Contemporary world market, values and consumption of fixed capital: insights from the World Labour Values Database

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Abstract: *The contemporary world market is marked by a strong integration of productive capital under the command of transnational companies. Such integration and the advancement of productive forces led to much broader and more detailed estimates from a sectoral point of view and for a vast number of countries. At the same time, based on the work of Piero Sraffa, the debate on prices and values was reignited, which involved ways of empirically approaching the consumption of fixed capital, or depreciation. The present article focuses on taking advantage of the information and results recently made public in the panel and World Labour Values Database (WLVD) to reflect on depreciation's accounting concrete impacts in the deviations of prices from estimated values, as recorded for near two decades, between 1995 and 2009. After a critical dialogue from a theoretical point of view, a brief exposition about the WLVD is made, a proposal, outlined to analyze the effect of considering or disregarding the consumption of fixed capital in the estimation of values and in its difference with the prevailing market prices. After analyzing results in both dimensions, final remarks are added to stress possible future research on the topic and of the limits of current methods, regarding extensions for when no data on capital stocks and depreciation is available.*
Keywords: *Marxist theory, labor values, fixed capital, depreciation, prices, contemporary world market*

1 Introduction

The need for private and state management for capitalist accumulation, in the context of wars, depressions and rivalry with centrally planned societies, along with advances conceptual, methodological and statistical in the world market contemporary, made it possible to sketch reasonably detailed pictures on the material cycle of productive capital, in a more cohesive analytical framework, regarding sectoral production, prices, wages and working labor time.

On the shoulders of a series of previous advances, the World Labour Values Task Force has successfully been a pioneer in taking advantage of such information, outlining an heterodox[5] methodology and concrete estimates for up to 43 countries and for the rest of the world, offering an acute view of the contemporary world market, corroborating the studies of several Marxists on the

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[5] Basically marxist, alhtough all the project, estimates and methods were constructed to be easily converted to more postkeynesian compatible approaches, as sraffian methods.

deep existing inequalities, in particular bringing innovative support regarding the differences in the rates of exploitation and unequal exchange, among other dimensions (Franklin et al., 2022).

This paper continues the effort of joint reflection (both theoretical and concrete), opened by the World Labour Values Database (WLVD), as well as of documenting important parts of the methods developed and currently adopted to overcome barriers in reaching marxist estimates.

To this end, it is structured in four more sections in addition to the this introduction. Next, we review the accumulated debate around the consumption of fixed capital, particularly in Marx, Sraffa, and contemporary authors immersed in theoretical-methodological discussion regarding the consideration of fixed capital in the calculation of labour values from publicly available information.

In the third section, a brief exposition on WLVD's project and structure, documenting the form currently adopted as a base procedure to estimate fixed capital consumption is made. Then we outline an alternative procedure – that of disregarding depreciation accounting (a proposal for merely comparative purposes), and choose dimensions on which a concrete comparison will be made.

In the fourth section, estimated values are exposed and compared from 1995 to 2009. Finally, the paper adds final considerations regarding the practical and theoretical limits of current methods, the relative importance expressed in the comparison made, and open avenues for future research, particularly in terms of regional extension/disaggregation possibilities in the absence of available data on capital stocks and on depreciation.

2 Fixed capital and its consumption, prices and values

The preface by Michael Heinrich (2015) to the latest brazilian edition of Book II of *Das Kapital* gives rich indications about differences and restructuring between the manuscripts bequeathed by Marx and the work of publishing that resulted in Book II printed by Engels.

From a structural point of view, fixed capital is treated centrally in Section II of Book II, entitled The circulation of capital. There one finds a chapter on fixed capital and circulating capital (Chap 8), plus two chapters (10 and 11) related to the treatment given in the history of economic theory by physiocrats, Smith and Ricardo. Furthermore, when dealing with simple reproduction (Chapter 20), there is a subchapter dedicated to the replacement of fixed capital.

The consumption of fixed capital is a peculiar part in the process of capital's turnover, since it implies, for its replacement, the accumulation of provisional treasures, since ocassionaly cash flows back before it's needed as capital.

As Heirinch (2015, p. 20) notes, both the need to money as money capital before any ebb as the accumulation of treasures in the capitalist process itself makes up important elements in the supply and demand of credit.

Sraffa and sraffians

The proposition to treat depreciated capital goods as a result of "joint production", at the end of the production period, companies/sectors produce the goods and capital units "1 period (year) older", made it readily possible to compute from current input-output data values including fixed capital consumption.

Could it be that this would not amplify the "weight" of fixed capital? if considered the devaluation as measured in the secondary market, it would seem so. On the other hand, from the point of retrospective analysis, an alternative procedure would be to equate the depreciation fund to the wear and tear suffered such which evaluated by the legal and companies' regulation.

In general capital turnover is considered to be 1 rotation per year, a simplifying assumption owing to detailed data on turnover's unavailability.

Vincent Laure van Bambeke proposes a new approach as a solution to the problem of transformation, which starts from some ruptures methodologies (VAN BAMBEKE, 2018). Among the results of highlights achieved are the maintenance of equality fundamental principles indicated by Marx, in addition to the equality of the rate of profit in value or transformed, and a more intertwined between this, sectoral capital volumes and composition capital structure.

His solution includes elements of simultaneous determination to goods produced and consumed in the same period, but which is inspired by the temporal approach to incorporate, in a unprecedented, the fixed capital directly to the study of the transformation of values into prices.

The explicit consideration of fixed capital is one of the biggest contributions identified by the author himself in his analysis. The difference between his solution and circulating capital models, like those of the 'conventional interpretation' is fundamentally based on schemes of this type, as in sraffian terms would be, in the author's own terms to take into account a difference in nature of fixed capital(VAN BAMBEKE, 2017).

The value of fixed capital consumed in the period would be taken as given and would not be subject to transformation, since from the beginning is presented in purely monetary terms (in a

similar to variable capital in the 'New Interpretation' or all constant and variable capital, in the 'interpretation macro-monetary').

Another contribution pointed out by the author is to show the dependence of the rate of profit not only of the rate of exploitation and the organic composition of capital, but also of the structure and quantitative distribution of capital between sectors. For such, proposes systems of equation with second member, unlike the homogeneous systems of 'conventional interpretation'. The fee of profit, in systems like the sraffians, would not vary in absolute as to the volumes of capital operating in each sector, which would make it independent of the organic composition of capital, and, thus, would dispense with theories of labor-value and surplus-value.

The system as proposed by Bambeke is based on the category outlined by Marx of "market price of production". In addition to maintains Marx's two equalities, and in the iterative process of 'solution' of the system originates capital movements to the sectors with the highest capital composition, something hitherto seen as a paradox in Marxist reflection.

But unfortunately, this seems to suffer a grave misspecification: the author system mixes information in terms of labor time with a monetary-only fixed capital. Also, the result seems really awkard, as for only because of his transformative process, surplus value rates become different than what they were at the beginning.

3 The World Labour Values Database and depreciation

The World Labour Values Database (Franklin et al, 2022) combines publicly available data from the World Input Output Database (Timmers et al, 2015), with a sectoral disaggregated Capital Account whose main source is the EU-KLEMS project data on capital stocks by types of capital goods and corresponding depreciation rates. This results in the addition of a depreciation matrix estimated for WLVD purposes.

It is in the process of being launched and was already made publicly available. The World Labour Values Task Force constructed the dataset and panel with complete replicability in mind and ease of exploration and use. Both primary data gathering, calculation steps, procedures and results, besides allowing for building different perspectives, and methods, and the data panel itself, are available publicly as git repositories.

To the best of our knowledge, the WVD is the first publicly available and replicable dataset and open applied methods that account for estimating from labour values to direct prices, profit and exploitation rates, unequal exchange through trade, production-prices and its deviation from market prices and values, organic composition of capital, among other fundamental marxist concepts and categories, or variables.

We proceed to briefly expose the adopted other methodological procedures adopted and the points in which each method diverges from each other. The common base for both methods is centered at values and direct prices (prices proportional to values whose sum equals the sum of market prices).

The labour value of a commodity is composed not only of the labour time spent in the last stage of its production, but of all the socially necessary labour time spent in all different stages of the production process. Thus, it also takes into account the labour time spent in producing all the intermediate inputs consumed as well as the depreciated portion of fixed capital. Ochoa (1984, p. 47 *et seq*.) showed that the sum of the labour time required for those three elements (last stage of production, intermediate inputs and capital depreciation) is represented by:

$$v = a_o (I - A - D)^{-1}$$ (1)

Where v is the vector of labour value per unit of output of n sectors[6]; a_0 is the vector of labour requirements; A is the $n \times n$ matrix of technical coefficients of intermediate inputs; D is the $n \times n$ matrix of depreciation coefficients of fixed capital; and I an identity matrix of order n. Labour requirements (a_0) represent the amount of reduced labour (l') directly employed in the jth sector by its output (x):

$$a_{0j} = \frac{l'_j}{x_j}$$ (2)

Here the chosen approaches for comparison keep the main procedure adopted in WLVD. Reduced labour (l') is constituted by the total amount of labour time (l) spent in each sector j; and a multiplier (z) which translates labour time into hours of simple labour, considering the composition of skilled and unskilled labour of each sector:

$$l'_j = l_j \cdot z_j$$ (3)

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[6]   As Ochoa attested in his work, it doesn't matter if this output is measured by physical or monetary units (Ochoa, 1984, p. 61-63).

The main procedure, based on earlier empirical assessments (Franklin et al, 2022), considers all labour as simple labour, thuz $z_j = 1$.

Where both methods diverge is regarding depreciation accounting. WLVD base procedure for estimating a depreciation matrix is outlined below.

3.1 Depreciation in the standard procedure of the World Labour Values Database

From a macroeconomic point of view, intuitively, if there is series on annual "real" fixed capital, the value of the capital annual real, at current prices, subtracted from the investment that year, is equal to the capital value of the previous period subtracted of the wear suffered, procedure used in the WLVD.

Annual sectoral data on the capital stock (in currency current national) can be found in the Socio Economic Accounts (SEA) of WIOD. However, to determine the share of the value of fixed capital (in terms of working hours socially necessary) that is transferred to the value of goods produced, it is necessary to seek other sources of information to: first, decompose this capital stock into different types of existing capital; second, infer the rate of depreciation that must be applied on the stock of

capital in each sector according to its peculiar composition.

To carry out this first step, we use information from the EU KLEMS database whenever available 8

For countries that do not have adequate information in the referred basis, we assumed that the composition of capital was equivalent to the average composition of the available sample.

. This base provides information on the composition of capital for a set of 29 countries for the years 1995 to 2017, considering 10 types of capital and 40 sectors. like our purpose is to build a 35x35 depreciation matrix – and as the 40 sectors of the EUKLEMS base have no correspondence exact with WIOD's 35 sectors – we aggregate and decompose the capital stock of these value-weighted sectors aggregate of each year of the corresponding sectors. with respect to 10 types of capital, they were distributed across 35 sectors of WIOD from the weighting of gross capital formation annual fixed. The proportions of the capital composition obtained were eventually used to distribute the stock data of capital present in SEA.

For the second step, we start from the depreciation rates that were used in the EU KLEMS studies and defined for each one of 10 types of capital in each of 40 sectors. Again, weightings were made based on the added value of each sector to perform aggregations when necessary.

3.2 Disregarding Depreciation for comparative purposes

The alternative proposal to test in the remainder of this essay, is to treat D as null matrix; in other words, to consider no fixed capital is consumed in each period.

We end up with market prices, direct prices as per WLVD standard procedure, and direct prices calculating withouth depreciation. We also arrive at exploitation rates, unequal exchange and other categories.

As a primary aim, the essay assesses the impacts of disregarding depreciation for price – value (direct prices) deviations. The interest in doing so resides in it being a part of a more extended effort on how to treat depreciation, improve measures for depreciation matrices, or try to regionally extend the WLVD, disaggregating the "rest of the world" for including directly more countries.

4 Empirical assessment

Before delving mostly into country data, and in line with most research done on the subject of empirical estimates of values, direct prices and other Marxian categorical variables, we begin by assessing the entire dataset's market-direct price deviations.

Some remarks are due before describing some notable features of the metrics displayed in Table 1 below. First of all, we compare whole global estimates since the source data is at the world level, and all methods are solved departing from a world IO matrix. Another important note refers to the exclusion of unproductive sectors, for which values and direct prices are supposed to be 0 (as per the designed and implemented method just described). Not doing so would imply introducing bigger divergences derived from our method's design choices. Hence our assessment is done excluding the effect of unproductive labour. Moreover, because of heteroscedasticity concerns regarding direct price and market price vectors (Ochoa, 1984, p. 130-131) and since price-value deviation graphs are commonly depicted with logarithmic values, the metric displayed were produced on the natural logarithms of direct and market prices. Finally, we combined every year's estimates vector into a single vector with all price-values data points for the whole period from 1995 to 2009.

Finally, we present most important and common price-value deviation metrics: R, R squared, mean absolute percent deviation (MAD), mean absolute weighted percentage deviation (MAWD), a normalized vector distance (NVD) as in Ochoa (1984), root mean squared percentage

deviation (RMSPD) as in Petrovic (1987), the angle between direct price and market price vectors (θ), the distance related measure (d) and the coefficient of variation of the ratios of direct to market prices (cv), the later three metrics as suggested by Steedman and Tomkins (1998).

Table 1 – Measures of association and deviation between vectors of direct prices and market prices for the entire world and period between 1995 and 2009

Metric	WLVD base procedure	Not accounting for depreciation
R	0.907	0.904
R²	0.823	0.818
MAD	0.0949	0.0981
MAWD	0.0934	0.0965
NVD	0.1114	0.115
RMSPD	0.118	0.124
θ	6.50	6.88
cv	0.114	0.121
d	0.113	0.120

Source: authors' calculations available at WLVD (https://panel.worldlabourvalues.org).

As per Table 1, the deviations obtained are relatively small. As theoretically expected, accounting for depreciation result in direct prices that are closer to market prices. But, again, the magnitude of all measures change only marginally when considering no fixed capital consumption.

Table 2 – Measures of association and deviation between vectors of direct prices for the entire world and period between 1995 and 2009, considering or disregarding depreciation

Metric			
R	0.99885	RMSPD	0.03097568
R²	0.9977013	θ	1.739286
MAD	0.0093537	cv	0.03036559
MAWD	0.008732976	d	0.03035509
NVD	0.01388218		

Source: authors' calculations available at WLVD (https://panel.worldlabourvalues.org).

The closeness of results with both methods is further stressed in Table 2. R and R squared close to 1, and distance measures close to zero, display that, at least for the base data and estimations available, not considering depreciation does not seem to give abhorrent or unacceptable results.

The graph on World's exploitation rate below, indeed, shows that changes in surplus value level are minor, and overall, both series display the exact same evolution[7]

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[7] One thing to note is that, owing mainly to raw input data problems, both series produce too low or even totally implausible "negative exploitation rates" for 1995, and, in the case of WLVD base procedure, for several more years.

Figure 1: World Exploitation Rate (%) - 1996 to 2009
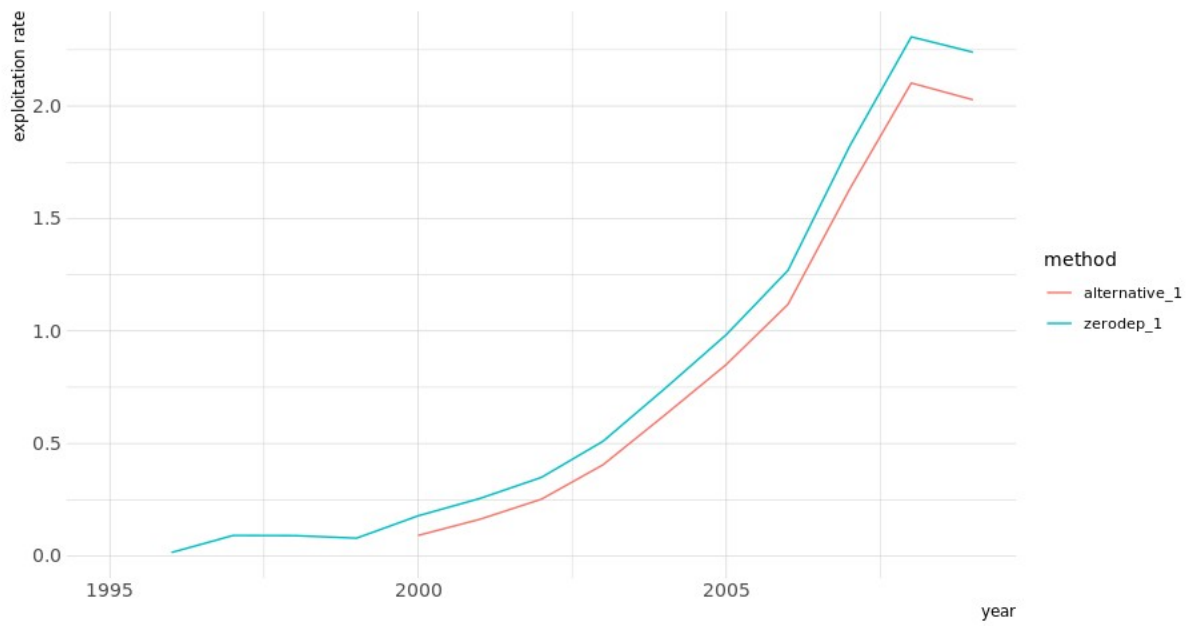
Source: authors' own calculations.

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5 Final remarks

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