

## INTERNATIONAL TRADE AND INCOME FORMATION: A DEVELOPING COUNTRY'S PERSPECTIVE

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### Abstract

Using OLS technique, this paper estimates the role of the international sector of developing economies on the monetary mechanism and economic growth. Results obtained show that significant variation in money stock is explained by changes in exports, capital inflow, and the balance of payments. However volatility in these variables, due to the narrow range of exports and international capital market conditions for such economies, present real limits to growth, and cautions against indiscriminate use of bank credit creation.

### INTRODUCTION

The work of J.J. Polak and his associates synthesizes monetary formation and income determination analyses, emphasizing the importance of the balance of payments and the consequent limitations on domestic credit expansion in developing countries (Polak, 1957; Polak & Boissoneault, 1960; Polak & Argy, 1971). In the Polak tradition, this study estimates the impact of autonomous shocks (both domestic and foreign) on the money supply and fluctuations in income. The central hypothesis is that economic growth (defined in terms of increases in national income) is severely circumscribed more by the international sector variables such as exports and capital inflow, although changes in domestic credit policy may stabilize national income in the short run. Results confirm the relevance of the integrated approach to the explanation of income and payments development in developing economies such as Ghana, and more importantly the significant impact of the international sector on the monetary mechanism in such economies.

### I. THE MODEL

This paper uses the Polak model [see Polak 1957, 1971 and Polak and Boissoneault, 1959] (1), regarded as important, albeit simple tool for understanding macroeconomic relationships in open, developing economies, to estimate the impact of international trade flows on the monetary mechanism and income formation in these countries. Typically these economies contain, at one extreme, a large subsistence sector and at the other, an export sector whose production is subject to international demand. Not uncommonly, exports account for a substantial proportion of Gross Domestic Product and investment takes place largely within the export sector. Real investment is therefore influenced more by international market prospects for exports than by domestic monetary conditions. In such circumstances, it is only the residual amount of domestic monetized production which is potentially responsive to domestic monetary policy. These include construction, services, and local manufacturing as the activities which might show the traditional responses to discretionary monetary policy. In total these industries are unlikely to account for a large portion of economic activity in an open developing country.

The foregoing generalized structure of a dependent economy would suggest that international leakages and injections are of primary importance in determining both domestic income and the quantity of money. By relating income determination to the money supply and to foreign exchange reserves, the Polak model serves as a guide to policy where balance of payments constraints are binding, thus providing insights into the interaction between real and financial flows.

The model begins with the assumption of constant income velocity. Based on this assumption, the income process represents a flow in which the stock of money and the flow of income are related proportionally. In addition, the model assumes that the leakage of primary importance to the system is imports while the primary injections consist of net domestic credit creation, exports and net capital inflow. Finally, all domestic income is spent with no net hoarding or accumulation of idle cash balances. This last assumption reflects the particular conditions of economies where low levels of income lead to low levels of private savings mainly by small-scale entrepreneurs in commerce, industry and farming. In most instances these savings are likely to be channeled into these enterprises. With these underlying assumptions, the interrelationships between economic activity and monetary flows are contained in a system of four equations:

- (1)  $NIME = v \text{ MONY}$
- (2)  $IMPT = m \text{ NIME}$
- (3)  $CMONY = BLCE + CBKT$
- (4)  $BLCE = EXPT - IMPT + KAPT$

where the time subscript is suppressed in all equations, and

$NIME$  = nominal national income,  
 $MONY$  = quantity of money,  
 $CMONY$  = change in the money stock,  
 $IMPT$  = money value of imports,  
 $CBKT$  = change in bank credit,  
 $EXPT$  = money value of exports,  
 $BLCE$  = changes in net foreign assets of the banking system,  
 $BLCE(1)$  = lagged value of changes in net foreign assets of the banking system,  
 $KAPT$  = net capital inflow of the nonbank sector,  
 $m$  = marginal propensity to import, and  
 $v$  = velocity of money.

The first equation states the quantity theory while equation 2 explains expenditures on imports in terms of national income. Equation 3 demonstrates the sources of changes in the money supply. According to this equation, a change in the money stock is partly of foreign origin ( $BLCE$ ) and partly of domestic origin ( $CBKT$ ). The fourth equation identifies the components of the balance of payments. According to the classical link between the balance of payments and the monetary process, a favorable balance of payments means that export industries are experiencing strong demand and/or that foreign investment capital is flowing into the country. In either case, producers seek bank credit in order to cater for imports (both consumer and capital goods varieties) which follow the increase in autonomous foreign sector variables. The higher level of economic activity causes local construction, food and manufacturing activities to

flourish. The banking system is well able to meet the demands for credit for any or all of these purposes because the balance of payments surplus provides it with the excess reserves.

Conversely a balance of payments deficit means a reduction in the quantity of money and bank reserves and is associated with a general decline in the level of domestic economic activity and a poor outlook for exports and foreign capital inflow. The dominant role of the balance of payments is evident in the statistics of sources of money supply in any developing country [Furness, 1975 gives several African examples] (2). There are two reasons for expecting this pattern. First the openness of these economies means that exports, imports and capital inflows necessarily constitute a large portion of total monetized transactions. Secondly, there is limited scope for non-inflationary domestic credit expansion mainly because of inelasticity of supply of real resources in many of these economies. This means that should domestic credit expansion be attempted without regard to these resource constraints, either the balance of payments will suffer and/or inflation will ensue. It appears, therefore, that a sustained balance of payments or a tendency to such is a necessary condition for a sustained non-inflationary monetary expansion. In other words, where discretionary domestic credit expansion is possible, it needs to be accompanied by a continuing movement towards a balance of payments surplus if inflation and severe loss of reserves are to be avoided.

The dynamic character of the model derives from the fact that it contains both MONY and CMONY in equations (1) and (3). By solving the difference equation (3), the reduced form may be expressed in terms of the absolute values of variables in the system. On the other hand, the model can be solved in terms of changes in the variables. The latter approach would have the advantage of implicitly prewhitening the serially correlated information for estimation. The system can be written in the difference form as follows:

- (5)  $CNIME = v \text{ CMONY}$
- (6)  $CIMPT = m \text{ CNIME}$
- (7)  $\text{CMONY} = \text{BLCE} + \text{CBKT}$
- (8)  $\text{CBLCE} = \text{CEXPT} - \text{CIMPT} + \text{CKAPT}$

Equation (8) can be solved for B as follows:

$$\begin{aligned} \text{CBLCE} &= \text{BLCE} - \text{BLCE}(1) = \text{CEXPT} + \text{CKAPT} - m \text{ CINME} \\ &= \text{CEXPT} + \text{CKAPT} - mv \text{ CMONY} \\ &= (\text{CEXPT} + \text{CKAPT}) - mv (\text{BLCE} + \text{CBKT}) \text{ BLCE} (1 + mv) \\ &= (\text{CEXPT} + \text{CKAPT}) - mv (\text{CBKT} + \text{BLCE}(1)) \end{aligned}$$

for the short run:

$$(9) \quad \text{BLCE} = \frac{1}{1+mv} (\text{CEXPT} + \text{CKAPT}) - \frac{mv}{1+mv} \text{CBKT} + \frac{1}{1+mv} \text{BLCE}(1)$$

Combining (9) with equations (6) and (7) would yield the short run solutions in discrete time periods, for the other dependent variables, namely MONY, NIME, IMPT. Accordingly:

$$(10) \quad \text{CMONY} = \frac{1}{1+mv} (\text{CEXPT} + \text{CKAPT}) - \frac{1}{1+mv} \text{CBKT} + \frac{1}{1+mv} \text{BLCE}(1)$$

$$(11) \quad CNIME = \frac{v}{1+mv} (CEXPT + CKAPT) - \frac{v}{1+mv} CBKT + \frac{v}{1+mv} BLCE(1)$$

$$(12) \quad CIMPT = \frac{mv}{1+mv} CEXPT + CKAPT - \frac{mv}{1+mv} CBKT + \frac{mv}{1+mv} BLCE(1)$$

The short run solutions do not ensure that there is equilibrium in the balance of payments, i.e.,  $BLCE = BLCE(1)$ , a longrun condition. The longrun solutions for the system are as follows:

$$(13) \quad BLCE = \frac{1}{mv} CEXPT + CKAPT - CBKT$$

$$(14) \quad CMONY = \frac{1}{mv} (CEXPT + CKAPT)$$

$$(15) \quad CNIME = \frac{1}{m} (CEXPT + CKAPT)$$

$$(16) \quad CIMPT = CEXPT + CKAPT$$

The reduced form model has the following characteristics: 1) The proportion of an increase in credit, exports, or capital inflow that leaks foreign assets in the first year in the form of imports is positively related to the size of the propensity to import and to velocity. It should be noted that only the product of the two coefficients ( $mv$ ) appears in the formulas explaining the balance of payments. This product represents:

$$\frac{dIMPT}{dNIME} \cdot \frac{dNIME}{dMONY} = \frac{dIMPT}{dMONY}$$

Assuming that marginal propensities are equal to average propensities, (3) we find  $\frac{IMPT}{MONY} = \frac{1}{mv}$ , i.e., a ratio of imports to money that can be determined for

any country without the need to resort to (sometimes defective) national income statistics. 2) A once-and-for-all permanent increment in exports and capital inflow will cause an increase in money income, an increase in imports equal in size and an increase in money supply and external reserves. New equilibrium income, money supply and imports will all be higher and reserves will have leveled off at the new and higher level. 3) A once-and-for-all increase in money created by the banking system will all leak out in the longrun in the form of increased imports. In the transitional period income will be higher, but in the longrun both income and imports will revert to their original levels. This case demonstrates that, over time, a sustained increase in money created by the banking system will result in the loss of reserves of the same order. In this connection, the implication for financial policy in dependent economies in this connection is that, given the expected export receipts and net capital inflow, the appropriate rate of bank credit expansion is contingent upon the desired change in the net foreign assets of the banking system. In the next section, the reduced form model is estimated

using economic data for Ghana for the period 1961 to 1981.

## II. ESTIMATION RESULTS AND IMPLICATIONS

The model specified in the preceding section was estimated using ordinary least squares. To remove any serial correlation, all the equations were estimated in the second difference form. As we expected, this prewhitening procedure improved the reliability of the estimates of the reduced form equations. This fact is confirmed by the Durbin-Watson test for autocorrelation. Further efforts were made to ensure the consistency of the results. For example, since the model was over identified, reduced form estimates could not provide reliable estimates of the structural model. As a result, 3SLS was used to estimate the structural coefficients in order to ensure consistency. All these results are reported in Table 1.

The equations for both the short run and the long run models have performed very well. In all cases, at least one of the included variables is

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significant at the 1% level or better. The R values of most of the estimated equations indicate that the included variables have explained a substantial portion of the variation(s) in the dependent variables. The response(s) of endogenous variables such as income, money and imports to domestic and foreign autonomous shocks have been substantiated by the estimated coefficients. According to the results, autonomous increases in exports, capital inflow and bank credit appear to have a significant impact on income, money supply, imports and balance of payments. In addition lagged values of the balance of payments variable BLCE(1) appear to significantly influence the level of imports and nominal income and to a lesser degree, the money supply. As was postulated, domestic as well as foreign sources of the money supply were confirmed. For example, an increase/ decrease in these autonomous variables increase/decrease the money supply. A significant portion (approximately 99%) of variations in the wider definition of money is explained by these autonomous variables, even though the domestic credit variable appears to be the most significant source of the money supply.

Similar to the money supply equation, income and imports models performed rather well (See equations 11e. & 12e.). Autonomous changes (domestic and foreign) explained about 78% of the variations in gross national income and close to 90% of the variations in imports(4). The autonomous variables are significant at five percent level or better in both equations. Overall, the short run reduced form equations provide a significant statistical explanation for the annual changes in nominal national income and money supply and strongly suggest that both external disturbances affect monetary as well as income mechanisms. For all equations, the F test indicates the relationship estimated between changes in the dependent variables and autonomous variables is statistically significant at the one percent level or better. The two-tailed test indicates that the intercept is not significantly different from zero at the five percent level.

The estimated longrun equations show similar results. The domestic credit variable BKT is highly significant in influencing the balance of payments accounts. It is worth pointing out that this variable has a negative effect on the balance of payments in the short run but this effect is not highly significant. This result is, however, confirmed by the longrun estimate of the bank

TABLE 1: Coefficients of Reduced Form and Structural Equations

Eq. Variable	Constant	BLCE(1)	KAPT	EXPT	(EXPT+KAPT)	BKT	MONY	NIME	R <sup>2</sup>	Sig F	Durbin Watson
9e. BLCE	8.064 (.486)	-.639 (-3.908)	-.128 (-1.341)	.291 (1.919)					.703	.0003	2.403
10e. MONY	12.102 (0.389)				.214 (1.637)	.817 (15.058)			.934	.0000	2.865
11e. NIME	-41.524 (.161)	5.556 (2.276)			7.072 (5.721)	1.953 (4.223)			.777	.0000	2.040
12e. IMPT	-2.712 (-0.137)	1.491 (8.00)			.983 (10.419)	.061 (1.740)			.896	.0000	2.300
13e. BLCE	12.315 (.487)			.161 (1.519)	-.084 (-1.906)				.289	.0650	2.497
14e. MONY	103.829 (1.115)		1.123 (2.132)	-1.925 (-2.608)					.384	.0207	2.497
15e. NIME	225.290 (.555)				5.263 (3.030)				.351	.0075	2.382
16e. IMPT	16.353 (.364)				.598 (3.108)				.362	.0064	2.768
5e. NIME							2.7348 (3.295)		.996	.0040	2.000
6e. IMPT								.0592 (1.466)	.159	.0965	2.296
7e. MONY	12.1029 (0.389)				.2143 (15.637)	.817 (15.058)					

Note: Results of estimation equations are labelled to conform to the original equations as specified in the previous section. The (e) indicates equation(s) are estimated and figures given in parentheses are standard errors.

credit coefficient, which not only has the right (negative) sign but also is highly significant at the less than one percent level, a reinforcement of the short run estimates. The importance of this result is that a cumulative expansion of domestic credit that increases imports hence stimulates a huge leakage is likely to cause a deterioration in the balance of payments--a situation which worsens over time. As was expected, capital inflow and increased exports positively impact the balance of payments, though the evidence is not very strong. On the other hand, these autonomous changes appear to have very strong long run effects on economic activity. Over thirty - five percent of variations in long run income, and imports have been explained by these variables and the results are statistically significant at better than the one percent level in both equations.

These results have significant bearing on financial policy in developing economies. The role of domestic and foreign factors in the determination of income, quantity of money and imports in the economies which are export-oriented has been strongly validated by the empirical results. These results suggest that a unit increase in bank credit causes nominal income to increase by almost twice that amount, causes the money stock to increase by 83% and imports to rise by 6 percent of the bank credit increase [See equations 14e., 11e. & 12e.]. Similarly a unit change in exports and capital inflow will cause the money supply to rise by between .16 and .21 of the unit change, the nominal national income and imports to rise by seven-times and .98 respectively of the unit change in these foreign sector autonomous variables. The interesting feature of this foreign sector impact can be seen in the extent of the leakage that occurs both in the short run and the longrun. About 98% of the unit increase in combined export and capital inflow leaks out via imports. These results suggest that the foreign sector, instead of promoting longrun growth in income, tends to drag down the growth process. This interpretation should support the conventional wisdom of development strategy that increased exports and capital inflow are necessary conditions for long term, sustained real economic growth (defined here in terms of growth in Gross National Product) in the economies that are primarily export-oriented. However, for the foreign sector to provide the leading role in the growth process, changes have to be made in the import-mix, away from preponderance of consumption and towards "productive" imports.

Furthermore, deficit financing policies which expand domestic bank credit, may temporarily cause nominal income to increase. However, a large portion of this increase may be due to inflation which is inherent in such fiscal-monetary strategy, with the potential slowdown in real growth in the longrun. This interpretation of empirical results is in accord with the historical growth record of inflationary-recession evident in many of these economies despite increased growth and capital inflow during the last several years.

The structural behavior of the model estimated in this paper can be seen by the estimated structural coefficients such as income velocity of money,  $v$ , and the marginal propensity to import,  $m$ . However, since the reduced form model is over identified (as mentioned earlier), it is not possible to get a unique and consistent solution for the structural model from the reduced form, using OLS. Consequently, the 3-Stage-Least-Squares (3SLS) method was used to derive a unique and consistent estimation for the structural coefficients. This approach has produced satisfactory results (See equations 5e., 6e., & 7e.). Equation 5e. gives a highly significant estimation of the income model,

underscoring the role of monetary policy in determining the level of economic activities in Ghana. It shows that changes in GNP are very well explained by 2 the changes in the money supply ( $R = .9966$ ) strongly suggesting that we would have a satisfactory explanation of income by means of monetary analysis (or framework). However, the relatively small value of velocity of money ( $v=2.7348$ ) indicates that circulation of money is slow and these economies are yet to be fully integrated or monetized in that there are few money substitutes.(5)

### III. SUMMARY AND CONCLUSIONS

Similar to the conclusions drawn by Baker-Falero and Schotta(6), this study shows that both a money and an income mechanisms operate to effect changes in national income in dependent economies such as Ghana. Like the Baker-Falero findings for the Peruvian economy, our results show that more explanatory power is achieved via the monetary mechanism rather than through the income mechanism. Almost 99% of the variance in changes in money is explained by changes in the autonomous variables, compared to 78% of the variance in changes in income.

This integrated approach yields results which suggest that the international sector has a dominant impact on open, developing economies. Both the short-term and long-term growth in income tends to be contingent upon the growth of exports and capital inflow. At the same time, the volatility in these variables, due to the narrow range of exports and international capital market conditions, present a real limit to growth, and cautions against indiscriminate use of bank credit creation.

### NOTES AND REFERENCES

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4. For comparable results see: Baker, A.B. and Falero, F., Jr. (1971) "Money, Exports, Government Spending and Income in Peru, 1951-66" The Journal of Development Studies, Vol. VII, July 1971 and Schotta, Charles, Jr. (1966) "The Money Supply, Exports, and Income in an Open Economy: Mexico, 1939-63", Economic Development and Cultural Change, Vol. XIV (July).
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