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Fiscal policy and structural transformation in developing economies*

Peter Skott[†]

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Abstract

Developing economies with high levels of open or hidden unemployment face structural transformation problems. Unlike in mature economies there are no structural aggregate demand problems, and sustained aggregate demand stimulus can lead to a profit squeeze in the modern sector and deindustrialization. Adaptations of ‘functional finance’ to developing economies should aim to stabilize the level and composition of demand at values that are consistent with a target rate of growth of the modern sector. Populist temptations, however, may lead to deindustrialization.

EL codes: E62, O11, O23

Key words: Sectoral transformation, Dutch disease, functional finance

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1 Introduction

The DSGE orthodoxy along with most of the endogenous growth theory explain long-run growth almost exclusively by the supply side. Aggregate demand policy has a limited role and mainly comes into play via tax distortions and adverse supply-side effects. Dominant schools within the (post-) Keynesian tradition have gone to the opposite extreme. Aggregate demand is seen as the driver of economic growth, and supply-side constraints have been dismissed as largely irrelevant.¹ Like their mainstream counterparts, post-Keynesian economists have applied their models to both developing and advanced economies.

This paper adopts a different perspective. Both the demand and supply sides are important for long-run growth and, even as a first approximation, a distinction must be made between ‘mature’ and ‘dual’ economies. Labor is a binding supply-side constraint on long-run growth in mature economies, but unemployment data can be misleading. According to the World Bank, in 2019 the unemployment rates in India and France were 2.6 and 9.1 percent, respectively.² These figures suggest that if aggregate demand were to expand rapidly, India would experience labor shortages sooner than France. The Indian unemployment rate does not, however, tell us much about the extent of un- and underemployment. For all its shortcomings, the French rate provides a much more reliable picture of the degree of slack in the labor market.

France does not have full employment, but an economy need not have full employment in order to be mature.³ Economies are mature, and labor becomes a relevant constraint on the medium- and long-run growth rate, if attempts to raise the growth rate significantly through aggressive aggregate demand policies would generate labor shortages and inflation within a relatively short period. By this criterion the French, Japanese and US economies are labor constrained: official unemployment rates may be misleading, but even taking into account discouraged workers, Chinese-style annual growth rates of ten percent could not be maintained for more than a couple of years; immigration could alleviate impending labor shortages, but political constraints block this option.

Most developing countries, by contrast, have dual economies with large amounts of hidden unemployment and underemployment. India may experience shortages of some types of skilled workers, but underemployment, learning by doing and the potential for technological catch-up imply that growth rates of ten percent a year could be maintained for many years without a general labor shortage. The supply-side constraints on the modern sector come from a combination of low stocks of private fixed capital, inadequate public infrastructure and shortages of human capital. The precise form of the capital constraint differs across countries, and the details are crucial in the formulation of con-

¹See e.g. Lavoie (2014, p. 360) and Hein (2014, p. 181). Blecker and Setterfield (2019) provide a recent survey and discussion of different strands of heterodox macroeconomics and the debates between them.

²<https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS?locations=FR-IN>

³The level of ‘full employment’ is ill-defined in economies with employment hysteresis. Employment hysteresis does not, however, eliminate constraints on the long-run growth rate of employment.

crete development policies. For the purposes of this paper, however, the point is simply that current resources must be invested in order to expand the modern sector.

The supply side interacts with the demand side. Mature economies may suffer from *structural aggregate demand problems* ('secular stagnation'). The long-run growth rate of the capital stock is constrained by the 'natural growth rate' (the growth rate of the labor force in efficiency units), and a high saving rate leads to chronic aggregate demand deficiencies. In these circumstances fiscal and monetary policy along the lines suggested by 'functional finance' may be needed to sustain full employment growth and achieve a desirable share of investment in output (Lerner 1943).

Dual economies face a *structural transformation problem*. With a small modern sector and large amounts of (open or hidden) unemployment, the policy targets must change. Capital constraints make it impossible to achieve full employment in a meaningful sense, but aggregate demand policy may target the growth rate of the modern sector and the full utilization of the capital stock in the modern sector, rather than 'full employment'.

High saving rates do not cause structural aggregate demand problems in dual economies; they represent an opportunity to increase investment and the growth rate of the modern sector.⁴ The private sector must have an incentive to invest, however, and macroeconomic policies are needed to stabilize the demand for the output of the modern sector. In open economies, additionally, balance of payments problems must be avoided, and the domestic modern sector must be internationally competitive. But successful development requires high saving, and a sensible aggregate demand will typically avoid persistent deficits and high public debt.

The analysis in this paper emphasizes sectoral differences and interactions between the demand and supply sides. There are strong affinities with classical development theory, but the paper also builds directly on Keynesian theory and my work with Soon Ryoo on functional finance.⁵ The one-sector model in section 2 illustrates a key result from Ryoo and Skott (2013): the long-run debt income ratio is inversely related to the growth rate of the economy. In a mature economy the growth rate is constrained by the growth of the labor supply in efficiency units, and causation runs from growth to debt. In a dual economy, however, there is no unambiguous one-way causation; the inverse relation between the debt ratio and economic growth reflects a tradeoff between accumulation and current consumption.

One-sector models have intrinsic limitations, but the severity of the limitations depend on the questions the models are asked to address and the economies to which they are applied. A one-sector model may be adequate for the analy-

⁴As argued by Nurkse (1953, p.1), the supply side constraints in developing economies derive from the shortage of capital which is "at the centre of the problem of development".

⁵See Ryoo and Skott (2013) and Skott (2016) for formalizations and extensions of functional finance to the long run. The application of functional finance to dual economies is discussed in Skott (2020). Ros (2013) provides an overview and discussion of classical development theory and its relation to neoclassical and Keynesian theories of economic growth.

sis of aggregate demand shocks in an economy like France, the US or Japan. For India, Brazil or South Africa, however, the sectoral differences are greater, and the interaction between the sectors should not be ignored. The model is extended in section 3, which adds a second sector. A modern sector is able to draw in workers from an informal sector with underemployment and low incomes but, unlike in the one-sector model, the two sectors also interact on the demand side. Workers in the informal sector consume both formal and informal sector goods, and incomes in the formal sector are spent on informal as well as formal sector goods.⁶

An economy is dual if the modern sector has a highly elastic labor supply at a wage rate that makes it profitable for firms in the modern sector to expand production. The model implies that average incomes in the informal sector are demand determined and that populist temptations to boost aggregate demand and/or redistribute income towards the informal sector can lead to ‘premature maturity’. These temptations can become particularly strong if the economy is open, contains a resource-based third sector – ‘oil’, as a shorthand – and obtains a windfall gain from rising oil revenues.

This possibility is considered in the three sector-model in section 4. The model implies the possibility of a Dutch disease in which a temporary oil boom sets in motion a process of permanent deindustrialization as the economy enters a development trap.⁷ This part of the paper can be seen as a companion piece to Martins and Skott (2020). The focus is different, however. Martins and Skott analyze sources of inflation and the short- to medium-run impact of inflation targeting and balanced budgets in developing countries; the present paper looks primarily at fiscal policy and its implications in the medium and long run. Both papers share an obvious limitation: aggregate demand policy is only one element in a larger package of policies. Mismanagement of aggregate demand can jeopardize economic development, but complementary policies, including industrial and education policies, are crucial for successful development. A discussion of these broader issues is beyond the scope of this paper.

The concluding section 5 considers the relation between this paper and some mainstream and (post-) Keynesian perspectives.

⁶The model is related to those in Razmi et al. (2012) and Skott and Gomez-Ramirez (2018). Neither of these papers, however, discusses fiscal policy, and the detailed specifications also differ in some respects.

⁷Development traps were central to classical development theory (e.g. Rosenstein-Rodan 1943, Leibenstein 1957). Kaldor (1966, 1970) inspired a large literature on related themes of increasing returns to scale and uneven development. The Dutch disease has been analyzed by Corden and Neary (1982) and Krugman (1987), among others; Rodrik (2016) and Bresser-Pereira et al. (2014) are among the contributors that have emphasized the dangers of overvalued exchange rates and premature deindustrialization.

2 The warranted growth rate in a one-sector model

Disregarding short-run lags and assuming that consumption is a linear function of after-tax wage income, after-tax capital income and wealth, the goods market equilibrium condition for a closed economy can be written

$$\begin{aligned} \frac{Y}{K} &= \frac{C}{K} + \frac{I}{K} + \frac{G}{K} \\ &= c_w(1-\tau)(1-\pi)\frac{Y}{K} + c_\pi(1-t)\left(\pi\frac{Y}{K} + rb\right) \\ &\quad + \mu(1+b) + (g + \delta) + \gamma \end{aligned} \quad (1)$$

Y, C, I and G denote output, consumption, investment and government spending on goods and services. Wage and capital income are taxed at the rates τ and t , respectively.⁸ The parameters c_w, c_π and μ are the consumption rates out of wages, capital income (profits and interest payments on the public debt) and wealth. The specification of consumption includes several standard consumption functions as special cases. With $c_w = c_\pi$, consumption depends on aggregate disposable income and wealth; the case with $c_\pi = 0$ yields a specification in which labor income and wealth determine consumption, as in many traditional Keynesian consumption functions; a post-Keynesian/classical specification of consumption has $\mu = 0$ and $c_\pi < c_w$. Private wealth is taken to be equal to the sum of the capital stock K and the public debt B , and b denotes the ratio of public debt to capital ($(K + B)/K = 1 + b$);⁹ g, δ and γ are the growth rate of the capital stock, the rate of depreciation, and the ratio of government spending to capital (G/K). The share of the government sector in the economy – the value of γ – is contentious but, for present purposes, may be taken as exogenous; through some decision process it has been decided how many resources to devote to public health, education and other public services.

The output capital ratio is determined by the choice of technique and the utilization rate of capital, u . Smooth capital-labor substitution plays a central role in mainstream growth models, but the Cambridge Capital Controversy cast doubt on this approach, and I shall take the production technique as given,

$$Y = \min\{\kappa K, \lambda L\}$$

This Leontief specification may be the *ex-post* reflection of a choice of technique and an exogenously given real rate of interest; Skott (1989).

Some strands of post-Keynesian economics see the utilization rate as an accommodating variable that can take pretty much any value, even in the long

⁸The tax rate t may be interpreted broadly to include indirect taxes on luxury goods which can act as a consumption tax. Wealth taxes could be also be included but would not add anything for present purposes.

⁹In a corporate economy household wealth takes the form of financial assets, including equity and corporate bonds, rather than direct ownership of fixed capital. The analysis of fiscal policy in a mature economy is extended in this direction by Ryoo and Skott (2013).

run. This approach is unconvincing on both behavioral and empirical grounds, and I assume that the utilization rate will be at a ‘normal’ or ‘desired’ level in steady growth, $u = u^d$; I shall return to this issue in section 5.

The desired utilization rate is determined by structural characteristics of goods and labor markets, and it need not be constant; in the US, for instance, it may have declined since the 1980s as a result of decreasing competition in the goods market. For present purposes, however, there is no harm in taking the desired rate of utilization as constant, and I shall assume that steady growth requires that $Y/K = \kappa u^d = \sigma$. With these assumptions, the equilibrium condition (1) describes a long-run tradeoff between accumulation and consumption (private and public):

$$g + \delta = \sigma - \left[\frac{C}{K} + \gamma \right] \quad (2)$$

Equation (2) defines a warranted rate of growth, g . For given values of the private consumption ratio C/K , the output capital ratio σ and the government consumption ratio γ , the equation determines the unique accumulation rate that is compatible with goods market equilibrium; an increase in the consumption ratio reduces the warranted rate.¹⁰

The natural rate of growth – the growth rate of the labor supply in efficiency units – sets an upper limit on the accumulation rate in a mature economy; the left hand side of equation (2) cannot exceed the natural rate. A combination of high saving rates (a low value of C/K), low government spending and a low natural rate of growth therefore produces structural aggregate demand problems: in the absence of policy intervention, the left hand side will exceed the right hand side. The problem can be addressed by sustained fiscal stimulus; tax reductions and high government debt ratios or a sustained increase in government spending can be used to maintain full-employment growth (e.g. Schlicht 2006, Ryo and Skott 2013, Skott 2016).

Matters are quite different in dual economies with large amounts of underemployment and a supply of labor to the modern sector that is (almost) perfectly elastic. The capital stock – rather than the labor supply – represents the binding supply-side constraint in the modern sector. Unlike in mature economies, investment can absorb high saving rates: high accumulation rates are desirable, and there is no structural aggregate demand problem.

While Harrod’s first problem (the reconciliation between the warranted and natural rates of growth) applies only to mature economies, the second problem – the instability of the warranted growth path – may be relevant in both dual and mature economies. Dual economies, like their mature counterparts, may require active stabilization policy. The focus in this paper is on the properties of long-run growth paths, and I assume that this stabilization policy is successful: there may be short-run fluctuations in utilization rates, but stabilization policy ensures that u^d provides a good approximation to the average, long-run value

¹⁰The equation is similar to the consumption-growth frontier in classical economics; see e.g. Foley et al. (2019).

of u .¹¹

With this assumption, a self-contained modern sector with access to a perfectly elastic supply of labor can be analyzed using equation (2) as the starting point. The equation shows that current private and/or public consumption must be squeezed to allow an increase in accumulation and faster expansion of the modern sector. This squeeze can be achieved by increasing taxes: the higher the growth rate, the lower must be consumption and the higher the required taxes. As a direct implication, successful development is likely to be associated with low government deficits and low public debt ratios.

Consider a simple scenario in which government policy follows an adaptation of functional finance to dual economies. Specifically, assume that the ratio of government consumption to capital is constant and that taxes are adjusted to maintain a constant accumulation rate. Using equations (1) and (2) we have

$$c_w(1 - \tau)(1 - \pi)\sigma + c_\pi(1 - t)(\pi\sigma + rb) = \sigma - (g + \delta) - \gamma - \mu(1 + b) \quad (3)$$

The total tax revenue is given by

$$\frac{T}{K} = \tau(1 - \pi)\sigma + t(\pi\sigma + rb) \quad (4)$$

The tax rates τ and/or t must be chosen to satisfy equation (3) and – unless $c_w = c_\pi$ – equations (3)-(4) imply that the tax revenue depends on the tax structure. Consider the empirically plausible case with $c_w > c_\pi$. Consumption drops by c_π if taxes on capital income increase by one unit. To offset this fall and maintain the aggregate level of consumption, taxes on wage income have to decrease. But because the consumption rate out of wages is larger than the consumption rate out of profits, the required fall in wage taxes is less than one unit, and the aggregate tax revenues increase. Formally, if $c_w dT^w + c_\pi dT^\pi = 0$, we have $dT^w/dT^\pi = -c_\pi/c_w > -1$ and $dT = dT^w + dT^\pi = (-c_\pi/c_w + 1)dT^\pi > 0$.

These results cast light on the dynamics and comparative statics of public debt. The evolution of the debt ratio is given by

$$\dot{b} = \gamma + rb - \frac{T}{K} - gb \quad (5)$$

where $\dot{b} = db/dt$ is the rate of change of the debt ratio. An increase in the debt ratio raises the interest payments (rb), but if taxes on capital income are used as the fiscal instrument, the induced increase in taxes dominates. Intuitively, an increase in wealth (a rise in b) must be associated with a fall in rentiers' after-tax income in order to keep consumption constant; rentiers' after tax income will not fall, however, unless taxes increase by more than the rise in pre-tax interest payments. Thus, we have $\partial[\gamma + rb - \frac{T}{K} - gb]/\partial b < -g < 0$, and the differential equation (5) has a stable stationary solution: the public debt converges to a steady growth value (see Appendix A).

¹¹Ryoo and Skott (2017) and Franke (2018) analyze stabilization policy in a Harroddian economy.

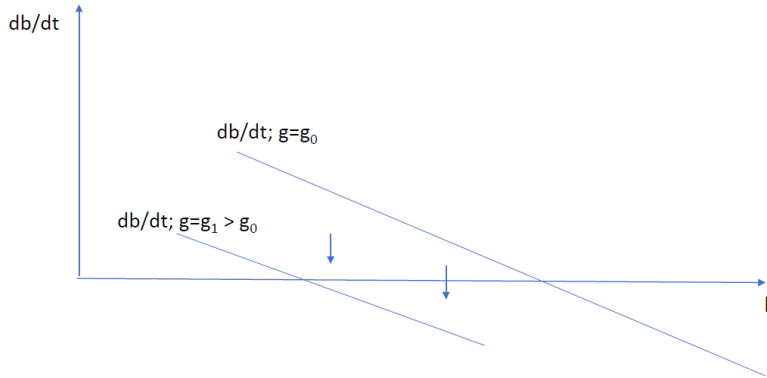


Figure 1: Dynamic effects on the debt ratio of a rise in economic growth

The differential effects of wage and profit taxes imply that the stability properties become ambiguous when taxes on wage income are used as the fiscal instrument. The consumption effect of an increase in wealth must still be offset by reductions in after-tax incomes, but high consumption rates out of wages imply that only a small tax increase may be needed. For plausible parameter values the stationary solution will still be stable (Appendix A), but the structure of taxation affects the long-run debt ratio: the higher the tax rate on wages, the higher will be the debt ratio. Regressive taxation, in other words, will tend to produce high debt ratios. Putting it differently, if reductions in the debt ratio are a priority, policy makers should shift taxation from wages towards capital income.¹²

The growth rate also affects the debt ratio; the higher the growth rate, *ceteris paribus*, the lower the asymptotic debt ratio. An increase in accumulation requires a squeeze on consumption, the tax rates must be raised, and an increase in tax rates reduces the rate of change of the debt ratio \dot{b} for any given level of b . The downward shift in the expression on the right-hand side of equation (5) must reduce the stable stationary solution (see Figure 1). In other words, successful development and fast structural transformation will be associated with low public debt.

The inverse relation between growth and debt is subject to an important caveat. Public investment in infrastructure and education can be essential for successful development, and state-owned enterprises have been important in the development of many economies, including China and other East Asian

¹²Calls for reductions in government consumption to reduce debt, by contrast, would be counterproductive: they would *raise* the long-run debt ratio. This result, which may seem paradoxical, follows from equation (3). Private consumption must fill the gap if public consumption is reduced, and because consumption rates are less than one ($c_w < 1, c_\pi < 1$) this requirement implies that a tax reduction must exceed the fall in government consumption. Thus, the public deficit increases and the debt ratio will rise.

countries. To the extent that successful development is associated with active government intervention and a large share of government investment in total investment, the implications for government deficits become ambiguous: a large share of public investment in total investment tends to raise the government deficit and the long-run debt ratio.¹³

The above analysis has taken as given the target rate of growth of the modern sector. It is not obvious, however, how the target rate should be chosen. In a mature economy the full employment target for economic policy is relatively uncontroversial and reasonably well-defined.¹⁴ Matters are different in the adaptation of functional finance to a dual economy; the tradeoff between accumulation and current consumption implies that the choice of the target rate of growth can be contentious. In highly unequal dual economies there are strong arguments in favor of a squeeze on the luxury consumption of the rich, but that does not settle the issue. The resources that were previously absorbed by luxury consumption could be used to increase accumulation or alleviate current poverty; decision makers still face an intertemporal tradeoff.

If we disregard the thorny questions about the appropriate weighting of current and future welfare, there is an additional issue: the nature of the tradeoff may not be well understood by policy makers and the population at large. This lack of understanding can give rise to a short-termist bias. The benefits of investment come in the future, and low incomes in the informal sector provide strong incentives for governments to engage in fiscal expansion and redistribution of income. If the accumulation rate – and thereby the growth rate of the formal sector – is adversely affected, future incomes will suffer, and underemployment will increase (or decline more slowly). But these losses will be less visible than immediate sacrifices associated with high accumulation and low current consumption.

3 A two-sector model of a dual economy

The one-sector model in section 2 points to dangers of fiscal expansions that boost consumption. But a dual economy, by definition, has at least two distinct sectors, and a one-sector analysis can be misleading if there are significant interactions between the sectors.

The traditional Lewis model (Lewis 1954) identifies the informal sector with subsistence agriculture. Subsistence agriculture may be self-contained; it nei-

¹³The required tax revenue, which is determined by the tax structure and the equilibrium condition (1), depends on the value of $g + \delta + \gamma$, where the accumulation rate $g = (I^{public} + I^{private})/K$ includes both private and public investment and γ is the ratio of government consumption to capital. Taking into account public investment, the debt dynamics, by contrast, depends on $\gamma + I^{public}/K = \gamma + \rho g$ where ρ is the share of public investment in total investment. An increase in ρ has no effect on the required taxes but increases government deficit. Thus, if public investment makes up a large proportion of total investment, fast growth need not be associated with low debt.

¹⁴Measurement problems and path dependencies complicate matters in practice. These problems are important but outside the scope of this paper.

ther sells output to the modern sector nor provides a market for the goods produced by the modern sector. In many developing economies, however, large parts of agriculture are formal, while significant proportions of non-agricultural production belong to the informal sector. The informal sector will not in general be self-contained in these economies. The appropriate delineation of the sectors and the precise ways in which the sectors interact will depend on the particular applications, but the stylized model in this section illustrates the kind of issues that cannot be addressed by a one-sector analysis.

The formal sector typically is much more capital intensive than the informal sector. As a simple version of this stylized fact, it may be assumed that the informal sector has labor as its only input, while the modern sector uses capital and labor.

The production function in the modern sector is taken to be Leontief, as in the one-sector model in section 2. The utilization rates of capital and labor fluctuate but, as in section 2, the fluctuations take place around average values that may be taken as approximately equal to the desired levels. Formally,

$$M = \sigma K = \lambda L_M$$

where M , K and L_M denote output, capital and employment in the formal sector. The capital stock is predetermined in the short run, and employment is determined by the capital stock and the level of labor productivity, $L_M = \sigma K/\lambda$. The capital coefficient (σ) is constant, but labor productivity (λ) increases over time. Using a Verdoorn-type specification, labor productivity growth ($\hat{\lambda}$) depends on the rate of accumulation (which is equal to the rate of growth of output in the modern sector),

$$\hat{\lambda} = \rho_0 + \rho \hat{K} = \rho_0 + \rho \hat{M} \quad (6)$$

where hats are used to denote growth rates. The product real wage (w_M) in the modern sector is given by

$$w_M = \lambda(1 - \pi) \quad (7)$$

where π is the profit share.

Workers who fail to get a job in the modern sector move to the informal sector. Hence,

$$L_A = N - L_M = N\left(1 - \frac{L_M}{N}\right) = N\left(1 - \frac{\sigma K}{\lambda N}\right) \quad (8)$$

where N is the total labor supply. The total labor supply grows at a rate n ,¹⁵

$$\hat{N} = n$$

¹⁵In the one-sector model no distinction was made between the growth rate of labor in natural units and the rate of technical change; the natural growth rate was given by the sum of the two. The distinction becomes important in this two-sector model, and n represents the growth of the labor force in natural units. In a mature economy, the natural rate of growth is $n + \hat{\lambda}$; if n is exogenous and labor productivity follows Verdoorn's law, the (semi-endogenous) natural rate is equal to $(n + \rho_0)(1 - \rho)$.

The informal sector produces the output A , using labor as the only input. If p_A denotes the price of informal goods, total income in the sector is $p_A A$, and the average income (w_A) in the sector becomes

$$w_A = \frac{p_A A}{L_A}$$

Let

$$A = F(eL_A)$$

where e is the ‘employment rate’ in the informal sector and unemployment ($1-e$) can take the form of hidden underemployment.

The production function in the informal sector may exhibit constant or decreasing returns to scale. A constant-returns assumption would seem reasonable for an urban sector; it would be unreasonable for agriculture, where land is a critical input. Given the simple specification of the structure of demand in this paper, however, average incomes in the informal sector are independent of the returns to scale and the rate of unemployment in the informal sector (see below). Thus, the returns to scale in the informal sector and the determination of the employment rate e can be left open.

As in section 2, formal-sector wages and capital income are taxed at the rates τ and t , respectively. Informal sector workers may benefit from transfers and targeted public services, but the avoidance of taxes and regulations is typically seen as a defining characteristic of informality. Thus, I assume that incomes in the informal sector go untaxed. The sum of government consumption (G) and transfers to the informal sector (Θ) is taken to be proportional to the capital stock: $G + \Theta = \gamma K$, where γ is policy determined and exogenous. Transfers to workers in the modern sector are reflected in the tax rate τ , which is net of transfers.

All after-tax wage incomes are spent on consumption, as are direct transfers from the government to workers.¹⁶ The consumption by profit recipients in the modern sector depends positively on after-tax income and wealth; the relation is linearly homogeneous and, as in section 2, wealth is taken to be the sum of the capital stock K and the government debt B .

Formally, consumption, investment and government spending are given by

$$\begin{aligned} C &= C^w + C^\pi \\ &= [(1 + \theta)w_A L_A + (1 - \tau)w_M L_M] + c_\pi(1 - t)(\pi M + rB) + \mu(K + B) \\ I &= (g + \delta)K \\ G &= \gamma K - \theta w_A L_A \end{aligned}$$

where $\theta = \Theta/(w_A L_A)$ is the ratio of informal-sector transfers to informal-sector market income. All prices and wages are measured in terms of formal sector goods (p_M is normalized to one).

¹⁶Because workers do not save, it does not matter for present purposes whether transfers take the form of goods or cash; the demand effects are the same.

For simplicity, it is assumed that nominal private consumption and government spending are split between the formal and informal sectors in the same, fixed proportions, the proportion α going to the formal sector.¹⁷ Investment goods, by contrast, tend to be relatively advanced (and often have to be imported in developing economies), and as a first approximation it seems reasonable to assume that investment is produced by the formal sector.

These assumptions about the composition of demand imply that the equilibrium condition for the informal A -sector can be written

$$\begin{aligned}
w_A L_A &= p_A A = (1 - \alpha)(C + G) & (9) \\
&= (1 - \alpha)\{(1 + \theta)w_A L_A + (1 - \tau)w_M L_M + c_\pi(1 - t)(\pi M + rB) \\
&\quad + \mu(K + B) + (\gamma K - \theta w_A L_A)\} \\
&= (1 - \alpha)\{w_A L_A + \\
&\quad [(1 - \tau)(1 - \pi)\sigma + c_\pi(1 - t)(\pi\sigma + rb) + \mu(1 + b) + \gamma]K\}
\end{aligned}$$

Solving for w_A and using equation (8), we get

$$w_A = \lambda \frac{1 - \alpha}{\alpha} \frac{1}{\sigma} [(1 - \tau)(1 - \pi)\sigma + c_\pi(1 - t)(\pi\sigma + rb) + \mu(1 + b) + \gamma] H(k) \quad (10)$$

where k is the modern sector's share of employment,

$$k = \frac{L_M}{N} = \frac{\sigma K}{\lambda N}$$

and

$$H(k) = \frac{k}{1 - k}$$

The IS condition provides a second equilibrium condition,¹⁸

$$\begin{aligned}
Y &= M + p_A A = C + I + G \\
&= w_A L_A + (1 - \tau)(1 - \pi)\sigma K + c_\pi(1 - t)(\pi M + rB) + \mu(K + B) \\
&\quad + (g + \delta)K + \gamma K
\end{aligned}$$

or

$$\sigma K = (1 - \tau)(1 - \pi)\sigma K + c_\pi(1 - t)(\pi\sigma + rb)K + \mu(1 + b)K + (g + \delta)K + \gamma K$$

Dividing through by K , this equation can be solved for the accumulation rate g ,

$$g + \delta = \sigma - [(1 - \tau)(1 - \pi)\sigma + c_\pi(1 - t)(\pi\sigma + rb) + \mu(1 + b) + \gamma] \quad (11)$$

¹⁷Constant expenditure shares of consumption are consistent with a Cobb-Douglas utility function.

A distinction could be made between consumption out of wage income (which may go predominantly to the informal sector) and consumption out of profit income (which may go predominantly to the formal sector). Razmi et al. (2012) make this alternative assumption about consumption patterns.

¹⁸The equilibrium condition for the formal good could have been used instead. The two conditions are equivalent in the two-sector model when the equilibrium condition for the informal sector is met.

The dynamics of the debt ratio, finally, is given by

$$\dot{b} = (\gamma + rb - t(\pi\sigma + rb) - \tau(1 - \pi)\sigma) - gb \quad (12)$$

Equations (11)-(12) correspond to equations (3) and (5) in the one-sector model. There is a tradeoff between growth and current consumption, and if γ is kept constant, equation (11) implies that suitable adjustments in the tax rates are needed to maintain a constant target rate of growth g^T , that is, to ensure that (11) is satisfied with $g = g^T$. As in section 2, this adaptation of functional finance to a dual economy produces a differential equation for the debt ratio. The stationary point is unambiguously stable, if the tax rate on capital income is used as the fiscal instrument, and stable for plausible parameter values, if the tax rate on wage income (τ) is used as the instrument. As in section 2, the long-run value of b depends inversely on the growth rate.

Limited institutional capabilities of the fiscal authorities may hamper the implementation of the dual-economy version of functional finance, but even if we disregard this constraint on government policy, the temptations to prioritize current consumption carry over to the two-sector model. Populist movements may have neither the inclination nor the power to confront political and economic elites by imposing significant taxes on capital income and luxury consumption; reduced taxes on wages and increased government social spending, by contrast, may find widespread support. As in the one-sector model, these policies will reduce the long-run growth rate (equation (11)). But the two-sector model introduces an additional complication.

Dual economies with large informal sectors have small capital stocks, low levels of modern-sector labor productivity, and low modern-sector wages.¹⁹ But if incomes are even lower in the informal sector, the supply of labor to the formal sector will still be highly elastic. By assumption, workers in the informal sector do not pay taxes, and their relative position is enhanced by government transfers. Combining equations (7)-(11), the post-tax income ratio is

$$\frac{w_A(1 + \theta)}{(1 - \tau)w_M} = \frac{1}{\sigma} \frac{(1 + \theta)(1 - \alpha)}{(1 - \tau)(1 - \pi)\alpha} [\sigma - (g + \delta)]H(k) \quad (13)$$

Equation (13) determines the post-tax wage ratio as a function of τ, θ, π, g and k . The ratio depends positively on the employment composition $k = L_M/N = \sigma K/(\lambda N)$, which changes over time. Employment shifts away from the informal sector and towards the formal sector if the accumulation rate exceeds the ‘natural rate of growth of the formal sector’ ($\hat{N} + \hat{\lambda}$). As the formal sector expands during a process of successful development, the average income in the informal sector rises for any given values of the tax parameters, the growth rate and the profit share (equation (10)). The improvement for informal sector workers carries over to the relative wage (equation (13)); workers in the informal sector gradually catch up with workers in the modern sector.

¹⁹Learning by doing, as specified in equation (6), implies that the level of labor productivity is related to the size of capital stock.

High post-tax relative incomes in the informal sector can endanger the development process. Duality requires that formal-sector jobs be seen as more attractive than staying in the informal sector. Thus, the post-tax wage rate in the formal sector must be at or above some threshold level related to the average income in the informal sector. Suppose duality requires that

$$(1 - \tau)w_M \geq \nu(1 + \theta)w_A \tag{14}$$

There are no entry barriers to the informal sector, and if this lower bound on after-tax wages in the modern sector represents a reservation wage, the labor supply to the formal sector would cease to be elastic if the inequality did not hold.

The ‘dual-economy condition’ in (14) can be given an alternative interpretation, however. The lower bound on modern-sector wages may reflect established pay norms, rather than a constraint on the ability of the modern sector to hire workers. Workers receive a wage premium and willingly accept modern-sector jobs, but a violation of the norms is seen as unfair, and there may be adverse effects on morale and ‘effort’ as well as increasing nominal wage demands (Akerlof and Yellen 1990, Skott 2005).

Suppose that a shock has led to a violation of the dual economy condition. Nominal wages in the formal sector start increasing, but this increase may not return relative wages to the norm. Increased money wages have no effect on the product real wage in the modern sector as long as firms maintain a fixed markup, and if tax rates, government spending and accumulation rates were kept constant, nominal wages in the informal sector would rise *pari passu* (equation (13)) The wage ratio would be unchanged, and the scene would be set for explosive inflation. Demand and supply factors combine to produce this result. High aggregate demand and/or redistributive policies raise incomes in the informal sector; the rise in informal sector incomes leads to cost-push inflation in the formal sector; increasing nominal wages and prices in the formal sector are transmitted back to the informal sector in the form of rising nominal demand, and nominal incomes in the informal sector increase. The loop is closed, and inflationary pressures can develop despite high levels of underemployment and normal utilization rates of capital in the modern sector; Martins and Skott (2020) discuss the cross sectoral interactions and the implications for inflation in greater detail.

Increasing inflation will prompt a policy response. Adjustments could be made to the structure of taxes and transfers in order to raise the relative wage in the formal sector and maintain the target rate of growth. This could be achieved by shifting taxes towards the rich (raising the tax on profit income to offset the demand effects of a reduction in the taxation of workers in the modern sector) or by regressive changes that offset reductions in τ by reductions in θ . More likely than not, however, inflationary pressures will be seen as a sign of a general overheating of the economy that needs to be countered by contractionary policies.²⁰ Thus, suppose that faced with inflationary pressures, governments

²⁰Martins and Skott (2020) consider a scenario along these lines, showing that a combination

abandon growth targets for the modern sector when the dual economy constraint becomes binding. Policy, instead, is adjusted to ensure that the dual economy constraint (14) will be satisfied as an equality. For given values of the policy parameters t and θ , the required relative wage in the modern sector ν and the predetermined capital ratio k , equations (13)-(14) define a relation between the profit share π and the growth rate g :

$$\frac{1}{\nu} = \frac{1}{\sigma} \frac{(1+\theta)(1-\alpha)}{(1-\tau)(1-\pi)\alpha} [\sigma - (g + \delta)] H(k) \quad (15)$$

The profit share need not be constant. Firms' pricing decisions react to demand conditions and, following a Robinson-Kaldor-Harrod tradition in post-Keynesian economics, it may be assumed that high demand and persistent positive gaps between actual and desired utilization rates lead to increasing profit shares and accumulation rates.²¹ Disregarding short-run fluctuations, the average utilization rate must be (approximately) at the desired level, that is, $M/K = \sigma$. With utilization at the desired rate, the rate of growth can be determined by the strength of the incentives to expand production as reflected in the profit share. Formally, firms' pricing and investment decisions imply a second, positive relation between growth and profitability,

$$g = g(\pi); \quad g' > 0 \quad (16)$$

Equation (16) is consistent with a variety of specifications of the short-run dynamics for pricing and investment; Appendix B outlines three examples.

Equations (15)-(16) take the place of functional finance and a commitment to a target growth rate. The general story is as outlined above. Violations of the dual economy constraint and the ensuing inflationary pressures lead to contractionary policies; profit margins and accumulation rates decline as utilization rates fall below the desired rate; inflation is curbed by the decline in profit shares; policy is relaxed to allow utilization rates to return to the desired rate; profit shares stop falling, but the new steady growth path has lower profit shares and accumulation rates. In short, the dual economy condition is satisfied by a squeeze on the profit share which raises the modern sector wage w_M . The incentives for firms to expand are blunted, and growth rates suffer.

The story presumes that a decline in the profit share and accumulation raises the relative wage of modern sector workers and reduces the inflationary pressures. If it did not, the adjustment process would be unstable. The 'stability requirement' is satisfied as long as the sensitivity of the growth rate to variations in the profit share is sufficiently low.²² Formally, the right hand side of equation

of large relative income shocks and inflation targeting can squeeze the modern, tradable sector.

²¹Skott and Zipperer (2012) discuss differences and similarities between different post-Keynesian models.

²²This stability condition is different from the standard Robinsonian condition. The standard condition ignores policy and considers the effect of changes in profit shares on aggregate demand. In the present context, policy adjusts to the inflationary pressures, and a condition is needed to ensure that a decline in the profit share in the formal sector will raise the relative wage of formal-sector workers, taking into account the effect of changes in profit shares on the accumulation rate.

(15) is decreasing in π if

$$(1 - \pi)g'(\pi) < \sigma - g(\pi) - \delta \quad (17)$$

If the condition (17) is satisfied and the duality condition is binding, equations (15)-(16) define the profit share and growth rate as implicit functions of k, θ, τ, ν . We have

$$\begin{aligned} \pi &= \pi(k, \theta, \tau, \nu); & \pi_1 < 0, \pi_2 < 0, \pi_3 < 0, \pi_4 < 0 \\ g &= g(\pi) = g(k, \theta, \tau, \nu); & \pi_1 < 0, \pi_2 < 0, \pi_3 < 0, \pi_4 < 0 \end{aligned}$$

Thus, increases in θ and τ reduce economic growth if the dual economy condition is binding.

The empirical relevance of this analysis may seem questionable. The relative wage norms, first, are likely to be path dependent. Differences between actual and fair relative wages can be eliminated if wage ratios that are initially seen as unfair gradually acquire the status of reference ratios and become what is expected (e.g. Kahneman et al. 1986, Skott 2005). Actual wages, in Hicks's (1975, p. 65) words, may get the "sanction of custom"; they become "what is expected; and (admittedly on a low level of fairness) what is expected is fair". This endogeneity of fair wages implies that a gradual expansion of the modern sector – a gradual increase in k – may be accommodated by adjustments in the wage norm ν ; large shocks to relative wages, by contrast, cannot be accommodated in this way (Martins and Skott 2020).

It may seem unlikely, second, for the duality condition to be binding if the modern sector is small; the expression on the right hand side of equation (15) goes to zero if the share of modern sector employment goes to zero (which implies that $H(k)$ goes to zero). But not all dual economies have tiny modern sectors and, perhaps more important, the two-sector model underestimates the potential risks of 'premature maturity'. The risks increase significantly if the economy is open and we add 'oil' as a resource-based, export sector. 'Oil' can be seen as a shorthand for a range of activities that are sensitive to external shifts in demand, but where the input of domestic labor and capital changes little in response to variations in export prices or the discovery of new resource endowments. Oil, minerals and some other commodities are among the goods that fit this category.

4 A three-sector model of an open economy

The extension to three sectors is relatively straightforward if the inputs of domestic labor and capital in the oil sector are negligible and oil is a pure export good.

Oil exports generate private rents and public taxes and royalties. Let $p_x X$ denote total oil revenues (in terms of domestic formal goods) and let β be the fraction that goes to the state. Assume, as a first approximation, that oil revenues are being spent on consumption; private rents $(1 - \beta)p_x X$ are spent on

private consumption, while government spending is now given by $(G + \Theta)/K = G/K + \theta w_A L_A = \gamma_0 + \beta p_x X/K$. The motivation for this respecification of government spending is simple: oil exports affect both government revenues and aggregate income, and both of these are likely to have an influence on what is deemed the appropriate amount of public spending.

Empirically, virtually all tradable goods are produced by formal sectors. The output of the informal sector therefore is taken to be nontradable. But domestic consumption and the equilibrium condition for the informal sector are affected by oil, and this in turn affects average incomes in the informal sector. By assumption the oil sector uses no domestic inputs of labor and capital, but – still assuming that the fraction $1 - \alpha$ of private and public consumption goes to the informal sector – equation (10) now includes an extra term:

$$w_A = \lambda \frac{1 - \alpha}{\alpha} \frac{1}{\sigma} [(1 - \tau)(1 - \pi)\sigma + c_\pi(1 - \tau)(\pi\sigma + rb) + \mu(1 + b) + \gamma_0 + \frac{p_x X}{K}] H(k) \quad (18)$$

Turning to trade, most developing countries face balance of payments constraints. As a stylized version of these constraints, it is assumed that trade must be balanced, that is,

$$NX = 0$$

If this balance of payments constraint is satisfied, the IS condition remains unchanged, compared to the two-sector model of a closed economy. Domestic production and exports increase by the value of oil ($p_x X$), but imports go up by the same amount,

$$\begin{aligned} Y &= p_A A + M + p_x X = C + I + G + NX = C + I + G & (19) \\ &= w_A L_A + (1 - \tau)(1 - \pi)\sigma K + [c_\pi(1 - t)(\pi\sigma + rb) + \mu(1 + b)]K \\ &\quad + (\gamma_0 + \frac{p_x X}{K})K + (g + \delta)K & (20) \end{aligned}$$

Subtracting $p_x X$ and $p_A A = w_A L_A$ from both sides and dividing by K , this equilibrium condition can be written

$$\sigma = (1 - \tau)(1 - \pi)\sigma + c_\pi(1 - t)(\pi\sigma + rb) + \mu(1 + b) + \gamma_0 + g + \delta \quad (21)$$

This equation is equivalent to equation (11), the only difference being that γ_0 has taken the place of γ .

Using equations (18)-(21), the post-tax relative wage now becomes

$$\frac{(1 + \theta)w_A}{(1 - \tau)w_M} = \frac{(1 + \theta)}{(1 - \tau)(1 - \pi)} \frac{1 - \alpha}{\alpha} \frac{1}{\sigma} \{[\sigma - (g + \delta)]H(k) + \frac{p_x X}{K}H(k)\} \quad (22)$$

Oil is a pure export good, and the price of oil in foreign currency (p_x^*) is taken as exogenous. Hence,

$$p_x = E \frac{p_x^*}{p_M} = \eta \frac{p_x^*}{p_M^*} = \eta \quad (23)$$

where E denotes the nominal exchange rate; $\eta = Ep_M^*/p_M$ is the price of foreign tradable goods in foreign currency and to simplify notation, the foreign currency prices of oil and foreign tradable goods have been normalized to one. $p_X^* = p_M^* = 1$. I shall refer to η as the real exchange rate.

Combining equations (6) and (22)-(23), the duality condition can be written (see Appendix C)

$$\frac{(1+\theta)w_A}{(1-\tau)w_M} = \frac{1}{\nu} = \frac{(1+\theta)}{(1-\tau)(1-\pi)} \frac{1-\alpha}{\alpha} \frac{1}{\sigma} \left\{ [\sigma - (g+\delta)] \frac{\sigma K^{1-\rho}}{B - \sigma K^{1-\rho}} + \frac{\sigma \eta X}{BK^\rho - \sigma K} \right\} \quad (24)$$

where

$$B = B_0 e^{(n+\rho_0)t}$$

It follows from equation (24) that a positive shock to ηX increases the relative post-tax incomes in the informal sector. This result in itself is not surprising. A booming oil sector raises private consumption and allows the government to pursue popular policies of expansion and redistribution. But the equation has a more subtle implication. The duality condition may now be violated even if the M -sector is small: the right-hand side of equation (24) goes to infinity for $K \rightarrow 0$. This is in sharp contrast to the two-sector model (corresponding to $X = 0$) in which the right-hand side goes to zero for $K \rightarrow 0$. The contrast becomes important – and empirically relevant – if oil revenues make up a significant proportion of the aggregate income.

Equations (16) and (24) define the profit share π as an implicit function of τ, θ, ν, K, B and ηX . The right-hand side of equation (24) is decreasing in ηX , and if the modified Robinsonian stability condition (17) is satisfied, it follows that $d\pi/d(\eta X) < 0$. Intuitively, a rise in oil revenues gives a boost to consumption demand, and informal sector incomes rise. With a given relative wage, the profit share in the domestic modern sector suffers, and the accumulation rate falls; the economy experiences a Dutch disease.

In extreme cases, an oil boom can produce permanent deindustrialization and a long-run reduction in incomes. To see this, consider a simple case with $n = \rho_0 = 0$ and, hence, $B = B_0$. In this case, equation (24) implies that $\pi \rightarrow -\infty$ for $K \rightarrow 0$, that is, the graph in Figure 2 of π as a function of K has a vertical asymptote at $K = 0$ (see Appendix C for details). Thus, the solution for π becomes negative when K is sufficiently small. The expansion of the modern sector, however, requires that the profit share exceed a critical value; formally, we must have $\hat{K} = g(\pi) > (n + \rho_0)/(1 - \rho)$, which in this case simplifies to $g(\pi) > 0$.

An increase in ηX reduces the profit share for any given value of K , the π -function shifts down, and the growth rate of the capital stock declines. The (net) accumulation rate can turn negative, and the economy converges towards a state with $K = M = 0$ and $Y = \eta X/\alpha$. Had there been no oil ($\eta X = 0$), aggregate income would also have converged to a constant, but if the economy is sufficiently large, the long-run value of Y would have been higher than in

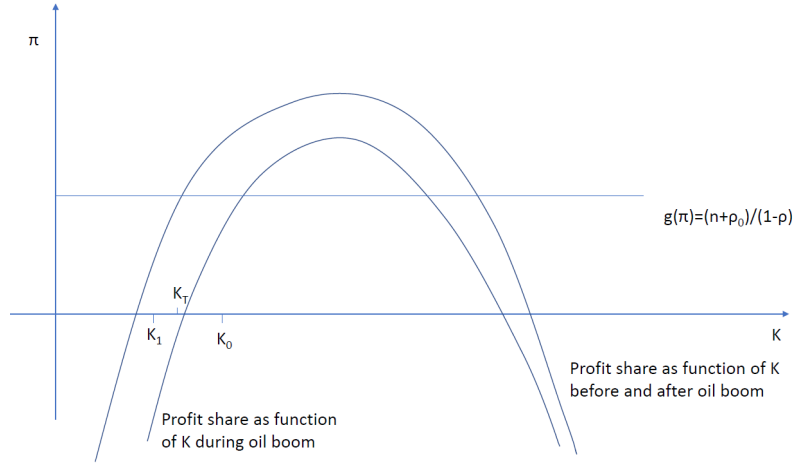


Figure 2: Permanent decline of the modern sector after a temporary oil boom

the case with deindustrialization (see Appendix C for details). Intuitively, the size of the economy is important because the long-run productivity gains from industrialization derive from (dynamic) increasing returns to scale. Thus, a large economy will achieve higher productivity levels than a small economy, and the gains from industrialization must outweigh the income from oil if the economy is sufficiently large.

Even a temporary boom can lead to permanent deindustrialization. Consider an economy with an oil sector and suppose that the capital stock is above the industrialization threshold (K_T) associated with the initial oil revenue. A positive shock to X now reduces the profit share for any given capital stock, and the threshold rises.²³ If the shock is large enough, the capital stock is below the new threshold and starts falling, and if it declines sufficiently during the oil boom, the economy may find itself locked in a development trap when ηX returns to its previous value. This outcome is illustrated in Figure 2. At the start of the oil boom we have $K = K_0 > K_T$. The oil shock generates a downwards shift in the π -function and K starts declining. The π -function shifts back to its initial position at the end of the boom; if the capital stock has declined to $K_1 < K_T$, however, it continues to decline. Premature maturity has pushed the economy into a deindustrialization trap.

The above analysis has considered a shock to ηX . The real exchange rate, however, is endogenous. As a general specification, the division of domestic demand between imports and domestically produced formal goods will depend on the ratio of foreign to domestic formal sector prices in common currency, that is, on the real exchange rate η . Thus, the trade balance condition can be

²³A shock to the international price of oil, p_X^* would have the same effect as a rise in domestic output X .

written

$$\frac{NX}{K} = \frac{\eta X}{K} + \psi\left(\eta, \frac{C+G}{K}, g + \delta\right) = 0 \quad (25)$$

where $\psi\left(\eta, \frac{C+G}{K}, g + \delta\right)$ is the net exports of non-oil. Equations (16), (9), (19), (24) and (25) can be used to solve for $g, \pi, \eta, w_A L_A$ and $(C+G)/K$.

The solution is simple if imports and domestically produced formal goods are perfect substitutes.²⁴ Net exports become perfectly elastic at a constant real exchange rate in this case, $\eta = \bar{\eta}$, and a shock to X maps directly into a shock to ηX . The constant real exchange rate can be plugged into equation (24), and the earlier analysis now applies without any other modifications.²⁵

If imports and domestically produced goods are imperfect substitutes, a shock to X affects the real exchange rate η , but the qualitative results will be unchanged as long as a positive resource shock (an increase in export revenues in foreign currency) does not produce an appreciation that is so large that the resource revenues in domestic currency decline. Formally, this (mild) condition is satisfied if

$$\frac{d \log \eta X}{d \log X} = \frac{d \log \eta}{d \log X} + 1 > 0$$

5 Discussion

Aggregate demand policy is important for long-run growth but so is the supply side, and the supply sides are different in mature and dual economies. The informal sector is very large in poor economies, the productivity levels are low in the informal sector, economic growth comes from the formal sector, and workers in the informal sector would move to the formal sector if offered a chance. Workers in the two sectors, moreover, have similar qualifications, and the formal sector is not held back by a shortage of skilled workers (La Porta and Shleifer (2014)).

Both mainstream and post-Keynesian models tend to ignore or play down the differences between mature and dual economies. These differences, however, have implications for economic policy. Aggregate demand policies that work well in one economy may be disastrous in economies with a different supply side. Mature economies are labor constrained and may face structural aggregate demand problems; dual economies are capital constrained and face structural transformation problems. The policy problems and the appropriate fiscal policies are quite different. A permanent stimulus may be needed in mature economies with a low natural rate of growth. The warranted growth rate must be brought into equality with the natural rate, and a fiscal stimulus is helpful precisely because it reduces the warranted rate.

²⁴This assumption clearly makes no sense if applied to the short run. It takes time as well as marketing efforts or price discounts to break into export markets, but the assumption arguably provides a reasonable first approximation for the long run.

²⁵With perfect substitutability the shock to X can be given an alternative closed-economy interpretation: the model becomes isomorphic to a closed-economy model with X as a windfall increase in the flow supply of modern-sector goods.

In dual economies, by contrast, a reduction of the warranted growth rate is the opposite of what one wants. Successful development requires the stabilization of the actual growth rate at a high warranted rate, and sustained fiscal expansion and high shares of consumption in income can hold back structural transformation. Sectoral interactions, moreover, can increase the risks of deindustrialization.

The framework in this paper is quite different from that of ‘New Neoclassical Synthesis’. DSGE models play down the role of aggregate demand policy in the medium and long run and misspecify the supply side. Profound sectoral differences are ignored, hyper-rational representative agents are at the center of the analysis, and the economy fluctuates around a steady growth path with a natural rate of unemployment.

The approach is closer to (post-) Keynesian theory. Economic development and the growth of the modern sector require investment, and private firms will not invest if there is insufficient demand for their output. If the expansion of the capital stock relies on private investment, incentives must be created for firms in the modern sector to carry out the investment, and the management of aggregate demand becomes an essential prerequisite of fast growth. The management of aggregate demand becomes especially important, if the warranted growth path is unstable and low aggregate demand can lead to cumulative decline. But capital constraints complicate the picture: it is not enough to create incentives for investment, the resources for investment must also be available. Managing aggregate demand is different from sustained stimulus.²⁶

In a capital constrained economy, a sustained increase in the rate of accumulation requires reductions in the share of private and public consumption (or an increase in net imports). This key ingredient in the analysis in sections 2-3 is subject to qualification: in principle, resources for accumulation could be found by eliminating or reducing waste, wherever that waste may be found.

Attacks on big government often draw on this theme, and public programs can become sources on inefficiency and corruption (defenders of public programs should be the fiercest critics whenever this happens). But government programs are not the only source of social waste. Inefficiency and rent-seeking activities abound in the private sector, from zero-sum interactions in the financial sphere to bloated bureaucracies, market failures and misallocation of resources in private healthcare systems.

In the post-Keynesian literature, Kaleckian models rely on particular inefficiencies and market failures. There are no binding capital constraints and no long-run tradeoff between the share of consumption and the rate of economic growth in these models. The specification of the investment function in these models assumes that a large and sustained fall in utilization will have only small negative effects on the accumulation rate. As the flip side of this assumption, a positive shock to demand – a reduction in saving rates, for instance – generates a large demand-induced increase in the steady growth value of the utilization

²⁶See Aboobaker and Ugurlu (2020) for a recent discussion with special reference to ‘modern monetary theory’.

rate. This increase allows long-run increases in both the accumulation rate and the share of consumption in income.

Empirically, the models predict that countries with *low* shares of investment in output will tend to have high rates of economic growth, a prediction that is at odds with the evidence (e.g. Girardi and Pariboni 2018). Behaviorally, the specification of investment assumes that, blinded by uncertainty and conventions, private firms keep investing, even if they have large amounts of excess capacity. The resources that go into idle capital stocks could have been used to expand consumption, and this behavior is clearly socially wasteful. It is wasteful, however, not just from a social perspective, but also from the perspective of a single, goal oriented firm that aims to make profits. Nothing compels the firm to keep investing if it has large amounts of unwanted excess capacity; this makes it hard to provide a behavioral justification for the Kaleckian investment function (Skott 2012).

Sections 2-4 adopted an extreme specification in which utilization must be at an exogenously given desired rate in steady growth. The long-run tradeoff between consumption and investment does not depend on this extreme assumption; it holds as long as the long-run accumulation function is sufficiently sensitive to variations in capital utilization, taking into account both the direct effects of utilization on accumulation and indirect effects via induced changes in the profit share.²⁷ The empirical estimation of investment functions is notoriously difficult, but industry level evidence points to large differences in growth rates across industries and only modest differences in average utilization rates. The US computer industry, for instance, recorded average annual growth rates above 25 percent between 1970 and 2000 and had average utilization rates below 80 percent; over the same period the textile industry grew at an average annual rate of less than 2 percent and had utilization rates above 80 percent.²⁸

Utilization rates are subject to measurement problems,²⁹ but macroeconomic evidence also casts doubt on claims that substantial immediate expansion of consumption can be achieved without sacrificing long-term growth. Populist governments from Argentina to Venezuela and Zimbabwe have pursued policies that promised win-win solutions for everyone but culminated in economic crisis and decline. Less dramatically, the experience of resource-rich economies since

²⁷Formally, if $dg/d(\kappa u)$ denotes this total derivative, the condition is that

$$\frac{dg}{d(\kappa u)} > 1$$

The tradeoff condition is stricter than the condition for Harrodian instability. Harrodian instability only requires that the the long-run accumulation rate be more sensitive than the saving capital ratio to variations in the output capital ratio, that is,

$$\frac{dg}{d\kappa u} > \frac{d\frac{S}{K}}{d\kappa u}$$

²⁸Data for ‘computer and peripheral equipment’ (NAICS 3341) and ‘textile mills’ (NAICS 313) from FRED.

²⁹Nikiforos (2016) discusses some of the issues and their implications; Girardi and Pariboni (2019) question his analysis.

the turn of the century illustrate the risks of premature maturity. The commodities boom in the early 2000s generated (relatively) fast growth in many Latin American economies.³⁰ But – consistent with the model in section 4 – the tradable sector suffered, and deindustrialization left the economies in a bad state when the commodities boom came to end.

Appendix A: Debt dynamics

The evolution of the debt ratio is given by

$$\dot{b} = \gamma + rb - \frac{T}{K} - gb$$

where

$$\frac{T}{K} = \tau(1 - \pi)\sigma + t(\pi\sigma + rb)$$

The tax rates must satisfy

$$c_w(1 - \tau)(1 - \pi)\sigma + c_\pi(1 - t)(\pi\sigma + rb) + \mu(1 + b) = \sigma - (g + \delta) - \gamma \quad (26)$$

By assumption, the right-hand side of equation (26) is kept constant. It follows that

$$d\frac{C}{K} = -c_w(1 - \pi)\sigma d\tau - c_\pi(\pi\sigma + rb) + c_\pi(1 - t)rdb + \mu db = 0$$

Thus, if t is the fiscal instrument and $d\tau = 0$, we have

$$\frac{\partial t}{\partial b} = \frac{c_\pi(1 - t)r + \mu}{c_\pi(\pi\sigma + rb)}$$

and

$$\begin{aligned} \frac{d\dot{b}}{db} &= r - \frac{d\frac{T}{K}}{db} - g = r - tr - (\pi\sigma + rb)\frac{\partial t}{\partial b} \\ &= -(g + \frac{\mu}{c_\pi}) < 0 \end{aligned}$$

Analogously, if τ is the fiscal instrument,

$$\begin{aligned} \frac{d\dot{b}}{db} &= r - \frac{d\frac{T}{K}}{db} - g = r - tr - (1 - \pi)\sigma\frac{\partial \tau}{\partial b} \\ &= (1 - t)(1 - \frac{c_\pi}{c_w})r - (g + \frac{\mu}{c_w}) \\ &\leq (1 - t)r - (g + \mu) \end{aligned}$$

Empirical estimates suggest that $0.02 < \mu < 0.06$. With a target growth rate of 0.04 and $\mu = 0.04, t = 0.1$, a real interest rate below 0.09 is sufficient to ensure stability.

³⁰Martins and Skott (2020) discuss the Brazilian case in greater detail.

Appendix B: The growth-profit nexus

Dynamic adjustments in both g and π in response to deviations of actual from desired utilization are consistent with the long-run relation between the levels of g and π . As a simple example, let

$$\begin{aligned}\dot{g} &= \mu_g(u - u^d) \\ \dot{\pi} &= \mu_\pi(u - u^d)\end{aligned}$$

This specification implies that $\dot{g} = \frac{\mu_g}{\mu_\pi} \dot{\pi}$. Integration now yields,

$$g = g_0 + \frac{\mu_g}{\mu_\pi} \pi$$

where g_0 is an arbitrary constant of integration.

The linearity of the relation between g and π is a special case. A simple Robinson-Steindl version of the dynamics has the profit share react to deviations of actual from desired utilization, but the adjustment in accumulation is slightly different: accumulation now adjusts towards an equilibrium rate determined by utilization and the profit share,

$$\begin{aligned}\dot{g} &= \mu_g(g^*(u, \pi) - g) \\ \dot{\pi} &= \mu_\pi(u - u^d)\end{aligned}$$

A stationary solution for this system has $u = u^d$ and $g = g^*(u^d, \pi)$. The relation between growth and the profit share is positive but, in general, nonlinear.

As a third example, a Harrod-Kaldor version retains the specification of changes in accumulation as determined by deviations of actual from desired utilization. But now the profit share is a fast variable that adjusts to clear the goods market; output becomes a state variable and the pricing/output decision describes firms' output decisions – the growth rate of output – as a function of the demand signal that they receive. A shock to demand raises the profit share and firms respond by increasing output (Skott 1989). Formally,

$$\begin{aligned}\dot{g} &= \mu_g(u - u^d) \\ \hat{Y} &= h(\pi)\end{aligned}$$

A stationary solution has $u = u^d$, $\hat{Y} = g$ and $g = h(\pi)$.

Appendix C: The duality condition and long-run outcomes in the three-sector model

Equations (22)-(23) imply that

$$\frac{(1 + \theta)w_A}{(1 - \tau)w_M} = \frac{(1 + \theta)}{(1 - \tau)(1 - \pi)} \frac{1 - \alpha}{\alpha} \frac{1}{\sigma} \{[\sigma - (g + \delta)]H(k) + \frac{\eta X}{K} H(k)\}$$

or, using the definition of $H(k)$,

$$\frac{(1+\theta)w_A}{(1-\tau)w_M} = \frac{(1+\theta)}{(1-\tau)(1-\pi)} \frac{1-\alpha}{\alpha} \frac{1}{\sigma} \left\{ [\sigma - (g+\delta)] \frac{\sigma K}{\lambda N - \sigma K} + \frac{\sigma \eta X}{\lambda N - \sigma K} \right\} \quad (27)$$

The value of λN can be found by integration of Verdorn's law (equation (6)). We have

$$\hat{\lambda} = \rho_0 + \rho \hat{K}$$

Hence,

$$\log \lambda = b_0 + \rho_0 t + \rho \log K$$

or

$$\begin{aligned} \lambda N &= e^{b_0} e^{\rho_0 t} K^\rho N_0 e^{nt} = B_0 e^{(\rho_0+n)t} \\ \text{where } B_0 &= e^{b_0} N_0 \end{aligned} \quad (28)$$

Combining (27)-(28) and the duality condition, we get

$$\frac{1}{\nu} = \frac{(1+\theta)}{(1-\tau)(1-\pi)} \frac{1-\alpha}{\alpha} \frac{1}{\sigma} \left\{ [\sigma - (g+\delta)] \frac{\sigma K^{1-\rho}}{B - \sigma K^{1-\rho}} + \frac{\sigma \eta X}{BK^\rho - \sigma K} \right\} \quad (29)$$

where

$$B = B_0 e^{(n+\rho_0)t}$$

Long-run outcomes when $n = \rho_0 = 0$ and $B = B_0$. The right hand side of (29) is increasing in π if the modified Robinsonian stability condition is satisfied. For given values of $\pi < 1$ and $\eta X > 0$, moreover, the right-hand side goes to infinity for $K \rightarrow 0$ from above and for $K \rightarrow (B_0/\sigma)^{1/(1-\rho)}$ from below. Thus, we must have $\pi \rightarrow -\infty$ for $K \rightarrow 0$ from above and for $K \rightarrow (B_0/\sigma)^{1/(1-\rho)}$ from below. It follows that the solution for π becomes negative when K is close to 0 or $(B_0/\sigma)^{1/(1-\rho)}$; that is, the graph for π in Figure 2 has vertical asymptotes at $K = 0$ and $K = B_0^{1/(1-\rho)}/\sigma$. Thus, the solution for π becomes negative when K is sufficiently small.

The expansion of the modern sector requires that the profit share exceed a critical value; formally, that $\hat{K} = g(\pi) > 0$. An increase in ηX reduces the profit share for any given value of K , the π -function shifts down, and the growth rate of the capital stock declines. The (net) accumulation rate can turn negative, and if this happens, the economy converges towards a state with $K = M = 0$.

With no modern sector and no investment, the demand for imports IM is given by

$$IM = (1-\alpha)(C+G)$$

while the $NX = 0$ condition implies that

$$Y = C + G \quad (30)$$

$$\eta X - IM = 0 \quad (31)$$

Combining (30)-(31), we have

$$Y = \frac{\eta X}{\alpha}$$

Now consider the implications of $\eta X = 0$. In this case, using (29), the capital stock K will converge to a positive value:

$$K \rightarrow K^* = \left[\frac{\Omega B_0}{(1 + \sigma \Omega)} \right]^{1/(1-\rho)}$$

where

$$\begin{aligned} \Omega &= \frac{(1 - \pi)(1 - \tau)\alpha}{(\sigma - \delta)(1 + \theta)(1 - \alpha)\nu} \\ \pi &= g^{-1}(0) \end{aligned}$$

Thus, a sufficiently large value of B_0 will ensure that the long-run level of income and consumption will be higher in an economy without natural resources ($\eta X = 0$) than in one with natural resources ($\eta X > 0$). Intuitively, the size of the economy is important because of the dynamic increasing returns; a small economy is unable to achieve the learning that raises average incomes..

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