

Sectoral Composition, External Constraints, and Policy Space in a Dual-Sector Supermultiplier Model

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1 Abstract

Recent geopolitical developments, including war, tariffs, trade fragmentation, and shifts in global demand, are reshaping the external environment faced by developing economies. These changes affect export demand, exchange-rate dynamics, and external financing conditions, with direct implications for growth and the scope for macroeconomic policy. In this context, this paper develops a dual-sector small open economy model within the Sraffian supermultiplier tradition Freitas and Serrano (2015), building particularly on the open-economy frameworks of Morlin (2022) and Dvoskin and Landau (2024). The analysis is grounded in the literature on Latin American structuralism (Prebisch, 1950) and balance-of-payments-constrained growth (Thirlwall, 1979; Cimoli et al., 2010), where productive structure, trade composition, and external dependence are central.

The model is driven by autonomous demand, namely government expenditure and exports, and incorporates a BoP constraint with explicit financial flows dynamics. The economy is composed of a modern sector, characterized by higher income elasticity of export demand, and a traditional sector associated with lower export dynamism. Sectoral composition therefore affects both export performance and the import content of domestic activity. In particular, the aggregate propensity to import is endogenously determined by the sectoral composition of output, such that an increase in the share of the modern sector reduces import leakages and relaxes the external constraint. Structural transformation therefore affects not only export growth but also the import intensity of domestic demand, with implications for the trade balance, reserve dynamics, exchange-rate pressures, and external indebtedness.

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The central argument is that the balance-of-payments constraint is structurally mediated. The model formalizes the interaction between real and financial external constraints, both of which depend on the economy's productive structure. The introduction of a dual productive structure allows different external shocks to propagate through distinct channels. A decline in rest-of-world income operates primarily through the trade channel, reducing export revenues and tightening the external constraint, with subsequent effects on reserve accumulation, capital flows, and exchange-rate dynamics. By contrast, increases in global interest rates affect the economy initially through financial channels, altering capital flows, reserve dynamics, and debt-service costs before constraining domestic demand and growth. In both cases, the severity of adjustment and the available space for fiscal, monetary, and exchange-rate policy depend on the underlying structure of production and trade.

The model provides a framework to analyze how alternative sectoral configurations, associated with different patterns of structural transformation and external integration, generate distinct growth trajectories, external vulnerabilities, and macroeconomic policy space in small open economies.

2 Model structure

2.1 Growth side

The economy has two sectors: a modern sector (m), which uses capital and labour and attracts investment, and a traditional sector (a), which uses only labour and does not invest. Total output is the sum of sectoral outputs:

$$Y = Y_m + Y_a \quad (1)$$

The modern sector's output is demand-determined by consumption, investment, government, and net exports of modern goods:

$$Y_m = C_m + I_m + G_m + X_m - M_m \quad (2)$$

The traditional sector has no investment demand (no fixed capital) and, in this version, does not export:

$$Y_a = C_a + G_a + X_a - M_a, \quad X_a = 0 \quad (3)$$

Aggregating, total output is:

$$Y = C + G + I_m + X_m - M \quad (4)$$

Consumption. Consumption is induced, with exogenous propensity to consume c :

$$C = cY \quad (5)$$

and is split across sectors by the demand-composition parameter α :

$$C_a = \alpha cY, \quad C_m = (1 - \alpha)cY \quad (6)$$

Government. Government expenditure is autonomous and split by the same composition parameter:

$$G_a = \alpha G, \quad G_m = (1 - \alpha)G \quad (7)$$

Investment. Only the modern sector invests. In the short run investment is a fixed proportion h of modern-sector output:

$$I_m = hY_m \quad (8)$$

Following Freitas and Serrano (2015), the propensity to invest adjusts to the degree of capacity utilisation through a flexible accelerator: it rises when utilisation u exceeds its normal level u_n and falls when it lies below,

$$\dot{h} = h\gamma(u - u_n), \quad \gamma > 0, \quad (9)$$

where γ governs the speed of adjustment. In the fully adjusted position utilisation returns to normal ($u = u_n$), so that $\dot{h} = 0$ and the propensity to invest stabilises.

Autonomous demand. The autonomous components are government expenditure and exports:

$$Z = G + X \quad (10)$$

2.2 Sectoral structure and the import propensity

The modern-sector share of output, β , is the structural parameter of the model. Economies with different productive structures are represented by different values of β :

$$Y_m = \beta Y, \quad Y_a = (1 - \beta)Y, \quad 0 < \beta \leq 1 \quad (11)$$

Imports are sector-specific and proportional to sectoral output. The modern sector is less import-intensive than the traditional one, $m_m < m_a$:

$$M_m = m_m Y_m, \quad M_a = m_a Y_a \quad (12)$$

Aggregate imports then depend on the composition of output,

$$M = m_m Y_m + m_a Y_a = [\beta m_m + (1 - \beta)m_a]Y, \quad (13)$$

so that, defining the aggregate propensity to import as a function of structure,

$$m(\beta) \equiv \beta m_m + (1 - \beta)m_a, \quad m'(\beta) < 0, \quad (14)$$

we obtain $M = m(\beta)Y$.

A larger modern sector thus lowers the aggregate propensity to import. This reflects a well-established structuralist regularity: more industrialised and technologically diversified economies tend to be less constrained by the balance of payments (Cimoli et al., 2010). The same intuition runs through the recent global value chains literature, where a broader and more diversified productive base embodies a wider set of technological and organisational capabilities, easing the reliance on foreign inputs when global supply is disrupted and so reducing external vulnerability (Coveri and Zanfei, 2023).

Empirically, this regularity works mainly through the export side: as economies upgrade, the income elasticity of their exports tends to rise faster than that of their imports, relaxing the external constraint even when the import elasticity itself exceeds unity. In the present version the traditional sector does not export, so we convey the same net effect through the import side, with a larger modern share β reducing aggregate import leakage. Letting both sectors export with different income elasticities ($\epsilon_m > \epsilon_a$, with $a_a > 0$) would route the mechanism through exports directly — a natural development that the two-sector notation already accommodates.

2.3 The supermultiplier

Substituting consumption, investment, and imports into the output identity, and using $Y_m = \beta Y$:

$$Y = Z + cY + h\beta Y - m(\beta)Y \quad (15)$$

Solving for output yields the supermultiplier:

$$Y = \frac{1}{1 - c - h\beta + m(\beta)} Z \quad (16)$$

Keynesian stability condition. The supermultiplier is positive and the adjustment is stable provided the marginal propensity to spend is below unity (Freitas and Serrano, 2015):

$$c + h\beta - m(\beta) < 1 \quad (17)$$

Note that β enters this condition twice: a larger modern sector raises induced investment ($h\beta$) and lowers import leakage ($m(\beta)$), both of which raise the marginal propensity to spend and thus tighten the stability margin.

2.4 Demand composition and initial consistency

The demand-composition parameter α is constant. Its value is calibrated at the initial period so that the economy begins in sectoral consistency, given the initial modern-sector share β_0 . From modern-sector equilibrium:

$$Y_m = (1 - \alpha)cY + hY_m + (1 - \alpha)G + X_m - m_m Y_m \quad (18)$$

imposing the initial share $Y_m = \beta_0 Y$ and collecting terms:

$$\beta_0 Y(1 - h + m_m) = (1 - \alpha)(cY + G) + X_m \quad (19)$$

which determines the initial-consistent value of α :

$$1 - \alpha = \frac{\beta_0 Y(1 - h + m_m) - X_m}{cY + G} \quad (20)$$

This calibration ensures the modern-goods market clears at $t = 0$. Thereafter α is held fixed. Out of the fully adjusted position, if the autonomous components grow at different rates (e.g. $g_X > g_G$), the modern-sector share β adjusts during the transition until $g_G = g_X$ is restored and the economy reaches its fully adjusted position, at which point β is again constant.

2.5 Exports and the growth of autonomous demand

Exports originate in the modern sector. World demand for each sector's exports depends on rest-of-world income Y_{RoW} and the real exchange rate Q , with sector-specific income and price elasticities:

$$X_i = a_i Y_{RoW}^{\epsilon_i} Q^{\eta_i}, \quad i \in \{m, a\} \quad (21)$$

where a_i is a sectoral scale factor, ϵ_i the income elasticity, and η_i the price elasticity of export demand.

In this version the traditional sector does not export, which we impose through a zero scale factor:

$$a_a = 0 \Rightarrow X_a = 0 \quad (22)$$

so that total exports originate entirely in the modern sector:

$$X = X_m = a_m Y_{RoW}^{\epsilon_m} Q^{\eta_m} \quad (23)$$

The two-sector notation is retained so that income-elastic primary exports ($a_a > 0$) can be reintroduced in future extensions.

Growth of exports. Log-differentiating and assuming a constant real exchange rate ($\dot{Q} = 0$), the growth rate of exports is governed by the modern sector's income elasticity and the growth of rest-of-world income:

$$g_X = \epsilon_m g_{RoW} \quad (24)$$

Composition of autonomous demand. Let θ denote the share of exports in autonomous demand:

$$\theta = \frac{X}{Z} = \frac{X}{G + X} \quad (25)$$

The growth rate of autonomous demand is the weighted average of the growth rates of its components:

$$g_Z = \theta g_X + (1 - \theta) g_G \quad (26)$$

Differentiating the definition of θ with respect to time gives its law of motion:

$$\dot{\theta} = \theta(1 - \theta)(g_X - g_G) \quad (27)$$

The share of exports in autonomous demand rises whenever exports grow faster than government expenditure, and falls otherwise.

Fully adjusted position. A persistently stable growth rate of autonomous demand requires a constant composition, i.e. $\dot{\theta} = 0$. Given $\theta \in (0, 1)$, this holds if and only if both autonomous components grow at the same rate:

$$\dot{\theta} = 0 \iff g_G = g_X \equiv g_Z \quad (28)$$

This is the stability condition for the composition of autonomous demand.¹ The model admits periods in which the two autonomous components grow at different rates ($g_G \neq g_X$), with θ drifting accordingly. In the fully adjusted position, θ is constant at $\theta^* \in (0, 1)$, capacity utilisation has converged to normal, the propensity to invest has stabilised, and output grows at the common rate of autonomous demand:

$$g_Y = g_Z = g_X \quad (29)$$

Out of the fully adjusted position $g_G \neq g_X$, so θ drifts and the modern-sector share β adjusts transitionally until the common growth rate is restored.

¹The law of motion $\dot{\theta} = \theta(1 - \theta)(g_X - g_G)$ also admits the boundary fixed points $\theta = 0$ and $\theta = 1$. If the two growth rates remain persistently different, θ does not settle at an interior value but is driven asymptotically toward one of these extremes, in which a single component dominates the growth of autonomous demand. We abstract from these limiting cases, as economies typically present positive demand from both exports and government expenditure, and restrict attention to the interior case $\theta^* \in (0, 1)$ in which both components grow at the common rate.

2.6 Financial flows

Following Vaz (2024), net financial flows (F) are driven by the differential between the domestic and the international interest rate ($i - i_f$), scaled by the size of the economy (Y), plus an exogenous component capturing investors' liquidity preference (σ), also taken proportional to income. The parameter $\kappa > 0$ captures the elasticity of financial flows to these factors, reflecting the degree of financial openness. Flows are net: $F > 0$ denotes net inflows (net borrowing), $F < 0$ net outflows.

$$F = \kappa [(i - i_f) + \sigma] Y \quad (30)$$

2.7 External debt

Net external debt accumulates through net financial flows:

$$\dot{D} = F = \kappa [(i - i_f) + \sigma] Y \quad (31)$$

A net inflow ($F > 0$) represents net borrowing from abroad and adds to the stock of external liabilities; debt service does not enter here, but is paid out of reserves (Section below).

We work with the debt-to-exports ratio $d = D/X$, the relevant solvency measure for a country whose external liabilities are denominated in foreign currency (Bhering et al., 2019). Differentiating:

$$\dot{d} = \left(\frac{\dot{D}}{X} \right) = \frac{\dot{D}}{X} - d g_X \quad (32)$$

Using (31) and the identity $Y/X = (Y/Z)(Z/X) = \phi/\theta$, where ϕ is the supermultiplier ($Y = \phi Z$) and $\theta = X/Z$ the share of exports in autonomous demand:

$$\dot{d} = \frac{\kappa [(i - i_f) + \sigma] \phi}{\theta} - d g_X \quad (33)$$

The debt-to-exports ratio converges to an equilibrium value, obtained by setting $\dot{d} = 0$:

$$d^* = \frac{1}{g_X} \frac{\kappa [(i - i_f) + \sigma] \phi}{\theta} \quad (34)$$

Since capital flows (and hence external indebtedness) grow proportionally to income, while output growth is led by autonomous demand with government and exports growing together in the fully adjusted position, the debt-to-exports ratio converges to (34). The ratio is stable provided $g_X > 0$.

2.8 International reserves

International reserves vary with the current account (trade balance plus net foreign interest) and the financial account. Reserves earn the foreign rate i_f ; external debt is serviced at the domestic rate i and paid out of reserves:

$$\dot{R} = X - M + i_f R - i D + \kappa [(i - i_f) + \sigma] Y \quad (35)$$

We evaluate the dynamics of the reserve-to-income ratio $r = R/Y$, a measure of the economy's short-run capacity to cover external obligations. Differentiating:

$$\dot{r} = \frac{\dot{R}}{Y} - r g_Y \quad (36)$$

Substituting (35) and using $M = m(\beta)Y$:

$$\dot{r} = \frac{X - M}{Y} + i_f r - \frac{iD}{Y} + \kappa[(i - i_f) + \sigma] - r g_Y \quad (37)$$

Using $X/Y = \theta/\phi$ and $D/Y = (D/X)(X/Y) = d(\theta/\phi)$:

$$\dot{r} = \frac{\theta}{\phi} - m(\beta) + i_f r - i d \frac{\theta}{\phi} + \kappa[(i - i_f) + \sigma] - r g_Y \quad (38)$$

Collecting terms:

$$\dot{r} = \kappa[(i - i_f) + \sigma] + \frac{\theta}{\phi}(1 - i d) + (i_f - g_Y)r - m(\beta) \quad (39)$$

In (39), all terms are fixed by exogenous parameters or by supermultiplier objects (ϕ, θ) that converge in the fully adjusted position, except the debt-to-exports ratio d , whose own dynamics are given by (33). The reserve ratio therefore converges once d has converged. Setting $\dot{r} = 0$ and evaluating at $d = d^*$ gives the equilibrium reserve-to-income ratio:

$$r^* = \frac{1}{g_Y - i_f} \left[\kappa[(i - i_f) + \sigma] + \frac{\theta}{\phi}(1 - i d^*) - m(\beta) \right] \quad (40)$$

with the reserve ratio stable provided $g_Y > i_f$.

3 The external constraint: solvency and liquidity

The external constraint has two faces, bounding the economy's external position on opposite sides.

Solvency: an upper bound on debt. The first is a *solvency* constraint, expressed as an upper limit on the debt-to-exports ratio, $\bar{d}$, above which access to international capital markets is curtailed (Bhering et al., 2019; Morlin, 2022):

$$d \leq \bar{d}. \quad (41)$$

This is a long-run condition: it binds when the equilibrium ratio d^* in (34) would otherwise exceed $\bar{d}$, in which case the variables determining d^* must adjust to bring it back within the limit.

Liquidity: a lower bound on reserves. The second is a *liquidity* constraint, expressed as a lower limit on the reserve ratio:

$$r \geq \underline{r}. \quad (42)$$

Whereas solvency concerns the sustainability of the debt stock over time, liquidity concerns the economy's short-run capacity to meet its external obligations: reserves are the buffer that absorbs any gap between the current and financial accounts, and a country whose reserves fall to the floor can no longer finance its import bill or service its debt, regardless of its longer-run debt position. The floor may be specified as a minimum reserve-to-income ratio or, more naturally, as a minimum import-cover requirement (R/M) , which in the model's notation becomes a structure-dependent floor $r \geq \underline{r}(\beta)$, since more import-intensive economies require larger reserves per unit of exports to achieve the same cover.

The constraint as a region. Together, (41) and (42) define a region within which the external position must remain:

$$d \leq \bar{d} \quad \text{and} \quad r \geq \underline{r}. \quad (43)$$

The two bounds interact. As shown in the policy-space analysis below, the available instruments allow the economy to substitute between them — relieving the debt (solvency) constraint by drawing down reserves, or rebuilding reserves at the cost of higher debt — but cannot lift the economy outside the region altogether. The severity with which each bound binds following an external shock, and the room this leaves for fiscal, monetary, and exchange-rate policy, depends on the economy’s productive structure, and is the central object of the analysis. The full characterisation of the reserve floor and of the joint (d, r) dynamics is developed in the simulations.

4 Comparative statics of the debt constraint and policy space

The external constraint takes the form of an upper bound on the debt-to-exports ratio, $d \leq \bar{d}$. It binds when the equilibrium ratio d^* would otherwise exceed $\bar{d}$. We examine how the three policy levers available to relax the constraint operate on d^* , recalling:

$$d^* = \frac{1}{g_X} \frac{\kappa [(i - i_f) + \sigma] \phi}{\theta} \quad (44)$$

Lever 1 — Real depreciation ($Q \uparrow$). A real depreciation raises exports through the price elasticity, increasing both the export growth rate g_X and the export share of autonomous demand θ . Both effects lower d^* :

$$\frac{\partial d^*}{\partial g_X} = -\frac{1}{g_X^2} \frac{\kappa [(i - i_f) + \sigma] \phi}{\theta} = -\frac{d^*}{g_X} < 0, \quad (45)$$

$$\frac{\partial d^*}{\partial \theta} = -\frac{1}{g_X} \frac{\kappa [(i - i_f) + \sigma] \phi}{\theta^2} = -\frac{d^*}{\theta} < 0. \quad (46)$$

A depreciation thus relaxes the constraint by improving the current account.²

Lever 2 — Demand contraction ($g_G \downarrow$). Slowing the growth of government expenditure reduces output growth and, with it, the growth of imports ($M = m(\beta)Y$), improving the current account and lowering d^* . In terms of the equilibrium expression, the effect registers through a rising export share of autonomous demand: as $g_G < g_X$, the relative weight of the domestic component falls, $\theta = X/Z$ rises, and $\partial d^* / \partial \theta < 0$ lowers d^* . The lever thus works on the same margin as depreciation — an improvement in the current account — but at the cost of lower output growth during the adjustment.

²This abstracts from the Marshall–Lerner condition: the net effect on the trade balance requires that the sum of export and import price elasticities exceeds unity. We treat this as satisfied. A depreciation also carries costs not captured in d^* : it raises the domestic price of imported goods, with a regressive impact on the consumption basket of the traditional sector, and operates partly through real-wage compression as a source of export price-competitiveness.

Lever 3 — Domestic interest rate ($i \downarrow$). The domestic rate enters d^* through the interest differential ($i - i_f$) in the financial-flow term, with

$$\frac{\partial d^*}{\partial i} = \frac{1}{g_X} \frac{\kappa \phi}{\theta} > 0. \quad (47)$$

A lower domestic rate narrows the differential, reducing capital inflows and slowing the accumulation of external debt, so that d^* falls. This deleveraging is feasible without depleting reserves only when the current account is in surplus or near balance; otherwise the shortfall in inflows is met by falling reserves. Lever 3 thus relieves the solvency constraint by drawing down the liquidity buffer — substituting reserve depletion for debt accumulation — a margin that can be sustained only up to the reserve floor.

Summary. The signs are

$$\frac{\partial d^*}{\partial g_X} < 0, \quad \frac{\partial d^*}{\partial \theta} < 0, \quad \frac{\partial d^*}{\partial i} > 0. \quad (48)$$

Only improvements in the current account — via g_X (depreciation) or θ (demand restraint) — relax the debt constraint directly. Attracting inflows through a higher domestic rate relieves short-run liquidity pressure but accumulates debt, tightening the solvency constraint. The two faces of the external constraint are therefore bounded on opposite sides: an *upper* bound on the debt-to-exports ratio ($d \leq \bar{d}$) and a *lower* bound on reserves, to be introduced as a reserve floor. The reserve floor may be specified either as a minimum reserve-to-income ratio ($r \geq r_{\min}$) or, more naturally, as a minimum import-cover requirement ($R/M \geq \underline{\kappa}$), which in the model's notation becomes a structure-dependent floor $r \geq \underline{\kappa} m(\beta)$. Its implementation is left for the next step; here we note only that policy can choose where to sit within the box defined by the debt ceiling and the reserve floor, but cannot step outside it.

5 Preliminary comparative statics and next steps

The modern-sector share enters the equilibrium debt-to-exports ratio through the super-multiplier. In the present specification, exports are determined by world demand and are independent of structure, so the structural effect operates entirely through $\phi(\beta)$:

$$\frac{\partial \phi}{\partial \beta} = \phi^2 [h + (m_a - m_m)] > 0, \quad \frac{\partial d^*}{\partial \beta} = \frac{d^*}{\phi} \frac{\partial \phi}{\partial \beta} > 0. \quad (49)$$

Since $m_m < m_a$, a larger modern sector lowers the aggregate propensity to import and raises induced investment, increasing the supermultiplier and thus the level of output relative to a structure-invariant export base. The equilibrium debt-to-exports ratio is therefore higher in more industrialised economies.

This sign should not be read as a statement about policy space. A higher equilibrium debt ratio d^* is descriptive of where the economy settles; it is not, on its own, a measure of vulnerability. What matters for the external constraint is the position of d^* relative to the ceiling $\bar{d}$, together with the economy's capacity to service the resulting debt — both of which are revealed only when a shock is imposed. The room for policy is bounded on two sides: by the debt ceiling from above ($d \leq \bar{d}$) and by the reserve floor from below ($r \geq \underline{r}$), so that adjustment to a shock must keep the economy within this region. Because $\phi(\beta)$

is convex — rising without bound as β approaches the Keynesian stability boundary — the response of d^* to structure and to shocks is non-linear, so the comparative behaviour across β is properly assessed through simulation rather than through the sign of $\partial d^*/\partial \beta$ alone.

These comparative statics should therefore be read as indicative. They map the relations built into the model and the direction in which structure pushes the equilibrium debt ratio, but they are partial: the equilibrium reserve ratio $r^* = R/Y$ has not yet been characterised in structural terms, and the joint behaviour of debt and reserves following a shock — together with the room it leaves for fiscal, monetary, and exchange-rate policy — can only be established through simulation of the full dynamic system. The numerical experiments, comparing economies with different β under the trade and financial shocks, are the object of the next stage of the work.

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