Ecologically Unequal Exchange

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There is a paradox in the politics of international trade: everybody loves exports but hates imports. While a state is seen to benefit from exporting ever more goods and services, imports are considered a necessary evil, acceptable only in as far as they allow a country to export ever more by improving its productive capacity, or perhaps as necessary in order not to be shut out from prospective export markets in retaliation for a protectionist trade policy, thus something which has to be endured for the benefit of prospective exports.

In real politics, self-serving nationalist and protectionist policies are ubiquitous, especially in countries of the North[2]. This miss-match theory-politics needs to be explained, as stated in a leading text book on international trade:

> "throughout history, governments have protected sectors of the economy from import competition. For example, despite its commitment in principle to free trade, the United States limits imports of steel, textiles, sugar, and other commodities. If trade is such a

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[2] North and South are terms that try to capture relationships among countries, falling back on a geographical metaphor which partly obfuscates the complexities of the real world. Some NGOs, especially if based in the South prefer the terms Global North/Global South in recognition of the fact that there are poor people and regions in the geographical North, just as there are rich people and highly sophisticated production systems in the geographical South.

However, since the purpose of this paper/chapter is to discuss various aspects of unequal exchange among nations, I am forced to rely on national statistical data which makes concepts such as Global North and Global South difficult to apply. Hence I stick to the imperfect terms North and South and accept a basically geographical division of the globe. I will also apply these concepts interchangeably with Centre and Periphery.

> good thing for the economy, why is there opposition to its effects?" (Krugman & Obstfeld 1994:38).

Yes, why indeed? One reason is that trade may enlarge differences among countries and thus to be (at least partly) responsible for perpetuating divisions in terms of rich/poor, raw materials/manufactures producers, agricultural/industrial nation, and so on. It seems that politics – if not the political discourse – at least recognizes the possibility that the benefits of trade may be unequally distributed, some gaining at the expense of others.

Prebisch-Singer Hypothesis

If the overriding task of economic policies is to promote industrialization, as it certainly was in the South after the Second World War, the traditional embrace of "the outdated schema of international division of labour" carries "a flaw", according to the Argentinian economist Raúl Prebisch. In a surprisingly early framing of the Centre-Periphery perspective he maintained that:

> "The enormous benefits that derive from the increased productivity have not reached the periphery in a measure comparable to that obtained by the peoples of the great industrial countries." (Prebisch 1950:1).

Prebisch claimed that the positive stance towards exposing your economy to international competition rested on committing the error of "generalizing from the particular", with the already industrial countries constituting a particular case. Drawing general conclusions from this "particular" situation for the Periphery was wrong as it obviously required something different than a policy "based on an assumption which has been conclusively proven false by facts": that "the benefits of technical progress tend to be distributed alike over the whole community" and that hence the "countries producing raw materials obtain their share of theses benefits through international exchange, and therefore have no need to industrialize." (ibid).

The hidden mainstream position[3] that Prebisch argued against is the British economist David Ricardo who 133 years earlier had set out to teach politicians that trade may be beneficial to all parties involved, importers no less than exporters. His stance was based on a model economy which assumed that capital could not cross borders. This is the most essential assumption for Ricardo's argument as otherwise – "if capital freely flowed to those countries where it could be most profitably employed" (Ricardo 2006/1817:959) – there would be no difference in prices between different countries, and hence no reason to trade. As a consequence, everyone would suffer: the seller from being restricted to a smaller market, and the buyer by having access to fewer goods at higher prices.[4]

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[3] Development discourses have two stylized positions, one dominant mainstream position, and one opposing counter-point, which lies dormant beneath the surface, as if waiting for an opportunity to turn the tables and transform itself from counter-point to mainstream. See Hettne 1995.

[4] Ricardo also stresses another benefit of trade which has come to the fore much later, the peace motive: "Under a system of perfectly free commerce, each country naturally devotes its capital and labour to such employments as are most beneficial to each. This pursuit of individual advantage is admirably connected with the universal good of the whole. [...] while by increasing the general mass of productions, it diffuses general benefit, and binds together, by one common tie of interest and intercourse, the universal society of nations throughout the civilized world. It is this principle which determines that wine shall be made in France and Portugal, that corn shall be grown in America and Poland, and that hardware and other goods shall be manufactured in England". (Ricardo 2006/1817:93). Neither the Rome Charter of 1957, the founding document

Hence, Ricardo argued, all countries ought to open up to trade, to the benefit of all. Even countries that had no advantages in terms of productivity, climate or knowledge were well advised to trade with their superior competitors as this would increase the overall welfare of the trading partners. In words that have become part of standard economics textbooks, a country should exploit its comparative advantages – even if all of them were comparative disadvantages.

Not so, according to Prebisch looking back to his own thinking: "outward-oriented development" was "incapable of permitting the full development of [Latin American] countries." (Prebisch 1984:177). As a result, a more inward-oriented policy proposed itself, although Prebisch 34 years later still refrained from giving it a name, testifying to the controversial nature of trade policies to this day.[5]

Prebisch partly based his analysis on a UN study presenting falling raw materials prices that had been elaborated by German-British economist Hans Singer.[6] Singer himself has claimed that he in turn was inspired by his teacher in Cambridge 1934-36, JM Keynes, who shared his idea "that primary commodity prices would have a long-run downward trend".[7]

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of today's European Union, nor the preamble of the World Trade Organisation of 1995, have put the pacifying impact of international trade in clearer terms.

Also note that the only producer of manufactures mentioned was Ricardo's home country England.

[5] In the 1960's and 1970's, and especially in Latin America, this policy, was dubbed "import-substitution", alluding to the attempt to substitute domestic production – by protecting it – for imports from the centre. Prebisch later called this policy protectionist (1984:179) in what may seem like an attempt to dissociate himself from it, but the fact is that he already in 1950 preferred "a wise policy of economic inter-dependence". (Prebisch 1950:7)

However, the position that isolation from the world market may be a good thing was not uncommon among development economists, and even Keynes had embraced it, at least towards the end of WWII, when thinking about the post-war period, he argued that "industrialising countries might want to retain high tariffs to protect their ´infant industries´". (Skidelsky 2000:378).

[6] Hans Singer wrote two studies 1949-1950, the anonymous UN study - Post War Price Relations in Trade between Under-Developed and Industrialized Countries, E/CN.1/Sub.3/W.5, February 23, 1949 – and, based on that, an article, Singer 1950. Toye & Toye (2003) and Brolin (2006) give all the details that you can possibly want regarding the question if Prebisch or Singer was the first to establish (or postulate) a tendency of falling terms of trade for raw materials.

The verdict: Singer first formulated the thought in his anonymous UN study 1949, and then it was made use of and quoted by Prebisch when he the following year wrote his booklet on Latina America. Hence, Singer seems to be the originator of the Prebisch-Singer Hypothesis, which perhaps should be called the Singer-Prebisch Hypothesis. Nevertheless, Prebisch's approach was more interesting, as we will see, and the one that led onwards to the theory of unequal exchange and not just deteriorating terms of trade.

[7] Singer 1984:279. However, although it is true that Keynes argued in favour of buffer stock to stabilize raw material prices and to reduce volatility in international markets – an idea he later re-used when he tried and failed to have an international trade organisation established as part of the Bretton Woods negotiations – he saw this in the light of cyclical price movement: the purpose was to stabilize wildly fluctuating prices, not to counter a falling trend. See Skidelsky (2000:207).

Singer's reference to Keynes may owe something to the fact that Keynes "tirelessly" (and successfully) petitioned the British authorities to release Singer (and Piero Sraffa, among others) who had been interned upon fleeing fascism to England as "enemy aliens". (op cit:78). Keynes wrote to a friend in his typical style in July 1940, two years before Stalingrad and while the Battle of Britain was still raging: "Our behaviour towards refugees is the most disgraceful and humiliating thing which has happened for a long time. Also rather disconcerting to find that we have such obvious fatheads still in charge [...] if there are any Nazi sympathisers still at large in this country, we should look in the War Office and our Secret Service, not in the internment camps." (Quoted in Harrod 1963:497).

Singer's own treatment of the issue begins by him dismissing the productivity gap theory as untrue. That theory claimed that the terms of trade of raw materials were falling on account of poor countries having higher productivity gains than rich countries specializing in manufactures. On the contrary, said Singer:

> "All the evidence is that productivity has increased if anything less fast in the production of food and raw materials [...] in the underdeveloped countries, than has productivity in the manufacturing industries in the industrialized countries." (Singer 1950:477-478).

And faster productivity growth in manufactures ought to lead to a deteriorating terms of trade for industrial production vis-à-vis raw materials, not the other way around. Since raw material prices in fact had fallen – Singer refers here to his own anonymous UN study that details prices 1876-1947 – he looks for other explanations underlying the terms-of-trade deterioration. The first one relates to technical progress:

> "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." (Singer 1950:478).

Thus, trade means that consumers in industrialized countries gain (their imports become cheaper and their wages higher), while consumers of underdeveloped nations loose (their imports become dearer and their wages fall), a fundamentally unequal situation.

Singer's second explanation deals with the low price and income elasticity of primary commodities: when prices fall or incomes grow, the demand for food and raw materials increases but little (i.e. elasticity is low, below 1); in the case of manufactures, however, the situation is the opposite, the demand for industrial produce grows faster than the income (i.e. the elasticity is high, above 1). In addition, Signer stipulates a general trend of increasing efficiency whereby technical progress in manufacturing leads to

> "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". (Singer 1950:479).

In other words, a country that tries to develop by increasing its exports of raw materials will be confronted by reduced purchasing power in terms of the industrial goods that it can acquire.[8]

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[8] Ecological considerations are totally absent from Singer's discussion, a neglect which was customary after WWII for easily understandable reasons: avoiding a repetition of the economic downturn post WWI was seen as the overriding task in order to avoid a new economic downturn like the one of the 1920's. Had he been prescient and believed, like Herman Daly 27 years later, that "biophysical facts have asserted themselves in the form of increasing ecological scarcity" (Daly 1990/1977:3), Singer might well have included a growing demand for ever more scarce ecological resources of the South as a mitigating factor operating against what he saw as the main tendency. But, as we will see, this concern may now be entering the mainstream: raw materials – and areal resources in general – may increasingly be in short supply in relation to an ever growing demand. Which could imply a reversal of the Prebisch-Singer Hypothesis.

While Singer, perhaps[9], paid too little attention to the internal characteristics of the exporting country, Prebisch had domestic factors at the centre of his concerns, thus combining an international perspective with an analysis of the internal preconditions for development. Taking as his point of departure the falling terms of trade of primary commodities 1870-1947 established in Singer's UN study – the purchasing power of primary commodities expressed in manufactures decreased by 31 percent during this period – Prebisch found the explanation in the unequal ways productivity gains were reflected throughout the Centre and the Periphery, respectively. (Prebisch 1950:13).

Although productivity gains, which were higher in manufacture, could have been expected to lead to improving terms of trade for raw materials (where productivity increased less), the opposite occurred. This counter-intuitive trend, Prebisch argues, is explained by the fact that power relations in the Centre allow a larger share of the gains to be transformed into profits and wages, which both are "rigid". Workers in the Centre thus manage to keep part of the gains, a situation that is caused by the competition between entrepreneurs, as well as the strength of trade unions in the Centre.

But in primary production in the Periphery, workers suffer from a "characteristic lack of organization" which "prevents them form obtaining wage increases comparable to those of the industrial countries and from maintaining the increases to the same extent." The result is that although markets and prices are cyclical, terms of trade do not behave cyclically:

> "If profits could fall in the same way in which they rose [in the Centre], there would be no reason whatsoever for this unequal movement [i.e. the ´inequality in the cyclical movement of prices´ Centre/Periphery]. It occurs precisely because they cannot fall in that way." (ibid).

Prebisch's words may sound trivial today: warnings that trade can constrain countries, keeping them underdeveloped and dependent on raw materials, have been common in the development discourse for sixty years, in fact since Prebisch's warnings. From this follows that trade may lead to a transfer of resources from the exporting to the importing country, and that international exchange thus may constitute a fundamentally unequal activity which amasses riches and power at one end of the globe while simultaneously creating poverty and powerlessness at the other. Thus, Prebisch's position has been transformed from being

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[9] Singer's 1950 article is more internally focussed than normally recognized. Although it is true that his main argument deals with markets and the characteristics of raw materials demand, he nevertheless also mentions the different internal conditions that would make productivity gains translate themselves into higher incomes in industrialized countries, while in underdeveloped countries they would only result in lower prices.

Furthermore, Singer continues to discuss why falling terms of trade should constitute a developmental difficulty. His explanation is wholly placed in the domestic corner: underdeveloped countries cannot absorb the income that they generate through exports, nor the income obtained via foreign investments, they cannot achieve a reinvestment of profits in their own countries. This leads him to argue against "progressive social legislation" in the Periphery since as it "prematurely introduced and indiscriminately applied to export and domestic industries [alike] may in the end turn out a retarding factor in economic development and undermine the international bargaining strength of the primary producers." (Singer 1950:484-485).

Surprising as Singer's conclusion is, he nevertheless has good insights and warns against a phenomenon that many years later was named "the Dutch disease": the negative impact of a windfall gain in income, be it from exploiting natural gas in the North Sea (the Dutch case), large inflows of loans or of aid money. For a brief discussion of this "disease", see Stiglitz 2006:147-149.

counter-point to becoming mainstream in academic development thinking (albeit not in actual development policies).

But there is another context for the development-trade debate that needs to be stressed. The emphasis placed on international trade was clearly at odds with the political economy strand in development thinking which understood underdevelopment as a situation or process primarily caused by domestic factors. Poor countries were poor because they lacked the ability to mobilize and make productive use of the potential surplus that they could have had access to. In this spirit, Paul Baran stressed that the potential surplus of poor countries was not being realized on account of four characteristics which hampered the development that otherwise could have taken place:

> "*One* is society´s excess consumption (predominantly on the part of the upper income groups [...]), the *second* is the output lost to society through the existence of unproductive workers, the *third* is the output lost because of the irrational and wasteful organization of the existing productive apparatus, and the *fourth* is the output foregone owing to the existence of unemployment caused primarily by the anarchy of capitalist production and the deficiency of effective demand." (Baran 1967 [1957]:24, italics in original).

This tradition, which focuses on the domestic relations, has been carried forward by many analysts of the relationship trade – development, at least in the political economy tradition.[10] Summing up the debate, we may conclude, with Dani Rodrik:

> "Countries that have done well in the postwar period are those that have been able to formulate a domestic investment strategy to kick-start growth and those that have had the appropriate institutions to handle external shocks, not those that have relied on reduced barriers to trade and capital flows. [...] countries whose economies grow fast typically also become more open; but the converse progression – from increased openness to faster growth – is much less apparent." (Rodrik 1999:13)

Testing the Prebisch-Singer Hypothesis

The opinion that raw materials dependency is a problem has for the last sixty years been hotly debated, and the Prebich-Singer Hypothesis (PSH) of deteriorating terms of trade for raw materials is a firmly held belief by many development economist, UN agencies such as the UNCTAD, and, not least, by politicians in the South. The Prebisch-Singer thesis has been scrutinized ever since it was presented, sometimes based on quite unreasonable (i.e. untrue) assertions.[11] One of the main problems with the thesis is that it confounds the terms of trade of goods with those of countries. This may partly be an effect of the lack of information existing after WWII, as Singer claims in his frequent revisits to the topic (Singer 1984, Sarkar

[10] Also Porter in his influential study *The Competitive Advantage of Nations* concludes that the discussion about competition among nations should be dealt with within a "theory of competitive *strategy*", which means that competitive advantages develop over time as a consequence of strategies – i.e. domestic policies – that strengthen (or weaken) national economies and their competitiveness. (Porter 1990:xiii, italics added).

[11] In an impressive collection of men named "Pioneers in Development", both Prebisch and Singer found a place. Following Prebisch's own text about himself, he is criticized by both his commentators for relying on the difference in elasticity for raw materials compared to industrial goods, a factor which did not play any role in Prebisch's 1950 piece. The commentators were Albert Fishlow and Jagdashi Bhagwati, a well known proponent of "free trade"; the latter wrongly accuses Prebisch of having "converted to elasticity pessimism". (See Meier & Seers 1984: 192-204).

& Singer 1991:333), but Prebisch managed to focus more on the characteristics of the Centre and the Periphery as such, instead of the characteristics of their respective exports.[12]

The real test of the Prebisch Singer Hypothesis (PSH), however, is not theoretical but empirical. Singer has updated his own analyses at the same time that he has broadened his approach, in an argument that complements his previous focus on the goods exported (i.e. raw materials and other primary commodities) with the international position of the countries in the North-South hierarchy. While primary products still can be seen to be a bad choice – a decline of terms of trade by more than 2 percent annually 1972-1986 in terms of manufacture – even manufactures exported from the South suffers from a gradual erosion of purchasing power, minus 1 percent 1970-1987 (also measured as their purchasing power in relation to manufactures imported). (Sarkar & Singer 1991:338).[13] Thus, the South comes out poorly, irrespectively of what it exports: primary commodities are bad, and manufactures are not good.

What Singer is doing here is in fact combining the two main approaches, terms of trade decline as a consequence of the products traded, and as a consequence of where a country belongs in the Centre/Periphery hierarchy. In the end he thereby manages to confirm both what Ocampo & Parra (2003:8) call the PSH I (considering the exports of primary commodities, frequently but as I have argued somewhat erroneously attributed to Singer) and the PSH II (considering the exports of countries, Prebisch's focus in his 1950 booklet).

Two subsequent studies have covered the whole of the 20th century (Ocampo & Parra 2003, Zania 2005). They both study 24 non-oil commodities (and Ocampo & Parra in addition include eight commodities indices) for the whole century, and reach similar conclusions: terms of trade of commodities have in fact declined, amounting to an overall loss of purchasing power of two thirds 1900-2000.[14]

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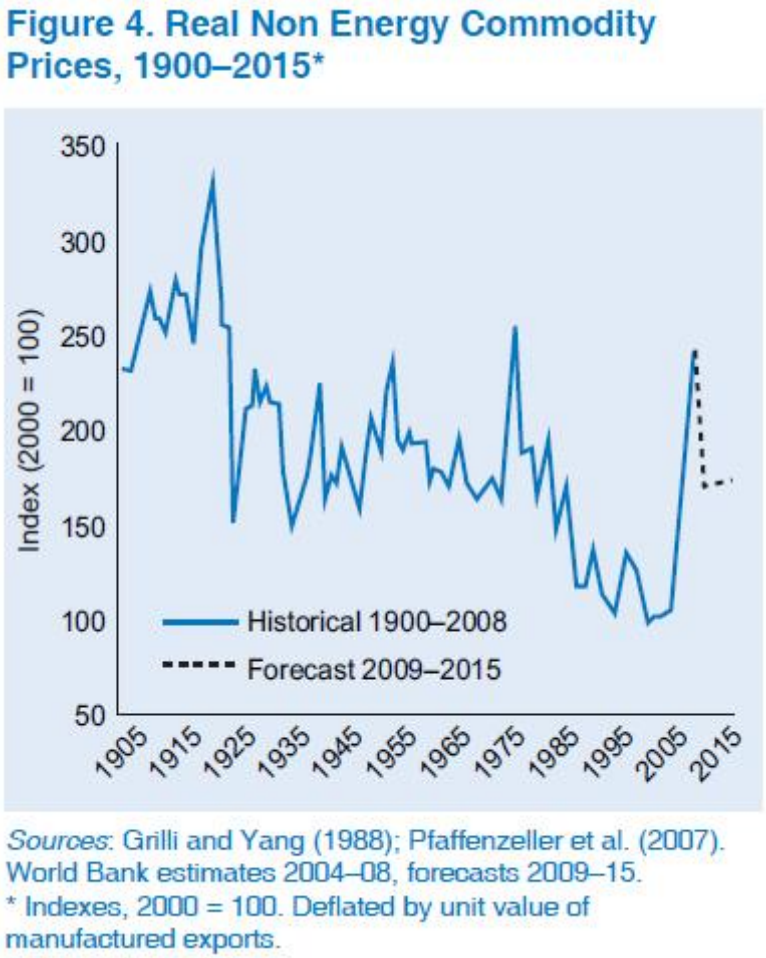
[12] Raw materials dependency is not a thing of the past: although the average dependence of the South taken as a whole is "only" about 40 percent of exports, down from 50 percent twenty years ago, low-income countries' dependency was as high as 75 percent 2005-07. Brahmbhatt & Canuto 2010:1-2.
Or put in other terms: for as many as 77 out of 118 countries studied, the dominant export product was fuels (25 countries) or primary commodities (52 countries). (UNCTAD 2005:91).

[13] The conclusion appears to be somewhat "doctored": the evidence that Sarkar & Singer present is divided in two equal parts in relation to their manufacture terms of trade which they measure for a longer period than the one just mentioned, 1965-85, and then a negative terms-of-trade trend is just as dominant as a positive one. The wise conclusion here is to refrain from strong assertions, but Sarkar & Singer are not to be deterred, and by changing the period of analysis (they shorten the period covered and simultaneously delay the end year) the negative trend of the terms of trade of the Periphery can be upheld. Not very convincing.

[14] Similar to other studies, the behaviour of individual commodities vary: nine of the 24 commodities and all the composite indices give strong evidence for the existence of a secular negative trend; eight commodities were volatile (with 5 of them clearly falling), while four showed rising terms of trade and three showed no trend. (Ocampo & Parra 2003:28)

Strong recommendations should perhaps be avoided, especially since new studies refuting – or at least questioning – the PSH see the light of day continuously; see Kellard & Wohar (2006:149) who conclude that although 15 of the 24 commodities studied had negative trends during some of the period investigated, only 8 of them were negative for more than 70 years of the 20th century. The authors conclude that the evidence for the hypothesis "is less than overwhelming" as they consider that the trend must hold true for at least 70 percent of the period. No matter what one is to think about this threshold – and I personally believe it to be too demanding – the debate is certain to continue with ever more statistical sophistry.

Figure 1. Historic and Future Terms of Trade 1900-2015



Source: Brahmbhatt & Canuto (2010)

However, this Terms of trade deterioration did not occur smoothly, but rather took place at two distinct shifts, after WWI, and after the oil price rises and the following world food crisis in 1973-1974. The reasons for this the studies only speculate about, but the breaks may have been caused by a structural shift to less dependency upon commodities in general (and perhaps specifically on commodities that can be seen as insecure in geopolitical terms.[15] In a recent World Bank study, this conclusion is confirmed (see Figure 1). The conclusion here is quite similar to the above long-term studies, with each successive peak ending lower than the previous, thus indicating a downwards sloping movement in the long term, but not each and every year. So the PSH seems to have held true for the last century.

But what about the future? If we were to go by earlier bust-boom cycles, we would expect to be entering a new phase of deteriorating terms of trade for primary commodities as measured by the price of manufactures, after the speculative price hikes of the last few years. This is however not what Figure 1 guesses, and the forecast 2009-2015 may turn out to be correct as "commodity exporters are likely to face a more benign medium-term price environment than in the 1980s and 1990s". (Brahmbhatt & Canuto 2010:3) Contributing to this change of the relationship – from decreasing to improving terms of trade for primary commodities – is a

[15] I deal with this issue briefly in a paper on agrofuels, see http://www.hek.lu.se/upload/Humanekologi/Hermele_Brazil_Agrofuel_and_Competing_Land_Uses.pdf

growing importance of areal resources – raw materials in general, and for fuels, feed stocks and food.

Continuing speculating about the future, the rise of new industrial and economic giants will have a major influence on the terms of trade, further contributing to making deteriorating terms of trade for primary commodities a thing of the past. If (as posited by Kaplinsky 2006) global *manufacture* prices will fall on account of the economic expansion of China and India, the terms of trade trend may well shift significance for quite a long period, as seems to have happened just prior to the financial crisis 2008. If these trends, which dominated until 2008, will resume, raw material dependent countries may benefit from exporting ever more scarce primary commodities.

But improving terms of trade may be a mixed blessing, at least according to Baran who already in 1957 dismissed the importance of deteriorating terms of trade (although he recognized that the hypothesis could hold true, in spite of the fact that he also noted that it had been questioned as early as 1951, one year after it was first presented). The problem with stressing deteriorating terms-of-trade, according to Baran, is that it could lead us to preferring *improving* terms of trade. But higher prices would lead to higher profits, and such were not necessarily to be welcomed:

> "[I]t cannot be stressed too strongly that the relevance of the magnitude of profits to the welfare of the peoples inhabiting the underdeveloped countries or to their countries' economic development depends entirely on to whom these profits accrue and on the use which is made of them by their recipients." (Baran 1967/1957:233).

Baran went further and presented a thesis which in fact constitutes an early version of what today is called "the curse of oil":[16] higher profits and incomes would lead to higher profits being transferred abroad and would thus "not result in an increased capacity of the underdeveloped countries to import foreign goods". (ibid) By implication, deteriorating terms of trade would not decisively affect the situation one way or the other.

But stressing the internal dimensions – or pre-conditions – for development should not lead to a wholesale denial of the importance of the international dimensions, or to neglecting altogether external influences: if countries are loosing out in the international exchange this certainly would not improve their potential for development (unless you embrace a vision where corruption and other development traps wholly originate from external influences).

Unequal Exchange of Labour

Frequently, a distinction between Prebisch and Singer is made: while Prebisch is said to explain the deteriorating terms of trade with internal conditions and not with the characteristics of the goods being exported, Singer is considered to be focusing only on the products being exchanged. Although this, as we have seen is not entirely correct, it has nevertheless led to a greater acceptance of Prebisch's approach in the Marxist tradition,

[16] That resources may be more of a curse than a blessing is one of the central tenets of some development economists when explaining the pervasive poverty in the South. For a recent example, see Collier 2007, who deals with what he calls "the natural resource trap" at some length; it is a more serious case than just an ordinary spell of the Dutch disease as the resource curse frequently finances criminal activities, smuggling and corruption.

whereas Singer is held as a superficial analyst who only discusses the demand faced by the South. (Emmanuel 1972/1969:80-87, Amin 1974/1970).[17]

Going back to Ricardo's argument in favour of trade benefitting all trading partners – "a wonderful game in which each partner has every chance of winning without the slightest risk of losing" in the sarcastic words of Emmanuel (1972/1969:xiii) – the exchange that is studied is the one between nations and not of specific products:

> "Are there really certain products that are under a curse, so to speak; or is there, for certain reasons that the dogma of immobility of factors [i.e. capital, labour] prevents us from seeing, a certain category of countries that, whatever they undertake and whatever the produce, always exchange a larger amount of their national labour for a smaller amount of foreign labour?" (Emmanuel 1972/1969:xxxi).

Emmanuel sets out to explain a paradox: if productivity improves faster in industrial production than in primary production – as assumed by Prebisch and many other economists based on actual trends – then the terms of trade ought to move against industrial products and in favour of agricultural and primary products. This was indeed the position of the classical economists, and Emmanuel refers to Mill, Malthus, Ricardo, Marx, Marshall, Bukharin, and Keynes – all of them backing up the proposition that raw materials would become more expensive compared to manufactures as populations and economies grow. (Emmanuel (1972/1969:xxvii-xxix). 260 pages later Emmanuel concludes:

> "I think it is possible to state that unequal exchange is the *elementary* transfer mechanism, and that, as such, it enables the advanced countries to begin and regularly to give new impetus to that *unevenness of development* that sets in motion all the other mechanisms of exploitation and fully explains the way that wealth is distributed." (Emmanuel 1972/1969:265, italics in original).

In other words, it is not the nature of the products exchanged which is the key: we need "to go beyond world market relations, to study world *production* relations" (op cit:266). It is not the fact that poor countries export agricultural products that explains why they are poor, nor does the fact that rich countries export manufactures explain their wealth, to refute this thought "one has only to mention Australia, New Zealand and Denmark, on the one hand, and Spain, Italy and Japan, on the other" Emmanuel explains (op cit:266). Low-wage countries are poor because they have an abundance of labour which keeps wages low, and low wages leads to the use of more labour in the products exported than the products imported.

Is this unequal exchange important? Obviously, Emmanuel thought so, but *qualitatively* we are led to be more cautious: if interior, domestic relationships are placed at the centre of the analysis when explaining uneven development, then unequal exchange can only be a secondary factor. But no, Amin (1976:144) presents an estimate of the size of what the Periphery would have received from its exports had its labour obtained the same salaries as in the Centre:

[17] Amin makes this distinction between Prebisch and Singer and favours the former over the latter – not enirely justified as I have argued – Emmanuel treats them together in the same negative light, thereby being "guilty of a confusion that causes him to be unjust to Prebisch" according to Amin (1974, Vol 1:311, note 70). Emmanuel for his part treats Prebisch-Singer's position as if it were one and the same and places it "on the fringe of unequal exchange". (op cit:80).

> "The hidden transfer of value from the periphery to the center, due to the mechanism of unequal exchange, are of the order of $22 billion, that is to say, twice the amount of the 'aid' and the private capital that the periphery receives. One is certainly justified in talking of the plundering of the Third World."

Emmanuel believed that his work was very "controversial", and that he "on all points" held "the opposite line to the official theory of international trade" (Emmanuel 1972/1969:267) which as we have seen argued that international trade was of mutual benefit to all parties concerned. And at the time when he wrote, 40 years ago, he was probably right.[18] But today the discussion about the benefits and drawbacks of trade has become more "sophisticated", at least if we are to believe another and more recent textbook:

> "It is clear that trade between advanced countries and developing countries is marked by ´unequal exchange.´ Developing nations use much more labour to produce the goods they export to advanced nations than these nations use to produce the goods they supply in return." (Krugman & Obstfeld 1994:269).

This vindicates Emmanuel's position, it would seem, but again, no, the inevitable unequal exchange "is not a an indication that the poor countries are losing from their trade", since the correct question to ask is whether the imported goods contain more labour than the poor countries themselves would have used had they produced the goods instead of acquiring them from abroad:

> "you should compare the labour used to produce your exports with the amount of labor it would have taken to produce your imports yourself". (Krugman & Obstfeld 1994:22).

Thus unequal exchange is real but still does not matter; in fact, from reading Krugman & Obstfeld one gets the impression that the Periphery would be worse off without it.

There is however another drawback of trade that Krugman & Obstfeld recognize, at least as a possibility that needs to be tested: "uneven development",[19] which in their view may be caused by infant industries being exposed to competition too soon.[20] Hence the

> "division of the world into rich manufacturing nations and poor agricultural countries is a historical accident – the rich countries just got there first, and their industrial

[18] Andersson (1976:152) refers to one of the leading economics text books of the 1960's and 1970's, Lipsey & Steiner's *Economics*, which "completely dismiss[es] ´the exploitation doctrine of trade´".

[19] As we have seen, "uneven development" is also a concept used by Emmanuel to describe the *effect* of unequal exchange. Andersson (1976) distinguishes three kinds of unequal exchange: disjunctive, asymmetric, and non-equivalent. "Disjunctive exchange" seems to be closest to "uneven development" while "non-equivalent exchange" has great similarities with Emmanuel's concept of unequal exchange of labour.

[20] The infant industry argument holds that late-comers should protect their industries until they become competitive with the leading industrial countries; the argument is credited to the German economist Friedrich List who in the mid 1800's argued that "history" showed that trade was beneficial to countries that already were at an advanced state while late-comers would be well-advised to protect their industries while they grew competitive. The reasoning for regulated trade was dubbed the "infant-industry argument". See Shafaeddin 2000 for a summary. In fact, List was inspired by the arguments presented by Alexander Hamilton – the first Treasury Secretary of the US – and other US friends of protecting the domestic industry, see Chang 2005:107-108.

> development precluded development by the rest of the world." (Krugman & Obstfeld 1994:269).

The statement sounds somewhat ironic – surely the state of the world cannot be an accident? – but Krugman & Obstfeld nevertheless recognize this as an empirical issue and end up by negating the possibility that they set out to investigate:

> "it is hard to find evidence that the wealth of the advanced countries has been achieved at the expense of developing nations." (op cit:270).

A nice conclusion follows, after spending as much as 13 lines on the matter:

> "Both the failure of protected industries to achieve efficiency and the success of unprotected industries indicate that competition from established industries in advanced countries is not the main factor inhibiting growth in developing countries." (op cit:269).

Once again, external relations are relegated to a secondary position, just as in the arguments of Baran, Emmanuel and Prebisch. This procedure hides more than it discloses: even though it may be correct that unequal exchange may not be the main factor, it can nevertheless be *one* factor that contributes to explaining uneven development. Thus, the question of the *impact* of unequal exchange must be held separate from the question of its *existence*.

Ecologically Unequal Exchange (EUE)

Unequal exchange of ecological resources was not among Emmanuel's main concerns, to put it kindly. Rather, he was a child of the development optimism of the early post-WWII period, which led him to complain that too little land was cultivated, too few rail road lines built, and too little cement and steel, and too few cars, were being produced. In short, "our world still largely lies fallow". (Emmanuel 1972:262).

Today, such lament would indeed seem inappropriate. Not because global gaps of unacceptable dimensions have ceased to exist – they have not – but because a growing global population coupled with a growing economy has ushered the world into a "sociometabolic transition" which seems unstoppable. (Krausmann et al 2008).

There is a consistent divide in material and energy use between typical agrarian and industrial countries, where the factor of difference is in the order of 3-5 when it comes to energy and material use per capita. But if the comparison agrarian-industrial metabolism is made per area – and not per capita – the differences are much greater, 10-30 times, testifying to the concentration of technomass (Hornborg 2001) in the affluent parts of the globe. With this transition already in course, global energy and material needs will increase considerably, at least by a factor of 2-3, which by all indications is way beyond carrying capacity for most ecological systems. (Krausmann et al 2008:652).

This scenario points to an increasing demand for material and energy resources, leading to a geographical transfer of these resources from the poor regions of the world to where the purchasing power is highest, a transfer that is effectuated via trade. Above, this increasing demand for primary products was seen to harbour a potential benefit for the exporters with improving terms of trade as a possible consequence. But now the perspective is different: the fact that some parts of the globe supply the remainder with ecological resources is cause for

alarm, especially if we see a systematic net- transfer of ecological resources from one part to another.

We must however take care not to label everything which we consider unfair ecological unequal exchange (EUE). For instance, when the "Netherlands fallacy" is criticized for obscuring that "the Dutch population and their average standard of living are only made possible through reliance upon imported resources" (Rice 2007:63), this is not the same thing as saying that the Netherlands is benefitting from ecological unequal exchange. Although the fallacy – which should not be confounded with the Dutch disease – is real, measuring exchange requires that a two-directional flow of resources is considered. Likewise when rich countries export pollution and waste: although they are transferring an environmental load to the importing countries, it is not a measure of unequal exchange (although it may well be part of a global system that is unfair and promotes uneven development).

A complicating factor when measuring EUE is that the exporting of environmental loads from the Centre to the Periphery may only constitute a brief pause before the problems strike back: the fact that many environmental issues are classified as "global" – e.g. climate change, ozone layer depletion, sea level rise – also implies that the Centre cannot get rid of its environmental loads; it only displaces them temporarily in space, but they are eventually felt everywhere, also in the Centre. Of course this impact is felt in the South as well, and here the consequences are likely to be more serious due to the fact that the Periphery harbours more people, in vulnerable living conditions, with fewer resources to adapt. For instance, sea level rise will affect poor urban populations more than rich. My point here is simply that environmental load displacement may be a temporary reprieve, the ecological load does not disappear once and for all, it keeps on coming back.

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That systematic and unequal ecological exchange takes place – and has taken place for a long time – is almost a trivial proposition in world system analysis and global environmental justice studies (see Hornborg, & Crumley 2007 and Hornborg et al 2007) for representative contributions).[21] But it has not been seen like this until twenty five years ago when Stephen Bunker postulated a difference between extractive and productive economies in terms of their opposed "dynamics of scale". (Bunker 1985).

[21] Labelling studies that do not deal with exchange "Ecological Unequal Exchange" should perhaps be seen as a good thing, testifying to the good-will that the concept carries. This was brought home by a recent collection of articles in the *International Journal of Comparative Sociology*, vol 50, 2009. For instance, a study shows how biological diversity is threatened in the South: "poor nations with higher flows of primary sector products to rich nations tend to have higher levels of threatened mammals species" (Shandra et al (2009:302). Another study documents "an ecological curse" in the footstep of "the economic development of capitalism", exploiting Guano (used as fertilizer) found in South America. (Clark & Foster 2009:329).

Although both studies seem to prove that exploitative and unfair conditions North-South exist and how "environmental overdrafts" (Clark & Foster 2009:330) have taken place, they do not constitute cases of unequal exchange in spite of their headings.

Similarly, there exists a tendency to argue as if the historic behaviour of the North "precludes the ability of the L[ess] D[eveloped] C[ountries] to follow a similar trajectory, within the confines of the global environment" (Rice 2007:56), when we in fact can register an increasing trend for the major economies of the South (China most pronounced but also India, Brazil, South Africa....) to do just that. Perhaps the last words of the quote were added in recognition of this fact: as some countries of the South do follow in the footsteps of the North, this brings us beyond "the confines of the global environment" (although we probably do not end up outside it ...).

According to Bunker, an extractive economy suffers increasing costs of production, while a productive economy gains from becoming ever more efficient, hence laying the ground for an unequal exchange between the two. The reason for this imbalance is found in the nature of the two economies: while the productive economy becomes ever more efficient as its scale (i.e. volume of production) increases, thereby lowering the unit costs of labour, energy and material resources, the logic works itself out quite differently for extractive economies:

> "In extractive systems [...] unit costs tend to rise as the scale of extraction increases. Greater amounts of any extractive commodity can be obtained *only* by exploiting increasingly distant or difficult sources." (Bunker 1985:25, my italics).

If this holds true, Bunker´s inverse "economies of scale" – in fact a theory of diseconomies of scale – would lead to a tendency for extracted materials to become more expensive (in terms of the produce that "productive" economies bring forth); i.e. the opposite of what the Prebisch-Singer hypothesis (and most of the statistical data) suggest. But in contrast to Prebisch and Singer, who set out to explain why the purchasing power of primary products behaved counter-intuitively, Bunker never really enters into explaining how EUE is brought about in spite of the postulated diseconomies of scale of primary products in an extractive economy. Surely, in economic terms, exchanging extracted resources which are becoming ever more expensive – Bunker's assertion – would benefit countries specializing in such exports when they exchange them for industrial goods which are assumed to become ever cheaper. If this does not in fact take place, we need a theory to explain why.

Bunker stresses that real societies present "variable mixes of extraction and production" and uses his perspective to "explain the extreme and progressive underdevelopment of the Amazon". (Bunker 1985:13). Thus, his analysis applies primarily to *regional* economies, as underlined by Hornborg (2007a:8), which could make it less relevant for studying *national* economies and the exchange between them. In fact, Bunker's argument could be even more restricted. Rice (2009:231-232) stresses that "decreasing returns to scale" primarily apply to "point sources", e.g. fuels, hard minerals such as copper, bauxite, gold diamonds and plantations crops. Such concentrated resources encourage the capture by "domestic economic and/or state elite groups and transnational corporations", words that remind us of the argument that resources may be a curse for the country which is unfortunate enough to harbour them.

If we take this line of reasoning one step further, Bunker´s thesis of unequal exchange in fact argues that certain products and resources are unequally exchanged, not that certain countries are disfavoured in the international exchange of goods. Thus, his argument follows more along the lines of Singer than those of Prebisch and Emmanuel (who argued that it was the countries and not the commodities that caused the unequal exchange Centre-Periphery).

Bunker himself, however, applies his understanding to uneven development as such and seeks to complement Emmanuel's too limited understanding of unequal exchange with an ecological dimension:[22]

[22] The definition of extractive economies is central to Bunker's argument but such economies are not easily delineated. For instance, there is a great difference between a country like Venezuela, which is in essence extractive, and Brazil, which although it extracts more per capita (14 tons vis-à-vis 12 in Venezuela) uses most

> "If we amplify [Emmanuel's] notion about wages to include all measure of unequal exchange, then we can say that *countries* where labor value and natural values are seriously undercompensated will tend indeed to be underdeveloped." (Bunker 1985:252, italics added).

Box 1. Unequal Exchange of Embedded Ecological and Labour Resources

Hornborg (2007) captures ecological unequal exchange in two different albeit related meanings by combining Emmanuel's preoccupation with labour time with the use of ecological resources measured in areal terms. The first comparison juxtaposes cotton production in 19th century USA with textiles produced by Britain. By using capital accumulated in Britain for the production of cotton – a manufacture which needs almost no land – it can be shown that one thousand pounds worth of imported raw cotton embodies eight times as many labour hours and 60 times as much land as the cotton sold for the same amount.

Now, let us assume that there are only two countries and two products, in the tradition of Ricardo's trade arguments, in order to measure the exchange between them: England and USA, cotton and textiles, respectively. Using Hornborg's figures, and assuming that Britain exports 1000 pounds worth of textiles to the US in exchange for 1 000 pounds of raw cotton, we have a case of unequal exchange in ecological as well as in labour terms:

- Labour: Britain receives 33 000 hours in exchange for 4 100 hours of domestic labour.
- Land: Britain receives 59 hectares in exchange for one ha.

The second case also uses the labour time and the areas used in producing cotton in the USA of the early 19th century, but now the comparison is with the labour time and areas needed to produce equally valued volumes of wool in Britain. It turns out that Britain in this exchange gained twice as many labour hours by importing American cotton than it would have spent producing its own wool; simultaneously it saved over hundred hectares domestically while appropriating 19 hectares in the USA.

Again, Britain benefited from the trade, the cotton produced by American slave labour yielded products that embedded more labour hours and land than what Britain would have "embedded" had it relied only on woollen products.

Following the surprisingly unclear lead of Bunker, a number of propositions have been tabled to help us understand the concept of ecological unequal exchange. Some of these discussions do look at exchange relations, such as the "thermodynamics of imperialism" (Hornborg 2001:35), where the productive potential of material resources may diminish in thermodynamic terms when raw materials are converted into manufactures, implying a loss of exergy, the quality of energy and its capacity to do useful work.[23] Increasingly, a balanced exchange in monetary terms is compared to a highly unbalance exchange of material resources measured in volume (tons, or embedded carbon dioxide, for instance). A case in

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of it domestically. See Eisenmenger & Giljum (2007:298-299) who conclude that "extractive economies should thus be defined as those specialized in extracting resources for exports rather than for domestic use."

[23] Giampietro & Mayumi 1998 argue in this tradition for an entropy-based theory of North-South trade exchange. See also Andersson & Lindroth 2000, Muradian & Martinez-Alier 2001, Giljum & Eisenmenger 2004, Rice 2007.

point is a diagram that frequently has been reproduced, and which shows the more or less balanced trade of the European Union, when using monetary measures, side by side with the great imbalance that exists when measuring in terms of volumes imported and exported. (Giljum & Hubacek 2001).

Box 2. Calculating Ecological Unequal Exchange. Three Examples

In a separate paper I discuss the various measures available to gauge Ecologically Unequal Exchange (EUE) and conclude with something of a paradox (see http://www.hek.lu.se/upload/Humanekologi/Hermele.Measuring.EUE.pdf): the best measures in *ecological* terms – such as the Ecological Footprint and the Carbon Footprint – are poor indicators of *local* impact, which makes them unsuitable for measuring unequal exchange; but the best indicator of *local* loads – the physical trade balance – is a poor measure of the *ecological* impact. Hence what is good for measuring local impact is not so good for measuring ecological impact, and vice-versa.

One way out of this paradox would be to re-calculate the Ecological Footprint: by eliminating the carbon part of the footprint (about half of the Ecological Footprint in general) we get a measure that is relevant from an ecological as well as a local point of view. A first such exercise was recently published (although with a different purpose) and gives some indications of what such an exercise might show. (See Table 1 and my presentation of the same data in Table 2).

Table 1. Ecological Unequal Exchange (excluding carbon footprint) between regions, million global ha

	Source								
Destination	Africa	Asia-Pacific	Latin America	M East & C Asia	North America	Other Europe	Western Europe	From all countries	**Ecological Deficit (-) or Surplus (+)**
Africa	*3.0*	2.3	0.1	5.1	0.9	0.5	11.7	23.5	**- 5.9**
Asia-Pacific	5.7	*63.0*	6.3	12.8	22.4	1.1	11.5	122.9	**- 2.3**
L America	3.9	9.1	*14.1*	5.6	16.3	1.0	14.4	64.4	**- 19.3**
M East & C Asia	6.6	3.5	0.2	*13.8*	0.5	1.9	7.9	34.4	**- 25.4**
North America	5.8	41.1	61.9	5.1	*57.2*	0.4	7.3	178.9	**+ 78.3**
Other Europe	1.1	0.6	0.1	9.8	1.0	*11.3*	20.4	44.2	**+ 23.4**
W Europe	3.3	5.7	1.1	7.5	2.3	4.5	*60.7*	85.1	**- 48.8**
To all countries	29.4	125.2	83.7	59.8	100.6	20.8	133.9		

Source: Moran et al (2009): table 3; and Dan Morna, personal communication 20100619.
Figures in italics = intra-regional trade.

The data is presented in geographical regions – Africa, Asia-Pacific, Middle East and Central Asia, North America, Other Europe, and Western Europe – which admittedly is not well suited for my purpose of measuring North/South, Centre/Periphery exchange, and this may be the reason why we have counter-intuitive results.

Here it can be seen that North America indeed has a positive balance – i.e. it benefits from ecologically unequal exchange by importing more ecological resources than it exports,

measured in ecological footprints (with the carbon footprint excluded); in other words, the North American exchange confirms the hypotheses of Ecologically Unequal Exchange. And so do the exchanges reported for Africa and Latin America with their negative exchanges along the North/South divide.

However, Western Europe appears as an anomaly, with a large negative net exchange, for which no satisfactory explanation has been put forwards so far.[24] Perhaps one lead could be taken from Table 2: we need to distinguish more carefully among the various participants in international trade in order to judge their position in the North/South hierarchy, for instance separating Japan and South Korea as well as Australia and New Zeeland from China and India in the Asia-Pacific group.

Table 2. Ecologically Unequal Excange among regions

Region	**Positive EUE**	**Negative EUE**
Africa	W Europe	Asia-Pacific, Latin America, M East & C Asia, North America, Other Europe
Asia-Pacific	Africa, Other Europe, M East & C Asia, W Europe	Latin America, North America,
Latin America	Africa, Asia-Pacific, M East & C Asia, O Europe, W Europe	North America,
M East & Central Asia	Africa, W Europe	Asia-Pacific, Latin America, North America, O Europe
North America	Africa, Asia-Pacific, L America, M East & C Asia, W Europe	O Europe
Other Europe	Africa, M East & C Asia, North America, W Europe	Asia-Pacific, Latin America
W Europe		Africa, Asia-Pacific, Latin America, M East & C Asia, North America, O Europe

Source: same as Table 1.

Table 3 presents a different take on how to measure the EUE (following the lead of Alf Hornborg, see Box 1). Here, the exchange is calculated transforming actual Brazilian trade into physical measures, or in other words I measure the ecological purchasing power of its ethanol exports in energy and area terms, respectively (see Table 3).

My first calculation of Brazil's Ecologically Unequal Exchange is the energy content of Brazilian ethanol exports per dollar exported, compared to the energy content of its oil imported, also expressed per dollar.

The second measure compares the ecological footprint (areas) in order to produce Brazilian ethanol, with the areas "occupied" by the ecological footprint of its oil imported, both in the fictitious measure "global hectares".

Table 3 shows that Brazil's ecological unequal exchange is favourable in terms of energy as

[24] E-mail message from Dan Moran, 20060619.

well as areas exchanged: in both cases, Brazil imports more ecological resources than it exports.

A number of comments are warranted. First, this result is different from other attempts to calculated the ecological exchange, for instance the study by Machado et al (2001) where Brazilian exports contained 40 percent more energy (and 56 percent more carbon) per dollar than its imports for the year 1995 (in spite of the fact that this study used Brazilian technichal efficiency data to measure the contents of its imports, which probably exaggerated the ecological content as Brazilian technology can be assumed to be less efficient in ecological terms than its average imports, which most likely underestimates its unfavourable ecological balance).

Secondly, Table 3 only accounts for direct energy content and not the energy used to produce the ethanol and the fossil fuel, respectively. Nevertheless, adding the indirect energy costs for producing ethanol – i.e. the embedded energy content – only brings the total energy footprint for ethanol to the same level as fossil fuel has without its indirect costs, 116 GJ/1000 USD. Thus, if we add the indirect costs for the energy content of oil – as we should in order to be able to compare – Brazil would still come out as a winner in the exchange.

Thirdly, the areal comparison – contrary to Table 1 and 2 – uses the total ecological footprint, which as I argue, is a less meaningful measure of the local ecological load. (Once I get the data without the carbon footprint, I will recalculate the relationship.)

Table 3. Brazil's Ecologically Unequal Exchange measured in energy (joule) and area (global ha)

	Ethanol (Brazilian export prices)	**Oil (Brazilian import prices)**
Energy exchange 2000-2008		
Average export price	0.3 USD/l (1)	51 USD/barrel (159 l: 0.32 USD/l) (2)
1000 USD	3 334 l	19.6 b (3 125 l)
Average energy content	21.5 MJ/l (3)	6.1 GJ/b (38.4 MJ/l) (4)
Average energy content including indirect use	34.8 MJ/l (3)	?
1000 USD in energy content	**71.7 GJ**	**119.6 GJ**
1000 USD in energy content including indirect use	116 GJ	?
Area exchange 2007/08		
Area w sugarcane for ethanol exports	544 000 ha(5)	
Ethanol Exports income	1491 MUSD(1)	
Global ha exported/imported	1 177 000 gha(6)	1 777 692 gha(7)
Global area exported/imported/1000 USD in global ha	**0.789 gha**	**1.192 gha**

(1) UNICA Exportacões Anuais de etanol pelo Brasil, www.unica.com.br 20100617
(2) Anuário Estatístico Brasileiro do Petróleo, Gás e Biocombustíveis, 2009
(3) Pimentel & Patzek 2007

(4) Bioenergy conversion facts, Oak ridge national laboratory, US Department of energy, http://bioenergy.ornl.gov/papers/misc/energy_conv.html
(5) 3.4 Mha sugar cane area for ethanol, 22 Gl total production 2007/08, of which 3.6 Gl exported = 16 % ==> 544 000 ha of sugarcane for exported ethanol.
(6) 3.4 Mha for ethanol fr sugarcane = 43 % of total sugarcane area; Total production 487 Mt x 0.43 = 209 Mt x 0.268 gha/t = 7 357 000 gha for total sugarcane ethanol: 16 % exported = 1 177 000 gha exported sugarcane area. Sugar footprint courtesy the Global Footprint Network (GFN).
(7) Oil imports for 1 491 MUSD 2007/08 (average import price 0.58 USD/l): 2 571 Ml. Carbon content 2.58 kg/l[(4)] = 6 633 180 t x 0.0352 gha/ton = 1 777 692 gha. Carbon footprint courtesy GFN.

Environmental load displacement/Pollution Haven Hypothesis (PHH)

The discussion regarding EUE includes aspects which have nothing to do with two-directional exchange, such as a displacement of environmental costs of consumption in the Centre to the Periphery, or the appropriation "of limited global environmental space or carrying and sink capacity of ecological systems well beyond [the Centre's] own borders", a process of environmental load displacement, or "environmental cost-shifting". (Rice 2007:44, 54). Of course, environmental load displacement may be part and parcel of a larger picture where the South is disfavoured in various respects, not only in terms of its exchange with the North.

It sounds intuitively plausible that poor countries should specialize in exporting "pollution intensive" raw materials and manufactures to the North, which in effect would mean that rich countries are transferring their environmental loads abroad, to poor countries. This, in essence, is the Pollution Haven Hypothesis (PHH). But although we know that such cases of pollution displacement occur, are they of general significance?

An intuitive case for expecting a transfer of pollution is the increasingly demanding environmental regulations introduced in the North, expected to stimulate a transfer of "environmental-intensive" industries to the South, e.g. as a response to the green house mitigating policies instituted in many countries of the North in the wake of the Kyoto protocol of 1997 (in which case the transfer is called "carbon leakage"). That such a transfer ought to take place became clear when the then chief economist of the World Bank, Lawrence Summers, infamously argued that poor countries have a comparative advantage in taking care of pollution and waste emanating from the rich world.[25]

Pollution Havens should be possible to identify by a growing flow of polluting and energy-intensive primary and manufactured goods from the South to the North, as well as in a flow of pollution-intensive Foreign Direct Investments (FDI) in the opposite direction, North to South, to produce equally polluting and energy-intensive products. But intuition is one thing, proof something else, and a lively debate rages in order to establish if PHH actually does take place.

The World Bank has argued that such transfer of environmental loads are "not very pronounced". Comparing the imports and exports of goods from energy intensive industries,[26] the World Bank finds "a gradual increase in the import-export ratio of energy-

[25] I discuss the memo sent out by Summers to his World Bank colleagues in my paper The Use and Misuse of Reductionist Measures of the Nature-Economy Interface, see http://www.hek.lu.se/upload/Humanekologi/HermeleUseandMisuseofReductionism.pdf.

[26] Energy intensive industries are pulp and paper, industrial chemicals, iron and steel, nonmetallic mineral products and nonferrous metals. (World Bank 2008:30). Petroleum products are not included. Similarly, in an influential discussion on "pollution-intensive industries, the same five sectors are selected, irrespective of if you use by the cost of abatement or by actual emissions per unit of output. Note that petroleum is left out of the

intensive industries in developed countries, and a gradual decline in the ratio in some developing regions" (primarily East Asia). (World Bank 2008:34) This supports the PHH hypothesis, but only mildly, at least in the eyes of the World Bank.

As we will see shortly, this conclusion is based on the fact that the World Bank measures the trade flows in monetary and not in physical terms.[27] But before turning to measures that are more relevant from an ecological point of view, I will briefly review the literature on the PHH.

The PHH has been tested and found not to be statistically significant in a number of studies. The explanations for this counter-intuitive conclusion frequently hinge on the small weight that environmental costs carry in investment decisions: the costs are not high enough to actually have a decisive influence as they only constitute a minor share of the overall picture, approximately 10-20 percent according to one estimate, "not trivial but also not dominant". (World Bank 2008:30).[28]

But the overwhelming evidence is that there is a pollution haven effect as the discussion has shifted to how important the PHH is, and how lasting.[29] The proponents of ever increasing trade flows maintain that the phenomenon is "transient" (Mani & Wheeler 1998:244), or, just as in the World Bank study above, "small" (Copeland & Taylor 2004:67); furthermore it can "fortunately" be mitigated once economic growth takes off in the South, as the South then will become more environmental conscious and impose more environmental-friendly regulations and taxes, just as the North supposedly has done already.

This happy-end result, one is led to understand, is caused by the beneficial impact on growth that the pollution-intensive foreign investments brought about: "Ultimately, income growth will be the answer."[30]

However, industries may be distinguished by other traits than their pollution- or energy-intensity. Some activities move more easily than others (so called foot loose industries), some are more sensitive to environmental costs being imposed, and some have lower costs for reducing their environmental loads. These three factors taken together make it possible to identify those industries where the PHH can be expected to hold.[31]

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analysis for the somewhat spurious reason that "a very few countries are actually involved in its production". See Mani & Wheeler 1998:219-220, and note 3.

[27] In general this holds true, but I want to stress that also with material flow analyses, the evidence is not unambiguous and "there also exists empirical evidence against the hypothesis that the affluent economies exploit the natural resources of developing countries to their own benefit" (Weisz 2007:293).

[28] The span given here is in fact much higher than figures normally given which typically are as low as 5-10 percent.

[29] See Hettige et al 1992, Mani & Wheeler 1998, Copeland & Taylor 2004, Erderington et al 2005. In this discussion the final outcome depends on at least three factors working together: composition (what is traded), scale (how much), and technique (how it is produced); in other words it is not a simple relationship environmental regulation ==> environmental load displacement. See Antweiler et al 2001.

[30] Mani & Wheeler 1998:245. The upbeat conclusion does not reflect upon the fact that the authors have excluded GHG from their analysis.

[31] See Ederington et al 2005. Interestingly, Ederington et al find no basis for the assumption that pollution-intensive industries are more sensitive to environmental regulation than the average; in other words, most of the studies may have been looking at the wrong relationship: it is the ease or difficulty with which an industry can move that decides the likelihood that it will move; polluting industries, with high fixed costs, have a tendency to stay put. The conclusions are supported by Kellenberg 2009:243.

Table 3. How FDIs in and Exports from the Less Developed Countries Confirm the PHH and imply Environmental Load Displacement (ELD)

Periods	ELD to the South proven by	Sector	Driver*)
1990-2000	Pesticide and fertilizer use	Primary sector	FDIs North==> South
1990-2005	Deforestation	Primary sector	FDIs North==> South
1970-2000	Deforestation	Primary sector	Exports South==>North
1975-2000	Carbondioxide emissions	Manufacturing sector	FDIs North==> South
1975-2000	Water pollution	Manufacturing sector	FDIs North==> South

*) the studies summarized here take care not to imply causality by only claiming that the various indicators of increasing environmental loads are "positively associated with" FDIs and export growth South-North.
Sources: Jorgenson (2007, 2008, 2009), Jorgenson et al (2009), Jorgenson & Kuykendall (2008).

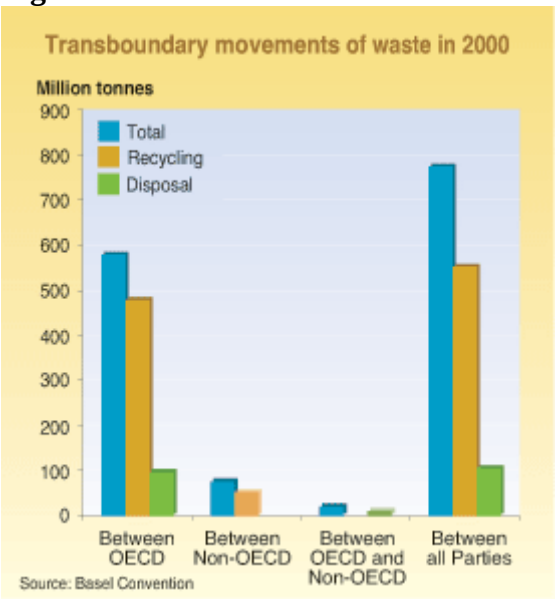
A more telling way – at least from an ecological point of view – to discuss the PHH is to measure actual trade flows and FDI North-South and gauge their impact on environmental and environmental related indicators. A series of studies show that indeed the environmental as well as the health situation deteriorates hand in hand with trade and FDI, an indication that indeed a generalized case of environmental load displacement is taking place (see Table 1).

Box 3. Toxic Waste Trade

The discussion on Pollution Havens should be held separate from the debate about trade in waste, including the trade in toxic waste, although all of them are part and parcel of environmental load displacements.

In 1989, the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Deposits was signed; today 172 parties are members of the convention, some without ratifying it.[32] Figure 2 summarizes their *reported* waste flows; Figure 3 gives some examples of illicit . The Basel Convention builds on the assumption that a large flow of hazardous waste is leaving the North and creating problems in the South, although there are few data to prove the case; according to *official* statistics, the North is a net importer of toxic wastes. (Baggs 2009).

Figure 2.



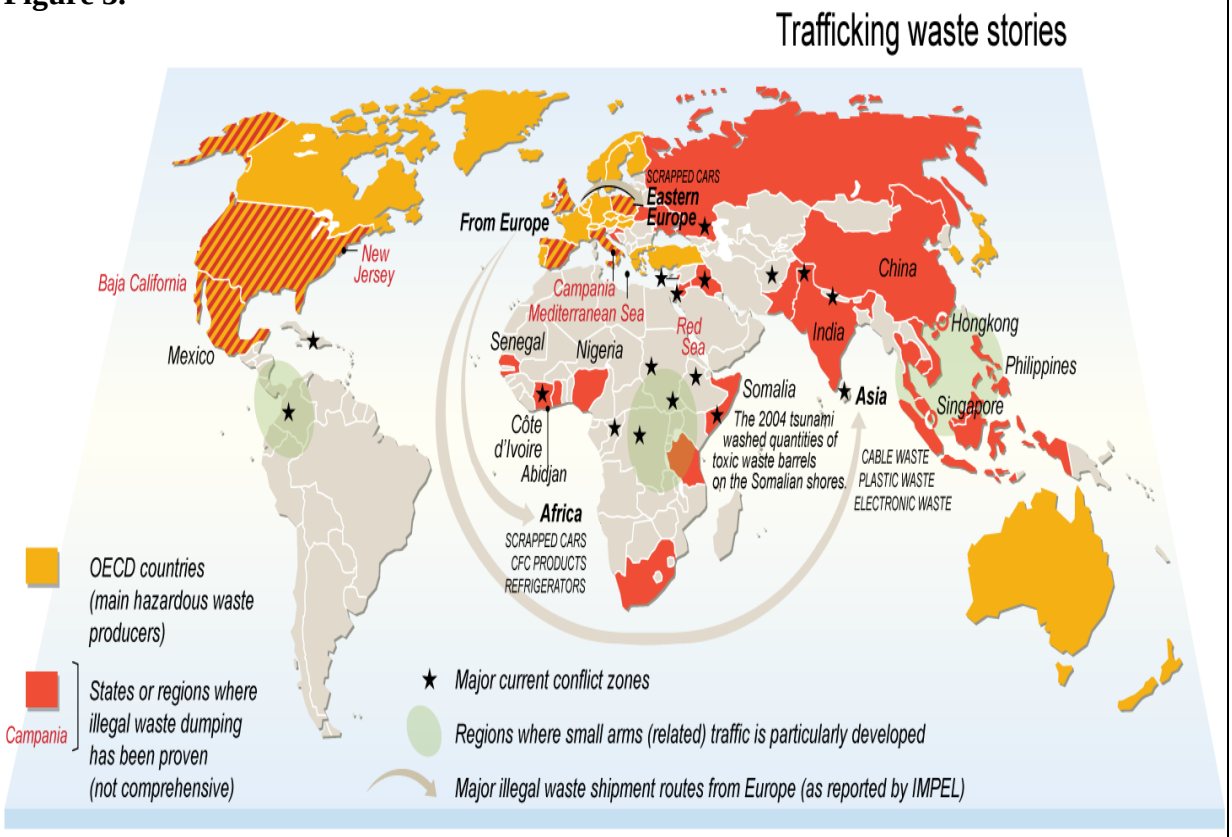
Although North-South trade of waste may not be the main issue, at least not in quantitative terms, a "Ban Amendment" was added to the original Convention (not yet legally binding, see www.basel.int/pub/baselbanhtml). The Ban amendment – signed by 68 countries by early 2010 – prohibits all exports of hazardous wastes from the OECD to the rest of the world for final disposal, another indication that the PHH has a strong grip on the minds of policy makers in the South, at least.

Until the Ban enters into force, the rules of the Convention as such will be the only judicial mechanism that attempts to regulate the trade, and they simply require exporters to assure themselves that the waste will be taken care of securely and safely at the point of destination. The Convention has been criticized for being too lax, but it does nevertheless contain some strong points.[33]

[32] Of the original signatories, only Afghanistan, Haiti and the United States have yet to ratify the Convention (see http://www.basel.int/ratif/convention.htm, 20100409).

[33] One case in point is that the Convention prohibits trade in hazardous waste to and from non-parties to the Convention (see Article 4(5); de Sadeleer 2009:450).

Figure 3.



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