Distributional effects of stabilization policies in a dual economy: the case of Brazil — 1981-88

André Urani*
Carlos D. Winograd**

Summary: 1. Introduction; 2. The model; 3. The case of Brazil during the 1980's; 4. Conclusion.

The model presented in this paper clarifies the links existing between the stabilization policies which were implemented in Brazil during the 1981-88 period, the trade balance, the GDP path, the rate of inflation and the dynamics of the relative income of the workers of a dual economy. Basing our analysis on special tabulations of household surveys (Pnad/IBGE) we show that this very general model contributes to understand how, despite the stagnation that characterized this period as a whole, the losses of the informal workers were smaller than those of the formal.

O modelo que apresentamos neste texto explicita as relações existentes entre as políticas de estabilização implementadas no período 1981-88, a balança comercial, a trajetória do PIB, a taxa de inflação e a dinâmica do diferencial de salários em uma economia dual. Baseando nossa análise em tabulações especiais da Pnad/IBGE, mostramos que esse modelo é capaz de explicar por que os trabalhadores informais registraram perdas menores que os formais ao longo desse período.

1. Introduction

After more than three decades of fast economic growth. Brazil had to implement, from the beginning of the 80's, severe stabilization policies in order to cope with its foreign exchange constraint.

The attempts to devaluate the real exchange rate, the maintenance of high real interest rates as well as the structural adjustment program adopted since the mid-1970's explain the fast clearing of the balance of payments (see table 1). The "secondary effects" of this external stabilization were a stagnation of per capita GDP, a sharp increase in the inflation rate and an income concentration, which led to a significant increase of poverty: in 1988, Brazil had 2/3 more poors than in 1981.¹

One could expect that such a stagnation would hit especially the income of the workers of the informal sector, which, in an economy without an efficient social security system, plays the role of a buffer in the labour market. However, the available data suggest that the losses of the workers of the modern sector were more important than those of the informal workers. This apparent paradox can be explained by the fact that informal workers have showed a stronger capacity to preserve their real income against the increasing inflation that characterized this period.

^{*} IEI/UFRJ and Ipea.

^{**} Delta (Paris) and Nuffield College (Oxford).

¹ For surveys about distributional effects of stabilization policies and structural reforms see Squire (1991) and Bourguignon et alii (1991).

Table 1
Economic and social indicators

	1981	1982	1983	1984	1985	1986	1987	1988
TB (US\$10 ⁹)	0.8	0.5	6.2	13.1	12.5	8.3	11.2	19.2
CA (US\$10 ⁹)	-11.7	-16.3	-6.8	0.0	-0.2	-5.3	-1.4	4.2
GDP per capita (1980 - 100)	94.1	92.2	87.3	89.2	95.1	100.0	101.0	99.0
Theil-L	0.59	0.60	0.62	0.62	0.66	0.61	0.64	0.72
Percentage of poors (H)	32.4	34.4	46.9	47.7	41.0	30.9	40.1	41.1
Absolute poverty (Sen)	17.3	17.7	24.5	25.0	21.9	12.1	20.4	25.3

Sources: Anuário Estatístico do IBGE (several issues); Pnad/IBGE (special tabulations).

Notes: TB: trade balance of the balance of payments; CA: current account of the balance of payments. The poverty line has been established at one real minimum wage of 1980, deflated by INPC. The measure of Sen (S) is given here by: $S - H \cdot (I + (1 - I) \cdot I)$, where H is the percentage of poors, I is the distance between the poors average income and the poverty line, and I is the income inequality among poors, measured by the Theil-L.

The model presented in the next section clarifies the links between the stabilization policies which were implemented, the trade balance, the GDP path, the rate of inflation and the dynamics of the relative income of the workers in a dual economy. Basing our analysis on special tabulations of household surveys (Pnad/IBGE) we show, in the third section, that this very general model contributes to understand the stylized facts presented above. Finally, the fourth and last section is the one of our conclusions.

2. The model

We analyze the case of an open economy composed by two sectors:

- a) the modern (or formal), which produces a tradable good (a perfect substitute for the one produced by the rest of the world) and demands wage-labour; and
- b) the informal, composed by self-employed urban workers and producer of a non-tradable good which is an imperfect substitute for the formal one.

Formal sector is price-taker on the international market. We have, then, that: $p_F = e$. p_F^* , where p_F is the price of the tradable good on the domestic market, e is the nominal exchange rate (Cr\$/US\$) and p_F^* is the price of this good on the international market. If we assume $p_F^* = 1$, we have $p_F = e$.

The supply of this sector is determined by its profitability:

$$Q_F^s = Q^s \left(\overline{w_F} / e, \overline{\rho} \right) \tag{1}$$

where Q_F^S represents the production, w_F the nominal wage in this sector and ρ the real interest rate.

The domestic demand is a positive function of the informal/formal relative price (p_1/e) and depends negatively on the real interest rate:

$$Q_F^D = Q^D \left(p_I / e, \bar{\rho} \right) \tag{2}$$

Net exports are determined by the excess supply in this sector:

$$B = Q_F^S - Q_F^D \tag{3}$$

The informal sector is perfectly competitive; its supply (Q_l) is given by the number of people it employs (L_l) :

$$Q_{I}^{s} = a.L_{I} \tag{4}$$

where a represents the labour average productivity in this sector (assumed as a constant).²

The demand for the informal good depends negatively on the relative price (p_i/e) and on the real interest rate:

$$Q_I^D = Q(\bar{p_I}/e, \bar{\rho}) \tag{5}$$

We assume that the informal sector has no entry barriers. In an economy that doesn't have a developed social security system there is no long-term unemployment. We have, by definition:

$$L = L_F + L_I \tag{6}$$

The labour supply results from the maximizing behaviour of individuals which utility function is given by:

$$U^{e} = \pi.w_{i}^{e} - \delta.\sigma_{i} + \epsilon.\beta_{i} ; \pi, \delta \text{ and } \epsilon > 0$$
 (7)

where the index i represents the sector, w^{ϵ} the expected income, σ the risk that the effective income differs from the expected one and β non-pecuniary benefits. We assume that:

$$\sigma_F < \sigma_I$$
 (8)

and that:

$$\beta_F > 0$$
 and $\beta_I = 0$ (9)

² Therefore, there is no capital into the production function of this sector.

In what follows, we shall suppose that the formal sector is sistematically preferred to the informal, independently of the income differential between the two sectors, which means that:

$$\pi \cdot (w_F^e - w_I^e) - \delta \cdot (\sigma_F - \sigma_I) + \epsilon \cdot \beta_F > 0 \tag{7'}$$

In such a framework, formal employment is given by the demand and the informal is obtained residually. In other terms:

$$L_F = L_F^D (Q_F^s (w_F/e, \rho))$$
 (10)

$$L_I = L - L_F^D(Q_F^s(w_F/e, \rho))$$
 (11)

Combining (4) and (11), we can re-write the supply of informal goods as:

$$Q_I^S = a \cdot [L - L_F^D(Q_F^S(w_F/e, \rho))]$$
 (4')

with
$$\partial Q_I^s/\partial (w_F/e) = -a L_{F,Q}^{b} \cdot Q_{F,w}^{-s} > 0$$

and
$$\partial Q_I^s / \partial \rho = -a \cdot L_{F,Q}^{b} \cdot Q_{F,\rho}^{s} > 0$$

The supply of informal goods depends positively on the real wage in the formal sector and on the real interest rate. An increase of w_F/e or of ρ reduces the profitability of the formal sector; its production and its employment decrease, which implies increasing employment and production in the informal sector.

In the formal sector, the workers are wage-earners. In an inflationist environment, wage-contracts are indexed in a way that we can represent as:

$$w_F = w_F^0 (1 + \varphi \cdot \hat{p})$$
; $0 < \varphi < 1$ (12)

where w_F^0 is the reference-wage to be indexed, \hat{p} is the rate of inflation and φ is the degree of indexation.³ It is generally assumed that indexation is perfect. Nevertheless, in practice, wage-indexation to prices is not instantaneous but lagged. The degree of indexation φ synthetizes here the percentage of adjustment of nominal wages to the last period's rate of inflation and the frequency of these adjustments.

From (12), it follows that the real wages (w_F) are given by:

$$w_F^r = w_F^{r,0} \cdot (1 + \varphi \cdot \hat{p}) / (1 + \hat{p})$$
 (13)

³ This formulation has been suggested to us by Antonio Fiorencio.

where $w_F^0 = w_F^0 / p^0$. The relationship between real wages and inflation is negative:

$$\partial w_F' / \partial \hat{p} = (\varphi - 1) / (1 + \hat{p})^2 < 0$$
 (14)

To simplify our exposition, we can re-write the effect of the rate of inflation on the real wages as:

$$w_F^r = w_F^{r,0} - \lambda \cdot \hat{p}_F$$
 (15)

where $\lambda = 1/\varphi$ and the price index is computed taking into account exclusively the prices of the formal goods. The path of the real wages is then given by:

$$\hat{w}_{F}' = -\lambda \cdot d\hat{e} \tag{16}$$

This expression enhances that the variations of the real wages are determined by the acceleration of the devaluation rate.

As we said above, the informal sector is composed uniquely by self-employed workers who don't find employment in the formal sector: they have to sell goods and services to survive. The per capita nominal income of these workers (w_i) is competitively determined as:

$$w_I = p_I \cdot Q_I / L_I \tag{17}$$

From (4) and (17), we have that:

$$w_t = a \cdot p_t \tag{17}$$

Then, the nominal income of the informal workers follows the evolution of the prices of informal goods:

$$\hat{w}_I = \hat{p}_I \tag{18}$$

As we said above, the goods and services which are produced or traded by the informal sector are imperfect substitutes for those of the formal sector. We suppose that the price-determination in this market follows a rule that incorporates perfect expectations about the evolution of the formal prices (so as to maintain a constant relative price) and a component which expresses the excess demand for the informal good:

⁴ For a more complete analysis of the relationship between wages and inflation, see Frenkel (1986), Modiano (1983) and Verdier & Winograd (1988).

$$\hat{p}_I = \hat{e} + \gamma \cdot (Q_I^D - Q_I^S) \tag{19}$$

The average real income in this market is then given by:

$$\hat{w}_{I}^{r} = \hat{w}_{I} - \hat{e} = \gamma \cdot (Q_{I}^{D} - Q_{I}^{S})$$
 (20)

From (16) and (20), we can obtain the path of the relative real income between the two sectors:

$$\hat{w}_I^r - \hat{w}_F^r = \gamma \cdot (Q_I^D - Q_I^S) + \lambda \cdot d\hat{e}$$
 (21)

We can see, in (21), that the relationship between the real income of informal workers and the one of the wage-earners depends positively on the excess demand for informal goods and on accelerations of the devaluation rate, and negatively on the degree of indexation.

From (16) and combining the expressions (5), (4') and (17') with (20), we obtain the following system:

$$\hat{w}_F^r = -\lambda \cdot d\hat{e} \tag{16}$$

$$\hat{w}_{I}^{r} = \gamma \cdot [Q_{I}^{D}(w_{I}/e, \rho) - Q_{I}^{s}(w_{F}/e, \rho)]$$
 (20')

In figure 1, the straight line WW indicates a constant relative real income (w_I^r/w_F^r) between the two sectors. An increase (decrease) of w_I^r/w_F^r provokes a downward (upward) rotation of WW. WF represents a constant real wage in the formal sector. Along this line, the devaluation rate is constant (i.e. $d\ell = 0$); an increase of inflation (or of the devaluation rate) moves WF downwards. WI represents the set of points $(w_f^r; w_I^r)$ for which the informal real income is unchanged, i.e., $\hat{w}_I^r = 0$. Its slope is negative because, from (20') it results that:

$$\frac{dw_F^r}{dw_I^r}\bigg|_{WI} = \frac{\partial Q_I^D/\partial w_I^r}{\partial Q_I^S/\partial w_F^r} < 0$$
 (21)

The region at the right (left) of WI represents situations where the informal real income is higher (lower) than at the equilibrium. There is an excess supply (demand) for informal goods and w_I^r decreases (increases). E indicates a stationary equilibrium from a distributive standpoint for a given rate of inflation.

In figure 2, we analyze the impact of an acceleration of the devaluation rate on the relative incomes: WF shifts downward and WI doesn't move. The increase of \hat{e} produces a reduction of the real wage of the formal workers. The economy shifts from the initial stationary equilibrium E to the point A. In A, the profitability of the formal sector is higher than in E: its production and its employment increase, reducing the employment and the supply of the informal sector. The result is an excess demand for informal goods, which increases their prices. The real income of informal workers increases and the systems shift to a new stationary equilibrium in E, with a higher W_I / W_F .

Figure 1

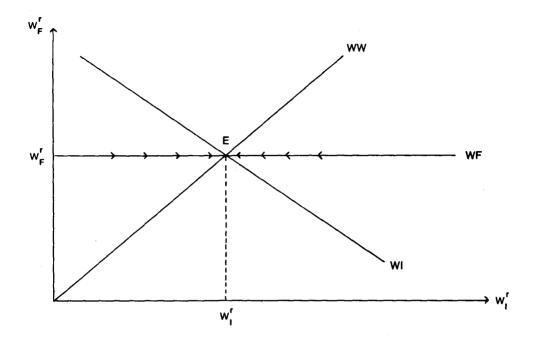
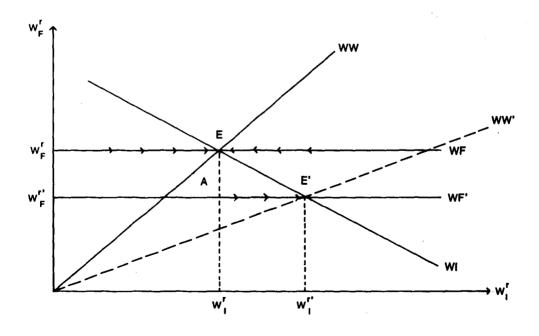


Figure 2



The impact of $d\hat{e}$ > on the trade balance is ambiguous:

$$\frac{dB}{d\hat{e}} = \frac{\partial Q_F^s}{\partial w_F^r} \cdot \frac{dw_F^r}{d\hat{e}} - \frac{\partial Q_F^D}{\partial w_F^r} \cdot \frac{dw_I^r}{d\hat{e}} > < 0$$
 (22)

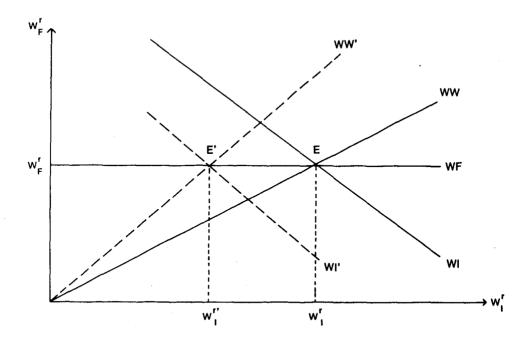
The acceleration of the devaluation rate produces a diminution of w_F^r and then an increase of the supply of tradable goods; on the other hand, the informal/formal relative price increases and domestic demand shifts further to the formal (tradable) good. The first effect results in an increase of exports, whereas the second one produces a diminution of net exports.

Figure 3 illustrates the impact of an increase of the real interest rate. The result is opposite to that provoked by a devaluation. WI shifts downwards: the increase of ρ provokes a diminution of the demand of the informal good, generating an excess supply which will result in a decrease of \hat{p}_I . Consequently, the real income of informal workers will fall. The economy moves along WF from E to E', where w_I^r / w_E^r is smaller.

The impact of an increase of ρ on the trade balance is also ambiguous:

$$\frac{dB}{d\rho} = \frac{\partial Q_F^s}{\partial \rho} - \left(\frac{\partial Q_F^D}{\partial w_I^r} \cdot \frac{dw_I^r}{d\rho} + \frac{\partial Q_F^D}{\partial \rho}\right) > 0$$
 (23)

Figure 3



In fact, the supply of tradable goods decreases, but the domestic component of the demand for these goods also decrease.

Figures 4.a to 4.c show a situation where both instruments, ρ and $d\hat{e}$, are used simultaneously, i.e., a standard stabilization package. WF shifts downwards and WI to the left. The real wage of formal workers falls but the impact on w_I^r (and then on the relative income between the two sectors) is uncertain: while the acceleration of the devaluation rate provokes an increase of w_I^r , the increase of ρ has an opposite effect.

Figure 4.a illustrates the case where the real income of both sectors decrease and w_I' / w_F' falls. WW rotates to the left: the impact of the acceleration of \hat{e} is here dominated by the increase of ρ .

In figure 4.b, w_F^r and w_I^r fall and w_I^r/w_F^r increases. WW rotates to the righ: the effect of the devaluation prevails over the one of the increase of ρ in the determination of the relative income.

Finally, figure 4.c represents a situation where the real wage of the formal sector falls, and where, on the other hand, w_I^r increases. The increase of w_I^r/w_F^r is then more significant than in the previous case (WW rotates more to the right).

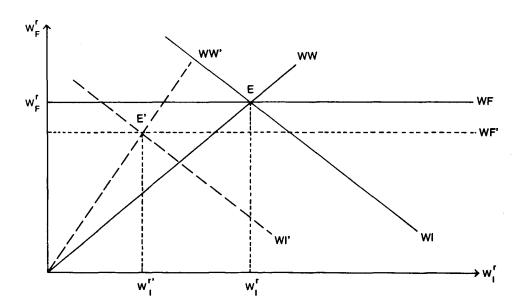


Figure 4.a

3. The case of Brazil during the 1980's

Table 2 illustrates the evolution of the main variables of the model between 1981 and 1988. Data about the labour market come from special tabulations of Pnad. They include only urban workers (wage-earners and self-employed) with less than 12 years of schooling. We can consider, in fact, that there is an excess demand for qualified workers in the formal sector

Figure 4.b

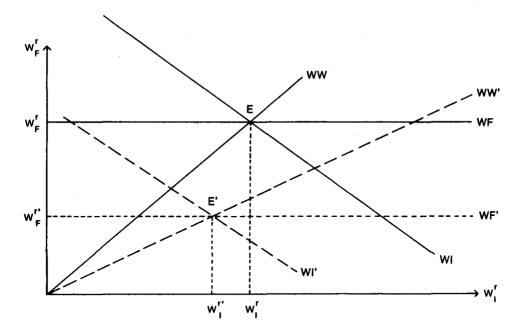
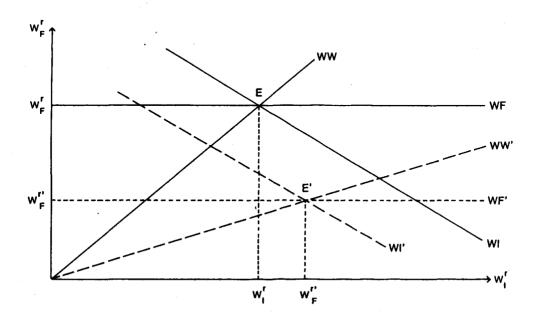


Figure 4.c



and that self-employed with 12 or more years of schooling cannot be considered informal workers.⁵

It is interesting to see that in the beginning of the period the average real income of the wage-earners and of the informal workers are grosso modo equivalent. Inequality among informal workers (T_I) , however, is much more significant (37.9 percent) than among wage-earners (T_F) , in accordance with what we assumed in the model.

Table 2
Evolution of the main variables of the model: 1981-88

	1981	1982	1983	1984	1985	1986	1987	1988
Q (%)	-4.4	0.7	-3.4	5.0	8.3	7.5	3.6	0.0
p̂ (%)	95.2	99.7	211.0	223.8	235.6	62.4	366.0	933.6
ê (%)	95.1	98.0	288.9	223.6	229.5	42.4	383.6	947.1
e . p */p (1980 = 100)	108.9	111.4	143.3	146.3	149.1	136.2	142.4	141.4
L(1,000)	27,794	28,938	29,111	30,009	32,498	35,108	36,758	37,534
L_I/L (%)	21.6	22.5	22.9	22.6	22.0	21.7	22.4	22.3
w_I/w_F (%)	99.1	94.7	102.5	103.1	107.6	134.8	117.7	103.8
w _F (1981 - 100)	100.0	102.2	75.5	76.5	87.4	111.2	89.3	77.9
T_I/T_F (%)	137.9	145.0	138.5	142.3	150.7	172.1	155.5	146.3

Sources: Anuário Estatístico do IBGE (several issues), Pnad/IBGE.

Notes: \hat{Q} : rate of growth of GDP; \hat{p} : official rate of inflation; \hat{e} : Cr\$/US\$ devaluation rate; e. p*/p: real exchange rate (the evolution of the domestic price level is measured by the official rate of inflation, and the international price level by US CPI). The real wage in the formal sector (w_F^r) is obtained deflating by INPC. T_i : inequality intra-group i measured by Theil-L.

In 1982, the stabilization policy was concentrated on the diminution of absortion and, particularly, on a very restrictive monetary policy; despite the strong devaluation of the nominal exchange rate, the real exchange rate has been maintained constant and the rate of inflation has remained at the same levels of 1981. In fact, the main effects of the diminution of absortion have been on quantities: GDP growth rate has been insignificant and, given the demographic growth, the share of the informal sector in total employment has increased. This last effect, combined with the stability of the rate of inflation, explains, in terms of our model, the diminution of w_I/w_F .

The reduction of absortion has been followed up in 1983, combined to a strong devaluation of the real exchange rate, which had a strong impact on the rate of inflation, that increased from 99.7 percent to 211 percent in annual terms. This increase of inflation provoked a significant diminution of the average real wage of the formal sector workers, which became

⁵ As is shown by Urani (1991).

⁶ High-powered money decreased 7 percent in real terms.

⁷ Modiano (1985) estimates that the increase of the rate of inflation in 1983 is entirely due to the devaluation.

smaller than the per capita real income in the informal sector. In other terms, the impact of the devaluation prevailed on the effect of recession in the determination of the relative income between the two sectors.

In 1984 and 1985, the rate of inflation (and of devaluation) remained relatively stable and the economy apparently recovered its growth path, thanks to the favourable effect of the 1983 devaluation on the supply of tradable goods. As we can see in table 2, this implied a decrease of the share of the informal sector on total employment, which explains the increase of w_I/w_F .

The year of 1986 constitutes a special case: the Brazilian government decided to implement an *heterodox* stabilization policy focused on a generalized price freezing (that has been effective only for the formal sector) and on the attempt to abolish the indexation of the different kinds of contracts, especially those concerning wages. The price freezing in the formal sector, associated to a fiscal and monetary latitudinarianism, caused a rationing in that market. The generalized excess demand for formal goods produced a diminution of net exports and a spillover in the informal goods. This spillover and the high GDP growth rate explain why w_I/w_F increased despite a significant decrease of the rate of inflation.

Finally, in 1987 and 1988, the end of the rationing in the formal sector, the sharp decrease of the GDP growth rate and the increase of the degree of indexation of formal wages¹⁰ that followed the failure of this plan seem to have played, together, a more important role in the relative income dynamics than the explosion of the rate of inflation that occurred: w_I/w_F , in fact, decreased significantly.

4. Conclusion

The model described in this paper allows to analyze the effects of standard stabilization policies on the dynamics of the relative incomes of a dual economy:

- a) an increase of the rate of devaluation has inflationary effects that decrease the real wages in the formal sector and increase the average real income of informal workers;
- b) an increase of the real interest rate produces a reduction of the average real income of informal workers.

If these two measures are implemented together, the effect on the relative income between the two sectors is indeterminate.

The Brazilian experience between 1981 and 1988 shows that the workers as a whole have suffered significant losses in their real incomes. We observe, however, that the evolution of the relative incomes is favourable to informal workers. This result confirms the greater capacity of these workers to preserve their real incomes against increases of the inflation rate.

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⁸ Winograd (1991) makes a detailed analysis of the measures adopted during the Cruzado Plan and of the rationing that resulted.

⁹ Camargo & Ramos (1988) have been the first to explain this phenomenon in a similar way. Nevertheless, their analysis is purely descriptive and they consider that Cruzado Plan "inverted the previous logic of income determination", while we are trying to show here that it has only pronounced a tendency that already existed.

¹⁰ The adjustment periodicity of wages, that was semestral before Cruzado Plan, became monthly.

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