A General Equilibrium Perspective of Aggregate Import Demand

Tuck Cheong Tang*

Abstract
This study extends the analytical framework for the specification of import demand behaviour from the conventional partial equilibrium to a general equilibrium perspective. This perspective emphasises the macro dimension of import demand and the potential influence of financial factors. Two new structural import demand equations are developed: (1) one specification utilises the macroeconomic income-expenditure relationships in the goods market; and (2) the second specification utilises the portfolio balance approach to capture financial market developments.

Key words: Aggregate import demand; General equilibrium perspective; Income-expenditure equilibrium; Portfolio balance

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*Department of Economics, School of Business, Monash University Sunway campus.
Email: tang.tuck.cheong@monash.edu

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1. **Introduction**

This study proposes a structural framework for analysing long-run aggregate import demand that is derived from a general equilibrium perspective. This framework differs from the partial equilibrium approach by incorporating both real factors and financial factors of the economy. In general, partial equilibrium analysis focuses on one market at a time under the strict proviso of *ceteris paribus*. This approach has been commonly applied to import demand analysis with a focus on the real sector of the economy. The influence of the financial sector in explaining the demand behaviour for imports is essentially ignored on the (implicit) grounds of the classical homogeneity or neutrality postulate that financial forces are essentially accommodating. Some existing studies have considered the role of select financial variables such as bank credit, money supply, or interest rates as additional explanatory variables of import demand (Athens, 1985; Ceglowski, 1991; Craigwell, 1994; Tang, 2004). But these specifications have been generally of an *ad hoc* nature rather than being embedded in a formal general equilibrium framework.

Economic activity must satisfy the conservation principle that characterises the circular flow of income. This principle affirms the equivalence of the real resource flow and the financial flow between households and firms. The former involves the exchange of goods and services for factor services (of labour, land, capital and entrepreneurship) and the latter involves the corresponding payment flows between the two sectors. In an open economy the real resource flows also involve cross-border transactions, exports and imports of goods and services. Firms import real resources such as raw materials and final products that cannot be provided domestically, while they export those goods and services that are in excess of domestic requirements. The cross-border real resource flow is typically regarded as the swapping of some real resources for other real resources. In formal analysis it is treated as if it were a
barter system with balanced exchanges where financial considerations have no independent role to play.

In a monetised economy, as distinct from a barter system, any transaction or exchange has by definition a monetary or financial side. This is captured in Clower’s memorable phrase that “money buys goods and goods buy money.” This implies that the goods market flow is necessarily associated with an equivalent financial flow. As such, this fundamental relationship says nothing about the direction of causation. Specifically, it does not follow that always and everywhere goods markets drive asset markets or, equivalently, that financial transactions accommodate the autonomous transactions in goods and services. Rather, the circular flow relationship merely depicts the fundamental simultaneity (or systemic interdependence) between the real sector and the financial sector. This relationship has received extensive attention in closed (autarky) economy analysis but has traditionally been ignored in the analysis of international trade flows. The systemic simultaneity implies that adjustment behaviour in the financial sector may be one of the forces that drive adjustment flows in the goods and services market. And, *vice versa*, imbalances in goods markets may be one of the factors that determine adjustment behaviour in the financial sector. In the present context, this interdependence raises interesting questions about the relative importance of financial and real factors in influencing the demand for imports. In the absence of money illusion non-monetary factors, that is the “real” factors of tastes, resources, and technology, are the ultimate determinants of production, consumption, *trade*, and relative prices in economic equilibrium. However, Niehans (1984) noted that financial factors may play an important role during the adjustment process to equilibrium, and that their relative importance varies with the length of the time horizon of analysis. Financial factors are particularly
important for short–run adjustment, while the real factors gain in relative importance as the time horizon is extended.

Since equilibrium does not apply continuously the general equilibrium perspective suggests that explicit consideration of financial markets may assist in the identification of the response of an economy to spontaneous disturbances and exogenous policy shocks. In pursuit of this end we adopt in this study a simplified structure of the open economic system that comprises three markets (for goods, money and bonds\(^1\)) and three types of transactors or sectors (the domestic private sector, the domestic public sector, and the external sector). The goods and services which each sector absorbs must be paid for with financial assets, money or bonds (Mundell, 1963, pp. 476-477). This applies irrespectively of whether the goods and services originate at home or abroad. Similarly, the sale of goods and services to domestic or foreign residents involves the receipt of financial assets. It follows from the fundamental simultaneity property that financial disturbances may well affects the gross and net flows of cross-border exchanges of goods and services. Hence, a structural relation that models the demand behaviour for imports within a general equilibrium perspective should take both the real and financial sectors simultaneously into account. This study develops such an import demand function.

The next section identifies the core elements to derive the demand for imports that is embedded within the general equilibrium framework. Section 3 explores the linkages between imports and other forces driving the establishment of income-expenditure equilibrium, portfolio balance and external balance to derive a long-run import relation. Section 5 concludes the study.

\(^1\) The distinction between money and bonds is designed to capture the traditional distinction between transaction and investment assets or, in contemporary terminology, the distinction between assets that do not earn an income stream and those that do.
2. **General Equilibrium Perspective**

This section employs a simple general equilibrium structure to provide a convenient platform for the development of an aggregate import demand relation (refer to Table 1 in Mundell, 1963, pp. 475-477). In order to focus on the essential elements it is assumed that exchange rates are fixed and that capital moves freely between national economies.

**Goods and Services Market: Income-Expenditure Equilibrium**

In equilibrium markets must clear. In the goods and services market this means that planned expenditure (E) equals planned output (Y) per period:

\[ E_t = Y_t \]  

(1)

Given that \( E_t = C_t + I_t + G_t + X_t - IM_t \), and \( Y_t = C_t + S_p^t + T_t \), the income-expenditure equilibrium condition can be rewritten as:

\[ I_t + G_t + X_t = S_p^t + T_t + IM_t \]  

(2)

where \( C \) is domestic consumption of goods and services, \( I \) is domestic investment, \( G \) is domestic government expenditure; \( X \) represents exports of goods and services, \( IM \) stands for imports of goods and services, \( S_p^t \) is private sector saving, and \( T \) is the total tax revenue accruing to the domestic government.

Given that \( T_t - G_t \) represents public saving (\( S_g^t \)) and that the sum of public and private saving represents national saving (\( S_n^t \)) it follows that the trade balance is equal to planned net national saving (\( S_n^t - I_t \)):

\[ X_t - IM_t = S_n^t - I_t \]  

(3)
This condition implies that for goods market equilibrium net imports \((IM_t - X_t)\) must provide the resources to cover the excess of investment spending \((I)\) that is not provided from domestic sources (i.e., national saving, \(S^n\)). Alternatively, any domestic spending or exports that cannot be provided for from domestic resources requires the importation of the requisite resources from abroad.

Equation (3) can be arranged in terms of a relation between various balances that have received prominent attention in open economy macroeconomics discussion. These balances provide potentially useful insights into possible adjustment processes that may affect import demand.

\[
(X_t - IM_t) = (S^p_t - I_t) + (T_t - G_t)
\]

The trade position \((X_t - IM_t)\) is equivalent to the sum of net private saving \((S^p_t - I_t)\) and the government’s budget surplus \((T_t - G_t)\). This formulation draws attention to the potential relationship between fiscal policy and the trade balances. The twin deficit hypothesis maintains that the external balance is dominated by the government budget, that trade deficits reflect predominantly budget deficits, and conversely. This would not be the case in a Ricardian world where government spending is a perfect substitute for private spending and taxes are lump sum. A budget deficit, public dis-saving, elicits a corresponding flow of net private saving without affecting the trade balance. However, if savers (households) are not Ricardian and the substitutability between private and public spending is less than perfect, a budget deficit is associated with insufficient private saving. This must be reflected in a negative trade balance as a result of the net imports that are required to realise the excess government expenditure. This logic applies *ipso facto* to explain adjustment to changes in the budget.
The response of domestic investment and the trade balance to budget deficits depends on the degree of capital mobility and the exchange rate regime. Given fixed exchange rates and a high degree of capital mobility, the domestic interest rate responds to a fiscal stimulus. The tightening of domestic credit conditions is moderated as foreign funds flow in, maintaining a higher level of domestic investment and a negative trade balance. Capital inflows put upward pressure on the real exchange rate, either through a nominal exchange rate appreciation or a rising domestic price level. Either way, the appreciation of the real exchange rate, as a result of a budget deficit, further contributes to the adverse trade balance (Miller & Russek, 1989, pp. 97-98).

Re-arranging the equilibrium relation with the imports variable into left-hand side:-

\[ IM_t = -(S^p_t - I_t) - (T_t - G_t) + X_t \]

\[ IM_t = I_t - S^p_t + BD_t + X_t \]  \hspace{1cm} (5)

A budget deficit (BD) may be offset by an increase in private saving or fall in domestic investment (I) or exports (X). The latter adjustment response does cause the trade balance to fall as emphasised by the twin deficit hypothesis. The requirements for equilibrium in the goods market suggest that demand for imports can be explained by a set of behavioural variables that determine domestic investment, private saving, fiscal deficit and exports.

**Financial Market: Portfolio Balance**

The financial sector can be sub-divided into two markets– money market and bond market in order to distinguish between two distinct financial asset categories. Money (M) represents those assets that do not earn an income stream and are prominently used for transactions. Bonds (B) represent the set of income-earning assets. Money market equilibrium requires
that the stock of money is willingly held by the public. More formally, it requires that the money stock supplied by the central bank and the banking system is equivalent to the private sector demand for money. The stock supply of money is backed by central bank assets - domestic credit (DC) which represents central bank lending to the private sector, prominently the banking system, and to the government, and by international reserves (IR). Accordingly, the stock and flow clearing conditions in the money market are

\[ M^d = M^s = DC + IR, \]

\[ \Delta M^d = \Delta M^s = \Delta DC + \Delta IR \]  \hspace{1cm} (6)

In closed economies the money supply is typically considered to be exogenously determined by the monetary authority. But, in open economies the money supply is influenced by international reserve flows (given fixed exchange rates). Equation (6) shows that the response of money supply to domestic credit and international reserves depends on transactors’ behaviour to demand cash balances. Portfolio balance behaviour suggests that transactors desire an optimum amount of money and other assets. If that is not provided by the monetary authority they try to secure it through other means by building up cash balances through reduced spending (and conversely). In an open economy the reduction in spending improves the trade balance (reducing net imported goods and services) and draws in reserves. Hence, any excess stock demand for money that is not accommodated by domestic monetary expansion will draw international reserves into the domestic monetary system to expand the money stock endogenously.

Similarly, stock equilibrium in the bond market requires that transactors willingly hold the existing stock of income-bearing financial assets. The bond market clearing condition is that the stock demand for bond holdings must equal the net stock supply of bonds \((B^d = B^s)\). In an open economy characterised by capital mobility, domestic residents are not restricted to
domestically issued bonds but they can also hold bonds that are issued abroad. Since central banks do not hold privately issued securities all bonds issued in the private sector are held by private wealth owners. Consequently, the net stock supply consists of bonds issued by the domestic government \((B^g)\) and by foreign agents, private and public \((F)\). Hence, stock and flow clearing conditions in the bonds market are:

\[
B^d = B^s = B^g + F \quad \text{and} \quad \Delta B^d = \Delta B^s = \Delta B^g + \Delta F \quad (7)
\]

Since the stock of government bonds is determined exogenously, flow equilibrium implies that an excess demand for bonds must be satisfied by additional foreign bond holdings, and conversely.

The monetary approach to the balance of payments provides one conceptual framework for illustrating the influence of the financial sector on import demand. The basic premise of the monetary approach is that in a monetised economy the money demand function and the money supply process should play a central role in balance of payments analysis and, hence, in the determination of its flow components, particularly in the long-run (Mussa, 1974). In contrast, Keynesians tend to ignore money in balance of payments analysis. The monetary approach to the balance of payments challenges pre-modern understanding of money in a manner similar to David Hume.\(^2\) Money demand depends on the value of exchange transactions which in turn depend on domestic economic activity and cross-border trade. With given tastes an increase in trade will require more money to transact the larger trade volume. At the same time, the money supply changes endogenously because of cross-border trade in goods and services and in reserve assets - gold, US dollars in circulation. However, Paganelli (2006, p. 537) argues that money is not the cause of trade in general but excess

\(^2\) Fausten (1979) examined the alleged Humean origin of the contemporary monetary approach to the balance of payments, and he noted that the monetary approach differs in some respect from the Humean approach. According to Hume, “[money] is none of the wheels of trade: It is the oil which renders the motion of the wheels more smooth and easy” (Fausten, 1979, p. 670).
money supply can change the trade pattern through changes in the price level which make
domestic goods less attractive compared to foreign goods. A deterioration of the trade
balance with domestic inflation implies, ceteris paribus, that the domestic supply of money
decreases.

The balance of payments is an accounting record that is reckoned in monetary terms by the
principles of double-entry bookkeeping. Any imbalance in its component accounts (current or
trade account and capital account) represents a discrepancy between money receipts and
money payments. In other words, this suggests that the balance of payments is governed by
monetary forces and monetary policy rather than by real factors such as real incomes and
relative prices operating through spending propensities and price elasticities of demand for
exports and imports (Johnson, 1972). Accordingly, one of the three basic principles of the
monetary approach is that the balance of payments is essentially a monetary phenomenon and
not a real phenomenon.

According to Mussa (1974), the monetary approach to the balance of payment does not
attempt to provide a theory of the individual component accounts such as goods, services,
transfers, short- and long-term capital. Instead, the monetary approach attempts to provide
only a theory of the overall balance of payments outcome in the sense of the balance of
autonomous transactions between residents of one country and the rest of the world. To the
extent that monetary forces influence the overall outcome they must affect (at least some of)
the individual component accounts of the balance of payments. Imports (of goods and
services) and exports are traded in exchange for some quid pro quo. These are typically
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corresponding “accommodating” financial flows (International Monetary Fund, 1993, p. 159).
The same logic applies to cross-border capital flows. Domestic and foreign bonds are also traded in exchange for some *quid pro quo* so that net purchases are reflected in corresponding cross-border “accommodating” financial flows. These “accommodating” financial flows affect the portfolio balance of domestic wealth owners which leads to adjustments that may impact on their spending plans, including expenditure on traded goods.

**External Balance**

The balance of payments accounts record each cross-border transaction and its settlement (“*quid pro quo*”). From this principle of double-entry book-keeping it follows that, *ex post*, the sum of all international transactions (on current and capital or financial account) and their settlements (flows of reserve assets) must be equal to zero. This fact simply captures the essence of voluntary exchange in a monetised system. Analogously, *ex ante* it captures a requirement for general flow equilibrium in the three markets of the economy. In terms of balance of payments accounting categories this means that net cross-border resource flows, i.e. net exports of goods and services (CA)\(^3\), must be financed by an equivalent net cross-border flows of money and bonds. Thus, the balance of payment (BoP) constraint is:

\[
\text{CA}_t + [\text{KA}_t + \Delta \text{IR}_t] = 0 \tag{8}
\]

where CA is the current account balance (net exports of goods and services), KA is the capital account balance (net capital outflow) and \(\Delta \text{IR}\) denotes the balance of official monetary movements, i.e. an decrease the change in domestic holdings of international reserves.

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\(^3\)The current account (CA) covers all transactions that involve economic value and occur between resident and non-resident entities including net income payments (D) - compensation of employees and investment income. The net income payments (D) variable has been ignored here for simplicity.

\(^4\)Note that in balance of payments accounting \(\Delta \text{IR}>0\) represents a loss of reserves, and conversely.
Rearranging this identity yields an equation for the demand for imports which explicitly recognizes the potential influence of the financial sector working through net capital movements and cross-border reserve flows:

\[ CA_t = X_t - IM_t = -(KA_t + \Delta IR_t) \]

\[ IM_t = X_t + (KA_t + \Delta IR_t) \quad (9) \]

Equation (9) shows that import demand is influenced by portfolio balance behaviour in assets markets. Specifically, it recognizes that the planned flow of imports can be “funded” by planned exports \( X \) obviating the need for any net financial settlement flows. Alternatively, any excess import demand (trade deficit) must be financed by disposals of domestic holdings of financial assets, i.e. either by sales of foreign bond holdings or by foreign borrowing (sales of domestic bonds to foreign wealth owners) or by a reduction of international reserve holdings.

Conventional monetary analysis provides the behavioural determinants that drive adjustment behaviour. The demand for real money is positively related to a scale variable \( Y \) that captures the volume of transactions to be effected and negatively related to interest rates \( r \) which determine the opportunity cost of holding money. Accordingly, the demand for nominal balances is given by

\[ M^d = P.L (Y, r). \quad (10) \]

The stock supply of nominal money is determined by the volume of domestic credit (DC) extended by the central bank and the holdings of international reserves (IR):

\[ M^s = DC + IR. \quad (11) \]
With the assumption of purchasing power parity, \( P = E P_w \), favoured by the monetary approach, where \( E \) denotes the nominal exchange rate and \( P_w \) the world price level, the demand function for money in stock and flow terms can be rewritten as

\[
M^d = E P_w \cdot L \left( Y^+, r^{-} \right), \quad \text{and} \quad \Delta M^d = \Delta E + \Delta P_w \cdot L \left( Y^+, r^{-} \right), \quad (12)
\]

Combining the flow equilibrium condition for the money market (equation 6) and the balance of payments constraint (equation 8), substituting equation (12) for flow changes in the demand for money (\( \Delta M^d \)) and rearranging yields a general import demand relation that captures money and bond market developments:

\[
IM_t = X_t + KA_t + [\Delta E + \Delta P_w \cdot L \left( Y, r \right)]_t - \Delta DC_t^0 \quad (13)
\]

With fixed exchange rates, \( \Delta E = 0 \), so that this equation simplifies to \( IM_t = X_t + KA_t + [\Delta P_w \cdot L \left( Y, r \right)]_t - \Delta DC_t^0 \). For flexible exchange rates, \( \Delta IR = \Delta M^d - \Delta DC = 0 \), and the import demand relation becomes \( IM_t = X_t + KA_t \). This derivation supports the inclusion of bank credit and money supply variables in import demand analysis by Craigwell (1994) and Athens (1985) from different conceptual frameworks. By way of placing the bond market into more direct focus we can replace the capital account variable in equation (13) by the change in net foreign bond holdings. \( \Delta F > 0 \), the net acquisition of foreign bonds, constitutes a capital outflow or negative capital account balance (\( KA < 0 \)).

3 Functional Relations and Aggregate Import Demand Equations

Equations (5) and (13) have been derived from market clearing conditions and sectoral budget constraints. As such, they are identities that define \textit{ex post} relationships among variables rather than describing the behaviour of economic agents. In other words, these equations are not fully specified behaviour relations that provide a full analysis of the determinants of the
demand for imports. But they identify the requirements for market equilibrium. As such they imply certain behavioural responses for rational agents who satisfy their budget constraints. This interpretation provides a starting point for an analysis of the demand for imports. The equations identify sets of variables that may exert important influence on import demand. These include those variables that determine private sector savings and the state of the government budget as well as portfolio balance considerations.

**Structural import relation**

Interpreting equations (5) and (9) and its underlying building blocks as behavioural relationships yields

\[
IM_t(.) = I_t(.) - S_p(.) + BD_t(.) + X_t(.) \quad (14)
\]

and,

\[
IM_t(.) = X_t(.) + KA_t(.) - \Delta IR_t(.)^5 \quad \text{or}
\]

\[
IM_t(.) = X_t(.) + KA_t(.) - [\Delta P_w.L(Y, r)]_t + \Delta DC_t^0 \quad (15)
\]

where each term is written in functional notation in order to emphasise the behavioural nature of the variables reflecting planned magnitudes. Import demand (equation 14) is derived not from partial equilibrium considerations but from the market clearing requirements in the goods market. Equation (14) states that an increase in imports is associated with an increase in exports, capital inflows or reserve losses, or some combination of these changes. It represents aggregate import demand as an element of macroeconomic equilibrium. It brings into clear focus that import demand is determined not only by relative price considerations and spending propensities but also by the overall resource requirements of the home economy.

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5 In order to make the notation consistent between the balance of payments relation and the money supply, redefine (\(\Delta IR > 0\)) as a gain in reserves. That means inverting the sign in front of the \(\Delta IR\) variable in the balance of payments relation.
However, equation (14) is *de facto* still partial because it looks only at one market, the goods and services market. It ignores the role of the financial sector (money market and bonds market). For instance, easier conditions in the money and bond markets may stimulate spending, including spending on imports and a loss of international reserves, *ceteris paribus*. These associations are captured by equation (15) which relates the demand for imports to the overall macroeconomic balance of the domestic economy. Unlike a closed economy where domestic markets must clear, an open economy permits market imbalances provided they are mutually consistent.\(^6\) That consistency requirement is captured in the balance of payments constraint. In a one-period equilibrium\(^7\), an economy may well ‘spend beyond its means’ if the excess spending (net imports from abroad) is funded by equivalent net financial inflows. But those financial inflows or reductions in net claims on the rest of the world, must be consistent with the equilibrium requirements in the domestic assets markets. Equation (15) thus captures both the real sector (exports and imports) and the financial sector (bond and international reserve flows). When exchange rates are not perfectly flexible international reserve flows create disturbances in the domestic money market (\(\Delta IR \neq 0\)) which are likely to feed into the goods and bond markets as wealth owners react to the disturbance of their portfolios. Conversely, when exchange rates are flexible changes in real exchange rate alter the value of real money balances and create price disturbances in the markets for domestic goods which will have further repercussions in the remaining sectors of the economy.

The determinants of the right hand side behavioural variables can be derived from conventional assumptions of economic behaviour or economic structure. The demand function for exports \(X_t(.)\) relates the quantity of exports to world (foreign) income, \(Y^*\), and

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\(^6\) These imbalances are reflected in cross-border flows and, hence, strictly confined to flow equilibria. Full equilibrium, in the sense of stock and flow equilibrium, obviously precludes any such adjustment flows.

\(^7\) The sustainability over time of such imbalances is not of immediate concern in the present context. An extensive literature deals with the dynamic adjustment paths in open economies.
relative price of domestic goods, \( \frac{P_d}{P_w} \) (where \( P_d \) represents domestic prices and \( P_w \) is the world price, both expressed in same domestic currency). This relative price variable has a negative impact on exports as an increase in relative domestic prices decreases exports. The aggregate demand for exports is positively related to world income through import propensities. Higher interest rates discourage domestic investment because of higher cost of borrowing.

Private savings (\( S^p \)) is defined as \( Y - T - C \). Conventionally, the basic behavioural function of private saving, \( S^p(t) \) is a positive association with income and interest rates. Higher domestic interest rates generate higher interest income and, hence, encourage private savings. The Keynesian savings function relates domestic savings to GDP, while the Non-Keynesian saving functions consider permanent income, interest rates, taxation and exports as determinants.

The capital account balance (KA) is the difference between the change in foreign ownership of domestic assets and the change in domestic ownership of foreign assets. Changes in income, the world interest rate, exchange-rate expectations and in monetary policy instruments have strong effects on the capital account (Kouri & Porter, 1974). For simplicity, it is assumed that the capital account balance is dominated by the cross-border yield differential which is captured by the difference between the interest rates at home (\( r \)) and abroad (\( r^* \)). An increase in domestic interest rates attracts inflows of capital that re-establish interest rate parity by easing credit conditions in domestic financial markets. The foreign interest rate has the reverse influence on the capital account as improved profitability of foreign assets encourages their purchase by domestic residents (and repatriation of crossborder investments by foreign residents), lowering the capital account balance.
However, exchange rate expectations and inflation expectations may attenuate or even reverse these effects. If increases in domestic interest rates are associated with higher expectations of depreciation then the expected capital losses reduce the attraction of domestic assets. Households will tend to reduce cash balances and other domestic asset holdings to buy foreign bonds (capital outflow). Similarly, with strong inflation expectations real interest rates are expected to fall, once again reducing the attractiveness of domestic assets.

Budget deficits (BD) may be financed by selling bonds to domestic residents and/or foreigners. This may initiate a process of portfolio substitution as households (domestic and foreign) reduce their demand for cash balances and foreign bonds in order to buy domestic bonds resulting in a possible improvement in the capital account balance. Similarly, tax increase to finance the BD reduce the demand for cash balances as households curtail spending in response to the fall in their disposable incomes. BD is assumed to be exogenous for simplicity in the empirical implementation. Similarly, the domestic credit (DC) variable in equation (20) is assumed to be exogenous.8

Now, the open functional forms of the behavioural variables in import demand relations (14) and (15) can be presented as follows.

\[
IM_t(.) = I_t(r_t^{(+)} - S^p_t(Y_t^{(+)}), Y_t^{(+)} + X_t(Y^{*}_t^{(+)}, P_{dt}/P_{wt}^{(-)} + BD_t^0 + X_t(Y_t^{*^{(-)}}, P_{dt}/P_{wt}^{(-)}) (16)
\]

and,

\[
IM_t = X_t(Y_t^{*^{(+)}}, P_{dt}/P_{wt}^{(-)} + KA_t(r_t^{(+)}, r_t^{*^{(-)}}, [\Delta P_{w,L} Y^{(+)}, r^{(-)}])_t + DC_t^0 (17)
\]

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8 However, according to Wagner’s thesis (Wagner, 1890) government spending is determined by a country’s growth trajectory rather than exogenously decided. The Keynesian school emphasises the expansionary effects of fiscal policy (Borcherding, 1985, pp. 363-376). Hence, a fully specified model would need to recognize the endogenous forces that influence the formulation of fiscal and monetary policy.
where $r$ and $r^*$ are domestic and foreign real interest rates, $Y$ and $Y^*$ are domestic and foreign income, $P_d$ is domestic price and $P_w$ is the world price. The superscripted symbols (.) note the direction of adjustment of the right hand side behavioural variables.

Equations (16) and (17) represent the general equilibrium demand functions for imports derived from the market clearing conditions in the goods and financial markets, respectively. Equation (16) emphasises the potential influence of investment ($I$), private and public saving and exports ($X$) on import demand ($IM$). Domestic activity ($Y$), the relative price of domestic goods ($P_d/P_w$) and domestic real interest rates ($r$) have negative signs. The negative relationship between domestic activity ($Y$) and the demand for imports ($IM$) is explained by the saving channel. A rise in domestic activity ($Y$) increases saving ($S_p$) and reduces the demand for imports, cet.par., because more resources are now available domestically. The adverse effect of domestic inflation ($P_d/P_w$, rises) on exports must be offset, ceteris paribus, by import contraction to preserve goods market balance. Foreign activity ($Y^*$) has positive explanatory power on imports as it stimulates exports. The additional demand for domestic resources increases the demand for imports.

Domestic interest rates ($r$) are expected to have an adverse effect on import demand via the investment and saving channels ($dIM/dr = dI/dr - dS_p/dr < 0$ because $dI/dr < 0$). Increases in real interest rates reflect higher cost of investing that discourage investment. Ceteris paribus, the increased demand for capital goods is met, in the short run, from additional imports. Any induced increase in private saving in response to the higher real yields releases resources from domestic absorption and reduces the amount of resources that need to be imported. As

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9 Given that BD, X and I are exogenous, $dIM/dY = -dS_p/dY$. A marginal propensity to save, $MPS < 1$ implies that some of additional income ($\Delta Y$) is available for import replacement or additional expenditure on investment ($I$) and exports ($X$). The fall in imports and negative domestic activity elasticity would also follow if the increase in domestic activity ($Y$) reflects an increase in the production of import-substitute goods (Bahmani-Oskooee & Niroomand, 1998, p. 102).
discussed in the context of the twin deficits hypothesis, increases in the budget deficit (BD) cause adverse movements in the trade balance unless they are matched by equivalent increases in private saving. Lastly, any increase in export demand that is not accompanied by an equivalent reduction in domestic absorption can be accommodated in the presence of full employment only by additional imports since no additional resources can be obtained through higher output.

Equation (17) emphasises the potential influence of financial factors on import demand. An increase in domestic interest rates ($r$) or foreign income ($Y^*$) raises the demand for imports, while domestic activity ($Y$), the relative price of domestic goods ($P_d/P_w$) and foreign interest rates ($r^*$) return negative effects on imports. As interest rates reflect the opportunity cost of holding money, an increase in interest rates leads to an excess supply of real money balances which would tend to stimulate imports (as well as capital inflows). An increase in domestic activity ($Y$) increases the demand for cash balances. If this demand is not satisfied through monetary expansion, transactors will need to reduce their spending including purchases of imported goods and services to build up their cash balance holdings. The effect of foreign activity ($Y^*$) and relative price of domestic goods ($P_d/P_w$) are driven by their direct effects on exports as discussed in the income-expenditure approach. Domestic inflation and income expansion also initiate portfolio substitutions as they increase the demand for nominal balances. In the absence of accommodating monetary expansion this requires that households reduce spending including spending on imports. Lastly, the demand for imports is expected to be negatively associated with foreign interest rates ($r^*$). An increase in foreign interest rates reduces the interest rate differential in favour of the domestic country and attracts capital.

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10 In this case the interest rate effect works through portfolio substitutions initiated by changes in the demand for money. The net effect on the demand for imports will be positive as long as the interest elasticity of the demand for bonds is smaller than the interest elasticity of the demand for money balances.
outflows. In the absence of official financing, deteriorations of the capital account balance require improvements on current account.

In the presence of full employment, increases in exports must be “funded” by resources that are imported from abroad in the absence of any accommodating drop in domestic absorption. In the absence of reserve movements an improvement on capital account can occur only if there is a corresponding deterioration on current account. Failing such a deterioration, any attempt to obtain domestic bonds can be accommodated only through portfolio substitutions that will leave the net foreign asset position unchanged.

For empirical implementation, the two equations modelling import demand can be estimated by the structural import demand equations in reduced form (equations 18 and 19). These equations capture the minimalist functional form of the behavioural structure of import demand that is informed by the equilibrium requirements in the goods and financial markets, respectively.

\[
\text{IM}_t = BD_{t0}^0 + IM_t(Y_t, P_{dt}/P_{wt}, Y_t^*, r_t) \\
\text{IM}_t = \Delta DC_{t0} + IM_t(Y_t, P_{dt}/P_{wt}, Y_t^*, r_t, r_t^*)
\]

The expected signs of the explanatory variables are identified by the super-scripts. They have been derived from the underlying economic structure captured in equations (16) and (17). The reduced form import demand equations show consistent signs for the explanatory variables except for domestic interest rates. This reflects their different modi operandi in the two models, relying on saving and investment adjustment in the goods market model (18) and
on portfolio substitution in the more general financial markets model (19). Both the budget deficit \( \text{BD}^0 \) and domestic credit \( \text{DC}^0 \) are assumed to be exogenous to import demand. \( \text{BD}^0 \) is captured by the constant term (of equation 18) which is expected to have a positive sign in recognition of the twin deficits association. Similarly, domestic credit expansion \( \Delta \text{DC}^0 \) is captured by the constant term in equation (19) with an expected positive sign.

It should be noted that the particular behavioural relations, and their signing in this subsection, are primarily intended for illustrative purposes. We do not intend to examine the appropriateness of the alternative approaches employed here or to present a rigorous fully specified general equilibrium model of import demand. Such a model lies outside the scope of this study.

4. **Concluding Remarks**

This study extends the import demand modelling framework to provide an additional setting for examining the robustness of empirical cointegration findings. To this end it derives two structural import demand equations that account for both real sector and financial sector influences. From the income-expenditure equilibrium (goods market), the demand for imports is explained by domestic and foreign activity variables, domestic real interest rates and the relative price of domestic goods. The portfolio balance approach emphasises adjustment processes in financial markets. This model recognises also forces operating in the financial markets, such as foreign interest rates, and different adjustment mechanisms such as the real balance effect and portfolio adjustment and their impact on goods markets.
References


