Macroeconomic Effects of Exchange Rate and Price Distortions.

The Cuban Case.

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The Cuban economy is subject to widespread distortions stemming from government controls on key variables and the subsequent failure of markets to clear. There are price controls on many commodities, including those subject to the rationing system (*libreta*). And the exchange value of the non-convertible Cuban peso (CUP) is fixed through exchange controls at 1 peso/US dollar in the official market, compared with around 23 pesos/US dollar in the unofficial market. Ownership of U.S. dollars was allowed in 1994 and use of the dollar in special state stores (*shopping*) was authorized. But prohibition was reinstated in 2004 and purchases in the previously dollarized *shopping* stores were permitted only in a special currency called the "convertible Cuban peso" (CUC), currently fixed at a rate of CUC0.93 per U.S. dollar. Several authors, including Di Bella and Wolfe (2008), Canler (2008) and Orro (2008) have noted that this exchange rate system reduces economic efficiency, has controversial distributional effects, and complicates the measurement and interpretation of key economic variables. It also hinders the effectiveness of macroeconomic policy, which is the main focus of the present article.

For analytical purposes, this paper makes two simplifying assumptions. First, Cuba's exchange rate system can be simplified by focusing on a fixed exchange rate between the non convertible Cuban peso (CUP) and the U.S. dollar, thus ignoring the market for CUCs. As pointed out by Canler, this assumption is fairly inconsequential as long as the CUC is fixed to the .S. dollar. It also simplifies the analysis considerably, providing a relatively simple way to examine economic conditions and policies when markets fail to clear because of controls.

Second, this paper generally assumes that price controls apply to all domestic transactions. This is, of course, an extreme assumption: there are markets in Cuba, notably in the agricultural and services sectors, where participants are allowed to set prices more or less freely. Nevertheless, emphasis on the controlled sector of the economy highlights the complexities of the Cuban situation that result directly from distortions created by government intervention, and the consequent failure of markets to clear.

Section 1 of this paper provides a description of the underlying market-clearing model used as a first step in the analysis. Section 2 modifies the underlying model by introducing price and exchange rate controls, and examines the behavior of key variables

when certain markets fail to clear. Sections 3 and 4 analyze the effects on the economy of monetary and fiscal policies, with and without rationing. The following sections examine the effects of an increase in foreign remittances, a discrete exchange rate devaluation, and the liberalization of markets for goods and foreign exchange. The conclusion argues for full price and exchange rate decontrol coupled with fiscal transfers to protect the poor from the impact of price increases. The Annex presents a summary of the models discussed in sections 1 and 2.

1. The underlying market-clearing equilibrium model

The underlying model presented in this section is a modified version of the small, open-economy, Mundell-Fleming model[1]. In Fig. 1.a, equilibrium is represented in exchange rate/output space by the intersection of the IS* and LM* schedules.[2] The IS* line shows the combinations of income and exchange rate that are consistent with the equality of total saving and investment (or equivalently, the equality of domestic production and expenditure). Starting from any point on the IS* line, an appreciation of the exchange rate increases net imports (foreign saving), which requires a reduction in income (investment) to restore equilibrium. The IS* schedule is therefore upward sloping.

In panel b, the aggregate demand curve represents the model's equilibrium in price/output space. Together with an aggregate supply curve—that summarizes equilibrium in the labor market and the economy's production technology—the demand schedule determines the level of output and the price charged by domestic producers. Panel c represents the balance of payments. The current account deficit, defined as net imports of goods and services minus remittances from abroad, is positively related to the value of the peso since an appreciation of the exchange rate erodes the competitiveness of net exports. In the absence of central bank intervention, the current account deficit must be equal to the net inflow of foreign capital (both at d_0), and the market for foreign exchange clears at an exchange rate of e_0.

The basic Mundell-Fleming model is modified in various ways to make it more compatible with several features of the Cuban economy.

• There is no domestic bond market in Cuba, and Cubans are generally not allowed to trade freely in foreign securities. Therefore, the original Mundell-Fleming assumption of a domestic interest rate equal to the world interest rate, which implies perfect capital mobility, is untenable. However, the government—and, at times, certain enterprises—are authorized to borrow from foreign banks or suppliers. Information on such credits is scant, but it will assumed that the cost of borrowing is equal to the world interest rate (say

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[1] See Mundell (1968) and Fleming (1962). For a somewhat more complex version of the Mundell-Fleming model, similar in some respects to the underlying model presented in this paper, see Mankiw (1992), Appendix to chapter 12.
[2] The stars are used to differentiate the IS and LM lines from those used in the conventional, closed economy version of the model, where the vertical axis typically measures the interest rate rather than the exchange rate. Throughout this paper, the exchange rate is defined so that a higher value involves an appreciation of the Cuban peso.

LIBOR) plus a country-specific risk premium related to the size of external borrowing. The implication of these assumptions is that domestic credit conditions are affected, albeit certainly not determined, by world interest rates. Other capital inflows in Cuba are basically exogenous, including direct investment, always subject to government authorization, and bilateral assistance from 'friendly' countries—Venezuela now, the Soviet Union in earlier days.

• The LM* curve in Fig. 1.a is upward sloping because the real supply of money balances is assumed to depend not only on the domestic producer price but also on the price of imported goods and therefore on the exchange rate. Thus, a depreciation of the peso which increases consumer prices will lower the real supply of money, and this will require a fall in income to bring down the demand for money and restore equilibrium. The demand for money is assumed to be interest-inelastic—a seemingly realistic assumption given the lack of interest bearing substitutes in Cuba[3]

• The aggregate supply schedule is assumed to be upward sloping (i.e., in the keynesian range) because of nominal wage rigidity and because resources are under-employed. Points on this schedule represent combinations of output and prices that clear the labor market and are consistent with the economy's production function.

In Fig. 1 the model determines the market-clearing equilibrium levels of income (y_0), the domestic producer price (p_0), the current account deficit (d_0), and the exchange rate (e_0). In this version of the model, both prices and the exchange rate are free to move and help to equalize supply and demand in the markets for goods, money, and foreign exchange, given the equality between income and expenditure (or, equivalently, between total saving and investment). In panel c, the current account deficit schedule D is upward sloping because net imports of goods and services are positively related to the value of the peso. Jointly with the capital inflow schedule KI, whose position on the horizontal axis is determined by the cost of borrowing abroad and by exogenous events, the D schedule determines the exchange rate. This model solution represents the working of a small, relatively free market economy. The next step in coming closer to a description of the Cuban economy is to transform the model by incorporating government controls and rationing mechanisms.

2. The Model with Price Controls and a Fixed Exchange rate.

We consider two major sources of distortion: price controls coupled with a rationing system for basic consumer goods; and a fixed value of the peso supported by exchange controls. Fig. 2 shows how these distortions prevent markets from clearing and affect the values of key variables in the model.

a. Price controls

Suppose that the government controls the domestic price at a level P that is *below* the market-clearing equilibrium level p_0[4], with the objective of supplying goods to the poor at 'affordable' prices (Fig. 2.b). Given their cost structure, enterprises cannot produce the market clearing level of output y_0 and sell it at P without suffering losses[5]; they will therefore restrict their production to Y, on the aggregate supply curve, at which level there is excess demand in the product market (indicated by the blue double arrow).[6] This level of output will be rationed evenly to the population in the case of basic consumer goods; or allocated to consumers at the discretion of state agencies. In Fig. 2.a, the constrained level of income Y is consistent with the equality between total saving and investment at an appreciated exchange rate E. This point is to the left of the LM curve and therefore implies inequality between demand and supply of money. (This is discussed below in connection with Fig. 3).

 Fig. 2.c shows that, at the overvalued exchange rate E, the notional current account deficit exceeds the net capital inflow, as indicated by the horizontal double arrow. In that situation, the authorities have three alternatives.

- o They can accommodate the higher demand for net imports by selling some of their reserves to importers. This would shift the net capital inflow schedule to the right and allow the trade deficit to widen. It would also reduce the money supply and shift both the LM* curve (panel a), and the aggregate demand curve (panel b), to the left Of course, this could go on only as long as official reserves last, and it is therefore unsustainable.

- o They can authorize additional external borrowing by the public sector, which again would shift the KI schedule to the right and sustain a larger current account deficit.

- o More likely in the Cuban case, the authorities can prevent the current account deficit from widening by rationing foreign exchange. In that case, the LM* and the KI schedules will remain unchanged, and the excess demand for foreign exchange will persist. Note that the gap between the official exchange rate E and the floating parallel market exchange rate e is an indicator of the intensity of foreign exchange rationing.[7]

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[4] In general lower case letters refer to the market-clearing values and capital letters to quantity-constrained values associated with controls.

[5] They can, of course, keep producing as long as they are subsidized by the government, as happened in the 1980's when the Soviet Union was willing to pay for the subsidies. After the collapse of Soviet aid in 1989-90, the Cuban government provided huge budgetary subsidies to offset the losses of state enterprises, with the resulting fiscal deficits being financed largely by monetary expansion. But this could not last.; in 1994 subsidies were slashed as part of a comprehensive stabilization plan.

[6] This is an example of the *minimum principle,* according to which the market clearing condition $x = x^D = x^S$ is replaced by the condition $x = \min(x^D, x^S)$, where x^D and x^S denote the demand and the supply for variable x, respectively.

[7] In this model, the parallel market for foreign exchange is assumed to be too small to affect other variables.

To sum up, Fig. 2 examines the direct and indirect effects of price controls. The rationing of goods at below market prices constrains income, and domestic saving, which leads to an appreciation of the exchange rate and the rationing of foreign exchange, *even if the value of the peso is not fixed.* This illustrates an important aspect of markets that fail to clear: distortions in one market will have consequences for other markets.

b. Fixing the exchange rate

Suppose now that the authorities wish to fix the exchange rate at E. The constrained level of output consistent with this exchange rate and with the equality of saving and investment in Fig 2.a will be the same as the one determined by the aggregate supply in Fig.2.b, namely Y. This could happen by coincidence, or because the authorities intentionally ensure consistency between the levels at which it controls prices and the exchange rate. But this situation is unlikely to persist. Indeed, any disturbance will move the equilibrium to a point where the fixed exchange rate is not consistent with the initial price set by the rationing authorities. Given the long standing parity between the Cuban peso (CUP) and the dollar, it seems realistic to assume a rigidly fixed exchange rate (in panel a), and to allow the price level to adjust to disturbances (in panel b). These price adjustments will alter the degree of tightening of the rationing system and the excess demand for goods over time. In summary, fixing the exchange value of the peso at an overvalued level increases net imports, thus lowering national income and generating excess demand for goods and services *even if prices are not controlled.* Again, controls in one market will have consequence for other markets.

A different perspective on the quantity-constrained model is given in Fig. 3 where panel a reproduces the IS*-LM* diagram of Fig. 2. Panel b now shows the demand for money (a function of income) and the exogenous supply of money, with market-clearing equilibrium at $m^S y_0$. If income is constrained at Y as a result of controls, there will be an excess supply of money (overhang) equal to the vertical distance $m^S M^D$.[8]

Fig. 3.c displays the schedules for total saving and investment, with market-clearing equilibrium at $s_0=i_0$ and e_0. Total saving is the sum of domestic and foreign saving, and the latter is identical to the current account deficit which tends to widen when the exchange rate appreciates. Therefore the total saving schedule is upward sloping. Since both saving and investment are positively related to output, Fig. 3.c must include a family of saving and investment schedules for each particular value of output. If the exchange rate is fixed at E, the equality between saving and investment, required for each point on the IS* schedule, will imply lower levels of saving (S) and investment (I) than those prevailing under market-clearing conditions.

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[8] The constraint on income will cause the exchange rate to appreciate (to E) which will raise import prices and consumer prices and therefore cause the demand for money function in 3.c to rotate to the left. The overhang is the vertical distance between the money supply m and the new level of the demand for money M, evaluated at the income level Y.

3. Effects of an expansionary monetary policy.

We now turn to the effects of macroeconomic policies. Consider first an increase in the nominal supply of money by the central bank that shifts the LM* curve to the south-east and the aggregate demand curve to the north-east (Fig. 4). When markets clear, the result is a rise in income (from y_0 to y_1), upward pressure on prices (from p_0 to p_1), and a depreciation of the peso (e_0 to e_1). In panel c, the current account deficit declines from d_0 to d_1 and the inflow of foreign capital diminishes as liquidity conditions ease. With a fixed exchange rate E and exchange controls, the monetary expansion has no effect o on incomes or prices; all it does is to increase the excess demand for goods (as well as the monetary overhang) as indicated by comparing the blue (solid) and the red (dotted) double arrows. The unsatisfied demand for foreign exchange also rises.

4. Effects of an expansionary fiscal policy.

Because the model (and the Cuban economy) do not allow for domestic bond financing of deficits, we consider two alternative forms of fiscal expansion: (i) a rise in spending financed by foreign borrowing; and (ii) a rise in spending financed by monetary expansion. In both cases, the fiscal expansion translates into a shift in the IS* and aggregate demand curves to the north-east, as shown in Fig.5.

(i) Fiscal expansion financed by external borrowing. Under market-clearing conditions, this action will raise output from y_0 to y_1, and domestic prices from p_0 to p_1. Since the government is assumed to borrow from abroad to finance its emerging deficit, the capital inflow schedule KI will shift to the right in panel c and intersect the current account deficit schedule D at point e_1d_1, to the right of the initial equilibrium.[9] The peso will appreciate from e_0 to e_1 which induces a widening of the current account deficit from d_0 to d_1.

If the exchange rate is fixed at E, the initial quantity constrained equilibrium involves income at Y_0 and the domestic price at P_0. As in the market clearing case, the increase in government expenditure shifts the IS* and the aggregate demand curves to the north-east, which raises income and prices (to Y_1 and P_1, respectively). This absorbs some of the excess demand for output (as indicated by the red dotted double arrows) and reduces the monetary overhang. Government borrowing to finance the emerging deficit shifts the capital inflow schedule to the right (panel c), narrowing the gap between the official rate and the parallel market rate and reducing the need for foreign exchange rationing.

(ii) Fiscal expansion financed by monetary creation. This method of deficit financing, which is routine practice in Cuba, involves a shift to the right in the LM* and aggregate

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[9] This is not quite the end of the story, however. The increase in prices reduces the *real* money supply and the LM* curve shifts to the left, intersecting the new IS* curve at a point such as H. This shift has no *qualitative* effect on the key variables of the model.

demand schedules, in addition to the upward shift in the IS* curve. If markets clear (with equilibrium at points J and J' in Fig. 5) the rise in output and prices will be larger than in the case where the fiscal deficit is financed by foreign borrowing. If, however, markets fail to clear because of exchange rate and price controls, the effect of fiscal expansion on output and prices will be independent of the method of financing, but the imbalances in the goods, money and foreign exchange markets will be larger if the deficit is monetized.

5. Effect of an increase in remittances

Inflows of remittances from abroad reflect largely the decisions of Cubans residing outside the country. However, the associated use of U.S. dollars in domestic transactions has been affected at various times by Cuban government measures concluding legalization in 1993, re-prohibition in 2003, and taxation via forced conversion of dollars into CUCs. Thus, government decisions influence *how* an inflow of remittances will influence the economy.

Remittances from abroad appear as a positive item in the definitions of both the current account of the balance of payments and in national income. Therefore an increase in remittances shifts the IS* schedule to the right (Fig. 6.a) and the current account deficit schedule D to the left (Fig. 6.b). Moreover, the counterpart of current account transfers in the balance of payments is an increase in Cuban residents' net claims on foreigners as the recipients of remittances acquire bank deposits or U.S. dollar currency. Therefore, the net capital inflow schedule in panel 2c shifts to the left.

If markets clear, the peso would appreciate from e_0 to e_1 and national income would rise from y_0 to y_1. The current account position improves from d_0 to d—by less than the increase in remittances because net exports of goods and services are crowded out by the appreciation of the peso. Under a single, fixed exchange rate E, income would also rise (to from Y_0 to Y_1), and the imbalances in the markets for goods, money and foreign exchange would diminish (all the double-arrows shrink). In the realistic case where dollar remittances can be converted into Cuban pesos (CUPs) at the free market exchange rate e_1, the excess demand for dollars will be further reduced. Goods in the amount of Y_0 will continue to be supplied by the rationing authority at the controlled price P_0, and an amount Y_1-Y_0 will be sold in *shopping* stores at the higher price P_2.

6. Exchange rate policy

A devaluation of the peso. Returning to Fig. 2, a discrete devaluation of the peso (CUP) against the dollar would show up in panel a as a parallel downward shift (and reduction in the length of) the blue double arrow, with a new fixed exchange rate somewhere between E and e_0. The result would be to increase income and prices, and to lessen the need to ration goods and foreign exchange. If the authorities insist on keeping price controls

unchanged the increase in output may fail to materialize, illustrating the difficulties of partial liberalization.[10]

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Liberalization. The effect of simultaneous and full price and exchange rate decontrol is straight forward:

- ◆ National income would rise (from Y to y_0); as a result employment would increase, partly through absorption of disguised unemployment; and government revenue will expand; saving and investment would rise, setting the stage for faster growth over the long term;
- ◆ the rationing system would come to an end as domestic prices move up to their market-clearing level p_0, eliminating the welfare loss associated with queues and outages;
- ◆ The peso, assuming no central bank intervention in the foreign exchange market, would depreciate (from E to e_0), stimulating exports and making exchange controls obsolete.

7. Some tentative conclusions

This paper shows that the combination of exchange rate, price and foreign exchange controls practiced in Cuba lowers output and employment, reduces domestic saving and investment, and hinders the efficacy of macroeconomic policies. (The key policy effects are summarized in Table 1). In particular, under rationing conditions, an expansionary monetary policy loses its ability to influence income and prices, and serves only to boost the monetary overhang and increase the severity of exchange control. An expansionary fiscal policy retains some of its ability to increase output, but is likely to generate a larger increase in prices.

Full exchange rate and price liberalization would increase national income and eliminate rationing in all markets, thus ending the shortages, queues and power failures that have made the lives of Cubans so difficult for so long. At the same time it will end the corruption and political arbitrariness inevitably associated with government controls, and the discrimination against exports resulting from an overvalued exchange rate. There is only one serious objection to liberalization that deserves consideration: that the resulting increase in both domestic and import prices (the latter stemming from the depreciation of the peso that would result from floating) would create an untenable situation for the poor. But there is a way out, which is to couple liberalization with a rise in fiscal transfers to the poor and a one-time increase in public sector salaries to protect employees from the

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[10] It may be noted that the exchange rate that is fixed by the authorities is the *nominal* exchange rate, while the one that features on the vertical axis of panel a is the *real* exchange rate. Since prices rise as a result of the devaluation, any given nominal depreciation of the peso would be accompanied by an even larger real depreciation.

effects of the devaluation. Contrary to what is sometimes asserted on both sides of the Florida straights, this can be done without endangering the fiscal position (even in the absence of foreign aid) in part by eliminating the subsidies associated with price controls and other unnecessary government outlays.

In conclusion, the policy of full price and exchange rate liberalization coupled with a reinforcement of the social safety net is a winning combination. There is, in fact, no reason **not** to adopt it—other than the political fear that it might give Cubans too much freedom.