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Unequal Exchange in International Trade: A General Model

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Abstract

Increasing world inequality and mass migration make the topic of unequal exchange ever more important. Unequal exchange arises when spatial production of value is disjointed from its geographical distribution. The lack of a coherent theoretical framework has limited empirical research on value transfers in trade. This paper aims to overcome this gap. A disaggregated monetary model of world economy with heterogeneous labour, non-specific commodities, and different national production techniques is presented on the grounds of Marx's labour theory of value. All the different forms of unequal exchange in international trade are explained without incurring the traditional impasses. Estimates of value transfers for recent years are presented. The operational character provides a consistent basis for further empirical research on the uneven spatial distribution of gains from global trade.

Keywords: International trade, Unequal Exchange, Uneven development, Labour Theory of Value.

JEL classifications: B51, F10, O19, R10.

1. Introduction.

The belief that international trade is mutually beneficial to all partners dates back to Ricardo's theory of comparative advantage. This was the theoretical underpinning of market globalization that led to rapid growth of international trade from the 1990s until the outbreak of the Great Recession. In the period 1990–2007, the growth in volume of international trade was 362%, almost two and half times greater than the growth of world real output (WTO, 2011). In 2007, world openness, measured as exports/GDP ratio, reached its maximum historical level, well above those attained in the previous stages of economic globalization in the 19th and 20th centuries (Federico & Tena-Junguito, 2016). The trade collapse in recent years was due to a general fall in demand and not to structural changes in global production networks (Behrens et al., 2013).

However, contrary to the assertions of classical and modern exchange theory, the huge increase in international trade has not been matched by a reduction of welfare disparity between different regions of the world economy. In the period 1980–2009, absolute global income inequality rose in parallel with the expansion of international trade (Bosmans & alt., 2014; Goda & Garcia, 2016), and between-country inequality explains most of the overall inequality (Anand & Segal, 2015). The growth of top incomes is the factor driving the rise in inequality both within and between countries (Franzini & Pianta, 2016). In today's world, geographical location is the most important factor determining personal income opportunity and accounts for more than half of the variability of global income differences (Milanovic, 2012, 2015). The age of globalization is at the same time the age of mass migration caused by increasing global inequality (Bastia, 2013). The spatial heterogeneity of economic globalization is both the cause and effect of uneven geographical development (Coe & Yeung, 2001).

The simultaneous increase in trade and global inequality does not accord with the belief of mutual benefit provided by international trade, or, at least, the benefits are not equally distributed among all partners. That belief has been questioned according to different arguments, from ancient mercantilism to the latest economic theories (Shaikh, 1980a; Brodin, 2007). The theory of unequal exchange is one of the most influential among them, and several schools of economic thought, competing with the neoclassical mainstream, share this issue. Unequal exchange arises when spatial production of value is disjointed from its geographical distribution in the same way as social production of value diverges from its distribution between social classes (Harvey, 2006, pp. 439–442). Production and capture of value by locations are two different things (Henderson et al., 2002), and trade is one of the ways of their uncoupling.

The recent theoretical framework of global commodity chains (Somel, 2005; Heintz, 2006; Selwyn, 2012, 2015), as well as ecological economics (Lonergan, 1988; Nordlund, 2014; Foster & Hollemann, 2014; Honborg, 2014), has some common features with the unequal exchange tradition. The persistence of unequal development in the current free trade era, despite the rapid industrialization of some formerly peripheral countries, most notably China, makes unequal exchange in international trade still

crucial for analysing the economic mechanisms of globalization (Itoh, 2009; Bieler & Morton, 2014).

Unequal exchange has both a spatial and a social dimension, and its study necessarily requires overcoming the rigid disciplinary boundaries between international economics and the geographical political economy (Sheppard, 2011). The aim of this paper is to define a unified theoretical framework that incorporates all the possible forms of unequal exchange highlighted in the literature, in the context of a disaggregated version of the ‘new interpretation’ (NI) of Marx’s theory of value (Dumenil, 1980; Foley, 1982; Dumenil & Foley, 2008). Two key points distinguish this approach from traditional approaches: first, the equality between ‘sum of values’ and ‘sum of prices’ applies to net product rather than gross product because ‘living labor (as opposed to the ‘dead labor’ embodied and paid for in other commodities) is the exclusive source of real value added in production’ (Harvey, 2001, p. 314); second, ‘surplus-value’ consists of the monetary equivalent of unpaid living labour-time. In this way, there is no ‘transformation problem’ to be solved. Extending this framework to a spatial dimension¹, through the analysis of international trade relations, sheds new light on the mechanisms of uneven development in a capitalist space economy and contributes to depicting new ‘geographies of unequal global exchange’ (Sheppard, 2016, chap. 7).

This paper is structured as follows. Section 2 presents a review of unequal exchange debate. Section 3 discusses the meaning of unequal exchange in Marx’s labour theory of value (LTV). Section 4 introduces a multisectoral, multicountry monetary model of the world economy, with heterogeneous labour and non-specific commodities. Section 5 investigates all possible forms of international value transfers hidden in international trade relations. In section 6, empirical estimates of value transfers for recent years are presented by use of the World Input Output Database (WIOD). The operational character of the model lays the foundation for further empirical research on the quantitative dimension of international value transfers in the present global economy. Finally, Section 7 presents some concluding remarks.

2. Forms of Unequal Exchange.

The term ‘unequal exchange’ was originally coined by Emmanuel (1962, 1972, 1973, 1975) to indicate international transfers of value hidden behind apparent equality in trade (for critical reviews, see Evans, 1984; Raffer, 1987; Sheppard, 2012; Edwards, 2015; Brodin, 2016; Lichtenstein, 2016). In Emmanuel’s view, differences in monetary wages between underdeveloped and developed economies, determined by institutional factors, such as trade union power, produce inequality in trade and value transfers from

¹Previously, another attempt in this direction was accomplished by Devine (1990), but the macroeconomic nature of the model allowed the inclusion of only Marxist versions of unequal exchange, thereby excluding other interpretations.

the former to the latter. The influence of this theory was due to the provocative argument of the exploitation of southern poor workers by their affluent colleagues of the North. Emmanuel's thesis can be explicated either by Marxian price of production schemas or by Sraffian price systems (Bacha, 1978; Barnes, 1985). The assumptions of perfect international capital mobility, relative immobility of labour and competitive markets make Emmanuel's unequal exchange theory different from previous structuralist and Marxist theories on inequality in trade.

Structuralist unequal exchange theory was inspired by the works of Arthur Lewis (1954, 1969, 1978, 1979), Raul Prebisch (Economic Commission for Latin America and the Caribbean [ECLAC], 1950; Prebisch, 1959) and Hans Singer (1950), first published in the 1950s. Labour market dualism in peripheral countries, between a traditional/informal sector and a modern/formal one, is the core of Lewis's model (Field, 2004). The traditional sector is characterized by an unlimited supply of labour that blocks wages to the subsistence level, while wages in the modern sector are higher to encourage migration of workers from 'country' to 'town'. The modern sector wage rate, however, remains below labour productivity because of the latent competition of traditional workers. By contrast, in central countries, sectoral labour markets are nationally integrated, and the wage rates are set to productivity level. Under the classical assumption of equal profit rates, productivity growth in peripheral countries results in lower export prices, benefiting consumers in central countries. Generalizing from Lewis's model, labour market dualism determines a deterioration in terms of trade for countries specializing in low-wage sectors and a value transfer to countries specializing in high-wage sectors (Findlay, 1980, 1989; Evans, 1976, 1989; Burgstaller, 1987; Thirwall, 2015). Intersectoral wage differentials due to labour market segmentation are a source of unequal exchange in international trade.

In May 1950, Prebisch and Singer published, independently of each other, two articles asserting that there is a long-run trend toward worsening in net barter terms of trade between primary products and manufactured goods. As a result, gains from international trade are not equally distributed, penalizing peripheral countries exporting raw materials and benefiting central countries exporting industrial goods. This idea of unequal exchange inspired the development strategies formulated by the ECLAC, based on an import-substitution policy to promote industrialization in developing countries (Floto, 1989). In the Prebisch-Singer hypothesis, the divergent trend in relative prices is explained by two factors (Love, 1980; Toye & Toye, 2003): first, the existence of monopolistic conditions in industrial product markets, allowing higher profits than in competitive primary markets; second, a lower income and price elasticity of demand for primary products compared to industrial goods. Adverse international specialization in low-income-low-price exporting sectors leads to a continuous decline in terms of trade. Intersectoral profit-rate differentials due to non-competitive product markets are a source of unequal exchange in international trade.

The emphasis on the role of commercial and technological monopoly power as a fount of exploitation of the centre on the periphery is also typical of a neo-Marxist approach to the issue of unequal exchange, known as 'monopoly capitalism' (Baran,

1957; Baran & Sweezy, 1966; Amin, 1976). The increasing concentration and centralization of capital produce a commercial and technological dualism between a few transnational corporations (TNCs) and a large number of small producers. TNCs' monopolistic practices, as price manipulation, super-exploitation of labour in poor countries and 'imperialist rent' deriving from control of strategic resources (Higginbottom, 2014), determine a transfer of surplus from peripheral to central countries in the form of supra-profits. International differences in profit rates are thus another source of unequal exchange.

Monopoly power is not the only form of unequal exchange in Marxist theory. Formerly, another source was identified, the so-called 'non-equivalent exchange' or 'unequal exchange in a broad sense' (Bettheleim, 1962). According to Marx's LTV, in a capitalist economy with many capitals, commodities do not exchange at their values but at prices of production to equalize profit rates between branches with different capital intensity. Value transfers occur from labour-intensive to capital-intensive sectors through interindustry competition. Competition within an industry to reduce cost of production likewise implies value transfers from less-efficient to more-efficient firms (Shaikh, 1980b). Applying this schema to different regions (Bauer, 1907) or nations (Grossman, 1929; Carchedi, 1988, 1989; Seretis & Tsaliki, 2012), unequal exchange arises via the normal functioning of the price-formation mechanism in a competitive capitalist economy. International differences in organic composition of capital (OCC) are another source of unequal exchange.

In the controversy following the publication of Emmanuel's works, different strands of criticism emerged, among them the lack of consideration of the transformation problem from values to prices of production (Palloix, 1970; Somaini, 1973); the restriction of the analysis to complete specialization unable to treat non-specific, intraindustry trade that assumed increasing relevance in the contemporary world economy (De Janvry & Kramer, 1979); the assumption of wages as exogenous variables, independent from differences in labour productivity between countries due to different techniques of production (Evans, 1984); and the extreme assumption of worldwide identical rates of profit not substantiated by empirical evidence (Bernal, 1980).

A generally accepted conclusion was that the proper definition of unequal exchange as a condition in which double-factorial terms of trade, that is, the quantity of foreign labour embodied in exports per unit of domestic labour embodied in imports, are different from one (Findlay, 1984; Ocampo, 1986; Liidakis, 1996; Erten, 2011). According to Gibson (1980), the 'Fundamental Theorem of Unequal Exchange' relates increase/decrease in relative wages between countries and improvement/deterioration in barter terms of trade.

In summary, two main factors driving unequal exchange arise, as shown in Table 1: differences in industrial specialization and differences in remuneration of factors of production.

Several attempts have been made to measure empirically the size of unequal value transfers, both in international and interregional trade (Amin, 1976; Gibson, 1980;

Marelli, 1983; Webber & Foot, 1984; Williams, 1985; Joseph & Tomlinson, 1991; Nakajima & Izumi, 1995). The recent growth of North–South trade has stimulated further research on the opposite effects for the North in terms of higher income and lower employment, deriving from the coexistence of unequal value transfer and deindustrialization (Kollmeier, 2009). The main limitations of these empirical analyses have been the problem of measuring the gap between values, prices of production and market prices within classical LTV on one hand, and the shortage of statistical data able to express real equivalence of economic variables on an internationally comparable scale, on the other. Furthermore, the lack of a general and unified theoretical model has limited empirical analyses to particular aspects of unequal exchange.

Differences in:		Main authors:
<i>Industrial specialization</i>	Intersectoral wages	Lewis
	Intersectoral profit rates	Prebisch and Singer
	Capital composition	Classic Marxist theory (Bauer, Grossmann)
<i>Remuneration of factors of production</i>	International wages	Emmanuel
	International profit rates	Monopoly capitalism theory (Baran, Sweezy, Amin)

A new methodology to estimate unequal exchange has been proposed to overcome these problems (Reich, 2007, 2014), based on the gap between current and purchasing power parity (PPP) exchange rates, the so-called Exchange Rate Deviation Index (ERDI). In the real world, terms of trade do not depend only on relative prices and productivity but also on nominal exchange rates as independent variables. In the foreign exchange market, the long-run equilibrium is not established according to the law of PPP because other factors, including interest rate parity and real market imperfections, systematically affect currency prices, the so-called ‘PPP puzzle’ (Rogoff, 1996). As a consequence, there is no common unit of measurement of value in the world, and the spatial distribution of gains from trade is affected by monetary and exchange rate constraints (Dunford et al., 2014). From this perspective, several empirical works calculate value trade transfers by the difference between actual monetary value of exports/imports less their fair value measured in PPP exchange rates. Unequal exchange results from the persistent real undervaluation of the currencies of less-developed countries against those of developed countries (Kolher & Tausch, 2002; Somel, 2003; Tausch, 2005; Elmas, 2009; Kohler, 2015).

The ERDI approach to unequal exchange has been criticized (Subasat, 2013) because it ignores the Balassa-Samuelson effect (BSE). The BSE states that higher relative productivity in the export sector gives rise to higher relative wages in non-tradable ones, thus determining a real currency appreciation in high-income countries by

a higher domestic price level. The empirical validity of this effect is still in question, in particular in the presence of fixed or managed exchange rate regimes in many developing countries (Wang & al. 2016; Mao & Yao, 2016). However, regardless of the empirical validity of BSE, this kind of criticism misses the point, because the BSE precisely demonstrates that in high-income countries, labour markets are not competitive, and the average national wage rate is above the average productivity level, as in Emmanuel's argument.

A more consistent criticism was made by Raffer (2006), who claimed that ERDI can measure unequal exchange only if labour is homogeneous between countries. Comparison between PPP wages should, therefore, take into account productivity differences. In addition, it does not seem plausible that international value transfers would completely disappear when current exchange rates are aligned with the PPP. Empirical estimates of unequal exchange, including the ERDI approach, cannot disregard a clear definition of theoretical hypotheses and conditions explaining international transfers of value.

3. Unequal Exchange in Marx's LTV.

In Marx's LTV, value transfers appear as a consequence of the mismatch between different measures of the magnitude of value: value in labour form and value in money form or exchange-value. The substance of value is socially necessary labour or abstract labour. The social character of necessary labour has a double meaning (Rubin, 1973), triggering the qualitative splitting of value into two contradictory forms: value in production and value in circulation. It is labour working under average technical conditions within a particular sphere of production on one hand, and it is labour necessary to satisfy existing social needs on the other. In the first sense, socially necessary labour is homogeneous labour, representing labour with an average combination of skills, labour intensity and means of production, that is, labour with average physical productivity. Homogeneous labour is the quantitative expression of the labour form of value, for which the appropriate unit of measurement is time. In the second sense, labour expended in production under average technical conditions has to be validated by a corresponding level of effective demand. When the production of a particular use-value corresponds to social demand, homogeneous labour corresponds to the quantitative expression of value in money form, the exchange-value, for which the appropriate unit of measurement is money.

In a capitalist market exchange, value necessarily metamorphoses from labour form to money form, and it manifests itself as exchange-value in the surface of the commodity circulation. This metamorphosis derives from the private character of social production in a capitalist economy. Exchange is equivalent when the monetary unit constituting the exchange-value represents the same magnitude of value in labour form, that is, the same quantity of homogeneous labour, in both commodities. With produced commodity-money, the equivalent monetary unit is the quantity of gold produced by a

unit of gold-producing, homogeneous labour (Moseley, 2005). With fiat money, the equivalent monetary unit is the quantity of net product produced by a unit of homogeneous labour (Foley, 2000; Moseley, 2010), the monetary expression of labour time (MELT). The quantitative difference between value in money form and the monetary expression of its labour form originates value transfers.

Technical conditions of production are known at any given time, so homogeneous labour can be measured independently of any market exchange conditions. What is not immediately known is the correspondence between social production and social demand. When this condition is verified, exchange-value takes the form of market-value, and the measure of value in money form is equivalent to its measure in labour form. In conditions of equal capital intensity between industries, the specific form of market-value is value, while, with different capital intensities, it is the price of production. Only value expresses the full equivalence between different measures of socially necessary labour. In a capitalist economy, however, commodities exchange according to their prices of production because of interindustry capital competition, which leads to equalization of profit rates. Price of production is the specific, capitalist form of equivalence between value in labour form and value in money form. Capitalist market exchange is, by its very nature, a non-equivalent exchange that implies value transfers or unequal exchange in a broad sense.

Market-value is a long-run concept, assuming market clearing conditions between demand and supply, and it represents the gravitational centre around which short-run market prices fluctuate. In long-run equilibrium, the equivalence between the two different forms of value is determined by the technical conditions of production (Rubin, 1973, p. 190). In this respect, only a value transfer deriving from intersectoral equalization of profit rates is conceivable.

In the real world, however, the long run is nothing more than a succession of short-run periods in which disequilibrium conditions normally prevail and other types of value transfers occur, originating unequal exchange in the strict sense. In classical political economy, long-run equilibrium is a thought-experiment aimed at analysing the conditions of reproduction of a decentralized market economy (Foley, 2013). Defining long-run equilibrium is a necessary and preliminary condition for studying real phenomena that would otherwise appear as a chaotic combination of accidental events. Nevertheless, it is not an end in itself. In a capitalist space economy, disequilibrium is an endogenous result of the complex dynamics between individual actions and social structures in which firms' competition interacts with class conflicts and spatial antagonisms (Sheppard, 1990). In this context, unequal exchange in a strict sense is, by definition, the result of a state of disequilibrium. It was precisely for analysing disequilibrium conditions in the context of rent generation that Marx introduced in Volume III of *Capital* the form of regulating market-price or market-price of production (Marx, 1894, pp. 146, 458).

Market-price of production allows the consideration of the effects of both supply and demand on the short-run distribution of value between industries (Kristjansson-Gural, 2003, 2005). In market clearing conditions, the market-price of production

coincides with the market-value. Under structural conditions of excess or deficient demand, the market-price of production is higher or lower than the market-value because it incorporates a sectoral profit rate higher or lower than the general average. Structural disequilibrium between supply and demand in a particular branch originates from market imperfections, such as scarcity of fertile soils and mines in the primary sector or barriers to entry in secondary and tertiary sectors. It can persist for a long time without causing a general crisis if the market-price of production remains within defined limits. In overproduction sectors, the lower limit is the cost-price of the least-efficient producer, below which conditions of capital reproduction are not satisfied and supply declines. In underproduction sectors, market-price of production is the individual price of production of the least-efficient producer, and more efficient producers have rent in the form of super profits and/or higher wages.

The market-price of production is a more concrete form of exchange-value than the price of production because the short-run profit-rate equalization between industries is not assumed in advance (Marina-Flores, 1998). It is, therefore, a useful theoretical tool for analysing value transfers. Sectors with a market-price of production above the price of production have a rent in the form of higher net revenue per unit of homogeneous labour, obtained via value transfers from sectors in the opposite situation. Sectoral or differential rent differs from individual or absolute rent. Individual rent comes from a market price higher than the market-price of production, resulting in intraindustry value transfers from competitive to monopolistic firms because of commercial (i.e. brand power) or technological monopoly.

Causes		Differences in:	
<i>Industrial specialization</i>	Differential rent	Intersectoral wages	Market-price of production — price of production
		Intersectoral profit rates	
	Profit-rate equalization	Capital composition	Price of production — value
<i>Remuneration of factors of production</i>	Absolute rent	International wages	Market price — market-price of production
		International profit rates	

Applying this analysis on a world scale with the formation of international market-values², sectoral (differential) rents give rise to international value transfers, deriving from different industrial specializations, whereas individual (absolute) rents give rise to international value transfers, deriving from different national remunerations of factors

²The discussion around Marx's conception of international value is particularly developed in Japanese and Eastern European Marxist economic traditions; see Matsui (1970) and Bakos (1992).

of production. Table 2 summarizes the measure of international value transfers due to different forms of unequal exchange previously identified.

The method used in the following sections to determine value transfers is analogous to that of Marx's *Capital* from Volume I to Volume III (Wolff & alt., 1984). First, we determine the virtual conditions of equivalent exchange in the absence of value transfers. Afterwards, unequal exchange conditions are derived from differences between market-values, market-price of production and market-prices.

4. Equal Exchange Conditions in a Multicountry and Multisectoral World Economy.

In the literature, there are different contending views on the possibility of extending the NI theoretical framework at the sectoral level. Some authors argue that NI is an approach to LTV that focuses only on macroeconomic relations between aggregate variables, and it is indifferent with respect to any microeconomic specification (Fine & alt., 2004; Mohun, 2004). Others instead claim that NI theoretical tools can be similarly applied to the micro level to capture fundamental aspects of the capitalist economy (Rieu, 2006, 2008; Dumenil et al., 2009). In doing so, however, the question that arises is that of the determination of homogeneous labour at the sectoral level (Rieu, 2009). This issue is closely connected with the classical problem in Marxian LTV concerning the quantitative reduction of heterogeneous labour into homogeneous labour. According to Foley (2005), within the framework of the NI, this is a pragmatic issue that can be addressed through econometric analysis.

One of the main assumptions of the NI is the identity between total aggregate homogeneous labour and total aggregate effective labour as a result of the macroeconomic identity between total net product and total effective labour-time. In the macro framework of NI, homogeneous labour is defined as labour with *average aggregate value productivity*. The issue of sectoral homogeneous labour is addressed in the literature in terms of redistribution of aggregate homogeneous labour among various industries. In this context, Rieu et al. (2014) have suggested a model in which sectoral homogeneous labour is a function of sectoral skills and labour productivity. Sectors with higher skills and productivity than average have a conversion coefficient of effective labour into homogeneous labour higher than sectors under the opposite conditions. Without specifying the quantitative relations, the definition of sectoral homogeneous labour remains confined to a qualitative dimension.

In a disaggregated framework, however, the appropriate procedure should be from sectors to whole economy and not from whole economy to sectors. As discussed in the previous section, homogeneous labour is determined only by the average technical conditions of production of each particular category of commodities. Average technical conditions of production are expressed by average physical labour productivity, which can be defined only on a sectoral level because of the heterogeneity of the production process of different categories of commodities (Saad-Filho, 1997). Homogeneous

labour, then, is labour with *average sectoral physical productivity*, which implies equivalence between sectoral effective labour and sectoral homogeneous labour. Aggregate effective labour is equal to aggregate homogeneous labour just because this identity is first logically verified at sectoral level. Intersectoral transfers, due to different OCC or to other factors, occur as transfers of value in money form not in labour form, by the differences between market-values, market-prices of production and market-prices.

On this basis, we present a general, disaggregated model of world economy to analyse the various forms of unequal exchange in international trade³. The aim is to determine if the price structure of a given real economy at a given time complies with a condition of equal exchange. The model analyses an *ex post* economy and, therefore, it takes quantities and prices as given data of the real economic system.

Assumptions.

Consider a no joint-production world economy in self-replacing state with n countries and m non-specific commodities, freely traded in integrated international markets. Subscript letters j , w and i indicate industry, world and country, respectively. Each national industry uses effective labour (L), working with given intensity⁴, skills and means of production (constant capital), to produce a unit of good. Technical change is capital-using and labour-saving with constant returns to scale⁵. Consequently, within each industry producing the same use-value, capital is homogeneous and can be expressed by its monetary value. No prior assumptions are made on capital and labour mobility. Each country has its currency and aggregate world economic variables are expressed in US dollars.

In each industry, world surplus product⁶ (Y) is equivalent to world effective labour-time:

$$(1) \quad Y_{wj} \equiv L_{wj}$$

Within each branch, homogeneous labour (L^h) is defined as labour with world average productivity. Each unit of homogeneous labour has an average combination of skills, labour intensity and means of production⁷. On the world sectoral level, this normalization leads to the identity between homogeneous labour and effective labour:

³ I would like to thank Yoshinori Shiozawa for helpful critical comments on an earlier version of the model.

⁴On the significance of labour intensity in Marx's LTV, see Reuten (2004).

⁵ Marquetti (2003) and Dumenil-Levy (2003) show that this sort of technical change represents the long-term historical trend of the capitalist economy. It is the classical, or Marx-biased, concept of technical progress; see Kurz (2010). For a theoretical framework of this biased technical change, see Foley and Michl (1999).

⁶ Surplus product is the physical output corresponding to the new value, or national income, created in a period. On surplus product see Sraffa (1960), chap.2.

⁷The micro assumptions implicit in this procedure are: (a) normalization of skills measurement to world average sectoral level (Dumenil & al. 2009) or, alternatively, the presence of industry-specific skills widely recognized by empirical research on labour markets (Neal, 1995; Parent, 2000; Sullivan, 2010);

$$(2) \quad L_{wj}^h \equiv L_{wj}$$

The aggregate world homogeneous labour is the sum of all sectoral homogeneous labours and coincides with effective aggregate world labour:

$$(3) \quad L_w^h \equiv \sum_j L_{wj}^h \equiv \sum_j L_{wj} \equiv L_w$$

and aggregate world surplus product is equivalent to aggregate world effective labour-time:

$$(4) \quad Y_w \equiv L_w$$

Proposition 1.

For each industry, national homogeneous labour is an aliquot part of world effective labour equivalent to the aliquot part of PPP national net product on world monetary net product⁸.

In each industry, world monetary net product⁹ ($Y_{wj}^{\$}$) is given by the following expression:

$$(5) \quad Y_{wj}^{\$} = \sum_i e_i^{\$} Y_{ij}^{nc}$$

where:

$e_i^{\$}$ = Local currency unit per current dollar;

Y_{ij}^{nc} = national monetary net product expressed in national currency.

The world aggregate monetary net product is:

$$(6) \quad Y_w^{\$} = \sum_j Y_{wj}^{\$}$$

The ratio between aggregate monetary net product and aggregate effective labour-time is the MELT, which corresponds to the average value of labour productivity (Foley, 2005):

$$(7) \quad MELT_w = \frac{Y_w^{\$}}{L_w}$$

(b) labour intensity affects relative surplus labour, not absolute surplus-value (Mavroudeas & Ioannides, 2011), because ‘on the world market the more productive national labour reckons also as the more intense’ (Marx, 1887, p. 569).

⁸ On the “Aliquot Part” reasoning in Marx’s LTV see Roberts (2004, 2005).

⁹ Monetary net product represents the monetary value of the surplus product.

$MELT_w$ indicates the value-creating capacity of a unit of homogeneous labour, and it converts value in labour form into value in money form¹⁰. On a sectoral level, MELT can be decomposed in monetary expression of value (MEV), indicating the quantity of monetary net product per unit of homogeneous labour, and value expression of labour time (VELT), indicating the quantity of homogeneous labour per unit of effective labour (Rieu, 2008; Rieu & alt., 2014):

$$(8) \quad MELT_{wj} = MEV_{wj} \times VELT_{wj} = \frac{Y_{wj}^{\$}}{L_{wj}^h} \times \frac{L_{wj}^h}{L_{wj}} = \frac{Y_{wj}^{\$}}{L_{wj}} \times 1$$

MEV_{wj} represents the average net price per unit of homogeneous labour in industry j , or *normalized market-price of production*. For each world industry and for aggregate world economy, VELT is equal to one, and MELT coincides with MEV.

Conversely, since effective labour is heterogeneous between countries, according to different amount of skills, means of production and labour intensity, national VELT's are normally different from one¹¹. $VELT_{ij}$ will be greater than one for countries with higher than world average productivity and vice versa for countries with lower productivity. The first produce varieties of better quality and higher unit price, and the latter specialize in unskilled-labour-intensive varieties with lower unit price. Within each branch different proportions of capital and skilled labour represent different national production techniques used to produce different varieties of the same commodity. Specialization in international trade is within-product and not across-product, and unit values of varieties are positively associated with capital and skills-intensive production techniques (Schott, 2004). National varieties are demanded both as intermediates and as final consumer goods. Market prices are prices of national varieties while market-prices of production are the world average prices in each industry.

Within a world industry, a unit of homogeneous labour has, by definition, identical productivity in all countries and, therefore, MEV_{ij} is equivalent to MEV_{wj} . The former, however, is expressed in national currency while the latter is expressed in dollars. To compare them, we have to convert MEV_{ij} in international dollars¹². In this regard, the proper exchange rate is the PPP exchange rate because it expresses an equivalent quantity of goods among countries.

We have, therefore, the following condition:

$$(9) \quad e_{ij}^p MEV_{ij} = MEV_{wj}$$

where:

e_i^p = Local currency unit per PPP international dollar;

¹⁰ The inverse of $MELT_w$ is the labour expression of money, or value of money, and it expresses value in money form into value in labour form.

¹¹ For each industry, national MELT's are therefore normally different from national MEV's.

¹² One unit of international dollars represents the same basket of goods as one unit of U.S. dollars in the United States.

$$e_{ij}^p = e_i^p ERDI_{wj}^{13};$$

$$ERDI_{wj} = \frac{\sum_i (e_i^{\$} Y_{ij})}{\sum_i (e_i^p Y_{ij})}.$$

By decomposing MEV's, we obtain:

$$(10) \quad \frac{(e_{ij}^p Y_{ij}^{nc})}{L_{ij}^h} = \frac{Y_{wj}^{\$}}{L_{wj}^h}$$

By solving (10) for national homogeneous labour, we have:

$$(11) \quad L_{ij}^h = \frac{\left(\frac{e_{ij}^p Y_{ij}^{nc}}{Y_{wj}^{\$}} \right)}{L_{wj}^h}$$

This reduction procedure is independent of the existence or non-existence of intra- and interindustry equivalent exchange, because non-equivalent exchange affects the measure of value in money form, and it does not alter the measure of value in labour form.

Proposition 2.

There is intraindustry equal exchange when the current exchange rate is equal to the PPP exchange rate.

Under intraindustry equivalent exchange, the international price of net product per unit of homogeneous labour is equal for all countries:

$$(12) \quad e_i^{\$} MEV_{ij} = MELT_{wj}$$

The expression ($e_i^{\$} MEV_{ij}$) indicates the international market-price of a national variety of commodity j produced by a unit of homogeneous labour or *normalized market-price*, while $MELT_{wj}$ represents the normalized market-price of production of the same commodity. When (10) is verified, normalized market-price coincides with normalized market-price of production. Under equal exchange, *effective* market prices of different varieties of the same good could differ from *effective* market-price of production to the extent that the quantity of homogeneous labour per unit of variety differs from world average.

Substituting (11) in (12), we obtain

¹³We have to apply e_{ij}^p and not simply e_i^p because the PPP exchange rate is different for each branch. This transformation assures the equivalence between world net product measured in current dollars and in PPP international dollars: $\sum_i (e_{ij}^p Y_{ij}) = Y_{wj}$.

$$(13) \quad (ERDI_{ij} - 1) MELT_{wj} = 0,$$

where: $ERDI_{ij} = \frac{e_i^{\$}}{e_{ij}^p}$.

Proposition 3.

There is interindustry equivalent exchange when the monetary net product per unit of homogeneous labour is equal for all industries:

$$(14) \quad MELT_{wj} = MELT_w$$

When this condition is verified, normalized market-price of production coincides with value. In a capitalist economy, this condition is normally not fulfilled because of different organic compositions of capital, resulting in unequal exchange in a broad sense.

Proposition 4.

There is total equivalent exchange when the monetary net product per unit of homogeneous labour is equal for all countries and for all branches.

Combining interindustry and intraindustry ECC, we obtain the total ECC:

$$(15) \quad e_i^{\$} MEV_{ij} = MELT_w$$

or equivalently:

$$(16) \quad ERDI_{ij} MELT_{wj} - MELT_w = 0$$

When total ECC applies, normalized market-prices are identical to value; otherwise, there is unequal exchange and transfers of value in monetary form.

5. Unequal Exchange in International Trade.

Define total value transfer between national industry and world economy in branch j (T_{ij}) as follows:

$$(17) \quad T_{ij} = X_{ij} (ERDI_{ij} MELT_{wj} - MELT_w) - \sum_{n \neq i} M_{inj} (ERDI_{nj} MELT_{wj} - MELT_w)$$

where:

X_{ij} = exports of country i expressed in homogeneous labour;

M_{inj} = imports of country i from country n expressed in homogeneous labour.

Under the usual assumption in sectoral analysis of identical input coefficients for all final uses of product, exports in units of homogeneous labour are obtained by multiplying gross exports and gross output by homogeneous labour coefficients. Since, by definition, monetary net product coincides with value added, which is the sum of wages and operating surplus or profits, international trade is expressed in the form of value added in trade (Stehrer, 2012), and there are international transfers of value added.

There is unequal exchange when:

$$(18) \quad T_{ij} \neq 0.$$

T_{ij} represents the total amount of implicit transfer in international trade for country i . It can be subdivided in transfer within-industry (T^W) and between-industries (T^B) as follows:

$$(19) \quad T_{ij} = T_{ij}^W + T_{ij}^B,$$

where

$$(20) \quad T_{ij}^W = [X_{ij} (ERDI_{ij} - 1) - \sum_{n \neq i} M_{inj} (ERDI_{nj} - 1)] MELT_{wj}$$

and:

$$(21) \quad T_{ij}^B = (X_{ij} - \sum_{n \neq i} M_{ij}) (MELT_{wj} - MELT_w).$$

Proposition 5.

Intraindustry unequal exchange depends on two factors:

(a) *differences between national monetary wages per unit of homogeneous labour and world monetary wages, due to imperfect international labour mobility. This transfer corresponds to Emmanuel's type of unequal exchange, adjusted for differences in labour productivity;*

(b) *differences between national and world sectoral rates of profit, due to different market power of national firms and imperfect international capital mobility. This transfer corresponds to monopoly capitalism theory of unequal exchange.*

Absolute rent constituting intraindustry unequal exchange could benefit wages and/or profits of rentier countries at the expense of workers and/or capitalists of deprived countries.

From (12), we can alternatively represent within-industry transfer per unit of traded homogeneous labour (t_{ij}^W) as follows:

$$(22) \quad t_{ij}^W = e_i^{\$} MEV_{ij} - MELT_{wj}$$

Intraindustry unequal exchange results from the difference between normalized market-price and normalized market-price of production, and it is equivalent to absolute rent. Decomposing net product in different categories of net revenue and remembering that world wage and profit per unit of homogeneous labour are equal to those per unit of effective labour, we have

$$(23) \quad t_{ij}^W = (e_i^{\$} w_{ij}^h - w_{wj}) + (e_i^{\$} \pi_{ij}^h - \pi_{wj}),$$

where:

w_{ij}^h = wage per unit of homogeneous labour;
 π_{ij}^h = profits per unit of homogeneous labour.

Defining OCC as the ratio between the value of total (constant) capital and homogeneous labour¹⁴, and indicating the profit rate with r , expression (22) becomes

$$(24) \quad t_{ij}^W = (e_i^{\$} w_{ij}^h - w_{wj}) + (r_{ij} - r_{wj}) OCC_{wj},$$

where OCC_{ij} is replaced by OCC_{wj} because within a world branch, each unit of homogeneous labour has the same amount of means of production.

Proposition 6.

Interindustry value transfer depends on three factors:

(a) *Differences in monetary wages between industries, due to sectoral segmentation of labour markets. This transfer corresponds to the Lewis type of unequal exchange.*

(b) *Differences in profit rates between industries, due to barriers to entry, imperfect market competition or divergent demand's elasticity. This transfer corresponds to the Prebisch-Singer hypothesis on unequal exchange.*

(c) *Equalization of profit rates between industries with different organic compositions of capital. This transfer is the broad unequal exchange or non-equivalent exchange of classical Marxist theory of international value.*

From (14), transfer per unit of traded homogeneous labour between industries (t_{ij}^B) is derived as follows:

$$(25) \quad t_{wj}^B = MELT_{wj} - MELT_w$$

¹⁴The ratio between the mass of physical capital and labour-time is the technical composition of capital (TCC). The value expression of TCC is the organic composition of capital (OCC). Within an industry producing a particular use-value, the OCC is merely a reflection of the TCC and depends on technical requirements of production. Shaikh (1990) defines this ratio as materialized composition of capital. For different concepts of composition of capital, see Saad-Filho (1993).

By substituting monetary net product with net revenue and by adding and subtracting the expression $(r_w OCC_{wj})$, we obtain:

$$(26) \quad t_{ij}^B = (w_{wj} - w_w) + (r_{wj} - r_w) OCC_{wj} + r_w (OCC_{wj} - OCC_w).$$

The first two categories of intersectoral unequal exchange derive from differences between normalized market-price of production and price of production, that is, from differential rent. The third category derives from the difference between value and price of production. As well as absolute rent, differential rent could benefit (damage) workers and/or capitalists in countries with favourable (unfavourable) international specialization¹⁵.

Proposition 7.

Even when current exchange rates are equal to the purchasing parity level, there could be likewise unequal exchange both in broad and strict senses.

Total unequal exchange per unit of traded homogeneous labour (t_{ij}) results from the sum of intra- and interindustry unequal exchange as follows:

$$(27) \quad t_{ij} = (e_i^{\$} w_{ij}^h - w_{wj}) + (w_{wj} - w_w) + (r_{ij} - r_w) OCC_{wj} + r_w (OCC_{wj} - OCC_w)$$

In Emmanuel's hypothesis of international perfect capital mobility and labour immobility, total transfer reduces to

$$(28) \quad t_{ij} = (e_i^{\$} w_{ij}^h - w_w) + r_w (OCC_{wj} - OCC_w).$$

In this particular case, total transfer consists of two components: (a) unequal exchange in a strict sense, deriving from differences in monetary wages per unit of homogeneous labour due to both international and intersectoral differences; (b) unequal exchange in a broad sense, depending on different organic compositions of social capital between countries. We can conclude that Emmanuel's thesis is correct, provided that wages are expressed per unit of homogeneous labour, that is, per unit of equal productivity labour.

Expressing total transfer in ERDI form and decomposing net revenue, we obtain

¹⁵Baiman's definition (2014) of 'rentier economies' (like that of the United States) and 'unequal exchange economies' (like that of Germany) corresponds to our distinction between absolute rent-seeking countries and differential rent-seeking countries, as opposed to 'developing economies' (like that of China).

$$(29) \quad t_{ij} = (ERDI_{ij} w_{wj} - w_w) + (ERDI_{ij} r_{wj} OCC_{wj} - r_w OCC_w),$$

and in the case of perfect capital mobility,

$$(30) \quad t_{ij} = (ERDI_{ij} w_{wj} - w_w) + r_w (ERDI_{ij} OCC_{wj} - OCC_w).$$

The ERDI approach captures international value transfers deriving from differences in remuneration of factors of production or absolute rent. It, however, fails to capture non-equivalent exchanges resulting from different industrial specializations, or differential rent. We can conclude that although ERDI is certainly a useful tool to measure international value transfers, it can only partially grasp the full dimension of unequal exchange.

6. World Tables of Unequal Exchange.

The unequal exchange estimates for the years 1995, 2000 and 2007 have been calculated according to the methodology set out in previous sections. The data used are the following:

- World Input-Output Tables (release 2013)¹⁶ at current prices for bilateral international trade in 34 industries¹⁷ at basic prices and current exchange rates;
- Socio-economics Accounts of WIOD (release 2013) for hours worked, wages, profits, gross output and value added at basic prices;
- World Bank for PPP exchange rates of 39 countries;
- IMF for PPP exchange rates of Taiwan.

Forty countries are examined, grouped according to the following regions:

- North America (Canada and USA),
- North European Monetary Union (Austria, Belgium, Germany, Finland, France, Luxemburg, Netherland),
- South European Monetary Union (Cyprus, Spain, Greece, Ireland, Italy, Malta, Portugal),
- North Europe (Denmark, United Kingdom, Sweden),

¹⁶ See: Timmer, M. P., et al. (2015).

¹⁷ The 'Private Households with Employed Persons' sector has been excluded because of the lack of data for many countries.

- Est Europe (Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia),
- Latin America (Brazil, Mexico),
- China,
- India,
- North East Asia (Japan, South Korea),
- Other Asian countries (Indonesia, Turkey, Taiwan),
- Russia
- Australia.

In 2007 these countries accounted for 88% of total world value added at basic prices and 78% of world gross exports. Tables from 3 to 5 show the size in millions of dollars of international value transfers in years 1995, 2000 and 2007. Total value transfers for each region are decomposed according to their source (differences in remuneration and in industrial specialization) and their income providers/recipients (wages and profits). Table 6 shows total value transfers in percentage of domestic value added at basic prices. Finally, graph 1 shows the time evolution of the size of international value transfers for each region.

Over the period considered, the global amount of value transfers in international trade expressed in billions of dollars is increasing from 452,5 in 1995, to 511,7 in 2000 and 865 in 2007. Four regions (North America, North EMU, North Europe and North East Asia) had always had an inflow transfer, while five regions (Est Europe, Latin America, China, India and Other Asia) an outflow transfer. Three regions (South EMU, Russia and Australia) went from an initial deficit to a surplus at the end of the period.

Table 3: Unequal Exchange in millions of current dollars, 1995

<i>Region</i>	Remuneration	Industrial Specialization	Total	Wages	Profits
NORTH AMERICA	39.620	31.107	70.727	41.715	29.011
<i>Usa</i>	42.907	31.973	74.880	51.905	22.975
EMU-North	53.329	120.312	173.642	138.508	35.134
<i>Deu</i>	55.763	68.457	124.220	105.109	19.111
<i>Fra</i>	-10.559	21.241	10.681	9.753	929
EMU-South	-11.579	4.128	-7.451	-6.313	-1.138
<i>Esp</i>	-7.312	-1.423	-8.735	-5.812	-2.923
<i>Ita</i>	-2.124	6.200	4.076	5.631	-1.555
NORTH EUROPE	29.568	15.626	45.194	22.447	22.747
<i>Gbr</i>	27.792	-317	27.476	13.592	13.883
EST EUROPE	-18.402	-33.465	-51.866	-31.967	-19.899
LATIN AMERICA	-28.703	-31.797	-60.500	-47.999	-12.502
<i>Bra</i>	-19.295	-7.872	-27.166	-18.857	-8.309
CHINA	-57.883	-67.791	-125.674	-84.576	-41.098
INDIA	-48.997	-24.174	-73.171	-46.260	-26.912
NORTH EST ASIA	79.495	83.467	162.962	109.960	53.002
<i>Jpn</i>	70.121	82.530	152.651	99.210	53.441
OTHER ASIA	-30.331	-64.689	-95.020	-65.806	-29.214
RUSSIA	10.668	-40.694	-30.026	-23.038	-6.988
AUSTRALIA	-16.783	7.968	-8.815	-6.671	-2.144

Table 4: Unequal Exchange in millions of current dollars, 2000

<i>Region</i>	Remuneration	Industrial Specialization	Total	Wages	Profits
NORTH AMERICA	52.119	84.275	136.394	100.890	35.504
<i>Usa</i>	54.755	79.698	134.453	115.674	18.779
EMU-North	62.604	83.190	145.794	119.008	26.786
<i>Deu</i>	58.684	47.396	106.080	92.621	13.459
<i>Fra</i>	-8.466	13.000	4.534	3.156	1.379
EMU-South	-20.343	8.239	-12.103	-13.767	1.663
<i>Esp</i>	-15.099	-2.152	-17.251	-10.030	-7.221
<i>Ita</i>	-2.248	9.145	6.896	6.797	99
NORTH EUROPE	40.917	42.174	83.091	49.229	33.862
<i>Gbr</i>	36.276	30.006	66.282	40.507	25.775
EST EUROPE	-17.669	-31.955	-49.625	-31.474	-18.151
LATIN AMERICA	-31.159	-27.014	-58.173	-56.425	-1.748
<i>Bra</i>	-27.603	-11.818	-39.421	-26.049	-13.372
CHINA	-40.030	-78.142	-118.172	-82.078	-36.095
INDIA	-85.061	-32.245	-117.306	-71.397	-45.909
NORTH EST ASIA	60.844	85.604	146.448	98.621	47.827
<i>Jpn</i>	54.285	83.307	137.592	90.717	46.875
OTHER ASIA	-30.463	-80.912	-111.375	-78.106	-33.269
RUSSIA	23.091	-62.537	-39.447	-27.109	-12.337
AUSTRALIA	-14.850	9.324	-5.526	-7.392	1.866

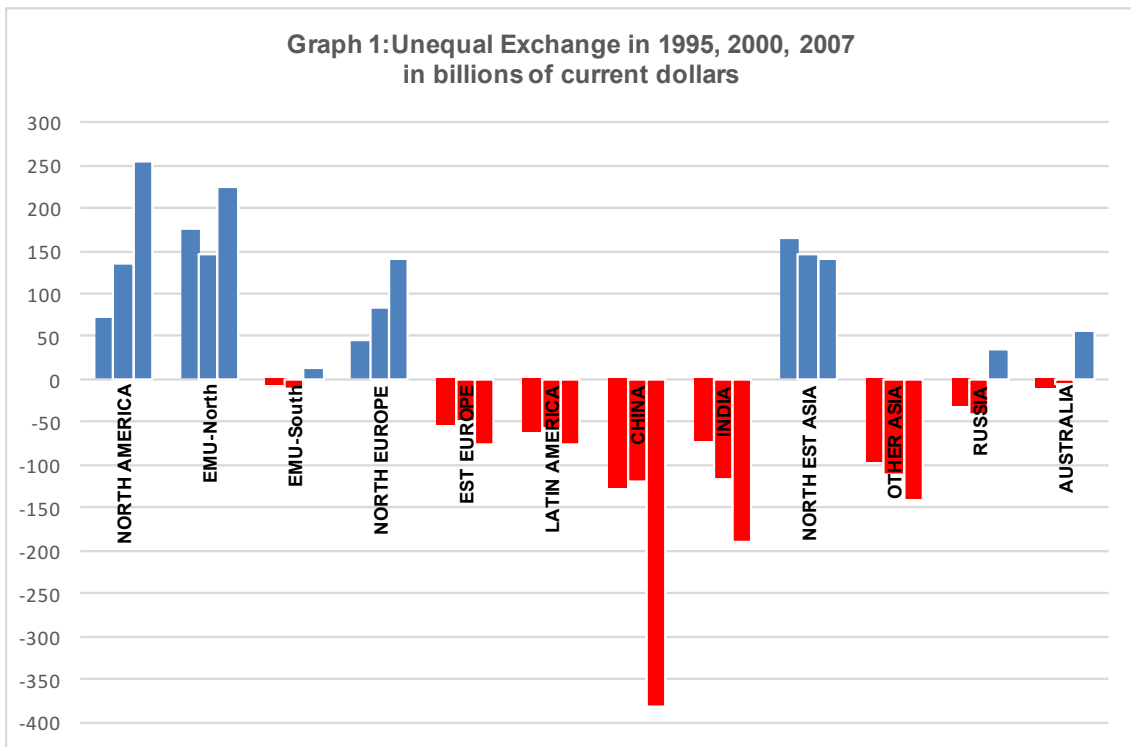
Table 5: Unequal Exchange in millions of current dollars, 2007

Region	Remuneration	Industrial Specialization	Total	Wages	Profits
NORTH AMERICA	161.361	94.154	255.515	197.544	57.971
<i>Usa</i>	107.321	88.261	195.582	176.829	18.753
EMU-North	188.677	36.318	224.996	184.695	40.300
<i>Deu</i>	91.196	47.776	138.972	113.061	25.911
<i>Fra</i>	25.779	-4.538	21.241	24.005	-2.764
EMU-South	35.933	-23.570	12.363	9.910	2.453
<i>Esp</i>	5.725	-9.733	-4.008	-29	-3.979
<i>Ita</i>	23.658	-2.674	20.984	26.817	-5.833
NORTH EUROPE	88.048	51.330	139.378	93.207	46.170
<i>Gbr</i>	64.670	56.881	121.551	78.858	42.693
EST EUROPE	-47.670	-29.236	-76.906	-52.630	-24.275
LATIN AMERICA	-30.584	-44.423	-75.007	-75.385	378
<i>Bra</i>	-13.880	-49.384	-63.264	-36.304	-26.960
CHINA	-257.805	-124.691	-382.496	-279.129	-103.367
INDIA	-117.457	-71.886	-189.343	-114.817	-74.526
NORTH EST ASIA	74.753	66.080	140.833	109.432	31.401
<i>Jpn</i>	57.523	47.280	104.803	76.125	28.677
OTHER ASIA	-102.542	-38.604	-141.146	-96.865	-44.281
RUSSIA	-40.664	75.369	34.704	8.943	25.762
AUSTRALIA	47.950	9.160	57.110	15.095	42.014

Table 6: Unequal Exchange in % of value added at basic prices

Region	1995	2000	2007
NORTH AMERICA	0,89	1,28	1,66
<i>Usa</i>	<i>1,01</i>	<i>1,35</i>	<i>1,39</i>
EMU-North	3,81	3,88	3,21
<i>Deu</i>	<i>5,44</i>	<i>6,19</i>	<i>4,65</i>
<i>Fra</i>	<i>0,76</i>	<i>0,38</i>	<i>0,91</i>
EMU-South	-0,40	-0,67	0,32
<i>Esp</i>	<i>-1,59</i>	<i>-3,27</i>	<i>-0,31</i>
<i>Ita</i>	<i>0,40</i>	<i>0,70</i>	<i>1,11</i>
NORTH EUROPE	2,93	4,94	4,32
<i>Gbr</i>	<i>2,62</i>	<i>5,00</i>	<i>4,75</i>
EST EUROPE	-16,80	-14,27	-7,52
LATIN AMERICA	-6,16	-4,98	-6,38
<i>Bra</i>	<i>-4,04</i>	<i>-7,05</i>	<i>-5,38</i>
CHINA	-17,26	-9,86	-10,94
INDIA	-20,92	-26,18	-17,00
NORTH EST ASIA	2,85	2,86	2,68
<i>Jpn</i>	<i>2,91</i>	<i>2,97</i>	<i>2,43</i>
OTHER ASIA	-13,26	-15,15	-10,25
RUSSIA	-9,53	-16,96	3,11
AUSTRALIA	-2,50	-1,51	6,53

**Graph 1: Unequal Exchange in 1995, 2000, 2007
in billions of current dollars**



6. Conclusions.

In the current age of economic globalization, increasing world inequality and mass migration make the topic of unequal exchange in international trade even more relevant than in the past. Different schools of economic thought have contributed to defining this concept. From the extensive literature on the subject, two main factors driving unequal exchange arise: differences in industrial specialization and differences in factors remunerations between countries. Many empirical studies have been devoted to measuring the quantitative dimension of value transfers in international and interregional trade. Recently, a new approach has been proposed, based on the difference between nominal and PPP exchange rates, but the lack of a coherent theoretical framework has limited empirical research only to particular aspects of unequal exchange.

This paper presents a general model that is able to encompass all the various forms of unequal exchange in international trade identified in the previous literature. The model was inspired by Marx's analysis of absolute and differential rent in Volume III of *Capital*. Value transfers originate from the contradictory character of abstract labour, which gives rise to a potential discrepancy between two different measures of the magnitude of value: value in production or in labour form and value in circulation or in monetary form. In structural disequilibrium conditions between supply and demand deriving from non-competitive markets, unequal exchange in a strict sense appears in the form of differential rent due to industrial specialization and in the form of absolute rent due to different factors remunerations. The former depends on the difference between market-price of production and market-value and leads to interindustry value transfers, while the latter relies on the difference between market-price and market-price of production and leads to intraindustry value transfers. In addition, interindustry value transfers, due to different organic compositions of capital or unequal exchange in a broad sense, are considered.

Unequal exchange is a technical definition with no moral significance. An act of exchange technically unequal may be ethically fair. Both forms of unequal exchange in a strict sense may benefit workers and/or capitalists of recipient countries in the form of higher nominal wages and/or profits at the expense of workers and/or capitalists of provider countries. From a theoretical point of view, only particular, ad hoc assumptions on international and intersectoral labour and capital mobility could produce a priori a result rather than the other. The issue of the distribution of benefits and losses between social classes deriving from unequal exchange is a pragmatic one and needs to be addressed by empirical analysis. Domestic benefits and losses could socially distribute in a different manner depending on what historical period is tested. Contrary to Emmanuel's opinion, even in a divided world, there is scope for international workers' solidarity, provided that trade unions evolve from national to transnational strategies and organizations in line with the complex structure of global production and trade networks (Coe & Ness, 2013).

The model presented in this article has dual significance: theoretical and empirical. First, it resolves the traditional problems triggered in Marxist unequal exchange theory by the presence of heterogeneous labour and non-specific commodities. A consistent reduction procedure from heterogeneous labour into homogeneous labour, on one hand, and a trade network based on exchange of different national varieties of the same commodity, on the other, are presented. Second, the model shows that a recent empirical methodology of measuring international value transfers by the ERDI could only partially capture the full extent of unequal exchange in the world economy. Specifically, this approach does not succeed in considering interindustry value transfers.

Finally, estimates of value transfers for recent years are presented. Unequal exchange is not the only cause of economic underdevelopment but it is one of the several mechanisms that reproduce uneven development in a capitalist space economy. The operational character of the model provides a coherent theoretical basis for further empirical research on international value transfers, deriving from the unequal geographical and social distribution of value added in trade.

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