

Trends and cyclicalities of commodity prices (Part 1)¹: debating the Prebisch-Singer hypothesis

By Yves Jégourel

Summary

Dealing with the dynamics of commodity prices requires the characterization of three phenomena to which they are subject: (very) long-term trends, medium / long-term cycles and short-term variability / volatility (Jacks, 2013). As they strongly influence the economies of exporting countries, each of these phenomena calls for the implementation of specific strategies, particularly in terms of public policies. Thus, whereas volatility raises the question of availability of hedging tools and financial techniques for their effective use, commodity prices cyclicalities call for the definition of stabilization policies aimed, in particular, at ensuring the continuity of fiscal policy. The question of long-term trends followed by commodities, taken separately or as a whole, is probably even more fundamental. Largely referring to the Prebisch-Singer hypothesis formulated in the 1950s, it raises the question of the relevance of sectoral specialization in commodities and, consequently, queries possible means to diversify the economies of commodity producing countries. Noting the importance of the scientific work conducted on this hypothesis, this policy brief first recalls its theoretical and ideological foundations and subsequently briefly highlights the conclusions of the main empirical work related to it. Lastly, we identify the questions these works raise and propose some lines of research, which, we hope, will make a useful contribution to the public debate on the specialization of commodity exporting economies.

Much more than any other economic sector, the commodities industry must constantly deal with a short time and a long-term horizon. The short time is that of the derivatives markets on which many commodities are exchanged and where their price is set and, in the case of listed companies, it is that of stock markets where they are financed.

The long-term horizon, which is just as fundamental, is that of economic profitability on which the investment

strategies for production capacity are based, and which therefore largely determines the supply for the years to come. From this point of view, 2016 and 2017 are probably much more important than it seems at first glance.

The likelihood of an upcoming new uptrend in the eyes of operators depends, in fact, on the future shape of the commodity markets. After a substantial increase between 2004 and 2012, commodity prices fell sharply between December 2015 and February 2016 and have, in many cases, rebounded significantly since.

¹. The first policy brief on the long-term dynamics of commodity prices will be followed by a second one entitled "Trends and cyclicalities of commodity prices (part 2): the super-cycle of commodities in question".

The Prebisch-Singer hypothesis and its theoretical justifications

To reflect on the existence of a cyclical dynamic requires, first of all, the questioning of the existence and nature of the trends that commodity prices follow. In the short or long term, the variability of commodity prices can indeed be organized around a long-term trend, be it positive or negative². From this perspective, the so-called "Prebisch-Singer" hypothesis (PSH) is probably the best-known approach.

Based on Hans Singer's empirical analysis of the period 1876-1948 and developed at the same time by Raúl Prebisch³, this hypothesis states that the prices of raw materials (exported) decrease relative to those of manufactured products (imported) over time, which leads to a deterioration of the terms of trade for commodity producing countries. As the effects of technical progress are asymmetric⁴ and the price and income elasticity of demand are lower for agricultural or mineral products than for manufactured goods⁵, global economic growth does not favor demand from developing countries⁶. Contrary to 19th century English political economy theories, the growth of international trade would therefore lead to an increase in global inequalities in terms of per capita income. In other words, there would be a negative relationship between the terms of trade and national income. According to Singer (1950) in particular, industrialized capital-exporting countries stand to gain twice in international trade: their investments in the primary sector of developing countries

make it possible, through technical progress, to reduce the cost of raw materials that they import while those made in their national manufacturing sectors create the conditions for an increase in real incomes.

According to Prebisch and Singer, industrialization through import substitution is therefore one of the keys to economic development and sectoral diversification is an imperative for commodity exporting countries. As recalled by Baffes and Etienne (2016), the PSH is in line with the work of Engel and Kindleberger (1943). Although they are not mentioned often enough, cyclical dynamics are not absent from Prebisch's analysis.

For the author, if the increase in the price of raw materials is greater than that of manufactured products in the upward phase of the cycles, their fall is greater also in times of decline. The presence of trade union organizations in industrialized countries creates the conditions for downward wage rigidity and thus favorable demand for manufactured products (Toye and Toye, 2003).

Heterogeneous conclusions to empirical verifications

The PSH has been the subject of a considerable number of empirical studies without, it seems, any definitive conclusion being drawn. Among the first studies often cited are those of Spraos (1980) or Sapsford (1985).

The first demonstrates the existence of a negative linear trend in the seventy years (1871-1939) that preceded World War II. The extension of the study period to 1970 however results in the non-verification of the PSH. Considering the period 1900-1982, Sapsford (1985) suggests, conversely, that the PSH seems to be verified. Notwithstanding the significance of these results, it is really only with the work of Grilli and Yang (1988), whose data has been widely reused and extended since (Pfaffenzeller et al., 2007), that studies on PSH truly took off. Developing their own indices⁷, Grilli and Yang show that the prices of commodities, considered both as a whole and excluding energy products, fell on average by 0.5% and 0.6% per year over the period 1900-1986. At the heart of the methodological issues raised by the verification of the PSH is the necessary reckoning with any changes of trend (acceleration or deceleration, inversion and disappearance).

2. Let us recall here that from an econometric point of view, a trend can be deterministic or stochastic, both of which correspond to the form $X_t = \alpha + \beta t + \epsilon_t$; $\epsilon_t \sim iid(0, \sigma^2)$

3. There is a debate as to which one of these theses predates the other. For Toye and Toye (2003), however, it seems that Singer was the first to have developed such an analysis. As this issue does not affect the theses developed here, we will not dwell on this controversy.

4. Singer (1950) writes (p. 478): "technical progress in manufacturing industries showed in a rise in incomes while technical progress in the production of food and raw materials in underdeveloped countries showed in a fall in prices".

5. In accordance, most notably, with Engel's Law. Singer's writings are explicit: "Technical progress, while it operates unequivocally in favor of manufactures - since the rise in real incomes generates a more than proportionate increase in the demand for manufactures - has not the same effect on the demand for food and raw materials. In the case of food, demand is not very sensitive to rises in real income, and in the case of raw materials, technical progress in manufacturing actually largely consists of a reduction in the amount of raw materials used per unit of output, which may compensate or even overcompensate the increase in the volume of manufacturing output. This lack of an automatic multiplication in demand, coupled with the low price elasticity of demand for both raw materials and food, results in large price falls, not only cyclical but also structural" (p. 479).

6. Other explanations such as the existence of oligopolistic markets for manufactured products and not for raw materials have also been put forward.

While some studies postulate the monotonic character of price evolution, this reality is present in the works of Grilli and Yang (1998). They in fact demonstrate the existence of structural breaks, i.e., a modification in the long-term relation defined by the PSH, for certain raw materials included in this study, but do not generalize these breaks to all commodities⁸. As a sign of the dependence of studies on the PSH on the methodology used and the period considered, Cashin and McDermott (1992) argue the existence of a negative trend over the period 1862-1999 without verifying the existence of a break.

«The authors' goal is indeed to determine whether the decline in relative prices of commodities is true not over the entire study period but, rather, over certain sub-periods, by adopting a recent methodology for identifying trends.»

The recent adoption of more advanced econometric techniques has shed new light on the work of Prebisch-Singer. Arezki et al. (2014) have thus tested this hypothesis over a very long period of time⁹ in panel data and authorizing the existence of endogenous structural breaks. Twenty-five commodities -minerals, metals, energy and agricultural products-were thus considered in this study by reusing the series constructed by Harvey et al. (2010). While some of the results obtained are specific to the commodity considered (number of breaks, sign of regression and significance of coefficients), Arezki et al (2014) suggest that, on average, the Prebisch-Singer hypothesis cannot be rejected. In addition to the adoption of panel econometrics, which, as justified below, reinforces the scope of the results obtained, what is also of interest in the work of these authors is their approach to explaining the structural breaks identified econometrically in historical terms. Among the elements selected are the decline of the primary sector in the GDP of advanced economies, state interventionism in the agricultural sector observed between 1930 and 1970, the reduction in transport costs (boom of the steamship, bulkers) which fostered international trade in "low value" commodities by making it profitable, but also the development of refrigeration for the transport of meat and fruit.

⁷. Notably The Economist's index, W. A. Lewis' index, the index on manufactured products developed by the United Nations or the index of American manufactured products.

⁸. As the authors remind us, failure to take into account these breaks notably impairs the scope of unit root tests.

⁹. A period ranging from 1650 to 2005 for eight of these raw materials (beef, lamb, lead, sugar, wheat, wool, coal, gold), from 1872 to 2005 for 14 of them and from 1900 to 2005 for the remaining three.

Similarly, Hamada and Yoon (2014) sought to "flexibly" test the scope of the PSH by extending the work of Grilli and Yang (1988). The authors' goal is indeed to determine whether the decline in relative prices of commodities is true not over the entire study period but, rather, over certain sub-periods, by adopting a recent methodology for identifying trends¹⁰. Several interesting results are obtained. The authors thus demonstrate that the PSH is verified over the entire period for only one raw material: aluminum. However, the PSH remains valid for certain sub-periods (especially during the 1970s and 1980s) for most of the other commodities considered in this study. Hamada and Yoon (2014) also highlight that the PSH loses consistency from the 2000s onwards due to the very sharp increase in prices.

Food for thought

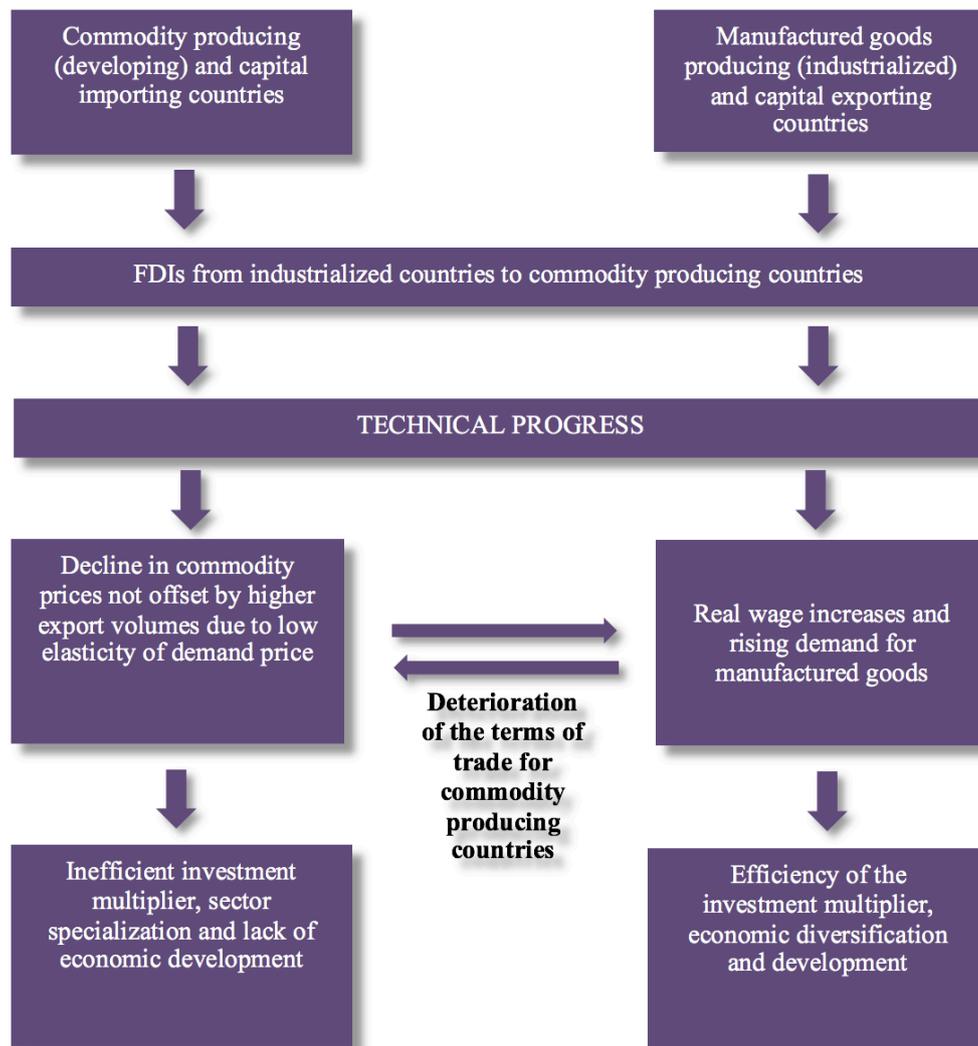
Published for the most part in top scientific journals and now based on the analysis of trend or difference stationarity of relative prices with structural breaks, these various studies are certainly methodologically robust. They nonetheless give rise to a certain number of questions and even criticisms.

The first of these - certainly the most fundamental but also the most subjective - is the gradual distancing of empirical work from the theses developed by Prebisch and Singer. If we focus specifically on those of Singer (1950), it is clear that the ambition is twofold: to emphasize the considerable impact of foreign trade on the economies of developing countries and highlight the constraints and imbalances that it sustains: (1) fluctuations in the volume and value of exports that are much greater for these countries than for the industrialized countries and (2) much higher factor productivity in the export sectors than in the sectors whose production is aimed to satisfy domestic demand. This last point is central to Singer's argument (1950) and cannot, according to the author, give credence to the idea that, by making it possible for developing countries to strengthen their productive efficiency, the development of international trade has been favorable to them. Singer (1950) in fact emphasizes that (1) the

productive apparatus of the extractive and agricultural sectors - and therefore of export - of developing countries is largely held by non-nationals because of the importance of FDIs,¹¹ and (2) this distribution of capital may have led

¹⁰. Different from the approach used in particular by Grilli and Yang (1988) or the traditional Hodrick-Prescott filter. from 1900 to 2005 for the remaining three.

Graph 1: Singer's analysis (1950)



to a small redistribution of profits from international trade to local economies. As can be seen in Figure 1 below, the benefits of technical progress are imperfectly distributed among countries due to the unequal distribution of capital and resulting economic interests.

They result in lower production costs - and therefore prices - in the agricultural and extractive sectors of developing countries and higher real wages in industrialized countries: two effects that are favorable to industrialized countries. Singer (1950) goes as far as to suggest that if the productivity of export sectors were higher than that of traditional productive sectors, this might not have been the case had investment from industrialized countries not favored the ultra-specialization of developing countries.

11. Here, the title of Singer's (1950) article "the distribution of earnings between investing and borrowing countries" takes on its full sense.

Obviously, the exegesis of Prebisch and Singer's theses goes far beyond the scope of this article. However, this recalls that the hypotheses they develop cannot be limited to the mere idea of a progressive deterioration of the terms of trade for producing countries. Ultimately, this deterioration is in fact the consequence of the unequal distribution of the effects of technical progress.

As pointed out by Baffes and Etienne (2013), this implies that the study of the stationarity of commodities' relative prices - which is the basis of the vast majority of the econometric work on the PSH - is not, as such, sufficient to check the scope of the theses developed by Prebisch and Singer¹². Singer. An analysis of the relationship between the terms of trade and domestic income, but also the measurement and analysis of the effects induced by FDIs in the commodities sector of developing countries must also be undertaken.

The very acceptance of the idea that it is above all the evolution of relative prices of raw materials that must be analyzed in order to measure the significance of Prebisch and Singer's theses does not answer all the questions posed by empirical work. Among these: the arbitration to be carried out on the number and nature of raw materials considered, between the desire to reinforce the representativeness of the sample (or indices retained) and its necessary compatibility with the PSH. It must however be admitted that there is a certain ambiguity in Singer's writings (1950) on what he calls "commodity exporting countries" and therefore on the type of raw materials to be taken into account in empirical studies. Since they are opposed to manufactured goods producing countries, there is little doubt that the author refers to developing countries (which he mentions repeatedly elsewhere) and that it is these countries' terms of trade that must be qualified¹³.

« An index is thus created in which first, there is a weighting of each raw material in a given country's total commodity, and second, there is a weighting for each partner country in the total exports of each raw material.»

The raw materials to be included in the sample used to support empirical analyzes cannot encompass all the raw materials whose price series are available over a long period but only those produced by these developing countries. From this point of view, the absence of energy prices in the indices constructed by Grilli and Yang (1988) and in the numerous studies that have reused them raises questions.

This may be justified by the absence over the long term of a sufficiently representative international prices (the large difference in prices that has historically been observed between the rest of the world and the United States -due to the export ban on crude- which can in turn explain this

¹² It will be noted, moreover, that if there is indeed one element that Singer (1950), not without malice, does not seem to consider as a hypothesis but as an indisputable fact, it is that the terms of trade are degraded for countries producing raw materials. He writes: "It is a matter of historical fact that ever since the seventies the trend of prices has been heavily against sellers of food and raw materials and in favor of the sellers of manufactured articles. The statistics are open to doubt and to objection in detail but the general story which they tell is unmistakable." (p. 477).

¹³ This is, actually, a longstanding issue. As Spraos (1980) emphasizes: "And whereas the Prebisch Singer hypothesis related clearly, if only implicitly, to the primary products in which developing countries had a major interest, the price or unit value data did not distinguish between traded primary products according as they originated from developed or developing countries" (p. 107).

reality¹⁴), however, this argument is not explicitly made by these authors.

To accept this justification would amount to criticizing other works which, like Cuddington (1992) or Arezki et al. (2014), introduce coal or oil prices into their empirical verification of the SPH. The problem is not isolated: as we will explain in the following paragraph, the fact that bauxite is not taken into account in any of the panels or price indices used can only come as a surprise given 1) that aluminum is included and that their respective dynamics cannot be equated and (2) that price series for bauxite starting in 1990 are available for the United States in the USGS database, like almost all other solid mineral resources.

Conversely, the presence of certain raw materials in PSH studies raises questions. Although it does not, as such, pose any methodological problem, the inclusion of products such as wheat, corn, aluminum or wood reflects the discrepancy between the results obtained from an econometric point of view and the recommendations that can be drawn from a public policy perspective. In terms of volume of production and exports, global grain markets are dominated by the United States.

Europe (of 27), for its part, occupies the second place on the world wheat exporters podium with France as the leading producer. The same goes for oilseed and protein crops. Canada dominates world markets as diverse as softwood lumber or refined zinc. Primary aluminum is also very largely produced by China after being overwhelmingly produced by European (Pechiney, Alusuisse) and North American (Kaiser, Reynolds, Alcan, Alcoa) producers. Although they export raw materials, all the countries above do not theoretically fit in the reasoning framework of Prebisch and Singer. Although they include raw materials accounting for 54% of world trade (Pfazensteller et al., 2007), the indices developed by Grilli and Yang (1988) are perhaps not as indispensable as it seems at first glance. By using them, studies on the SPH can indeed conclude whether or not there is a negative trend in the relative price of commodities, however, they do not fundamentally provide an argument in favor of the industrialization and economic diversification of countries producing raw materials.

¹⁴ This would also apply to natural gas, which is still characterized by significant geographic segmentation between North America, Europe and Japan.

¹⁵ Persistently high price levels over the long term would be indicative of the inability of supply to offer enough price elasticity to meet the increase in demand.

The implementation of an econometric based study, like Arezki et al. (2014), on panel data and studying the evolution of terms of trade by commodity exporting country using unit values could perhaps be interesting from this point of view. These representative unit values could be considered as a double weighted average of bilateral unit values: by exported commodity and by partner country. An index is thus created in which first, there is a weighting of each raw material in a given country's total commodity, and second, there is a weighting for each partner country in the total exports of each raw material.

« As is the case for the refining of crude oil into gasoline, fuel oil, kerosene and other distillates, the transformation of a raw material does not necessarily guarantee stable transformation margins.»

It is also important to recall that commodities are designated under a common term because they share certain economic characteristics: homogeneity of product, which makes quality differentiation difficult--if not altogether impossible--, high price volatility, and disparity between production and consumption geographical areas, thus generating significant international trade flows. The notion of commodities is nonetheless extensive and cannot be limited to raw products.

Thus, aluminum undergoes several industrial transformations (transformation of bauxite into alumina and alumina into aluminum by electrolysis), which make it a relatively complex product. It should also be noted that although the low level of prices of a given raw material is naturally due to a weak demand and/or excess supply, the issue of production cost reduction cannot be ruled out. Major research and development efforts are sometimes undertaken in some primary sectors, at the hands of national producers who own their production tools.

Chinese aluminum from the 1980s, 1990s and 2000s is another illustration of this point (Lucia et al., 2013), as is shale gas, more recently. Whatever the scope of this argument, it appears that while low commodity prices is, in theory, hardly good news for a producing country, it is rather the profitability criteria, and not only the price level, that should determine the appropriateness of a country's sectoral specialization¹⁵. This argument put forward by Tilton (2013) must nevertheless be approached with caution. As is the case for the refining of crude oil

into gasoline, fuel oil, kerosene and other distillates, the transformation of a raw material does not necessarily guarantee stable transformation margins.

Beyond the question of the inclusion/exclusion of certain raw materials, there is the issue of representativeness of the price series used. It is naturally understandable that the availability of data may have guided the authors in their choice since long series are quite scarce. This, however, requires great caution in the interpretation of results obtained. Grilli and Yang fully recognize the limits of the commodity price indexes they use: missing data during the two world wars, lack of some international prices, etc. Some justifications were nevertheless advanced to make the case for the "acceptability" of these imperfections. Harvey et al. (2010) recall that several studies have shown that deviations from purchasing power parity were relatively stable over time for many agricultural products. Similarly, the use of Brent as a proxy for world oil prices poses few methodological problems. In addition to these justifications, several studies also focus on improving the quality of the series used. Harvey et al. (2017) thus explain that they removed the gold and silver price series used by Harvey et al. (2016) because of their statistical ambiguity and the distortions they could have created.

Several articles have also sought to correct the inflationary bias of price indices of traditionally used manufactured goods (Svedberg and Tilton 2011, Fernandez 2012). Despite these methodological improvements, it is legitimate to question the ability of certain price series, such as that of timber, to represent the reality of export prices of Southern Hemisphere countries given how different the fundamentals of softwood, oak and various exotic wood markets are. The same goes for beef and lamb price series based on US and New Zealand references. Lastly, it is noted that some prices come from financial markets such as the London Metal Exchange (copper, aluminum, lead) and are therefore "publicly" observable, while others appear to be "physical" prices on a free on board (fob) or cost insurance freight (cif) basis, or even unit values (timber).

An analytical framework in need of modernizing?

Written in 1950, the founding articles of Prebisch and Singer stem from a very particular economic context. Although the SPH still serves as a type of historical

enigma whose mystery can be solved through improved econometric techniques, it would probably be useful to rethink its analytical framework for at least two reasons. First, although produced in developing countries, not all raw materials are necessarily intended to be systematically and wholly exported. Natural gas is a good example. If we look at the strategies adopted recently by producing countries in Africa, it appears that low world prices have led to an increase in domestic demand for the purposes of power generation, to the detriment of export flows. While this is certainly a recent development and is unlikely to be representative of the strategies of most commodity-producing developing countries, it may be of particular importance in the years to come. Secondly, the very sharp increase in commodity prices observed between 2004 and 2012 led producer countries to increase the counterparties required from international companies investing in their primary, especially extractive, sector. The so-called "local content" policies combined with the increase in the "government take" of host countries could limit the scope of Prebisch and Singer's argument that the benefits of FDI are only captured by investor countries.

There are few empirical studies on this issue nowadays, but it is probably an issue that academic research should actively look into. As they will necessarily need to have a country or region focus because of the national legal and regulatory frameworks governing investment in agriculture, mining or oil, these studies would not be able to have the general scope of work on the SPH. On the other hand, they would make a useful contribution to updating and verifying Prebisch and Singer's theses.

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