Capítulo 5

BETWEEN THE EXPLOITATION OLIGOPSONIC AND-FAIR TRADEIN REVERSE LOGISTICS OF SOLID WASTE IN BRAZIL: MATHEMATICAL FOUNDATIONS, TRANSITION REGULATORY AND PROPOSAL OF POLICY IN THREE STEPS

Rilton Gonçalo Bonfim Primo[1] and José Félix García Rodríguez[2]

ABSTRACT

This analysis has for object the process of regulatory transition experienced by the solid waste recycling sector in Brazil, whose market structure is oligopsonic, causing environmental externalities and holding of the base of the reverse logistics of chain represented by scavengers. Making a analysis microeconomic of monopsonic exchange, discusses the mathematical foundations classic of disequilibrium prices in simple and systemic exchange, respectively: 1) adapting the Marxian models of simple and extended reproduction and algebra of analysis input-output 2) introducing equations of trade in differences to study the instability of equilibrium prices. Concludes by proposing the adoption of a public policy to overcome the imbalances and externalities, in three steps: national administration of waste prices by a committee of representatives of the public authorities, civil society and entrepreneurs; direct contract between cooperatives and industries; social reeducation through of innovative systems of stimulus monitored by radio frequency (RFID).

Key-words: Recycling of waste solid. Transition Regulatory.Fair Trade.Foundations Mathematical.

RESUMEN

Este análisis tiene por objeto el proceso de transición regulatoria experimentado por el sector de reciclaje de residuos sólidos en Brasil, cuya estructura de mercado es oligopsónica, provocando externalidades ambientales y exploración de la base de la cadena logística inversa representada por carroñeros. Hace un análisis microeconómico del intercambio monopsónico, discute fundamentos matemáticos clásicos del desequilibrio de precios de intercambio sencillo y sistémico, respectivamente, 1) adaptando los modelos marxianos de reproducción sencilla y ampliada y el álgebra insumo-producto y 2) introduciendo ecuaciones en diferencias para estudiar la instabilidad de los pre-

[1] Coordinator of Management Advise (Executive Coordination) - *Superintendence of Solidarity Economy* - SESOL of the *State Secretary of Labor, Employment, Income and Sport* – SETRE, by ordinance nº 20101 of the *Government of Bahia-Brazil* (since 10/2009 to 05/2013). Specialist in Production of Economic Information, Social and Geo-Environmental of the *State Secretary of Planning* - SEPLAN of *Government of Bahia-Brazil*, approved in public tender nº 02/2012 of the *Superintendence of Economic and Social Studies of Bahia* - SEI. Accept at 2013, by evaluation of the Scientific Commission, in the PhD Program of Political Economy - *Faculty of Economics, University of Havana*-Cuba.

[2]Expert of*Secretary de Health* of Tabasco.*State System of Social Protection in Health*. Teacher in Universidad Juárez Autónoma de Tabasco (Academic Departure of Economic and Administrative Sciences). PhD. in *Philosofical Sciences* by *Center of Studies in Health and Human Welfare* of *Faculty of Philosophy and History* of *University of Havana*-Cuba.

cios de equilibrio. Concluye proponiendo la adopción de una política para superar los desequilibrios y externalidades, en tres pasos: administración nacional de precios de los residuos por un comité de representantes de los poderes públicos, sociedad civil y empresarios; contrato directo entre cooperativas e industrias; reeducación social a través de innovadores sistemas de estímulos monitorizados por identificación de radiofrecuencia (RFID).

Palabras Clave: Reciclaje de Residuos Sólidos. Transición Regulatoria. Comercio Justo. Fundamentos Matemáticos.

1. INTRODUCTION

The prognosticated crisis systemic of employment associated with the configuration of accumulation and concentration intensives in capitalconstitutesa critical scenario totraditional labor forms, stimulating the alternativecreative inassociated or autonomous labor, but the worker isolated is a hunted.Thus, it did to reflow of informality to cooperatives a billion people in the world and 30 million in Brazil. It is no coincidence that the *General Assemblyof United Nations* (UN)has selected 2012 the *International Year of Cooperatives,* with three main objectives**:** increase awareness;promote growth; establish appropriate policies**. "**Through their distinctive focus on values, [said the Secretary-General Ban Ki-Moon] cooperatives have proven themselves a resilientand viable business model that can prosper even during difficult times." The systemic dereliction to the investment in 2008, with major consequences, has restructured this global tendency, closing old entrance and opening innovative windows. In others words, the "socioeconomic crisis that, starting from Wall Street, struck the world, offers to Brazil and several countries the opportunity to introduce changes in its development strategy", signals,from *Ecole de Hautes Etudes en Sciences Sociales* (EHESS) of Paris, Ignacy Sachs, for who, "in the context of a market economy, may wish to broaden the scope of social and solidarity-based economy, whereas this is not governed by the principle of individual appropriation of profits" (Sachs, 2009, p. 139-140). However, this process of social reintegration is not linear,and is not always symmetric. If the dialectic relation between center and periphery in the dynamics of 'metropolitan areas' ofBrazil is not new or neutral, the bartering between suppliers and urban bargain hunter of recyclable materials are still less, dating back to the reverse logistics of pauperism in Brazil Empire.[3] Officehistorically dispersed around sinuousprices, the *Brazilian Institute of Geography and Statistics* - IBGE points that, in Brazil, still yesterday,

> [...]recycling is, for the most part, the result of the activity of scavengers (autonomous or organized in cooperatives), and is not a result of a compromise more profound and widespread population and the authorities with the process of separation and selective collection of garbage. In this context, the percentage of recycling of materials fluctuates greatly as a result of fluctuations in the prices of industrial raw materials and the level of employment. (Vilanova Neta, 2011, p. 4).

[3] Among the self-employed, then, include, e.g., "the 'recyclers', divided into two lineages clearly different - of that surreptitiously collect rags clean and the dirty rags; the 'wastes'; the *'cavaqueiros'*, which remove the mountains of garbage in search of objects and materials bought; the 'plumbers', pickers of remnants of lead; the 'hunters of cats', purchased by restaurants where they were sold as rabbits; the 'collectors of boots and shoes'; the 'catch-labels' and postage stampers, who were looking for labels of imported items and stamps of fine cigars to sell them to counterfeiters; the 'mousers', which they bought the rats dead or alive to private individuals to resell them to the Board of Directors of Health; the 'readers of hand', the 'tattoos', the 'hawkers' of prayers and Literatures of twine and the composers of *'modinhas'*". (Sevcenko, 1999, p. 60).

In fact, "the scavengers are the basis of the productive chain of recycling - as it has been estimated that 90% of all the recycled material in Brazil is recovered by the hands of these agents" (Freitas, Fonseca, 2012, p. 9). One should mention, in competitive terms, "only 10% of the gatherers are linked to a collective organization. The vast majority still operates in isolation, in precarious conditions and without the possibility of access to best selling prices of recyclables." (Id., p. 60). Jumps to the eyes of the issue of the relative weakness of recyclers at a market highly concentered dictating prices and conditions. It is not a regional exception but a conflict,indigence against opulence, in very poor regions.

> The major benefit of the entire process of recycling garbage in Brazil and in the world are the industries, precisely because they are highly concentrated, representing a model of oligopsony, when a small number of companies consumes the recyclable materials and imposes the conditions and prices to the gatherers and cooperatives, making them the hostages of the exploitation of the formal economy on the informal. This is the sad situation in which these agents to working with garbage in our country. With cooperatives/associations or with collectors autonomous, the exploitation happens in all levels of the sequence productive and reproductive of recycling. Under these conditions, the recycling, in itself, does not represent a cost-effective alternativeand much less environmental; only smothers shortlythe social pressures on the unemployment of the excluded and provides a gain by industries, through the reduction of their costs; and these, using the scrap, the great "lords of rubbish", control the market for recycled products. (Magera, 2008, p. 17).

In addition to the reverse logistics required by law, such as the pesticides, their waste and packaging, batteries, tires, fluorescent lamps, electronic products and their components, etc., "other waste can be objects of the string of reverse logistics, for example, medicines and packaging in general" (Fernandez, 2012, p. 9), these in particular. In the field of recycling urban waste economically and environmentally more relevant in Brazil are containers and other objects of glass, paper/pulp, plastics, aluminum and steel. The *Scavenger of Recyclable Material* since 2002 is in *Brazilian Code of Occupancies* (CBO), but is very little recognized. Nowhere the scenario is more delicate formal interpretation, in the case of economic actors more invisible, without steady income, outsiders of formal jobs, at least when they are not in any way meeting. Rigorously, nor would it be possible to calculate a *rate of exploitation*of this workers[4], because it is calculate on the salary which, in common, they do not have[5].

---

[4] "In response to the virtual loss of source of income, the path already paved by the gatherers is the collective organization of category. The gain immediate to the scavenger organized is with respect to the terms and conditions of work that is in cooperatives, as regular day as personal protective equipment and sanitary conditions more suitable for the performance of its activities. However, the employment relationships are still very weak in most of the cooperatives and associations - only in a minority of cases, these organizations have legal record and are able to observe the entire labor legislation and tax, and in most cases do not have equipment and sufficient knowledge to ensure economic efficiency. The elaboration of public policies geared to the gatherers will require a more in-depth knowledge of the current situation of organizations of collective work." (Freitas, Fonseca, 2012, p. 17).

[5] The rate of exploitation (Ω) would be calculated at the same time that $\Omega = \frac{\sum_{i=1}^{n} S}{(R_t - D)}$ in which *S* are the gross wage average of *n* workers, *Rt* total revenues and *D* the spending of period, given by (*Fixed Costs* + *Variable Costs*).

> The scavenger also would be associated with the term "exploitation. According to the literature, they would be operated by other sectors more articulated chain (Buenrostro, Bocco, 2003; Gonçalves, 2003; Kaseva, Gupta, 1996; Magera, 2003), due to the very structure of the market for recycling and the sectors that dominate - intermediaries and industry -, being common training of oligopsonys informal, that lead to a control of the price paid by the material. (Carmo, 2011, p. 9).

The discussion of *Fair Trade* today is renewed with technical and empirical reviews:

> The issue of marketing is quite complex and involves several aspects that deserve special attention, since the limit for the improvement of the conditions of marketing cooperatives. Even if they have gained some power of negotiation of prices, the recycling market, as explained by Gonçalves (2003, p. 143), is a oligopsony, i.e. there is only a small number of purchasers: "Without competition, a product such as the recyclable material separated from the source (or not) is sold at a price that the oligopsony want to pay, which keeps the cost of reverse flow extremely cheap." The power of industry is evident in the analysis of Calderoni (2003) that attaches to this segment of the value chain up to 75% of total gains possible provided by recycling (Grimberg, Tuszel, Goldfarb, 2004, p. 18-19).

The researcher R. Smith, in his *Unequal Trade and Industrialization in the Northeast*, explained that, contemporaneously, involucre into the free trade, "the unequal exchange is focused as the exchange of quantities of work (or value) not equivalent", or by economics "that admit the non-equivalence in trade as a result of a mismatch in transitional competition, since it does not lose the referential of equilibrium", or for "those who admit to not transience of remoteness in market prices in relation to the prices of production. Is the oligopolistic capitalism that determines the permanent nature of this remoteness" (Smith, 1985, p. 10).Precisely this is the scenario of concentrated sector.

> In the cycle of recyclable materials, recycling companies located in upper circuit using a technology of relatively high level of expertise, usually capital intensive from the advanced countries. Thus, the activities of the upper circuit tend to concentrate power and control the cycle as a whole. It is important to remember that the market for recyclable if configures, on the demand side, as anoligopsony - few companies have the ability to purchase certain goods -, which further demonstrates the concentration exerted by upper circuit. This way, the materials that are collected by the workers of the lower circuit (which make up a situation of "perfect competition" on the supply side) are separated and then sent to the companies. In this process the material will having its value increased, as it move through the cycle in the direction of the upper circuit (Dagnino, Dagnino, 2010, p. 71).

In fact, the markets for solid waste in Brazil are structured as oligopsonys within which proliferates a floating number of middlemen who sign frequent price agreements (and other conditions of purchase) that not only generates inefficiency in the process of allocation of resources, with reductions in quantities recycled and the level of welfare of society; in particular, they degenerate in demeaning the work values of the gatherers, whose income/product is transferred, in a staggered form, to the links above the value chain of the industry. Nationally, the demand direct focuses on traders (middlemen), which are more than half of the supply of waste, followed by industry (addressed to direct and indirect end), with less than 20% (Brazil, 2008). The professor of

the *Graduate Program at the School of Management and Business, University of Rio Grande*, Maria do Carmo, portrayed the local scenery[6] in a convergent form to the Paraná[7]. Among other urban concentrations, the biggest example is São Paulo with your scenario of Piracicaba, among other several examples sub-regional:

> The marketing of the material collected, separated and pressed by the Cooperative is made by own recyclers from the realization of a register of buyers. The so-called 'scrap' acquires the materials collected by recyclers and determines prices by reference to the selling prices (prices at which the materials will be sold to companies that recycle - companies end). Already in the case of the relationship between the scrap with the companies end are the latest that deter-mine prices, setting in some cases a situation of oligopsony. (Martins, Peres, 2006, p. 3).

2. MICROANALITICAL APPROACH, CLASSICAL THEORY AND UNEQUAL TRADE

Clearing the possible lines of regulatory action on markets above mentioned,will makea brief microanalysis theirs, whereas the practical effects of the agreements between the oligopsonists approach these environments to the standard monopsonic, of which, for clarity and simplicity of exposure, will be as such treaty, not compromising the consistence of reflection.

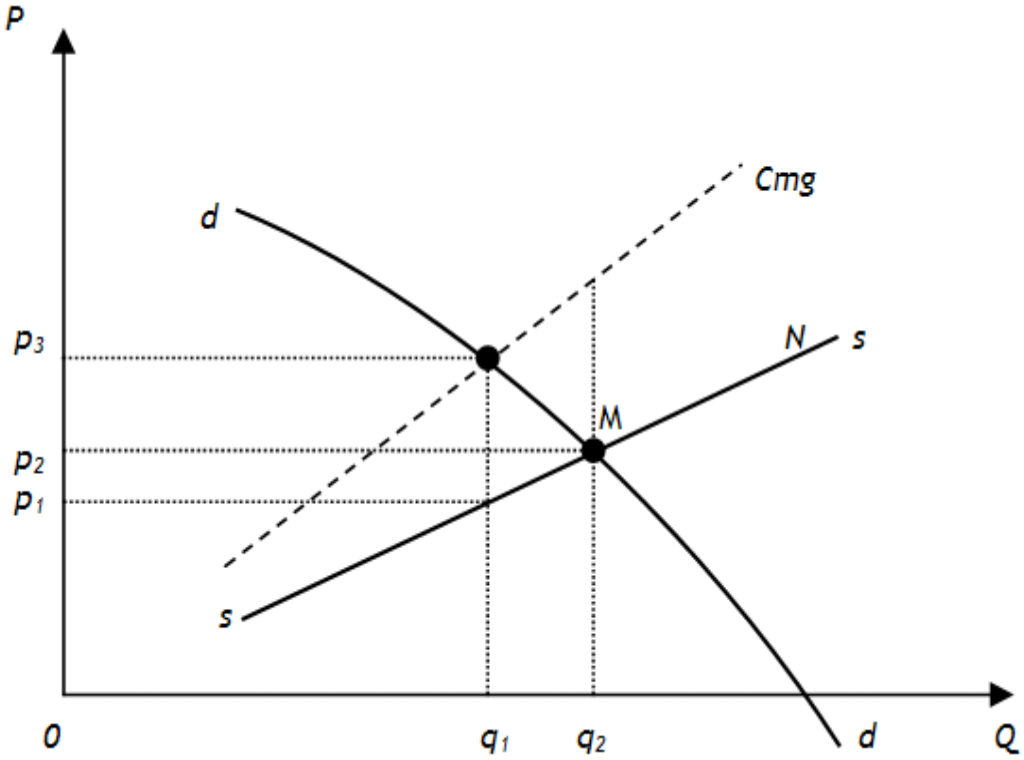
The functional results of "adjustment of minimum prices" are often mentioned among the measures to mitigate, when not to neutralize the adverse effects of power monopsonic, as shown in *Graph 1*, where are the possible prices (*P*) and quantities (*Q*), the supply curve (*ss*) of the gatherers, the demand (*dd*) monopsony and marginal cost (*Cmg*). Reign that the plaintiff, "seeking to maximize the profit, restricts the amount of resource used (from q_2 to q_1) and paid unit price less than the marginal revenue of corresponding product " (Leftwich, 1974, p. 323), i.e., p_1 not p_3.

Derived from two restrictions of economic system of capitalist accumulation that all monopsonics markets behave this way, which are: (A) the contender with power monopsonic is encouraged to purchase up to the point of intersection of the curves of demand and marginal cost (ordered pair *p*3, *q*1); (B) the curve of marginal cost (*Cmg*) is higher than that of supply (*ss*), because they must pay, at the price of the extra unit (marginal), all units purchased (Salvatore, 1984, p. 398-429). Given an initiative that, in this *Graph 1*, takes $p_2$to a minimum price of the residue, the amount and the equilibriumprice may be *M*, neutralizing the power of monopsony and returning to the gatherers to rent/product transferred to monopsony. Other, eliminated the demeaning of prices, will be drawn on the environment waste not collected (q_2 - q_1). Of course, in any case will fit attempts to price adjustment that neutralize the monopsony, being that, for every moment in a real situation, "such precision can be reached or not. However, any price between p_1 and p_2 would also counterequilibri-

[6] "Unlike the gatherers, buyers would be well articulated, because the paper trading in the city of Rio de Janeiro is marked by the union of three large middlemen. This union gave rise to Recycling Center of Rio de Janeiro (CRR), - considered to be the main buyer of material collected by collectors in the city, a oligopsony." (Carmo, 2009, p. 62).

[7] "In the four cities (Paraná) researched, there is no recycling industries installed. All the recyclable material collected is pressed and sent to companies that recycle cardboard, paper, aluminum, glass and plastic. In the case of Paraná, are five the recyclers of paper registered in Cempre (Corporate Commitment to Recycling). If this number is compared to the observation that picking recyclable is a reality in more than 200 Parana municipalities that are related to the Project 'Parana Environmental', it goes to a characterization of these recyclers as forming a oligopsony" (Bosi, 2008, p. 108).

um the monopsony. The closer to p_2 is the set price, closer to elimination of exploitation" (Leftwich, 1974, p. 329), as well as of environmental externalities, when price/value =1.



Graph 1: *Dynamic of Monopsonics Markets*
Source: Elaboration of the author.

Unmake the apparent paradox mathematical of postulates $D_t = D_{t+1} > D_t$, when, for example, the value of a ton of waste, in line ascending of the value chain, from the scavenger loose to industrial consumer, is bought by a quantity of money *D* the initial moment *t* and resold in moments *t* + 1, *t* + 2, ..., *t* + *n*, for a sum of money greater than the original, or is that there has been adding value to the residue in the form of human labor, or that is the retroactive effect of the power of monopsony, or for both of these reasons. The law of accumulation private and concentration, finally, responds by fetishized capital productivity that co-transforms the residue in gross condition.Thus, the *process of production* of aluminum, paper, glass or plastic recycled, generating a total value end higher than the initial can be highest simplified in this chain of three equations + one inequality:

$$D_t = [(M_t^1 + M_t^2 + \cdots M_t^n) + (L_t^1 + L_t^2 + \cdots L_t^w)] = (M_{t+1}^{n+1} + M_{t+1}^{n+2} \ldots M_{t+1}^{m}) = D_{t+1} > D_t$$

Or, more concisely,

$$D_t = \sum_{i=1}^{n} M_t + \sum_{i=1}^{w} L_t = \sum_{i=n+1}^{m} M_{t+1} = D_{t+1} > D_t$$

where D_t is the money in advance during the period *t* necessary to the production line of final goods, M_t^1 is the value of the first of thes *n* goods acquired with productive determined purpose, including the inputs from the recyclers, L_t^1 is the quantity of labor socially necessary type 1 of other *w* types used in this production, including recycling, M_{t+1}^{n+1} is the value of the first *m* goods produced at time t +1, D_{t+1} is the sum of the value of these goods, greater than the sum D_t advanced in *raw materials*, *inputs* and *wages* (*v*), being

$$D_{t+1} > D_t \Leftrightarrow \exists\, L_t^{\alpha} > v_t^{\alpha}$$

where v_t^{α} is the remuneration of *L* type α at time t, and $1 \leq \alpha \leq w$. Stay explained that $D_t = D_{t+1} > D_t$ because $D_t = \sum_{i=1}^{n} M_t + \sum_{i=1}^{w} L_t = \sum_{i=n+1}^{m} M_{t+1}$. But, thing distinct occurs when the profit is only commercial, when the plaintiff makes a profit without adding value to the residue, but because buying it below the real value.We not intend in here to discuss how, in the sphere of production, can occur $L_t^{\alpha} > v_t^{\alpha}$ and how $\sum_{i=1}^{n} M_t$ can be retransmitted full to $\sum_{n=1}^{m} M_{t+1}$ without generating any part of $\Delta D = D_{t+1} - D_t = D' - D$, since that

$$\frac{M_t^{\beta}}{P_t^{\beta}} = 1 \; \forall \; \beta$$

where P_t^{β} is the price of the goods β at time *t* where $1 \leq \beta \leq n$. This last condition, quotient unit, however, it is almost never met in concentrated capitalism. This result fruitful is often neglected. In Marxian terminology, if the *constant capital* is purchased below its value, it becomes variable (generator of Δ*D*) in the same way that the advance in wages, which alters the original theoretical formulation for

$$D_{t+1} > D_t \Leftrightarrow \exists\, L_t^{\alpha} > v_t^{\alpha} \text{ and/or } \exists\, M_t^{\beta} > P_t^{\beta}$$

although, considering the economy as a whole$\sum \Delta D = \sum_{i=1}^{w} L_t - \sum_{i=1}^{w} v_t$, always, because when $\exists\, M_t^{\beta} > P_t^{\beta}$ in a given production process, in a symmetric form, $\exists\, M_t^{\beta} < P_t^{\beta}$ in at least one production process, nullifying the *departures folded* where macroeconomic Σ losses - Σ earnings = 0. It is, in this respect, the case of when the plaintiffs of solid residues influence the prices, with losses related to the sellers. The reverse in the offer. Such inferences will be extrapolated to *n* markets in *Appendix A*, where it demonstrated the systemic consistency of this argument line.

More easily accepted when the analysis of the imperfections of the market, this result becomes controversial when introduced in the productive processes, but do not assume or imply in hypothesis of, this rather controversial, 'productivity of capital', which postulates that all or at least a fraction of ΔD is explainable by the consumption of goods β even when $P_t^{\beta} - M_t^{\beta} = 0 \; \forall \; \beta$. Insists the neoclassical theory that is all, because every penny of value ΔD in the form of profit (interest etc.), is pocketed by capitalist, factthat indicates only the final destination of the surplus, not its origin. Against this hypothesis of an object, extrinsic to the human being, with the ability to generate new value, D. Ricardo had pointed in his *On the Principles of Political Economy and Taxation* (London, 1821, pp. 336-337), which already

> [...] Adam Smith not underestimate in any place the services that natural agents and the machinery in render but distinguishes very precisely the nature of the value they add to goods [...] as they carry out their work of charge free, the aid that we provide nothing adds to the value of an exchange. (Ricardo apud Marx, 1996b, p. 40. 22n).

On this note, K. Marx said: "Of course the observation of Ricardo is correct against J.-B. Say, that can imagine that the machines provide the 'service' to create value, which is part of the 'profit'." (Marx, 1996b, p. 40. 22n). Written between the years of 1861 to 1863 to compose the *Book 4* of *The Capital*, Part 3 of the so-called *Economic Manuscripts* (or *Grundrisse*),it elucidates the apparent *productivity of capital* in these terms:

> Since the live work - with the exchange between capital and worker - is incorporate in the capital and appears as your activity, since the beginning of the work process, all productive forces of social work pass to play the role of productive forces of the capital, in the same way that the social form of labor appears in money as the property of a thing. Thus, the productive power of social work and its particular forms if present then the quality of productive forces and forms of capital, labor materialized, the material conditions (objective) of the work - which, in this independently, in face of live work, embody in capitalist. Here, once again, the inverse relationship that, in dealing with the money, we call fetishism. [...]. In its simplicity, this relationship is already a perversion, the personification of the thing, and reifying the person; because what distinguishes this form of all of the above is that the capitalist dominates the worker does not by virtue of a personal attribute, but only as long as it is "capital"; this might just work materialized $[\sum_{i=1}^{n} M_t]$ on the lives $[\sum_{i=1}^{w} L_t]$, the product of the worker on the worker. But the relationship is even more complicated and look more enigmatic because, with the development of the mode of production specifically capitalist, are opposed to the worker and against in the role of "capital", in addition to these things immediately materials - they all work products [...] - the forms of work socially developed, cooperation, manufacturing (a form of division of labor), plant (form of social work organized on the basis material in machinery), representing forms of development of the capital, and, therefore, the productive forces of the work developed, from these forms of social work, as a result also the science, and the natural forces, appear as productive forces of capital. (Marx, 1987, pp. 384-385).

This debate was resumed in *Cambridge Controversy* (Cf. Robinson, 1953; Samuelson, 1962; Pasinetti, 1969) on the *theory of capital*, debate between the results of which it is said that if ΔD it is the owner of D_t, regardless of $P_t^{\beta} = M_t^{\beta}$ or $P_t^{\beta} \gtrless M_t^{\beta}$, this occurrence is notfounded because the economic science see goods are born, by chance, of other goods, but "necessarily to see the capital $[M_t^{\beta}]$ as a social object - and not as a mere factor of production, a physical object" (Teixeira, 2004, p. 1), so that, at time t+1, having origin exclusively or not in v_t^{α}, for any specific industry, "the difference [ΔD] if forwards it to the owners of the property, because they monopolize the means of production $(\sum_{i=1}^{n} M_t]$." (Harris, 1974, p. 563). The relationship of ownership is fetishized in *productivity* of things (capital). The latter was mathematically measured, zero. The supply/demand equilibriumis usually differentof unitary fraction price/value. The mathematical bases of analysis of the processes of formation of disequilibriumprice composes the *Appendix B*, that only introduce, does not exhaust the subject.

3. REGULATORY AND TECHNOLOGICAL OPPORTUNITIES OF CHALLENGERS

In 2010 the *Ministry of Environment* requested the highest scientific organization of advice political-economic of the Presidency of the Republic, the *Institute of Economic Research Applied* - Ipea, an estimate of how the Brazil loses with the gap between the amount of recyclable waste and effectively recycled, and the Ipea has reached the figure of R$ 8 billion annually (approximateUS$ 3,48 billion). In fact, even though 60% of the municipalities in the country is already in possession of some initiative of selective collection, the quantity which in fact returns to the productive chain does not reach 2% (Agência Brasil, 2013). This framework is changing at an increasing rate, and is expected to become deeply in ten years, or the rationalization of logistics will be much more costly and emergency, calculates the *Brazilian Association of Cleaning Companies Public and Special*

Waste (Abrelpe). Already surpass the positive inflection point. The present proposal, were found the demand to offer, can elevate the volume of solid waste sent to the reverse logistics industry.

More broadly, in other research compiled by Ipea, to subsidize the process of discussion and preparation of the current *National Plan for Solid Waste*(*Plano Nacional de Resíduos Sólidos*), it should be noted that the contributions of the gatherers in the area of recycling can and should be estimated economically and environmentally not inverting the hierarchy of values according to which "the social benefits, particularly the generation of employment and income for a portion of the population, a category of work before neglected, are the main factors that justify a public policy in favor of collectors of recyclable" (Freitas, Fonseca, 2012, p. 9).

While the recycling in a space of intersection of social and private interests, when does not affect by market structures inefficient as the oligopsonic, it is necessary to consider that, in addition to the opportunity costs, competitive and cumulative environmental advantages has caused a point turning not only national, but international, in this sense. It is becoming increasingly clear the importance of recycling for the minimization of the cost of production of a range of industries and the reduction of energy consumption, increasing its competitiveness, as well as its relevance to the retraction of the pollution of water, air and soil, preventing the flooding by blockage of manholes and trenches, thinning of landfills, sanitation of lakes, rivers and beaches, with impact on tourism, health and welfare social. Not really new, we already have more than twenty years of initiatives.[8]

The regulatory recommendation is indicative of the administration of minimum prices (or subsidized), whose financial costs are offset by marginal revenue derived from the differentiation of services able to retain customers on the basis of total utility of contrast agent local regulator, the example, in Salvador, the *Cooperative Complex Recycling of Bahia* (CCRB). Thus, the services there were differentiated by utilities logistical, operational and support to aggregate demand of the CCRB, which are the equal pay, exact and at the time of delivery, all gatherers, complainants balancevitiated in market controlled by agents intermediaries; the new infrastructure (organization, digital weighing, water, lighting, security, presence of SETRE/SESOL[9] etc.); the personal protective equipment (EPI): uniform, boots, sleeve, bone, and ear protector; food three times a day and mineral water; collection points at strategic locations (Bahia, 2010); Credisol, new form of "credit solidarity" for the purpose of enlarging the capitalin cashand the dilation of the ability to hold up to the cyclical revaluation of solid waste awaited for the post-Carnival (Bahia, 2010). The focus is on deletion of unequal exchange.

[8] "The first programs of selective collection and recycling of solid waste in Brazil began in the mid-1980s to 1980, as innovative alternatives to reduce the generation of solid household waste and stimulation of recycling. Since then, communities organized, industries, companies and local governments have been mobilized and induced the separation and classification of waste in its sources. Such initiatives represented a great advance in respect of solid waste and its production. The first official information on the selective collection of solid waste were raised by PNSB 1989, which identified, on that occasion, the existence of 58 selective collection programs in the Country. This number grew to 451, according to PNSB 2000, and to 994, according to PNSB 2008" (Brazil, 2008).

[9] The CCRB is composed of five cooperatives, all with a number of members between 20 and 26. The community involvement, however, goes far beyond them, extending over the 11 years of operation, the 18 (eighteen) thousand scavengers and partner associations bidding of food and clothes. Only in 2014, 15 groups of women co-joined the action, among other partners such as the Center of Art and Environment (Cama).

The intermediaries of oligopsonycould only compete with strategy of price of short-term, that the CCRB can respond in one of the movements, raising the price of one kilogram of aluminum can of R$1.00 to R$1.30, almost increasingtenfoldbilling physical, and, in the majority of the movements, raising of R$1.30 to R$1.50 the minimum price, with results also expressive, movements that are equivalent, in Graph 1, the variations of *p1 to* p_2 - *np* and q_1 to q_2 - *qm*, where *np* and *qm* are the residual differential between the prices and quantities effectively practiced and that would eliminate the power monopsonic, i.e., when these *m* and *n* = 0, the goal higher.

Table 1: Social Indicators

		INDICATORS	Brazil	South	Southeast	Northeast	C. West	North
CATEGORIES	1. Demographics	Average age of scavengers	**39.40**	38.90	40.60	38.30	40.00	36.50
		Percentage of women	**31.10**	34.10	30.90	29.30	34.10	29.10
		Percentage of blacks (blacks and mestizos)	**66.10**	41.60	63.00	78.50	71.30	82.00
		Percentage of scavengers living in urban areas	**93.30**	93.50	96.20	88.50	95.60	93.20
		Child dependency ratio in households with at least 1 collector	**50.00**	53.50	43.60	55.30	46.30	64.10
		Average income from work of scavengers	**571.56**	596.90	629.89	459.34	619.00	607.25
	2. Employment and Income	Income inequality among pickers (Gini Index)	**0.42**	0.42	0.39	0.43	0.37	0.42
		Percentage of residents in households with at least 1 collector extremely poor (less than $ 70.00 per capita or US$ 30,43)	**4.50**	4.10	2.20	8.40	1.80	3.80
		Percentage of scavengers with social security contribution	**57.80**	59.10	56.10	61.50	55.10	54.80
	3. Pension Plan	Coverage of the elderly population in entering with at least 1 collector	**57.80**	59.10	56.10	61.50	55.10	54.80
		Illiteracy rate among pickers	**20.50**	15.50	13.40	34.00	17.60	17.20
	4. Education	Percentage of scavengers with 25 years or more with at least elementary school complete	**24.60**	20.60	28.30	20.40	23.90	30.00
		Percentage of scavengers with 25 years or more with at least secondary education complete	**11.40**	7.90	13.50	9.70	10.80	14.00
		Percentage of children (0 to 3 years) living in households with at least 1 collector who attends daycare	**22.70**	19.80	27.90	21.70	18.50	13.00
	5. Access to Public Services	Percentage of household with at least 1 collector with access to electricity	**99.00**	98.50	99.70	98.40	99.50	98.40
		Percentage of household with at least 1 collector with adequate sanitation	**49.80**	40.90	75.40	32.50	28.00	12.30
	6. Digital Inclusion	Percentage of household with at least 1 collector with access to computer	**17.70**	20.10	26.40	7.00	19.20	9.00

There is an existing diagnosis of Ipea, on the basis of the most recent Census (IBGE), concerning the current social situation of recycler (Silva, Goes, Alvarez, 2012, p. 8), which Table 1. The *expected improvement*, conservative, is tripling of average national income, duplication of pension contributions and reduction of 3/5 of the standard-deviation regional these two indices. With the integration of associations partners in supply of uniforms etc., it is expected a multiplier effect of 1 to 10 poor in metropolitan communities (*Botton Up*). The technology with chip sets streamline and cheapens the services collection and recycling. The economies with the prevention of floods and urban pollution in general are presumed. The revaluation of the professional recycler is the main cultural change expected, change slowly, and not without support of campaigns re-educative of population. *Needs and skills* of the project meet internally, by the actors involved. Each agent-local regulator must go through a process of incubation for 12 to 24 months, involving management training, financial, market strategies and cooperative principles.

The core of this project is the *reverse logistics of solid waste* (in the direction it has for the purposes of new Federal Law nº 12,305, Art. 11º: an instrument *of economic and social development characterized by the set of actions, procedures and means to facilitate the collection and refund of the solid waste to the corporate sector, for reuse in your cycle or other productive cycles* (or other final disposal environmentally appropriate, without prejudice to the systems of public collection of waste, *latu sensu*). This legitimacy did not exist. It gives legal support to initiatives to promote the selective collection. The garbage dumps were with your days counted since the institution

of the National Policy for *Solid Waste* (PNSR)[10] in 2010, when states and municipalities had set 2012 as legal deadline

> [...] to submit a plan for the management of solid waste, and only then, receive funds from the Union to work in this area. There will be no obligations to consumers, retailers and manufacturers. All will be subject to penalties of Law of Environmental Crimes if not reverse correctly the products after the consumption. The factories, for example, will have to collect the "excess residual waste" after use. The manufacturers of products with greater environmental degradation (pesticides, batteries, fluorescent lamps, tires and electric-electronic) are obliged to implement systems that allow the recollection of the products after the use by consumers. The text creates the so-called "reverse logistics" (Article 3º, item XII) for collection of discarded products by consumers. Dealers and distributors will be the main points of fencing of discarded products, which should then be sent to the manufacturers or importers. The latter will give the final destination to the trash. (Denadai, 2010).

Experts of the Ipea concluded that, in the actual pace of operations, it will be very difficult achieve the goal of extirpating the garbage dumps until 2014, non-compliance regardless of which, once this deadline has passed, garbage dumps will be considered illegal and, for any purpose, "outside the law". The law establishing the *National Policy of Solid Waste,* in its Art. 11º, establishes that the selective collection system should prioritize the participation of cooperatives or other forms of association of collectors of reusable materials and recyclable consisting of persons of low income. The connection between this sector and the public policies directed at associations is new.

The first paragraph of Article 18ºof lays down that the participation of the gatherers in systems of reverse logistics should be prioritized, particularly in the case of post-consumer packaging, as well as, according to the Art. 23º, the sectorial agreements aiming at the implementation of the reverse logistics should contain the possibility of hiring organizations of gatherers for the implementation of the proposed actions on the systems to be deployed. States and municipalities legislate, in a complementary way, in order to apply the proper law of the Solidarity Economy, as in this nine cases of Pernambuco, Rio G. do Norte, Santa Catarina, Minas Gerais, Mato Grosso, Rondonia, Mato G. do Sul, Acre, Bahia, four other projects-of-law state and numerous legislative initiatives municipals. In June 21, 2006 was published the *Decree nº 5.811* that had on the composition, structure, powers and functioning of the National Council of Solidarity Economy - CNES. Finally, tying legally the three variables in this project (recycling, cooperatives and fair-price), the signing, by the *Presidency of the Republic*, the *Decree nº 7.358*, of November 17, 2010, instituted the *National System of Fair Trade*[11], becoming the first country with a such system, which redefined:

---

[10] Sanctioned by the *Presidency of the Republic* after being approved in a joint meeting of the CCJ (*Commission Constitution, Justice and Citizenship*), CAE (*Commission of Economic Affairs*), CAS (*Commission for Social Affairs*) and CMA (*Commission of Environment*) of the Senate, this Federal Law no. 12.305/2010 establishing the *National Policy for Solid Waste* (PNRS), regulated by Decree nº 7.404 (December, 23/2010), it was processed in *NationalCongress* for 21 years.

[11] "The National System of Fair Trade (SNCJS) is a set of parameters: concepts, principles, criteria, actors, instances of control and management, organized in a single strategy of affirmation and promotion of Fair Trade in our country. Organized in a document that merges regulatory mechanisms and incentives, the SNCJS seeks to consolidate as a public policy, through the enactment of a law that would institutionalize. It is, thus, as political project as economic. Political, because it formaliz-

> I - fair trade: commercial practice differentiated based on the values of social justice and solidarity held by ventures economic solidarity; [...]; V - fair price: is the definition of value of the product or service, built from the dialog, transparency and effective participation of all the actors involved in its composition that results in equitable distribution of gain in the productive chain. *Unique Paragraph* - The terms fair trade, fair exchange, fair trade, fair equal, alternative trade, solidary trade, ethical trade, ethical trade and solidary are understood in the concept of fair trade, under the terms of this Decree. (Brazil, 2010, italics originals).

4. BACKGROUND, GOALS AND STRATEGIES OF THE POLICE

The policy proposed here is directed to Brazilian Metropolitan has been verified the exercise of power oligopsonicin reverse logistic of solid waste, having aim to establish new standard of competitiveness and fairness intra and inter-regional, combining innovative efficiency allocative and distributive to technologicinnovation local of the sector by *System of Radio Frequency Identification* (RFID).

Although have been identified good tests in regulatory enforcement in the Country, as example of the Campaigns *The Decent Work Preserves the Environment*[12], developed in the state of

---

es the recognition by the Brazilian State of Fair Trade as social policy of confronting social inequalities and the precariousness of labor relations. And, economic, to provide an identity to the products and services of the Solidarity Economy, adding value and concept to them, and, thus, expanding its sales opportunities." (Faces of Brazil, 2013). "Art. 3º -The SCJS is designed to strengthen and promote the concept of fair and equitable trade in Brazil, which includes achieving the following goals: I - strengthen national identity of fair trade, and through the dissemination of its concept, its principles and criteria for the recognition of practices of fair trade and its promotion; II - encourage the practice of fair price for anyone who produces, sells and consumes; III - disseminate the products, processes, services, as well as the experiences and organizations that must comply with the standards of the SCJS; IV - subsidize the economic solidarity ventures, accreditation bodies of conformity of this entities with the fair trade practices, assessment and the supporting entities promoters of fair trade, by means of the national basis of information on solidarity economy and economic solidarity ventures with practices of fair trade recognized by SCJS; V - help with public and private efforts to promote actions to promote the improvement of conditions for the marketing of economic ventures solidarity; VI - encourage the economic collaboration between economic solidary enterprises [...]." (Brazil, 2010).

[12] "The strategy of intersectionality in the implementation of the policy of support for cooperatives and associations active with solid waste has proved to be consistent in RMS (Metropolitan Region of Salvador) during the periods analyzed, covering aspects age, environmental, health, organizational, logistical, technological, competitive, lending and ethnic-cultural." (Primo, 2011, p. 36). Restructured from the report of the Public Prosecutor's Office in 2007, the policy of recycling the SESOL/SETRE became a comprehensive and transverse action regional involving state, municipalities, businesses, enterprises and civil society, removing hundreds of tons of waste from the environment and benefiting tens of thousands of collectors. Although the policy is re-territories for well beyond the RMS, she comprehend the municipalities of Camaçari, Candeias, Dias d'Ávila, Itaparica, Lauro de Freitas, Madre de Deus, Mata de Sao Joao, Pojuca, Salvador, São Francisco do Conde, São Sebastião do Passé, Simões Filho and Vera Cruz, influencing more directly in Sergipe, Alagoas, Pernambuco and Piaui.

Bahia[13], the incipience of linkage intra-regional unfolds in a uncoordinated national policy in relation to systems of management of regional developments in sectors recyclers. For that year, which is a transverse action that alliance public authorities and civil society around commitments socio-environmental[14], it should be stressed that at least since 2012, the *Brazilian Association of Producers of Highly Recyclable Cans* (*Abralatas*) "want to submit this project to other states, as an example of initiatives that are able to minimize problems social, environmental and economic in a single action", as note disclosed in February 23, 2012 by Ascom/Setre, but without corresponding result multiplier for the other regions of the country, so that it is still, in general, unique. On 14, 2012, likewise the *Central Cooperative Ventures and Solidarity of Brazil* (Unisol - Brazil) did record that "is engaged in the project to strengthen it further and, in particular, contribute to the socialization of experience", in expectation. Assuming that general objective, the policy proposed here has the following specific objectives:

- Eliminate nationally the *Exploitation Oligopsonic* of recyclers (Trajectory of the Minimum price to *Fair Trade*) integrating regional markets through the federal administration of the price of each element recyclable, safeguarding standards in competitive reverse logistics of solid waste;
- Raise significant and persistently the amount of recycled solid waste industrially useful and raise the level of *Environmental Sanitation* in the short term;
- Educate the public through incentives (prizes) and burden (system of fees and surcharges) through monitoring pilot their discards of solid waste through the chip RFID (radio frequency identification).

The first step of the project is to characterize, so calculated, the market structures of solid waste in metropolitan areas of all regions, by estimating the corresponding deviations between prices and values added, privileging cyclical and structurally the links in the chain of reverse logistics of the residue from the scavenger loose to industry. It is justified, because the fight multilateral of civil society and the public authorities against the distributive inefficiency-allocative resulting from the merger is theoretically based between us:

> The trend toward concentration that created in certain branches situations of virtual monopoly provoked reactions reversed in defense of the public interest, such as the antitrust laws the end of the last century. Closed the door to the monopoly, it was necessary to develop ways to coordinate more subtle. The oligopoly [and oligopsony] is the culmination of this evolution: it allows a small group of large firms to create barriers to entry for other in a sector of economic activity and administer jointly the prices of certain products, preserving, however, autonomy financial, technological and administrative. The administration of prices creates relative advantage for compa-

[13] 43% of ventures of solidarity Brazilian are in the North East, but only 10% are in Bahia (approximately 2.200 initiatives, involving around 80 thousand people). The other 90%, and of these 10%, interest us as potential beneficiaries.

[14] The multiple needs of strategic design, marked the previous note, correspond coordinated efforts of the Secretariats of State Setre, Seats, Sedir, Serin, in addition to the Car, Casa Civil, Uneb, Ingá, UFRB, Abralatas, Petrobras, Brahma, Center of Art and Environment, Municipal Departments of Public Services (Sesp), Cleaning Firm Urban (Limpurb), in addition to the Hatchery for Economic Ventures and Supportive of the University of the State of Bahia (Incubation/Uneb), among other partners and several cooperatives in the state. The *transversally, territoriality and the thematically* constitute the so-called "3T" of Plan Pluri-Anual – PPA at 2012-2015.

> nies that more innovate both in productive processes and the introduction of new products in a given sector. Differently of traditional competition of prices which translates into reduction of profits, weakening financial, plant closures or, in the case of empires a monopolist, increase in prices and demand reduction, the world of the oligopolies resembles more the [...] a sport to which only has access champions. (Furtado, 1996, p. 26-27).

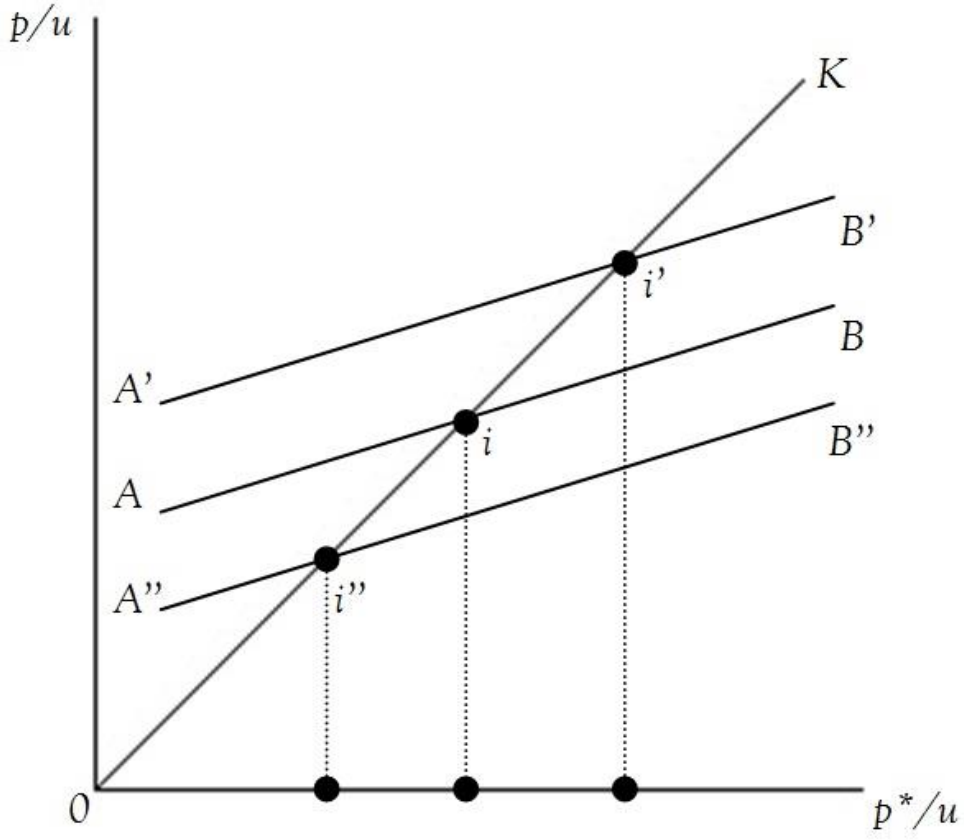
Already in *The Economy and the Art of Controversy*, K. Galbraith intervened in debate of *unequal exchange*, focusing on the situation of the small farmer[15], but it is a dialecticrelapsing in Political Economy. In his free-teaching thesis submitted to the Institute *of Economics at the State University of Campinas* (Unicamp), M. Coutinho has recovered the classics, more particularly of Adam Smith, which, in particular without-had, "the question of the value should refer to the faculty that the goods have, in exchange, to commandthelabor of others." (Coutinho, 1993, p. 113). But, regardless of whether it is measured by work or by another measure, the issue is that the value may differ from the price and, in this case, that profitsare transferredwinnerof the loser. In the most recent global stage of mergers/acquisitions, the policy measures for the prevention of the abuse of power in systems of trade, though not restricted to oligopolies, whose action is free, have become commonly used, including in Brazil, and it is opportune to mention here in note[16]. Also called the

[15] "The struggle in the labor market, with its controversy, was the result of primitive inequality in ability to contract and the efforts of unions to delete it. This inequality is not exclusive to the labor market, nor are the consequences to which it gives rise. Similar Problem occurs there where many people, individually powerless because they are numerous, exchange with some large companies, of relative strength much higher, precisely because they are few. This is the weakness of the lone worker, who also is characterized, in general, the situation of the farmer. So typical, the farmer alone does not influence on the price of sale or purchase. He lives in a world where, as a result of stronger position occupied by other circles on the market, it has become commonplace the exercise of some power to influence prices. [...]. Approaching its weakness in the ability of the contract, the worker never had doubts about the appropriate solution, which was to organize a union. The vision of the farmer of his problem and its solution has never been so defined. [...]. Voluntary Organizations to expand its economic power - cooperatives - seemed at moments constitute the solution." (Galbraith, 1959, p. 36-39). For a theoretical comprehension more complete the *task* of development, see Furtado (1979).

[16] "After the democratization process, more specifically from the year 1994, the date of the promulgation of the new antitrust law Brazilian, the Brazilian System of Defense of Competition - SBDC began to become apparent through analysis of acts of concentration. Many famous trials was press in memory, as paradigmatic examples, as the acts of concentration involving companies Kolynos and Colgate (AC no. 0027/1995), Antarctica and Brahma - AMBEV (AC no. 08012.005846 / 99-12) and, more recently, Nestlé and Garoto (AC no. 08012.001697 / 2002-89). To analyze acts and contracts that may have an impact on competition, in accordance with the procedure laid down in Article 54º, caput and paragraph 3º of Law no. 8.884, components of SBDC exert its preventive function, whose objective is to prevent the possible formation of market power that will enable a possible abuse more ahead by the company resulting from. […]. The components of the SBDC also have legal competence to repress anti-competitive behavior, which constitutes its repressive function. In fact, after a start widely focused on analysis of acts of concentration, from 2003 it started a strong trend toward focusing on the actions of public officials in the fight against cartels, especially with the effective use of agreements of leniency, as well as advanced techniques of research, such as the search and seizure and the telephone interception. In order to punish the anticompetitive conduct proven, components of SBDC may impose financial penalties and not cash too." (Ragazzo, 2007, p. 1-2).

"degree of monopoly", the *market power of the company* can be kaleckian defined, so simple that was, once, even considered tautological, where $K = \frac{p}{u}$ in which p is the *price*, u direct costs and K the *degree of monopoly*, which changes due to 1) changes in the degree of economic concentration, 2) advertising (and middlemen), 3) The ratio of indirect costs (wages, cost of capital, taxation etc.) on the direct and 4) power of the trade unions/cooperatives. Recalling that the direct costs (u) are data for the costs with wages (w) and by expenditures (both measured per unit of product) with raw materials (m), so that $u = w(1 + j)$, where j is the quotient raw materials by the hourly wage, come

$$K = \frac{p}{W\left(1 + \frac{m}{w}\right)}$$



Graph 2: *Modification of the Degree of Monopoly*
Source: IE-UFRJ, Fonseca (2014).

It stands out in this brief argument to influence the degree of monopoly on the formation of prices, each firm in an industry more or less concentrated by fixing prices by mark -*up.*[17]Low prices, with subsequent restriction of purchases, is inverselyproportional to thecompetition. This rule is well-known, so that the price at which the companies offer their goods and services is a function of

[17] A normal feature of the economy, second Kalecki, is operating with idle capacity due to the degree of monopolization of the economy. Thus, the production is not where the price equals the marginal cost, but which gives the maximum profit. With the existence of idle capacity and given the characteristics of the production, there is a follow-up on horizontal curve marginal cost, and the price determined by a margin on costs according to a rule of *mark-up*. (Gremaud, Braga, Vasconcelos, Toneto Jr., 2000, p. 142).

their direct costs and the price of its competitors, in the form $p = mu + np^*$ in which p is the price, p^* is the price of the good or service substitute (weighted average of prices of all firms competing within the structure of the market), u are direct costs and m a positive margin (*mark-up*)on these costs, by order, n being a coefficient of market power within the range $0 < n < 1$, so that the smaller the size and the market power of the Company, p^* both more converges to p and the quantities produced more approaching the level that could be achieved were it not for the influence of the degree of monopolization (Kalecki, 1976).

By dividing the formula of rule mark-*up* by *u* we obtain the following equation of a straight line in which *m* converts the linear coefficient of an affine function, vertical effect indicated in the graphic above:

$$\frac{p}{u} = m + \frac{np^*}{u}$$

Plotting in an axis coordinated *p/u* and *p*/u* it is possible to observe (Graph 2) that maintained constant direct costs (*u*), when *m* grows, that is, when the degree of monopoly rises, the straight *AB* moves upward (A′*B*′), or, if decreases, down to (*A*"*B*"*)*. This representation adopt the line of 45º (*0K*) as the axis on which *p/u = p*/u* and by which are marked *i*, *i*′ and *i*" whose project on the abscissa is directly proportional to the degree of monopolisation. In the stretches of straight lines *AB* to the left of the shaft *0K* the ratio of prices to direct costs of the firm is greater than the set of competitors. It is not here exhausted the possible inferences of this model, when vary *u* empriseto emprise or its market power, or when *m* is equal to the average degree of industry, converting the firm in industry representative. Knowing that the smaller the number of firms and the more unequal distribution of size between them, less competitive and more concentrated is the market, there are many ways to measure *m* and *n*, among which is the method *Herfindahl-Hirchman Index* (HHI) used in the United States in one of its variants, of which the usual formula of *Hannah and Kay* (1977) is the general case, index mathematically given by

$$HK_{NE}(\propto) = \left(\sum_{i=1}^{n} S_i^{\propto}\right)^{\frac{1}{(1-\propto)}}$$

where S_i is the *market share* (the percentage of the market/industry of each *i-th* firms) *n* is the number of firms, $0 < \alpha \neq 1$ and the subscribed *NE* indicates that its result is calculated in such a way as to present the response in terms of the *Equivalent Number*. An orientation to the use of Excell for the calculation of this index for any industry can be found in P. Latreille and J. Mackley (2014). What matters here highlight is just that *m* and *n* are determinable and are often known, and that can and should fall, where are taken into account the interests of the company, offended by shortage speculative and/or artificially more expensive goods and services, since any *market power m* or *n*. On the basis of these calculations it is possible to identify possible environment to abuses on the part of the industry demand for solid waste in Brazil.

A second step is the *innovative proposal* to connect directly the networks of cooperatives to the industries, through contracts, with the stipulation of minimum selling prices (on the part of recyclers associated with) for each residue, adjusted quarterly by *tripartite commission and joint representatives of public authorities, civil society and business.* The goal is to define values of products or services - from the dialog, transparency and effective participation of all the actors involved in its composition - generating the trade resulting in equitable distribution of gain in productive chain, in conformity with Art. 2º of Decree nº 7.358. This law is a new and advanced instrument to solidarity.

5. LEAP IN TECHNOLOGY

Technologically, it is a situation of almost zero incorporation of machinery, equipment and technology of information to the processes of selective collection and recycling, in the vast majority of cases surviving situations of garbage dumps in outdoorand spurious trade. The fourth and last variable of present project is a *technological innovation* capable of leveraging the selective collection through incentives and over-taxation electronically monitored, accelerating and expanding the system, possibility open actually.

This second front is constituted by the deployment-pilot, in metropolitan regions of two systems of chip sets of gatherer boxes junk RFID (radio frequency identification) 1) individual and 2) collective, with the control of who discards what and how much. This technology has been considered a success in the Dutch city of Enschede, where recycling has grown 42%, making the educational campaigns more effective. It can run a dual vector of stimuli of good practices and inhibition of bad-conduct in relation to the production of irrational solid waste, because, relating the garbage to those who produce it can, according to the *U.S. Environmental Protection Agency*, offer bonus to consumers aware, for purchases in shops accredited, as done in Chicago or, conversely**,** encumber with a surcharge that raising the services of waste collection, as done in Maia, Portugal, informs the *Group of Studies of Spatial Planning Environmental Portugal*. The technology deserves special attention in edition of dec./2010 of *Superinteressante review*, which synthesizedthe efficiency and low-cost of RFID systems, which uses the strategy of containers underground and personal card. Of reason cost-benefit low, the system will refine and restructurer the studies measured gravimetrically and nationally in sanctions and rewards, and will generate a gradient of convergence between the standards of domestic generation of municipal solid waste, state and regional, directly proportional to its progressiveness in relation to the income in each situation of bad conduct of selective discard.

The cost-effectiveness of the system is low because reduce to less than half of the current expenditure logistics of collection. The system is flexible, account with numerous technical options and is adaptable to local needs. For example, it can treat differently the more thinly populated regions and central, as already done in the aforementioned city Enschede.

> Each property (in the streets with relatively few households) receives a set of cans of different colors - one for each type of waste. They are at home, and they are only made on the street on the dates determined by the company's calendar collection. The brass is installed a chip RFID (radio frequency identification). He works as a barcode: saves a number of usersare then crossed with a database. The difference is that it can be read up to 5 meters away. When the trash truck raises the brass, your RFID reader identifies the user and records the data collection: when and where it was made and what the weight of the waste. Then, it sends the information to the company. [...]. For central regions: The company pickup installs large containers of garbage in the basement of public areas and distributes to each home a card with RFID chip. The user can make the disposal of garbage on the day that he wants to. The cover of the container opens when the resident is approaching with the card. Data such as user, date of discharge and weight of garbage are stored on the card or transmitted to the company collection. As each container meets multiple users, the trucks do not need to stop all the time for collect the garbage. Door-to-door turns on a block-by-block basis. This leaves the collection much faster. (Steffen, Cunha, Sorano, Ducroquet, 2010).

6. DANGER, PARTNERSHIPS AND SUSTAINABILITY

From the social point of view, the main factor is the possible existence of indices of income inequality within the cooperative, which requires attention to the distribution of rents. The articulation and coordination of the efforts of public authorities and private are the central challenge, but the new regulatory frameworks requires the adoption of measures protective that mitigate risk. First of all, the Ministry of Development and Regional Integration need to follow narrowing their policies with those of the Ministry of Labor, through the National Secretariat of Economy of Solidarity, and both have to strengthen its ties with the State Secretariats of Labor and the National Forum of the Secretaries of Labor - FONSET, until the corresponding Municipal Secretaries of Labor. Giving sustainability executive this first institutional arrangement, follow with the Casa Civil, the Ministries of the Cities and Environment, Science and Technology, Secretariats of Development and Social Assistance, Child Protection, Justice and Citizenship, by supposed, always in conjunction with other national bodies and state related to the activity of recycling, such as the Fund for Combating and Eradicating of Poverty - FUNCEP, Development Agencies and Public Banks able to offer encouragement and claims solidarity (differentiated for cooperatives), finally, extending the current partnerships with NGOs and companies of wide acting as Abralatas, Cempre, Petrobrás, Brahma, Coca-Cola, Unisol, Pangaea and Caritas, as well as with the Forums andCouncils National,State and Municipal of Solidary Economy etc. The goal is to make the growth and convergence of rent.

The project is backed by three relatively new Federal laws, by nine recent state laws and numerous municipal laws that proliferate, being strictly convergent to the plans of government and to the priorities of the 27 states of the Federation, offering stable and increasing opportunities for returns. The empowerment (self-management) of cooperatives, done well, will make the system turn without cost in 36 months, opening from there, a virtuous cycle new reverse logistics.

7. SIMILAR EXPERIMENTS, DEPLOYMENT TIME AND REPLANNING

With regard to the aspect Technologic-Operational of project, pioneering experiences and successful in Brazil with chip sets garbage containers and underground were carried out, in 2012, with prospects for wide dissemination in 2014, at the intersection of Brigadeiro Faria Lima avenue and Rebouças, in the city of São Paulo, separating organic Waste from recyclable, as well as in the district of Parada de Taipas (North Zone) and in the Municipal Market, in addition to other 27 locations then planned, whose collection ability, set out in the contract with the concessionaire responsible for testing, is 165 thousand tons of waste until 2019. Was in city of Caxias do Sul that took place one of the first experiences with this kind of technology in Latin America, through the Collection System Mechanized Side, deployed by Portuguese company *Sotkon Waste Systems Brazil,* in Street Alfredo Chaves, to demonstration; this experience, however, remained isolated.

As to the Social-Technologic aspect of the present project, regulatory experience pioneering and successful has been recorded over the 11 years of Recycling Campaigns in Bahia, through the SESOL/SETRE, Prefecture, NGOs and private sector, as we have already seen. As to the costs of manufacture and installation of equipment for *recycling system with chip*, it can be shared between the actors involved, as each scenario of relations between the public and private spheres, but the implementation needs to be owned by their territoriality. Must begin with the largest urban centers, in the first phase, scaling the other, being feasible duplicatethe recycling in 18 months.

The project has economic returns and social immediate, with strong potential for expansion in the middle and long term, on the one hand, on the basis of pent-up demand for recycling of waste and, on the other hand, according to be passing through a time of technological and regulatory in-

flection;the maturity, in this first stage, it is expected for 36 months, with the first 12 to 24 months for the process ofincubation and qualification (strategic) of the agent regulator local, on the one hand, and the creation and deployment of the system of recycling with chip sets, on the other hand. In addition to this period,more 12 months of training with new technologies, adjustments of trajectories or functions-reaction to regional actors-competitors and the cyclical fluctuations per annum, providing opportunitiesstudies of measured gravimetrically and inspection *in loco* for effective verification of the results obtained, reevaluating scenarios, redesigning partnerships and raising the sustainability of the changes triggered as a whole.

REFERENCES

1. Agência Brasil. (2009). *Menos de 2% dos resíduos sólidos produzidos no Brasil são reciclados.* Recuperado de http: ultimosegundo.ig.com.br/ciencia/meioambiente/2013-09-09/menos-de-2-dos-residuos-solidos-produzidos-no-brasil-sao-reciclados.html.
2. Ascom-Setre.(2012). *Campanha 'Trabalho Decente Preserva o Meio Ambiente' coleta 65 toneladas no Carnaval de Salvador*. Recuperado de http: homologa.setre.ba.gov.br/noticias/campanha-trabalho-decente-preserva-o-meio-ambiente-coleta-65-toneladas-no- carnaval-de-salvador-3.
3. Bahia. (2010). Secretaria do Trabalho, Emprego, Renda e Esporte. Superintendência de Economia Solidária (SETRE/SESOL).*Relatório Síntese das Políticas Públicas de Economia Solidária Desenvolvidas Pelo Governo do Estado da Bahia: Período 2007-2010. 2010*. Salvador: SETRE.
4. Bettelheim, C. (1972). "Observaciones Teóricas", en A. Emmanuel. *El Intercâmbio Desigual: Ensayo Sobre los Antagonismos en las Relaciones Internacionales.* México: Siglo XXI.
5. Bosi, A. (junho/2008). "A Organização Capitalista do Trabalho 'Informal': O caso dos catadores de recicláveis", en*Revista Brasileira de Ciências Sociais*, v. 23, n. 67.
6. Brasil.(2010). Presidência da República.Casa Civil.*Decreto Nº 7.358, de 17 de novembro de 2010. Institui o Sistema Nacional do Comércio Justo e Solidário - SCJS, cria sua Comissão Gestora Nacional, e dá outras providências*.
7. Brasil. (2008). Ministério do Planejamento, Orçamento e Gestão. Instituto Brasileiro de Geografia e Estatística – IBGE.Diretoria de Pesquisas Coordenação de População e Indicadores Sociais.*Pesquisa Nacional de Saneamento Básico 2008*.Brasília: IBGE.
8. Carmo, M. (2011)."As Políticas de Estimulação ao Trabalho dos Catadores no Rio de Janeiro Como Estratégia Oriunda da Valorização dos Resíduos", en *Cadernos Gestão Pública e Cidadania*, v. 16, n. 58. São Paulo.
9. Carmo, M. (abr./jun. 2009). *A Semântica 'Negativa' do Lixo Como Aspecto 'Positivo': Um Estudo de Caso Sobre uma Associação de Recicladores na Cidade do Rio de Janeiro, Brasil*. Administração Pública e Gestão Social, Viçosa, v. 1. n. 2, pp. 21-50.
10. Chiang, A. (1982). *Matemática para Economistas*. São Paulo: Ed. USP.
11. Coutinho, M. (1993).*Lições de Economia Política Clássica*. São Paulo: Editora Hucitec.
12. Dagnino, R y R. Dagnino. (julho/2010). "Políticas para Inclusão Social de Catadores de Materiais Recicláveis*", en Revista Pegada* – especial, n. 66.
13. Denadai, N. (2010). *Presidente Lula sanciona lei que prevê fim dos lixões*. Recuperado de http: www.projetomundomelhor.com/2010/08/s era-o-fim-dos-lixoes.html.

14. Faces do Brasil. (2013). Plataforma de Articulação do Comércio Justo e Solidário. *Conheça o SNCJS*.Recuperado de http: http://www.facesdobrasil.org.br/sistema-nacional-de-comercio-justo-e-solidario/3-sncjs.html.
15. Fernandez, J. (2012): *Diagnóstico dos Resíduos Sólidos de Logística Reversa Obrigatória*: Relatório de Pesquisa. Brasília: Ipea.
16. Freitas, L. y I. Fonseca. (2012). *Diagnóstico sobre Catadores de Resíduos Sólidos: Relatório de Pesquisa*. Brasília: IPEA.
17. Furtado, C. (1996). *O Mito do Desenvolvimento Econômico*. Rio de Janeiro: Paz e Terra.
18. Furtado, C. (1979). *Teoria e Política do Desenvolvimento Econômico*. São Paulo: CEN.
19. Galbraith, K. (1959). *A Economia e a Arte da Controvérsia*. Rio de Janeiro: Fundo de Cultura.
20. Gremaud, A. y M. Braga y M. Vasconcelos y R. Toneto Jr.A Economia Kaleckiana e o Princípio da Demanda Efetiva. In. Lopes, L.; Vasconcelos, M. (Orgs.).*Manual de Macroeconomia***:** Nível Básico e Nível Intermediário. São Paulo: Atlas, 2000.
21. Grimberg, E. y L. Tuszel y Y. Goldfarb. (2004). *Gestão Sustentável de Resíduos Sólidos e Inclusão Social: Estudo de caso sobre as Cooperativas das Centrais de Triagem do Programa Coleta Seletiva Solidária da Cidade de São Paulo*. São Paulo: ITCP/USP.
22. Harris, D. (1974). "Um 'post mortem' à Parábola Neoclássica", *Pesquisa e Planejamento Econômico*, Rio de Janeiro 4(3), pp. 563-600, dez.
23. Kalecki, M. (1976).*Teoria da Dinâmica Econômica*. São Paulo: Abril.
24. Lange, O. (1986). Algumas Observações Sobre a Análise Insumo-Produto. En. Lange, O. *Ensaios Sobre Planificação Econômica.* Nova Cultural: São Paulo.
25. Leftwich, R. (1974). *O Sistema de Preços e a Alocação de Recursos*. São Paulo: Pioneira.
26. Latreille, P. y J. Mackley. "Using Excel to Illustrate Hannah and Kay's Concentration Axioms",*International Review of Economics Education*. Recuperado de http: http://www.heacademy.ac.uk/resources/detail/subjects/economics/10-1-Using-Excel-to-Illustrate.
27. Lopes, T.; Neder, H. (2011). Teoria da Programação e Economia Política: uma introdução alternativa a partir de Sraffa, Leontief e Lange, **Anais**, 39º Encontro Nacional de Economia/ANPEC, 2011.Recuperado de http: http://anpec.org.br/encontro/2011/inscricao/arquivos/000-b63a24aa275f5c5156d906357513a62f.pdf.
28. Magera, M. (2008).*A Reciclagem dos Resíduos Sólidos Urbanos e o Uso das Cooperativas de Reciclagem: Uma Alternativa aos Problemas do Meio Ambiente*. Recuperado de http: www.fundace.org.br/cooperativismo/arquivos_pesquisa_ica_la_2008/043-magera.pdf.
29. Martins, L. y M. Peres. (24 to 26 ofoctober, 2006). "Economia Solidária: A Experiência da Cooperativa do Reciclador Solidário de Piracicaba", en Unimep. *Anais.*4ª Mostra Acadêmica.
30. Marx, K. (1996a). *O Capital*: Crítica da Economia Política (O Processo de Produção do Capital). Livro Primeiro, Tomo 1. São Paulo: Editora Nova Cultural.
31. Marx, K. (1996b). *O Capital*: Crítica da Economia Política (O Processo de Produção do Capital). Livro Primeiro, Tomo 2. São Paulo: Editora Nova Cultural.
32. Marx, K. (1991). *O Capital*: Crítica da Economia Política (O Processo de Circulação do Capital). Livro Segundo. São Paulo: Bertrand Brasil.
33. Marx, K. (1987*). Teorias da Mais Valia*: História Crítica do Pensamento Econômico (Livro 4 de O Capital). Volume 1. São Paulo: Bertrand Brasil.
34. Pasinetti, L. (1969). "Switches of Techniques and the 'Rate of Return' in Capital Theory"**,***Economic Journa***l**, vol. 79, pp. 508-31.

35. Primo, R. (2011). "Política Transversal de Regulação do Mercado Oligopsônico de Resíduos Sólidos nos Carnavais de Salvador de 2007 a 2012 por meio de um Complexo de Economia Solidária*", Isegoria - Ação Coletiva em Revista*, UFV - Área Temática: Economia Solidária e Cooperativismo, Ano 1, vol. 1, n.2, set. de 2011/fev.
36. Ragazzo, C. (2007). *Análise Econômica da Regulação:* O Papel da Advocacia da Concorrência. *Berkeley Program in Law and Economics*. UC Berkeley: Latin American and Caribbean Law and Economics Association (ALACDE) Annual Papers.
37. Ricardo, D. (1988). *Princípios de Economia Política e Tributação*. 3ª ed. São Paulo: Nova Cultural.
38. Robinson, J. (1953). "The Production Function and the Theory of Capital", *Review of Economic Studies*, vol. XXI (2), nº 55, pp. 81-106.
39. Sachs, I. (2009). "A Saída da Crise: Novas Tarefas para RTS −Tecnologia Social, Sustentabilidade e Cidadania", en *Rede de Tecnologia Social*.Tecnologias Sociais Caminhos para a sustentabilidade.Brasília.
40. Salvatore, D. (1984): **Microeconomia**. Trad. and rew. Marco Antônio Sandoval de Vasconcelos. São Paulo: McGraw-Hill do Brasil.
41. Samuelson, P. "Parable and Realism in Capital Theory: the surrogate production function",*Review of Economic Studies*, vol. 39, pp. 193-206, 1962.
42. Sevcenko, N. (1999). *Literatura como Missão*: Tensões Sociais e Criação Cultural na Primeira República. São Paulo: Brasiliense.
43. Silva, S. y F. Goes y A. Alvarez (2012). Situação Social das Catadoras e dos Catadores de Material Reciclável e Reutilizável: Região Nordeste. Brasília: Ipea.
44. Steffen, R., Cunha, S., Sorano, V., Ducroquet, S. (dez. 2010):Como Funciona a coleta seletiva com chip?*Superinteressante.*
45. Smith, R. (1985). *Troca Desigual e Industrialização no Nordeste*. São Paulo: IPE.
46. Vilanova Neta, M. (2011)."Manejo de Resíduos Sólidos", en IBGE.*Atlas de Saneamento 2011*. Brasília: IBGE.

APPENDIX A - *Unequal Exchange* and *Equilibrium Asymmetrical*

A.1 Diagrams Adapted Marx's Writings: Preliminary Considerations

Herewe describethe economic model with unequal trade mostconcisepossible, covering a minimum number of sectors and disregarding the existence of the government and foreign market. In section A.2 we will consider the system with *n* sectors.

Each residue enters in two forms:commodityto the consumption and/or tothe production. Different the analysis of intersectoral reproduction of capitalist economic system made in *Book II* of *The Capital*(1991), but keeping with her a theoretical and mathematics identity, here it is considered that the value of the national product, during a given period (a fiscal year, for example), is composed of four parts:

- Two on the income of the owners of the workforce (employees direct, autonomous o cooperatives), already deducted the plot on the unequal exchange with the owners of the means of production, which are *v* and s^{I}, respectively, *salaries* and *surplus-value I* (work non-paid);
- Other two constitutive of the value of the means of production used (raw materials, inputs, depreciation of machinery, technological depreciation etc.) of ownership of suppliers intermediaries, already deducted from or added to the portion of the unequal exchange with the owners of the means of production consumers of their products (banks, industries, agribusiness, commerce, etc.), which are *c* and s^{II}, respectively, *production costs paid* and *surplus-value II* (production costs non-paid).

A primary condition for the sustainability of the system is that s^{II} does not compromise the refitting of capital *c* and, in fact, it is no longer that plot of s^{I}. The *cost of producing non-paid* are merely *transfers* of intersectoral *surplus-value I*. The *work non-paid total* (*s*) can be defined or subdivided, thus, as $s^{I} + s^{II}$. The *national product total* (P^{N}) can be represented by the sum of four plots:

$$\boldsymbol{P^N = c + v + s^I + s^{II}}$$

Unifying gains of *unequal trade*, as *equilibriums asymmetrical* e^{i}, is accepted:

$$s^I + s^{II} = e^i$$

Segmenting the economic system integer in two major sectors, compounds by *producers of goods of production* or *intermediaries consumer* ($P^N{}_1$) and *goods of consumer or of final consumer* ($P^N{}_2$), it canbe structured:

$$Total\ output\ of\ goods\ of\ production = P^N{}_1 = c_1 + v_1 + e_1^i$$
$$Total\ output\ of\ goods\ of\ consumer = P^N{}_2 = c_2 + v_2 + e_2^i$$
$$\boldsymbol{National\ Product\ Total = P^N = c + v + e^i}$$

A.1.1 The Simple Reproduction

The dynamics of an economy without growth, that reproduces itself continuously, requires that the total demand of the means of production is equal to the total *needs of refitting* of the system, in the same way that the total demand for consumer goods is identical to the wage's fund and earnings totals with the *unequal trade national*.

$$Total\ Demand\ of\ goods\ of\ production = c_1 + c_2$$
$$Total\ Demand\ of\ goods\ of\ consumer = v_1 + v_2 + e_1^i + e_2^i$$

There is the *condition of equilibrium 1, identity* of *demand* and *product* of the means of production:

$$c_1 + c_2 = c_1 + v_1 + e_1^i \quad (1)$$

There is the *condition of equilibrium 2, identity* of *demand* and *product* of *means of consumption:*

$$v_1 + v_2 + e_1^i + e_2^i = c_2 + v_2 + e_2^i \quad (2)$$

Simplifying the equations 1 and 2, we have, respectively, these identical equations 3 and 4:

$$c_2 = v_1 + e_1^i \quad (3)$$

and

$$v_1 + e_1^i = c_2 \quad (4)$$

Are identical thus indicate the *relation input-the product* of this *double-sectoral*economy, such that:

$$\begin{aligned} P^N{}_1 &= c_1 + \boldsymbol{v_1} + \boldsymbol{e_1^i} \\ P^N{}_2 &= \boldsymbol{c_2} + v_2 + e_2^i \end{aligned} \quad (5)$$

Analytically, the product of the Sector *1*, whose value is equal to c_1, remains within the sector, to *refitted to the means of production consumed*; the remainder, **in bold**, with a value equal to the sum $v_1 + e_1^i$, is replaced with $c_2$from *Sector 2* that, reciprocally, preserves $v_2 + e_2^i$within itself, *to its final consumption*, and leasing $\boldsymbol{c_2}$. Theexcess of each sector is sued by the rest of the economy, and inverse too. This *intersectoral* equilibrium must be maintained for the *simple reproduction.* This approach saves intimate relationship with the input-output which, in turn, amounts to pioneer classic analyzes.

A.1.2 The Extended Reproduction

The dynamics of a *growing economy*, that reproduces itself continuously, requires that the total gain with the *unequal trade national* are higher than the consumption needs of the system, part being accumulated to raise the amount of the means of production and to employ more *labor force*, which resets (or recalculates) the mass of *surplus-value* total or the *intersectoral equilibrium* equilibriums *asymmetrical* e^i, nowadded theportion$\bar{s}$:

$$e^i = s^I + s^{II} + \bar{s}$$

This amount e^i will be divide, on the one hand, for investments in sectors producing goods of production ($e_{1c}^i + e_{1v}^i$) and consumption ($e_{2c}^i + e_{2v}^i$) and, on the other hand, in refitting the merely necessary to economic reproduction simple, e_{r1}^iande_{r2}^i, respectively, in *Sectors 1* and *2*. Emerges the following system:

$$\begin{aligned} P^N{}_1 &= c_1 + v_1 + e_{r1}^i + e_{1c}^i + e_{1v}^i \\ P^N{}_2 &= c_2 + v_2 + e_{r2}^i + e_{2c}^i + e_{2v}^i \end{aligned}$$

$$\boldsymbol{P^N} = \boldsymbol{c} + \boldsymbol{v} + \boldsymbol{e_r^i} + \boldsymbol{e_c^i} + \boldsymbol{e_v^i}$$

To the demand for means of production is equal to the sum of the needs of refitting and expansion of both sectors and so that the demand for consumer goods is identical to the wage's fund,

increasedbythe expansion of this, increasedbysurplus consumed in both sectors, the demands total of *means of production* (D_1) and consumption (D_2) composes the equations:

$$D_1 = c_1 + c_2 + e_{1c}^i + e_{2c}^i$$
$$D_2 = v_1 + v_2 + e_{1v}^i + e_{2v}^i + e_{r1}^i + e_{r2}^i$$

The condition of equilibrium in the sector of the means of production ($P^N{}_1 = D_1$) is given:

$$c_1 + v_1 + e_{r1}^i + e_{1c}^i + e_{1v}^i = c_1 + c_2 + e_{1c}^i + e_{2c}^i$$

Simplifying, we have, in the same way as for *simple reproduction*, the *relation input-output* which, as we shall see, must be respected in *extended reproduction:* $v_1 + e_{r1}^i + e_{1v}^i = c_2 + e_{2c}^i$.The condition of equilibrium in the sector of means of consumption ($P^N{}_2 = D_2$) is given:

$$c_2 + v_2 + e_{r2}^i + e_{2c}^i + e_{2v}^i = v_1 + v_2 + e_{1v}^i + e_{2v}^i + e_{r1}^i + e_{r2}^i$$

Simplifying, emerges the same*relation Input-Output* guests in Sector 1: $c_2 + e_{2c}^i = v_1 + e_{1v}^i + e_{r1}^i$. Structuring the system of sectorial interdependencies in extended reproduction:

$$P^N{}_1 = c_1 + e_{1c}^i + \boldsymbol{v_1} + \boldsymbol{e_{r1}^i} + \boldsymbol{e_{1v}^i}$$
$$P^N{}_2 = \boldsymbol{c_2} + \boldsymbol{e_{2c}^i} + v_2 + e_{r2}^i + e_{2v}^i$$

This is the configuration of systemic markets oligopsonics of solid waste in Brazil. Part of the product of the Sector *1*, whose value is equal to $c_1 + e_{1c}^i$, remains within the sector, for *refitting of the means of production consumed*the remainder, **in bold**, with a value equal to the sum $\boldsymbol{v_1} + \boldsymbol{e_{r1}^i} + \boldsymbol{e_1^i}$, is replaced with $\boldsymbol{c_2} + \boldsymbol{e_{2c}^i}$from *Sector 2* that, reciprocally, retains $v_2 + e_{r2}^i + e_{2v}^i$internally, *to its final consumption*. The outcome is similar to the end of the analysis of the conditions of previous reproduction: the excess of each sector is the demanded by the rest of the economy, and inverse. For the *extended reproduction,* such intersectoral relationship of equilibrium must be maintained. Fair Trade is equilibrium in the exchange and in the system, but the reverse is not necessarily true. The system can be inequilibrium with unequal trade.

Thus are patents the conditions and the structural possibilities of systemic reproduction capitalist with the presence of monopsonic elements. The exercise of market power, coercion explicit or simulated and subsequent unequal trade do not generate disequilibrium itself, only transfers *income and/or product,* or *unequal gains*. The *equilibriumasymmetrical*is broken only with the oversights of relations crosscutting techniques.

A.2 W. Leontieff's Systems[18]

A. 2.1 Preliminary Considerations

[18] "The economy input-output has become, since the publication of the pioneering works of Leontief[…], one of the branches of huge importance to the economic sciences, due especially to its practical character support to the policies. In accordance with this development, the theory that underlies the use of matrices to model the economic structure of society has been concomitantly with the development of computersIf on the one hand, she allowed an economic modeling complexity unimaginable in past recent, this has led to the theory of programming and of economic planning is a very advanced to economists outside of this tradition, which devote themselves primarily to historical studies of the development of social relations that reflect the technical basis of production." (Lopes, Neder, 2011, p. 2).

To understand the interdependence of *n* sectors, the input-output matrices, in its static version, back to the question of determining the level of production that each one of sectors should reach to the demand of different products is satisfied accurately on the basis of *technical relations*.

To simplify the model, which can acquire any degree of complexity, considering the totality of methods/technologies productive, the heterogeneity of goods and joint production, three initial abstractions will be made: 1) each industry or sector produces only a homogeneous goods (or more than one, since they are produced in fixed proportion between themselves); 2) each business or industry uses a fixed ratio of inputs (combination of production factors); 3) the production in all industries is subject to constants incomes in a way that, if the total inputs vary in proportion *k*, the product varies in identic proportion. Made these assumptions, for the production of a unit of any *j*-th goods, the inputs required, in terms of *i*-th goods, are a constant amount, now given by the notation a_{ij} by which, therefore, the first subscribed (*i*) indicates the *input* and the second (*j*) the *product*. Also called *coefficient of input and product*, where it says, for example, that $a_{ij} = 0{,}65$ already indicates that $0{,}65$ units of goods *i* are required as input to produce one unit of product *j*, in general.

A. 2.2 Simple ReproductionWithout Unequal Exchange

In this Table *1* are highlighted in gray the *coefficients of inputs* of products that each sector (I, II, III, ... , *n*) generates for itself, the other to meet the needs of the rest of the economy. Of course, some of these cells are null.

		Product					
	Sectors	I	II	III	...	*N*	***Total***
Input	I	a_{11}	a_{12}	a_{13}	...	a_{1n}	X_1
	II	a_{21}	a_{22}	a_{23}	...	a_{2n}	X_2
	III	a_{31}	a_{32}	a_{33}	...	a_{3n}	X_3
	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	N	a_{n1}	a_{n2}	a_{n3}	...	a_{nn}	X_n
	Total	Y_1	Y_2	Y_3	...	Y_n	***VBP***

Table 1: *Sectorial Interflows*
Source: Own Elaboration.

Should be noted that the *Gross Value of Production* (VBP) is the aggregate of any totals.This is still a closed model, where all demands are considered intermediate,thefinal demanddoes not exist. Emphasize, therefore, among *n* industries or sectors, a sector that determines a *demand non-intermediate*, but *final*, to product of each industry (d_1, d_2, ..., d_n), the families, in return for the provision of a *primary input*, which is: the labor services. The *preliminary condition of equilibrium* is that, e.g., if the *Industry I* produces value enough to meet not only your needs, but those of all the other sectors in terms of their product (x_1), including the *final demand*, its production expressed an *equation:* $x_1 = a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n + d_1$. Isolating d_1, hence reversing the signs and segregating x_1 in evidence, it follows that:

$$(1 - a_{11})x_1 - a_{12}x_2 - \cdots - a_{1n}x_n = d_1$$

By doing the same procedure with the other sectors, will emerge this system:

$$\begin{gathered}(1 - a_{11})x_1 - a_{12}x_2 - \cdots - a_{1n}x_n = d_1 \\ -a_{21}x_1 + (1 - a_{22})x_2 - \cdots - a_{2n}x_n = d_2 \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\end{gathered}$$

$$-a_{n1}x_1 - a_{n2}x_2 - \cdots + (1 - a_{nn})x_n = d_n$$

Translated into matrix notation, has algebraic operative opportunities:

$$\begin{bmatrix} (1-a_{11}) & -a_{12} & -\cdots- & a_{1n} \\ -a_{21} & +(1-a_{22}) & -\cdots- & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ -a_{n1} & -a_{n2} & -\cdots+ & (1-a_{nn}) \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix} = \begin{bmatrix} d_1 \\ d_2 \\ \vdots \\ d_n \end{bmatrix}$$

Denominating*A* the *Sectorial Interflows* of *Table 1* we see that the first matrix of the equation above is equal to -A added to the identity matrix (*I*) in which the elements of the first diagonal are always 1 and the othersare zero. Hence:

$$(I - A)x = d$$

there *x* and *d* are, respectively, the vectors of variables *value* and *final demand*, and $(I - A)$is usually called *technologic matrix*.Hence, by isolating the vector *x*, comes:

$$\bar{x} = (I - A)^{-1}d$$

This $\bar{x}$ is the single solution, which expressed all *values of equilibrium* co-determined; it is sufficient that the technological matrix is *non-singular* (and there is no reason *a priori* to assume its *singularity*[19]) for its inverse $(I - A)^{-1}$exists, and manages the $\bar{x}$.

A.2.3 Extended Reproduction and Unequal Exchange

Let us consider, therefore, the first equilibrium relationship, expressed in this equation:

$$X_i = \sum_{j=1}^{n} x_{ij} + x_i \qquad (6)$$

where X_{ij} is the quantity of the product of the *i*-th sector transferred to the *j*-th, in which it is used as input, and x_i is the part of the product of this industry *i*-th not earmarked for other sectors, surplus, not appearing between the *relations of* industrial interdependence, and may x_i be *consumed*, *exported* or *accumulated*. It deduces the following system of *input-output:*

$$\begin{gathered} X_1 = x_{11} + x_{12} \ldots x_{1n} + x_1 \\ X_2 = x_{21} + x_{22} \ldots x_{2n} + x_2 \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ X_n = x_{n1} + x_{n2} \ldots x_{nn} + x_n \end{gathered}$$

Can highlight among these lines the quantities of labor force employed in the production, indicating the whole by X_0, which can be subdivided into the labor force employed in the genera-

[19] That is to say, simply, that no row or column can have all its elements void, nor be linearly dependent, which would generate a determinate null too, and the vector prices would not have a single solution. But the assumption of sector zero, or with linear dependence of another, it is not realistic or likely.

tion of the products of *i*-ths sectors (X_{0i}), required them, highlighted in bold, and in the workforce used in addition to these needs (x_0) . It follows an interflow sectorial:

$$X_0 = \boldsymbol{x_{01}} + \boldsymbol{x_{02}} \dots \boldsymbol{x_{0n}} + x_0$$
$$X_1 = \boldsymbol{x_{11}} + \boldsymbol{x_{12}} \dots \boldsymbol{x_{1n}} + x_1$$
$$X_2 = \boldsymbol{x_{21}} + \boldsymbol{x_{22}} \dots \boldsymbol{x_{2n}} + x_2$$
$$\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots$$
$$X_n = \boldsymbol{x_{n1}} + \boldsymbol{x_{n2}} \dots \boldsymbol{x_{nn}} + x_n$$

Being this system conceived in terms of values, and not on physical quantities, it may be more appropriately called 'table of transactions'. The technological conditions of production are a synergy systemic continuous, can be described by those same *technical coefficients* or coefficients of production (a_{ij}), redefined as the reason of sector products *i*-th to the *j*-th (x_{ij}) and the total of productive demand of *j*-th (X_j), which implies: $a_{ij} = \frac{x_{ij}}{X_j} \therefore x_{ij} = a_{ij}X_j$. Replacing this definition x_{ij} set out in equation (6) emerges from this: $X_i = \sum_{j=0}^{n} a_{ij}X_j + x_i$. Considering $X_i = X_j$, can replace it in the above equation and generate this: $x_i = (1 - a_{ii})X_j - \sum_{j \neq i}^{n} a_{ij}X_j$. Distributing to all sectors, embodies the matrix of *technical coefficients*, identical to that which we have seen, equal to –A increased the identity matrix (*I*), in form:

$$\begin{bmatrix} (1-a_{11}) & -a_{12} & -\cdots- & a_{1n} \\ -a_{21} & +(1-a_{22}) & -\cdots- & a_{2n} \\ \dots & \dots & \dots & \dots \\ -a_{n1} & -a_{n2} & -\cdots+ & (1-a_{nn}) \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}$$

The volume of production of inputs, including solid waste, which satisfiesthe needs of consumption crosscutting is:

$$\bar{X} = (I - A)^{-1}x$$

In the system are flagged absolute quantities, measured in physical units or values, but the system needs to be expressed in prices and quantities to come to the surface, how the transactions are showed to market players. Indique, therefore, the twofold schema notations:

- *Workforce:*

  p_0 = Remuneration of labor force.
  p'_0 = Remuneration of labor force employed in addition to the needs of refitting crosscutting;
  q_0 = Quantity of workforce;
  q'_0 = Quantity of employed work force in excess of the needs of refitting crosscutting;

- *Products of Work:*

  $p_1, p_2 \dots p_n$ = Prices of the products in the sectors 1, 2, ... , *n* needed to interflow of economy;
  p'_i = Price of the product of the sector *i*-th that exceeds the needs of interflow of economy.
  $Q_i = \sum q_i = q_1 + q_2 + \cdots + q_n$ = Total quantity of physical product of sector *i*-th;
  q_i = Quantity of physical products of sectors 1, 2, ... , *n* necessary to interflow of economy;
  q'_i = Quantity of physical product of sector *i*-th that exceeds the needs of interflow of economy.

Applied such prices at which quantities, has economic costs overall:

$X_0 =$ Wage fund (total remuneration of labor);

$x_{0j} = p_0 q_{0j}$ = Wages necessarily employed for replacements crosscutting (Obs.: $p_0 q_{0j} = p_i q_{ij}$ when $i = 0$);

$x'_0 = p'_0 q'_0$ = Wage employed in addition to the needs of refitting crosscutting;

$X_j =$ Aggregate cost of product of sector *i*-th;

$x_{ij} = p_i q_{ij}$ = Cost of each product in the sector *i*-th to the *j*-th (i =1, 2, ... , n).

$x'_i = p'_i q'_i$ = Cost of the products of the sector *i*-th not intended to interflows sector;

Before structure in a matrix in orders these magnitudes, formalizes the two species of fundamental equations that constitute the model input-output:

$$X_0 = p_0 \sum_{j=1}^{n} q_{0j} + p'_0 q_j \ \ (i = 0)$$

$$X_j = p_i \sum_{i=1}^{n} q_{ij} + p'_i q_i \ \ (j = 1, 2, \dots, n)$$

Expanding the summation or disaggregating each q_{ij}, emerges the matrix:

$$X_0 = p_0 \sum q_{0j} + p'_0 q'_0 = \boldsymbol{p_0 q_{01} + p_0 q_{02} \dots p_0 q_{0n}} + p'_0 q'_0$$

$$X_1 = p_1 \sum q_{1j} + p'_1 q'_1 = \boldsymbol{p_1 q_{11} + p_1 q_{12} \dots p_1 q_{1n}} + p'_1 q'_1$$

$$X_2 = p_2 \sum q_{2j} + p'_2 q'_2 = \boldsymbol{p_2 q_{21} + p_2 q_{12} \dots p_2 q_{2n}} + p'_2 q'_2$$

.....

$$X_n = p_n \sum q_{nj} + p'_n q'_n = \boldsymbol{p_n q_{n1} + p_n q_{n2} \dots p_n q_{nn}} + p'_n q'_n$$

$$\boldsymbol{S_1} \ + \ \boldsymbol{S_2} \ \dots \ \boldsymbol{S_n}$$

$$\boldsymbol{Y_1} \ + \ \boldsymbol{Y_2} \ \dots \ \boldsymbol{Y_n}$$

To demand for *refitting* is equivalent to offer it is necessary to reserve the last plots of horizontal sums (without bold), which does not maintain relationship with that demand, and on the basis of relations of interflow sectorial, not implying costs of production. The $\boldsymbol{p_i q_{ij}}$(i = 0, 1, 2, ... , n) are *horizontal plots* of inputs necessary to *j*-th products and total production costs incurred with the labor forces *and with the n products :*$x_{0j} q_{ij}$

$$Equation\ of\ Costes = x_{0j} + p_i \sum_{i=1}^{n} q_{ij} \ (j = 1, 2, \dots, n) = X_j$$

The surplus $S_j$is the difference between the costs of the products of *sector* (X_j) and the sectorial prices market, that the classic called *cost of production*(Y_j) (with profit): $S_j = Y_j - X_j$ (j = $1, 2, \ldots, n$). Rewriting $Y_j = X_j + S_j$ and replacing X_j in the cost equation, extracts a theoretical relationship fundamental, identical to *Marxian decomposition of the valueof the product* of a national economy (Lange, 1986, p. 66), given by:

$$Y_j = x_{0j} + \sum_{i=1}^{n} x_{ij} + S_j \ (j = 1, 2, \ldots, n)$$

The 'decomposition Marxian of value of product', remember, was given by $c_j + v_j + s_j$, respectively equal to the terms $p_i \sum_{i=1}^{n} x_{ij}$, x_{0j} and S_j above. It would be possible to do the demonstration of identity, in two sectors, this analysis with the schemes of reproduction of *Book II* of *The Capital*before adapted, as a clear sign of their strict consistencies *mathematics* and *theoretical-methodological*.

In our terminology, unlike the matrix notation leontieffian, the superscript *i of* e^i non indicates the *i*-th sector of production of an input, but the *unreciprocal* allocation between the value transferred and the price paid in a transaction, the *unequal exchange*, than its rating will be changed to e^{TD}. As $S_j = Added\ Value = e^i$,concludes: $Y_j = x_{0j} + \sum_{i=1}^{n} x_{ij} + e_j^{TD}$ $(j = 1, 2, \ldots, n)$.

Remembering that $x_{0j} = p_0 q_{0j}$, that $x_{ij} = p_i q_{ij}$ and that S_j is the product of X_j from a particular *coefficient of profitability*, *growth rate* or *exploitation*,identical in magnitude to the index *of asymmetry* between the sectorial values and final prices traded, now noted by $\Psi_{e_i^{TD}}$, can then rewrite it:

$$Y_j = p_0 q_{0j} + \sum_{i=1}^{n} p_i q_{ij} + \left[\left(\Psi_{e_i^{TD}}\right)(X_i)\right] (j = 1, 2, \ldots, n)$$

Given that $Y_j = X_i p_i$ and $x_{ij} = q_{ij}$, given that $a_{ij} = \frac{x_{ij}}{X_j}$ and $X_j = X_i$, emerges:

$$\frac{X_i p_i}{X_j} = \frac{p_0 x_{0j}}{X_j} + \sum_{i=1}^{n} \frac{p_i x_{ij}}{X_j} + \left[\frac{\left(\Psi_{e_i^{TD}}\right)(X_i)}{X_j}\right] \therefore p_i = p_0 a_{0i} + \sum_{i=1}^{n} p_i a_{ji} + \Psi_{e_i^{TD}}$$

Note that this is a *column*, not a *line*, the *ij* reverse in *ji*. By isolating $\Psi_{e_j^{TD}}$ this equation of technical coefficients and replacing p_i highlights:

$$(1 - a_{ii}) p_i - \sum_{j \neq i}^{n} p_i a_{ji} - p_0 a_{0i} = \Psi_{e_i^{TD}}$$

The matrix technique, now, he praises the *indices of asymmetry* at: $\overline{\Psi_{e_i^{TD}}} = (I - A)^{-1} p$ or:

$$\begin{bmatrix} (1 - a_{11}) & -a_{21} & -\cdots- & a_{n1} - a_{01} \\ -a_{12} & +(1 - a_{22}) & -\cdots- & a_{n2} - a_{02} \\ -a_{13} & -a_{23} & +\cdots- & a_{n3} - a_{03} \\ \ldots & \ldots & \ldots & \ldots \\ -a_{1n} & -a_{2n} & -\cdots+(1 - a_{nn}) & -a_{0n} \end{bmatrix} \begin{bmatrix} p_1 \\ p_2 \\ \vdots \\ p_n \\ p_0 \end{bmatrix} = \begin{bmatrix} \Psi_{e_1^{TD}} \\ \Psi_{e_2^{TD}} \\ \vdots \\ \Psi_{e_n^{TD}} \\ \Psi_{e_0^{TD}} \end{bmatrix}$$

Should be noted that, derivedfrom equation column, this *matrix technique* is different. There are a great number of inferences and possible interpretations of this formalization, but which certainly one of the point mostsuggestive is the explanation of that, in different general equilibrium models, remains hidden, the *unequal exchange general*, without breaking the laws of *reproduction*.

Appendix B - Simulacrum of Market Price (*in Disequilibrium*)

Being A_m and B_n values of goods *m* and *n*, respectively, of the owners *A and B*, in which α it's the *rate of exchange*, is unrealistic that, if $|\Delta A_m| \neq 0$, i.e. if A_m varies, thereis

$$\frac{A_m}{B_n} = \alpha = \frac{(A_m \pm \Delta A_m)}{B_n}$$

E.g., $A_m = 15$ and $B_n = 15$, $\alpha = 1$. If $|\Delta A_m| \neq 0$, α is *greater* or *less than* 1.

$$1 \lessgtr \frac{(A_m \pm \Delta A_m)}{B_n} = \alpha$$

The double equality will be particularly important when defining the process by which the rents that the riches generated are divided, unsuspectingly, by means of inequalities in trade. Without this consistency quantitative cannot even conceptualize the *value of exchange*, whatever, nor operate it, and the exchange tract be, always, between equivalent values for the simple fact that occur. Now formalize such bases with *inequalities* and with *equations in differences*. Given the relationship $A = y_{t-1} B$ where*A*and *B* are the actual values of goods *a* and *b*, where y_{t-1} is the rate *of exchange* at the moment precedent (*t*- 1), raising the value *A*, generates the *inequality*$A+\Delta A > y_{t-1}B$. Being y_t the rate to exchange (or price) that *equalize* the *inequality* at time *t*, generates this other *inequality*$y_t > y_{t-1}$or

$$y_{t-1} = \frac{A}{B} < \frac{(A + \Delta A)}{B} = y_t$$

Inversely, the value*A*can low, generating *inequality*similar. We can observe the situation from the difference in price, not values, i.e., between $y_t$and y_{t-1}, in the form of Δy, which may take many magnitudes over time. When, e.g., the *actual value* and the *nominal* (price) of *A* diverge, adventures taken place. Both usually vary together, not always in the same direction or proportion. If, at a given time, the price of*a* diverts from the *A*and *a* is replaced by *b*, whose price is not in the same disarray with *B*, there is an *unequal exchange*[20].Thus, we have always set a $\Delta y \equiv y_{t+1} - y_t$where y_t is the greatness of y the *t*-th period and y_{t+1} is your successive value. Adopting notation more concise, the equation is rewritten as $\Delta y_t = y_1 - y_0$. Now dynamizing the model. Given a *mean variation constant positive* Δy, e.g., along quarters or semesters; expanded the *arithmetic progression*, will emerge.

[20] Note that the variable *t* can also be continuous or discrete, producing no effect on the basic nature of the analysis, although the formalization of the problem if modify, in the first case it is the notation of *lead dy/dt* and in the second the differentiation $\Delta y/\Delta t$, which is the corresponding discrete from.

$$y_1 = y_0 + \Delta y_t$$

$$y_2 = y_1 + \Delta y_t = (y_0 + \Delta y_t) + \Delta y_t = y_0 + 2(\Delta y_t)$$

$$y_3 = y_2 + \Delta y_t = [(y_0 + \Delta y_t) + \Delta y_t] + \Delta y_t = y_0 + 3(\Delta y_t)$$

$$\vdots \qquad \vdots \qquad \vdots \qquad \vdots$$

thenappears the generalization$y_t = y_0 + t(\Delta y_t)$, when the proportion of exchange between *A* and *B* becomes enunciable as $A = [y_0 + t(\Delta y_t)]B$ or simply $\boldsymbol{A = y_t B}$. This result is and will be, of course, always the same. E.g., if we move to a separate expansion any, as the geometric $y_1 = (\Delta y_t)y_0$, now will emerge:

$$y_1 = (\Delta y)y_0$$

$$y_2 = (\Delta y)y_1 = [(\Delta y)y_0]\Delta y = (\Delta y)^2 y_0$$

$$y_3 = (\Delta y)y_2 = [(\Delta y)^2 y_0]\Delta y = (\Delta y)^3 y_0$$

$$\vdots \qquad \vdots \qquad \vdots \qquad \vdots$$

thenappearsthe generalization $y_t = (\Delta y)^t y_0$, when the proportion of an exchange between *A and B* becomes enunciable as $A = [(\Delta y)^t y_0]B$ or, once again, $\boldsymbol{A = y_t B}$. Is thus demonstrated that, by more or less that is Δ*A* (or Δ*y)*, regardless of whether this variation is positive or negative, compassionate or accelerated, there is always an $\boldsymbol{A = y_t B}$ final as a supposed "*equilibrium price*". But is generally in disequilibrium!

> What characterizes this form of movement is that always presents itself as a phenomenon that ensures the exchange of products 'equivalent'. This is why Marx can show that the exchange market has, necessarily, the form of *equivalent exchange*. Therefore, the form 'value' is what he calls the '*equivalently form*'. The latter is not more than the form of a 'reflection': each commodity 'reflects' its value in another commodity which serves as a mirror. This mirror effect is typical of a space of representation; in this case it is the space of representation of mercantile society, space that provides the bourgeois ideology their *family figures*: the equivalence, equality, reciprocity, etc. The struggles that develop on the ground of bourgeois ideology always puts in action these notions, from which those who are wrapped up in this ideology are looking for 'justify' the 'fair' and 'unfair', 'demonstrate' that this particular relationship satisfies or does not satisfy the ideological criteria of equivalence, or equal, etc. Also the 'disorders' that the ideological battles do suffer to appearances of equivalence does not leave the field of illusory forms inherent in the space of representation of itself Market relations. The denunciation of injustice of an exchange implies the illusion of 'exchange fair', the 'fair price', etc. (Bettelheim, 1972, pp. 306-307).

This equation$\boldsymbol{A = y_t B}$, presentable of different ways, since the *exchange simple* to *complex*, is the symbol of all the mystification of prices and quantities that are exchanged in a equality without necessarily are equivalent.

Now let's to a brief look at the general process of solution of *equationsin time*, preliminarily observing a generic procedures for solution of an equation of differences in homogeneous form $my_{t+1} - ny_t = 0$ that, rewriting, is

$$y_{t+1} = \left(\frac{n}{m}\right) y_t$$

Remembering that we have defined, always a $\Delta y \equiv y_{t+1} - y_t$, where y_t is the value of y the *t*-th period and y_{t+1} its value then. Now, streamlining iteratively the above model, we have the final generalization given by this sequence

$$y_1 = \left(\frac{n}{m}\right) y_0$$

$$y_2 = \left(\frac{n}{m}\right) y_1 = \left[\left(\frac{n}{m}\right) y_0\right] \frac{n}{m} = \left(\frac{n}{m}\right)^2 y_0$$

$$y_3 = \left(\frac{n}{m} y\right) y_2 = \left[\left(\frac{n}{m}\right)^2 y_0\right] \frac{n}{m} = \left(\frac{n}{m}\right)^3 y_0$$

$$\vdots \qquad \vdots \qquad \vdots \qquad \vdots$$

$$\boldsymbol{y_t = \left(\frac{n}{m}\right)^t y_0}$$

Is particularly important the interpretation of the term $\left(\frac{n}{m}\right)^t$ which generated the y values from t. For the purposes of this appendix, only signal that, noting y_0 to A and $\left(\frac{n}{m}\right)^t$ tob^thave a formula *of solution* more concise$\boldsymbol{y_t = Ab^t}$. Now discuss the capital role of b^t in the determination of the stability or not of the equilibrium, *ceteris paribus*, depends onthecomplementary functiony_c tending tozero in long run, i.e., depends on the trajectory of $Ab^t$when *t* rises; to simplify the analysis, by focusing attention on exponential basis b^t, adopt provisionally that $A = 1$. With the possible values of *b* between $+\infty$ and $-\infty$around the axis 0, is possible to compose a table of values of b^t and defines *seven distinct regions*:

Region	**Value Range from *b***	**Example Random Value of *b***	**Value of b^t**				
			T=0	T=1	T=2	T=3	T=4 ...
I	$b > 1$	2	1	2	4	8	16
II	$b = 1$	1	1	1	1	1	1
III	$0 < b < 1$	1/2	1	1/2	1/4	1/8	1/16
IV	$b = 0$	0	0	0	0	0	0
V	$-1 < b < 0$	-1/2	1	-1/2	1/4	-1/8	1/16
VI	$b = -1$	-1	1	-1	1	-1	1
VII	$b < -1$	-2	1	-2	4	-8	16

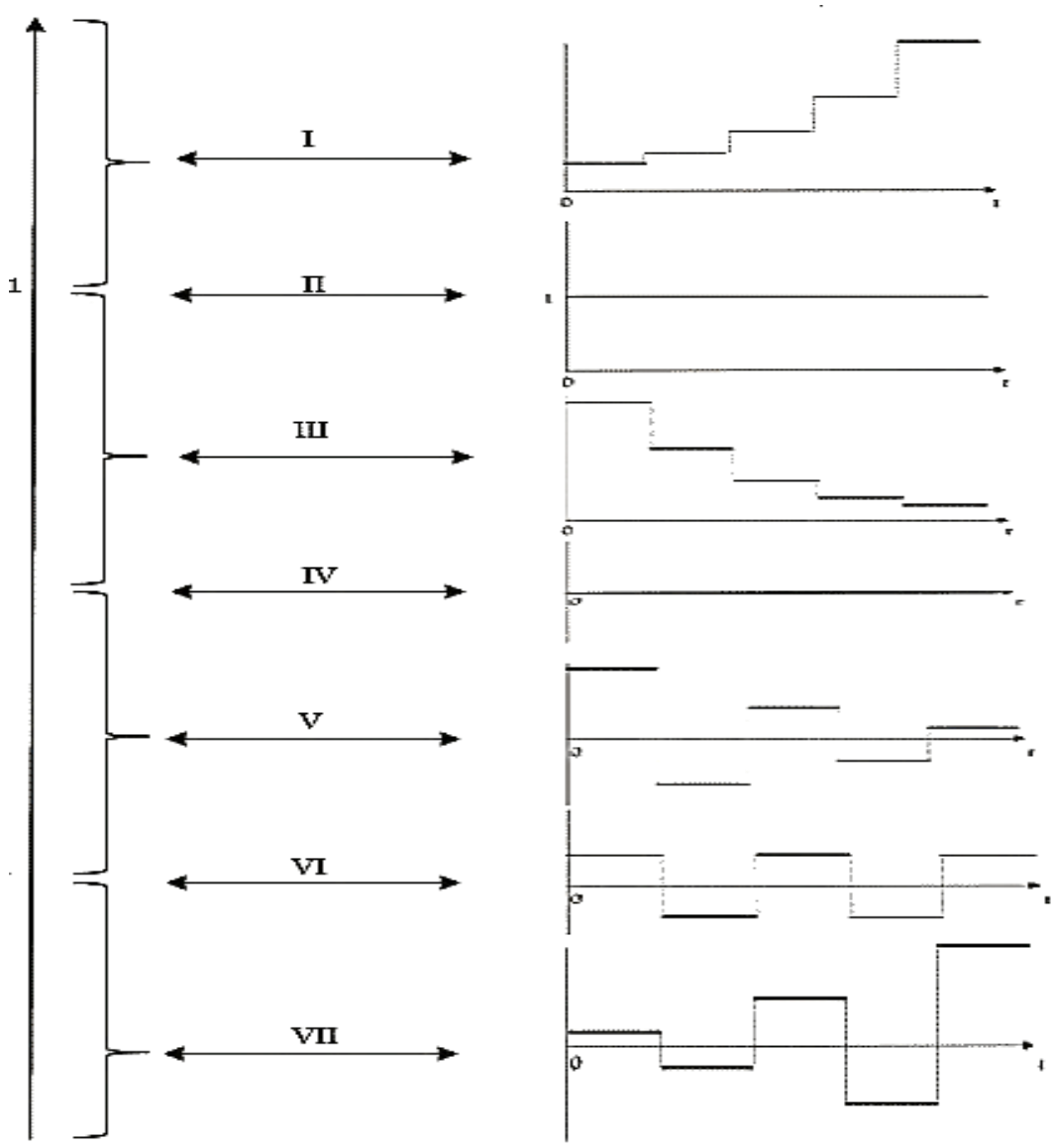
Representing graphically these results (Graph 3), we have an excellent perspective: only for the *Regions III* and *V* the complementary function y_c (=Ab^t) tends to zero over time, except the *Region IV* where she is constantly equal to zero, while in the other or is equal to 1 (*Region II*), or, in an accelerated manner, each time greater than 1 (*Region I*) or, alternately (or oscillatory), now equal to 1 and -1 (*Region VI*), sometimes with positive values exponentially greater than 1 or less than -1 (*Region VII*). Summarize the typologies of the *table above* on the diagram:

- Temporal Trajectory of Ab^t*Non-Oscillatory*: if b>0.
- Temporal Trajectory of Ab^t*Oscillatory: if b<0.*
- Temporal Trajectory of Ab^t*Explosive: if* $|b|>1$.
- Temporal Trajectory of Ab^t*Compassionate: if* $|b|<1$

Value of b Region Setting b^t

Obviously, this approach is abstract and must be econometrically adapted to local realities. Empirical studies show that the explosive behavior are not realistic, except in situations of crisis or exogenous shocks, insolvency of the offer or accelerated speculation. Rates of unequal trade usually converge to a swing point.

Now observer the solution of *Equation Non-Homogenous Complete*.Assuming the need for solution of an equation in differences of the first order, where a *and* c are constant, in the form $y_{t+1} + ay_t = c$, whose general resolution consists of the sum of two elements, which are: (I) a *particular integral* y_p (perhaps more appropriately called a *particular solution*, because it does not involve integration process) that resolves the *equation complete non-homogenous* above and (II) an additional function y_c, which is the root of the equation *reduced*$y_{t+1} + ay_t = 0$, being that the component y_p represents the level of *equilibrium* of y and that, inversely, y_c responds by deflection of the *trajectory of equilibrium*. This element is the focus of analysis of the exercise of domination power. This sum solve the equation by induction of constant. Thus, the algebra will generates a solution from consider an initial condition of the waste market.



Graph 3: *Dynamic Equilibrium of Non-Equilibrium*

Source: (Chiang, 1982).

Employ, so evocative, for the *equation reduced* $y_{t+1} + ay_t = 0$ a solution in the form $y_t = Ab^t = y_c$, for which, it is logical, $y_{t+1} = Ab^{t+1}$ etc.

$$Ab^{t+1} + aAb^t = 0 \Leftrightarrow Ab^{t+1} = -aAb^t \Leftrightarrow b^{t+1} = -ab^t$$

The initial moment (when t=0) is defined: $b = -a \therefore \boldsymbol{y_c = A(-a)^t}$**.** Alternative solutions, therefore, are in front of the analyst, initially. The simplest, of course, is the assumption that $y_t = k = y_p$, i.e., that y remains constant throughout the time, provided that it works, so that $y_{t+1} = y_t$, generating, by replacing in *equation non-homogenous complete*, these:

$$k + ak = c \quad e \quad k = \frac{c}{1+a} \;\therefore\; y_p(= k) = \frac{c}{1+a} \qquad (a \neq -1)$$

In this case, the equilibrium would be stationary, provided that really $a \neq -1$, otherwise the solution would no longer be satisfactory, requiring new attempt of solution, not more assuming that $y_t = k$, but, for example, that $y_t = kt$, hence:

$$y_{t+1} = k(t+1) \;\therefore\; k(t+1) + akt = c \quad and \quad k = \frac{c}{t+1+at} = c \quad (thus\ a = -1)$$

Hence, $\boldsymbol{y_p(= kt) = ct}$**.** Representing a function not constant of *t*, this second option points to a sort of equilibrium mobile, which, as far as the constant, just tell us about two forms of stability of the variables of an unequal exchange real. To determine it is necessary some tests, initially adding y_p and y_c and writing the *general solutions alternatives* in possible ways

$$y_t = A(-a)^t + \frac{c}{1+a}(a \neq -1) \qquad (F1)$$

$$y_t = A(-a)^t + ct \qquad (a = -1) \qquad (F2)$$

Being *an*arbitrary constant, both solutions are uncertain, still, being necessary, to *F*1, to use the*initial condition* $(t = 0)$:

$$y_0 = A + \frac{c}{1+a} \Leftrightarrow A = y_0 - \frac{c}{1+a} \therefore \boldsymbol{y_t = \left(y_0 - \frac{c}{1+a}\right)(-a)^t + \frac{c}{1+a}}$$

Also, in*F*2, $y_0 = A$, hence emerge the *solution* $\boldsymbol{y_t = y_0(-a)^t + ct}$ or, remembering once again that, in this case, $a = -1$, we have the simply$\boldsymbol{y_t = y_0 + ct}$.

ACKNOWLEDGMENTS:

First the Secretary of State for Labor, Employment, Income and Sports, Prof. PhD. Nilton Vasconcelos, for the opportunity to act in the management of the policy of Solidary Economy in Bahia, Brazil. The Superintendents of Solidary Economy of the Government of Bahia, Teach. PhD. Milton Barbosa Filho and Doc. Eng. Helbeth Lisboa de Oliva, by stimulating research.To Teach.PhD. Henrique Tomé and Teach. PhD. Vitor Athayde, by teaching and academic incentive. To economics Doc. Joselito Moura and Teach.MSCA. Plinio P. Moura, respectively, by the microeconomic debates and by some aspects of the analyses in classical political economy.To Teach.PhD. Rafael Antonio Sorhegui Ortega, for receiving at the University of Havana and the example of dedication to economic science. The Teach. PhD. Vilma Hidalgo y Teach. PhD. Yaima

Doimadiós, for example to take on challenges in applied economics. The Teach. Doc. Jecilda Melo and the General Coordinator of AMACH, Mr. Cícero Melo, the partnership and institutional support.