.58)	(0.84)	(0.36)
	[1.10]	[0.41]	[-0.39]	[1.99]	[1.30]	[0.96]	[0.69]	[0.26]	[0.33]
Lagged inflation	0.133	0.167	0.219	0.65	0.344	0.376	0.337	0.049	0.285
	(0.12)	(0.08)*	(0.13)	(0.12)	(0.11)**	(0.09)**	(0.09)**	(0.14)	(0.10)**
	[1.09]	[2.05]*	[1.63]	[0.55]	[3.09]**	[4.09]**	[3.92]**	[0.35]	[2.75]**
Pig iron	0.107		0.239			0.103		0.346	0.120
	(0.02)**		(0.07)**			(0.03)**		(0.07)**	(0.04)**
	[5.14]**		[3.56]**			[3.04]**		[4.81]**	[3.18]**
Linseed		0.206		0.042					
		(0.06)**		(0.01)**					
		[3.63]**		[3.55]**					
Lead							0.167		
							(0.04)**		
							[3.881]**		
Timber					0.299	0.149			
					(0.10)**	(0.06)**			
					[3.01]**	[2.73]**			
Adjusted R-squared:	0.19	0.24	0.25	0.08	0.29	0.39	0.21	0.34	0.32

Why pig iron?

- In the US, pig iron prices and production have often been used as an indictor of the business cycle during this period (railways).
  - Miron and Romer (1990), Mitchell and Burns (1946), Gorton (1988), Calomiris and Hubbard (1987).
  - More recently, more comprehensive measures of industrial production have been calculated, but still include pig iron (Davis (2004)).

Further work

	Median growth rate in GDP per capita*	Global pig iron production	Annual change in pig iron prices	Median consumer price inflation
Median growth rate in GDP per capita*	1.00			
Global pig iron production	0.48	1.00		
Annual change in pig iron prices	0.40	0.45	1.00	
Median consumer price inflation	0.07	0.15	0.50	1.00

*Median growth in per capita GDP is for 14 countries; data are not available for Iceland.

- Global growth is positively and significantly correlated with changes in the prices and production of pig iron.
  - Swings in pig iron prices reflect global business conditions.
- Global inflation is strongly correlated with changes in pig iron prices but not global growth.
  - Pig iron prices seem to provide a channel for transmission of global business cycle fluctuations to domestic inflation.

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Thank you

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