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TREND AND CYCLE IN PRIMARY COMMODITY PRICES: A NEO-SCHUMPETERIAN INTERPRETATION

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Abstract

This paper adapts Schumpeter"s theory of economic development and the business cycle for the purpose of analysing movements in prices of primary commodities in both the short and long run. Schumpeter focuses his analysis on movements in prices of finished consumer goods, but he clearly recognizes that prices of primary products are both directly and indirectly affected by the same mechanism that drives finished goods prices. We extend Schumpeter"s analysis by directly examining features of primary commodity production and consumption that are weakly developed by Schumpeter. We find that the extended analysis fits nicely to data on commodity prices over the period 1650 to 2008.

1. Introduction

Schumpeter provides a framework for understanding the essentially endogenous nature of innovation in capitalism. The Theory of Economic Development (Schumpeter, 1934) sets out the fundamental notion of development as a process of discontinuous change in the hands of entrepreneurs who introduce new products and new production processes, open up new markets and sources of supply of inputs, and carry out new forms of organization of an industry. Business Cycles (Schumpeter, 1939) then provides the theoretical, historical and statistical flesh to the earlier skeleton.

Schumpeter argues that innovation drives down prices of affected products, but generally with considerable delay due to resistance to new ways of doing things. Only after an innovation has overcome initial resistance, and entrepreneurs have been able to divert substantial amounts of inputs from other activities, does the intense competition associated with the process of creative destruction emerge and result in substantial price reductions for products that are directly affected by the innovation. There are also "secondary wave" influences that tend to increase prices of other products, at least initially, through competition from the new activities for inputs to production. The net result is an expectation that prices trend downward in the long run, but with a cyclical pattern that depends on the bunching of major innovations in long waves and is subject to irregular influences external to the economic evolution (for example, wars and natural disasters).

The focus of analysis in Business Cycles is on trend and cycles in prices of finished consumer goods. However, Schumpeter is clear that the forces of capitalist development impact on primary commodity production as well as on the production of finished consumer goods. Business Cycles is replete with examples of innovation affecting prices of primary commodity products, particularly in terms of the opening up of new areas to production and cost-reducing innovations in production methods in agriculture and mining. There is also recognition of "secondary wave" influences on

prices of primary commodities as the basic raw materials for production of goods. Thus, there is a presumption that primary commodity prices will behave in a pattern similar to that of finished goods.

The contrast between Schumpeter"s analysis of primary commodity prices and the analysis provided by classical and neoclassical economics is profound. Classical economic theory predicts rising prices for primary commodities in the process of economic growth, as production expands with finite natural resources and fixed technology. Neoclassical economic theory is less definite, allowing serendipitous new discoveries or exogenous improvements in production and consumption technology to offset the tendency for diminishing productivity and rising price. However, there is still a presumption in favour of rising prices, especially for primary products from non-renewable natural resources, as the returns on holding in situ reserves are expected to be equalized to returns on other assets (Hotelling, 1931).

Accepting that there are related forces of innovation at work on the prices of both primary commodities and finished consumer goods, we extend Schumpeter"s analysis to ask whether there are special features in production and consumption of primary commodities that might lead to systematic differences in the pattern of price movements from that for finished consumer goods. In particular, we note that production processes are not as easily imitated in primary product production because the natural resource input to production base is inherently heterogeneous. This slows the diffusion of innovations, leading to further delay in the impact of innovations on prices and may increase the amplitude of cyclical price movements as well as introducing further irregularities into the patterns of price movements for individual primary commodities. Also, the standardized nature of primary commodity prices reduces the scope for development that enhances quality and value, which exposes primary commodities to particularly intense competition from innovations leading to new products (particularly synthetic substitutes). We conclude that this leads to a downward trend in primary commodity prices relative to prices of manufactured goods due to the differential impact of the innovation process.

We apply the extended Schumpeterian analysis to data on commodity prices covering the period, 1650 to 2008. This period is much longer than Schumpeter was able to examine, thanks to the passage of time and to the continuing work of economic historians. We also have parallel data on prices of manufactured goods and utilize this data series to assess whether Schumpeter"s conclusions about the trend and cycle in finished consumer goods prices hold for this closely related data series outside of the 1786 to 1938 period he examined in Business Cycles. Finally, we combine the data series to give the terms of trade between primary producers and manufacturers in international trade, and then examine whether the trend and cycles in this relative price provides evidence of greater cyclical amplitude and long-run downward trend for primary commodity prices relative to those of manufactured goods.

Our data series show patterns that support Schumpeter"s analysis for the existence of long cycles in prices. The series for both manufacturing unit values and primary commodities show a pattern similar to that found by Schumpeter over the two full long cycles (1786 to 1842 and 1842 to 1897) covered by his data on finished consumer goods prices. The data for earlier and later periods also exhibit generally conforming cyclical patterns, although prices since 1900 are affected by a general inflationary trend that interferes with interpretation of the price cycles. The combined series for the terms of trade, which removes the inflationary trend, clearly supports the expectations from our extended Schumpeterian analysis.

In Section 2 below we summarize some of the key results for trend and cycles in prices from Schumpeter"s analysis of economic development and business cycles. Section 3 considers how these

results apply to the special characteristics of primary commodities. Section 4 discusses trend and cycles over the period 1650 to 2008 for the price series of primary commodities and manufactured goods, as well as the combined series for real commodity prices. Implications for economic policy are discussed in Section 4 and Section 5 presents our conclusions.

2. Schumpeter's schema

In Schumpeter"s analysis innovation is the driving mechanism for development and the business cycle. Innovation occurs with the introduction of new processes, new products, new means of organization and new markets and is localized to a particular industry or group of related industries. Development to Schumpeter implies structural change as the old ways of doing business are swept away by the new.

Schumpeter argues that aggressive competition from the new activities is required to accomplish this structural change as there is resistance from the interests associated with the old ways.

The process of "creative destruction" in which the old ways are swept away by the new is discontinuous and time consuming, taking several decades to complete in the case of major innovations or groupings of innovations. In Business Cycles, Schumpeter associates major innovations and their associated structural changes with each of several long cycles of development in the modern capitalist epoch. In particular he identifies the period from 1786 to 1842 as a cycle associated with the industrial revolution, the period from 1842 to 1897 as a cycle associated with railroadization, and an incomplete (at the time of writing in 1938) cycle from 1897, associated with electrification.

In addition to long cycles lasting between 50 and 60 years, noted as Kondratieff cycles, Schumpeter also recognizes the existence of shorter Juglar cycles that last between 9 and 10 years and Kitchin cycles that last around three years (see Schumpeter, 1939, p.213 for a stylized chart showing how the various cycle lengths overlap). The basic structure of each cycle has four phases, prosperity, recession, depression and revival, although for some cycles, especially the shorter ones, there is no clear distinction between recession and depression.

While groupings of innovations that are specific to a few sectors of the economy are the dominant mechanism of development in Schumpeter"s schema, he clearly recognizes that impacts spread throughout the economy as the innovations upset the prior normality. The working out of the cycle includes "secondary wave" phenomena, which ripple through sectors away from the bunching of innovations[1]. Also, Schumpeter is careful to explain in setting out the theoretical schema that external factors, such as wars, natural disasters and political events, lead to irregularities in the cyclical pattern. As a result, the schema needs to be applied with the peculiarities of each historical case clearly recognized. Accordingly, Schumpeter"s analysis of the historical record is based on the separate interpretation of each period in each country and with reference to specific sectors, rather than relying on statistical methods applied to aggregate data.

In the spirit of taking account of the particulars of each country and time period, Business Cycles contains extensive discussion of developments in output, employment, credit markets. However, the key marker of stages of the business cycle is movements in prices of finished consumer goods. This choice of marker follows logically from having innovation as the motivating force of trend and cycles. Schumpeter argues that there is a clear path for prices of finished consumer goods over the course of the long (Kondratieff) cycle. The initial competition for resources in the prosperity phase tends to push up prices, especially for products not directly affected by innovation. However, the eventual spread of the innovation eventually leads to

[1] For a detailed critical discussion of the distinction between the primary and secondary dimensions of Schumpeter"s schema see Oakley (1990), especially Chapters 8 and 9.

aggressive competition, with creative destruction driving down prices. In the situation of normality that Schumpeter associates with revival at the end of the cycle, he expects prices to be below the corresponding point of the previous cycle. Thus, Schumpeter expects prices of finished consumer goods to have a downward trend over the full cycle, with a rise in the initial prosperity phase followed by a larger fall in the recession and depression phases and, perhaps, some recovery in the revival phase.

3. Extending Schumpeter's analysis to primary commodity prices

While Schumpeter"s primary focus in Business Cycles is on developing the implications of his analysis for prices of finished consumer goods, he nonetheless clearly recognizes that innovations in primary commodity production impact substantially on prices for these products. Indeed, in discussing the evolution of early English capitalism he cautions that „we must, of course, bear in mind both the smallness and the agrarian nature of the economic organism" (Schumpeter, 1939, p.237). He then goes on to attribute to innovations the approximate doubling of wheat yield between 1500 and 1785, although without having enough detail to identify the specific changes in farming practices that led to the higher productivity.

For later periods in all three of the countries examined in Business Cycles there are clear examples of specific innovations in primary production. For England in the decades surrounding the beginning of the 19th Century the examples include enclosures, intensive cultivation in the neighbourhood of cities, improved methods of raising beef cattle and improved drainage by steam pumps (Schumpeter, 1939, p.266-7). In Germany around the same time changes in land tenure, adoption of English methods and spread of cultivation of potatoes are pointed to as examples of innovations leading to expanded agricultural production (Schumpeter, 1939, p.268). In America the opening up of new areas to agricultural production is noted as a continual process of innovation, with production of grains shifting from New England to Virginia and Maryland, then to the Great Lakes region and continuing westward into the early decades of the 20th Century (Schumpeter, 1939, p.270).[1]

Innovation in primary commodity production has continued apace since the writing of Business Cycles. There has been the green revolution in agriculture, the development of the offshore oil industry and the spread of open-pit mining to mention but a few examples. Simpson (1999) provides case studies of technological change and productivity improvement for a variety of primary industries, while Bartos (2007) compares the innovation experience of mining industries to that of manufacturing over the past 50 years and concludes that the innovation experience of mining is comparable to that of mature manufacturing industries but less than high-tech manufacturing.

While there clearly have been both major and minor innovations in the production of primary commodities, the way in which innovation proceeds can be expected to differ in some potentially important respects from manufacturing. First, production processes are not as easily imitated in primary product production because the natural resource input to production base is inherently heterogeneous. This slows down diffusion of innovations to the extent that each production site has unique characteristics that require modifications to the innovative process, equipment or mode of organization.

Another feature potentially slowing diffusion of innovations is the structure of property rights associated with the natural resources from which primary commodities are produced. Both land and mineral deposits have institutionalized constraints on the usage that can impede changes in the

[1] Schumpeter (1939, p.430-1) also notes the example of the development of rubber plantations, particularly in Malaya, to augment the supply of "wild" rubber from Brazil after the surge in demand for tires following the innovation of mass produced motor cars. Innovations in primary production are thus responding to profit opportunities opened up by the primary force of innovation and constitute a "secondary wave" phenomenon.

methods of production. These constraints vary across political jurisdictions, leading to uneven implementation of innovations.

Slowing diffusion of innovations in primary commodity production can delay the impact of innovations on prices, which may attenuate the cyclical pattern that Schumpeter associates with prices of finished consumer goods. Also, the same factors that slow diffusion interfere with the rapid adjustment of primary commodity production to shocks, which can introduce greater short-term irregularities into the movements of primary commodity prices. Overall, the implication is that the pattern of cyclical price movements that Schumpeter associates with finished consumer goods will be less clear in the case of primary commodity prices[1].

The character of innovations in the primary commodity business is limited by the standardized nature of the product. Indeed, the term, commodity business, has taken on special meaning beyond the production of primary commodities, denoting limits on the ability to alter product characteristics that might add value from the perspective of the buyer. This exposes primary commodities to particularly intense competition from innovative products, both direct competition from synthetic substitutes and indirect competition from new goods absorbing an increased share of consumer budgets.

Competition from innovative manufactured products imparts a downward trend in primary commodity prices relative to prices of bundles of finished consumer goods. The downward trend has been amplified by the substantial reduction in bulk freight rates both domestically and internationally over the historical period examined below, which has reduced the prices of primary commodities at the market centres at which our commodity prices are measured relative to f.o.b. prices at the point of production[2]. Further, there is a potential upward bias in prices of manufactures due to failure to fully correct for improvements in quality[3]. Finally, conditions of competition influence the relative price, as imperfect competition in manufacturing raises profit margins on the cost of primary commodities as raw materials[4].

Schumpeter notes the difficulties in comparing price movements for primary commodities and manufactures in discussing the fall in relative commodity prices in the aftermath of the Great Depression. He states, „In no case is it possible to infer from these facts anything about the lack of balance in the price system or about lack of flexibility in prices per service unit." (Schumpeter, 1939, p. 120) Thus, while there is a clear expectation of downward movement in the price of primary commodities relative to that of manufactured goods, there are less clear implications for structural change in prices at either the point of production or from the point of view of the ultimate consumer.

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[1] Schumpeter identifies a role for the decline in the price of primary commodities relative to manufactures in the recovery from recession in the long cycle. In discussing such a decline in the aftermath of the Great Depression, he notes, „The relative fall in raw-material prices foreshadows, and is a condition of, a new equilibrium at vastly increased figures of output" (Schumpeter, 1939, p.120).

[2] See Williamson (2006) for a discussion of the impact of declines in freight rates the prices received by producers as opposed to the prices paid by the ultimate buyers (including freight).

[3] For a contemporary account of the extent to which the decline in the relative price of a specific primary commodity, copper, is a reflection of incomplete adjustment for the improved quality of manufactures see Svedberg and Tilton (2006).

[4] Bloch and Sapsford (2000) examine the impact of manufacturing profit margins and unionized wages in manufacturing on the price of primary commodities relative to manufactured goods. They also show evidence of a short-run impact of fluctuations in manufacturing activity on prices of primary commodities, such as expected with secondary wave influences in Schumpeter"s analysis.

4. Price trend and cycles in primary commodities and manufactured goods

a. Data

We examine trend and cycles in prices of primary commodities to see if they exhibit the pattern expected from Schumpeter‟s analysis in Business Cycles, making allowance for the modifications suggested in the section above. We measure primary prices with an index of the average price of a variety of primary products from agriculture and mining[1]. We also examine a price index series for manufactured goods, which allows a more direct comparison to the series that Schumpeter presents for prices of finished consumer goods. Finally, we obtain a series for the real price of primary commodities, calculated as the price index for primary commodities divided by the price index for manufactured goods.

The data series we use for primary commodities and manufactured goods extend from 1650 to 2008. Construction of such a long series necessarily involves linking together of price data from a number of different sources. The range of products and countries included increases over time reflecting the greater availability of reliable data. Details of the original sources for the primary commodity and manufactured good price data are discussed in Harvey, et al (2009)[2].

Figure 1 displays a chart of the logarithm of each of the original series as well as a series for the real price of primary commodities. Logarithms are used so that a vertical movement of a given amount represents the same percentage change in price from any initial point[3]. The use of logarithms also means that the series for the real commodity price is given by the vertical difference between the series for the nominal commodity price and the manufacturing unit value[4].

b. Trends

Schumpeter argues that prices of finished consumer goods rise and then fall over the course of a long cycle and that the price level ends the cycle at a level below that at the beginning. This is a reflection of the working of innovation in first bringing down production costs and then prices as the process of creative destruction unfolds. We argue that a similar process can be expected for primary commodity prices, except that the cycle may be attenuated by the slower diffusion of innovations and more disrupted by external shocks due to slow adjustment of primary commodity production. Figure 1 offers some support for these arguments, but also some counter evidence.

In Figure 1 the commodity price index moves irregularly downward from 1650 through the depression of the 1930s. Whether the irregularities follow the proposed cyclical pattern is discussed in more detail below with respect to each particular long cycle. However, since the 1930s there is an unmistakeable upward tilt to the movement of commodity prices, with only temporary interruptions. The upward tilt is even more noticeable in the case of the index of manufacturing prices, which has fluctuated up and down without much trend until moving onto a distinct upward path after the 1930s.

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[1] Schumpeter (1939, p.449-452) discusses the advantages and disadvantages of using price indexes as opposed to prices of individual products and comes down in favour of using an index measure.

[2] The individual primary commodity price series described in Harvey, et al (2009) are combined into an aggregate primary commodity index as a simple average of the series. The manufactured goods price series is constructed as an average of prices from different countries, where the sample of countries expands over time as more data for more countries become available. Both data series are extended from 2005 to 2008 by chain linking, with the commodities index linked to the IMF all commodities world price index series and the manufacturing price series linked to values from the OECD total manufacturing price index series.

[3] For logarithms of base ten used in figures below a doubling of the arithmetic value of the index is represented by a rise of .3 on the vertical scale and a halving of the arithmetic value is indicated by a fall of .3.

[4] The logarithm of a ratio is given by the difference between the logarithm of the numerator and the logarithm of the denominator. In this case the log(real commodity price) = log(commodity price/manufacturing price) = log(commodity price) – log (manufacturing price).

Figure 1. Logarithms of Price Series 1650-2008

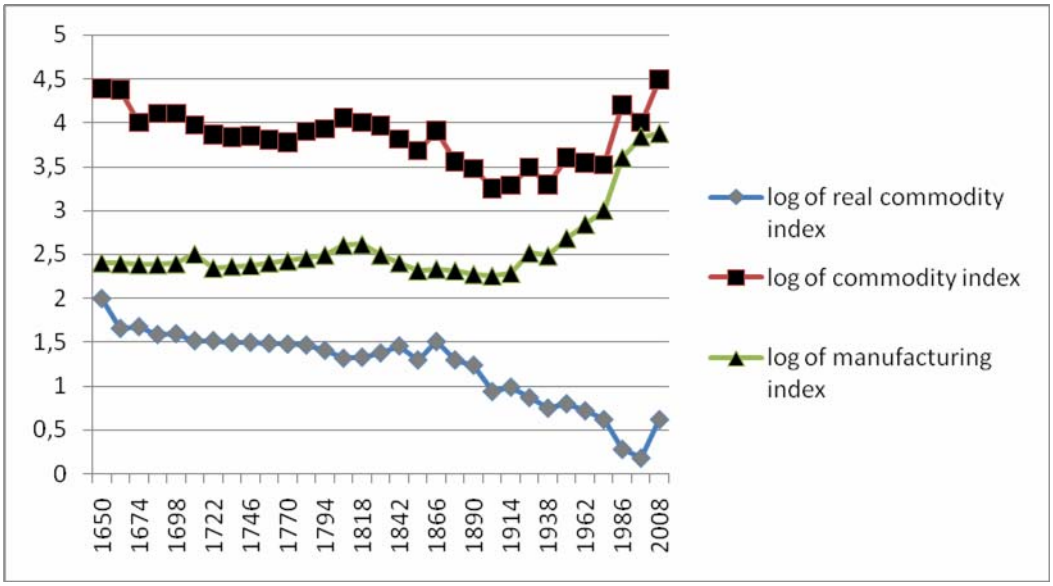


Figure 1 shows that something substantial happened to the course of both commodity and manufacturing prices in the 20th Century. Schumpeter (1939, pp.109-123) argues forcefully that credit creation is tied logically to the innovation process that drives capitalism. While banks are the active agents in the process of credit creation they react to the opportunities for the productive use of credit by business. However, there are limits, albeit somewhat elastic, to credit creation imposed by the requirement that deposits of the banks be redeemable in legal tender. Further, Schumpeter notes that, „For the purpose of describing prewar patterns it will be convenient to reason in general on what, from the standpoint of the theory of money, is a very special case, namely, the case of perfect gold monometallism" (Schumpeter, 1939, p. 120). Thus, Schumpeter"s theoretical, historical and statistical analysis is based on the functioning of a monetary system in which departures from the gold standard are exceptions. This no longer applies as various countries progressively suspended the gold standard temporarily, then devalued the gold content of their currencies and, finally, after 1971 completely abandoned any tie to gold.

The loosening and then abandonment of the gold standard has been accompanied by an inflationary bias to prices of both primary commodities and manufactures. Comment on the policy implications of this change is deferred to the next section. Here, we simply note that the change interferes with the process analysed by Schumpeter as well as with extension of the analysis to prices of primary commodities. In particular, the change in monetary conditions means that the upward slope of the price trends in the 20th Century doesn"t constitute a refutation of the analysis.

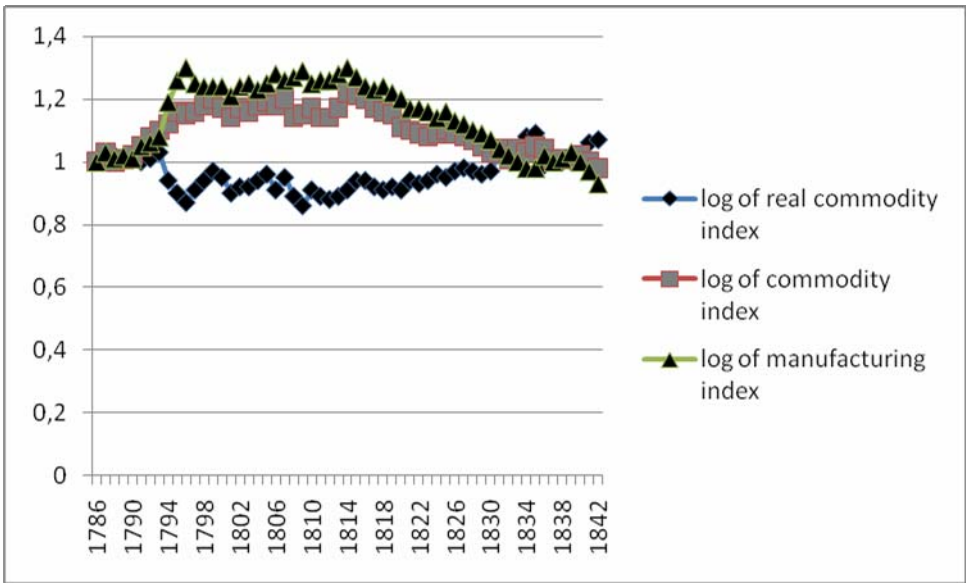
Because the real commodity price is a relative price, the impact of any general inflationary trend is removed. Hence, it is possible to use the real commodity price index in Figure 1 to evaluate the implications of the extended Schumpeterian analysis for the full three and a half centuries without adjustment for the inflationary trend of the 20th Century. The results are strongly supportive. There is a fairly steady decrease in the real price for most of the period, with notable irregularities generally related to external shocks, such as the American Civil War in the early 1860s and WWI in the 1910s. The one clear anomaly is the experience of the last two decades, which is discussed at the end of the sub-section below in the context of the cycle in which it occurs.

c. Cycles

Schumpeter dates the beginning and ending of long cycles as occurring during periods that are relatively free of the influence of the innovation process and, hence, represent periods in the neighbourhood of equilibrium. He relates this to the time path of the prices of finished consumer goods suggesting that these periods in the neighbourhood of equilibrium occur at points of inflection in the smoothed curves of the price series (see Schumpeter, 1939, pp.212-219). The dates for the completed long cycles discussed in detail in Business Cycles are 1786 to 1842 and 1842 to 1897. Applying this methodology we identify a third complete long cycle beginning in 1897 and ending 1955. Finally, there is a cycle beginning in 1955 that, according to Schumpeter"s schema, remains incomplete in 2009.

Figures 2 and 3 provide charts of our price index series for the two complete long cycles identified by Schumpeter, from 1786 to 1842 in Figure 2 and from 1842 to 1897 in Figure 3. The indexes are shown in logarithmic form so that a given vertical distance represents the same percentage change regardless of the starting point. Also, each series is normalized to have a value of 1 in the initial period, which offers a more direct comparison of the movement of the series over the cycle and also permits easier comparison of amplitude across different cycles.

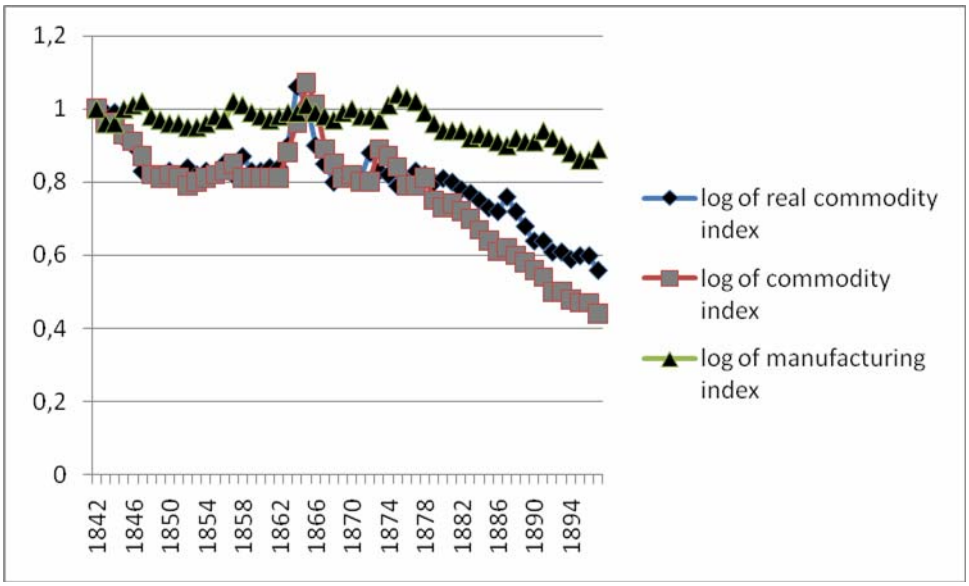
Figure 2. Logarithms of Price Indexes, 1786 -1842 (1786 = 1)



The cycle starting in 1786 nicely follows Schumpeter"s expectations. Prices of manufactured goods rise in the prosperity phase of the cycle and then decline in the recession and depression phases before stabilizing in the revival phase. There is a slight irregularity in terms of an unexpected rise in the series at the end of the 18th Century, but this is consistent with an external shock due to the world wars from 1793 to 1815. At the end of the cycle, manufacturing prices are slightly below their initial level.

As expected from our extension of Schumpeter"s analysis to the prices of primary commodities, the commodity price series in Figure 2 follows a similar path to that of manufactures. There is some indication of attenuation, with the rise in the commodity series being less than that for manufacturing while the ending levels are quite similar. Contrary to our findings for trend over the full 350 years, the commodity index actually increases slightly relative to manufacturing at the end of the period.

Figure 3. Logarithms of Price Indexes, 1842- 1897 (1842=1)



The steadiness of the manufacturing price series in Figure 3 for the first three decades of the cycle is contrary to expectation based on Schumpeter"s schema. However, the decline thereafter fits expectation as does the slight uptick at the end of the cycle revival. In terms of deviation from trend, the whole pattern is in conformity, with a deviation above trend followed by a dip below trend and then a return to trend at the end.

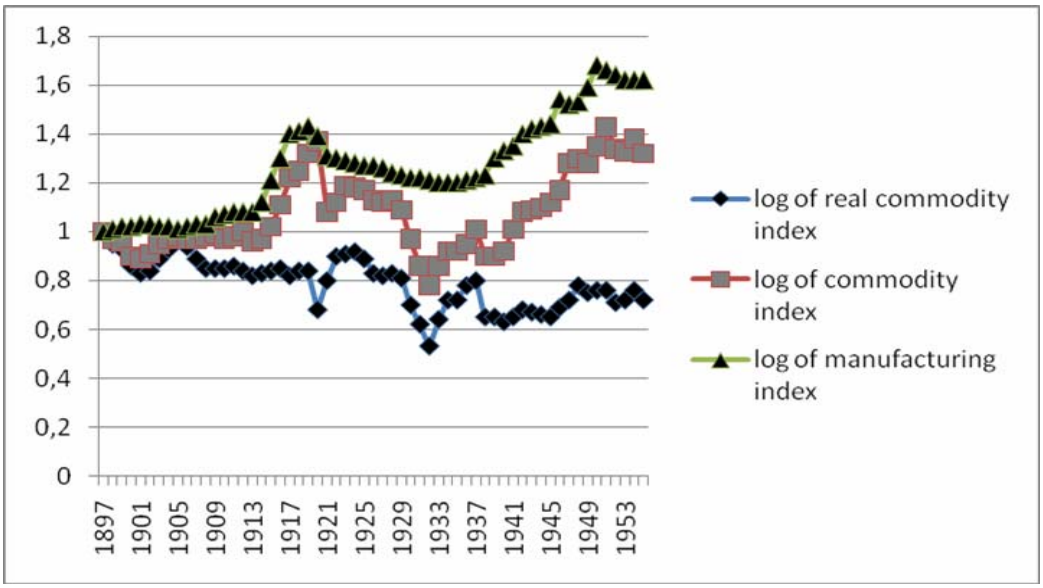
The decline in primary commodity prices for the first two decades of the cycle in Figure 3 is contrary to expectations. While this is followed by an upward thrust, the external shock of the American Civil War is a disturbing factor that heavily impacted on prices of American export commodities, such as cotton and wheat. This provides an example of the effects of slow adjustment of commodity production amplifying the effects of external shocks on commodity prices. The decline in commodity prices during the recession and depression phases of the cycle fits expectations but there is no sign of stabilization in the revival phase. Overall, the pattern fits the expectations of our adaptation of Schumpeter"s analysis only to the extent that movements in commodity prices parallel those in manufacturing prices but at an increasingly lower level and with greater irregularities (as during the Civil War period). By the end of the cycle the real price of primary commodities has fallen to about one third of its initial level (.4 on the logarithmic scale).

Schumpeter closes Business Cycles in 1939 expecting the long cycle beginning in 1897 to be completed by a revival phase typical of his schema. While WWII provided an external shock, the cycle can be marked according to Schumpeter"s schema as finishing in 1955 due to an inflection in the curve of the price of manufactured goods in that year. The inflection is shown in Figure 4 as a levelling of the path of the manufactured goods price series at the end of the chart period. Manufactured goods prices resume rising thereafter as shown in Figure 5, which charts prices for 1955 up to the present time.

The cycle shown in Figure 4 displays an upsurge in manufacturing prices for the first two decades that is associated with the prosperity phase in Schumpeter"s schema. The upsurge is amplified and, perhaps, extended by the external shock of WWI. The subsequent downturn is characteristic of the downgrade of the cycle in the schema, with the initial sharp slope reflecting the prior excessive rise. However, the decline in prices leaves them above the level at the start of the

cycle, which is contrary to Schumpeter"s schema. He notes this abnormality and says of the rise in prices in 1936 that, „The rise in prices heralded not prosperity but "inflation"." (Schumpeter, 1939, p. 118) Thus, Schumpeter takes note of the change in monetary conditions that as we suggest above began sometime in the early decades of the 20th Century and has continued since[1].

Figure 4. Logarithms of Price Indexes, 1897-1955 (1897=1)



Primary commodity prices follow a similar pattern to that of manufactured goods in Figure 4, although with the expected greater sensitivity to external shocks as evidenced by the sharp declines in 1897 to 1902, 1920, 1929-1933 and 1937, each followed by a partial recovery. Notably, the real commodity price is at a lower level after each decline episode. The cumulative effect is that real commodity prices end the cycle some 50% below the initial level (a drop of .3 on the logarithmic scale), while manufactured goods prices and commodity prices end the cycle, some 200% and 100%, respectively, above the initial level.

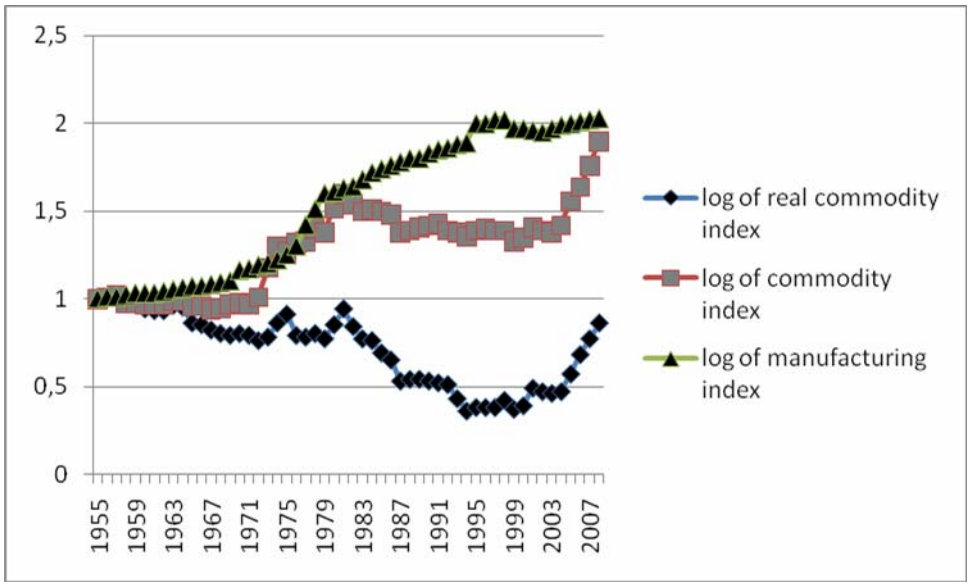
The last long cycle beginning in 1955 is not complete by 2008 according to the criteria of Schumpeter"s schema. As shown in Figure 5 there is an expected upturn in manufacturing prices during the prosperity phase of the cycle through the early 1970s, but then instead of declining, prices rise at an accelerating rate through the end of the decade. The recession of the early 1980s slows the increase in prices, but prices don"t decline as expected of a long-cycle downgrade until into the 1990s and then only for a few years. This continues the underlying inflationary trend observed for the previous cycle, which interferes with applying Schumpeter"s criterion that prices end at a level below that at the start of the cycle. The upturn in the early 2000s might satisfy the criterion for a revival phase of the cycle, except that experience since 2008 suggests that the recession and depression phase of the cycle is continuing.

The path of commodity prices in Figure 5 shows deviations from the expected cyclical pattern. First prices fall, rather than rise, in the initial phase of prosperity although they catch up quickly in the early 1970s. Then after a short decline there is another period of rapid rise. The external shock of actions by the OPEC cartel and military tensions in the Middle East undoubtedly play a role in these

[1] Schumpeter (1939, pp. 996-1001) notes the role of suspension of gold payments by the US Treasury in March 1933 and the subsequent devaluation as having the intention, if not the immediate effect, of promoting "inflation".

irregularities. There follows the type of downward movement in prices associated with a cyclical downgrade, but this is reversed in contradiction to expectations as prices soar from 2003. The correction in 2009 (not shown) has wiped out much of the gain, but the whole episode is a deviation from expectations for a cyclical downgrade or revival, especially without an external shock such as war.

Figure 5. Logarithms of Price Indexes, 1955-2008 (1955=1)



Two characteristics of primary commodity prices that stand out over the four long cycles in Figures 2 through 5 are the sensitivity of primary prices to external shocks and the decline in commodity prices relative to manufacturing (at least over the last three cycles). Our extension of Schumpeter"s analysis assigns the former characteristic to slow adjustment of primary commodity production arising from the heterogeneous nature of the natural resources from which the commodities are produced. The latter characteristic follows from innovations in primary production (and synthetic substitutes) that have led to intense competition at least equal to that in manufacturing[1].

5. Policy implications

Schumpeter (1939, p. vi) explicitly denies that his analysis in Business Cycles justifies a policy of non-intervention to alter the course of the economic process. Yet, by treating cycles as endogenous to the capitalist process his schema does suggest constraints on the scope for policy to ameliorate the

undesirable features without impeding the working of the process. Particularly important is avoiding policy that interferes with the process of innovation and the subsequent creative destruction.

[1] A firm conclusion that innovation and the associated competition has been more intense in primary production than in manufacturing is cautioned by the measurement problems arising from sharply falling bulk freight rates and inadequate adjustment of manufacturing prices for quality change as discussed in notes 4 and 5 above.

An example of policy intervention that survives Schumpeter"s disapproval is the US National Industrial Recovery Act of June 1933, which he notes, „pegged weak spots within industries, stopped spirals in many places, mended disorganized markets, especially in cases of inelastic demand and that of "overproduction" which is incident to the process of underselling the obsolete." Schumpeter (1939, pp.992-3) He then draws a distinction between situations in which this had impaired industrial transformation and situations where it had avoided wanton destruction (oil and bituminous coal).

The key distinction above is whether the policy aids or inhibits structural change associated with the replacement of outmoded products and processes with new. Applying this distinction to primary production an immediate candidate as an example of obstructionist policy is the use of trade barriers and subsidies in the name of food security. In particular, the preservation of high-cost agricultural production in the rich industrialized countries impedes expansion of new production areas and methods abroad as well as impeding structural adjustment of the protected industry at home.

Modern governments have individually and collectively, at least since formation of the International Monetary Fund, have intervened to act against downturns in output, employment and prices. One outcome clearly evident in our historical prices series is an inflationary bias to movements in prices of primary commodities and manufactures from at least the early decades of the 20th Century. However, this upward tilt has not prevented episodes of sharply dropping prices of primary commodities, perhaps none more dramatic than the current experience that doesn"t yet appear in our charts.

The current long cycle appears incomplete according to Schumpeter"s criteria, making it difficult to assess whether government interventions have prevented the sharp contractions in output and employment experienced in the depressions of the previous two cycles. At least the timing of the contraction has been affected, as we are further into the current cycle than the point at which depression occurred in the last two cycles. The next few years may reveal whether government interventions have eradicated or simply postponed depression.

The evidence suggests that government interventions have at best a muted effect on dampening downturns in prices, output and employment. On a more positive note, there is not yet any clear evidence that government interventions to modify price, output and employment cycles have disabled the innovation process at the heart of Schumpeter"s analysis. Innovations and the attendant creative destruction continue apace in both manufacturing and primary commodity production.

6. Conclusions

Our analysis and review of the historical record clearly points to the positive contribution Schumpeterian analysis makes to understanding trend and cycle in the prices of primary commodities. Innovation and the subsequent process of creative destruction are clearly reflected in downward trend in nominal commodity prices from the 17th through 19th Century and in the price of primary commodities relative to manufactures throughout our historical period, including the 20th Century. This experience contrasts sharply with the expectation of classical economics that economic growth would lead to rising prices of food due to the natural limits on available land or the expectation of neoclassical economics that depletion would lead to rising prices of non-renewable resource products.

Cyclical movements in primary commodity prices in our analysis are expected to be attenuated and more subject to irregularities than is the case with manufacturing prices. This arises from the heterogeneous nature of natural resource products that impedes the diffusion of innovations

and slows adjustment to external shocks. The historical record shows the movement of primary commodity prices over long cycles is far from regular and subject to substantial spikes when there are external shocks.

Schumpeter"s approach suggests that there are substantial constraints on the degree to which policy intervention can ameliorate downturns in prices, output and employment that accompany the process of innovation and creative destruction. Our review of the historical record for the 20th Century suggests that intervention by government, individually or collectively, has yet to eliminate cyclical ups and downs identified by Schumpeter as inherent to capitalism. An inflationary bias to price movements is observed from the early decades of the 20th Century, but volatility remains a clear feature of prices for primary commodities. Whether government intervention can avoid the depressions associated with earlier long cycles remains to be demonstrated as does whether there are any adverse consequences for the pace and significance of innovation.

We conclude that Schumpeter"s approach has relevance to primary commodity production as much as it has to manufacturing. Further, there is no indication that the approach is any less relevant today than it was in Schumpeter"s time. Certainly, the approach offers a firmer foundation for a proper understanding of the movement of prices and quantities under capitalism than does mainstream analysis with its presumption of a system in economic equilibrium.

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