THE USE OF INPUT-OUTPUT ANALYSIS TO SIMULATE EFFECTS OF INCOME REDISTRIBUTION ON ECONOMIC GROWTH

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RESUMO

Este artigo pretende simular os efeitos de uma redistribuição de renda sobre o nível do produto nacional. Para se estimar esse impacto, utilizou-se uma metodologia para elaborar as equações de determinação da renda no Brasil, tendo como base a matriz de relações intersetoriais do IBGE, de 1996 (último ano disponível). Com base nessa metodologia, foi possível estimar, em um cenário conservador, que o nível de renda, com o mesmo padrão distributivo de 1990, teria sido 3,0% maior do que o de fato verificado. Conclui-se, portanto, que uma redistribuição da renda em favor dos assalariados constitui, de fato, uma importante forma de política de promoção do crescimento.
Palavras-chave: Distribuição de renda, crescimento econômico, matriz insumo-produto

ABSTRACT

This paper aims to simulate the effects of income redistribution on the level of GDP, for the Brazilian economy. To estimate this impact, a methodology that uses the last available input-output matrix, i.e., 1996, was employed to estimate Brazil's income determination equations. Based on this methodology, it was possible to estimate, albeit in conservative manner, that the income level, with the same distributive pattern as in 1990, would have been 3.0% larger. It is therefore concluded that an income redistribution which favors workers could constitute, indeed, an important way of promoting economic growth.

Keywords: income distribution, economic growth, input-output matrix

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I – Introduction

It is widely known that inequality has long been a major problem in Brazil (Barros, Henriques and Mendonça, 2000). Nonetheless, very few actions have been taken to change this secular situation. Perhaps, one reason for that was an ancient mainstream view that considered inequality useful to achieve economic growth. This view, however, has been contested recently within mainstream economics. During the last years, there was a renewed interest on the relationship between economic growth and income/wealth distribution. This literature sustains that inequality can be harmful for growth (Bénabou, 1996; Bertola, 2000)[1] in that inequality can generate economic inefficiencies basically in two ways: imperfect capital markets and political choices. The former argues that some opportunities of investment cannot be exploited because some individuals do not have access to capital markets once they do not have enough wealth (Bourguignon, 2002). The latter,broadly speaking, intends to show that more inequality will lead to more redistribution from the riches to the poor in an electoral political equilibrium, which in turn reduces the incentives to capital accumulation (Ferreira, 1999)[2].

Brazil figures as one of the most unequal countries in the world. Thus, the aforementioned discussion can be of special interest to academics and policy makers[3]. If, some decades ago, the incredible growth achieved could have delayed the discussion about redistribution, nowadays it is unavoidable: during the nineties, income distribution has remained concentrated as growth vanished. To discuss the importance of inequality reduction policies and to recognize that growth can be enhanced by an improvement in income distribution is a task that cannot be postponed.

In spite of the remarkable recent advances in the theory, as stated above, it is worth noting that neither the "capital market imperfections", nor the "political economy" approach consider the effects of the principle of effective demand[4]. That is to say, both consider that supply determines income. Hence, this modern literature is not able to evaluate the effects of inequality on the demand side. One should not deny the contribution of those approaches, but they must be qualified more as a restriction to supply capacity than as a determinant of national income.

Once a redistribution of income necessarily leads to a change over the pattern of consumption, it is expected that national income will move to the same direction[5]. Thus, if redistribution that favors workers (the "poor") instead of capitalists (the "rich") occurs - as the marginal propensity to consume of capitalists is smaller than that of workers -, *ceteris paribus*, total consumption and therefore national product will increase. In other words, with wage increases, the demand for mass consumption goods also tends to increase. Thus, in the absence of productive restrictions, this increase leads, in turn, to higher income level, because, in the short run, other final demand components are not affected.

[1] These authors provide complete reviews about the theme.
[2] This view is, of course, very simple and does not hold empirically as shows Perotti (1996). However, the approach still holds interesting if one can admit that there is political pressure from different interest groups. See Atkinson (1997) and Campante (2002).
[3] Obviously, this is not the only motive, neither the most important to fight against inequalities. As Kolm (2000) points out, there are strong moral considerations to pursue social justice.
[4] The principle states that demand (i.e., expenditures) determine income, and not the contrary (Kalecki, 1954).
[5] It is assumed, as Kalecki (1954) states, that investment decisions do not change in the very short term.

By using the principle of effective demand as a cornerstone, this paper aims to simulate the effects of income redistribution on the level of GDP, for the Brazilian economy, by using Kalecki's departmental model. For that purpose, I simulate what the level of income in 1996 would have been, if the distributive pattern had been the same as that of 1990. To estimate this impact, a methodology which uses the last available IBGE's[6] input-output matrix, i.e., 1996, was employed to estimate Brazil's income determination equations.

Based on this methodology, it was possible to estimate, albeit in conservative manner, that the income level, with the same distributive pattern as in 1990, would have been 3.0% larger. Moreover, a better income distribution would not only affect the income level, but also the level of employment, production and imports. Respectively, there would be an increase of 3.6% (*i.e.*, 2 million people), 3.1% and 3.3%. It is therefore concluded that an income redistribution which favors workers constitutes, indeed, an important way of promoting economic growth[7]. Nevertheless, in order for this growth to occur, it is necessary that there exists idle capacity in the industry. Otherwise, the demand growth would only generate inflation without impacts over the real income level.

It is worth noting that the methodology utilized produces a result that must be analyzed within a static framework. However, it is possible to imagine the dynamic effects produced by the change on the income level: since a redistribution increases the purchasing power of workers, entrepreneurs' expectations would turn more optimistic, leading to an increment on investment orders. Hence, the total increment could be even larger than the one achieved by simulations

The paper is organized as follows. Section II presents the input-output framework and relates it to the Kaleckian departmental model. In Section III the model is applied to the case under analysis and the income multipliers are presented. Section IV is divided in two subsections. In addition, it presents and discusses the results achieved. The first presents some methodological notes whilst the second presents the results of the simulations, which are divided in two scenarios: benchmark and conservative. Section V discusses the impact of redistribution policies on commercial balance. Section VI concludes.

II – The input-output model and its application to the departmental model

The input-output model describes empirically the interdependence between the different sectors of an economy. As will be shown, this model can be adopted to describe an economy as in Kalecki's departmental model. All that is needed is some algebraic manipulation. However, first of all it is convenient to briefly recall the input-output model although the goal here is not to present that model in detail.

The model is represented by a system of equations that relates the output of each sector to the production of other sectors, considering the final demand an "autonomous sector", which is exogenous to the model. Thus, as usual, the production of any sector can be described as

[6] Brazilian Institute os Geography and Statistics.
[7] It can be argued, as well, that this situation is Pareto improving, since the capitalists remain in the same position and workers are better off.

$$x_i = \sum_{j=1}^{n} a_{ij} x_j + d_i \qquad (1)$$

where a_{ij} is the technical coeficient that determines the quantity of sector's *i* product necessary to the production of a unity of sector's *j* product. d_i is the amount of final demand for the products of sector *i* (*di = Ci + Ii + Gi + Xi - Mi*).

In matrix notation, this can be expressed by:

$$x = Ax + d \qquad (2)$$

where *x* is a *n x 1* production vector, *d* is a *n x 1* final demand vector and *A* is a *n x n* matrix which contains the technical coeficients of production.

Thus, as final demand is determined exogenously, total production must be:

$$x = (I - A)^{-1} d \quad (3)$$

where $(I - A)^{-1}$ is the Leontief matrix.

With this form, the model can show how a change in final demand will affect the whole production and also the production of each specific sector. It is therefore a very important instrument of economic planning[8].

From equation (3) one can have the components of the value added by final demand components. That is to say, with simple algebraic manipulation, it is possible to state the extent of wages, profits and taxes relative to the output of capital goods, consumer goods and so on.

Let us see how this result is achieved: the vector of value added components divided by the value of output – *v*-[9] is multiplied by the value of output:

$$v'x = v'(I-A)^{-1}.d \quad (4)$$

Thus, total output of final goods is represented by a matrix which has in its rows the components of value added and in its columns final demand's components.

As it has been argued, the result achieved with the above equation is similar to Kalecki's departmental model. Tauile and Young (1991) were the first to propose an 'empirical' use of Kalecki's model. They intended to simulate within this framework the effects of a better distribution between profits and wages on economic growth in Brazil[10],[11].

[8] One should not forget the limitations imposed by its premises, which are not to be explored here.
[9] This vector is *m* x *n* where m is the number of value added components, such as profits, wages, etc.
[10] The authors' study was for the seventies. They concluded that income level would be 3.2% higher in 1975 if functional distribution were the same as 1970.

As it is an empirical work, the departmental model must be extended with exports and government expenditures. Thus, besides the traditional departments[12], we now have a department for government expenditures (DIV) and another one for output that is to be exported (DV). We then have:

Table 1 – Extended Departmental Matrix

DI	DII	DIII	DIV	DV	Total
W_1	W_2	W_3	W_4	W_5	W
P_1	P_2	P_3	P_4	P_5	P
I	C_K	C_W	G	X	Y

From this model one can obtain the following equation that determines aggregate income[13]:

Equation 5

$$Y = \frac{[1+\alpha(w_1 - w_3)]I + [1+\alpha(w_2 - w_3)]C_k + [1+\alpha(w_4 - w_3)]G + [1+\alpha(w_5 - w_3)]X}{(1+m)(1-\alpha w_3)}$$

It is worth noting that in a vertically integrated model, income can only be generated through production chains related to final demand categories. So, government's and exports' participations are obtained through income generated by the production of final goods for government's consumption and exports. As long as taxes and imports incide over every sector and, therefore, every department, government and exports' participation must be treated in absolute terms (not in net ones)[14].

The model presented in equation (4) can be rewritten in such a way that makes its comprehension easier:

$$Value\ added\ at\ basic\ prices_{2x5} = [W\ P]'_{2xn}\ (I\text{-}A)^{-1}_{nxn}\ [I\ C_k\ C_w\ G\ X]_{nx5} \quad (6)$$

[11] One should remark that other authors also worked in a similar way, simulating effects on income distribution with input-output matrix. Nevertheless, these authors did not use the same methodology. See, e.g., Bonelli and Cunha (1981; 1982), Bêrni (1995) and Cavalcanti (1997) for more details.
[12] Which are capital goods (DI), capitalists' consumption goods (DII), workers consumption goods (DIII).
[13] As in the final appendix.
[14] As Tauile and Young (1991) pose, the model is compatible with the input-output matrix that use basic prices value added and does not consider the possibility of import substitution, i.e., imports are considered fix and non-competitive.

III – Basic model and income multipliers

This section applies the model presented in the previoussection to Brazil's 1996 input-output matrix. After that, the income multipliers, following equation (5) above, will be computed under three different hypothesis. Based on these results, the following section will proceed to the simulations which are the focus of this paper.

Table 2 shows the 'basic model'. Thus, it has six rows instead of two - wages; social contributions; autonomous income; gross operational surplus; other taxes and other subsidies – and fourteen columns instead of the five shown in Table 1. It is worth noting that consumption is divided according to the income distribution as measured in minimum wages[15].

Table 2 - Basic Model

in 1996 R$ MIlion

	0 ⊣ 2	2 ⊣ 3	3 ⊣ 5	5 ⊣ 6	6 ⊣ 8	8 ⊣ 10	10 ⊣ 15	15 ⊣ 20
Wages	2.119	2.451	5.880	3.432	6.399	5.378	12.090	9.461
Social Contrib.	524	603	1.452	838	1.577	1.323	2.937	2.291
Autonomous inc.	617	717	1.788	1.058	1.989	1.679	3.855	2.992
GOS	5.311	6.298	15.156	8.758	16.559	13.232	31.453	22.155
Other taxes	460	528	1.268	730	1.340	1.100	2.455	1.848
Other subsides	(78)	(94)	(215)	(117)	(207)	(160)	(327)	(230)
Total	8.952	10.503	25.328	14.699	27.658	22.553	52.462	38.518

	20 ⊣ 30	Mais de 30	GFFK	IV	G	X	Total
Wages	12.844	35.854	21.495	2.084	76.058	12.461	**208.006**
Social Contrib.	3.091	8.649	5.376	544	38.825	3.421	**71.451**
Autonomous inc.	3.977	11.107	6.797	362	3.198	2.354	**42.491**
GOS	28.838	79.491	73.998	5.591	14.150	24.630	**345.620**
Other taxes	2.453	6.601	6.984	520	3.176	3.325	**32.788**
Other subsides	(296)	(643)	(306)	(103)	(167)	(446)	**(3.388)**
Total	50.908	141.059	114.344	8.999	135.240	45.746	**696.969**

To adapt the results showed in the table above to the departmental model, it is necessary to group rows and columns. With respect to lines, the option was to put wages, social contributions and autonomous income in the same set, called "wages". The other set – "profits" – aggregates gross operational surpluses, other taxes and other subsidies[16].

In relation to final demand categories, gross formation of fixed capital and inventory changes are added up and represent demand for capital goods. Now, the division between capitalists' and workers' consumption is not that simple. An *ad hoc* hypothesis must be made to define the class of income, measured in minimum wage, that separates capitalists from workers.

For that, two different hypotheses were utilized[17]: the first defines as a *proxy* for capitalists' consumption the consumption of households that receive above twenty minimum wages per

[15] Therefore, 0-2, e.g., means the total consumption by households that receive from zero to two minimum wages, and so on.

[16] Other taxes and other subsides mean taxes and subsides that are not concerned to the production, but with the sell of products or income.

[17] A first version of this paper considered one more possibility. However, it was demonstrated that this possibility was unimportant.

month[18]. The second has as "capitalist's line"[19] the consumption of households that earn more than thirty minimum wages per month.

With hypothesis 1, we have the following result in Table 3:

Table 3 - Hypothesis 1: Ck>20 m.w.

in 1996's R$ Million

	DI (I)	DII (Ck)	DIII (Cw)	DIV (G)	DV (X)	Total
Wages	36.658	75.523	73.450	118.081	18.236	**321.948**
Profits	86.685	116.444	127.222	17.159	27.510	**375.020**
Income	**123.343**	**191.967**	**200.673**	**135.240**	**45.746**	**696.969**

The workers' propensity to consume, in this case, is 0.62, and capitalists' is 0.51. As was argued before, with these results the income multipliers are calculated using (5)[20]:

$$Y=1.24I+1.32Ck+1.71G+1.32X \quad (7)^{21}$$

Although it is already an interesting result, we must proceed to the second hypothesis for the *proxy* of capitalists' consumption. Thus,

Table 4 - Hypothesis 2: Ck>30 m.w.

in 1996's R$ Million

	DI (I)	DII (Ck)	DIII (Cw)	DIV (G)	DV (X)	Total
Wages	36.658	55.611	93.363	118.081	18.236	**321.948**
Profits	86.685	85.449	158.218	17.159	27.510	**375.020**
Income	**123.343**	**141.059**	**251.580**	**135.240**	**45.746**	**696.969**

Here, workers' propensity to consume is 0.78 and capitalists' is 0.38. These numbers are in line with the expectation that capitalists' propensity to consume is significantly smaller than workers'[22,23].

As a result from this hypothesis, it was calculated this income multiplier[24]:

$$Y=1.33I+1.43Ck+1.96G+1.44X \quad (8)$$

Having presented the model and resulting multipliers, the task is now to make simulations so as to evaluate the behavior of macroeconomic aggregates with a different distributive pattern. Then, two scenarios will be utilized for these simulations. The first scenario will be based on the second hypothesis described above ($C_k>30$ m.w.). The second scenario, more conservative, is based on the other hypothesis ($C_k>20$ m.w.). This scenario can be seen as a lower bound on growth derived from a redistribution favourable to wage earners.

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[18] It is worth noting that, nowadays, minimum wage is R$ 240.00, less than US$ 100.00.

[19] In allusion to the poverty line.

[20] This multiplier is defined as: $\Sigma_i [1+\alpha(w_i - w_3)]_i /(1-\alpha w_3)$, where $i=I, Ck, G$ e X.

[21] In this case, the calculation of the multiplier does not take into account the marginal propensity to import, as it is shown in the appendix, because imports excluded from intermediary consumption in Brazilian imput-output matrix.

[22] Actually, if one could measure it in terms of capitalists and workers.

[23] See, *e.g.*, Simonsen e Cysne (1989).

[24] One should notice, as expected, that the higher the workers' popensity to consume the higher the multiplier, once the income distribution remains equal in the two cases.

IV – Simulation

According to Kaleckian theory, a better functional income distribution leads, *ceteris paribus*, to a higher level of national income. This happens because, as Kalecki (1954) assumes, capitalists' decisions to consume and invest do not change in the very short term. Then, if there is a real wage gain, workers will consume more without lowering capitalists' expenditures. Based on that, this section intends to simulate how different distributive patterns would affect the level of product in Brazil in 1996.

A better functional income distribution leads not only to an increase in the level of income of an economy. It also has consequences to the employment level and imports. These consequences, in turn, can be estimated using the same methodology as the one described above (*cf.* Feijó *et al.*,2000). Therefore, these impacts on employment and imports are also estimated in this paper.

Next, in order to show the potential of economic growth from a redistribution in favour of wage earners, it is shown how much each component (separately) of final demand should increase to face the growth derived from redistribution. It is worth noting, however, that different forms of growth do not produce the same effects. Thus, the next step is to find out these effects on imports. This is of special importance because the need for foreign currency may constitute a constraint on the effective growth of national product.

Although this analysis furnishes subsidies to reflect upon redistribution and growth, it is worth stressing the need for idle capacity in the industry for the validity of results just presented. If there is no idle capacity, there will be a productive bottleneck to economic growth. In that case, an increase in inflation and/or increase in imports to meet the excess of demand may happen. Then, an analysis of capacity utilization in the sectors with higher demand increase would be an important step to ratify the conclusions reached in this paper. Nevertheless, this goes beyond the scope of this work and therefore it will be assumed that there is sufficient idle capacity to meet demand growth[25].

IV.1 – Some methodological notes

Considering that, during the nineties, functional income distribution has continuously deteriorated, the idea here is to present a simulation about what would be the income level in 1996 if the distributive pattern had remained the same as in 1990. The strategy is to evaluate how a different distribution would affect the income level in 1996.

To achieve this objective, matrix *v'*, which relates information on income distribution and sectoral output, is the object of simulation. That is to say, to make the necessary simulations, matrix v' will be replaced by its counterpart from the year that was chosen for simulation - say, 1990. In formal terms, it means changing, in equation (), matrix v' according to the income distribution of year (*xx*):

$$pd'_{96} = v'_{xx}\,(I - A)^{-1}_{96}\,d' \quad (14)$$

Nevertheless, this procedure is not enough because the relationship between value added and the value of output can be different for each year. This way, a simple change in *v'* would be more of a simulation of changes in sectoral income distribution (through the relationship between intermediary consumption and value added) than in the distribution between profits and wages. An

[25] As Giambiagi (2002) notes, capacity utilization did not pass 84% since 1980. According to simulations of the author, with na economic growth of 4% per year, capacity would be fully utilized in 5 years. So, it seems reasonable to suppose that industry's installed capacity would not be a problem to growth.

adjustment was then made in data such that the relationship between value added and value of output remained identical to the one in 1996 for each sector. With that, the simulated value added is, by definition, equal to the one observed in 1996. However, the income distribution is altered.

Moreover, as workers' consumption is endogenous, this result is not correct: to keep their consumption unchanged when the wage bill is increased means a reduction in the workers' propensity to consume. As this is considered, in a Kaleckian model, an exogenous variable, it was defined that the propensity in place in 1996 is the 'correct' one. Thus, with the new distribution, workers' consumption has been adjusted based on 1996's propensity to consume[26].

IV.2 – Simulation results

During the nineties, functional income distribution has progressively deteriorated[27]. Therefore, the simulation utilized on this work is uses 1990's distribution, since that year was the one that has presented the biggest participation of wages in income sharing. The idea is then to present how economic growth from 1990 to 1996 would have been affected if income distribution had remained the same as that of 1990. Two scenarios were adopted. Firstly, it is assumed that capitalists' consumption is equivalent to the consumption of those families that earn more than thirty minimum wages. This is considered the reference scenario. The second scenario, more conservative, treats capitalists' consumption as equivalent to families' earnings above twenty minimum wages. The purpose, with that, was to show that even under a very conservative hypothesis the effect on the level of income would still be significant.

IV.2.1 – Scenario 1 - reference

Let us see what would be the income level of 1996 if the distribution were to be the one in vigor in 1990:

Table 6 - Scenario 1

Hypothesis: Ck>30 — in 1996's R$ Million

	DI (I)	DII (Ck)	DIII (Cw)	DIV (G)	DV (X)	Total
Wages	50.476	59.062	109.054	119.330	19.536	**357.458**
Profits	72.867	81.997	163.668	15.910	26.210	**360.653**
Income	**123.343**	**141.059**	**272.722**	**135.240**	**45.746**	**718.111**

From the table above, it is possible to infer that the increase in workers' consumption due to increase in the wages' share on national income would lead to a level of income 3% higher than the one actually observed:

$$Y_{96} = 696{,}968{,}706;\ Y'_{96} = 718{,}110{,}879:\ (Y'_{96}-Y_{96})/Y_{96} = 3.0\%$$

This is a remarkable result, especially when compared to the relatively low rates of growth of the decade of 1990. When compared to the real rate of growth of 1996 – 2.7% - that value is shown to be very expressive. It can be argued that, if there had been a return to the distributive pattern of 1990, economic growth would have been 5.7%, against 2.7% observed.

[26] One should note that there are other ways to treat this problem. However this one seems to be less *ad hoc* than the others. For further details, see Sant'Anna (2003).
[27] According to IBGE (2002c).

One should note in addition that in terms of redistributive policies, it is a very conservative outcome, since it assumes a return to the already unequal distribution of 1990. Then, if one considers that there is enough room for redistributive policies, it can be argued that economic growth due to a better income distribution could attain even higher rates.

The impacts of a more equal income distribution are not restricted to the GDP level. It is also possible to estimate its consequences over the value of production, employment and imports.

Since the whole increase in final demand due to a better income distribution would go to the mass consumption goods' department, effects on production, employment and imports can only occur in the same way. The increase in workers' consumption would be by 8.4%. Thus, to estimate impacts on the value of production, it suffices to multiply by 1.084 the sectoral output needed to meet workers' demand. With that, the estimated value of output would be R$ Million 1,311,432.243, as opposed to the effective value of R$ Million 1,272,037.766, which represents a growth of 3.1% in the value of production.

Obviously, the increase in production would not be equally spread over the various sectors of the economy. Then, the following table details the impacts on production. It is worth noting that only the activities that have had a performance above the mean (3.1%) are presented.

Table 7 - Sectors most affected by increase in workers' demand

(in 1996's R$ Thousand)	Total - Base	Total - Sim.	Δ
MILK AND DAIRY PRODUCTS	8.952.669	9.475.836	5,8%
PHARMACEUTICAL AND PERFUMERY PRODUCTS	11.420.610	12.086.319	5,8%
FLESH PREPARATION	18.708.349	19.784.130	5,8%
CLOTHING AND ACCESSORIES	9.957.598	10.510.943	5,6%
OTHER FOOD AND DRINK INDUSTRIES	28.730.630	30.305.235	5,5%
VEGETAL ORIGIN PRODUCTS	21.669.292	22.846.772	5,4%
REAL ESTATE RENTAL	100.141.706	105.070.976	4,9%
FARMING AND CATTLE RAISING	95.973.827	100.673.588	4,9%
TEXTILE INDUSTRY	18.133.010	18.933.369	4,4%
PUBLIC UTILITIES	33.378.321	34.845.297	4,4%
COMMERCE	93.587.836	97.540.688	4,2%
PRIVATE SERVICES	9.004.388	9.384.425	4,2%
TRANSPORTS	44.309.712	46.166.343	4,2%
SERVICES TO HOUSEHOLDS	86.500.532	90.115.408	4,2%
REFINING OF VEGETABLE OILS	13.907.888	14.480.235	4,1%
SUGAR INDUSTRY	5.997.571	6.231.112	3,9%
CHEMICAL ELEMENTS, EXCEPT PETROCHEMICALS	13.044.400	13.526.250	3,7%
COMUNICATION	15.760.645	16.338.189	3,7%
REFINING AND PETROCHEMICS	44.463.431	46.055.032	3,6%
DIVERSE CHEMICAL PRODUCTS MANUFACTURING	17.851.987	18.482.538	3,5%
OIL AND GAS	6.365.583	6.583.483	3,4%
ELETRONIC EQUIPMENTS	16.018.302	16.547.037	3,3%
COFFEE INDUSTRY	6.583.284	6.799.906	3,3%
SHOES AND LEATHER PRODUCT	6.029.082	6.222.003	3,2%
TOTAL PRODUCTION	**1.272.037.766**	**1.311.432.243**	**3,1%**

Source: the author, from IBGE data

With the new final demand d'_{96} due to the new distribution, a new output level is needed to face the increase in demand[28]. In turn, this new output generates an increase in the employment level. To estimate this impact, it has been followed the methodology described by Feijó *et al.* (2000): the number of employees can be reckoned by multiplying the vector number of employees/value of production – L' – by the simulated value of production: $E=L'x$[29].

Based on that, the rise in employment level would be about 2 million people: from 58,784,857 to 60,918,171, i.e., an increase of 3.6%. Indeed, it is noteworthy that jobs creation would have a reasonably higher growth than that of income. This outcome is interesting especially in a decade marked by high rates of unemployment[30].

As has been seen, there is a tremendous growth potential resulting from redistribution of income. To have an idea of that potential, it was made, as proposed by Tauile and Young (1991), a calculation of the necessary increase in each component of final demand, separately, in such a way to reach the same increase of 3.0% of national income[31].

Firstly, it was obtained the requisite change in value of investments in order to generate the result previously simulated:

$$Y'_{96} = Y_{96} + 1{,}33.\Delta I; \quad Y_{96} = 696.968.706; \; Y'_{96} = 718.110.879$$

$$\Delta I = \frac{Y'_{96} - Y_{96}}{1{,}33} = \frac{718.110.879 - 696.968.706}{1{,}33} = 15.931.101;$$

$$\frac{I + \Delta I}{I} = \frac{123.342.875 + 15.931.101}{123.342.875} = 1{,}13$$

In sum, to reach the simulated income level for 1996, keeping the actual income distribution, investment should have been 13% higher than the actual level.

The same calculation is made for capitalists' consumption:

$$\Delta C_k = \frac{21.142.173}{1{,}43} = 14.744.586;$$

[28] As it was argued this new production may not be feasible due to the absence of idle capacity. Thus, it is assumed here that there exists in fact idle capacity.
[29] Where $x = (I-A)^{-1}d$ is the value of production.
[30] With total wages and total number of employees, it is possible to reckon the mean wage too. It would be 7.2% higher than the prevailing one.
[31] Actually, this level would be, *at least*, 3% higher, since an increase in expenditures stimulates new investments, what leads to a dynamics favorable to growth.

$$\frac{C_k + \Delta C_k}{C_k} = \frac{141.059.306 + 14.744.586}{141.059.306} = 1{,}10$$

In this case, to make up for the effects of a worse income distribution, capitalists' consumption should have raised 10%.

Following the same procedure for government expenditures:

$$\Delta G = \frac{21.142.173}{1{,}96} = 10.781.587\ ;$$

$$\frac{G + \Delta G}{G} = \frac{135.240.310 + 10.781.587}{135.240.310} = 1{,}08$$

The effort, in this case, should represent an increase in 8% in government's expenditures. It must be remarked that the effort is much smaller than for other final demand's components. It so happens because wage participation in this department's value added, as can be seen in Table 6, is far bigger than in other departments, and, therefore, its multiplier is also far bigger than others' multipliers.

Finally, let us look at the last department, exports:

$$\Delta X = \frac{21.142.173}{1{,}44} = 14.694.915\ ;$$

$$\frac{X + \Delta X}{X} = \frac{45.745.904 + 14.696.915}{45.745.904} = 1{,}32$$

As exports have a small share of total value added, only 7%, it should have grown 32% so as to reach the same increase of 3% in national income.

It is worth keeping in mind that to the promotion of exports is usually advised as an important policy to promote economic growth (*e.g.* Medeiros & Serrano, 2001). However, in view of the substantial effort that would be neededin order to generate an 'export-led growth' model, it can be argued that with the same effort there could be a meaningful income redistribution which would lead to an even higher income level[32].

It must be warned, however, that an economic expansion requires an increase in production, which leads to a higher demand for foreign products for its accomplishment. Hence, it leads to an increase in imports. In a developing country, as Brazil, there is, in general, scarcity of foreign

[32] An increase of such a dimension in exports would be possible only with a great depreciation of national currency, or through a wide subsidy program to exports. After all, such a competitivity gain is practically unfeasible in the short term.

currencies. Thus, as pointed out by Kalecki (1977, pp. 43-53), any kind of stimulus to economic growth, exception made to exports, would lead to a bigger constraint, instead of relief. That is why, in section V, it will be analyzed whether this increase in the need for imports represents an actual constraint on growth.

The table below presents the results described above:

Table 8 - Required Rate of Growth				
	I	Ck	G	X
Required Rate of Growth	12,9%	10,5%	8,0%	32,1%

As has been seen, a change of 7.8% (from 46% to 50%) in the wages' share of national income would produce an effect over national product that would only be attained by big efforts in any one of the departments. It can be argued, hence, that a redistribution of income in favor of wage earners has a high potential in promoting economic growth[33].

IV.2.2 – Scenario 2 – conservative

In this second scenario, the effects are, as expected, more modest. Nonetheless, it is yet an important result:

Table 9 - Scenario 2						
Hypotesis: Ck>30						in 1996's R$ Million
	DI (I)	DII (Ck)	DIII (Cw)	DIV (G)	DV (X)	Total
Wages	50.476	59.062	107.264	119.330	19.536	**355.668**
Profits	72.867	81.997	161.180	15.910	26.210	**358.165**
National Income	**123.343**	**141.059**	**268.444**	**135.240**	**45.746**	**713.833**

In spite of the conservative assumptions adopted here, this simulation produces a nonnegligible result: national income would have been 2.4% higher than 1996's actual GDP.

Output would have to be 2.5% higher to face the increase in demand. Table 9 below displays the most sectors affected within this scenario:

[33] Of course, it only happens if the assumptions of idle capacity and no change of capitalists', government's and rest of the world's expenditures remain valid.

Table 9 - Sectors most affected by increase in workers' demand			
(in 1996's R$ Thousand)	Total - Basic	Total - Sim.	Δ
PHARMACEUTICAL AND PERFUMERY PRODUCTS	11.420.610	11.974.030	4,8%
MILK AND DAIRY PRODUCTS	8.952.669	9.385.730	4,8%
FLESH PREPARATION	18.708.349	19.607.959	4,8%
VEGETAL ORIGIN PRODUCTS	21.669.292	22.688.345	4,7%
CLOTHING AND ACCESSORIES	9.957.598	10.412.933	4,6%
OTHER FOOD AND DRINK INDUSTRIES	28.730.630	30.038.091	4,6%
FARMING AND CATTLE RAISING	95.973.827	99.877.788	4,1%
REAL ESTATE RENTAL	100.141.706	104.084.706	3,9%
PUBLIC UTILITIES SERVICES	33.378.321	34.608.883	3,7%
TEXTILE INDUSTRY	18.133.010	18.775.448	3,5%
TRANSPORTS	44.309.712	45.874.773	3,5%
REFINING OF VEGETABLE OILS	13.907.888	14.389.580	3,5%
COMMERCE	93.587.836	96.736.209	3,4%
SUGAR INDUSTRY	5.997.571	6.195.696	3,3%
SERVICES TO HOUSEHOLDS	86.500.532	89.200.623	3,1%
OIL REFINING AND PETROCHEMICS	44.463.431	45.770.488	2,9%
PRIVATE SERVICES	9.004.388	9.267.757	2,9%
COFFEE INDUSTRY	6.583.284	6.773.228	2,9%
DIVERSE CHEMICAL PRODUCTS MANUFACTURING	17.851.987	18.366.362	2,9%
OIL AND GAS	6.365.583	6.544.454	2,8%
COMUNICATION SERVICES	15.760.645	16.202.005	2,8%
CHEMICAL ELEMENTS, EXCEPT PETROCHIMCALS	13.044.400	13.409.241	2,8%
SHOES AND LEATHER PRODUCTS	6.029.082	6.190.276	2,7%
ELETRONIC EQUIPMENTS	16.018.302	16.442.141	2,6%
PLASTIC MATERIAL INDUSTRY	9.599.936	9.837.894	2,5%
TOTAL PRODUCTION	**1.272.037.766**	**1.303.666.973**	**2,5%**

Source: the author, from IBGE data

In general, sectors most affected are the same as in the benchmark scenario. Some sectors, however, are more than proportionately affected, as farming and cattle raising, transportation and plastic materials.

Regarding the employment level, it seems that the income-elasticity of employment is in fact higher than one. Hence, the number of employees would rise by 2.9%. This is a consequence of the increase in the demand for mass consumption goods which are more labor intensive.

As in the former section, the required growth in each department has been separately estimated, in order to generate the simulated output level. Table 10 summarizes the results:

Table 10 - Required Rate of Growth				
	I	Ck	G	X
Required Rate of Growth	11,0%	6,7%	7,3%	27,9%

V – Impacts on trade balance

In this section, the impacts on trade balance will be analyzed relative to the benchmark scenario only.

The methodology used to calculate the impacts on imports is exactly the same used for output and employment. Hence, if the distributive pattern of 1990 had held in 1996, of the need for imports would have increased by 3.3%. This increase would be a little higher than the increase in

income. Nevertheless, it is worth mentioning that the imports/GDP ratio would remain constant: 9.8%.

Different forms of growth lead to different impacts on imports and, therefore, on the trade balance. As Brazil has a structural deficit on the services balance a good performance in the trade balance is essential to relieve the scarcity of foreign currencies, without relying on capital account surpluses. Thus, the purpose here is to evaluate what would the impacts on imports be from the different ways to achieve 3% of income growth. Moreover, other purpose is to evaluate whether an increase in imports would lead to a constraint on growth.

As has already been seen, the increase in imports due to redistribution of income would be of 3.3%. The same computation was made for the increase in import requirements if income growth had been due to an increase in each department's production. These values are described in the table below:

Table 11 - Rate of Imports' Growth in different cases

	DI (I)	DII (Ck)	DIV (G)	DV (X)
Rate of Import's Growth	2,8%	2,1%	0,5%	4,3%
Total of Imports	70.332	69.864	68.788	71.365

The department that produces export goods is precisely the one that would demand a higher level of imports. In spite of that, one must not forget that this happens because that department would have experienced an astonishing increase of 32% in its production.

Though exports would require a higher level of imports, they would lead to an increase in trade balance. Yet, when growth is pushed by the other factors, the tendency is to increase external disequilibrium.

It is worth noting, however, that an increase of R$ 2 Million, in average, probably should not constitute a constraining factor on economic growth (it is about 0.3% of GDP). Therefore, it has been assumed that imports would not prevent the increase in production.

Hence, although exports obviously present a beneficial effect on the balance of payments, it is necessary to take into account that to build an economic growth policy *exclusively* on exports' promotion is not a good option. After all, to obtain a increase of 3% on GDP, *ceteris paribus*, an increase of 32% on exports is needed.

VI – Final comments

It was attempted to show, in this paper, that redistribution of income that favors workers can have positive effects to economic growth. The idea behind that assertion is that with their purchasing power improved, workers consume more, without prejudice to expenditures on investment, capitalists' consumption, government and exports. It must be taken into account, nevertheless, that for this to actually happen, there must exist idle capacity in supply. Otherwise, such demand increase would only lead to inflationary pressure, without impacts on real income.

This preoccupation, though relevant, has not been treated in detail here. After all, a study about capacity utilization in the various sectors is by itself a topic for another work. Thus, it was

assumed that there existed idle capacity to meet additional production needs that resulted from the increase in demand for mass consumption good[34].

There is still a final comment with respect to the beneficial aspects of redistribution. Until this moment, the whole analysis has been based in comparative statics, where the effects of a change in functional income distribution are evaluated with respect to the GDP level. Nonetheless, in a dynamic analysis, it can be said that with the increase in the purchasing power of an important portion of the population, entrepreneur's expectations would turn more optimistic in relation to DII sales. Hence, there would be an increase in investment (DI). That is to say, if one considers an accelerator effect, total increase in income could be even higher than calculated by the simulations presented in this paper.

VII - Apendix

Model with workers' savings, government and external trade:

$$Y = I + C_k + C_w + G + (X - M) = P + W; with$$

$$C_w = \alpha W; M = mY; w_1 = \frac{W_1}{I}; w_2 = \frac{W_2}{C_k}; w_3 = \frac{W_3}{C_w}; w_4 = \frac{W_4}{G}; w_5 = \frac{W_5}{X};$$

$$Y + M = I + C_k + \alpha W + G + X \Rightarrow Y + mY = I + C_k + \alpha(w_1 I + w_2 C_k + w_3 C_w + w_4 G + w_5 X) + G + X \Rightarrow$$

$$(1+m)Y = (1+\alpha w_1)I + (1+\alpha w_2)C_k + \alpha w_3(Y + M - I - C_k - G - X) + (1+\alpha w_4)G + (1+\alpha w_5)X \Rightarrow$$

$$(1+m)(1-\alpha w_3)Y = (1+\alpha w_1 - \alpha w_3)I + (1+\alpha w_2 - \alpha w_3)C_k + (1+\alpha w_4 - \alpha w_3)G + (1+\alpha w_5 - \alpha w_3)X \Rightarrow$$

$$Y = \frac{[1+\alpha(w_1 - w_3)]I + [1+\alpha(w_2 - w_3)]C_k + [1+\alpha(w_4 - w_3)]G + [1+\alpha(w_5 - w_3)]X}{(1+m)(1-\alpha w_3)}$$

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[34] Indeed, utilization of capacity has been around 80%. Thus, capacity bottlenecking does not seem to constitute a factor of growth restriction in the short term. See Giambiagi (2002) for more details.

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