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THE WIDESPREAD DEPRESSION OVERSEAS: AMERICAN AND PACIFIC INFLUENCES†

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By JEAN-PAUL FITOUSSI AND JACQUES LE CACHEUX*

Ever since its inception, the world system of floating exchanges rates has been characterized by large and persistent movements in currency values, both nominal and real, with apparently no tendency for purchasing power parity to assert itself either in the aggregate or on a product basis; in particular, there is growing evidence that the "law of one price" does not seem to hold even for tradables and that price-cost markups display large and persistent fluctuations. In the 1980's, these movements have been accompanied by worldwide high real interest rates and ample, long-lasting differentials, as well as persistent trade and current account imbalances on a grand scale for many countries. In addition, there has been widespread concern that expansionary policies in one large country—namely the United States—may have had adverse effects on others, European countries in particular.

Such observations and opinions are apparently difficult to reconcile with standard open-economy theory, as synthesized, for instance, by Rudiger Dornbusch (1980), or with more "classical" models of the recent vintage. In a recent monograph, Fitoussi and Edmund Phelps (1988) showed that when firms are assumed to set prices in a way consistent with "customer market" behavior, international transmission is effected also via supply or markup responses, even when goods are traded and goods markets have a competitive structure. But, as shown by the revived interest in imperfect competition, price setting can arise in a large number of market environments. While the macroeconomic consequences of price setting in the closed economy have been the object of numerous recent contributions, applications to open economies are still in their infancy. The purpose of this paper is to sketch some (admittedly rather crude) working hypotheses and explore some of their macroeconomic implications that appear to be specific to open economies.

I. Alternative Foundations of Price-Setting Behavior

That price determination outside the very restrictive set of assumptions of Walrasian auction-market pricing is likely to differ markedly from the result of simply equating supply and demand has long been a major concern of economic analysis. The conditions for price-setting behavior are always such that the demand curve perceived by the firm is not infinitely elastic with respect to the price it charges for its product. Such characteristics used to be thought of as narrowly confined to cases of imperfectly competitive market structures, in which there will be strategic interactions between a small number of firms. However, when the concept of market imperfections is enlarged to include informational imperfections and consumer search, even firms operating in a fairly competitive environment may benefit from some—transient or long lasting—market power (Phelps and Sidney Winter, 1970).

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With consumer search, price-setting decisions by individual firms will be the result of complex conjectures, due to the existence of strategic interactions both with competing firms *and* with consumers. The outcome will therefore depend to a large extent on the precise specification of exchange and information technologies (see, for example, Joseph Stiglitz, 1987); in many cases, though, perceived demand curves of individual firms will be kinked at the going price, which entails major departures from the usual assumptions regarding price adjustment in competitive environments. Specifically, individual prices will not generally be competed down to marginal cost, that is, there will be positive markups in equilibrium; also, there will exist an equilibrium price distribution and individual prices will not be adjusted in response to shocks that move the equilibrium within a well-defined range. Consequently, individual prices are bound to change infrequently and to be determined by pricing conventions.

Infrequent price revisions also arise as a result of firms' optimizing behavior in the case when price changes involve "menu costs" (see, for example, Olivier Blanchard, 1983; George Akerlof and Janet Yellen, 1985). Under a wide variety of reasonable assumptions with regard to exogenous monetary processes, the existence of (even small) menu costs will also induce staggered price-setting by individual firms and some degree of stickiness in the aggregate price level.

II. Staggered Price Setting in the Open Economy

In the field of international economics, models of imperfect competition have recently been proposed to explain the response of import and import-competing prices to exchange rate changes (see, for example, Elhanan Helpman and Paul Krugman, 1986; Krugman, 1986; Dornbusch, 1987; Le Cacheux and François Lecointe, 1987). These analyses suggest that, with imperfect competition, firms may be able to charge a different price for their product on each specific market, (i.e., to "price to market"). They show that, in such cases, the elasticity of import prices—expressed in domestic currency units—with respect to the nominal exchange rate will be less than one and that there may be persistence in real exchange movements, as well as in trade balance adjustments, in response to exchange rate changes (Krugman and Richard Baldwin, 1987). However, existing analyses along these lines have been primarily confined to partial-equilibrium investigations of the consequences of exogenous changes in exchange rates on a single country's imports, with the cross-country effects left implicit.

By now, it is a common observation that nominal exchange rates move a lot in flexible rate systems; it is also generally agreed that day-to-day variations are determined in the financial markets in response to "news." Clearly, too, goods prices, whether in the aggregate or individually, are usually not changed quite as frequently: staggered price setting would therefore appear to be an appropriate working hypothesis for the analysis of exchange rate influences on goods prices, in addition to being consistent with a large number of the stories that can be told at the micro level, since the various foundations recounted in Section I are in no way mutually exclusive.

To make the point in the simplest possible way, let us consider a two-country world in which all goods are traded, with goods markets being somehow imperfectly competitive and characterized by consumer search. Rather than explicitly deriving optimal pricing rules from first principles, it will be convenient to appeal to simple, generic pricing conventions that are broadly consistent with the underlying microeconomic assumptions discussed above.[1] Firms are assumed to be based in one country and to sell their products on both markets, all goods being at least imperfect substitutes in demand. There is a large, but finite, number of firms; con-

[1]As is well known, this pragmatic analytical procedure gives rise to behavioral relations that may not be policy-invariant, but doing otherwise would require a complete specification of search technologies and individual firms' strategies. It should be clear, however, that pricing rules are likely to depend on the exchange regime.

sumers search in their home market, but cannot engage in search in the foreign market, so that firms may discriminate among the markets they provide, hence generally "pricing to market." Each firm's perceived demand curve on every market is downward sloping and may be expressed as

$$(1) \qquad N_{j,t} = A\left(P_{j,t}/Q_t\right)^{-\beta}$$

where $N_{j,t} = Z_{j,t}/Z_t$ is firm j's market share at time t, (i.e. its individual demand divided by total demand); $P_{j,t}$ is firm j's posted price and Q_t is an index of market prices. β is an elasticity parameter ($\beta > 0$) depending on consumer preferences and search technologies.

Due to "menu costs" of changing prices and/or to the demand curve being kinked at the going price, pricing decisions will be revised only infrequently and in response to large enough changes in market conditions. In the simplest case, when price tags are posted for a fixed length of time—assumed to be longer than the periodicity of exchange rate changes—and individual prices may be revised at the beginning of each successive period, we get a Taylor-like, staggered price-setting behavior. Individual firms set their price on each market so as to maximize expected future profits, which, in this case, is equivalent to maximizing the current-period expected flow of profit, defined in a standard fashion as

$$(2) \qquad \Pi_{j,t} = Z_{j,t}\left(P_{j,t} - C_{j,t}\right)$$

with $C_{j,t}$, the unit cost of production expressed in the same units as the price. In order to focus on the consequences of staggered price setting in the open economy, we assume that production technologies are characterized by constant marginal costs and that domestic costs do not vary.[2] This leaves exchange rate changes as the only possible source of relative cost variations. The pricing rule of any single firm on each market will therefore have the following, generic form

$$(3) \qquad P_{j,t} = F_j\left(E_t Z_t, E_t Q_t\right)$$

where E_t is the expectational operator, conditional on information available at time t; Z_t and Q_t are averages over the period when the price is fixed. With asynchronous staggered price setting, the aggregate price index Q_t will, at any time, depend on past and current price decisions.

Since there are both foreign and domestic firms in the market, individual pricing decisions will be influenced by the average exchange rate that is expected to prevail during the period between successive price revisions; and so will the aggregate price index. When individual demand curves are downward sloping and firms face a tradeoff between present profits and market shares, the elasticity of individual prices with respect to the expected exchange rate will be less than one and will depend on initial market shares, provided competition is of the Nash variety. Solving this pricing problem and aggregating will lead to an aggregate price equation—and an aggregate supply equation—which displays some degree of inertia, with both backward-looking and forward-looking characteristics, even assuming perfect foresight (see Taylor).

Ignoring the possible kink in demand curves, which would give rise to asymmetric pricing rules, this may be expressed in a linearized form as follows

$$(4) \qquad q_t = \alpha \cdot q_{t-1} + \varepsilon \cdot E_t z_t + \eta \cdot E_t x_t, \qquad 0 < \eta < 1$$

where constant terms have been omitted and lowercase letters stand for percent deviations in the variables, X_t being the nominal exchange rate, defined as the home-currency price of foreign currency.

When the firm's current price decision has consequences that extend beyond the period for which the price is posted, its pricing rule will be more complex. Such will be the case whenever there is a slow-moving element in the individual firm's expected demand, so

[2] Cases in which factor costs, and in particular labor costs, are affected by exchange rates through indexation have been extensively researched, especially in the context of open economies with staggered wage setting à la John Taylor (1980).

that its market share may be regarded as an investment. The customer market hypothesis, in which consumers slowly drift away when the price is raised, is one possible rationale for this intertemporal dimension; but there are other instances, like reputation. Then, not only current period's, but also future periods', expected profits depend on the present price decision, which becomes similar to any investment decision. The firm's maximization problem now involves discounting future profits; with perfect capital markets, this is done using the market interest rate of the relevant maturity. The individual supply schedules will thus be shifted up by an increase in the real interest rate, which can be regarded as the relative price of the firm's future real profits in terms of current ones (Fitoussi and Phelps). In order to capture this effect in the simplest possible way, the aggregate price equation may be rewritten as

$$(5)\quad q_t = \alpha' \cdot q_{t-1} + \varepsilon' \cdot E_t z_t + \eta' \cdot E_t x_t + \gamma \cdot R_t$$

where R_t is the expected real rate of interest that corresponds to the relevant time structure of the model, and is assumed to be a synthetic indicator of anticipated market conditions beyond the period for which individual prices are fixed.

III. Macroeconomic Consequences

To briefly explore some of the macroeconomic implications of price setting in the open economy, the model has to be closed by specifying the process-generating aggregate demand in each country and exchange rate determination. In the case of two countries with floating exchange rate, ignoring the complications arising from consumers' and investors' expectations, the simplest, standard assumptions include perfect capital mobility and asset substitutability (i.e., interest rate parity), which may be written as

$$(6)\quad i_t = i_t^* + E_t x_{t+1}$$

where i_t and i_t^* are the home and foreign nominal interest rates, respectively, and x_{t+1} is the percent depreciation of the home currency between period t and period $t+1$, based on the average exchange rate prevailing during the period. Aggregate demand in each country is assumed to be influenced by domestic macroeconomic policies in the following way:

$$(7)\quad z_t = (m_t - q_t) + d_t$$

which may be considered as a simple reduced-form, IS-LM type of demand determination, where m_t is the percentage change in nominal money supply and d_t is a shift parameter representing fiscal policy. A similar equation is assumed to hold in the foreign country. The aggregate price index in each country is given by equation (5), which implicitly determines an aggregate supply curve.

As an illustration, let us consider the short-run responses of both economies to an unanticipated, sustained fiscal shock in the home country. To the extent that it raises the interest rate (with constant money supply), it will boost velocity in both countries, thus stimulating demand in both countries, a standard outcome in models featuring this kind of demand and exchange rate determination. With the domestic interest rate rising more than the foreign one, this will result in an instantaneous appreciation of the home currency and an anticipated depreciation, also a standard result. Foreign firms will tend to increase prices and markups in the home market in response to the current exchange movement and the rise in world nominal interest rates, provided the latter were sufficient to raise anticipated real rates; however, they will not usually adjust to the full amount of the appreciation and will enjoy increased market shares. Prices and markups of domestic firms in the home market will go down, but by much less than the amount of the currency appreciation, as foreign prices in domestic currency unit increase, and higher real interest rates tend to inflate markups. In the foreign country, on the other hand, the exchange rate and the real interest rate effects work in the same direction to inflate prices and markups of firms based in that country, while their market shares also tend to increase there. On

the whole, domestic firms' markups and market shares will tend to decrease on both markets, while foreign firms will experience evolutions in the opposite direction; but, in general, prices and markups of a given firm are likely to evolve differently in each market.

In the home country, the exchange rate effect on markups implies a tendency for the aggregate price index to decrease, though the expected demand and real interest rate effects both act as countervailing forces. In the foreign country, on the other hand, the aggregate price index will sluggishy rise in response to exchange and interest rate changes. Due to the corresponding tendency for real balances to be eroded there, the outcome will be a demand contraction if macroeconomic policies are not accomodating in that country, and even more so if foreign authorities actively oppose "imported" inflation, a result which generalizes the conclusions of the Fitoussi-Phelps analysis to the present context of "pricing to market." However, whether production increases or decreases in the foreign country depends on the precise magnitude of the relevant elasticities.

Analyzing the medium-term dynamics and the adjustment path of the variables in this stylized model would require an adequate specification of the model's time structure, of policy regimes, and of expectations formation, which is well beyond the scope of this paper. However, without actually solving for the long-run equilibrium of the system, we may hint at some of its most salient characteristics. In the present context, the appropriate conditions for long-run equilibrium ought to be that, with constant policies, expected exchange rate equals observed exchange rate, and that the trade balance be in equilibrium, so that there is no sustained capital flow. However, with the kind of price-setting behavior investigated here, insofar as changes in market shares depend on pricing behavior, which in turn depends on initial market shares, trade balance equilibrium will, in most cases, entail an exchange rate level that corresponds neither to purchasing power parity, nor to relative cost parity, even when countries are similar in every respect, except for the initial shares of markets held by domestic and foreign firms. In general, long-run equilibrium following a shock is bound to depend on initial conditions and on the time path of adjustments, an outcome that arises in many imperfectly competitive settings and is made even more likely in this international environment with geographically segmented markets.

IV. Concluding Remarks

Simple hypotheses concerning market imperfections and price setting by firms can thus have far-reaching consequences in the context of open-economy macroeconomics. The conditions in which they arise are intuitively appealing, especially that of pricing to market; some of the results of the simple models featuring these assumptions seem to mimic available evidence, in particular on nominal and real exchange rates and on markups. But, owing to the extreme crudeness of the specifications discussed here, it is too early to decide whether the predicted patterns fit empirical data.

If they do have some validity, their major conclusion—namely, price setting in a context where firms price to market—has important macroeconomic implications. In the case of open economies with flexible exchange rates, the foregoing analysis suggests that a combination of integrated world capital markets and geographically segmented goods markets will often produce a great deal of instability, as measured by the variance of the economic aggregates, in response to shocks originating in policy changes or elsewhere, and this even if wages are highly flexible. In the case of countries managing their exchange rate, it also suggests that the choice of a target may not be self-evident; indeed, if some kind of purchasing power parity or relative cost parity policy is pursued, it may lead to sustained trade imbalances, a case that may characterize the current situation of countries participating in the European monetary system.

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