

ON THE CREATION AND DESTRUCTION OF VALUE IN CAPITALIST POLITICAL ECONOMY SYSTEMS IN PARTICULAR AND IN ECONOMIC SYSTEMS IN GENERAL

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I. HISTORICAL BACKGROUND

There is a debate within Marxism , fundamentally between the current known as the *New Interpretation* (abbreviated as "NI" and founded by Foley and Duménil)

and the current known as *Temporal Single System Interpretation* (abbreviated as TSSI and founded by Alan Freeman and Andrew Kliman) . The points of dispute between both currents are varied, however, the discussion about the conservation or destruction of value is of special interest.

A level of Classical Mechanics, there is a physical category known as *work* (physical nature), symbolized as W (of the English \acute{e} s " Work "), which has two key features (both theoretical nature and applied) that help to understand what Marx raised in reference to economic work and the value linked to it; This is so because Marx, like any person of his time, was influenced to some degree (which varies according to the author and the scientific branch of which one speaks - in Marx's case it was minimal, judging by his writings, especially the *Grundrisse* -) by the Classical Mechanics of the time, despite the fact that Marx advanced, for example, to break with the notion of equilibrium of Classical Mechanics (the transformation of values into prices of production follows a logic that to some extent recalls of the wave-particle duality of Quantum Mechanics), while in other cases there were economists (for example, Walras) for whom not only their notion of equilibrium, but their economic notions in general, were determined by Classical Mechanics .

The first characteristic is the same definition of work, *ie* , "(...) it is said that a force performs work when there is a displacement of the center of mass of the body on which the force is applied, in the direction of said force", while the second feature is that "since by definition work is an energy transit (...) never refers to \acute{e} l as increased workload, nor is symbolized as W ", as verified in (Wikipedia, 2021) . The first characteristic implies (considering it not at a physical level but reflecting it philosophically) that the work has a direction (as the course of a trajectory), a reason for being for that direction and an alteration of the location or state of the body on which it is applied. ; A synthetic way of looking at it is to think of physical work as "the application of a force along a displacement" (Wikipedia, 2021) , which captures the notion that it consists of the application of a force that opposes

the location of the object with sufficient intensity to displace it from its location within the system, regardless of the system . The second characteristic means that, by definition, since "transit" is defined as "Going or passing from one point to another through public roads or places" (Real Academia Española, 2021) , the physical work applied to an object transfers its energy to that object.

In a capitalist political economy system, the physical location of the object finds its equivalence in the value crystallized in a set of commodities made up of the means of production (constant capital, which is made up of property, plant, equipment, raw materials, materials intermediate products -products in the middle of the manufacturing process- and auxiliary materials), so in order to change the value of the means of production and make it possible for a surplus to exist, the work must be applied to such merchandise and, by definition, as “ only work creates value ”(the famous classical postulate - masterfully developed by Ricardo when studying political economy systems, since when studying geopolitical economy systems he abandoned the law of value and used Hume's Quantitative Theory of Money - which takes up Marx), then it is intuitive from this that to create value work must transfer the value of physical wear and tear and mental that of the worker to the merchandise he produces (determined in turn, like that of all merchandise - evidently, labor power is one of them - by the simple average labor socially necessary for its production - production being understood simultaneously as reproduction-) and transfer the value of the means of production. The logic of this will be verified below .

II. FACTORIAL CONTRIBUTION TO THE PRODUCTION PROCESS . A HISTORICAL, GNOSEOLOGICAL , THEORETICAL AND ECONOMETRIC REVIEW

III. First and scenario: no productive factor creates value

Assume then the reverse, that is, that labor does not create value and neither does capital create value, which would lead to the absurdity that there is no economic

growth because there is no surplus and, with it, the entire history of class societies. It could be interpreted, in the most benevolent of cases, as a deception of some god to the human mind. Of course, the Marginalist School and all its derivatives (the neo-marginalist school - miscalled "neoclassical" -, the Austrian school, the Keynesian school and the Post-Keynesian school) support subjectivist, metaphysical and dogmatic explanations, however, this research is not intended to be a compendium of refutations (there are several) of such "theories", so that this task will be carried out in another investigation.

II.II. Second e scenario: ú solely the means of production create value

The other possible scenario is that only the means of production create value, but if this were the case it would imply that in class societies the dominant class bloc of society would not need the dominated class bloc for anything more than mobilizing the means of production and themselves. They would create value with autonomy from the workforce; However, a minimal historical study of both the primitive community and the slave mode of production and the feudal mode of production shows that these forms of economic, political and social organization were sustained on the basis of human labor (mainly the slave mode of production), both in ancient Greece and in the Roman Empire -both the eastern and western-. Of course, the previous approach could seem objectionable in the case of capitalism, due to the high degree of automation achieved in current capitalist societies, however, this would be to confuse the fact that technological change fulfills the function of atomizing human labor in order to make its application more efficient and not only achieve this efficiency by atomizing it, but also by returning to the matter on which it is applied more efficiently in its absorption of such work, which is perfectly compatible with the statement that only human work creates value, so it is even more so with the affirmation that work creates value (without attributing any exclusivity to it in such a process); In addition, it would also be to ignore that such an appearance (that of an automation sufficient to dispense with work as a source of value) was not observed in the very genesis of

capitalism and, instead, the opposite phenomenon was observed, for example, when during the period of the original accumulation of capital (brilliantly described by Marx in Volume I of *Capital*, in the segment of the work devoted to his study) direct producers were violently expropriated in order to create a labor market, the intensification the slave trade (which not only mobilized slaves from Africa, but also from the colonies in America) during the period of initial formation of European capitalism, the long and intense working days in Europe that had recently seen the birth of the revolution in its bosom Industrial prior to the discovery of America, etc. This without considering the fact that in the initial technological state of humanity there were no more means of production than the inputs (in their most basic state) that nature normally provided and provides, not means of production such as chrysalis of human labor (property, plant and equipment, materials processed in any way, etc.) on such inputs, as at present (since that initial state was abandoned).

In (Sánchez & Ferrández, Valores, production prices and market prices from data on the Spanish economy, 2010) a study is carried out on the relationship between direct prices (proportional to value), production prices (the primus of capitalist industrial production, are the prices that are industrially formed) and the market prices or selling prices (the final prices set in the market by the interaction of supply and demand -in Marx they are called selling prices because they are fixed in the sphere of commercial capital, not productive capital-), obtaining results that verify the statements previously made. This relationship is modeled by using regression models regression of the form, as shown below.

Source: (Sánchez & Ferràndez, Values, producer prices and market prices based on data from the Spanish economy, 2010, p. 93) .

Source: (Sánchez & Ferrández, Values, producer prices and market prices based on data from the Spanish economy, 2010, p. 94) .

Some questions must be raised about this. As is widely known, there is in (Kliman, The law of value and laws of statistics: sectoral values and prices in the US economy, 1977-97, 2002) a critique of the experimental results obtained by Marxist econometricians in the last 15- 20 years of research related to the statistical correlation between values and prices obtained from the input-output matrices of different countries throughout the globe, arguing on them that the correlation was spurious in an apparently robust way and performing as an empirical demonstration of their argumentation a simulation posed in terms of statistically implying a non-spurious correlation between values and prices (and this will be verified at the end of the simulation^[11]), achieving this by assigning disturbance terms with specific magnitudes for this purpose; These disturbances in values mathematically express a theoretical and practical fact of political economy systems, which is nothing other than the variability that exists between values and prices due to the existence of an average rate of profit generated by capitalist competition (Stochastically this was raised in the simulation by multiplying the cost price-constant capital and variable capital- by the average rate of profit , which in turn is posed as a normally distributed stochastic variable with mean equal to the average rate of aggregate profit of the The political economy system to be studied and variance The reason why the average rate of profit is theoretically considered (in its stochastic version) as a variable whose distribution is normal is explained by two reasons.

The first of them obeys the same statistical theory and the verifications that have been carried out on this theory, since at the local level (in the topological sense) the central limit theorem (TCL) establishes that there is a convergence to the normal distribution when the number of observations (or stochastic vectors, in its most general form) is “large enough” (expression that crystallizes how statistical theory

defines, according to each probability distribution, the degree to which it must have traveled towards infinity to normalize), while at the global level it is the Law of Large Numbers (LGN, be it the weak or strong version) and the Ergodic Theorem (which is nothing more than a generalization of the LGN)[\[2\]](#). Of course, it could be objected that in complex systems (and the capitalist political economy system) the variables are closely related to each other, so expecting that there is stochastic independence between them violates the slightest common sense and that, therefore, Therefore, the statistical laws that justify the probabilistic normality of the average rate of profit should not belong to the domain of Classical Statistics and should be approached, for example, through copula theory, which formally seems to be true ... but not. it is, not even formally. Indeed, from the formal point of view of rigorously classical statistical theory, the central limit theorem, the law of large numbers, and the ergodic theorem inexorably require that random variables possess stochastic independence. is the performance of these theorems in the absence of stochastic independence between the study variables? An exhaustive review could be made here of the thousands of investigations (for example, in Econometrics) in which there is multicollinearity (which precisely violates the assumption of stochastic independence, because it implies that the scalar product of the stochastic vectors is different from zero, for what there is linear independence between such vectors, which, being stochastic, becomes stochastic dependence), however, it is possible to save the efforts that such a titanic task demands, since it is widely known that this stochastic dependence is not relevant at the applied level. provided that this dependence is not significant in terms of the impact it has on the variance (hence the importance of the tests that consist of measuring variance inflation factors), since linear dependence is fundamentally undesirable because it can return undesirably volatile the behavior of the variance, which reduces predictive power in the framework of classical statistical models, so if it is kept under control. So statistical theory has no relevance and the only thing that matters is the applications? Not at all!

Empiricism is not well received in Marxism, much less in its Marxian or classical aspect, which is what this research is leading[3].

What happens is that, like light and sound when Nature partes the sky with electric fury, practice "travels faster" than theory, so the deficiencies of the paradigm (in the sense of Thomas Kuhn) they are first evidenced in the applications and it is after that that the new findings are theorized and the new paradigm is consolidated, since the paradigms are nothing more than "(...) one or more past scientific achievements, achievements that some particular scientific community recognizes , for a certain time, as a basis for its later practice. " (Kuhn, 2011, p. 33) . Thus, in research (Dedecker & Prieur, 2007) the empirical existence of a central limit theorem for multidimensional distributions is demonstrated , in research (Andrews, 1991) the existence of the TCL for empirical processes indexed by soft functions is demonstrated (in which the underlying stochastic variables can be temporally dependent and non-identically distributed), the research (KO, RYU, KIM, & CHOI, 2007) proposes a general version of the TCL for weighted sums of random variables with linear dependence negative quadratic (the central idea of this research is to weight the elements of a non-negative triangular matrix, whose elements have a finite measure, weighting the elements of this matrix with a succession of negative quadratic linear dependencies), in the research (LI, 2015) a proof of the central limit theorem is proposed under the specified conditions (dependent variables under or mathematical structures known as spaces of sublinear expectations), in the research (Berk, 1973) a generalization of the TCL is proposed for dependent variables without considering any local boundary of the space where such a generalization is proposed, in the research (Parzen, 1957) a demonstration of compliance with the TCL is proposed for the case of multilinear stochastic processes , in the research (Godwin & Zaremba, 1961) the verification of the TCL is proposed when the variables, although they are dependent on each other, are only partially so (the ratio why the authors use " partly dependent " instead of " partially dependent " is due to the fact that, according to (Alan, 2011) , " parly " is used when an object is part of a

tangible whole and partially when it is not). Thus, the state of the art on the subject points not only towards an empirical validation of the aforementioned, but also that it is a matter of time before the paradigms of Classical Statistics become generalized and strengthened at the global level.

The second motif is compound. On the one hand, the fact of assuming that the stochastic behavior of the average rate of profit is normal obeys the same Marxian theory. The average rate of profit is, as the variables studied since Marxism are in general, a variable analyzed in the long term (large sample), which finds congruent complementation in the statistical theory previously exposed. On the other hand, from the epistemological perspective, if the average rate of profit were not stochastically normal in the long run, not only would points of contention appear (not necessarily irreconcilable) between statistical theory and Marxian theory, but it would also complicate the estimation. of production prices (since the average rate of profit is a variable with normal stochastic behavior, it is easy to express production prices as deviations from the average rate of surplus value - the result that capitalist competition causes the corresponding share of surplus value during simple mercantile production it is replaced by the average rate of profit that said competition generated-).

Long-Term Trend of Average Profit Rate. United States 1963-2008

Source: Own elaboration in R Studio, based on (Marquetti & Foley, 2021) .

Adjustment of the Normal Probability Distribution of the Average Rate of Profit for the United States, 1963-2008

Source: Own elaboration in R Studio, based on (Marquetti & Foley, 2021) .

It is verified that the stochastic assumption of normality for the average rate of profit of the capitalist political economy system is valid.

In the research of (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005) a forceful refutation is made to the criticism of the American Marxist economist Kliman, on which its essential aspects will be exposed.

Computer scientists argue that Kliman's claim of spurious correlation is based on a misconception of what spurious correlation is. Thus, they point out that "The danger of a false correlation is quite real. Take, for example, a study of the association between alcohol use and violent crime. Suppose a researcher runs a regression with the number of violent crimes as the dependent variable and the amount of alcohol consumed as the independent variable, for a sample of cities of highly variable sizes. We should expect to find a significant positive coefficient on alcohol consumption, but this would be of no scientific interest: it would simply be expected that larger cities would show both more crime and more alcohol consumed. The obvious correction here is to scale both variables of interest by expressing them per capita, dividing by the population of the city. If there is still a significant positive association, this could be of sociological interest. However, correlations in which the units of observation are of different "sizes" are not necessarily false." (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 310) .

Subsequently, they propose a modified version of the previous example, modified in the sense that the scenario of a researcher who has the hypothesis that population is the main factor that governs the size of cities (measured this size by its land surface)). Thus, they immediately state that "One way to evaluate this statement would be to make a regression of the territorial area of the city on the population and see if the relationship between these variables is close to the proportional one. In this case, one is well aware that both land area and population are measures of the 'size' of the city, and the object of the exercise is to see how

closely they are related. " (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 310) , to conclude with that "Suppose now that someone objected to this hypothetical study as follows:" This is a case of spurious correlation. *Of course, Larger cities will generally occupy more land area and have larger populations. To overcome this problem, you will have to deflate the land area and population with a suitable measure of the size of the city, say the number of residential units* . The objection is misplaced. In the first case above, the size of the city (population) was an independent "third factor" that could plausibly induce an apparent correlation between crime and alcohol consumption, while *in the second case there is no third independent factor at play* . " (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 310)[\[4\]](#). What follows next is an epistemological questioning (valid, by the way) made by the cited authors regarding the analysis of values and unit prices.

As Cockshott and Cottrell rightly point out, the attitude of looking suspiciously at the statistical correlation between values and prices stems from the (mistaken) conception that the object of investigation of political economy is unit values and prices, rather than aggregates. Before exposing what the authors put forward, it should be mentioned that, judging by his own work, Marx not only sought "the great painting" of the capitalist political economy system, but also the same dialectical logic (bequeathed by Hegel and revolutionized by Marx and Engels) is a logic designed to analyze "the great painting", all this obviously without mentioning that the sciences in general are conceived for the same purposes, since, for example, Molecular Biology is not interested in an organic molecule, but in the organic molecules in general.

" We have two responses to this suggestion. First , for many commodities there is no single natural "unit" other than the total output of the industry in question . We can divide the scope of commodities into two subsets: "countable" products and "bulk" products. The cars are a prime example of an accounting commodity:

natural unit is the individual car. You cannot buy half a car, and there is no relevant natural unit larger than an individual car (for example, one does not buy cars by the six-pack). Electricity is a good example of a consumer good. What is the natural unit of electricity? The kilowatt-hour can be used for billing purposes, but it is not entitled to special status as a natural unit. Liquids of all kinds (cooking oil, gasoline, milk, beer) are also products of mass consumption, as are flour, cheese, etc. These products are "divided" into units of various sizes for the convenience of the consumer, but the units are not intended to be unique. Is the unit of milk the pint, the liter, the half gallon or what? Given the presence (and importance) of consumer goods, there is simply no way to construct a non-arbitrary vector of industry sizes in natural units. In other words, the idea of "unit price" is generally not well defined and therefore cannot serve as a basis for a "correct" measure of price-value correlation. *Second*, even if we focus exclusively on commodities where there is an unequivocal natural unit (ignoring all commodities en masse), *it can be argued that the effect of moving to unit prices and values, by dividing aggregate output from the industry by the size of the industry in natural units, it would not reduce the price-value correlation found at the aggregate level of the industry.* " (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, pp. 310-311) . The mathematical foundation of his second argument is presented below, although in the investigation where he saw light it appears in the appendices, here it will be exposed immediately in order to achieve expository continuity, hoping thereby to achieve greater clarity and depth at an analytical level.

They point out (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 316) that "It might appear that if all industries produced 'countable' raw materials with an unambiguous natural unit of production, we could measure the 'correct' correlation 'between price and value if we first divided the price and value vectors of the industry by a vector of industry sizes, expressed in the physical units appropriate to each industry. ", to continue stating that" But note

that there is no reason to expect that this "physical size" vector is correlated with the industry price and value vectors. The fact that the baking industry produces more breads than the automobile industry tells us nothing about the relative price or value of the output of these industries. So what is the likely effect of a scale of the industry price and value vectors by the industry size vector? This is easier to see if we think in logarithmic terms. Let p and v be the vectors of the prices and industry aggregates, respectively, and let $\ln p$ and $\ln v$ be the vectors of the logarithmic prices and the logarithmic values (industry aggregates). Let s be the industry size vector in physical units and let $\ln s$ be the logarithmic size vector. The proposal we are considering is to measure the correlation of $\ln p$ and $\ln v$, rather than the unscaled correlation of p and v .

Thus, the correlation without logarithmic scaling is posed as follows:

While the correlation with logarithmic scaling like:

If the covariance of $\ln p$ and $\ln v$ is equal to the covariance of p and v and equal to zero, it would be in the presence of stochastic independence of the price vector and the value vector (both logarithmically scaled). In such a scenario, it is possible to express the previous correlation, for purely algebraic manipulation reasons (thanks to the nullity of the dot product [\[5\]](#)), as follows:

Thus, it can be seen that the correlation function is an increasing function of the variance of $\ln s$, so that the greater the variance of the physical scaling vector s , the

greater the *amplification* (understood in the sense of everyday use) of the correlation of $\ln Y$ and $\ln X$, which results from escalation (values and prices) through $\ln S$. Obviously the concept of amplification is different from the eradication, which is raised by Kliman (and wielding as evidence that the correlation is spurious) and it can be corroborated using the numerical example in the area of reference used by Cockshott and Cottrell. Suppose that $\ln S$ and $\ln X$ are such that the correlation without scaling is ρ . If $\ln S$ is scaled by α , then ρ becomes $\rho \alpha$, that is

greater than that obtained by Kliman, while if the variance of the scaling factor is increased (on a logarithmic scale, that is why it is denoted with lowercase) to two, that is, $\alpha = 2$, then ρ becomes 2ρ , that it is greater than ρ by that ρ , being clear the robustness of the argument of the cited computational scientists.

Continuing with their refutation of Kliman's criticisms, the authors propose a selection process for the scaling variable, epistemologically justifying their proposal. In this regard, they explain that:

“There is a valid argument for taking industry size into account when measuring price-value correlations, but it is quite different from the ideas previously considered. This point can be addressed through the concept of "specific price" proposed by Farjoun and Machover (1983), that is, the market price obtained per unit of incorporated labor. Farjoun and Machover suggest that we think in terms of the probability distribution of a specific price. If prices were everywhere exactly proportional to the content of labor, this distribution would be degenerate, the entire mass contained in a single peak. We don't expect to see that; The question is, how dispersed is the distribution of the specific price, compared to other economic variables of interest such as profit rates or the organic composition of capital? When constructing an empirical probability distribution of specific price from industry data, it is necessary to weight the industries according to the added value

of their production (see Cockshott and Cottrell, 1998). Each industry gets a weight equal to the proportion of the total value of production that the industry in question represents. This is because the starting point of the thought experiment is not "to select a commodity at random" but to "select a unit of time of incorporated labor at random." If one thinks in these terms, there is a good case for applying labor time weights of this type when calculating price-value correlations between industries, and also for using weighted least squares when estimating price-value regressions. " (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 311) .

The above corresponds only to the authors' criticism of Kliman's claim (already proven wrong) that it is necessary to deflate the prices and values of industries in the context of aggregate economic analysis, not even to the Kliman simulation as such. (which is based on the previous idea, already refuted). Despite this, Cockshott and Cottrell also do an analysis of the simulation as such. The simulation carried out by Kliman is carried out by conditioning it beforehand so that the correlation is true, selecting amplitudes (of the stochastic disturbance term) such that they force correlations between price and cost, as well as between cost and value, to appear at the end of the simulation . The logic that orchestrates this Kliman experiment is that if correlations exist (as is the simulation assumption) then they should survive the deflation process carried out by him (*ie* , divide by the "size" of the industry - which measures by the aggregate costs of each industry-). As they point out (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 312) , "This simulation seems convincing at first glance, but it misses a key feature of the actual empirical procedure. In the simulated Kliman data, the sectoral values are the given quantity, while the costs and prices are each obtained by taking a random step of the vector of values. The corollary is that the price and cost vectors are two random steps separated from each other, with the consequence that price and cost are less correlated than price

and value. Kliman establishes the characteristics of his simulated data in Table 2 (2002, p. 304). "

Table 2 of the referenced Kliman research is presented in this research below.

Source: (Kliman, The law of value and laws of statistics: sectoral values and prices in the US economy, 1977-97, 2002, p. 304) .

Thus, continuing with the exposition by Cockshott and Cottrell, "The fact that the price-value correlation is higher than the price-cost correlation is not reported (...) With cost and price" further apart "than price and value, cost deflation reduces, but does not destroy, the price-value correlation. *We assume that, if we had independent empirical data on the value of industry output, the results of deflation by industry costs (however unnecessary this may be) would be similar to those found in the Kliman simulation, reducing the correlation price-value, but not destroying it* . Unfortunately, however, we do not have independent data on securities. This would require a fully disaggregated input-output table together with data on labor inputs in hours. When we calculate industry values in practice, our primary data is nothing more than industry costs: we infer values from these costs, with an unavoidable error. " (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 312) , and the above even though this way of deflating the variables (using costs per industry) is not shared at the

epistemological level by Cockshott and Cottrell , since, as already seen before, the authors do not consider that deflation is necessary in aggregate studies of this type and, failing that, it would seem that they find more benefits in the deflationary method proposed by Farjoun and Machover in 1983[6], which in the opinion of the author of this research is true inasmuch as the work force, here as work units, is omnipresent at a methodological level in all theoretical and applied analysis, which makes it a equivalent at the level of statistical practice of what in economic theory is known as *standard merchandise* , a concept whose philosophical essence lies in being a single common unit of measure, which in terms of dynamic systems can be thought of as the characteristic length of the system.

Finally , (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, pp. 312-313) point out that there are three empirical sources of divergence between the underlying real values and the values estimated by industrial cost data:

1. Values are defined in terms of hours of socially necessary work time, but in most empirical work direct work hours are represented by the wage bill.
2. The assumption that the rate of surplus value is uniform across sectors: Most, if not all, empirical work on value uses this assumption, but it is not likely to be strictly true.
3. The question of aggregation: Each of the sectors or industries used in an empirical study represents the aggregation of a wide range of production processes. The aggregation is done, of course, in terms of monetary values. Therefore, the weights carried by each subsector in the formation of the figures for any given sector depend on market prices, which of course show a certain degree of divergence in values.

Table 1 presents the results of 500 replications of the simulation that Cockshott and Cottrell replicated of Kliman.

Source: (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 314) .

As can be seen, the correlation between values and prices was effectively destroyed under the deflation of industry costs (...) This simulation is a realistic representation of the procedure followed in the empirical work on price-value correlations. In light of this, Kliman's finding that the strong empirical correlation between prices and values disappeared under his industrial cost deflation procedure is not surprising, since when you divide values by costs, you are eliminating the source data on the value, leaving only the disturbance term, since

, where , it will now be expressed as , that as can be seen, it effectively eliminated the component , which is the data

corresponding to the work-values.

Of course, the debate did not end there, appearing in (Kliman, Reply to Cockshott and Cottrell, 2005) the answer to the research of Marxist computer scientists. In it, Kliman points out an aspect that has been effectively overlooked in Cockshott and Cottrell's research, in which he says that: "C&C challenges one aspect of my demonstration, my simulation exercise, but the results of my simulation simply

confirmed the results. that he had already proven deductively (Kliman, 2002, p. 303). For whatever reason, C&C just ignores this test. " (Kliman, Reply to Cockshott and Cottrell, 2005, p. 318) and is a "Therefore, if the labor theory of relative prices were true, it would still be equal to . However, the price-value correlation will necessarily be lower. " (Kliman, The law of value and laws of statistics: sectoral values and prices in the US economy, 1977-97, 2002, p. 303) to which Kliman refers in his 2005 research.

Despite what Kliman argues is true, it does not necessarily imply that the regression results are epistemologically invalid (for the reasons Cockshott and Cottrell put forward). This is so because the logic that led the C&C research is based on the idea that there is a significant correlation between values and prices (which Kliman claims is spurious and precisely to prove such a claim is that Kliman poses the simulation in terms such that it assumes the correlation as non-spurious), it is not intended to verify that the econometric approaches (and their possible theoretical implications) made by some NI authors are or are not completely compatible with what is theorized by Marx and Engels. Thus, one thing is the explanatory power at the statistical level of values in relation to prices (of production and market) and another thing is whether the theoretical foundation of that explanatory power is epistemologically valid or not, although they are clearly related aspects. but not for that reason equivalent. To what extent are both aspects of these econometric investigations (the purely statistical and the theoretical-economic) linked and to what extent are they separated? This will be discussed in depth in the next section.

Therefore, what Kliman refutes with his deductive proof is that the Theory of Value-Relative Labor [\[7\]](#) (TVTR) complies with the fundamental aspects of the theoretical system constructed by Marx and Engels, specifically that it is simultaneously fulfilled that at the aggregate level the sum of the capital gains is equal to the sum of the profits, and at the aggregate level the sum of values is

equal to the sum of prices, that at a disaggregated level the values and prices diverge and, especially for this case, that the existence of an average rate of profit with a decreasing trend in the long term is verified.

The reason why Kliman does not realize this is because what the American Marxist economist has in mind is not properly to refute the TVTR, but the NI, which is explained by the fact that the school to which he belongs, the TSSI, has an interpretation of the process of transformation of values into prices of production that is antagonistic to that of the NI (this will also be discussed in depth later).

Proof of the above claim is found in (Cockshott, Cottrell, & Zachariah, *Against the Kliman theory*, 2019, p. 17). There, the authors point out that "Kliman follows the error of Ricardo and Marx in assuming that the rate of profit can be considered the same in all capital. He puts all his effort into trying to build a consistent theory with equalized rates of profit. But there is no evidence of a rate-of-profit equalization trend since real rates of profit decrease with capital intensity!" This question will be addressed below.

Unfortunately for the interests of C&C, such a statement is categorically false, *ie*, there is a process of competition within the capitalist political economy system of a dynamic and long-term nature that results in an equalization of profit rates around their weighted average. aggregate or, what is the same, that the profit rates tend to equalize in the different productive branches with respect to their aggregate weighted average. To support the above statement, three empirical and one theoretical investigations on this phenomenon will be studied in depth, also pointing out its scope and limitations.

The first research to be analyzed is (Flaschel & Semmler, 1985). This research aims to be a reproduction of the capitalist competition process from the dynamic perspective of the classical economists' theory, as its authors point out in the first paragraph of their research. This research also raises on page 2 that it takes up the

assumptions of the von Neumann model with respect to workers' consumption and savings. Neumann's model assumes, on the one hand, that "Any product can be an input. It is not necessary to distinguish between products and primary factors; even the final demand is absorbed in the input demands for the next production period and labor is also assimilated to a product generated by an input: the vital energy consumed at work" (Mora Osejo, 1992, p. 219). Along the same lines, Neumann assumes that the consumption of merchandise takes place only within the production process, in the words of Neumann, cited by (Mora Osejo, 1992, p. 219): "The essential phenomenon that we want to capture is this: goods are produced among themselves and we must determine: 1) what processes are used; 2) what is the relative rate of increase of all goods produced; 3) what prices will be generated; 4) what the interest rate will be; and, *to completely isolate this phenomenon, one must include the additional assumption that the consumption of commodities takes place only through the production processes, including the consumption needs for the lives of employees and workers ... is clear to what kind of theoretical models these hypotheses allude.*"

The models that Neumann refers to are those built from heterodox economic theory, specifically from Marxist models (he cannot refer to Sraffian models because Sraffa's work, "Production of Goods by means of Goods" dates from 1960, while Neumann's research cited here dates from 1945; neither to Post Keynesians, because Post Keynesians are formed from Michael Kalecki -as a result of his work "Teoria i dynamika gospodarczej: rozprawa o cyklicznych i długofalowych zmianach gospodarki kapitalistycznej" or *Theory of Economic Dynamics: An Essay on the movements cyclical and long-term capitalist economy* - in 1958, while the fundamental work of Kaldor, who was the first post-Keynesian - entitled *Capital Accumulation and Economic Growth* appears to 1961), to which, curiously, it would seem to be forbidden to make explicit reference or to fear that making explicit reference to them is "bad publicity" for his model, very similar to when in the fictional universe of the novel known as Harry Potter they wanted to talk about the

main antagonist, Voldemort, fearing to say his name. Nor is it wasted what Mora comments in this regard, who evidences a clear need to make an apology regarding von Neumann's words in order to avoid any "bad thought" that such words could provoke, and in this regard he mentions that "From this Thus, *despite the ostensible conceptual lightness, uncomfortable for any orthodox economic doctrine* , they appear in von Neumann's essay for the first time (...) " and immediately afterwards he rushes to enumerate the benefits of Neumann's model so that the alarms do not go off. From the reader, "why should the alarms go off?" someone might ask. Thus, on the savings side, the research (Gloria-Palermo, 2010, p. 154) points out that Neumann's model assumes that workers do not save their simplifying assumptions as one.

Having established the above, the research (Flaschel & Semmler, 1985) includes circulating capital and fixed capital in its model and, if this were not enough for C&C, it makes its estimates also using simultaneous equations. After making a theoretical justification of how the proposed mathematical model is faithful to the classical theory (fundamentally it takes up Adam Smith and his "natural prices" - which in Marx are the prices of production-) included from page 3 to page 10, The authors carry out several simulations, of which one specific is of interest in this research. The dynamic models of simultaneous equations are called *models of dual crossed processes* (" cross- dual process ", in English) and the computational-statistical simulation, which emulates such models, is configured by establishing that capital migrate from one productive branch to another in search for the maximum possible profitability. The results of the simulation show that the dynamic process thus proposed will generate stable fluctuations around the steady state (which is the neoclassical terminology - popularized by Robert Solow in "A Contribution to the Theory of Economic Growth" - to refer to the economic equilibrium point) for input-output models that produce a single good and consider the existence of fixed capital.

The authors demonstrate mathematically (evidently assuming various assumptions - it should be remembered that Mathematics has shown that it cannot be self-provable, that is precisely one of the immediate conclusions about Gödel's completeness and incompleteness theorems-; however, no assumption to worry about It is assumed, except for the same use of simultaneous equations -However, since it is epistemologically indifferent to verify C & C's claim, supporters of simultaneous equations, it is epistemologically indifferent-) that all dynamic dual cross processes will be asymptotically stable at the global level (the investigations that preceded it exhibited asymptotic stability only at the local level) if and only if, when studying the direction of the variation rate of the different profit rates, the exodus of capital from a productive branch to other. The simulation had 200 iterations and the results are shown below.

Source: es (Flaschel & Semmler, 1985, p. 22) .

Source: (Flaschel & Semmler, 1985, p. 23) .

Source: (Flaschel & Semmler, 1985, p. 25) .

Source: (Flaschel & Semmler, 1985, p. 25) .

As verified (Flaschel & Semmler, 1985, p. 27) , the previous results, belonging to a basic model consisting of two activities to produce product 1 and one activity to produce product 2, are generalized by Flaschel and Semmler adding to the analysis of the additional investment criteria of the companies in the different productive branches.

Source: (Flaschel & Semmler, 1985, p. 30) .

Source: (Flaschel & Semmler, 1985, p. 30) .

The second research to consider is (Glick & Ehrbar, 1988) . This research, carried out in 1988, sought to take advantage of the new data referring to long-term measurements of industrial profit rates to confront directly and exclusively with regard to the size and theoretical significance of the differences observed in profit rates. in the industries of the United States and Europe.

The authors begin by raising the theoretical foundations of their econometric analysis, with respect to which they affirm that "The idea that market prices should gravitate around" natural prices "or" production prices "that correspond to profit rates The industry level has been a cornerstone of classic competitive analysis. This opinion was shared by Adam Smith (Smith, 1965, ch. 7), David Ricardo (Ricardo, 1981, ch. 4), and also by Karl Marx (Marx, 1981, ch. 10). In the classical view of competition, we find a description of market prices that "gravitate" around long-term natural prices or producer prices. These "centers of gravity" are prices that correspond to a state of uniform profit rates between industries and are the result of the competitive process. In competition, according to the classical analysis, a double mechanism is put in place that should result in an equalized rate of profit in the long run. " (Glick & Ehrbar, 1988, p. 179) .

Regarding the exodus of capital from one productive branch to another, the authors point out that " *On the one hand, companies that maximize profits move investment between industries that seek opportunities for higher profit rates and, therefore, expand supply in those industries with higher than average profitability. On the other hand, this increased supply will face the sanction of a downward sloping demand curve and prices and profits will be forced down. The same process can also work in reverse, as capital will come out of a low-profit-rate sector, a move that reduces supply and therefore increases prices and profits. The perfect fit is strictly described for the long term, and while this disequilibrium process is underway, the industry's profit rates are expected to be uneven . Furthermore, the existence of constant disturbances in the economy will transform this process into one of gravitation .* Rather than a uniform rate of profit actually expected in the economy, *the expectation is that when competition prevails, industry profit rates tend to fluctuate around equal average levels .* Recently, interest in the study of classical competition analysis has resurfaced. There have been several attempts to formalize this process and analyze its mathematical properties (Dumenil / Levy, 1983, 1984; Boggio , 1984; Flaschel / Semmler , 1984; see also Steedman, 1984). Unfortunately, this renewed theoretical interest contrasts with a poverty of empirical analysis on this subject. *The study of profitability spreads has rarely been directly considered. In contrast, competition analysis has been dominated by consideration of the impact of market structures on profit rates. This was the result of the conviction of neoclassical and Marxist economists that pricing procedures in the American economy should be described as monopolistic . "* (Glick & Ehrbar, 1988, pp. 179-180) .

The aforementioned authors consider that, to scientifically analyze the average rate of profit, its study should be carried out isolating it from the effect that the market structure has on it, this in order to understand its natural behavior, its behavior in general, beyond the deformations to its dynamics that may arise as a result of this or that market structure. In this regard, they point out, along with others aimed at

pointing out the deficiencies that in their opinion exist in previous studies, that “ *The basic assumption that permeates all the existing empirical literature on this subject is that there are profitability differentials and that the only relevant question is provide an explanation for these differences. In our opinion, the evidence for this claim is not convincing for several reasons* . First, the strongest criticism that can be made of attempts to measure profitability differentials between industries in the US is that only a short period of time is considered (often only one year and a maximum of ten years). *This was partly due to the inability to obtain consistent data at the industry level over a long period, and partly was an effect of the neoclassical framework used* . In the classical perspective, only the long-term estimation is relevant. In the second place, *the question of how the rate of profit should be defined was not discussed. For example, profit margin (that is, profit on sales) is often mistakenly used to represent profit rate* . Finally, *the levels of aggregation of companies and sectors are confused* . *Whether individual companies have persistent differences in profit rate above the average is a different matter from whether a particular market structure raises the average profit rate of an entire industry* . ” (Glick & Ehrbar, 1988, p. 181) .

Regarding the problems raised by the authors referred to on page 181 of the research, they propose the solution to them in the following terms: “ *The strict adherence to the classical perspective provides guidelines for solving these problems : 1. Profit rates they are not equal, but gravitate around equal centers* . Therefore, only a long-term calculation can produce the expected result. Since 1983, data from the Department of Commerce have been available to make this analysis possible. 2. *From the classical point of view, the appropriate definition of profit rate should be one that guides capital movements between industries* . In practice, two problems arise. First, *the study of real investment behavior is dominated by non-classical inspiration and is not well developed from the classical perspective* . Second, *there is no data available to accurately distinguish the different profitability ratios* . However, it is clear that the range of appropriate

profitability measures should be restricted to ratios that consider a narrow definition of profit (for example, net of tax) and a broad definition of capital (for example, gross of inventories). Clearly, the profit margin is an inappropriate guideline for investment from the classical perspective . 3. Although less explicit in Smith and Ricardo, in Marx's discussion of the equalization of the rate of profit, the prices of production correspond to the equalized rates of profit of industry. Within each industry, a hierarchy of rates of return reflects the existence of different technologies and business organizations (Marx, 1981, p. 281). Therefore, an investigation should be done on the equalization of the profit rate at the industry level. ” (Glick & Ehrbar, 1988, pp. 181-182) .

As can be seen, the theoretical justification of the econometric analysis is well founded, so it is time to proceed to analyze the quality of the data in terms of its processing and its sources.

Research Glick and Ehrbar is very thorough in terms of explanation of the data used because they were data on that novel era (there had been no studies of more than 10 years the average rate of profit) as the authors they inexorably faced the need to demonstrate categorically that their data processing, definitions, and measurement methodology in general did not question the deficiencies that they pointed out in the methodologies with which the behavior of the average rate of profit had previously been studied.

As noted in (Glick & Ehrbar, 1988, pp. 182-183) , the study used two primary data sources, the Eurostat database for the case of Europe and the national income and product accounts corresponding to the measurements of capital stock in the case of the United States.

The Eurostat database is an effort by the OECD group of economists to develop a consistent set of industry definitions for seven European countries (thereby making analysis possible at the industrial level), at a scale of 13 manufacturing industries. and mining (with the characteristic of comparability between

countries). This information allowed the initiation of a wave of studies on the dispersion of the profit rate in the industrially more advanced capitalist countries. Eurostat provided the authors with data referring to the gross capital stock by industry (measured by its replacement cost in this case) for four countries (Federal Republic of Germany, France, Italy and the United Kingdom, so the study of the European economies carried out by the author in his research is limited to these four countries. Finally, on the basis of Eurostat data, the authors point out that "The data referring to the capital stock are provided for the period 1960-1981. Eurostat provides a selection of data on income from the respective national accounts of income and products of the different countries *The profit can be constructed from the gross value added at market prices (available for the years 1960-81) and wages and salaries (only available from 1970 to 1981) As a result of these data limitations, we are restricted to a broad definition of profit that is constructed before taxes and depreciation, and includes the net interest, as well as the period 1970 to 1981.*" (Glick & Ehrbar, 1988, p. 183) .

For the US national accounts, the authors note that "*US industry data is available for a wider range of industries and a longer period of time. The data also allows for a broader spectrum of definitions of the rate of profit* . Our capital stock data comes from the most recent revision of the 4-digit SIC classification, 1948-79 (by Ken Rogers of BEA, 1984). This social capital is built through the perpetual inventory method (...)" (Glick & Ehrbar, 1988, p. 183)[\[8\]](#).

Thus, they continue to state that "The inventory data are available from the same source, but they only begin in 1958. We have supplemented the series of inventories with the Annual Survey of Manufactures for the years 1949-57. Therefore, these first years do not adjust to the changes in the definition of the industry, as happens with the series after 1958, but we find small changes in its pattern before and after 1958. The income data to build profits comes from of the

National Accounts of Income and Products of the United States. " (Glick & Ehrbar, 1988, p. 183)[\[9\]](#).

Along the same lines, they point out that "The accounts are disaggregated in the 2-digit industry classification of the SIC for the entire economy in GNP and components (14) by industry, 1948-79." (Glick & Ehrbar, 1988, p. 183) , on which in turn they explain that "Calculations with unweighted means give almost the same results." (Glick & Ehrbar, 1988, p. 199) .

" Our study of profitability differentials will be limited to a set of fairly aggregated industries . In fact, it would be more desirable to use an economically more appropriate definition of "industry". But this would require a further breakdown. Unfortunately, the BEA only has a 2-digit industry definition for a large number of years, and Eurostat is also restricted to 13 industries . " (Glick & Ehrbar, 1988, p. 183) .

Thus, it is possible to proceed to study the econometric model in its general form. According to (Glick & Ehrbar, 1988, p. 184) , *" Our study of the industry profit rate differentials is based on an econometric model of profit rate adjustment. We do not explicitly model the mechanism of this adjustment , but we assume that profit rates are adjusted according to the three guidelines mentioned above. The profit rate , in the industry in the year , is the sum of three components (...) "*, which are the that belong to the expression:

In the previous expression, it is the rate of profit given in a given year for the aggregate of all industries, which varies from year to year. On the other hand, "(...) it is an industry-specific component, which differs from one industry to another, but remains stable over time. This component measures the industry's profitability differential above or below of the average rate of profit. *If the 's are*

significantly different from zero, the objective of the adjustment process is not an identical rate of profit for each industry, but differs from one industry to another. We label these different objectives as " industry-specific components " (...)" (Glick & Ehrbar, 1988, p. 184) . Finally, it is "(...) a disturbance term, which reflects the possibility of an adjustment process by the simple assumption that the disturbance is heteroscedastic between industries, but homoscedastic and of the first order.

autoregressive in time (...)" (Glick & Ehrbar, 1988, p. 184) .

To better understand the above, it is necessary to remember to understand some fundamental concepts of Econometrics. The first of these is the concept of homoscedasticity. As indicated in (Wooldridge, 2010, p. 401) , homoscedasticity is a characteristic that has (or does not) the stochastic disturbance term (which in the applied models becomes known as error), which consists in that the variance of such an error is systematically the same no matter what instant of time is analyzed, so it is said that the errors are contemporaneously homoscedastic and is denoted mathematically as σ^2 , where σ is the abbreviation of standard deviation .

The other concept to understand is autocorrelation. As noted in (Wooldridge, 2010, p. 384) , the general form of an autoregressive model of order 1 is

$$y_t = \alpha + \beta y_{t-1} + \epsilon_t$$
 , where ϵ_t is here the error of that autoregressive model. The authors of the referred research, (Glick & Ehrbar, 1988, p. 184) , assume that the stochastic disturbance term in the econometric model of the profit rate is heteroscedastic between industries, but homoscedastic and first-order autoregressive [AR (1)] in time, that is, the error term in turn is modeled by

$$\epsilon_t = \gamma + \delta \epsilon_{t-1} + \eta_t$$
 , where η_t is the error of the statistical model of the error term of the statistical model of the rate of profit (since the error of the the rate of profit is also assumed as a stochastic variable) and where δ (ρ in Wooldridge's terminology) it

oscillates between μ (note that implicitly $\mu = 0$). Thus, it is also assumed that the mathematical expectancy $E(\epsilon_t)$ is zero ($E(\epsilon_t) = 0$) and its variance σ^2 is constant (or what is the same, the variation of its variance is zero), ie $\sigma^2 = \text{const}$. The stochastic estimation is carried out via the maximum likelihood method, in which all the parameters were estimated at one time.

In addition, the assumption that the stochastic process is normally distributed is assumed, as well as that the variance of the technological innovation carried out within the political economy system is unitary, which is reflected at the statistical-mathematical level in that the main diagonal of the covariance matrix (of the stochastic disturbance term), except for the element in the position $(1,1)$ (which is equal to σ^2), it is composed in its (i,i) positions by only 1's. As is usual in maximum likelihood estimates (due to the computational efficiency that allows working with logarithms), the specific function that the authors use is the maximum likelihood log function for each of the industries. Finally, the authors point out that "*The levels of μ and σ^2 are not identified* : adding a set sum to all and subtracting it from all μ would give an equally good fit . *To set these levels, the industry-specific components are normalized in such a way that the weighted average (weighted by the capital stock) of all the industry-specific components of the profit rate is zero. The industry-specific components therefore indicate the differences between the profit rate of each industry and the weighted average of all profit rates .*" (Glick & Ehrbar, 1988, pp. 185-186) .

Finally, they point out that "The parameters μ , σ^2 and β appear only in the industry likelihood function L_i , while the vector α appears in all industries.

Therefore, our numerical procedure has been a search for α while maximizing L , and μ for each industry separately. Given α , the optimum for each industry is

the root of a fifth-order polynomial, which can be calculated numerically with the available software, and given β , the optimum β 's can be found using generalized least squares. For the numerical search we use the Davison-Fletcher-Powell (DFP) algorithm, but instead of using the unit matrix, that is, the steepest descent method, at the beginning, and then update this matrix at each step until it converges to the Inverse Hessian, we start with the inverse Hessian starting point. Therefore, our method can be characterized as a cross between DFP and the Gauss-Newton method. " (Glick & Ehrbar, 1988, p. 186) . The industries studied by the researchers are presented below.

Source: (Glick & Ehrbar, 1988, pp. 186-187) .

Thus, defining the rate of profit as "In the previous section, the rate of profit was a ratio between the gross value added minus the compensation of the employees over the gross capital stock at replacement cost . *In this section we will use a new rate of profit, in which indirect taxes, net interest, and an estimate of the equivalent non-corporate salary are deducted from profit, while inventories are added to the capital stock* . Earnings and capital stock remain gross of depreciation, and capital stock continues to be estimated for accounting purposes

based on its replacement cost. Although the industry-level data available for the United States allows for a greater variety of choices than European data, we are still subject to significant limitations. *The main limitation of the new definition of profit rate, in our opinion, is that profit is gross of corporate taxes and depreciation . "* (Glick & Ehrbar, 1988, p. 192) .

Thus, the results for the case of the United States of the period

Source: (Glick & Ehrbar, 1988, p. 193) .

Source: (Glick & Ehrbar, 1988, p. 196) .

Finally, the authors conclude that “Although the notion of an equalized rate of profit has been a key concept in the analysis of the classics, modern empirical work addressing this issue has been inadequate. The work applied mainly by economists in industrial organizations, who were concerned with evaluating the impact of the market structure, has not directly investigated the question of whether there really are profitability differentials. Furthermore, the methodology in this literature was based on neoclassical theory. Most studies have only considered benefit rates for a very short period of time; Inappropriate definitions of profitability are often used; and the industry and company levels are confused. This work has attempted to overcome these shortcomings and take advantage of the publication of new data of a higher scope (comparability across countries and longer time series). We have reported three main results:

1. In section 2, we use a first definition of the rate of profit that we consider less than adequate, but that allows comparability of four European countries and the United States (for the years 1970-79). Statistically significant differences were found in the benefit rate in all the countries considered. The size of the total dispersion is comparable "(with the exception of Italy). Furthermore, the pattern of profitability produced in each country seemed similar in many respects. These observations suggest that these differences are the result of imperfect measurements or that they represent real values. Economic processes By imperfect measurement we mean inconsistent accounting procedures across industries By real economic processes we mean things like market structure, the impact of international competition, or other competitive mechanisms that may influence the formation of production prices.

2. In the first part of section 3, we find strong support for the hypothesis that the definition of the rate of profit has an impact on the magnitude of the rate of profit differentials. By substituting a more adequate definition of the rate of profit (for the United States), we got much smaller spreads.

3. In the second part of section 3, we tested the possibility of obtaining a superior result with a longer period of time. The maximum number of years for which data are available is 31 years. The profit rates measured during this period were somewhat less dispersed, but the confidence intervals widened, suggesting that the industry-specific components of the profit rate may not be constant over such a long period. With an adequate rate of profit and a substantial number of years, it is possible to argue that market prices are not far from gravitating around producer prices. Although this result has only been demonstrated for the United States, our analysis in the first section suggests that, with higher data , the same findings could be extended to other advanced capitalist countries. With regard to the remaining spreads, we are again faced with the dilemma described above. Are these differences the result of additional measurement biases or the expression of

real economic processes? Further investigation should not exclude either possibility. " (Glick & Ehrbar, 1988, pp. 197-198) .

The third research to study is that of (Fröhlich, 2012) . In it, Fröhlich begins by stating that "In recent years, several empirical studies have found that the deviations from labor values to market prices are quite small. However, most of these articles do not provide a detailed reason for this result. This article brings together two theoretical justifications for the labor theory of value together with some data on the value of labor, producer prices and market prices, based on German input-output tables from 2000 and 2004. In addition , the statistical characteristics of the profit rates are analyzed. *Both theoretical arguments are very much in line with the empirical observations, because there is only a slight tendency to transformation and, at the same time, profit rates and capital intensity are negatively correlated* . Furthermore, *during the period under observation, the German economy appears to be in a state of statistical equilibrium* . " (Fröhlich, 2012, p. 1107) . Thus, it is necessary to proceed to analyze not the executive summary of the investigation, but its actual content.

Right from the start, he shows how erratic his route will be:

"In unconventional economic theory, there are generally two ways to explain market prices. *First, there is the labor theory of value, which states that prices are driven by vertically integrated labor time (labor values). This approach, originally used by Karl Marx in Capital I* , evoked the famous transformation problem, because equilibrium of the rate of profit is only possible in the case of uniform capital intensity or zero profits. " (Fröhlich, 2012, p. 1107) . Clearly Fröhlich is completely sure that the NI interpretation of Marx is the correct interpretation, which in turn implies that he validates the use of simultaneous equations to deal with the temporal process of transformation of values into prices of production. This is equivalent to assigning a methodological "problem" to an author with a methodology that the author did not use and, based on this, begin to speculate, he

would seem like a good Hegelian: he starts from nothing, develops into nothingness and arrives at the nothing. There is no epistemological value at a general level in such an argument, however, there are particular aspects of Fröhlich's research that could have it.

Thus, Fröhlich proceeds to mention the debate previously treated in this research, on which he states that "On the other hand, there is a growing body of empirical studies that affirm that the deviations from values to prices are quite small (Shaikh, 1984; Petrović, 1987; Ochoa, 1989; Cockshott and Cottrell, 1997, 1998, 2003; Tsoulfidis and Maniatis, 2002; Zachariah, 2006; Tsoulfidis and Mariolis, 2007; Tsoulfidis, 2008). These authors found that the correlation coefficients and the coefficients of determination R^2 were considerably greater than 0.9. Therefore, labor values could be as good at explaining market prices as neo-Ricardian prices of production are. Although these results are rarely related to theoretical debates, they pose a serious challenge to traditional approaches to classical economics. As expected, there has been a fundamental criticism to doubt these results (see Kliman, 2002, 2005; Díaz and Osuna, 2005-06, 2007, 2009). The objective of this article is to connect theoretical and empirical arguments." (Fröhlich, 2012, p. 1108).

Subsequently, from the middle of page 1108 to page 1112 of his research. Fröhlich develops what he calls "the theoretical framework of the labor theory of value" and, as it could not be a surprise after his declaration of intentions in the executive summary of the research, such theoretical framework consists of all the neo-Cardian methodology originally proposed. by Sraffa and polished by the Post Keynesian school. Calling this theoretical framework that of Marx's labor theory of value is a matter that can only be considered, at least as lightly as Fröhlich does, a mere leap of faith. Then, taking up Farjoun and Machover's 1983 research, he

introduces the concept of *Probabilistic Political Economy* . In this regard, he comments with great descriptive clarity that:

“In the probabilistic approach developed by Farjoun and Machover (1983), all magnitudes, such as prices, labor values, profit rates, etc., are random variables. Instead of analyzing a deterministic system with "mechanical" equilibrium properties, as traditional Marxist or neo-Ricardian theorists do , they examine the elements of an economic system in a similar way to how ideal gas molecules encased in a container do. described by statistical mechanics (Farjoun and Machover, 1983, pp. 39-56). In his view, the transformation problem occurs due to the use of an inappropriate concept of equilibrium, namely the adoption of a uniform rate of profit (Farjoun and Machover, 1983, pp. 28–38). Instead, they assume that profit rates are described by a gamma distribution and replace the assumption of equalizing profit rates with the more sophisticated principle that for a given country in a steady state, the probability density function (PDF) of profit rates is virtually independent. of time (Farjoun and Machover, 1983, pp. 64-6). This concept is even compatible with large differences between sectoral profit rates, whereas traditional approaches must assume that the distribution of empirical profit rates must be quite narrow, which is hardly the case. " (Fröhlich, 2012, p. 1112) .

Both in the research of (Sánchez & Ferràndez, Valores, production prices and market prices from data on the Spanish economy, 2010, p. 94) , and in the 2006 research by Zachariah cited by the first referred authors, it is shown that the average rate of profit has a normal behavior in the long term and, as indicated in the investigation of (Glick & Ehrbar, 1988, p. 181) , until that moment a long term analysis had not been carried out of profit rates and, being Farjoun and Machover's investigation from 1983 (five years earlier), it is evident that the profit rate can behave in the short term as a gamma distribution, but in the long term it undoubtedly converges to the normal And, in the Marxian analysis, the

fundamental thing is the long-term analysis; This has been verified in this research from the logic of the same statistical laws, specifically the central limit theorem, the law of large numbers and the ergodic theorem. However, it is necessary to take advantage of this space to discuss some issues.

Arghiri Emmanuel, in the first passages of his great work (already cited here), poses a sad reality that occurs in Political Economy. Contrary to what this research has shown, Emmanuel's criticism considers that it applies to all economists since Quesnay, undermining the achievements of the Physiocrats, Classics and Marx; evidently he does not seem to be right about it. However, if we substitute "From" for "After" and "Quesnay" for "Marx", the sentence ends up being true (at least on a general level, there are clearly exceptions):

“After Marx, economists work on models of noble logic and behave as if the world did not exist. They reason in the name of the spirit, but they cannot pretend that their wisdom is like that of the veterinarian or that of the electronics technician. Since then, laymen no longer need to be silent and listen to them, as they usually do in front of those in the *know* . Political economy is no longer a respectable science. " (Emmanuel, 1972, p. 13) .

The case described above by Emmanuel is precisely what happens to Farjoun and Machover (from now on, F&M) in their research, since it is up to page 173 of the same that they present an empirical example with data taken from reality. Thus, F&M point out that “Consider the following diagram, which gives *the empirical distribution of profit rates in British non-oil manufacturing industries in 1972* . In the same diagram, the theoretical distribution of Chapter 11. is drawn. " (Farjoun & Marchover, 1983, p. 173) . As anticipated, Farjoun and Machover's research is not long-term and, therefore, cannot verify many of the fundamental Marxian laws, because these operate, as explained in this research, like statistical laws, is that is,

precisely in the long term (Marxism), in large samples (Statistical Theory), in the passage to the limit towards infinity (Mathematical Analysis). Thus, one is in the presence of 172 pages of pure theory and an empirical cross-sectional analysis, that is, it consists only of a time period.

However, the epistemological shortcomings of Jewish Marxist research do not end there. Later they point out "Beyond questions about behavior. of the profit rate of the economy as a whole lies in the problem of its behavior for the subsectors, or even for individual companies. *The profit rate distribution is the result of a huge number of independent destinations of individual companies* . The general distribution is far from being arbitrary, as can be seen from empirical evidence and theoretical consideration. " (Farjoun & Marchover, 1983, p. 176) . The dialectic of a process inexorably implies the interconnection of its parts. How could competing firms be independent with respect to the behavior of the others? Instead of justifying that point by arguing with the same theoretical and applied research carried out in Statistics (as has been done here), taking for granted as completely natural an assumption that is as far removed from Marx's theory as Leon Walras or anyone else is. another vulgar economist . Finally, regarding research previously studied should be noted that the results of applied research (Glick & Ehrbar, 1988, p. 184) , indicate that the ideal assumptions for experiments statistical of this nature are, firstly, that the Stochastic disturbance term in the econometric model of profit rates between industries (cross section) is heteroscedastic and that the average profit rate is homoscedastic and first order autoregressive [AR (1)] in time (time series), for What the results obtained by F&M, which are the starting point of most of Fröhlich's reasoning, do not represent any scientific support for the German economist's approaches. Despite this, its correlational results in cross-sectional data verify what was stated in this regard in this research.

Source: (Farjoun & Marchover, 1983, p. 181) .

Thus, Fröhlich reveals an astonishing misunderstanding of what Marx's theory is. This is manifested when he expresses "Therefore, it is typically considered as the state of the art and even prominent Marxian authors affirmed that labor values" do not play any role in the discussion of exchange and price "(Roemer , 1981, p. 200). The different views that held that the transformation problem is probably insignificant did not prevail. " (Fröhlich, 2012, pp. 1107-1108) .

Despite the fact that the quotation refutes itself, it is convenient to remember, with some observations to be made later, that "Many economists situated in or around Marxism consider that there are many important things in Marx's thought that they must be preserved, such as his theory of exploitation, class struggle or historical materialism, his approach to social conflicts, his historical perspective, his interdisciplinary or socio-economic sensitivity, his concern with the

institutional, and so on. But they do not realize that the defense of each of these elements, together or separately, is perfectly compatible with the maintenance of neoclassical economics as a theoretical skeleton. In fact, if all this is defended, but the labor theory of value is rejected, the essence of Marx's economic thought is betrayed, and the resulting product will therefore have to be considered an impossible reading" (Guerrero, 1997, p. 107). First of all, it is not about loyalties or betrayals here, it is about what is intuitive, logical and plausible in satisfactory proportions given the available evidence. Second, the theory of exploitation is not compatible with the neoclassical framework, since in the long run the economies of the neoclassicals (with more inspiration in the land of Mickey Mouse than in economic reality) converge to the steady state and, with This is due to constant returns to scale, which is a technological performance scenario in which the product is exhausted in factor remuneration and, therefore, exploitation does not exist (this is mathematically guaranteed thanks to the homogeneous functions of degree one and Euler's theorem related to this type of functions); In the absence of exploitation, the concept of class struggle loses an objective and technical foundation, so there is also no historical need to replace classes (except for some whim of the "incompetent" -since the factors are remunerated according to their participation in the productive process-), so that the concept of social justice would also seem to vanish, the same happens with social conflicts and in the case of historical materialism as well, since the word "materialist" has a deep philosophical meaning that enters into frank antagonism with the subjectivism of the neoclassical theory of value. Despite this, what Guerrero raised (although not due to the logical reasoning that he believed and, in fact, precisely because it was the antithesis of it) derives from Fröhlich's notion that there may be "Marxians" who do not agree with Marx's labor theory of value denotes a terrifying ignorance of the theory that, according to him, he is studying. This does not mean, obviously, that a Marxian approach is correct, it means that correct or incorrect, it cannot be separated from Marx's theory of value-labor.

Finally, the last nail of the intellectual coffin in which it has been since Fröhlich's research was born, is the fact that his sample is also small at a temporal level, it is four times larger than the F&M sample, but since the second one consisted only of one year, that of F&M consists of equally scarce four observations, *ie*, four years. This is verified since the author explains that "The data comes from the Federal Statistical Office of Germany, which offers IO tables that include information on 71 sectors. Because the statistics on German equity stocks only contain 57 sectors, the relevant columns and rows of the IO tables need to be merged in such a way that each sector finds a number of equity stocks. *The data refer to the years 2000 and 2004.*" (Fröhlich, 2012, p. 1117). In F&M it was understandable, because as seen in (Glick & Ehrbar, 1988, p. 181), until 1988 there were no adequate data to carry out a statistical investigation of Marx's theory, but in Fröhlich it is purely intellectual negligence for not carrying out an adequate review of the state of the art of the subject.

Finally, regarding Fröhlich's research, it must be said that it has the merit of showing O&D that "Now, the angle between e is an adequate way to measure deviations from prices to values, because it is only based on dimensionless numbers. It does not measure the length but the direction of the relevant vectors, that is, it is based on relative prices. Therefore, it must be independent of any physical unit and cannot be affected by the arbitrary choice of numéraire (...). Both the independence of physical units and the independence of the choice of numéraire are important. Although Díaz and Osuna (2009, p. 435) mention the second point, their criticism does not cover the first. Instead, they present an example in which physical units are defined in such a way that (Díaz and Osuna, 2009, pp. 437-8). As a consequence, your results depend on this arbitrary method of measurement. But this procedure is not in line with the approach described above: in equation (37) all physical units cancel out. Therefore, it is impossible for physical dimensions to have any influence on α when equation (37)

is used. " (Fröhlich, 2012, p. 1116) . As can be seen, Fröhlich makes a brilliant refutation of O&D from the logic of simultaneous equations.

The fourth and last research to study, of a theoretical nature, is the research of (Kuroki, 1985) . On page 35 the assumptions of the theoretical model are detailed, which are presented below:

- 1) Production technology is linear (it falls within the framework of linear production models) and leads to constant returns to scale.
- 2) Workers spend all their wages buying consumer goods and the real wage rate is constant. Underemployment may be the predominant state in the labor market (this in keeping with what Engels called *the industrial reserve army*).
- 3) Capitalists invest all their capital, including profits.
- 4) Capital constantly moves in search of the highest rates of profit. Thus, intersectoral capital movements will occur when profit rates are different from each other (which occurs in the process of adjustment or convergence to equilibrium).
- 5) Fixed capital is not considered, nor is joint production (in which the sectors are interrelated to generate a product that combines their inputs).
- 6) The production period is the same in all sectors and constant over time.
- 7) Price fluctuations depend on the excess demand of the market (calculated as the level of demand that exceeds the level that would empty the market - which would exhaust the supply, which is the quantity of products produced in the market- in the period of analysis), clearly keeping a direct relationship, *ie* , the higher the demand, the higher the price.

Obviously, the model presented has quite a few questionable assumptions, which will be discussed before presenting the results of this theoretical investigation.

Obviously in capitalism there are no constant returns (they are generally increasing, since technological change is incessant). It is also a fact of the non-

existence of saving and unproductive consumption (the part of its profit destined to the acquisition of consumer goods) of the capitalist should be present, however, they are assumptions that are usually omitted and whose omission does not significantly affect the robustness of the process being studied, since to study capital investment at the macro level it is possible to omit explicitly analyzing saving, given that macroeconomically saving equals investment (and that is not only a Kacleckian and Keynesian identity, it is an implicit assumption in Marx's extended reproduction schemes, proof of this is the same testimony of Joan Robinson - who points out precisely that theoretical anticipation of Marx - and the fact that Kalecki takes Marx as a starting point for all of his work. scale -and Kalecki anticipated Keynes in the discovery of Macroeconomics, as Joan Robinson herself points out-; because of the above it is that the Savings analysis -in the context of analyzing capital accumulation- is omitted, since they are "two sides of the same coin" and their differentiation would unnecessarily complicate models that only seek to analyze in general the capital accumulation process -because with They seek to analyze changes in investment, profit rates and capital accumulation rates, not strictly how the component of such investment funds corresponding to workers' savings was formed) and, on the other hand, that is immediately associated with the unproductive consumption of the capitalist is not of analytical interest when studying capital accumulation (since it is only important to know if the product of sector II -producer of means of consumption- was realized, was not realized and to what extent , not the detail of its realization process). On the other hand, although it is not realistic not to take into account joint production or to include fixed capital, unfortunately these are assumptions that are usually used, although they are not clearly the theoretical-applied ideal. Finally, although it is also widely usual in jobs of this nature, it is assumed that the production period is the same for all companies regardless of the category and is also invariant in time (which at least has some congruence with the initial assumption -unrealistic, obviously) that there is no technological progress.

Despite all the theoretical deficiencies raised, among which is the very use of simultaneous equations (which will be discussed later), the authors find results that significantly go in the same direction as the others previously exposed: " As a result of our analysis using closely the dynamic adjustment mechanism of competitive markets, it would be found that the equalization of sectoral profit rates through competition depends on the industrial structure, that is, on the degree of technical interdependence between sectors. When the organic composition of the capital goods sector (...) is greater than that of the consumer goods sector (...) and the closer the economic structure approaches the decomposable state), the higher the profit rates that have a divergent trend and gravitation towards the uniform rate of profit does not work. Then we could conclude that only the system in which both sectors use the other's production relatively much as their own input and, therefore, the degree of technical interdependence is large, has the stable uniform rate of profit (that is, for example , the economy where a lot of wheat is needed to make iron and at the same time a lot of iron is used to produce wheat). " (Kuroki, 1985, pp. 48-49) . In section IV.II of this research, a complementary research is presented (and elaborated specifically for this) that confirms that, despite all the theoretical and empirical falsehoods that orchestrate Kuroki's approach , the productive branches of global social capital are interrelated in a significantly high way, which is statistically verified. In the same place, the methodology used (built specifically to measure the long-term correlation described by Kuroki) is presented gradually (step by step), in addition to providing all the statistical tables used, as well as the manipulation code of the data in the R Studio program.

Finally, as it is also widely known in the Marxist community (which Sánchez and Ferràndez, from now on S&F point out) , the research (Díaz & Osuna, 2007) criticizes this type of research due to the indeterminacy between values and unit prices, however, the research (Sánchez & Ferràndez, Valores, production prices and market prices based on data from the Spanish economy, 2010) deals with aggregate values and prices, as well as all macroeconomic research of a Marxian

nature . Despite this, it is convenient to address the generality of this criticism and relate it to the above.

As most Marxist economists have had for decades more energy to fight among themselves than to make a unified front against the dominant orthodoxy (and to some extent it is understood, they have too many epistemological differences - although most of them do not know what it is. That, since a Marxist economist, in general, only understands Political Economy, the historical approach, the dialectical-materialist philosophical logic have been forgotten for them -of this problem on a general scale in Marxism Lenin and then Rosdolsky already warned -), as ironic as it may seem to the reader, it is Andrew Kliman who refutes Diaz and Osuna's investigation. The reason for such a sympathetic event is none other than the fact that D&O conclude that the victory of the dispute (of which by the way it was already seen that the American did not come out very well) between Kliman and C&C cannot be awarded to any part.

The conclusions of the D&O research are that "Throughout this work, we have demonstrated the existence of an inescapable problem of indeterminacy, which invalidates all the statistical results obtained from the transversal regression models used in the test of the Ricardian hypothesis. The selection of the units of measurement is the cause of the indeterminacy. We have shown in this article, analytically and empirically, that there is no way out of this trap. Indeed, all we can say is that any correlation measure, even with completely disaggregated data, is misleading, but not "strong" or "false". Consequently, we will not be able to assess whether direct prices are (or are not) good predictors of producer prices. Therefore, any attempt to empirically test "Ricardo's 93% theory of value" by employing correlation measures is pointless. (Díaz & Osuna, 2007, p. 398) .

Thus , (Kliman, What is spurious correlation? A reply to Díaz and Osuna, 2014, p. 346) begins by stating in his reply to D&O that "However, the finding of spurious correlation has been questioned by Emilio Díaz and Rubén Osuna in a recent

article in this magazine. *They state – correctly – that “if we use other indices of the size of the sectors instead of the total costs [,]. . . the results obtained are different ”(2005–6, p. 356) .* They then infer from this that "the correlation measures between prices and values are completely indeterminate, because they go from zero to one depending on the (arbitrary) choice of the industry size index" (ibid., P. 356, emphasis in original). Therefore, the dispute between the proponents of "the 'strong correlation hypothesis' and the 'spurious correlation hypothesis' cannot be resolved empirically" (ibid., P. 356). "

Thus, his response, to what he understands as a “challenge” to “his findings”, is stated in general terms as follows: “ *I respond to these challenges below* . First, I argue that the charge of indeterminacy stems from Díaz and Osuna's misunderstanding of the concept of spurious correlation. The results are equally "indeterminate" in many other cases of spurious correlation, including those that are obvious. Second, I show that cost deflation makes the value-price correlation disappear, not because of the effect of this procedure on "the variability of the returned variables," but because the original correlation is spurious. " (Kliman, What is spurious correlation? A reply to Díaz and Osuna, 2014, p. 346)

His reply begins by stating that “Imagine that cross-sectional studies consistently support the claim that adherence to Christianity is the dominant determinant of income. For example, state-level data for the United States in 2000 indicates that the r^2 between the number of Christians and income is 0.95, and that one additional Christian in the state increases state income by almost \$ 68,000 (...)

However , a researcher shows that the correlation is false; Income and adherence to Christianity are highly correlated only because total income and the total number of Christians are large in large states and small in small states. Once we control for differences in the size of states, when calculating the correlation between Christians as a proportion of the total population and income per person, the

correlation between Christianity and income vanishes. (Kliman, What is spurious correlation? A reply to Díaz and Osuna, 2014, p. 346) .

And he continues stating that “But the two critics point out that” if we use other indices of the size of the states instead of the total population [,]. . . the results obtained are different ”. *Area is no less valid index of state size than population, but if we control for differences in state size by dividing the number of Christians and income by the areas of the states, the original correlation between Christianity and income is preserved. almost completely* . Therefore, critics conclude, "the correlation measures between income and the number of Christians are completely indeterminate, because they go from zero to one depending on the (arbitrary) choice of the state size index." The dispute between the proponents of "the 'strong correlation hypothesis' and the 'spurious correlation hypothesis' cannot be resolved empirically." *I doubt that anyone, including Díaz and Osuna, takes critics' accusation of indeterminacy seriously. However, what the critics argue is strictly analogous to what they have argued. The statements of the critics in the last paragraph are the exact words of Díaz and Osuna, quoted in the second paragraph of this answer, except that I have replaced the terms "sector" and "industry" by "state", "costs" by "population", "Prices" with "income" and "values" with "the number of Christians" .* (Kliman, What is spurious correlation? A reply to Díaz and Osuna, 2014, p. 348) .

At first glance, just like their simulation (which C&C refute) would seem like a solid argumentation, however, for someone who does not intend to impose their arguments but to know the truth, it is clear that the analogy that Kliman is making is antidialectic and therefore unscientific and theoretically false. The reason for this is simple, she is comparing, as my mother would say, "mangoes with avocados", which unlike "pears with apples" denotes a certain similarity in their physical form, but that a minimally careful eye can see that it does not happen. of that, of being a mere and tenuous similarity in physical form. Flaunting a

mechanistic logic seldom exhibited by a Marxist, he maintains without blushing that “The statements of the critics in the last paragraph are the exact words of Díaz and Osuna, quoted in the second paragraph of this answer, except that I have replaced the terms "Sector" and "industry" by "state", "costs" by "population," Prices "with" income "and" values "with" the number of Christians "(...)" (Kliman, What is spurious correlation? A reply to Díaz and Osuna, 2014, p. 348) . This happens, in short, because for him it is "so common sense" that the empirical estimates inspired by the models of simultaneous equations show spurious correlation as the inadequate example that he used to "prove" his point and, furthermore, showing of an intellectual double standard, while pointing out to D&O appropriately that statistical laws should not be mixed with economic laws [“This conclusion is a hasty generalization from a data set. It is not based on or supported by statistical theory. *In fact, the correlation coefficient, which is defined as the covariance between two variables divided by the product of their standard deviations, has nothing to do with the relative sizes of the standard deviations .*” (Kliman, What is spurious correlation? A reply to Díaz and Osuna, 2014, p. 349)] implicitly states on the other hand that the epistemological validity of the thesis that “God provides” is as robust as the vast body of statistical research in scientific research journals (with blind peer criteria and other issues) written by professionals who have dedicated years of study to the subject. Make no mistake about these words, one issue is that the statistical estimates (and the conclusions derived from them) are wrong and quite another is that their cognitive value is epistemologically equivalent to the "God will provide" implied by Kliman's grotesque example. This aspect will be explored in more detail below.

After analyzing the most relevant evidence on the subject, the set of conclusions of maximum likelihood possible to obtain (until someone proves otherwise, obviously) is:

1. There is a *law of tendency to equalize industrial profit rates* [understand *equalization* as "Adjust the reproduction frequencies of a signal within certain values" (Real Academia Española, 2021)], just as it exists (and this is shared by the entire TSSI -including Kliman-, Shaikh, Guerrero and a good part of the NI) also a *law of the decreasing trend of the average rate of profit* [see (Nabi, ON THE LAW OF THE DECREASING TREND OF THE AVERAGE RATE OF PROFIT . Unit Roots and Non-Stationarity of the Time Series, 2020)].
2. The correlation between values, producer prices and market prices is not spurious.
3. Not only can the creation of value not be attributed exclusively to capital, but, even without questioning the validity of the assumption that both productive factors generated value (and the validity of this will be discussed in section II.III), it is labor the one that contributes the most to the production process and, the one that, paradoxically, would receive "the smallest slice of the cake."

III.II.I. Considerations g noseológicas s Obre the e cuaciones s imultáneas

This is, indisputably, the most important section of this research, insofar as it is in it where the epistemological foundations required to theoretically reconcile all the aspects that, in the light of the analyzed evidence, turned out to be true, will be established, specifically the compatibility between the TSSI's approach to the temporality of the transformation of values into production prices and the empirical results found by the NI and Shaikh.

To do this, it is necessary to start by talking about the process of transformation of values into prices of production from a historical perspective. As he rightly points out (Emmanuel, 1972, p. 427) , the concept of value "(...) has its roots in essentially precapitalist and largely non-mercantile modes of production. However, tracing the course of the evolution of capitalism one finds a fixed capital that is less and

less important and more and more personalized, the differences of the organic compositions are reduced so that in the limit it is legitimate, at least from the point of view methodological and making abstraction of contingent impurities, to speak of a situation in which capital is practically non-existent, or equal or proportional to wages. To move from this situation to that of developed capitalism, where the inequality of organic compositions becomes significant, an accumulation of quantitative changes is necessary that engender at a given moment the qualitative mutation by which (...) "the transformation of values in producer prices.

Emmanuel, despite holding a historical perspective, is also adept at the use of simultaneous equations, in this regard he argues that "As Bortkiewicz has shown, the" *transformation* "must be global or not be. You cannot operate this transformation in the product (*output*) without *simultaneously* operating it in the inputs (*inputs*), especially constant and variable capital. " (Emmanuel, 1972, p. 428) . However, his historical reflection is correct.

What is the epistemological problem of using simultaneous equations? In reality, based on what was proposed by Emmanuel, it is precisely that Marxism has as one of its three fundamental characteristics that it is a logic of a historical nature (the other two are that it is dialectical and materialistic), so that the transformation of values into Prices of production occurs for the first time in the transition from societies of simple mercantile production to societies of capitalist production and, presumably, it did not occur from one year to another and, like the generality of qualitative jumps, it almost certainly occurred. over a considerable period of time to stabilize around its mean (which is the inexorable minimum requirement to perform long-term analysis in complex systems). This being the case, the conception of a simultaneous transformation of the product and the inputs in the historical transition from the societies of simple mercantile production to the societies of capitalist production is fatally wrong from Marxian theory.

Before proceeding in this direction, it is necessary to address from the historical and theoretical perspective the reason for the appearance of the models of simultaneous equations in Political Economy, in order to determine the connection of this with the use of this class of systems in the search to propose a mathematical model of Marx's theory. As is widely known, the appearance of simultaneous equation models dates back to Walras's work known in French as *Eléments de l'économie politique pure*, which for "mysterious" reasons was translated from French into English (request made jointly by the Royal Economic Society - "Royal Economic Society" - and the American Economic Association - "American Economic Society" -, executed by William Jaffé of Northwestern University - Evanston, Illinois-) under the title of *Elements of Pure Economics*, omitting the word "politics".

Source: Image scanned by own account, taken from (Walras, 1954, p. 29) .

Source: Image scanned by own account, taken from (Walras, 1954, p. 3) .

Even more interesting than the suspicious modification to the title of the work is the work itself. From page 13 to page 28 of the cited version, the expository structure of the French marginalist's work appears in great detail, however, there is not a single chapter or a single section of chapter that is properly titled or speaks of the process of production. This is verified in "Lesson" 5 (that is the pretentious name with which Walras calls the sections of his work), when he defines *exchange value*, *merchandise*, *market* and "explains" the *emergence of exchange value*. In this regard, it defines the exchange value in the following way: "The exchange value is a property, which certain things possess, not to be freely given or taken, but to be bought and sold, that is, to be received and transmitted to change of other things in certain quantitative proportions (...)" (Walras, 1954, p. 83). Of course, this definition navigates through the mists of the most archaic metaphysics. In the first place, it talks about "certain things", but what are the common properties, inherent to these, that allow them to be interrelated? The answer would seem to be "that they are not given away", but are "bought and sold, received and delivered", in defined quantitative proportions", with which at a stroke all analysis of the production process and, even more, all analysis of the distribution relations of social wealth in capitalist society disappears from its theoretical system. Finally, a deeply elementary question jumps to the eyes, how are these quantitative proportions defined? On the basis of what? Of course, this poor definition of exchange value drew criticism even from other marginalists like Wilfredo Pareto. In this regard, in the first footnote of that chapter, made by the editor, it reads that "(...) cf. V. Pareto, *Manuel d'économie politique*, Paris, 1909, reprinted Paris, Giard, 1947, pp. 242-246; Antonio Osorio, *Theorie Mathématique de l'change*, Paris, Giard, 1913, pp. 194-195. *Pareto Walras attacked the definition of "value in exchange" for meaningless, because it defines a "value in exchange" unknown, in terms of a "property" equally unknown*. He finds it useless to refer to this metaphysical entity, when its concrete manifestation, the price, that is, the terms of trade, is all that is needed in the theoretical development that follows. This is not

entirely true, since, as Cournot pointed out, while exchange value “necessarily implies the idea of a relationship between two terms ... an achieved change in the relationship is a relative effect, which can and should be explained by absolute variations in the terms of reason”, Augustin Cournot, *Researches into the Mathematical Principles of the Theory of Wealth*, p. 24. But aside from the question of the fairness of the criticism, the acrimony of Pareto's comments directed against Walras's definition seems totally unnecessary. *Walras was not responsible for introducing the term into the economics literature, but he demonstrated conclusively, as seen in §§ 101-102, that the only meaning that could have "exchange value" was that of a term in a proportion without autonomous existence out of that proportion*. To this Pareto added nothing with his criticism. " (Walras, 1954, p. 498) .

Here, the key lies not only in Pareto's critique, but also in Walras' response and Pareto's silence in the face of his ignorance of the epistemology of science. As is well known in the XXI century, the natural sciences cannot be deduced purely from Physics and this cannot be deduced purely from Mathematics, just as Mathematics cannot be deduced purely from logic, as he points out (Levins, 1993) on the first page of your inquiry. The logic that leads to positively assess a relationship between economic variables as "a term in a proportion without autonomous existence outside that proportion" is precisely the previous logic (without thinking about the thing with political malice - which is very common in the academy of Political Economy, by the way-), in which Pure Mathematics (deduced from logic) is the “ether” that floods and weaves together all economic categories, so that the ideal economic theory, according to this vulgar pseudoscientific vision, is that that strips economic categories of all essence, replacing it with abstract mathematical definitions; however, although it would appear to be a noble scientific endeavor, at least scientific it has absolutely nothing. The reader must remember that what is talked about in Political Economy is precisely about economics (and the influence on it of political relations inherent to

class societies), so that the objects posed mathematically, *ie* , the mathematical approach of the categories , must always be anchored (not mechanistically or empirically, of course) to economic reality and that is precisely what happens in disciplines such as Physics, Chemistry, Biology and others, only in marginalist and neo-marginalist models the apparatus Mathematics turns out to be "applicable" (only at a formal level, obviously) to other types of qualitative states of matter (studied by the various scientific branches - orthodox economics is definitely not a scientific branch -), since the economic categories that they they pose are devoid of essence, almost completely disconnected from reality, and totally completely disconnected from reality. Only in the marginalist and neo-marginalist school to isolate completely from reality (and its essence, from reality) the definition of a phenomenon is desirable and represents an "irrefutable" argument.

Of course, the lamentable spectacle of epistemological ignorance of Walras does not end there, later he defines the act of buying and selling in the following way: "The buyer of a thing is the seller of what he gives in return. The seller of a thing is the buyer of what he receives in return. In other words, any exchange of one thing for another is made up of a double purchase and a double sale. " (Walras, 1954, p. 83) . The key here is (and I thank my mother for noticing it) that what Walras is implicitly proposing (bringing up that by the historical moment of writing and publication of the work money as a general equivalent was already fully developed -and because the approach dimensionality of the marginalists and neomarginalists, *ie* , the unit of measurement they use for economic variables, is precisely money-) which, for example, if the reader and the author of this research exchange, for example, a cell phone (belonging to to the reader) for USD \$ 200 (belonging to the author), the reader is the buyer of the money (and the seller of the cell phone) and the author is the seller of the money (and the buyer of the cell phone). Precisely this fact is the key to understanding Walras' need to use simultaneous equations, however, before developing such an argument, it is

necessary to review another "jewel" of the economic "theory" left by the vulgar French economist.

Thus, the previous exposition ends when Walras states that:

“Things that are valuable and interchangeable are also known as commodities. The market is a place where commodities are exchanged. *Thus, the phenomenon of exchange value is manifested in the market, and we must go to the market to study exchange value . The exchange value, when left alone, arises spontaneously in the market as a result of competition .* As buyers, merchants make their demands by outbidding each other. As sellers, merchants do this by sub-bidding each other. The union of buyers and sellers then results in giving commodities certain values in exchange, sometimes rising, sometimes falling, sometimes stationary. The more perfectly the competition works, the more rigorous is the way of arriving at the value in return. ” (Walras, 1954, p. 83) . Mr. Walras returned to Political Economy in the stone age, because even Aristotle, or even more so, even Xenophon (more distant in time from Stagirite), had more sophisticated conceptions of use value, exchange value, and exchange in general. ; or, to be more precise: it sent Political Economy to a state in which it never existed, because the economic world that Walras defines, inspired by the work *Robinson Crusoe* (in fact, his example of exchange economy is the economy of “Robinson and Friday, ” which, considering that Friday was a slave, would seem like a declaration of intent).

Precisely by stating that "the phenomenon of exchange value manifests itself in the market" it is eliminating any possibility of exploitation, class struggle, social conflict and all ethical and moral notions in social exchanges. In fact, it is precisely to this last point that he dedicates the first two chapters of his work (the first entitled " Definitions of Political Economy . Adam Smith; JB Say " -located from pages 51 to 57, in which he opts for definitions vulgar words of Say , who limited themselves to talking about supply and demand as if it were a poorly trained parrot- and the second entitled "Distinguished Science, Art and Ethics" -located

from page 58 to 64-) and in the third chapter " defines "the concept of *social wealth* in the following terms:" ***By social wealth I mean all things, material or immaterial (no matter what this context is), which are scarce .*** " (Walras, 1954, p. 65) .

Contrary to his "noble" intentions to disassociate Political Economy from ethics, when he states that social wealth depends on scarcity regardless of the context analyzed, not only does he again commit the same epistemological error of not anchoring his vulgar hypotheses to reality , but also, since it subsequently defines as exchange value what arises in the market of the bid between suppliers and demanders given their subjective needs (since the theory of value that marginalists and neomarginalists use is the subjective theory of value) Anything that is scarce is susceptible to being commodified and this, according to Walras, has no ethical implication. The reader is left to make the pertinent ethical-moral judgment.

Finally, it is possible to explain the methodological need for Walras to use simultaneous equations. As the production process and distribution relations disappear from the analysis, inexorably the determination of exchange value will emanate (as Walras himself explicitly recognizes in the references made) from circulation, from mere exchange. Under this conception, the trajectory of political economy systems, particularly for this case that of the capitalist, cannot be analyzed from a historical perspective since it is not conceived as a process, in fact, there is no trajectory of the system since there is no time.

Thus, to speak of modes of production that succeed each other is out of place and, consequently, also of historical processes and, worse still, of a logical concatenation of the facts that make up such historical processes, is nonsense within the Walras theory, as he almost certainly intended. This being the case, since everything is determined in exchange, in the sphere of circulation, and since Walras also defines a double act of buying and selling (in which the buyer of a commodity is a seller of money and the seller of a commodity is money buyer), the act of buying and

selling in general (defined in Marx as the process $DM-D'$, ie, Money-Merchandise-Money', where the extreme right D' is the commodity exchanged for money that already includes the surplus value previously generated in the production process -contained between the term "D" and the "M", while between "M" and "D'" is the circulation process) will require that they be simultaneously determined in the market not only the prices of goods, but also their physical quantities, since the interaction between supply and demand of such physical quantities is what will determine the exchange value, which will be expressed with "total technical fairness" in prices. It follows that Walras, in the quest to disappear from the analysis of the production process, productive consumption, unproductive consumption, the relationship between use value and exchange value, the generation of a surplus (in his model, it is impossible that the possibility of a surplus exists), the relationship between production and circulation, the common essence of merchandise, etc., theoretically raised his economic vision and that same theoretical approach inexorably forced him to use simultaneous equations, specifically because In its theoretical approach, prices and physical quantities must be simultaneously determined (independently of the dimensional problems exhibited by neoclassical theories and which it categorically indicates [(Sánchez, Inconsistency of neoclassical theory: application of dimensional analysis to economics, 2013, pp. 4-6)] and there is no production process or distribution relationships, so the ideal mathematical instrument for model that is the simultaneous equations.

Now, does this simultaneous transformation occur in the successive stages after the initial transformation described above? To answer this question, it must be remembered that at the beginning of the last century the Austrian economist Ladislaus Bortkiewicz criticized the process of transformation of values to prices of production that generated a "new" topic among the Marxist community (the quotation marks will be explained) known as "the problem of the transformation of values into prices of production".

This “problem” consisted, according to Bortkiewicz, in that when determining values and prices by means of a model of simultaneous equations, it made it impossible to fulfill three conditions simultaneously:

1. The sum of the values is equal to the sum of the prices.
2. The sum of the gains is equal to the sum of the capital gains.
3. The rate of profit obtained is the same if it is calculated in terms of monetary units as in terms of physical units.

As can be seen, the criticism is of a macroeconomic nature, but since production prices are a microeconomic category, the criticism also takes on a microeconomic dimension. Later we will return with the foundation of the historical approach and the criticism of the use of systems of simultaneous equations (whose explanation of widespread use is also of a historical nature). Next, a criticism will be presented, within the same framework of simultaneous equations, that refutes Bortkiewicz's criticism.

As pointed out (Valle Baeza, 1978) , the mistakes made by Bortkiewicz are:

1. It does not consider fixed capital, on the contrary, it assumes that there is only circulating capital (that is, that capital is consumed in the same period, which in everyday accounting is what is understood as short term).
2. No extended reproduction is used, only simple reproduction (and simple reproduction has its roots in the genesis of capitalism, presumably it would require additional assumptions and additional information).
3. From the logic of simultaneous equation models, it is not significantly relevant that the rate of profit is quantitatively equivalent if it is calculated in monetary units or in physical units. To deepen this aspect, see (Valle Baeza, 1978, p. 200) .

4. Furthermore, he also points out (Emmanuel, 1972, p. 431) that in the simultaneous transformation carried out by Bortkiewicz that the Russian economist of the Austrian school "(...) *makes the simultaneous transformation of inputs and outputs and their arrival scheme it is a scheme of equilibrium that respects the difficulties and coherence that are its own, but the determinations by the amounts of work have disappeared from it (...)* In fact, for Bortkiewicz, it is not a question of any form of "transformation". In its arrival scheme, every trace of value as a chronometric quantity of work has disappeared . "

Of course, the above only refutes the cognitive value of Bortkiewicz's critique, it does not prove that Marx's procedure through simultaneous equations is adequate. Therefore, it is necessary to begin by supporting the epistemological validity of the historical approach to the process of transformation of values into prices of production. In this sense, Richard Levins points out that:

" In the bookstores of my youth it was common to find titles that included the term 'foundations of science'. These were not books on science at all, but on logic, inheritors of the Russell-Whitehead program to derive mathematics from logic and the science of mathematics. The hope persisted that objectivity could be achieved through analytical methods: clear definitions, unambiguous categories, precise measurements, and the discovery of algorithms that could substitute for the whim of human judgment. But the program as a whole has been a failure, as indeed it had to be. The foundations of science are found in history and sociology, not in formal analysis. " (Levins, 1993, p. 547) .

Now, to understand how this applies to Political Economy, it is first necessary to understand what *value* is in terms of social metabolism. In such terms, when it is affirmed that only work creates value, it is affirming that "(...) work is the only common quality of commodities that explains their quantitative equivalence in exchange." (Emmanuel, 1972, p. 439) . It is precisely the foundation of this thesis

that must have a historical and sociological character, *ie*, the study of the transition from societies of non-mercantile production, to those of simple mercantile production to those of capitalist production as a historical and sociological process. , not fundamentally mathematical-formal, although the mathematical instrument is a useful tool, but, after all, a tool, not a foundation. Ironically, it is also Emmanuel who clearly shows how a historical materialist should not reason: "This means that the dream of economists of all times of finding an invariable pattern of the value of commodities, with which the relation of all commodities we would give an absolute value for each one of them, it is unfeasible, since there is more than one quantification factor and *the case is abandoned (theoretical or historical, it does not matter) in which the independent producer's tools are negligible or inalienable and in which the only factor of value is work* ." (Emmanuel, 1972, p. 432) . For him, and for many other Marxists (as will be seen below), the transition from societies of simple mercantile production to those of capitalist production is a mere "case", meaning a mere exceptionality, that is, a process that does not it is continuous and is naturally disconnected, like a reality "with holes" that are naturally inherent to it. However, on the same page Emmanuel points out with relative reason that Bortkiewicz's failure is not mathematical but logical. Thus, to substantiate his approach (which has certain minimal historical elements) he makes two citations, one from Engels and the other from Marx.

"The exchange of commodities for their values or roughly for their values therefore presupposes a much lower phase than the exchange based on the prices of production, which requires a fairly high level of capitalist development... it is, therefore, It is absolutely correct to consider the values of commodities, not only theoretically, but historically as the prius of prices of production. This refers to the regimes in which the means of production belong to the worker, a situation that occurs both in the ancient world and in the modern world with respect to the farmer who cultivates his own land and with respect to the artisan. " Marx in Volume III, Chapter X of Capital, cited by (Emmanuel, 1972, p. 426) .

In other words, Marx's law of value governs in a general character, insofar as economic laws always govern, for the entire period of simple commodity production, that is, until the moment in which it is modified by the emergence of the capitalist form of production. Until then, prices gravitate according to the values determined by Marx's law and oscillate around them ... Marx's law of value thus has a general economic validity, which covers the entire period from the beginning. of change ... until the fifteenth century of our era. " Engels in the prologue to volume III of Capital, cited by (Emmanuel, 1972, p. 426) .

Unfortunately, failing to understand the importance of the historical method, Emmanuel wonders "That Marx and Engels were right or wrong at heart, that is not the problem. What matters is asking why men like Marx and Engels felt compelled to use a historical argument that lends itself so much to discussion. " (Emmanuel, 1972, pp. 426-427) . The answer to Emmanuel is given by the same authors to whom he asks the question in question.

"Although the object of my specialized studies was jurisprudence, I considered it only as a subordinate discipline alongside philosophy and history (...) The general result I reached and that, once obtained, served as a guide to my studies can be briefly formulated as follows: In the social production of their lives, men enter into certain necessary relations independent of their will, relations of production, which correspond to a certain degree of development of their material productive forces. These relations of production as a whole constitute the economic structure of society, the real base on which the legal and political superstructure is erected and to which certain forms of social consciousness correspond. The mode of production of material life conditions the process of social, political and spiritual life in general. It is not the conscience of men that determines their being, but, on the contrary, the social being is what determines their conscience. At a certain stage of its development, the material productive forces of society come into contradiction with the existing relations of production, or rather, which is nothing

more than the legal expression of this, with the property relations within which they have unfolded until then. From forms of development of the productive forces, these relationships become their obstacles. And thus opens an era of social revolution. As the economic base changes, the entire immense superstructure is more or less rapidly transformed. When examining such transformations, it is always necessary to distinguish between the material transformation -which can be stated with the exactitude typical of the natural sciences- of the economic conditions of production and the legal, political, religious, artistic or philosophical forms, in brief, the ideological forms under which men become aware of this conflict and struggle to resolve it. In the same way that an individual cannot be judged by what he thinks of himself, neither can such an epoch of transformation be judged by his conscience; On the contrary, it is necessary to explain this consciousness by the contradictions of material life, by the conflict existing between the social productive forces and the relations of production. A social formation never disappears before all the productive forces within it develop, and new and superior relations of production never appear before the material conditions for its development have matured within the old society itself. existence. That is why humanity always considers only the problems that it can solve, since a closer examination always shows that the problem itself only arises when the material conditions to solve it already exist or, at least, are in the process of being formed. Broadly speaking, the Asian, the ancient, the feudal, and the modern bourgeois mode of production can be designated as epochs of progress in economic social formation. Bourgeois relations of production are the last antagonistic form of the social process of production, antagonistic, not in the sense of an individual antagonism, but of an antagonism that emanates from the social conditions of life of individuals. But the productive forces that develop within bourgeois society provide, at the same time, the material conditions to resolve this antagonism. With this social formation, then, the prehistory of human society is closed. Federico Engels, with whom I have maintained a constant written exchange

of ideas since the publication of his brilliant sketch on the critique of economic categories (...) (in the *Deutsch-Französische Jahrbücher*), had arrived by a different route (cf. his book *La situation of the working class in England*) to the same result as me, and when, in the spring of 1845, he also settled in Brussels, we agreed to formulate our conception as the antithesis of the ideological conception of German philosophy, actually to settle the score with our previous philosophical consciousness. This purpose was realized in the form of a critique of post-Hegelian philosophy " (Marx, *Contribution to the Critique of Political Economy*, 1989, pp. 7-9) .

For his part, Engels points out, located in the same source referred to, that:

"Developing the materialist conception, if only in light of a single historical example^[10], it was a scientific work that would have required long years of quiet study, since it is evident that here with simple sentences nothing is achieved, that only the existence of abundant historical materials, critically screened and totally mastered, make possible the solution of this problem (...) A book like this could not limit itself to critically criticizing some individual chapters of Political Economy in isolation, studying this or that disputed economic problem in isolation. Not; This book is oriented from the outset to a systematic synthesis of the entire set of economic science, to develop in a coherent way the laws of bourgeois production and bourgeois change. And since economists are only the interpreters and apologists of these laws, to develop them is, at the same time, to critique the entire economic literature. Since Hegel's death, little attempt had been made to develop a science in its own internal connection. The official Hegelian school had only learned from the teacher's dialectic the manipulation of the simplest procedures, which it applied left and right, and also with a not infrequently laughable clumsiness. For her, the entire inheritance of Hegel was reduced to a simple pattern by which all possible themes could be constructed, and to an index of words and turns that no longer had any mission but to be placed at the right

moment, that is, when ideas were lacking. and positive knowledge. As a professor from Bonn said, these Hegelians knew nothing about anything, but they could write about everything. And so it was, indeed. However, despite their presumption, these gentlemen were so conscious of their deficiency that they shunned, as far as possible, the great problems; the old pedantic science maintained its positions by the superiority of its positive knowledge. Only when Feuerbach came and gave a passport to the speculative concept did Hegelianism slowly languish until it disappeared, and it was believed that the reign of the old metaphysics, with its immutable categories, had re-established in science. " Engels, quoted in (Marx, Contribution to the Critique of Political Economy, 1989, pp. 157-158) .

The historical basis for the aforementioned situation is stated by Engels as follows:

"The thing had its logical explanation. The regime of the Hegelian diadocs, which had lost itself in mere sentences, naturally followed an era in which the positive content of science again outweighed its formal aspect. At the same time, Germany, consistent with the formidable bourgeois progress achieved since 1848, was launching itself with truly extraordinary energy into the natural sciences; and, as these sciences became fashionable, in which the speculative tendency had never acquired great importance, the old metaphysical way of thinking also gained ground, until it fell into the extreme vulgarity of Wolff. Hegel had been forgotten, and the new materialism of the natural sciences developed, which is hardly different, theoretically, from the one that existed in the eighteenth century and which in most cases has no advantage other than that of having a material of natural sciences, mainly chemical and physiological, more abundant. The narrow Philistine mentality of pre- Kantian times reappears to us, reproduced to the utmost vulgarity, in Büchner and Vogt; and even Moleschott himself , who swears by Feuerbach, is lost every moment, in a hilarious way, among the simplest categories. Naturally, the stiff head of bourgeois common sense stops perplexed at

the ditch that separates substance from appearance, and cause from effect; and if one is going to hunt with greyhounds in the rugged terrain of abstract thinking, it should not be done on the back of a pence. " (Marx, Contribution to the Critique of Political Economy, 1989, p. 159) .

It was then, as Engels relates, that the methodological and epistemological problems appeared:

"Here, therefore, there was another problem that, in itself, had nothing to do with political economy. By what method was science to be treated? On one side was the Hegelian dialectic, in the completely abstract "speculative" form, in which Hegel left it; on the other hand, the ordinary method, which was back in fashion, the method, in its metaphysical essence, Wolffian , which bourgeois economists used precisely to write their thick and incoherent books. This last method had been so theoretically destroyed by Kant, and especially by Hegel, that only inertia and the absence of another simple method could explain that it still practically persisted. On the other hand, the Hegelian method was entirely useless in its existing form. It was an essentially idealistic method, and here a more materialistic conception of the world had to be developed than all the previous ones. That method started from pure thinking, and here it was necessary to start from the most stubborn facts. A method that, according to Hegel's own confession, "started from nothing to arrive at nothing, through nothing" (...) was in any case improper under this form. And yet it was the only piece of existing logic material that could at least be used. He hadn't been criticized, he hadn't been outdone; none of the adversaries of the great dialectician had been able to open the breach in the graceful building; it had fallen into oblivion, because the Hegelian school did not know what to do with it. The first thing, then, was to subject the Hegelian method to a thorough critique. What set Hegel's discursive mode above that of all other philosophers was the formidable historical sense that served as its basis. No matter how abstract and idealistic its form was, the development of its ideas always went hand in hand

with the development of universal history, which in reality should only have been its touchstone. And even if this were to invert and turn the true relationship upside down, the real content nevertheless penetrated the whole of philosophy; All the more so because Hegel distinguished himself from his disciples in that he did not boast, like these, of ignorance, but was one of the most erudite heads of all time. He was the first who tried to highlight in history a process of development, an internal connection; and however strange many things about his philosophy of history may seem to us today, the greatness of the fundamental conception is still something admirable, if we compare with him his predecessors or those who after him have allowed themselves to make general considerations about the history. In Phenomenology, in Aesthetics, in the History of Philosophy, everywhere we see this grandiose conception of history reflected, and everywhere we find the matter treated historically, in a certain connection with history, although this connection appears inverted. in an abstract way. This epoch-making conception of history was the direct theoretical premise of the new materialist conception, and this already provided a starting point for the logical method as well. If, even from the point of view of 'pure thinking', this forgotten dialectic had led to such results, and if, furthermore, it had ended up as playing with all previous logic and metaphysics, there must undoubtedly be something more than sophistic and pedantic subtlety. But, subjecting this method to criticism, an undertaking that had done and still makes the entire official philosophy back down, was no small thing. " (Marx, Contribution to the Critique of Political Economy, 1989, pp. 159-160) .

Thus, Engels relates that the historical process by which Marx solved such methodological problems (the method to be used, which was the dialectical one in its materialistic form) and epistemological (how to approach reality with said method) was as follows:

"Marx was and is the only one who could dedicate himself to the task of extracting from Hegelian logic the core that holds Hegel's true discoveries in this field, and of

re-establishing the dialectical method stripped of its idealistic garb, in the simple way in which it appears as the only exact form of the development of thought. Having elaborated the method on which Marx's critique of Political Economy rests is, in our opinion, a result that hardly detracts from the fundamental materialist conception in importance. Even having discovered the method, the critique of Political Economy could be undertaken in two ways: the historical or the logical. As in history, as in its literary reflection, things also develop, broadly speaking, from the simplest to the most complex relationships, the historical development of publications on Political Economy provided a natural guiding thread for criticism, and, in general terms, the economic categories appeared here in the same order as in their logical development. This form apparently has the advantage of greater clarity, since it follows the actual development, but in practice it would only be, at best, more popular. The story often unfolds in jumps and zigzags, and if it were to be followed throughout its entire trajectory, it would be necessary not only to collect many minor materials, but also to break the logical thread many times. Furthermore, the history of political economy could not be written without that of bourgeois society, with which the task would become interminable for lack of any preparatory work. Thus, the only indicated method was the logical one. But this is really nothing more than the historical method, stripped only of its historical form and disturbing contingencies. Where history begins, the discursive process must also begin, and its subsequent development will only be the reflection, in an abstract and theoretically consistent way, of the historical trajectory; a corrected reflection, but corrected according to the laws that the actual historical trajectory provides; and thus each factor can be studied at the developmental point of its full maturity, in its classical form. With this method, we start from the first and simplest relationship that exists historically, in fact, for us; that is, here, of the first economic relationship with which we find. We proceed to analyze it. Already in the mere fact of being a relationship, it is implicit that it has two sides that are related to each other. Each of these two sides is studied separately, from which

their reciprocal relationship and interaction are later derived. Contradictions will emerge, which will have to be resolved. But, as here we are not following an abstract discursive process, which is operated exclusively in our heads, but rather a real succession of events that actually occurred at some time or that are still occurring, these contradictions will also have developed in practice and there will be also probably found your solution. We will study the nature of this solution and we will see that it is achieved by creating a new relationship, the two opposing sides of which we will have to develop now, and so on. " (Marx, Contribution to the Critique of Political Economy, 1989, pp. 160-161) .

Thanks to the masterful chair of methodology and epistemology given by Marx and Engels, together with what was proposed by (Levins, 1993, p. 547) , there would seem to be no margin for the existence of doubts like that of (Emmanuel, 1972, p. 426 -427) .

Arghiri Emmanuel points out that the quotation he refers to can be considered (and also points out that other Marxists expressed the same to him) as an authoritative argument in favor of his approach (Emmanuel differs from Bortkiewicz essentially because he manages to solve the problem, using simultaneous equations, making the wage rate the independent variable of the economic system, thereby seeking to express that there is a dual essence within market prices, that is, values and prices of production -which implies that capital It also creates value, although work appears as the determining productive factor - although determining only at the level of the system of equations, not of the economic logic- of the production process), but this confusion of Emmanuel (and of those who thought that) lies in which the quote made by Engels, in which he says that prices gravitate around values and oscillate around said values, however However, there Engels is not referring to prices of production, but to prices merely as a proportional expression of value (proportional in terms of the MELT, which is the *monetary expression of socially necessary labor time* - the acronyms belong to his

name. in English-)[111], which is what Anwar Shaikh calls *direct prices* . One of the problems that Emmanuel commits is the same problem that (Valle Baeza, 1978, p. 170) attributes to Shaikh: “Shaikh's mistake consists in not considering that money itself can be exchanged above or below its value, when it is a commodity. Hence, his vindication of Marx's procedure focuses on showing not the functions of money as a unit of value and price pattern , but on the formal aspects of the problem. ”, Which Valle points out as a source of divergences between values-prices. and surplus-profit, but it also serves to understand the role that the existence of the MELT plays and that it follows that the labor-values that Marx and Engels speak of in precapitalist production societies (simple mercantile - that's why Engels situates this set of societies from the beginning of the change to the fifteenth century of our era-), from the formation of the general equivalent of merchandise, evidently they have their corresponding expression in the market via prices (the immediately perceptible characteristic), which does not imply (by changes in the price of money -which can be changed above or below its value-) that such direct prices (or price-values) are equal to the values res, but it does imply that they are proportional to the values (measured in human-hours, of course - the MELT is then the coefficient that allows maintaining dimensional rigor in the analysis, by reconciling monetary units with temporal units).

FILL IN ARGUMENTALLY, HERE YOU FEEL A HOLE

Thus, after analyzing Emmanuel's approaches, it is convenient to do the same with Shaikh's solution to the criticism made by Bortkiewicz, which is iterative in nature. A masterful description of this process exposes it (Moseley, 2015, pp. 244-245) , who in this regard explains that:

“ A key assumption of this iterative procedure is the invariance postulate (or 'iteration rule') that the total price (for the economy as a whole) remains constant in the second step and in all subsequent steps, and equal to total direct price (the total value expressed in monetary terms) in the first step . As already mentioned,

this assumption is different from the Bortkiewicz-Sweezy invariance postulate (total profit = total surplus value). *Another key assumption is that in the second step and in all subsequent steps, the total benefit (for the economy as a whole) is determined differently from step 1A. Total profit (or total capital gain) is not determined by the product of variable capital and the rate of capital gain (as in 1A), but is determined by subtracting the revised total constant and variable capital from the total price. Since the total price remains constant and the constant capital and the variable capital vary from one iteration to another, the total profit will also vary inversely to the constant and variable capital* . This procedure is repeated step by step until changes in producer prices between two steps become negligible and producer prices converge to long-run equilibrium prices. At each step, the physical quantities of the means of production, the means of subsistence and the luxury goods remain the same, and are in effect the fundamental data in this iterative procedure, from which the values and prices of production are derived, similar to Bortkiewicz- Sweet interpretation. The final results of this iterative process are production prices that are the same as those derived from the Bortkiewicz-Sweezy method (except for a proportionality factor due to the different invariance postulate). Shaikh calls the Bortkiewicz-Sweezy prices the "correct prices", which his method is able to replicate. The win rate is also the same for both methods (= 25%). The advantage of this iterative method, according to Shaikh, is that these results are obtained, not by an alternative to Marx's transformation procedure, but by successive applications of Marx's procedure. The usual Bortkiewicz-Sweezy method `` skips " the Marx transformation procedure and goes directly from values to long-run prices of production and the associated rate of profit, so the Marx transformation plays no role. in determining the prices of production and the rate of production. profit. Shaikh argues to the contrary that, according to his method, the transformation of Marx plays a crucial connecting role between values and prices of production. "

However, Moseley's conclusions regarding Shaikh's approach is that "In summary, I conclude that Shaikh's interpretation is not a very promising defense of Marx's theory, nor is it a promising path for the further development of Marx's theory. The Shaikh interpretation is essentially the same as the Bortkiewicz-Sweezy interpretation, with a "dual system" and simple reproduction as the logical framework and the same system of simultaneous equations to be solved for the prices of production and the rate of profit. This is not a different interpretation of the logical structure of Marx's theory, but just a different method of solving this system of simultaneous equations. " (Moseley, 2015, p. 251) . What Moseley affirms is valid only in a certain applied sense and on this it will be deepened in section III.II.I. As it will be seen there, Shaikh's method is valid as an empirical methodology, which, due to the gap between the empirical procedures and the theoretical interpretations of the results [on which it is necessary to carry out deep private investigations, since this question not only It occurs in Political Economy but also in Quantum Mechanics, as it is verified in different passages of (Nabi, Lecciones de Gnoseología Marxiana I, 2021) that recapitulate elements about the foundational debate regarding the interpretation of the wave-particle duality ; Despite this, this issue is addressed in some depth in section III.II.] does not delegitimize its use in the scientific investigation of economic phenomena and, in fact, historically speaking, the genesis of input-output analysis is empirical, not theoretical, and in such genesis it was already implicit (which will also be addressed in section mentioned) the notion of vertical integration, which is even used today by modern capitalist firms in a significantly different sense from that used by Sraffa and Pasinetti (and by some Marxist currents to formalize the ideas "of" Marx behind their them) . In this sense, the *TSSI* approach categorically explains that within the economic dynamics (or even as an external influence to the economic system) variations can be generated both at the level of production prices (the values deviated from themselves - because of the process described by Marx in Volume III of *the Capital* - expressed monetarily) and direct prices (values-work

expressed monetarily) affecting the gains expected by the capitalists (and included in its estimates, forecasts and projections) based on its effect on the price of production or the direct price of the goods yet to be realized (where both prices may change as a result of technological change or fluctuations in the money market - in the latter scenario, the value does not change, but the MELT, which causes the same value to be expressed monetarily speaking in a different magnitude-, while the price of production also can change due to variations in the reciprocal influence of supply and demand), because they are simply waiting to be bought by the final consumer, that is, because the prices of raw, intermediate and auxiliary materials change (which is explained to their sometimes for the same reasons mentioned above) , but in both cases, due to certain rigidities of the same economic dynamics (for example, legal contracts previously signed by the capitalist, the time lag between the economic process occurring in the real sector and manifests itself phenomenologically to the monetary sector, etc.) the capitalist is unable to readjust the price to reflect the new economic reality in his favor, in favor of his profits. Of course, it is also necessary to consider the scenario in which the capitalist simply performs an accounting readjustment (be it within his firm, at the level of the productive branch, at the national level or at the global level), because even in such a scenario it exists as a real fact an accounting readjustment, empirical in nature and simple enough to apprehend analytically not to doubt such a fact as epistemological confirmation that it is valid to reason at the level of abstract thought including this real fact.

In (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 312) it is noted that "The definition of 'value' used by Kliman is different from the one used by us and most of the collaborators of the empirical literature ; This is a secondary issue in the current context, but nonetheless has some importance. From our point of view, Marxist "values" correspond to what some have called " vertically integrated labor coefficients ." *In principle, these can be obtained by multiplying the inverse Leontief matrix in the vector of direct sectoral labor*

coefficients. In practice, they are obtained through an iterative procedure: the first approximation to is the direct contribution of labor in the sector (generally, as represented by the wage bill), while the approximation is the sum of direct labor in the sector and the value of non-labor inputs consumed in that sector, evaluated in step . "

[12] As will be seen, they are different definitions, but not different definitions, which is different and distinct.

It is clearly evident that there is a break between the theoretical process proposed by the New Interpretation and its supporters: At the theoretical level, the work-values are determined as a vector of vertically integrated work coefficients (methodology proposed by Sraffa - self-considered a neo-Oricardian -), whose theoretical-mathematical foundation is systematically detailed from (Pasinetti, 1984, p. 95) to (Pasinetti, 1984, p. 101) , in addition to, evidently, in Sraffa's work entitled "Production of Goods by means of Goods ", which is where such an economic concept was born; However, at the applied level, the values are found through an iterative process (dynamic, therefore) in which the initial conditions are stated in such terms that the first iteration considers only the direct contribution of work in the sector , isn't it does that equivalent to the scenario in which the fixed capital is analytically negligible (as noted Arghiri Emmanuel happened in societies non-commercial and societies of simple commodity production) ?, and in turn, is not that case u na empirical equivalence that values historically appear before producer prices? Moreover, is not the simulation then precisely equivalent to the historical transit almost certainly aroused in the time period of components? In the opinion of the author of this research, the answer seems to be quite clear and affirmative.

Thus, everything seems to indicate that the historical approach to the transformation (which implies a temporal and single-system conception of this process -the other assumptions of the TSSI are not necessarily compatible, that will belong to another investigation-) is epistemologically compatible with the

empirical simulations carried out by Shaikh, as well as the statistical correlations found by C&C, Sánchez, Valle and others.

Interestingly, not all TSSI supporters have a historical approach to the issue, at least not Andrew Kliman. Based on (Borisov & Zhamin, 2009, p. 199) , PMS is production based on private ownership of the means of production and on the personal work of producers, who make articles for sale in the market. The most typical representatives of simple mercantile production today are the small peasants and artisans who do not exploit the labor of others. This type of production constitutes an economic regime that has existed in various socio-economic formations. By its nature, simple commodity production has a double character. Since it is based on private property over the means of production, the small peasant or artisan is an owner and this brings him closer to the capitalist. On the other hand, simple mercantile production has its roots in personal work, the producer is a worker, and this brings him closer to the proletariat. Simple commodity production and capitalist production differ from each other by the source from which private property emanates over the means of production. In the first case, this property is based on the personal work of the producer; in the second it is based on the exploitation of salaried workers. In the simple mercantile economy, only the products of human labor are merchandise, while in the capitalist economy, man's own labor power becomes merchandise. Simple mercantile production develops under the action of the law of value, a law which, through fluctuations in commodity prices and competition in the market, spontaneously regulates the distribution of the means of production and of labor power among the different branches of production. In simple mercantile production, the action of this law leads to the spontaneous development of the productive forces. The magnitude of the value of the commodity is determined by the socially necessary labor. Producers who use a higher technique and who organize production better, produce their goods at less expense than is socially necessary. Instead, the sale of goods is made at prices that correspond to socially

necessary labor. This results in the producer obtaining a surplus of money and enriching himself, which induces the other producers to introduce more improved production methods. Simple commodity production is unstable. The spontaneous action of the law of value, price fluctuations and competition cause the simple mercantile economy to break down and the producers to differentiate themselves: some (the minority) get rich; others (most) go bankrupt. The process of differentiation of producers under certain historical conditions - specifically: when there is private property over the means of production and labor power becomes a commodity - gives rise to the bourgeoisie and the proletariat, engenders capitalism, constitutes the basis initial for the capitalist mode of production to be born. But this does not imply the absolute disappearance of simple mercantile production. The PMS is not only a theoretical construction, it is the origin of capitalism itself in historical terms, in the only terms in which the origin of any society can be analyzed.

However, an acquaintance told the author of this investigation that on May 27, 2018, he had the opportunity to talk with Andrew Kliman through the social network known as Facebook. There, the person in question suggested to Kliman that the physicalist conception of exchange value, specifically that of the heterodox economist Adolfo Rodríguez Herrera, who maintains that exchange value is only one category of the capitalist mode of production was wrong, since It is a category (exchange value, as well as use value, it may be said) inherent in all production destined for exchange, since even surplus value already exists in precapitalist production societies and that, consequently, not only salaried work is abstract work. His answer was, verbatim, "I think you are right about the exchange value. However, there was never a society in which "simple commodity production" was the dominant mode of production. Furthermore, the physicalist may have simply meant that value is not a concept applicable to all societies. I also think you are right about abstract work. But that's a more complex discussion. " Obviously, although it is not impossible that the physicalist wanted to say what Kliman

proposes, what is important is what he said, since acting as a "translator" (or believing to act as) in scientific debates would not seem to be the most appropriate for the sake of the same scientific rigor. However, it is an undeniable fact that both use value and exchange value are applicable to practically every society, except very primitive societies, which did not produce for exchange.

III.II.I. Considerations g noseológicas s Obre the v ectors of c oeficientes of t ork v erticalmente i NTEGRATED s

As he points out (Zachariah, 2006, p. 3) , vertical integration consists of the sum of direct and indirect labor costs (indirect ones represent dated work, that is, past and crystallized work as means of production). These vertically integrated labor costs are, according to (Fröhlich, 2012, p. 1111) , labor costs expressed monetarily. As they point out (Cockshott, Cottrell, & Valle Baeza, The Empirics of the Labor Theory of Value: Reply to Nitzan and Bichler, 2014, p. 132) , this procedure, which crystallizes in the vertically integrated work vector, is composed by coefficients whose domain corresponds to the interval $[0, 1]$, which is why it is usually known as a vertically integrated vector of coefficients of work. Along the same lines, as stated in (Pasinetti, 1984, pp. 100-101) , "It is \mathbf{v} represented by a vector whose components have been obtained by means of the scalar product $\mathbf{v} \cdot \mathbf{c}_i$ (vector of direct work coefficients) by the corresponding column of the matrix Inverse

(...) we know that each column \mathbf{c}_i of the \mathbf{C} represents the physical quantities of merchandise that have been necessary, directly and indirectly, throughout the economic system to obtain a physical unit of merchandise \mathbf{q}_i as a final merchandise. By multiplying each of these physical quantities by the corresponding labor coefficient, and then adding the values thus obtained, the quantity of labor that has been necessary, directly and indirectly, in the entire economic system is determined to obtain a physical unit of the merchandise.

as final merchandise . We can conclude that the vector , defined, represents what we could call *vertically integrated work coefficients* . "

Such process is characterized with the word "integration" because the direct (labor force) and indirect (means of production) labor requirements are being combined (linearly, since it is a linear production model), with the word "Coefficients" because they are values that express a relationship between two magnitudes (a specific coefficient means how much a specific industry, to produce a specific merchandise, took from another specific industry) and with the word "vertical" because it is a row vector [see (Pasinetti, 1984, p. 96)], it is a matrix (which by definition has rows and columns, in this case it has rows and columns, known as the inverse Leontief matrix, where it is the matrix of interindustrial coefficients and is the inverse of the matrix (the matrix resulting from subtracting the matrix from the identity matrix) and its scalar product yields a row vector that integrated direct work (e xpresented horizontally by be a row vector) the indirect work through a multiplication by columns (which appear in a vertical position, clearly), which is a consequence of the structure that is a row vector, that it is a matrix and of the mathematical laws that govern the process calculation of the scalar product between two or more mathematical structures. The above will be explained by means of a brief fictitious numerical example devoid of any economic significance.

Beyond the epistemological invalidity of the use of simultaneous equations in the mathematical foundation of Marxian economic theory, vertical integration, not at a mathematical level but at a logical-conceptual level, describes a real process of political economy systems. Furthermore, the construction of the input-output matrix is essentially an accounting construction, under an accounting logic, although embodied by a neoclassical logic, since Leontief (who represents the roots of this type of analysis) was, obviously, a neoclassical economist. The proof of this is expressed by the fact that the first chapter of his work "Input-Output Economics" (which could be translated as "Input-Product Economic Science" or "Input-Product Economic Analysis" -the latter seeking more to preserve the meaning than to achieve word-for-word accuracy in the translation-), located from page 3 to 18, only presents empirical data of an accounting nature and from them raises its mathematical model, not the other way around.

Source: (Leontief, 1986, p. 6) .

Source: (Leontief, 1986, p. 8) .

Source: (Leontief, 1986, p. 7) .

Source: (Leontief, 1986, p. 9) .

It is even in the chapter where he makes the theoretical-mathematical approaches and developments. In his own words, "Input-output analysis is a method for systematically quantifying the mutual interrelationships between the various sectors of a complex economic system. In practical terms, the economic system to which it is applied can be as large as a nation or even the entire world economy, or as small as the economy of a metropolitan area or even a single company. "

(Leontief, 1986, p. 19) . In fact, the first chapter of his work was written in 1981, while the second was written in 1985 (the following were written after the two mentioned dates) as shown below; Furthermore, if the reader observes the accounting matrices presented above, they contain data from dates preceding 1981 (date of birth of the first chapter of his work), specifically 1947. Finally, it is worth mentioning that Leontief's notion of complexity is primitive, Since it is now widely known that nothing complex can be modeled with systems of linear equations, as it is clear from the research of Edward Norton Lorenz, father of complexity theory.

Source: (Leontief, 1986) .

The input-output matrices, as a macroeconomic-accounting construction that they are, do not have an architecture designed based on simultaneous equations. If, in addition to this, it is considered that, by the very nature of computing-computational processes, their statistical study is iterative and not simultaneous, the empirical results found by Marxists related to NI are compatible with the historical approach that is implicit in the approaches of the TSSI and Fred Moseley, as well as the fundamentally historical and sociological approach that is proposed in this research.

II.III. Third and scenario: t anto the labor force as the means of production create value

Finally, the other possible scenario is that both labor and capital create value, which to be refuted only requires refuting the specific fact that capital is capable of creating value. This refutation amounts to showing that capital, *ie* , the means of production, only transfers its value to the product. There are authors like Steve Keen who argue that, in their opinion, there is no reason to think that the loss of value of a machine is equal to the value that it adds, however, that judgment is deeply wrong and it is possible to refute it from the logic of the previously exposed notions related to theoretical physics complementing them with the biological dimension of the human being. Human labor transfers value, but this transfer of value is simultaneously creation of value in that a part of the transfer of energy carried out by the worker (which is what in Marx appears as the physical and mental wear of the worker) does not figure in the capital outlay (both to acquire means of production and labor power), so that both the means of production and the part of the labor force that the capitalist does pay do not express value creation, on the contrary, they only express the transfer of a fixed value (not necessarily a constant transfer over time - we will return to this later -) to the volume of goods produced (the level of atomization of these values - in the quantity of goods that a given magnitude of value is expressed - will depend on the degree of development of the productive forces of labor) and this is what Marx essentially refers to when

he affirms that *only labor created to value* . In addition, the human body has the ability to regenerate over time (reestablish itself to its state prior to wear and tear) in a natural way (by itself, biologically speaking) through a minimum of food, sleep and a series of other elements (which represents, biologically speaking, its inputs) that the worker acquires with his salary as a means of subsistence (the expression "minimum wage" is not only an economic technicality, it is also the formal expression of a social barbarism). It should also be considered that on many occasions workers have the ability to go technical (improving the quality of their workforce) through endless options that do not cost the capitalist a penny, which range from conventional conversations with their family and friends. to viewing videos on YouTube and browsing discussion forums on social networks, blogs and the web in general (something that did not arise on this scale in Marx's time) and this is precisely the reason why means of production cannot create value, since not only every repair, but also every improvement (at least in general) made on them by the capitalist will inexorably require an outlay of money capital (what vulgar economists call "investment").), that is, it is not an exogenous value to the political economy system (since the surplus is possible by the biological system of the human being, not by this or that system of political economy that is formed in human collectivities) but is in advance perfectly determined by the political economy system in question (capitalist or any other, even one of non-class societies). As it is, it seems that there are no holes in Marx's logic.

What is the function that models the transfer of value, for example, of the means of production, *ie* , constant capital? The answer to such a question will depend on the depreciation accounting method used for the capital that is specifically analyzed and It is precisely for this reason that depreciation does not necessarily have to be linear (*ie* , constant). It should be remembered that Marx proposed a general theory of capitalist political economy, so that in his mind it would not seem intuitive to expect detailed answers to be rigorously contained in questions such as whether constant capital aliquot transfers its value or does it. otherwise (the

simplifying assumption provisionally used by Marx in his work is implicitly that, that the transfer of value is constant), since the object of study is essentially global social capital (what a well-trained neoclassical would call "Macroeconomy").

Of course, there is research to back this up. Thus, "A relevant analysis that is necessary to carry out to corroborate the explanatory capacity of the TVT, is to compare its values obtained against other possible" alternative base values "(steel value, corn value, among others).

"As is known, some authors such as Hodgson (1982) or Roemer (1981) have defended the possibility of other base values as a way to criticize TVT. In table 5, following Cockshott and Cottrell (1997), we present the main results of the calculations for the 65 alternative base values, as many as the 65 sectors of the TIO-2000, and not only for some sectors as is usually done in the literature: steel, energy, (see Tsoulfidis and Maniatis 2002 and Cockshott and Cottrell 1997). " (Sánchez & Ferràndez, Values, producer prices and market prices based on data from the Spanish economy, 2010, pp. 98-99) .

Next, the table referred to in the previous reference is presented, on which some issues must be explained synthetically. In the first place, *DAM* is the word used to express the abbreviation of "Mean Absolute Deviation" and it is nothing other than the distance between each value and the average (it is a way of characterizing the variation in a set of data); As one StackExchange Cross Validated user (whose name appears on the site referred to as *andyl*) points out, "Today, statistical values are predominantly calculated using computer programs (Excel, ...), no longer with handheld calculators. Therefore, I would say that calculating the "mean deviation" is no more cumbersome than calculating the "standard deviation". Although the standard deviation may have "... mathematical properties that make it more useful in statistics," it is, in fact, a distortion of the concept of variance of a mean, as it gives additional weight to data points away from the mean. half. It may take some time, but I, for one, hope that statisticians will reuse "mean deviation" more

frequently when discussing the distribution between data points; it more accurately represents how we really think about distribution. " (StackExchange, 2014) . Along the same lines, it is noted in (Investopedia, 2020) that "Generally, according to mathematicians, when a data set has a normal distribution, that is, there are not many outliers, the standard deviation is the preferable indicator of variability. But *when there are large outliers, the standard deviation will register higher levels of dispersion or deviation from the center than the mean absolute deviation* . " The operational differences between the MAD and the standard deviation lie in their calculation process. The standard deviation is calculated through three steps: 1) The simple arithmetic mean, or simple average, of the data points is found (adding them and dividing the total by the number of observations), 2) The mean is subtracted from each observation, and squares the difference of each result, 3) Determine the mean of those differences squared and then the square root of the mean. The MAD is calculated through three other steps: 1) The mean of all the observations is calculated, 2) The difference between the mean and each observation is calculated, 3) The average of the absolute values of these differences is calculated. As can be seen, the differences lie in steps 2 and 3, since in step 2 the DAM is not squared, while in step 3, also belonging to the DAM, the average is calculated as the absolute value of differences (when estimating the standard deviation, not only does a square root intervene, but previously - as already indicated - for the solution to exist and belong to the domain of real numbers, such differences are squared - the standard deviation is, of In fact, a specific application of the distance function in Euclidean spaces, in which the differences are squared to guarantee the positivity of the result, since there are no negative distances-).

Secondly, *DAMP* is the abbreviation for "Weighted Mean Absolute Distance", it is obviously the weighted DAM, which is calculated, as verified in (fast.ai, 2017) , by

(where, from the computational perspective, n is the number of rows, \bar{x} is the simple arithmetic mean, x_i is the observations and w_i is the weightings - carried out according to some criteria determined *ex ante* in the investigation-).

As they point out (Sánchez & Ferrández, Valores, production prices and market prices based on data from the Spanish economy, 2010, p. 91) , “In the debate on the measures used, Steedman and Tomkins (1998) question the use of distance measures (DAM, DAMP), proposing measures supposedly independent of the units used to measure prices: an angular measure (θ), the coefficient of variation (CV) and a related measure of distance (d). For his part, Petrovic (1987) by means of RC% E1 affirms that this measure is independent of the numeraire; In fact, Steedman and Tomkins (1998) find that its tangent index of θ is related to the RC% E, and Díaz-Calleja and Osuna (2009), from their critical perspective with this type of empirical studies, 2 show how the main measures used: MAD, DAMP, non-centered Pearson R, among others, are related as distance measures (...) RC% E refers to the square root of the mean error percentage (...) The authors raise criticism of the empirical work that relates values and prices: due to the indeterminacy of the correlation between values and unit prices, due to incorrect specification in the regression models and due to aggregation problems. We will not address these criticisms in this paper. The current study relates sectoral and non-unit values and prices, the possibility of spurious correlation is evaluated and discarded in the section "Work values versus alternative base values". [\[13\]](#) Thus, thirdly, these other measures will be synthetically defined.

The angular mean is a rotational average, *ie* , it is the average with respect to a reference point, which applied to the study of economic phenomena from the perspective of simultaneous equations [which is verified in (Steedman & Tomkins,

1998, p. 381) , since its approach is carried out under the theoretical framework of vertically integrated work vectors], it is calculated as

where or, which is the same, "(...) the angle between the vectors and " which is another " pure numerical vector ", as read in the cited place. It is clear that they are wages (variable capital), prices, labor-values and it is a vector of unit elements (which plays the role in the system of equations, mathematically speaking, of "1 convenient").

Furthermore, the coefficient of variation is nothing more than the simple arithmetic mean divided by the standardized deviation and the result, expressed as a percentage by multiplying by one hundred. On the other hand, the measure related to distance referred to by S&F is the one proposed by Steedman and Tomkins in the following terms: "Although we are inclined to favor the measures suggested above, if it is considered that a measure of" distance ", then this can be obtained without resorting to the use of a numeraire, as follows. Let be the

distance between the vectors of unit length and . Then

. It can be seen that when it is measured in radians. " (Steedman & Tomkins, 1998, p. 382) , where is the number of goods .

As can be seen, the S&F research is a compilation, incorporating previous criticisms, of all possible measures of dispersion.

Finally, the coefficient of determination of Pearson not centered, is the usually known, with the particularity that the econometric model does not include intercept (which is due to be studied direct statistical relationship entr and values, prices of production and prices market, as well as the predictive power on the

different prices that exclusively the values have -and other explanatory magnitudes used, as will be seen below-).

Source: (Sánchez & Ferràndez, Values, producer prices and market prices based on data from the Spanish economy, 2010, p. 89) .

Source: (Sánchez & Ferràndez, Values, producer prices and market prices based on data from the Spanish economy, 2010, page 95) .

Source: (Sánchez & Ferràndez, Values, producer prices and market prices based on data from the Spanish economy, 2010, page 97) .

Source: (Sánchez & Ferràndez, Values, producer prices and market prices based on data from the Spanish economy, 2010, p. 100) .

Source: (Sánchez & Ferrández, Values, producer prices and market prices based on data from the Spanish economy, 2010, p. 101) .

As can be seen, in the study of correlations within production processes (which is precisely what an input-output analysis of an economy implies, since they only evaluate, and empirically, production at a specific moment in time), it is intuitive, logical and theoretically valid (in addition, as seen, empirically valid) to study only one moment of time (although, obviously, also a study with panel data seeking to generalize the results found by S&F and the other authors that have investigated this phenomenon).

S&F anticipated in their research that "The first objective is to provide empirical evidence about the explanatory capacity of values to determine the movement of market prices, comparing these results with those offered by other" alternative base values ". (Sánchez & Ferrández, Values, producer prices and market prices based on data from the Spanish economy, 2010, p. 87) . Thus, in relation to the reasons that lead to discard spurious correlation in particular, and as an essential conclusion of the econometric results in particular, S&F point out that:

"First of all, it stands out that no base value (1 to 65) has a measure of distance and coefficient of determination greater than that computed by means of work requirements . Therefore, the greater explanatory power of the alternative base values seems to be statistically ruled out. For the United Kingdom, Cockshott and Cottrell (1997) even perform multiple auxiliary regressions, explaining market prices together with several alternative base values (several explanatory variables). The elasticities of work are not only more significant (statistical t) and close to unity, but the signs and the impact of the other base values are sometimes negative and the elasticities do not remain close to unity (the log-log regressions to verify it, table 5 only presents the , which again are strictly comparable). In the Spanish case, at the same time, this greater explanatory power of the values occurs regardless of the index used. As mentioned above, the TVT has been criticized in the sense that the relationship between values and prices is arbitrary or

ambiguous, since it depends on the statistical index used, however, the results obtained relativize at least this type of critics. But, in addition, these results cast doubt on the existence of a spurious correlation due to the size of the sector (*eg* Kliman 2002 and replicas in Cockshott and Cottrell 1997, 2005), since we observe very low adjustments for some alternative base values. If there is a predominant false or spurious correlation for the size of the sector, although there is no real association between values and prices, the alternative values should obtain a significantly high. However, this is not the case, since it is found that operating with the same methodology there are goodness (...) of adjustment of 2% for agriculture and 86% for construction, while the vertically integrated work requirements obtain a goodness of 97% against market prices. It should be emphasized that the prices obtained have been multiplied by the sectorial gross production, so that they are sectorial prices. Thus, the relationship between values and prices within the TVT is reinforced, we make a brief international comparison.

" (Sánchez & Ferràndez, Values, producer prices and market prices based on data from the Spanish economy, 2010, pp. 99-102)

Source: (Sánchez & Ferràndez, Values, producer prices and market prices based on data from the Spanish economy, 2010, p. 103) .

Thus, they state in their final conclusions that:

“From a traditional reading, the results of our research confirm the greater ability of labor values to explain the entire price structure. Using the DAMP, the values approximate 11% to market prices and 18.5% to producer prices, while the latter approximate 15.8% to market prices. At the global level of the Spanish economy, it seems then that the values explain well the movements of market prices. This better explanatory capacity of the TVT is maintained: a) regardless of the deviation or regression measures used, since the same general conclusions are reached using different indices in this work, which empirically refutes the criticisms of some authors such as Steedman and Tomkins who pose problems with the measurement indices and b) with the use of alternative base values, since the comparative study finds that none of them better explain market prices than the results obtained by

the TVT (measured with R2, DAMP, d , among others). In this sense, criticisms about a possible spurious correlation between values and prices are also relativized. Furthermore, the strong association between values and prices is not only observed under the input-output scheme, the same conclusions are also obtained from a stochastic perspective. Under this scheme it has been found that in Spain the deviation between values and market prices does not exceed 17 percent. The research has also obtained results regarding the fundamental variables of the Spanish economy according to the TIO-2000. The rate of profit, with the different prices, is between 16 and 13 percent, the rate of surplus value between 67 and 77 percent, and the capital composition is greater than 4 and greater than 6 if we estimate it as a vertically integrated composition. Although very close to the measures λ and μ , in the different prices, the differences should be highlighted. Thus, a variable as important as the profit rate is higher in value than in price: 16% in market prices, 13.3% in producer prices and 17.2% in values. The Spanish economy boomed at the beginning of the century, with real product growth. gross domestic (GDP) above 4%, it seems then that the measurement in values is more sensitive to this boom situation than that indicated by the other prices. On the other hand, and from a stochastic approach, the distribution of returns shows a clear synchrony with the rise of the Spanish economy in certain sectors such as construction and services; Furthermore, when estimating profitability, including fixed capital, something anticipated by theory is shown: that the average level of this profitability is lower (16%) than if only working capital (25%) is weighted, however, the The first estimate shows less bimodality in its distribution (using the PDF). The above results seem to suggest that the labor theory of value remains a theoretically and empirically valuable scheme, capable of explaining the phenomena of capitalist economies. There are, however, lines of research that will need to be further developed in connection with the present work: on the one hand, it is necessary to examine the evolution of values over time, not only with the aim of observing the deviations between prices but also with the intention to

check if the theoretical prediction of a trend decrease in labor costs is fulfilled; on the other, it is also necessary to specify and clarify technical aspects related to the measures used (deviation and correlation) and that we have not addressed in this work. Last but not least, there remains the task of continuing to suggest interpretative lines that open the debate and that help to provide the TVT with greater theoretical consistency. " (Sánchez & Ferrández, Values, producer prices and market prices based on data from the Spanish economy, 2010, pp. 110-111) .

These results have also been replicated for the case of China in (Sánchez & Montibeler, The theory of labor value and prices in China, 2015) , as shown below.

Source: (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 337) .

Source: (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 338) .

Source: (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 338) .

In addition, a comparison of such empirical results is made between China, the United States, Greece and Spain.

Source: (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 339) .

Source: (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 342) .

The variable “Rank”, which appears in the previous graph, responds to the fact that “Similarly, it is possible in the cross-sectional analysis (III, between prices p and d , vgr .), To approach to construct a variable that identifies the order of the size of the sectors. This rank (R), orders each sector from lowest to highest according to its production level and is incorporated into the cross-sectional model (...) ” (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 341) .

In addition, regarding the results of the econometric model, the authors point out that "Models 1 and 2 show how the inclusion of the variable rank does not make direct prices irrelevant to explain market prices. The models present a residual with normal and homoscedastic distribution. " (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 342) . Regarding the dispersion presented by some points, they comment that "The dispersion between these variables in turn shows some atypical points that are modeled in the regressions in Table 7." (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 341) .

Source: (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 348) .

Finally, the authors conclude that: "The results of the great closeness between prices in the case of China are added to those of other recent works. The weighted average absolute deviation between direct and market prices is 15.13%, while between direct and producer prices it is only 9.07%. These results are not modified by changing the measure of deviation or distance, the direction and order of the proximities are not significantly affected. It seems that, for one of the most important economies on the planet, the force of attraction that values have towards different prices is quite strong, specifically the variations in the values determine

the variations in current prices by 97%. The regression analysis between the different prices also shows this conclusion, in the same line as what has been found in various countries such as the US, Greece, Korea, Spain, etc. " (Sánchez & Montibeler, The theory of labor value and prices in China, 2015, p. 349) .

III. DESTRUCTION OF VALUE AND ITS GNOSEOLOGICAL EQUIVALENCES

III.I. *Value destruction*

As verified in (Landau & Lifshitz, 1994, pp. 1-16) , the physical systems that preserve energy, *ie* , that conserve it, are the so - called *conservative systems* . The fundamental characteristic of conservative systems is that mechanical energy is an integral of motion (a constant value along the trajectory of the system, which is a function of position or generalized coordinates - arbitrary set of numerical parameters that determine unequivocally the state of a mechanical system given a finite number of degrees of freedom- and the conjugated velocities or moments - the quantities of motion associated with the generalized coordinates of the object within the system- of the physical objects involved in the analysis of the system in question), which happens only because every conservative system is an isolated system, so the first principle of thermodynamics (which is a generalization of the principle of conservation of energy), so that when a system is non-isolated the energy it will not be preserved.

Transferring this to the field not of mechanical systems but of political economy systems, a system is isolated (from the development of the productive forces of labor -capital is one of them-) *if and only if* the technological level remains unchanged, for What only in such cases is it to be expected that the exchange value will be preserved. This implies that in a scenario of technological change, there is destruction of value. After making the previous statement, it is necessary to ask: what factor of production destroys value? It is popularly said that "What God

gives, God takes away", because in an equivalent way this popular sentence applies to the Political Economy system.

Thus, what generates the destruction of value is the same force that created it, that is, the labor force. This occurs through technological innovation processes, which are characterized by being incessant within the capitalist mode of production (or capitalist political economy system, they are equivalent terms). This is so because technological innovation is past work that multiplies the productivity of the workforce, because the role of technological innovation is to distribute the physical and mental wear and tear of the worker (both the present -variable capital, the workforce- and the past - constant capital, the means of production -) in a greater quantity of goods in relation to the quantity of goods in which it was distributed before the innovation in question. This destruction of value is what Marx called *moral depreciation*. As noted in (Flores Morador, 2013, p. 2), "Marx uses the term 'moral' in the modern sense of 'cultural'. The term, very common since the fourteenth century and in later times, means "belonging to character or temperament", from the Latin *moralis* "proper behavior of a person in society", literally "belonging to manners". "

Marx reasons moral depreciation in the following terms:

"But, in addition to material wear and tear, every machine is subject to what we can call *moral wear*. Machines lose their exchange value to the extent that machines of the same construction can be reproduced at a cheaper price or they can be built better than the competition (...) In both cases, the value of a machine, for As new and strong as it is, it is no longer determined by the time of labor actually materialized in it, but by the time of labor necessary to reproduce it or to reproduce a better machine. In other words, the machine is more or less *depreciated*. The shorter the period during which its total value is reproduced, the lower the risk of moral wear and tear, and the longer the working day, the shorter that period will be. When the machinery is implanted in any branch of production, a

whole series of new methods are put into practice, one after another, to achieve its reproduction in conditions of greater cheapness (...) "In general, it is calculated that building a single machine a new model costs five times more than rebuilding the same machine on a given model. " (Babbage, *On the Economy of Machinery and Manufactures*, London, 1832, p. 211.) (...) and a whole series of reforms, which not only affect individual pieces or devices, but their construction as a block. That is why it is during the *first* period of his life that this special reason for extending the working day acts most acutely. " (Marx, *Capital*, 2010, pp. 332-333) .

III.II. On the gnoseological equivalence between value as economic value, value as energy and value as information

On this aspect, it is convenient to study the aforementioned research by Flores Amador, which not only contains a series of epistemological errors, but also a valuable foundational approach, which deals with conceiving exchange value as information (specifically as bits) and, as will be seen, This does not imply discarding working time as a unit of measurement, but rather finding a theoretical and applied equivalence between both units, as well as that the incorporation of such an approach is epistemologically harmonious with the Marxian philosophical system; The first point will be tried to prove, the second is only left raised for future research. The author in question argues that he finds a certain incongruity in Marx's conception of value because he attributes to the author a physicalist approach, since in his understanding it is from the combination of the following three elements of Marx's approach that the alleged incongruity emanates (and for which he is awarded being a physicalist):

- 1) The exchange value is defined as the chronometric quantity of simple weighted average labor (for each capital that produces the commodity in global social capital) socially necessary to produce a particular commodity.

- 2) Fixed capital is referred to on several occasions as physical capital [remember that in Marx's time there was no non-physical fixed capital (what in modern accounting is called *intangible fixed assets*), while now Objective research, development and innovation processes (which involve more abstract processes -consequence of the development of *intellectual work as a consequence of technological change-*, which although they are non-physical, do not cease to be objective-) are crystallized in the so-called *property rights intellectual property* (which are the main component of the so-called intangible fixed assets)]
- 3) Any idealistic conception (in its philosophical sense) of the production process is rejected.

The foregoing is based on the content of the referred investigation. There, Flores Amador states that "(...) For Marx, technologies are tools or machines and both are physical things. He was interested in studying the intrinsic value of work in the capitalist production process. He recognizes that the life of a machine depends first of two physical factors: 1) erosion by use and 2) corrosion by abandonment (...) For Marx, the productivity of a technology is "inversely proportional to the value it transfers to the product. The longer the life of the machine, the greater it is the mass of the products over which the value transmitted by the machine is distributed, and the smaller is the portion of that value added to each merchandise "2. We discover here some inconsistencies; Marx recognizes the transfer of physical information and matter of the technological device to the product, which is clearly wrong (...) When Marx speaks of "transfer of value", he speaks of physical erosion by use and corrosion by misuse (...) However, Marx also recognizes a *tercer* "moral" factor that depreciates the productivity of a machine (...) this "moral depreciation" of a technology refers to the cognitive condition of human technological capabilities at some point in history and not to any physical property. According to Marx, a machine bears the sign of a cognitive knowing-how. This knowledge cannot be measured in reference to any physical property

and has nothing to do with tears and wear and tear on a device. If any measurement can be made, it must be the measurement of cognitive ability expressed through practical applications. From the point of view of the 21st century, it is easy to conclude that the problem with Marx's view is that it is too narrow and that the only essential depreciation of value that is interesting to a labor theory of value is that of "moral depreciation. ". (Flores Morador, 2013, pp. 1-3) .

In the first place, it seems that what the cited author does not seem to be able to see is that the essence of what Marx proposes is the transfer and crystallization of the physical and mental wear of the worker (which undergoes modifications when the technological level of a society varies.).

Second, the cited author poses as "very narrow" Marx's conception of the due value of "his" physicalism (the one he attributes to Marx), because the author is not taking into consideration that one of the ends he was pursuing. The research carried out at the time by Marx was to strip Political Economy of all idealistic or metaphysical clothing (as the case may be), which in the context of the 19th century (specifically considering the influence on abstract thought that they had on different thinkers theoretical conceptions of Classical Mechanics at that time) makes it completely natural for Marx to make repeated references to capital as a physical existence, autonomous from the world of ideas, since his desire was to capture, as already seen previously (by citing his work *Contribution to the Critique of Political Economy*), precisely the process by which the world of ideas was ultimately conditioned by the world of mathematics. eria.

Third, Flores Amador states that "(...) this" moral depreciation "of a technology refers to the cognitive condition of human technological capabilities at some point in history and not to any physical property.", Which is a flagrant confusion between the implications that a certain technological level in the ideology of human society with what technology itself is. On this point, it must be said,

undoubtedly, that the name assigned by Marx to this type of depreciation (the "moral" wear) gives space to this type of reading, so here it is believed convenient that, instead of calling it moral wear This depreciation via technological innovation should be called technological *depreciation* or *competitive depreciation* , since within capitalism the engine of incessant technological change is competition.

Fourth, Flores Amador points out that "It is necessary to correct these misunderstandings by introducing the definition of work value (and share value in general) as information." (Flores Morador, 2013, p. 3) . Thus, he argues that the fact that he believes has already been proven (the "misunderstandings" to which the exchange value defined as a chronometric quantity of work leads), without having proven it in any way (beyond a purely formal-logic), as a deadly epistemological blow to Marxian materialism. In this regard, he posits, to later interpolate a reference to Marx that "Note that one of the most important consequences of the modern use of the term" information "had some importance for Marx's materialism: No materialism, which does not admit it, can survive in the Actuality The mechanical brain does not secrete thought "as the liver makes bile", as the previous materialist stated, nor does it emit it in the form of information, when the muscle produces its activity. Information is not information, it is not matter or information. " (Flores Morador, 2013, pp. 3-4) Thus, the author completely omits the fact that at that time the word "information" had a significantly different meaning than at the present time in which, for example, it exists incipiently quantum teleportation. Information could not be expressed, for example, in terms of bits, which is an objective unit of measurement (whether it is digital is another matter, which has to do with its shape rather than its essence, which is objective insofar as its foundations are objective, material -not to be confused with a physical existence-). Thus, as stated above, due to the context of the time, Marx sought to rule out any subjectivism and idealism, thus defining at that time the exchange value as information would seem to be far from that purpose.

Fifth, as mentioned above, not considering that the meaning of the word "information" is significantly different is equivalent to ignoring precisely the impact that the incessant technological innovation that has arisen since Marx to date has had on the ideology of information. society.

Sixth, Flores Amador confuses the epistemological validity of the unit of measurement with the capacity of that unit of measurement (time) to take other forms (energy, information, etc.), *ie*, to be equivalent to other units of measurement.

In the seventh place, what the author consciously or unconsciously sought, from the beginning, was to justify the revision of the Marxian philosophical system (unfinished in many aspects) under the logic of philosophical idealism and metaphysics. Proof of this is what he raises after making his "critique" of Marxian notions of value. In this regard, he begins by pointing out that "Rafael Capurro introduced a very interesting connection between the technological meaning of information and the phenomenological field of philosophy." (Flores Morador, 2013, p. 4), but who is Rafael Capurro? He is a Uruguayan philosopher whose works deal with the science and ethics of information, but also on psycho-analysis, whose philosophical foundation is essentially idealistic in nature, since Sigmund Freud "When investigating the causes of pathological processes of the psyche He resolutely rejected all attempts -based materialist vulgar in its essence- made to explain changes in content of psychic acts by physiological causes. But, at the same time, he completely departed from the materialistic worldview, renounced the objective methods of the investigation of the psyche, and created a theory that is, on the whole, arbitrary, artificial, and subjectivist. Its essence lies in separating the psyche from the material conditions and causes that engender it. The psyche is conceived as something independent, existing in parallel to material processes (*psychophysical parallelism*) and directed by special, unknowable and perpetual psychic forces, located beyond the limits of consciousness (*Unconscious*).

Immutable psychic conflicts prevail over the human soul like a fatality derived from unconscious tendencies to pleasure (above all sexual), to aggression in the face of the "principle of reality" to which consciousness adapts. Freud submits to psychoanalysis all psychic states, all man's actions, as well as all historical events and social phenomena, that is, he interprets them as a manifestation of unconscious passions, above all sexual. " (Rosental & Iudin, 1971, p. 197) .

Of course, someone could argue that just because Freud and psychoanalysis are essentially an idealistic approach (in the philosophical sense) to reality, it does not mean that Flores Amador necessarily is. This in itself is true, although in the case of the author studied it is not. On the one hand, not only does Flores Amador conceive of value and technology basically as "cultural states" (which can be inferred from the references to the author made earlier), but also states that "According to Capurro, *information is fragmented intentionality* . Capurro understands the modern era of computing as a postmodern phenomenon, *already found in the philosophy of Husserl and Heidegger* . *Another important difference is that the communication of information leaves behind the opposition between object and subject and replaces it within intersubjectivity and context ; in the new reality the informative content is not attached to a topic* . " (Flores Morador, 2013, p. 4) . Here are several points to make.

First, it is clear that defining information as fragmented intentionality is categorically an idealistic approach to reality. Second, his "bedside philosophers" to support his hypotheses are Husserl and Heidegger, when Husserl was the one who coined the philosophy of intentionality (defined as the power of minds to treat something, *ie* , to represent or defend things, properties and states of affairs) and Heidegger is one of the founders and main representatives of German existentialism (in fact, Heidegger was Husserl's assistant). This can be verified in (Rosental & Iudin, 1971, p. 211) . Third, conceiving the opposition between object and subject by that of intersubjectivities in a context, as well as the fact that the

informative content is not related to a specific topic, does not allow much discussion about the philosophical roots of Flores' vision. Dweller, since the first element is idealistic and the second is metaphysical.

In order to leave no room for doubt, the author in question points out that "Let us study here more closely what kind of" substance "is work. It cannot be considered a natural substance, as if it were a natural "energy", because the physical energy involved in the physical act of work is completely consumed in the act of work. If some work energy can be found in the product of work, it cannot be physical in nature. We can then conclude that the physical and moral spheres of reality are independent of each other. " (Flores Morador, 2013, p. 4) .

However, despite the profound epistemological deficiencies of Flores Amador's research, it is noteworthy that his research represents the first effort to conceive exchange value from the perspective of information technologies. Of course, this perspective must be an approach that allows the construction of equivalences between the measurement units (time for the Political Economy approach and bits for the Information Sciences approach). A reconstruction of Flores Amador's research, in line with the above, could shed new light on an update (other than reformulation) of Marxian theory. So far, there has been talk about the destruction of value in terms of technological innovation carried out within the productive processes by the workforce (regardless of their level of technification, the German scientist at CERN is as proletarian as the worker of a machine transnational in Honduras, El Salvador or Haiti, because social class is not provided by the level of scientific knowledge -or otherwise-, but by the relationship that the person in question has with social wealth, *ie* , with the crystallized and reversed surplus value as capital).

Thus, only in relation to the above, the following question remains to be answered: Do the variations in prices (whether of production or market) express value destruction? The answer is clearly no. At the social level, value is not destroyed (in

the absence of technological change), it is only redistributed (and this also applies when capital is depreciated merely through use and disuse.[\[14\]](#)).

IV. ANNEXES

IV.1. AN EMPIRICAL METHODOLOGY FOR DETERMINING THE MAGNITUDE OF SECTOR INTERRELATIONS WITHIN THE INPUT-OUTPUT MATRIX FROM THE SUPPLY AND USE TABLES IN THE UNITED NATIONAL SYSTEM OF NATIONAL ACCOUNTS

The content of the research carried out by (NABI & BA, AN EMPIRICAL METHODOLOGY FOR THE DETERMINATION OF THE MAGNITUDE OF SECTORAL INTERRELATIONS WITHIN THE SUPPLY-PRODUCT MATRIX IN THE CASE OF STATES , is reproduced in full below. UNIDOS 1997-2019, 2021) , designed in order to verify the degree of reciprocal relationship between industrial sectors or productive branches.

As is widely known, the input-output matrix (from now on, MIP) is a statistical table of a macroeconomic nature and with a disaggregated presentation, which crystallizes the entire annual economic activity in a disaggregated way, which in turn represents a kind of X-ray of the capitalist political economy system. In this sense, MIP is of fundamental importance to study the performance of the system, be it in an annual period or in the long term. In the analysis of economic phenomena, the statistical-mathematical approach[\[15\]](#) of the MIP is characteristic

of the Marxist school known as *New Interpretation* , very little is used in other Marxist schools and in orthodoxy, *ie* , the neo-marginalist school (misnamed “neoclassical”), the input-output analysis is not Of special interest from more or less the prehistory of the neo-marginalist synthesis, dating from the time of Paul Samuelson and Robert Solow raised around the midpoint of the epilogue of the last century.

There are theoretical investigations, such as that of (Kuroki, 1985) , in which it is affirmed that in the long term there is a process of equalization of industrial profit rates if and only if the sectors of the political economy system are highly interrelated. In this regard, Kuroki points out that “Then we could conclude that only the system in which both sectors use the other's production relatively much as their own input and, therefore, the degree of technical interdependence is large, has the uniform rate of profit. stable (*ie*, for example, the economy where a lot of wheat is needed to make iron and at the same time a lot of iron is used to produce wheat).” (Kuroki, 1985, pp. 48-49) . In this research, we want to empirically demonstrate that this assumption is always fulfilled, at least in the case of the hegemonic political economy at the planetary level of the last decades, since it is assumed that it is the representative case. For this reason, the case of the United States will be studied, as well as at the time, for the same methodological reasons, Marx studied England.

Due to the foregoing, IPM stands, therefore, as the ideal statistical resource par excellence for such a task. As is well known, the MIP is composed in its ranks by the different sectors that make up the production of an economy, while in its columns it is made up of intersectoral productive consumption (intermediate consumption) (including sectoral self-consumption), *ie* , by the breakdown of the intermediate consumption that each sector makes of the other sectors and of itself, necessary for a certain level of final product. In the US SNA, the MIP is presented divided into two parts, on the one hand, the well-known production tables and, on

the other, the uses tables. The production tables contain in the rows the sectors of the economic system and in the columns the disaggregated production (by the type of merchandise -according to the industry to which it belongs- that makes up its production); these tables should not be confused with production tables and use tables known as *COUs* .

see (Kliman, *The law of value and laws of statistics: sectoral values and prices in the US economy, 1977-97*, 2002) , (Cockshott & Cottrell, *Robust correlations between prices and labor values*, 2005) , (Kliman, *Reply to Cockshott and Cottrell*, 2005) , (Zachariah, 2006) , (Sánchez & Ferràndez, *Valores, production prices and market prices from data on the Spanish economy*, 2010) , (Cockshott, Cottrell, & Valle Baeza, *The Empirics of the Labor Theory of Value: Reply to Nitzan and Bichler*, 2014) , (Sánchez & Montibeler, *The theory of labor value and prices in China*, 2015) and (Cockshott, Cottrell, & Zachariah, *Against the Kliman theory*, 2019)], only in the study by Zachariah in 2006 a multi-regional investigation is carried out, while in the others only the IPM of a particular year is analyzed, no long-term econometric studies have been previously carried out and this is another novelty of this methodology.

As verified in (NABI, *ON THE US BUREAU OF ECONOMIC ANALYSIS METHODOLOGY FOR THE REDEFINITION AND REASSIGNMENT OF PRODUCTS IN THE UNITED STATES INPUT-PRODUCT MATRIX*, 2021) , in the US SNA the tables (both production and uses) are built under a two-step hybrid methodological approach, in which in the first step the empirical tables are obtained (which are the ones that are of interest in this research) and in the second their mathematical derivation, where the process that generates the tables obtained in the first step is known as *the redefinition and reassignment process* . Thus, as verified in the cited source, just as the IPM allows a more in-depth study of a capitalist political economy system, the redefinition and reassignment allow a deeper study of the IPM as a result of achieving within this statistical structure a

greater degree of homogeneity between its components or, from a more general conception of the systems, a lesser degree of heterogeneity.

Econometrically speaking, it is valid to conceive the interrelation between two variables as the degree of association between them (regardless of the orientation of such association) and in that sense, it is valid then to think that a correlation coefficient between the products and their inputs [position that such inputs are provided by the other industries (and based on them are placed within the MIP)], is a valid statistical indicator to infer the magnitude of the existing industrial interrelation (which is a qualitative notion as such -the interrelation industrial-), considering also that the form that IPM takes is linear (not for that reason its form reveals its essence, but that is the statistical instrument designed that exists and can be used in empirical research, one of linear conception) and that all the aforementioned investigations point in the same direction.

The empirical methodology proposed here seeks to construct time series with the help of the statistical program R that allows measuring the interrelation between industries through the correlation between products and inputs (those used to produce them) according to industry.

The system of national accounts (hereinafter, SNA) of the United States (hereinafter, US) is presented through the production tables and the uses tables (separately), under the label of " Supply Table "for the case of the table that contains the production of merchandise broken down by industrial sector and" Use Table "for the case of the table that contains the data of the inputs consumed by each industrial sector in the production of each merchandise corresponding to each industrial sector , where it denotes the rows and columns.

The objective of this document is to provide an empirical methodology so that it is possible to construct a time series for the period 1997-2019 of the total production

of each of the 71 industries that make up the US political economy system (this is the maximum level of disaggregation for which macroeconomic statistics are available for that period), as well as the inputs that each of these industries consumes and self-consumes to generate the level of output reported in the MIP. Thus, before proceeding to explain the empirical methodology proposed here, it is convenient to remind the reader that the data obtained from the original database are input-output matrices (broken down into a production table and a table of uses), which by definition they are cross section data. This type of data structure requires, since the intertemporal statistics (over time) of the MIP do not exist in a harmonic and continuous way, a construction such that it provides them with a harmonic continuity so that they can be successfully transformed into panel data. (which are cross-sections studied analyzed in terms of time series, in this case different MIP throughout the period 1997-2019) and that is precisely the need that the empirical methodology proposed here solves in an automated way through the use of the statistical program R .

Below are two images. One image shows the structure of the production table in the minimum sufficient proportion, while the other does the same with the uses table.

Source: (US Bureau of Economic Analysis, 2021) .

Source: (US Bureau of Economic Analysis, 2021) .

Thus, starting from the production tables (production tables) from 1997 to 2019, as well as the use tables (intermediate consumption tables or productive consumption), the following steps must be carried out.

1. The last row is extracted from the production table, which contains the total production of each of the industries that make up the economic system (in the case of the United States, in the period analyzed, there are 23 production tables, one per year , from 1997 to 2019) disaggregated at the level of the industrial sectors that produce it. Thus, each of the twenty-three production tables that contain the annual data on 71 industries will have a row vector, therefore, composed of 71 elements.
2. The table of uses is taken and transposed, that is, the location of the content of its rows is exchanged for that of its columns and vice versa. This is done so that the intermediate consumption or productive consumption that was originally in the columns of the table of uses is now located in the rows of the production table transposed to the original production table. This will be useful to facilitate the automation of the construction of the table that will contain the desired time series.

3. Combining the row vector extracted from the production table and the transposed uses table, 71 new tables are generated. Each of these tables will be composed in its first column by the time period in question (from 1997 to 2019), in its second column each of the industrial sectors that provide inputs to others and to themselves for production will be located, in the Third column will indicate the number of the industrial sector according to its position in the production-uses tables (since there are twenty-three years of study for industries in general and for each one in particular, the number that indicates the position of each industrial sector will be repeated twenty-three times), in the fourth column the total production of each sector will be located and, finally, in the (for this case there will be 71 remaining columns) each of the industrial sectors that generate global social production will be located. Thus, 71 tables will be formed with the configuration described above (one per industrial sector) and from that table the product-input correlations are obtained, which is what will be executed in the next step.

4. The table constructed in step 3, which contains the panel data for the 71 industrial sectors that make up the US economy for the period 1997-2019, can be separated into 71 parts, where each part contains the panel data for each one of the 71 industrial sectors individually. Thus, on each of these 71 panels of data generated, the correlation calculation is performed (the column vector of the total production of each industry correlated in time with each of the column vectors that represent the contribution at the level of intermediate inputs that each of the industrial sectors supplied the product in question), saving it in the R statistical program within a row-vector data structure and, finally, "stacking" the row vectors to form the Pearson correlation matrix.

5. Subsequently, a weighted average of the Pearson correlation coefficients of each of the 71 industrial sectors is calculated (which expresses the weighted average correlation coefficient of each industrial sector), where the weighting factor is the relative participation of each input in total intermediate consumption.
6. Finally, each of these weighted average intrasectoral coefficients (belonging to each sector) are weighted again to obtain the weighted average correlation coefficient of all industrial sectors, ie, the correlation coefficient that summarizes the interrelation between all industrial sectors. of the American political economy system. Here, the weighting factor is the relative participation of each industrial sector in the economic system.

It is evident that as in this research what is of interest is to know the magnitude of the sectoral interrelation and not the meaning of that interrelation (expressed in the sign of the correlation coefficient obtained), when estimating the averages, the calculations are made with the absolute values of these coefficients. Next, images are presented that ordinally and minimally and sufficiently contain the statistical tables resulting from the procedures described in steps 3 to 6.

Source : Own elaboration, under the methodology described in step 3.

Source: Own elaboration, under the methodology described in step 4.

Source: Own elaboration, with the data of the previous image and the methodology described in step 4.

Source: Own elaboration, under the methodology described in step 5.

Source: Own elaboration, with the data from the previous image and the methodology described in step 5.

Source: Own elaboration, under the methodology described in step 6.

Source: Own elaboration, with the data of the previous image and the methodology described in step 6.

As can be seen, the average of the correlations increased from approximately 0.68 before the first round of weights to approximately 0.78 after the second round of weights. Thus, it is necessary to state that, even though this or that reader may have disagreements with the double weighting carried out, with the first weighting the Pearson correlation coefficient reached a magnitude of 0.735, remembering that 0.70 is the usual standard to determine whether a correlation is high or not, specifically if the correlation is higher than 0.70 it is considered strong; Furthermore, even in the unrational scenario in which someone could question the methodological validity of the first round of weights, Pearson's coefficient of determination was 0.683, which separates it by just 0.027 (or 2.7%, which is the

same , *ie* , is what it would lack to be, in this example, 0.71) if it is a strong correlation. The foregoing is expressed in the table below.

Source: (Mindrila & Balentyne, 2021, p. 9) .

In conclusion, what is stated by (Kuroki, 1985) should not be considered a condition to be verified but rather a fundamental assumption of any theoretical model on sufficiently evolved capitalist political economy systems. To the reader interested in replicating or applying this empirical methodology, the code or "script" in R through which the custom function used to carry out the steps described by the proposed methodology was designed, as well as the original database, may be of interest. and the most important transformations on it [\[16\]](#).

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[1] Although Kliman does not provide details of how he built the simulation, the research (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005) details such a procedure, since these authors asked Kliman for the details of the simulation and they explain that the latter kindly provided them to them.

[2] In the annexes there will be a reading on proportional thinking in Marx.

[3] That a slope is classical (which is what I consider to be a true Marxian theory - *ie*, a theory whose foundations emanate unequivocally from the work of Marx and Engels-) does not mean that it does not evolve, all on the contrary, since all the fundamental principles of Marxism imply the dynamic and complex process of incessant transformation of reality. This implies that the *base and superstructure categories, alienation, exploitation, historical materialism, means of production, ideology, class consciousness, mode of production, political economy* are indispensable in any analysis carried out by the researcher, which were defined by Marx and Engels, as well as by other Marxians, among whom stand out the philosophers of the Soviet philosophical school (mainly in its post-Stalinist stage - who despite never leaving the Soviet Union at the political level, did, by all means, abandon the academy philosophical-), Trotsky, Lenin, Rosdolsky, Gramsci, Ernest Mandel, Alan Freeman, Rafael Menjívar Larín, Carlos Mariátegui and Dagoberto Gutiérrez; Of course, that they are Marxians does not necessarily mean that the totality of their contribution is epistemologically valid (nor that the epistemological validity of the works of the aforementioned Marxian authors is uniform - the same for all -), they are human, not perfect beings (at the same time just as it is human who has the pleasure of addressing the reader at this time), and it does not mean that other authors (even if they are not even Marxists) do not make contributions partially compatible with Classical Marxism, the epistemological reality is rich in its complexity. To these great revolutionaries, theorists and, with their permission, dear comrades, I dedicate this research as a humble tribute to their revolutionary greatness. Ever onward to victory!

[4] Bold and italics were added in this research in order to highlight the cardinal points of the aforementioned exhibition.

[5] This should not be confused with the independence or not of values and prices, but rather it is the physical scaling vector with respect to the vector of values and the vector of prices (be they production or market prices). It is valid to assume such independence with respect to the physical scaling vector because there are no theoretical or logical reasons to think that the price will be related to the numerical magnitude that merely refers to the number of times it occurs in physical reality (the number of bank loans made, the number of cars produced, etc.) or, what is the same, their size in the statistical sense.

[6] "There is a valid argument to take into account the size of the industry when measuring price-value correlations, but it is quite different from the ideas considered above. This point can be addressed through the concept of "specific price" proposed by Farjoun and Machover (1983), that is, the market price obtained per unit of incorporated labor." (Cockshott & Cottrell, Robust correlations between prices and labor values, 2005, p. 311).

[7] This is the name with which Andrew Kliman designates the set of investigations (of convergent conclusions to the same point) born within the NI that deal with the explanatory capacity of values with respect to production prices in data from cross section (input-output matrices are data structures of this nature).

[8] Regarding the perpetual inventory method, they point out that "This method adds gross investment and subtracts depreciation and discarded capital. Depreciation is estimated using the straight line method. Scrapping is estimated using a scrapping function." (Glick & Ehrbar, 1988, p. 199). In turn, it is known as "breaking" ("scrapping" in English) what defined by the OECD as "Scrapping occurs when capital assets are withdrawn from the capital to the end of its useful life. Scrapping is synonymous with "discards" and "retirements" (...) " (OECD, 2005). In short, scrapping a fixed capital is what is known in accounting as estimating the salvage value or residual value of a fixed asset.

[9] On this they add that "The national accounts of the USA are compiled from surveys periodically reviewed by the results of the census. Industries are classified according to establishment." (Glick & Ehrbar, 1988, p. 199).

[10] Engels here is making a hyperbolic assumption to prove a point. The minimal study of Marx's work verifies that it was not a single historical example.

[11] There is within Marxist schools a debate on the MELT is formed in the sphere of production or in the sphere of circulation. However, that debate will not be addressed here and will be the subject of another investigation.

[12] Italics and bold italics are added by the author of this research to make the discontinuity between the theoretical and empirical processes used by NI more evident.

[13] What S&F is referring to is that: "It will be clear that neither the nor the coefficient of variation depends in any way on the choices of physical or numerical units of measure." (Steedman & Tomkins, 1998, p. 381).

[14] *Physical Wear of the Means of Work*: "Loss of their use value as a result of productive operation or inactivity. "The material wear of every machine is double. One comes from use, as in the case of coins that wear out when circulating from hand to hand; another comes from its inaction, like the inactive sword, which rusts in its sheath " (C. Marx). Material or physical wear is reflected in the physical change of certain parts of the machine (destruction, friction, corrosion). As physical wear and tear occurs, the value of the means of work is transferred in parts to the new articles produced. The value of the means of work that is transferred to the product in proportion to their wear and tear constitutes the amortization, which is intended for the total or partial restoration of the means of work. Besides physical exhaustion, there is also moral exhaustion." (Borisov & Zhamin, 2009, p. 67).

Amortization: "Compensation in money of the value of the fundamental means of work (machines, installations, buildings), value that passes gradually to the new product obtained in the production process or to the work carried out (services). In the production process, the fundamental means of work not only wear out materially, but also in their value that they gradually transfer to the product. There is also an erosion of value as a consequence of the moral erosion (see) of the fundamental means, which is due, on the one hand, to the cheaper production of analogous means of production - as a consequence of the increase in labor productivity - and on the other, technical aging as a consequence of the progress of science and technology. Unlike what happens in the capitalist economy, where the amortization of fixed capital (see) is the private matter of each businessman or each monopoly, in the socialist economy it is society that, according to a plan, establishes the quotas of amortization that form an integral part of the cost price and are taken into account in the planned formation of prices. The annual sinking fund fee depends on two factors: the average annual value of the core funds being depreciated and the magnitude of the sinking installments. The amortization fee is established as a percentage of the value (price) of the basic funds and indicates in how many years the value of said funds must be replaced. The repayment installments are different, they depend on the type of the basic funds. In addition, to plan global amortization deductions by companies and branches, the National Economy Council and other

departments also determine the average amortization installments. Successful, scientifically established repayment rates are of great importance to the practice of socialist economics. If they are low, the renewal of basic funds slows down, indirectly slowing down technical progress; on the other hand, if they are high, the cost of production is unnecessarily increased. " (Borisov & Zhamin, 2009, pp. 6-7) .

[15] Here we distinguish "statistic-mathematical" from "statistician" in the sense that the first concept travels through fields that deal with the application of Mathematical Statistics to concrete problems of reality (*ie* , the scientific approach to data) While the second may be in the sense defined above, it may be in its purely descriptive sense or it may even be what is popularly understood by it.

[16] https://mega.nz/folder/mhtSCTbK#KNuyJr-BW2xo4LEqrYJn_g