AGRICULTURAL INCOME AND ITS ADVERSE EFFECT ON THE RATE OF PROFIT IN THE CASE OF EL SALVADOR 2006

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Abstract

This paper presents the existence of Absolute Rent and its impact in the Rate of Profits in El Salvador; from the labor theory and input-output perspective. As well, we make a comparison with Mexico that have a Rent growth when it eliminates sectors that produce rent, this also happened in the Central American Country.

En el presente trabajo se estudia la existencia de la renta absoluta y su impacto en la tasa de beneficio global y sectorial en El Salvador, desde la teoría del valor trabajo y el esquema insumo-producto. Asimismo, se realiza una comparación con México que muestra que la renta incrementa cuando se eliminan los sectores rentarios, al igual que en el país centroamericano.

Keywords: absolute rent, profit rate, organic composition of capital.

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1. Introduction

The main objective of the work is measured at the aggregate and sectorial level, the impact of income in the salvadoran economy. For the above, this is divided into four sections. First, a theoretical framework and background where the theoretical concept of rent, emphasizing the absolute rent is addressed develops. Secondly, the methodology used for the mathematical calculation of labor values, the profit rate, with and without rent and capital organic composition is exposed. Finally, in this section, the data used and their sources as well as the limitations of these are detailed. Third, the empirical results show, in which a comparison between the rates of profit of El Salvador and Mexico, which, according to the working hypothesis, are affected by agricultural absolute rent (predominantly, but not only); this will also serve to give consistency to the results. Finally, a sectorial analysis of profit rates and organic compositions of capital for El Salvador is performed. This section also takes an econometric model (ANOVA) to determine the gap of the impact of agricultural rent in the sectors. Finally, some conclusions are emphasized.

1.1. Theory and concepts. Rent

Several authors have discussed the rent of land, however, as Capraro (1985: 66) states, at present, even though it has worked, has been relegated to the background, despite being a category summary as well as the gain "reflected within the whole of the contradictions of capitalist society" (Capraro, 1985:66).

One of the first authors to put forward a theory of rent was Adam Smith who described in *The Wealth of Nations* the ground rent as "the price paid for the land use" (2010, 140), this is a price monopoly necessarily because the supply of land is limited and less than the demand.

Ricardo in his book *The Principles of Political Economy and Taxation*, states that "income is that part of the produce of the land paid to the landlord for the use of the original and indestructible powers of the soil" (1993, P. 51), developing so, his approach differential rent.

Capraro (1985), presents a concept of land rent, which is shared in this article, which refers to a particular form of surplus value or extraordinary profit "which comes from limited natural and not reproducible soil character and the himself and his qualities are monopolizable, appropriated privately" (Capraro, 1985: 59). Also it states that income arises "from the fact that market values are producers that produce with higher productivity, bringing to market a value for merchandise lower than average social values as a result of the particular operating conditions of capital "(Capraro, 1985: 59), in this sense, the extraordinary gain would be product of the average profit.

2. Methodology and data

2.1. Labor values

For the 2006 El Salvador data, we use the input-output matrix for 44 sectors of the economy. From here, we construct the matrix of input coefficients A and the column vector for gross production X.

The elements of matrix A show the input required from sector i to produce one unit of output from sector j. This is calculated by postmultipicar the matrix of transaction requirements T by the inverse of the diagonalized vector of gross production X.

$$\mathbf{A} = \mathbf{T}\langle \mathbf{X} \rangle^{-1} \qquad (1)$$

To calculate the vector of direct labor requirements, for the case of El Salvador we use data from the 2006 national Multi-Purpose Household Survey (EHPM). We reclassified the 44 sectors (or industries) by their contribution to total gross production. We vectorized (or multiplied element by element) the quotient o the labor vectors and gross production, as shown in equation

$$\mathbf{a} = \frac{\vec{\mathbf{L}}}{\mathbf{X}} \qquad (2)$$

The values of the labour theory of value, such as indirect labour (IL) used in a particular process corresponds to the contents of the means of production employed (fixed and circulating capital) and direct labor (DL). The first (IL) be decomposed in turn as the value of any other commodity, in new DL^1 and IL^1, and so on. This means that the total value or total labor of a commodity (TL) is the sum of the successive quantities of DL in the distinct periods that have been considered. Equations 3 and 4 represent this argument and are equivalent.

$$TL = DL + IL \qquad (3)$$

$$TL = DL + (DL^1 + IL^1) = DL + DL^1 + (DL^2 + IL^2)\ldots =$$

$$TL = DL + DL^1 + DL^2 + \ldots + DL^n \qquad (4)$$

An example, the production of a cell phone involves the employment of workers, but also the use of machinery, tools and materials, etc. This is represented by the equation (3). However, the indirect labor involved in plant and equipment was the result of other processes or production phases (supra-index 1) and these in turn required other and therefore other direct and indirect jobs (supra-index 2). In this approach, the value of a commodity is its socially necessary labor to produce, and is then integrated the sum of direct labor.

In terms of matrix algebra, and taking the input-output analytic framework, each market value can be expressed as a vertically integrated labor coefficient. This represents the quantity of total direct and indirect labor required to obtain, according to the average prevailing conditions at each moment, a unit of each type of commodity. Expressions 3 and 4 are correspondingly formalized in terms of the input-output analysis in equation 3' as the sum of the quantities of total DL, and in 4' as the sum of DL+IL:

$$\lambda' = a_0' + a_0' A + a_o' A^2 + ... = a_0' (I + A + A^2 + ...) = a_0' (I - A)^{-1} \quad (3')$$

$$\lambda' = a_0' + \lambda' A \quad (4')$$

Where a_0 is the row vector of cofficients of DL, I is the identity matrix, A is the matrix of input coefficients (including the depreciation of fixed capital) and _0 is the vector of labor values. The inverse of Leontief $(I-A)^{-1}$ is the means of transforming quantities of DL in total quantities (direct plus indirect). From this we obtain the vertically integrated labor coefficients that represent each labor value, which is emphasized in expression 3":

$$\lambda' = \mathbf{a}'(\mathbf{I} - \mathbf{A})^{-1} \quad (3'')$$

One of the current problems of the dominant approach in economics is the abstraction of the dimensions in which the variables are raised. For example, the dimensions of the unit value are quantities of labor by monetary unit of gross production in sector j. This is because: 1) the calculations are based on monetary matrices and vectors, are not physical

data and 2) because the information is added goods that make up a sector and not a sector with a single commodity.

The expression for total labor per dollar of gross production should be presented as a homogeneous vector in quantity of labor or money. Therefore, the vector unit values $\boldsymbol{\lambda_u}$ (amounts of labor / one dollar industry j) should be transformed into sectorial values $\boldsymbol{\lambda}$ (only amounts of labor, equation 5a), and these in turn must be transformed into money. Therefore, we need to know the expression in dollars to express a unit of value. In literature this multiplier is called the monetary expression of labor time, **MELT**, equation 5. This can be used to calculate the amount of total production as follows:

$$MELT = \frac{U\ X}{\lambda_U\ X} = \frac{\sum X_i}{\sum Value_i} \qquad (5 \text{ y } 5a)$$

$$\lambda = \lambda_U\ X \Rightarrow Value\ by\ \text{sec}tor$$

Where the vector **U** is a row vector of ones, this is usually called the vector sum. Its usefulness lies in summing the elements of the matrix. As we can observe in equation 5, the numerator represents the sum of total gross production in monetary units, while the denominator is the sum of direct and indirect labor. Furthermore, direct unit prices are defined as:

$$d_u = \lambda_u \left(MELT\right) \quad (6)$$

This implies calculating the value of the proportional prices or direct prices. Nevertheless, as mentioned earlier, it is necessary to express the entire vector in one dimension, of labor time or money. Therefore these direct unit prices are multiplied by the diagonalized vector of gross production < X >, and in this way we obtain direct prices by sector:

$$\mathbf{d} = \mathbf{d_u} \ < X > \qquad (7)$$

2.2. Rate of profit

The profit rate, as mentioned earlier, is ratio of the surplus value and the capital (the summation of variable capital and constant capital). Using the previously defined matrices and vectors, we can approximate this ratio. We defined the profit rate in equation 8 as:

$$\mathbf{g}' = \frac{\mathbf{d_u}\,(\mathbf{I} - \mathbf{A} - \mathbf{B} - \mathbf{D})\mathbf{X}}{\mathbf{d_u}\,(\mathbf{A} + \mathbf{B} + \mathbf{K})\mathbf{X}} \qquad (8)$$

Where **B**, **K**, and **D** are n x n matrices of wage requirements, fixed capital and depreciation for a unit of gross product. However, with the objective of making a comparison and checking the consistency of the results, we can use the "rate of excedent" (8`) as an approximation for the profit rate which excludes circulating capital (a component of constant capital).

$$\mathbf{e}' = \frac{\mathbf{d_u}\,(\mathbf{I} - \mathbf{A})\mathbf{X}}{\mathbf{d_u}\,(\mathbf{A})\mathbf{X}} \quad (8')$$

The profit rate (by sector or industry) and rate of excedent can be calculated by sector following equations 9 and 10.

$$p'_s = \frac{d_u\left(I - A - B - D\right) < X >}{d_u\left(A + B + K\right) < X >} \quad (9) \qquad e'_s = \frac{d_u\left(I - A\right) < X >}{d_u\left(A\right) < X >} \quad (10)$$

Now, our working hypothesis is that within the agricultural sectors there are productive units that can generate profits. The appropriation of this by these sectors would generate a reduction in total surplus stronger than the increase in total relative capital.

In the IO tables for El Salvador, sectors 1-9 represent the agricultural sectors. We therefore remove the corresponding rows and columns from the original matrices and generate matrices and vectors $\mathbf{A_1}$, $\mathbf{B_1}$, $\mathbf{K_1}$, $\mathbf{D_1}$, $\mathbf{X_1}$, $\mathbf{L_1}$, etc. These are substituted into the calculations of direct prices, profit rate, etc. In order to compare the profit rate in El Salvador without the rent sectors with Mexico, we remove the agricultural sectors from the El Salvador IO table.

2.3 Compositions of Capital

The calculation for the composition of capital using the matrices and vectors is defined by equation 11. The numerator is an approximation of constant capital and the denominator is an approximation of variable capital.

$$\mathbf{cc} = \frac{\mathbf{du(A + K)X}}{\mathbf{du(B)X}} \quad (11)$$

Again, to restrict the calculation to only circulating capital, an alternative form of the ratio of circulating capital to labor is presented in equation 12.

$$\mathbf{cct} = \frac{\mathbf{du(A)X}}{\mathbf{UL}} \quad (12)$$

Analogously, to determine whether the compositions of the agricultural sectors are below the average, we define the previous categories by sector with equations 13 and 14.

$$\mathbf{ccs} = \frac{\mathbf{du(A+K)} < X >}{\mathbf{du(B)} < X >} \quad (13) \qquad \mathbf{ccts} = \frac{\mathbf{du(A)} < X >}{\mathbf{U} < L >} \quad (14)$$

2.4. Data

The data used for El Salvador were obtained from the 2006 supply and use table published by the Central Reserve Bank of El Salvador (BCR). We used this data to calculate the matrix of input coefficients and the vector for gross production value. We used the 2006 Multi-Purpose Household Survey (EHPM, acronym in spanish) to determine the labor vector.

One clear limitation we encountered in this study is that the input-output matrix provided by the Central Reserve Bank (BCR) is not symmetric[1]. Therefore, the sum of the gross production does not coincide row by column.

[1] According to the BCR, we can assume the following with regard to the asymmetry:

The supply and use tables "are two asymmetric matrices that describe supply and use of goods and services produced and imported by a country in monetary units" (Haro,2008:5). Therefore, to make the dimensions symmetric it should be production activity by production activity or product by product. Additionally, these matrices are domestic and therefore do not include imports; we modified the matrices to include them.

2.5. Calculation of the Labor Vector

The labor vector is calculated using 2006 employment data by economic sector published in the Multi-Purpose Household Survey (EHPM). The calculation was performed by:

a. Aggregating the data for Gross Production Value according to the classification of economic sectors in the EHPM.

b. Calculating the factor weights as follows:

$$f = \frac{GPV_i}{GPV_j}$$

Where f represents the factor weight, GPV_i represents the gross production value for sector i, and GPV_j represents the gross production value for division j.

c. The data for the employment vector are calculated as the product of the number employed in each sector and the factor weight for the corresponding sector.

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1. The IO table for El Salvador is not symmetric. 2. There are not any large industries with secondary products. Since the production is predominantly primary products, we assume that the former are irrelevant. 3. We approximate total demand using the vector for the gross value of production to make the matrix symmetric.

Recall that the Leontief methodology presents fixed and linear coefficients. The violation of these assumptions will affect the calculation of the results. However, this limitation of the IO Table for El Salvador has been addressed with the data from the symmetric matrices for Mexico for 1970, 1980, and 2003. With this comparison we observe the fundamental results of the negative impact of absolute income on the remaining profit rate.

3. Empirical Results

The profit rate is the ratio of surplus to total paid-in capital. However, given the complications in building the capital matrix K, for a number of countries we tried to compute only circulating capital. Later, we will delve into a purified profit rate for El Salvador incorporating fixed capital.

By using only circulating capital, in reality what we get in the numerator is final demand and as being only a single part of the costs, the preferred name of this rate is, "the rate of excedent (equation 10), which is a proxy, still biased, for the profit rate. However, for simplicity both rates were taken as synonyms.

Table 1. *Rate of excedent, rent and internacional trade*. El Salvador y México

	México 1970		***México 1980***		***México 2003***		***El Salvador 2006***	
	Including agric. sectors	Without agric. sectors	Including agric. sectors	Without agric. sectors	Including agric. sectors	Without agric. sectors	Including agric. sectors	Without agric. sectors
With intern. trade	159.0%	239.0%	193.0%	291.0%	105.0%	113.0%	-	-

Without intern. trade	165.0%	232.0%	200.0%	290.0%	130%*	164.3%*	126.4%	140.5%

Source: data of Mariña (1993), INEGI (2003) and BCR (2006); calculations of authors.
* Maquiladoras are included.

Table 1 shows an approximation of the rate of profit to Mexico in 1970, 1980, and 2003 and for El Salvador in 2006. Reading by rows, we observe that in the case of El Salvador the profit rate increases when we remove the agricultural sectors (sectors 1 through 9). Thus, there exists a 14% difference in the rate of profit when we remove these nine sectors, presummably profitable, in an open economy.

Therefore, this allows us a glimpse that profit is an obstacle to the accumulation of capital in El Salvador. That is, the agricultural sector plays a significant role in the distribution of total surplus value and is reducing the surplus that can be realized and produced in other sectors.

Despite the limitations found in the data for El Salvador, we compare the results with those from the Mexican economy that used symmetric matrices for 1970, 1980, and 2003. The conclusion is the same when eliminating the farm sector (sector 1), a considerable difference persists in the profit rate. So this suggests the existence of sectors with rent in both countries.

On the other hand, and no less important, table 1 demonstrates a primary characteristic of the capitalist economy. In the columns we observe the role of trade on the rate of surplus of the two countries. Despite the statistical limitation in the case of El

Salvador, the observation of Mexico makes it clear that foreign trade causes a higher profit rate. As we know, Marx theorizes in *Capital* (Volume III) that this element an "counteracting" fall in the profit rate.

3.1 Rate overall gain

Table 2 shows the different rates of profit are presented with and without rent and weighting the various components A, B, K and D, this shows how the gap to the global economy is continuing in all cases.

Table 2. Rates of global benefit and the effect of rent. El Salvador, 2006

Weighting Capital	Ecuation [%/year]	With rent sectors	Without rent sectors	decrease
Only circulating capital	$g'_A = \frac{d_u\,(I - A)X}{d_u\,(A)X}$	126.51	140.53	-14.02
Circulating and variable	$g'_{A,B} = \frac{d_u\,(I - A - B)X}{d_u\,(A + B)X}$	60.94	79.66	-18.72
Circulating, fixed y Variable	$g'_{A,B,K,D} = \frac{d_u\,(I - A - B - D)X}{d_u\,(A + B + K)X}$	33.93	41.09	-7.16

Source: Based on data from the BCR and DIGESTYC.

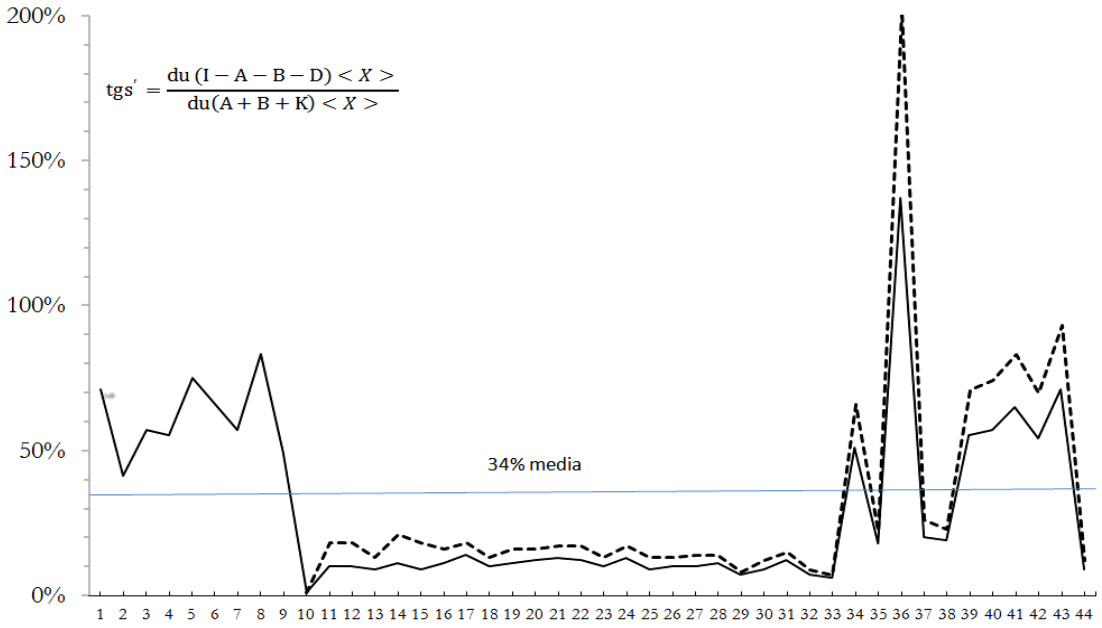
As can be seen the existence of rent makes the profit rate is lower. It is known that the maximum growth rate that can reach global capital is determined by the rate of profit, therefore, the reduction in rent slows the accumulation and therefore also sets limits to the growth of economic activity. This gap is observed at the aggregate level is also shown at the sectorial level.

3.2 Sectorial analysis of profit and capital composition

A variable that has enough interest to companies in the economy is called *profitability,* however there are very few estimates of this. In that regard it is considered important to make a first estimate of the cross-section for the economy of El Salvador. Figure 2 shows the sectorial profit rates considering all cost categories (A, B, K, D).

Figure 1: Rates of benefit with and without rent. El Salvador

% / Year, TIO-2006, 44 sectors



Source: Based on data from the BCR and DIGESTYC.

It can be seen that in terms of direct prices the average rate of profit is 34%, in this regard it is interesting to see how agricultural and service sectors are above this average, unlike the industrial sectors, which are below the average profitability. This latter aspect of industrial profitability is even beyond the explanations of farm incomes, as when disposing (dashed line), profit rates fall short significantly closer to the average. The following table presents

an ANOVA model to assess whether there is significant gaps between sectorial profit rates to contemplate or agricultural rent

Table 3. ANOVA Model, profit rate gap with and without rent sectors

Explained variable (Profit rates)	**Constant**	**Dummy associated to rent sectors**	**Atypical points**	**R^2**	**R^2 ajusted**	**F (k-1, n-k)**	**F calculated**
ANOVA	0.1298	0.1301	0.8468	0.5238	0.5095	F(3,67)	36.8433
t calc.	3.1611	2.3210	8.4581				

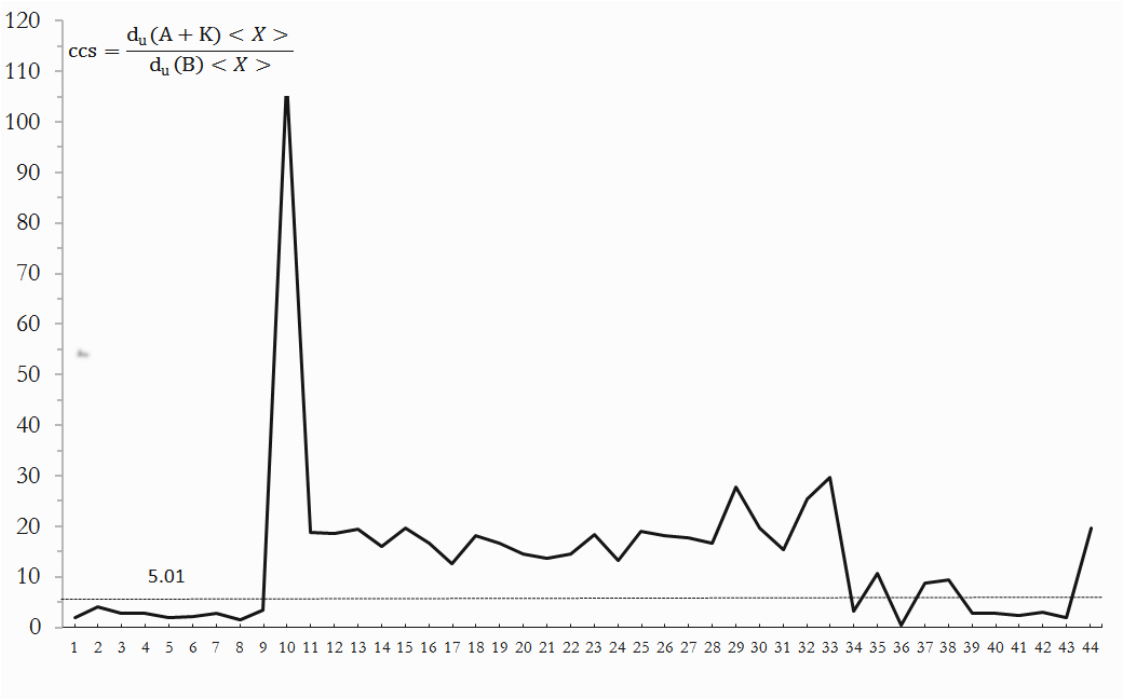
Source: Authors' calculations based on data from BCR and DIGESTYC.

Table 3 shows that the gap between the sector and non-profit sectors wit rent is statistically significant according to the t-calculated and adjusting the model *outliers,* likewise, the F-calculated is significant. Thus, there is a 13% increase in average profitability by eliminating sectors with rent, therefore, the profit rate of the whole economy is 26% (the sum of 12.9% + 13.0%).

The income is presented in a context in which the capital of agricultural sectors produce with a composition of capital below the average. This can be seen in Figure 2, which shows that the sectors 1 to 9 are below the average is 5.01, considering all categories capital (A, K and B), that is, these agricultural sectors work a technology laggard compared to other sectors of the economy.

Figure 2. Composition of sectorial capital. El Salvador

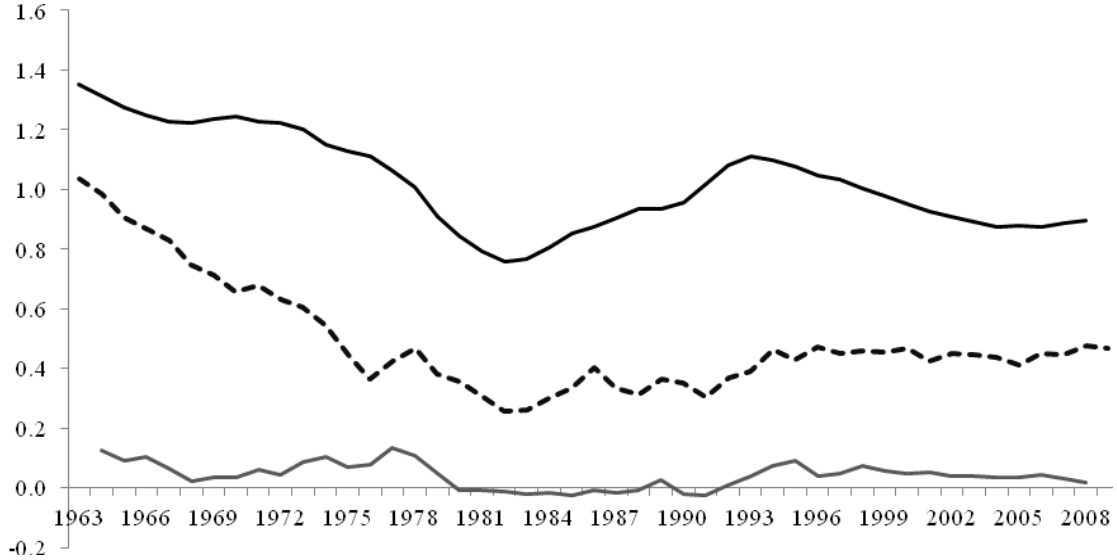
TIO-2006, 44 sectors



Source: Based on data from the BCR and DIGESTYC.

Given the statistical limitations, are calculated the maximum rate of profit (Product / Capital = Y / K) of the *Extended Penn World Tables* (EPWT) online to the issues raised by Shaikh (1989) and the rate of profit (Profit / Capital = G / K) Duran et al. (2010), in addition the growth of investment in El Salvador exposed. The purpose of these comparisons is to see the consistency of the results obtained in this study profitability.

Figure 3. Rate of maximum profit, rate of profit and accumulation. El Salvador, 1963-2008



Source: Own calculations EPWT data and Duran et al. (2010).

The Figure 3 shows, the maximum profit rate and the rate of profit has a similar development, the difference between them is determined by the rate of surplus value. From 1963-1980 (around the start of the war), the rate of return fell to 25% from 1981-1992 there is a deadlock at that level, while recovery occurs 1992 to 2008, although the rate maximum gain decreased.

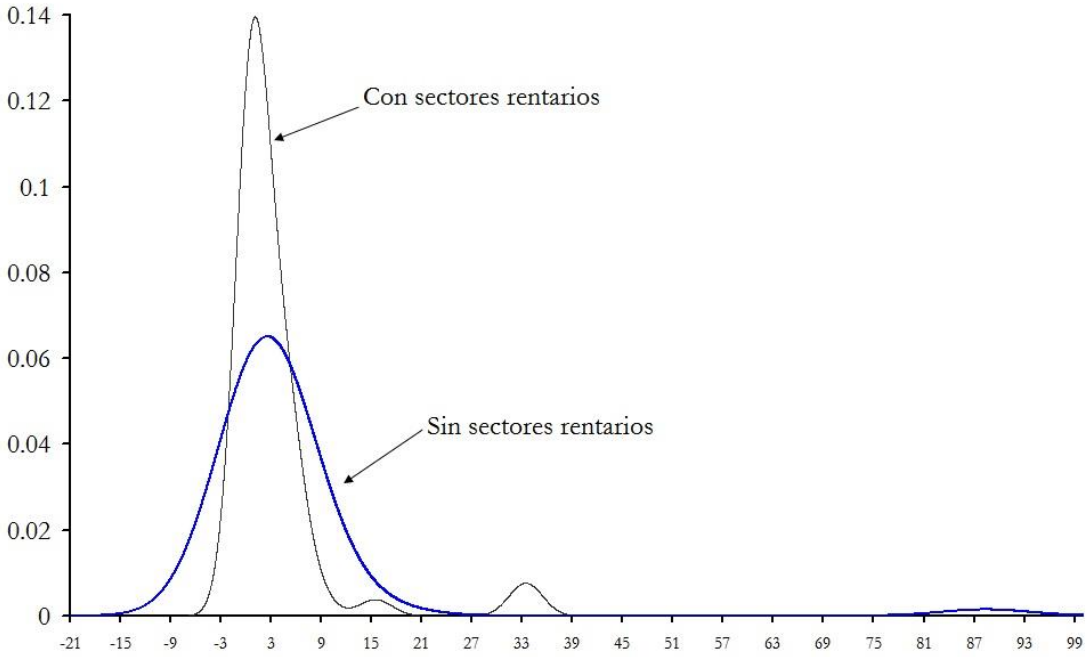
In 2006, according to Duran et al. (2010), the profit rate was 45%, in the calculations of the present research is at 34%, in both cases these levels are above the previous period. Finally, it is confirmed that the capital growth rate does not exceed the rate of profit and the correlation between them (57%) is strong and positive.

Density functions with the rate of profit without sectors with rent

As shown in Figure 4, there are more similar rate gain when sectors with rent are skipped when included; and the probability of finding profit rates in a small interval is greater with rent´s sectors without taking them into account.

The standard deviation reinforces this, since for earnings excluding sectors with rent there is greater dispersion (16.12), compared to that obtained when taking into account those sectors (6.03). Also, the average is larger for the first case (8.38) against the second (4.02).

Figure 4. Profit rates with and without rent. El Salvador, 2006



Source: Authors' calculations based on data from the BCR.

Conclusions

This work shows, first, that the absolute income drops the rate of profit. The comparison between El Salvador and Mexico shows a decrease in the rate of profit to Mexico in 1970, 1980 and 2003 and to El Salvador in 2006.

Likewise, this result is seen in El Salvador to take different ways to calculate the rate of profit; because in all the gain it is reduced. It is found that the rate of profit of El Salvador is 34% in 2006 and this is a result consistent with other studies such as Duran et al. (2006). In 2006 the rate of profit recovered to that of the 1980-1992 period (25%) also the rate of GDP growth was 4.1%, the highest in the first decade of this century. This confirms the explanatory power of the Marxist scheme, the link between profitability and economic growth.

Another aspect studied in this work is the sectoral analysis from which we can highlight: first, a gap between sectoral profit rates observed with and without income. Secondly, it is econometrically determined that this gap is 13%. Thirdly, in line with the definition of absolute income, capital compositions of agricultural sectors are below the social average.

When profit rates were observed without rentarios sectors, including foreign trade without taking into account Mexico, it concludes that trade leads to these rates are higher which means that this country will suit the foreign trade maintain a higher rate of profit that would be obtained if not perform transactions with other countries.

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