SHORT-RUN AND LONG-RUN EFFECTS OF DEVALUATION IN A MACROMODEL OF IMPERFECT COMPETITION

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ABSTRACT

A Hartian model of imperfect competition, extended to an open economy where domestic and foreign firms compete, has been constructed within an overlapping - generations framework. It is shown that the effects of devaluation on the economic activity are closely linked to the technology used by the firms. An unemployment equilibrium exists and in the short-run money is non-neutral and devaluation is contractionary. In the long run devaluation passes through completely to the domestic price and the output returns to its long-run equilibrium with unemployment.

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This paper is circulated for discussion purposes only and its contents should be considered preliminary.

INTRODUCTION

The purpose of the present paper is twofold. Firstly, it is aimed at contributing to the macroeconomics of imperfect competition literature by building an open-economy model founded on imperfectly competitive principles; and secondly, it seeks to contribute to the contractionary devaluation debate[1] and to the pass-through literature[2] by showing that when firms are imperfectly competitive there exists a linkage between the technology used by the firms and the effects of devaluation on output and prices. The model is not characterised by some of the special features of LDC's models: on the contrary, agents are homogeneous, there is no government and no imported inputs. These assumptions not only allow us to deal with a simpler model but also to isolate the effects of devaluation in the presence of imperfect competition.

The model is an open-economy version of Hart's model of imperfect competition with keynesian features (1982). In a fixed exchange regime an imperfectly competitive output market is shared by domestic and foreign firms, each of which produces and pays wages in its country of origin (see Dornbusch (1988) on this point) and labour for domestic firms is supplied by an imperfectly competitive labour market. This sector is complemented with an export sector that faces perfect competition in the output market and in the labour market. This structure is set in an overlapping-generations framework.

By allowing individual consumers, firms and unions to optimize some interesting results are obtained: 1) an unemployment equilibrium exists which, as usual in this kind of structure, is higher the less competitive is the labour market in the non-export sector; 2) in the short-run, devaluation is always contractionary and the more decreasing the returns to scale the lower the contractionary effect; 3) in the short-run, changes in the exchange rate pass-through completely to the import price only when returns to scale are constant, otherwise the more decreasing the returns to scale the less devaluation passes-through; 4) money is non-neutral in the short run -this result stems from the combined effect of imperfect competition and of rigidity in the foreign wage[3]; 5) in the long-run devaluation passes-through completely and output returns to its long-run equilibrium with unemployment. The paper is organised as follows. In the first section the model is outlined, its general equilibrium solution is derived and the short-run effects of devaluation and of money are obtained; in the second, the long-run equilibrium and its adjustment from short-run to long-run are analysed; in the final section the conclusions are summarised.

1. THE MODEL

There are two sectors in this economy, one produces for domestic consumption (the domestic sector) and the other produces for export (the export sector). Workers are rigidly distributed between the two sectors, which means that they can not move from one sector to the other and therefore there is no force to equate sectoral wages.

The domestic sector is imperfectly competitive in the output market and in the labour market, as in Hart (1982). The output market is divided into u identical sub-markets, each with n* identical foreign firms competing with n identical domestic firms to sell an homogeneous good. We shall assume that n and n* are small, so that firms have monopoly power in selling their product and that they act as Cournot-Nash maximizers facing the true output demand. For simplifying reasons we shall assume henceforth that n=n*=1.

Foreign firms produce and pay wages in their own country. By assuming that this market is small the foreign wage (w*) can be regarded as given. Domestic firms hire labour from an imperfectly competitive labour market divided into v identical sub-markets, each one consisting of r identical unions. We shall assume that unions have monopoly power (r is small) and act as Cournot-Nash maximizers facing the true labour demand. Each worker has an endowment of labour given by T and obtains no disutility of work. Unions maximize, consequently, total wage receipts.

In order to avoid the influence of firms on the income of consumers in their own markets we shall assume that workers from each labour sub-market are distributed, as consumers, across the different product markets and that each worker owns a proportional fraction of each imperfectly competitive firm. Hence, firms regard consumers' income as given when maximizing.

The export sector faces a given foreign price (p*) for its output, a perfectly competitive labour market and constant returns to scale. Given the labour allocated to this sector (l_x), the wage (w_x) will be adjusted until full employment is reached. The income derived from this sector is either spent on products of the domestic sector or saved.

Two generations co-exist, one young and one old, in an overlapping- -generations framework and we shall assume that only the young generation works. The young's income is partly spent in current consumption of goods sold in the domestic sector and partly saved as money to consume the next period when old.

Workers in the export sector and the old generation are assumed to be distributed as consumers uniformly across the different domestic sub-markets. Finally, the firms' technology requires only labour as input as in Hart (1982) and the consumers' utility function is of the Cobb-Douglas-type in current and next period consumption.

Having described the general structure of the model we proceed next to obtain its solution.

1.1 CONSUMER'S BEHAVIOUR

Given income, the young generation must choose optimally between current consumption and holding money in order to consume next period when old. Having assumed a Cobb-Douglas utility function for all consumers, the problem to be solved by the representative consumer i whose income comes from the domestic sector is the following:

$$\max \quad C_{iydt}{}^{a} C_{iodt+1}{}^{1-a}$$

$$s.t: \quad P_t \, C_{iydt} + M_{idt} = Y_{idt}$$

$$M_{idt} = C_{iodt+1} \; P^{e}_{t+1}$$

$$M_{idt} \geq 0$$

where the subscripts y and o indicate the period of life when young and old, subscript d indicates domestic sector, c is consumption of domestic goods, p is price, M money taken to the next period, Y_d nominal income received and the superscript e indicates expectation. The solution to this problem after aggregating over all consumers allocated to each domestic sub-market is given by:

$$C_{ydt} = a \, \frac{Y_{dt}}{P_t} \tag{1}$$

$$M_{dt} = (1-a) \quad Y_{dt} \tag{2}$$

where Y_{dt} is the total nominal income received in each sub-market of the domestic sector (wages and profits), c_{ydt} and M_{dt} total demand for goods of each sub-market and total money taken to the next period by the group of consumers allocated to each sub-market respectively. According to (1) and (2), the nominal spending in consumption goods as well as the money demanded are constant fractions of the nominal income, which is a particular property of Cobb-Douglas utility functions that will keep algebra simple. Identically, the demands for consumption goods and for money from the group of consumers whose income is obtained in the export sector is:

$$C_{yxt} = \frac{1}{u} \left(a \ \frac{Y_{xt}}{P_t} \right) \tag{3}$$

$$M_{xt} = (1-a) \quad Y_{xt} \tag{4}$$

where the subscript x relates to the export sector. Notice that Y_{xt} is the total nominal income (wages and profits) obtained in the export sector and u is the number of domestic sub-markets. Division by u is due to the assumption that workers from the export sector are distributed, as consumers,uniformly across the different domestic sub-markets. The old generation's demand for domestic goods is obtained as:

$$C_{odt} = \frac{1}{u} \ \frac{M_{dt-1}}{P_t} \tag{5}$$

$$C_{oxt} = \frac{1}{u} \frac{M_{xt-1}}{P_t} \quad (6)$$

where c_{odt} and c_{oxt} are the current consumptions of the old who where allocated when young, in period t-1, to the domestic and export sector respectively, and M_{dt-1} and M_{xt-1} are the amounts of money brought by these consumers from the previous to the current period. Division by u has the same explanation as above.

Aggregate demand faced by firms in each sub-market in the domestic sector is given by the sum of 1, 3, 5 and 6:

$$A_t = \frac{1}{P_t} \left(a \; Y_{dt} + a \; \frac{Y_{xt}}{u} + \frac{M_{t-1}}{u} \right) \quad (7)$$

where M_{t-1} is the total amount of money brought by the old generation from the previous to the current period. Let I_t be equal to the term in brackets, which represents the nominal aggregate demand to each sub-market in the current period:

$$A_t = \frac{I_t}{P_t} \quad (7')$$

Given the current total nominal income and the total money in the precedent period,the aggregate demand for domestic goods is a rectangular hyperbola. Bearing in mind that the aggregate demand consists of the sum of both generations' demand, we will dispose hereafter of any subscript.

1.2 FIRMS' BEHAVIOUR

Given the aggregate demand, the domestic firm and the foreign firm of each sub-sector choose the price and the quantity of output by maximizing their profits taking the wage and the other firm's output as given. With Cobb-Douglas technology, $y=l^{1/b}$, where b represents returns to scale, the problem faced by the domestic firm is:

$$\max \quad P\ (A - q^*) \ - \ w\ (A - q^*)^b \tag{8}$$

where the superscript * refers to the foreign variables, A is the real aggregate demand defined by 7, q* the foreign output, assumed by the domestic firm as given, w is the domestic wage set by the unions and assumed in 8 as given. The symmetric problem of the foreign firm is:

$$\max \quad P\ (A - q) \ - \ e\ w^*\ (A - q)^b \tag{9}$$

where q is the domestic firm's output assumed in 9 as given, e the exchange rate measured as the price in domestic currency of the foreign currency, w* the wage paid by the foreign firm in its country, assumed in 9 as given.The product ew* represents the value in domestic currency of the foreign wage.

The solutions to 8 and 9 are respectively:

$$P^2 = w\ b\ I\ \frac{\left(\frac{I}{P} - q^*\right)^{b-1}}{q^*} \tag{10}$$

$$P^2 = e\ w^*\ b\ I\ \frac{\left(\frac{I}{P} - q\right)^{b-1}}{q} \tag{11}$$

On the other hand, the equilibrium of the market requires the real aggregate demand for each sub-market's output to be equal to the sum of the domestic and the foreign firms' output in the sub-market. Substituting this equilibrium condition in 10 and 11, the ratio of outputs is obtained as a function of the relative wages in domestic currency:

$$\frac{q}{q^*} = \left(\frac{e\ w^*}{w}\right)^{\frac{1}{b}} \tag{12}$$

Equation 12 says that the higher the domestic currency value of the foreign wage the smaller the foreign firm's share of the output market. Absolute outputs are obtained straightforwardly:

$$q = \frac{(e\ w^*)^{\frac{1}{b}}}{w^{\frac{1}{b}} + (e\ w^*)^{\frac{1}{b}}}\ \frac{I}{P} \tag{13}$$

$$q^* = \frac{w^{\frac{1}{b}}}{w^{\frac{1}{b}} + (e\ w^*)^{\frac{1}{b}}}\ \frac{I}{P} \tag{14}$$

Equations 13 and 14 indicate that given the real aggregate demand the optimally chosen output of each firm is a function of the relative wages: the higher its relative cost the lower its output and vice versa. But p is not an exogenous variable to firms, on the contrary it is optimally determined in the Cournot-Nash interaction of both firms. By using the equilibrium of the sub-market condition in 13 and substituting 12 and 13 into 10 the price set in each sub-market is obtained as function of the domestic wage and the foreign wage measured both in domestic currency and of the nominal income:

$$P = b^{\frac{1}{b}} w^{\frac{1}{b}} \left(\frac{e\,w^*}{w} \right)^{\frac{1}{b^2}} \left[\frac{(e\,w^*)^{\frac{1}{b}}}{w^{\frac{1}{b}} + (e\,w^*)^{\frac{1}{b}}} \right]^{\frac{b-2}{b}} I^{\frac{b-1}{b}} \qquad (15)$$

By substituting 15 into 13 the domestic firm's output is obtained as function of the domestic currency value of the domestic and foreign wages and of the nominal demand:

$$q = b^{-\frac{1}{b}} w^{\frac{1-b}{b^2}} (e\,w^*)^{\frac{1}{b^2}} \left[w^{\frac{1}{b}} + (e\,w*)^{\frac{1}{b}} \right]^{-\frac{2}{b}} I^{\frac{1}{b}} \qquad (16)$$

Equations 15 and 16 represent the partial equilibrium of the model when nominal aggregate demand and the domestic wage are given. They show that in general under decreasing returns to scale ($b>1$) an increase in the nominal aggregate demand increases the price and the output of the domestic firm. Notice that output is homogeneous of degree zero and the price homogeneous of degree one in w, e and I.

In a general equilibrium framework, however, the domestic wage and income are not exogenous but endogenously determined, in our model by the unions' optimization and the national income identity respectively. This is discussed in the next two sub-sections.

1.3 UNIONS' BEHAVIOUR

The number of firms allocated to each labour sub-market is given by $s=u/v$ where as indicated above u is the number of output sub-markets (equal to the total number of domestic firms) and v the number of labour sub-markets. We have assumed that s is large and r, the number of unions in each labour sub-market, small; so that, in setting the domestic wage the firms have no monopoly power and the unions have. The total labour demand to each labour sub-market is, therefore, given by:

$$L = \left(\frac{u}{v} \right)^{b} b^{-1} w^{\frac{1-b}{b}} \left(e\, w^{*} \right)^{\frac{1}{b}} \left[w^{\frac{1}{b}} + \left(e\, w^{*} \right)^{\frac{1}{b}} \right]^{-2} I \qquad (17)$$

Given the nominal aggregate demand, I, and the domestic currency value of the foreign firm's wage, ew*, q is a decreasing function of the domestic wage. The unions know 17, as a result of the assumption that they face the true labour demand. Under the Cournot-Nash assumption each union chooses its labour sales l, taking the sales L_{-1} of the other r-1 unions as given. Hence each union solves the following problem:

$$\max \quad w\, l$$

$$s.t: \quad l + L_{-1} = L \qquad ; \quad l \leq zT$$

where T is the endowment of each worker and z the number of workers allocated to each union; L is given by 17.

The first order condition for this problem is:

$$l + w \frac{dl}{dw} \leq 0 \; ; \; l \leq z\, T \; ; \; \text{with complementary slackness} \qquad (18)$$

From the restriction:

$$\frac{dl}{dw} = \frac{dL}{dw}$$

As all unions are identical:

$$l = \frac{L}{r}$$

The optimization condition consequently is:

$$\frac{1}{r} \leq -\frac{w}{L}\frac{dL}{dw} = -\varepsilon_{L/w} \tag{19}$$

With equality if there is underemployment. Taking the domestic wage elasticity of 17 and substituting it into 19 with equality, the wage set by each union is obtained as:

$$w = \left[\frac{(1-b)\ r + b}{r + b\ (r-1)}\right]^{b} (e\ w^{*}) \tag{20}$$

A positive solution exists if the numerator of 20 is positive which requires that $r<b/(b-1)$. If $b=1$ any number of unions is compatible with a positive solution; however, if $b > 2$, only one union in each labour sub-market is compatible with a positive solution. Since our interest is the oligopolistic case we restrict b to $1 < b < 2$.

It is interesting to note that in the present model an underemployment equilibrium exists despite the fact that consumers have Cobb-Douglas utility functions. According to Hart (1982) under this type of utility functions only full employment equilibrium exists (see equation 18 and footnote 10 in Hart's paper). The reason for our different result is the presence of foreign firms whose wages are exogenously fixed, not under the command of labour unions responding to an endogenous optimization.

The optimal wage set by the unions is, therefore, independent of the income level and has an exchange rate elasticity equal to one. This means that any increase in the exchange rate will fully pass-through to wages, independently of the income reaction to devaluation. Notice also that the lower r, the less competitive the labour market, the higher the domestic wage set in relation to the foreign wage and, consequently, according to 12, the smaller the domestic firm's share of the market.

We can now substitute 20 into 15 and 16 to obtain the price and the output as a function solely of the domestic currency value of the foreign wage and of the nominal aggregate demand:

$$P = b^{\frac{1}{b}}\left[\frac{r(1-b)+b}{r+b(r-1)}\right]^{\frac{b-1}{b}}\left[\frac{2r}{r+b(r-1)}\right]^{\frac{2-b}{b}}(ew^{*})^{\frac{1}{b}}I^{\frac{b-1}{b}} \tag{21}$$

$$q = b^{-\frac{1}{b}}\left[\frac{r(1-b)+b}{r+b(r-1)}\right]^{\frac{1-b}{b}}\left[\frac{2r}{r+b(r-1)}\right]^{-\frac{2}{b}}(ew^{*})^{-\frac{1}{b}}I^{\frac{1}{b}} \tag{22}$$

To close the model we need to determine endogenously the nominal aggregate demand. For that purpose we now turn to the national income identity.

I.4-THE GENERAL EQUILIBRIUM SOLUTION.

Redefining the money brought to the current period from the previous, M_{t-1}, as Mo, the nominal aggregate demand is given by:

$$I = a\, Y_d + a\, \frac{Y_x}{u} + \frac{M_0}{u} \tag{23}$$

where Yd is the income obtained in each oligopolistic sub-market, Yx the income obtained in the export sector and u the number of oligopolistic sub-markets. From 21 and 22 Yd is obtained as the product of the price and the output of each firm:

$$Y_d = P\, q = [\frac{2r}{r + b\,(r - 1)}]^{-1}\, I \tag{24}$$

Equation 24 indicates that each firm's total revenue is a function solely of the nominal aggregate demand.

As previously indicated , the export sector faces perfect competition in the output and in the labour market; the wage therefore is adjusted until full employment in that sector is achieved and the output, consequently, is given as a function of the exogenously determined allocation of labour. Hence the income obtained in that sector is given as:

$$Y_x = e\, p^*\, y_x\, (L_x) \tag{25}$$

where p* is the international price of the export good, y_x the real output and L_x the labour allocated to that sector. Substituting 24 and 25 into 23 and simplifying:

$$I = [1 - a\, (\frac{r + b\,(r - 1)}{2r})]^{-1}\, [\frac{a\, e\, p^*\, y_x}{u} + \frac{M_0}{u}] \tag{26}$$

According to 26 the nominal aggregate demand for each domestic firm's output is determined by the output of the export sector and by the amount of money brought by the old generation to the current period. A non-negative I requires the domestic firm's revenue to be smaller than or equal to the total nominal aggregate demand. This restriction is obtained from 26 as:

$$b \leq \left(\frac{r}{r - 1} \right) \left(\frac{2 - a}{a} \right) \tag{27}$$

which is compatible with our previous restriction (see restriction to equation 20). The equilibrium of the model is obtained by substituting 26 into 21 and 22:

$$P = \theta \left(\frac{a\, e\, P^{*}\, y_{x} + M_{0}}{u} \right)^{\frac{b-1}{b}} \tag{28}$$

$$Q = \phi \left(\frac{a\, e\, P^{*}\, y_{x} + M_{0}}{u} \right)^{\frac{1}{b}} \tag{29}$$

where:

$$\theta = \left(\frac{2\, b\, r\, e\, w^{*}}{r + b\,(r - 1)} \right)^{\frac{1}{b}} \left[\frac{2\, r - a\,(r + b\,(r - 1))}{r\,(1 - b) + b} \right]^{\frac{1-b}{b}}$$

and:

$$\phi = \frac{u\,[2\, b\, r\, e\, w^{*}\,(2\, r - a\,(r + b\,(r - 1)))]^{-\frac{1}{b}}}{[r\,(1 - b) + b]^{\frac{b-1}{b}}\,[r + b\,(r - 1)]^{-\frac{1+b}{b}}}$$

Q is the output of the entire imperfectly competitive sector.

1.5 SHORT-RUN EFFECTS OF DEVALUATION

The general equilibrium responses of the price and the output to devaluation can be obtained directly from 28 and 29. The exchange rate elasticity of the domestic price is:

$$\varepsilon_{\frac{Q}{e}} = \frac{1}{b} + \frac{b-1}{b}\left(\frac{1}{1+\frac{M_0}{a\ e\ P^*\ y_x}}\right) \leq 1 \qquad (30)$$

Devaluation affects the price of the oligopolistic sector through two channels. The first is the increase in costs (for the foreign firm the higher cost of the foreign currency and for the domestic firm the higher wage set by the unions). The second term represents the higher demand derived from the higher income of the export sector. Only when returns are constant do changes in the exchange rate completely pass-through to the import price, otherwise the more decreasing the returns the less they pass-through. Similarly, the exchange rate elasticity of the oligopolistic sector output is:

$$\varepsilon_{\frac{Q}{e}} = -\frac{1}{b} + \frac{1}{b}\left(\frac{1}{1+\frac{M_0}{a\ e\ p^*\ y_x}}\right) \leq 0 \qquad (31)$$

Again devaluation affects output through two channels. The first is a real balance contractionary effect due to the higher price. The second is the positive responses of output to the higher demand due to the increased export sector's income. The second term is smaller than unity not only because of decreasing returns to scale, but also because the older generation's wealth (money brought from the previous period) is not adjusted to the higher price.

Under constant returns to scale 31 becomes:

$$\mathcal{E}_{\frac{Q}{e}} = -1 + \frac{1}{1 + \frac{M_0}{a\ e\ p^{*}\ y_x}} \leq 0 \qquad (31')$$

Devaluation fully passes-through to the price of the oligopolistic sector creating no real devaluation; however it is contractionary. This is an example of a nominal devaluation which does not produce real devaluation and still is contractionary; this property is not derived from imperfect competition but from the overlapping generations framework under which the old generation's wealth is not adjusted to devaluation.

1.6 SHORT-RUN NON-NEUTRALITY OF MONEY

Let us suppose now an exogenous increase in the money brought by the old generation from one period to the next. According to 26, the nominal demand for the output of the oligopolistic sector increases, which is accomodated partly by raising the price and partly by incresing the output. The money elasticity of these variables are respectively:

$$\mathcal{E}_{\frac{P}{M}} = \left(1 - \frac{1}{b}\right) \frac{1}{1 + \frac{a\ e\ P^{*}\ y_x}{M_0}} \quad ; \quad 0 \leq \mathcal{E}_{\frac{P}{M}} \leq 1 \qquad (32)$$

$$\mathcal{E}_{\frac{Q}{M}} = \frac{1}{b} \frac{1}{1 + \frac{a\ e\ p^{*}\ y_x}{M_0}} \quad ; \quad 0 \leq \mathcal{E}_{\frac{Q}{M}} \leq 1 \qquad (33)$$

When returns are constant the price effect of an expansion of money vanishes and the quantity effect reaches its highest value. The reason for the non-neutrality of money achieved in this model, as behind many of the special features of it, is the exogeneity of the foreign wage, ie: the asymmetry between the domestic and the foreign wage behaviour - whereas the domestic wage is allowed to adjust the foreign wage is kept constant. However, the assumption of an exogenous foreign wage seems plausible under the small economy assumption. We can easily think of a foreign wage determined by the price and the output behaviour of the market in which the foreign workers spend their income (which can be thought of as independent of the behaviour of the present model) as well as by the unions' strength in that labour market.

2. LONG RUN EQUILIBRIUM

Total expenditure on the foreign firms' output is given by:

$$E_F = u\, P\, q^* \tag{34}$$

By substituting 12 and 20 into 34, Ef can be expressed in terms of the price and the domestic output, q:

$$E_F = \frac{u\,(1-b)\,r + b}{r + b\,(r-1)}\, p\, q \tag{35}$$

The trade balance is then expressed as:

$$T = e\, P^*\, y_x - u\, \frac{(1-b)\,r + b}{r + b\,(r-1)}\, P\, q \tag{36}$$

From 24 and 26 we can express 36 as:

$$T = e\,P^{*}\,y_x - \frac{(1-b)\,r + b}{2\,r - a\,(r + b\,(r-1))}\,(a\,e\,P^{*}\,y_x + M_0) \qquad (37)$$

The system composed by equations 32, 33 and 37 forms a price-specie-flow mechanism that adjusts the economy towards trade balance equilibrium. Suppose an initial surplus in the trade balance. Money enters the economy, and 32 and 33 indicate that the price and the output level in the oligopolistic sector adjust upward. This means that the expenditure on foreign firms' output increases and the balance of trade tends to equilibrium. Long run equilibrium is achieved when the amount of money is such that the trade is in equilibrium. Equating 37 to zero:

$$M^{0} = \frac{2\,r\,(1-a)}{(1-b)\,r + b}\,e\,P^{*}\,y_x \qquad (38)$$

where M^0 is the long run equilibrium money stock.

The long run equilibrium of output, Q^0, is obtained by substituting the long run level of money, equation 38, into 29 and simplifying:

$$Q^{0} = \beta\,\frac{P^{*}\,y_x}{w^{*}} \qquad (39)$$

where:

$$\beta = \frac{u^{\frac{b-1}{b}}\,[b + (1-b)\,r]^{-1}\,[r + b\,(r-1)]^{-\frac{b+1}{b}}}{[2\,b\,r\,(2\,r - a\,(r + b\,(r-1)))]^{-\frac{1}{b}}}$$

The long run output, as expected, is inversely related to the degree of monopoly power in the labour market and it is independent of money and of the exchange rate,ie: money and devaluation are neutral in the long run. In the long run output can only be increased by allocating more labour to the export sector. From 28 and 38 it is easily seen that the only effect of devaluation in the long run is a proportional increase in the price. 39 also says that the more competitive the labour market (the larger r), the larger the output and employment. Consequently, given (p^*,w^*,L_x) there exists a degree of competitiveness in the labour market (a value of r) compatible with full employment; below that critical level of r, the long-run equilibrium of this economy occurs with unemployment.

When the trade is in equilibrium, money has the long run value given by 38. When the trade balance is initially in deficit, money flows out of the country, which means that the initial amount of money possessed by the country is larger than the amount of money in the corresponding equilibrium of the trade balance. In consequence, the second term in 31 will be smaller when devaluation takes place under trade deficit than under trade equilibrium, ie: the short-run exchange rate elasticity of output will be more negative when devaluation occurs with deficit in the balance of payments than when it occurs with equilibrium in it.

CONCLUSIONS

A Hartian model of imperfect competition extended to an open economy where domestic and foreign firms compete has been used to show that the effects of devaluation on the economic activity are closely linked to the technology used by firms. We have shown that under particular assumptions: 1) an unemployment equilibrium exists which is higher the less competitive is the labour market; 2) in the short run devaluation is always contractionary and the more decreasing the returns to scale the lower the contractionary effect; 3) except in the case of constant returns to scale devaluation passes-through incompletely to the import price;

4) money is non-neutral in the short run; 5) in the long run a devaluation passes-through completely and output returns to its long run equilibrium with unemployment.

The model can be extended to include a purely domestic imperfectly competitive sector not directly affected by the exchange rate in order to introduce a substitution effect in consumption. However, in that case, a different utility function would be required, since, as it is well known, the adoption of a Cobb-Douglas utility function would result in full employment in the labour allocated to that sector, and any shift in demand from the domestic-foreign sector to the purely domestic sector would create a proportional increase in its price resulting in no substitution at all.

FOOTNOTES

1-A non-contractionary analysis of devaluation is prsented in Johnson (1976). Hirschman (1949), Diaz Alejandro (1963), Cooper (1971) and Krugman and Taylor (1978) represent the literature on contractionary devaluation. Hanson (1983) and Lizondo and Montiel (1989) have recently challenged the contractionary literature by showing that their results depend crucially on the omission of some devaluation effects.

2-Contrary to what we assume here, the pass-through literature has drawn its conclusions mostly from partial equilibrium models of imperfect competition: Dornbusch (1988), Aizenman (1989) and Ohno (1990).

3-It has been recognised in this literature that imperfectly competitive models require the presence of a second imperfection to create non-neutrality of money: small menu costs in Blanchard and Kiyotaki (1987), non-unitary elasticity of price expectation in Rankin (1989), near rationality in Akerlof and Yellen (1985).

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