
**Demand Management and Exchange
Rate Policy: The Italian Experience**

A Comment on Tullio

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Demand Management and Exchange Rate Policy: The Italian Experience

Reply to Comments by Gandolfo and Padoan

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SOME OF THE POINTS raised by Gandolfo and Padoan concerning the model of the Italian economy that was published in *Staff Papers* (March 1981) arise from misunderstandings caused by the concise presentation of the model.¹ Others are more substantive. In either case, I welcome the possibility of some clarification.

This reply is divided into two sections, one commenting on the theoretical aspects and the other commenting on the estimation results and the simulations, corresponding to the comments of Gandolfo and Padoan.

I. Discussion of the Theoretical Framework

Gandolfo and Padoan argue that the demand equations for different financial assets are misspecified in the model because the scale variable, wealth, is excluded from the demand for currency and the demand function for each financial asset is not assumed to be a function of the whole structure of interest rates. A theoretical model of the financial sector of an economy can be specified that includes the same variables in all equations and

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¹For the basis of the published article, which contains a more detailed discussion of the specification of the model, the empirical results, and the data used, see Giuseppe Tullio, "A Quarterly Disequilibrium Model of the Italian Economy with Endogenous Exchange Rates" (unpublished, June 2, 1980). A copy is available upon request to the author, whose address is Ministero del Bilancio e della Programmazione Economica, Segreteria Generale Della Programmazione, Via XX Settembre 97, 00187 Roma, Italy.

satisfies all the across-equation restrictions derived from standard portfolio models. In econometric work, however, it is necessary to compromise with the quality and availability of the data, the changes in the structure of the financial system, and the difficulties of estimation, which increase with the size of the models. In particular, initial attempts to estimate the demand for currency showed that wealth was not a significant explanatory variable, while income was. This is not surprising, considering that the transactions motive prevails in the demand for currency.

The term structure of interest rates is included implicitly, since the model contains four domestic rates and one foreign rate—not just two as stated by Gandolfo and Padoan. These represent rates on assets of different average maturity, but only the interest rate on government bonds is endogenous, so that the term structure is rudimentary. However, for the period 1973–78 (the flexible exchange rate period), the model was re-estimated with both the treasury bill and the government bond rate endogenous, so that at least part of the term structure is endogenous for the flexible exchange rate period. The specification of the model during the fixed and flexible rate periods differed because the treasury bill market developed only in the 1970s.

Gandolfo and Padoan raise the question of whether some functions concerning financial assets are demand or supply functions. Equations (1')–(5') are clearly demand functions. For total bank deposits (*TBD*), however, a supply function is implicit in the commercial bank balance sheet—equation (25). This supply function is influenced by the level of interest rates, by the way that the government budget deficit is financed—equation (21), and by the balance of payments deficit—equation (23). As far as the lack of a supply function for currency is concerned, it is important to notice that the model explains currency in circulation outside banks, which is consistent with the exclusion of commercial banks from the definition of the private sector. Commercial banks are assumed to perform the function of residual buyers and sellers of currency to the nonbank private sector, which is a plausible assumption in the Italian context.

The comments by Gandolfo and Padoan on the specification of the net foreign asset position of commercial banks—equation (6)—are correct, since, as they state, in Italy “the net foreign asset position of commercial banks [*BFB*] is a variable that allows banks a certain freedom of action” but “in principle, [it] is also determined by regulations of the Bank of Italy.” If this constraint

had not existed, the equation would have been specified as a desired demand function with a process of adjustment like that in other equations. Equation (6) simply reflects the hybrid nature of the net foreign asset position of Italian commercial banks described earlier. Attempts to estimate more general functions were unsuccessful.

The demand for net foreign assets by the private sector—equation (5')—was estimated with the elasticity of wealth constrained to one, but the function included a trend term that implies that the share of net foreign assets increased over time. As Gandolfo and Padoan note, this implies that the model does not have a steady state—“a symptom of internal inconsistency in the model.” During the sample period, this share increased substantially, at about 1 per cent a year on average. See parameter β_{18} , which reflects the substantial increase in commercial and financial integration of the Italian private sector with the rest of the world in the 1960s and 1970s. This implies that the Italian economy did not grow along a steady-state path in the sample period but that there was a slow structural change or a move from one steady-state path with a low degree of financial integration to another with a high one. Introducing this degree of realism into the model does not entail an internal inconsistency. The steady state of the model still exists, if the trend term is replaced by a constant that could reflect either the initial condition of the financial system or the final one after the structural change had taken place. More generally, the constant terms—the γ 's—should be defined as a function that takes account of the structural change of the economy. If it incorporates the forces that induce the structural change, the model would be able to explain the adjustment of the economy from one “steady state” to another. However, this solution introduces nonlinearities in the parameters that would render the estimation of the model almost impracticable and would detract from the main purpose of the paper.

In the *real sector*, inventories do not appear explicitly because they are included in consumption as in the official ISCO publication.² An increase in aggregate demand thus affects output immediately, and the statement that output is demand determined in the short run is even more correct than for a model that explicitly takes inventory behavior of firms into account.

²Istituto Nazionale per lo Studio della Congiuntura (ISCO), *Conti economici trimestrali*, Schema SEC, Serie Storiche 1960–76 (Rome, March 1977).

The rationale for the inclusion of the cyclical term in a number of equations—inflation (13), expected inflation (14), imports of manufactures (12), imports of other goods (11)—may be clarified. The above-mentioned equations are a linear approximation of an equation in which the adjustment parameter is a function of the cyclical term:

$$\alpha = f\left(\frac{y_{IND}}{y_{IND}^* e^{\lambda t}}\right) \quad (1)$$

Thus, the inclusion of the cyclical term (say, in the price equation) implies that the speed of adjustment of the price level to the partial-equilibrium price level \hat{p} falls as the value added in industry approaches its steady-state level. This introduces more realism into the dynamic specification of the model.

Real private sector wealth and the real interest rate in the consumption function—equation (7')—can be considered as a proxy for real permanent disposable income because of the way in which real private wealth has been defined. It follows that disposable income is included as an argument in the consumption function, albeit in permanent form. The short-run side of the model strongly influences desired consumption, for instance, via the effect of changes in the price level on real wealth.

The supply side is based on a Cobb-Douglas production function, which underlies the investment function—equation (8'), the price-determination equation—equation (13'), and the demand for labor in industry—equation (16'). Gandolfo and Padoan argue that equation (13') cannot be derived from a Cobb-Douglas production function. The Cobb-Douglas production function for the Italian industrial sector defined in the model is as follows:³

$$y_{IND} = AK^{\beta_{21}} L^{1-\beta_{21}} \quad (2)$$

Profit maximization implies that the marginal product of labor derived from equation (2) is equal to the real wage rate

$$\frac{\partial y_{IND}}{\partial L} = (1 - \beta_{21}) \frac{y_{IND}}{L} = \frac{w}{p_{IND}} \quad (3)$$

where p_{IND} is the deflator of domestic value added in industry, a proxy for the price of all domestically produced goods. From equation (3), it follows that

³The same symbols and parameters are used here as in the article in *Staff Papers*, Vol. 28 (March 1981), pp. 80–117. (Hereinafter referred to as *Staff Papers* (March 1981).)

$$p_{IND} = \frac{w}{(1 - \beta_{21})(y_{IND}/L)} \quad (3')$$

Defining the consumer price level as a geometric average of the price of domestically produced goods and import prices, one obtains

$$p = p_{IND}^{\beta_{34}} p_i^{1-\beta_{34}} \quad (4)$$

where β_{34} is the weight of domestically produced goods in the consumer price index. Substituting equation (3') in equation (4) gives equation (13'), where

$$\gamma_{13} = \left[\frac{1}{1 - \beta_{21}}\right]^{\beta_{34}}$$

The derivation made above and a closer look at the equations in Table 2⁴ also make it clear that the average products of labor or capital are always multiplied by their respective share to obtain the marginal products.⁵

Equation (16) implies that employment adjusts with a lag to the excess demand for labor, with supply adjusting instantly to demand. The latter is not an implausible assumption for the Italian economy, which was characterized during the sample period by an excess supply of labor owing to a large pool of the unemployed and to a large number of Italians working in neighboring countries. This hypothesis is also supported by the author's inability to estimate a satisfactory supply function of labor and to find a significant impact of excess supply on employment or wages, despite numerous attempts.

Finally, from a theoretical point of view, a more satisfactory specification of the wage equation would explain the rate of change of nominal wages in terms of the discrepancy between partial-equilibrium demand and partial-equilibrium supply of labor.⁶ Equation (15'') is a plausible representation of wage determination in a country with very strong labor unions that have tended to fix wages above the level that would guarantee full

⁴*Staff Papers* (March 1981), pp. 106–108.

⁵As Gandolfo and Padoan state, there is a typographical error in the published paper: "... the average hourly product of labor is equal to the marginal product of labor if one assumes a Cobb-Douglas production function" (p. 88) should read "... the average hourly product of labor multiplied by the share of labor is equal to the marginal product of labor. ..."

⁶As mentioned earlier, difficulties arose in estimating the supply function of labor.

employment. Moreover, equation (15'') is consistent with the hypothesis underlying equation (16') that firms are profit maximizers in competitive markets, because firms can behave in one way and labor unions in another, by fixing wages at high levels and letting employment fall.

II. Discussion of the Estimates

My comments on the empirical points raised by Gandolfo and Padoan in their empirical section follow in the same order as in their note.

First, I accept the criticism on the lack of a table reporting the constant terms (the γ 's), which was due to limitations of space. The constant terms are, however, all included in the estimation.

Second, on the question of parameter restrictions, parameters can be constrained either on the basis of a priori considerations or, for elasticities of demand functions with respect to their scale variables, when they turn out in successive estimations to be not significantly different from one. This procedure makes the estimates of the remaining parameters more efficient, provided that the constraint is consistent with the data. It is on this basis that β_1 , β_{14} , β_{23} , β_{26} , and β_{30} were constrained to one. The wealth elasticity in other asset demand functions (β_7 and β_{10}) were not constrained to one because no similar empirical justification was suggested by the data. During the sample period, Italy did not grow along a steady-state path. There was a considerable increase in the relative importance of some assets in total financial wealth. Therefore, substantially different wealth elasticities and the addition of a trend term are justified by the development of financial markets during the period.⁷

Gandolfo and Padoan argue that "the values of the estimated adjustment velocities of some variables seem too low" and that "the discovery that prices (and some financial variables) have a slower adjustment velocity than quantities does not seem consistent with the behavior of the Italian economy in the period considered." Is this statement based on their a priori beliefs or on previous empirical work? In the latter case, it should be pointed out that estimates of the speed of adjustment based on ordinary

⁷See also the discussion on the specification of the demand for net foreign assets in the preceding section.

least-squares regressions of equations with lagged dependent variables are biased. The continuous time specification of the model eliminates this bias. In addition, the full-information maximum-likelihood simultaneous estimation takes care of the simultaneous equation bias.

Gandolfo and Padoan also argue that the way in which the flexible exchange rate version of the model is estimated is open to serious objections. Given the small number of observations for that period (only 27), it was not possible to estimate all 64 parameters of the 31-equation model. It would have been preferable to define a model to take account of both the fixed and flexible exchange rate periods, but this would have introduced a non-linearity and specifically would have involved the use of a switching function, which could not be eliminated by linearization. Although such models can be estimated,⁸ it would be difficult for a model of this size. The method used was chosen to allow the exchange rate to be made endogenous and to allow simulations to be performed under the flexible exchange rate regime.

Gandolfo and Padoan's perplexity in observing an estimated contribution of imported inflation to consumer price inflation of 0.737 ($1 - \beta_{34}$) as opposed to a weight of 0.263 (β_{34}) of internal sources reflects a very mechanical view of the weight of imports in consumer prices. The proportion of imports in consumer goods is certainly much smaller than 0.737, but from an economic point of view the division between tradable and nontradable goods is more relevant, and the large weight of import prices in equation (13') reflects the importance of tradable goods in Italy, that is, all goods that enter or could enter international trade. This much broader aggregate includes exported goods and all goods that could be exported.⁹ The same argument holds for the effect of import prices on expectations of inflation—equation (14).

The adjustment parameter (α_{14}) in inflationary expectations was constrained to unity only after it was found to be not significantly different from one. It is plausible that inflationary expectations adjust much faster than does actual inflation. Gandolfo and Padoan are certainly correct that the series used to represent inflationary expectations is not perfect, but it is among the best available.

⁸See Clifford R. Wymer, "The Use of Continuous Time Models in Economics" (unpublished, 1979).

⁹In the Scandinavian model of inflation, the relevant economic division would be the one between the sheltered and the nonsheltered sectors.

Finally, Gandolfo and Padoan consider that the simulations of the model do not seem to correspond to the behavior of the Italian economy in the 1970s. They suggest that casual observation of the effect of exchange rate depreciations on domestic inflation suggests much shorter lags than indicated by the model, and simulations performed with a smaller model of the real sector of the economy also suggest shorter lags (two–three years). The main problem with casual observation of exchange rate depreciations and accelerations of inflation is that both variables are determined by common factors, such as large budget deficits and the ensuing creation of money. Therefore, if it is observed that in a given year (say, 1976) the exchange rate depreciates and inflation accelerates, that does not tell us much about the effect of the exchange rate on domestic inflation, or about the speed with which prices react to the depreciation. Models in which the real and financial sectors are not integrated and in which fiscal variables are omitted (as is true of most of the estimated models of the Italian economy) exclude important transmission mechanisms, such as the effect of the destruction of financial wealth on consumption or fiscal drag. In the simulations reported in the paper, the paths of the exogenous variables are clearly stated, so that the behavior of the fiscal and monetary authorities in the years after the depreciation is explicit. This explains why a devaluation can cause a very long recession in the model. But the cyclical term in the price equation also contributes to the explanation of the long lags of domestic prices behind exchange rate changes. If the government kept gross domestic product on its steady-state path, inflation would react much faster. These considerations are crucial to an understanding of the stabilizing or destabilizing effect of fiscal and monetary policy.

III. Conclusion

I should like to thank Gandolfo and Padoan for their careful analysis of my model of the Italian economy and for giving me the opportunity to clarify some aspects of the model.

Their critical analysis is most welcome, especially if it will be followed by a similar deep scrutiny of other econometric models of the Italian economy. I hope that this will lead to a constructive exchange of views and eventually to an improvement in the quality of the work that is currently being done in Italy in both official institutions and universities.

ERRATA

The following revisions of the March 1981 issue of *Staff Papers* should be noted:

1. On page 86, the penultimate sentence in the last full paragraph should read, "In the version of the model estimated from 1973 to 1978, the interest rate of treasury bills is also endogenous (equation (19))."
2. On page 88, the last sentence of the first full paragraph should read, "Since the average hourly product of labor multiplied by the share of labor is equal to the marginal product of labor if one assumes a Cobb-Douglas production function, the approach adopted here is also consistent with a neoclassical framework."
3. On page 106, equation (2') should read

$$\hat{c} = \gamma_2 y^{\beta_2} e^{-\beta_6 \pi \pi}$$

4. On page 107, equation (16') should read

$$\hat{L} = \gamma_{16} \left(\frac{w}{p}\right)^{\beta_{39}} y_{INC}^{\beta_{40}}$$