Demand-Led Growth Theory in a Classical Framework: Its Superiority, Its Limitations, and Its Explanatory Power

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Centro Sraffa Working Papers
n. 29

March 2018

ISSN: 2284 -2845
Centro Sraffa working papers
[online]

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Abstract

The main purpose of this paper is to show that the Keynesian-Kaleckian demand-led theory of growth proposed within the classical framework of prices and distribution as articulated by Sraffa (1960), is superior to the neoclassical supply-driven theory in explaining economic growth. After showing the fundamental theoretical problem with the neoclassical supply-driven approach to growth, we expound a demand-led model of growth that abandons 'steady-state' and, instead, adopts an 'historical approach' in which the data is specified for historical periods of time. The model incorporates the contribution of technical progress to demand-led growth and, thereby, provides the basis to identify the most important political, social, and institutional developments that historically explain growth and economic development since the advent of capitalism. Our historical analysis shows how demand-led growth theory can provide the foundation for a new and more coherent interpretation of the history of economic development.

Keywords: Growth; J.M. Keynes; Classical Economics; Economic History; Development
JEL codes: O40; B51; N00

1. Introduction

In economic science the theory of growth has been dominated by a supply-driven approach, originally by classical economists on the basis of Say's Law and, then, in the neoclassical tradition, on the basis of the aggregate production function. But there has also been a tradition of explaining growth as demand determined going back before Keynes ([1936]1973) and Kalecki ([1933]1971) to the classical economists who rejected Say's Law, notably Malthus (1820), Blake (1823), and Sismondi ([1826]1991), and then Marx ([1894]1978), who argued that growth was regularly interrupted by a shortage of demand. However, the theories of growth of the classical economists and Marx,

whether they be supply-driven or demand-led, are not theoretically substantive in the sense that no mechanism exists within them by which saving (leakages) and investment (injections) are brought into equality necessary to suppose that aggregate output and aggregate demand are in equilibrium along a determined growth path.[1] Indeed, there are only two 'substantive' theories of growth in economic science that derive from theories of aggregate output which incorporate a coherent mechanism to establish macroeconomic equilibrium between planned aggregate output and planned aggregate demand, both developed in the twentieth century.[2]

The first substantial theoretical approach is the afore-mentioned neo-classical (or marginalist) theory of growth based on the aggregate production function in which investment is conceived to adjust to saving (at full-employment income) through the adjustment of factor prices – the rate of interest (profit) and the real wage – corresponding with aggregate demand adjusting to aggregate output at which all inputs to production are fully utilised. As is well known, with trend growth not constrained by demand, in this theory growth is driven entirely by supply-side forces, principally by reference to the growth of the labour force, the growth of the capital stock and the productivity of these inputs according to technological progress. This neoclassical supply-driven approach to growth, represented by the Solow (1956) and Swan (1956) models and subsequently by the array of 'endogenous growth' models, has dominated growth theory in the past sixty years.

The second substantial theoretical approach to growth is the demand-led theory of growth based on the Keynesian (or Kaleckian) principle of effective demand in which saving (leakages) is conceived to adjust to investment (autonomous demand) through the adjustments of income, output, and employment corresponding with aggregate output adjusting to aggregate demand. A feature of this theory is that growth is not limited, at least in the long run, by supply constraints, with the inputs, principally capital and labour, endogenously determined by demand according to the technique of production. Indeed, the demand-led theory supposes there is unutilised labour and/or capital stock that can be systematically exploited to expand production. In this connection, the theory is only compatible with a theory of prices and distribution in which relative prices and the distribution of income are determined at competitive equilibrium consistent with the existence of unemployed labour and capital. Another feature of this theory is that key factors explaining growth, notably, income distribution, technological progress, and political-economic institutions, are conceived to contribute to growth through their effect on the growth in demand.

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[1] With the exception of J.S. Mill, the classical economists did not even distinguish between decisions to save and decisions to invest by supposing that an act of saving was an act of investment (Garegnani 1983: 47-57; Smith 2014: 519).

[2] Indeed, Keynes was involved with the development of the neoclassical (Marshallian) theory of output in a monetary economy in the 1920s before he developed his principle of effective demand in the early 1930s (see Bridel 1987).

The main purpose of this paper is to show that of these two substantial theoretical approaches, demand-led theory is superior in explaining the phenomenon of economic growth. In doing so much of the paper will be concerned with developing the appropriate model of demand-led growth consistent with the classical approach to prices and distribution articulated by Sraffa (1960) and to elucidate on its explanatory power. In section 2 we show that there is a fundamental *theoretical* problem with the neoclassical supply-driven approach to growth that does not afflict the demand-led approach to growth. In section 3 we expound a demand-led theory of growth that abandons the usual 'steady-state' approach and, instead, adopts an 'historical' approach in which the data is specified for historical periods of time. On the basis of this model we can clearly identify the main factors which are conceived in demand-led theory to historically determine trend growth. In section 4 the theoretical limitations of our demand-led theory are considered, which nevertheless, shows its superiority to the supply-driven theory. In section 5, we show how our demand-led growth theory provides the foundation for a new interpretation of the history of modern economic development since the advent of capitalism in the eighteenth century. Finally, in section 6, a brief conclusion of the paper is provided.

2. Theoretical problems with a supply-driven theory of growth

A common feature of the neo-classical supply-driven theory of growth is that it is based on an aggregate production function, typically of the Cobb-Douglas variant, which thereby supposes that at least in the long run there is sufficient aggregate demand to ensure all the available inputs to production, predominantly labour and capital, are fully employed. This supposition derives from the conception that through the process of competition the prices of the inputs, mainly the real wage of labour and the rate of interest (or profit) of capital, adjust such that investment (or demand autonomous of income) adjusts to saving (or leakages) at full-employment income necessary for the demand for aggregate capital to adjust to its *given* supply associated with the demand for aggregate labour adjusting to its *given* supply. The systematic long-run establishment of this macroeconomic equilibrium between aggregate demand and output at full-employment income depends in neoclassical economics on supposing a functional inverse relationship between the quantity demanded of inputs and the relative prices of those inputs – that is, on the traditional investment (capital) demand function and, for a given technique, its counterpart labour demand function. In the event of a state of unemployment equilibrium in the economy, competition for scarce jobs in the labour market is conceived to drive down the real wage by a reduction in the money wage that also induces a reduction in the general price level, which, together with the excess supply of full-employment saving existing in the capital market, will induce a reduction in the rate of interest that functionally generates higher investment spending (i.e. the demand for saving) stimulating higher aggregate demand until full-employment

output is restored in the long run. Hence, in the neo-classical approach competition is conceived to ensure a long-run tendency toward a full-employment macroeconomic equilibrium (Garegnani 1983: 29-30; Petri 2004: 11-16). It is therefore a characteristic of this theory of growth that short-run cyclical variations in activity, when there may not be equilibrium between aggregate demand and full-employment output, are treated as a separate field of analysis from that of explaining long run trend growth. With respect to the latter, for the 'steady state' growth rate so determined by its theory to be sustainable the trend growth path must be characterised by macroeconomic equilibrium in which planned aggregate demand is equal to planned aggregate output at full-employment. Indeed, a growth rate at which there exists unemployed productive capacity because of insufficient demand or an excess of aggregate demand over full-employment output is clearly not sustainable in the long run.

The Solow-Swan model, which dominated post-war orthodox supply-side growth theory, epitomizes the above characteristics. As is well known, the 'steady-state' growth of this model is determined for a given technology by the growth of labour supply (or population) on the basis that labour is fully employed in the long run consistent with competitive forces endogenously generating the necessary aggregate demand. However, there is a fundamental problem with this conception. As the capital debates of the 1960s unequivocally showed, the generality of 'reswitching' and 'reverse capital deepening' invalidated any functional inverse monotonic relationship between the quantity of factors of production and their respective relative prices *via* factor substitution in a general economic system producing a multitude of commodities which are employed to produce other commodities by means of heterogeneous methods of production (see Petri 2004: 206-38).[3] Hence, in general, traditional demand for capital and counterpart demand for labour functions do not exist and cannot be relied upon to suppose that competitive forces can establish macroeconomic equilibrium at long period positions at which there is uniformity of the net rate of return on capital, necessary for neoclassical growth theory.[4] Only in one-commodity economic systems can well behaved demand for capital (saving) and labour functions be supposed to exist to ensure the long run adjustment of investment to saving corresponding with aggregate demand adjusting to full-employment output determined according to the aggregate production function.

In recent times the Solow-Swan model has been superseded by an array of endogenous growth models. As is well known, in the Solow-Swan model technological progress is treated as an exogenous labour-augmenting process so that steady-state growth is determined by the growth of labour supply *plus* growth in average labour

[3] For an account of the capital debates, see Harcourt (1972), Kurz and Salvadori (1995: 427-67), and Petri (2004: 206-55).

[4] In absence of competitive forces characterised in neo-classical economics, the other possibility is to assume ad hoc that government policy makers act to ensure the economy systematically gravitates around full-employment output. This would need to implausibly suppose that demand-management policies work in the short-run to counter cyclical fluctuations in national real income but do not work in the long run to persistently influence national real income. There is very little empirical support for such a supposition.

productivity (or 'efficiency') on the basis of there being no demand constraint. A major criticism of the model by endogenous growth theorists is that technological progress is treated as exogenous to the growth process as if it can be explained independently of it (see Romer 1994). Hence, neoclassical endogenous growth theorists have endeavoured to incorporate technological progress into a supply-driven growth process with the major objective of overcoming the limits to capital accumulation posed by diminishing returns by variously including human capital formation and/or knowledge creation and/or some other factor in the aggregate production function and/or adopting a linear aggregate production function as in the A-K model.[5] But this new species of neoclassical growth models faces the same fundamental problem as the Solow-Swan model in being able to suppose that corresponding with investment adjusting to saving, aggregate demand adjusts in the long run to full-employment output along the steady state growth path. Indeed, putting aside any technological change that involves the complexity of changes in relative prices, including factor prices, these models cannot suppose a well-behaved demand for capital (saving) function and a simultaneously specified well-behaved counterpart demand for labour function required to establish macroeconomic equilibrium other than in the special case of a one-commodity economic system.

Notwithstanding this fundamental theoretical problem, most neoclassical endogenous growth models basically *assume* the adjustment of aggregate demand to full-employment equilibrium output by adopting a dynamic stochastic general equilibrium (DSGE) model as based on the Arrow-Debreu general equilibrium (see Novales, Fernandez, and Ruiz 2014: 37-41).[6] Besides the insurmountable problems of aggregating from general equilibrium models, the equilibrium itself cannot be regarded as anything more than temporary since it is characterised by market-clearing but in which the rates of return on capital are systematically unequal on the basis of the implausible assumption of complete futures markets (Garegnani 1990; Petri 2004: 33-53, 284-6). This equilibrium can only be temporary because competition will cause capital to be continuously reallocated from productive activities with relatively low rates of return to those with higher rates of return, thereby altering supply conditions across all sectors and, accordingly, relative prices and factor prices. Indeed, general equilibria of this kind

[5] There are a whole array of such endogenous growth models. The more influential classes of models include the Lucas (1988) human-capital model, the Rebelo (1991) and Romer (1986) A-K models, the Romer (1990) knowledge creation model, and Aghion and Howitt (1992) Schumpetarian model. For insightful accounts of these models, see Kurz and Salvadori (1999; 2003) and Seiter (2003).

[6] This assumption derives from imposing restrictive conditions on individual consumer demand behavior to satisfy Walras' law for the establishment of general equilibrium in all markets and, therefore, by definition, for the aggregate economy. In absence of any conception of a disequilibrium position in relation to an equilibrium position, this approach bypasses the need to demonstrate how the aggregate level of planned saving and planned investment corresponding with planned aggregate demand and planned aggregate output are brought into equality. Moreover, *it cannot demonstrate how aggregate demand endogenously adjusts to aggregate supply at full employment except by reference to the traditional neoclassical theory of the long-period method* (see text below). The point is that a DSGE model employed in neo-classical growth theory cannot be a substitute for a theory of aggregate output.

are positions which a competitive economic system would move away from, not tend toward. That this equilibrium could be the basis for explaining long run growth of a macro-economy is absurd. It is simply not compatible with the traditional neoclassical theory for the adjustment of aggregate demand to aggregate output discussed above and yet this is what can only underlie *the assumption* of macroeconomic equilibrium by the endogenous growth theorists. Hence, in absence of simply pretending equilibrium of aggregate demand and aggregate output exists along the trend growth path, neoclassical supply-driven growth theory ultimately relies on the adjustment process of factor substitution which is shown to be only valid for a one-commodity economic system.

By contrast, in demand-led theory to establish macroeconomic equilibrium along the growth path the level of planned output is conceived to adjust to planned aggregate demand through a *change in quantities* – in aggregate output and employment – without requiring any change in distribution. Hence, for a given technique of production, the adjustment to macroeconomic equilibrium in which saving (leakages) endogenously adjusts to autonomous demand through an expenditure multiplier process, can occur for a *given* system of (relative) prices and distribution along the growth path. This is entirely compatible with the proposed classical economists' 'surplus approach' to prices and distribution as reconstructed by Sraffa (1960) in which under general conditions of capitalist competition long-period equilibrium normal (relative) prices and distribution are determined independently on the basis of *given* outputs, the level of aggregate output and employment as well as for a given technique of production and of either the real wage or rate of profit (interest). In this approach there is no factor price mechanism for bringing about the long-run tendency toward the full employment of labour and capital. Hence, unlike neoclassical (or marginalist) economics, the problems posed by 'reswitching' and 'capital reversing' for establishing macroeconomic equilibrium do not arise. At any long-period position along the growth path the determination of normal prices and distribution is conceived to correspond with the determination of long-run levels of aggregate output at which aggregate demand is not necessarily sufficient to fully employ all productive inputs available. Indeed, this conception is consistent with our demand-led theory of growth, which supposes that normally there are unutilised labour and capital along the growth path.

3. Historical model of demand-led growth

In Smith (2012: 546-50) it was shown that a major problem with the steady-state approach to demand-led growth, in which along the growth path there is a constant normal utilisation and consequently a given capacity saving rate, is that aggregate demand is denied a truly autonomous role in the determination of growth (also see Trezzini 1995). Ultimately the growth rate of demand must conform to the given growth rate of capacity output and its corresponding capacity saving rate. Hence, in particular, in this approach the expansion in productive capacity to enable capacity output to adjust to an increase in

the growth rate of autonomous demand corresponding with an accommodating increase in capacity saving, relies on an increase in the saving ratio most likely induced by a change in the distribution of income from wages to profits (or from lower to higher income earners). This kind of dependency of demand growth on distribution is not in our view plausible nor consistent with the demand-led approach originally developed by Keynes and Kalecki. By abandoning the steady-state approach and thereby the limitations imposed by a fixed capacity saving rate, we can develop a demand-led model in which demand growth is autonomous of capacity constraints and of income distribution. The demand-led growth model we shall employ is the historically-based one developed in Smith (2012) which abandons steady-state equilibrium. There are a number of distinctive features of this model. Firstly, the incorporation of historical time into a growth model means that the data is specified in terms of historical time (or periods). Hence, in our model, trend growth is determined as an average equilibrium growth rate for an historical period of time for which the data is specified as an average over that period and reflects the long run persistence of demand-generating forces. The period must be long enough for firms to adjust their fixed productive capacity to expected demand conditions consistent with long-run equilibrium growth. Secondly, the utilisation of productive capacity is determined endogenously both in the short and long run with the average utilisation for an historical period likely to vary from the normal utilisation upon which adjustment of productive capacity is premised. This means that at any point in time the growth rate of output and the growth rate of the capital stock can vary from each other in a historical period as reflected by endogenous variations in capacity utilisation. Thirdly, unlike the steady state approach in which trend growth is explained separately from the short-run cycle, in this approach the trend emerges as the average growth rate of its fluctuation in any historical period. Hence, factors that explain cyclical changes in activity will be associated with those that explain the trend.[7] Nevertheless, the trend growth rate is conceived to be the outcome of the most persistent and systematic forces that determine demand growth over an historical period.

We shall concisely outline our demand-led growth model for a closed economy, beginning with an equation for aggregate demand, AD_t :

$$AD_t = A_t + c_t Y_t + I^I_t \tag{1}$$

where A_t is autonomous demand, consisting of autonomous consumption, C^A_t, autonomous investment, I^A_t, and government spending, G_t; c_t is the social propensity to consume; and I^I_t is induced capacity-adjusting investment. For simplicity, we assume that autonomous demand is non-capacity creating. The most difficult aspect of our model is specifying the induced investment function consistent with the notion that long-run average utilisation during the historical period t is endogenously determined and that de-

[7] This is very different to the 'steady-state' approach, well exampled by Solow's theory, in which the cycle is considered to be studied independently of the trend movement in growth.

preciation on fixed capital, d_t, is positive (i.e. $d_t > 0$) and a function of its utilisation. Our investment function is as follows:

$$I^I_t = (v_t/u^n_t)(Y^e_t - Y_{t-1}) + v_t u^n_t d_t Y_t + (v_t/u^n_t - v_t/u^a_{t-1})Y_t \quad (2)$$

where u^n_t is the normal degree of utilisation in period t upon which capacity is installed by firms in aggregate, u^a_{t-1} is the average degree of utilisation realised in period $t–1$, v_t is the capital-output ratio (in period t) corresponding to the full utilisation of the capital stock, Y^e_t is expected demand (output) by firms in period t. To account for capacity utilisation, the capital-output ratio in the function is expressed as v_t/u^n_t in which $u_t = Y_t/Y^*_t$, meaning that the degree of utilisation is equal to the ratio of actual output to the level of output at full capacity utilisation, Y^*_t, and where $0 < u_t < 1$. There are three parts to the function: the first term on the right, $(v_t/u^n_t)(Y^e_t - Y_{t-1})$, represents adjustment of capacity to expected demand at normal utilisation; the second term, $v_t u^n_t d_t Y_t$, represents investment to compensate for depreciation of the capital stock; and the third term, $(v_t/u^n_t - v_t/u^a_{t-1})Y_t$, reflects the adjustment of capacity to demand toward establishing normal utilisation from existing average utilisation.[8] Underlying this function is the assumption that firms can revise normal utilisation in historical period t when new capacity is installed in its adjustment to expected demand. By substituting equation (2) into (1), expanding it and equating $AD_t = Y_t$, equilibrium income in our model is determined as follows:

$$Y_t = A_t / [1 - c_t - (v_t/u^n_t)g^e_t - v_t u^n_t d_t - (v_t/u^n_t - v_t/u^a_{t-1})] \quad (3)$$

where all variables are expressed as 'averages' so that g^e_t refers to the expected average growth in demand in period t and the condition $1 > [c_t + (v_t/u^n_t) g^e_t + v_t u^n_t d_t + (v_t/u^n_t - v_t/u^a_{t-1})]$ is met. Since we are not assuming firms have perfect foresight, expected average growth in demand (and hence, in output) will not necessarily be equal to the average growth in output in period t, g^y_t, such that $g^e_t \neq g^y_t$. Given the values of c_t (or s_t), v_t, d_t, u^n_t, u^a_{t-1} and g^e_t, which together determine the super-multiplier, and given the level of autonomous demand, A_t, equilibrium income and output is determined.[9]

On the basis of the analysis above, the average growth rate in period t will be equal to:

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[8] With respect to the third term on the right-hand side of equation (2) if we denote K^n_t as the capital stock with normal utilization and K^r_t the capital stock that would be realised in period t based on the average utilization in period t–1, then $K^n_t - K^r_t = (v_t/u^n_t - v_t/u^a_{t-1})Y_t$. Hence, for example, if $u^a_{t-1} > u^n_t$, this means for an existing level of demand and output, Y_t ,the capital stock that would be realised without any adjustment to induced investment in period t, K^r_t, is smaller than necessary for aggregate production to occur at a normal degree of utilisation; that is, $K^n_t > K^r_t$.

[9] This equilibrium corresponds to equality between saving and autonomous expenditure plus induced investment, expressed as follows:

$$s_t Y_t = A_t + v_t/u^n_t (Y^e_t - Y_{t-1}) + v_t/u^n_t d_t Y_t + (v_t/u^n_t - v_t/u^a_{t-1})Y_t$$

Given the propensity to save, s_t, the level of saving adjusts, *via* the super-multiplier, to any given level of autonomous expenditure plus capacity-adjusting investment through changes in the long-run level of income (i.e. Y_t).

$$g^y_t = Y_t - Y_{t-1} / Y_{t-1} \quad (4)$$

where $Y_{t-1} = A_{t-1}/[1 - c_{t-1} - (v_{t-1}/ u^n_{t-1}) g^e_t - (v_{t-1} u^n_{t-1} d_{t-1}) - (v_{t-1}/ u^n_{t-1} - v_{t-1}/ u^a_{t-2})]$. For simplicity, we can denote the super-multipliers for period t and $t-1$ as:

$$m_t = 1/[1 - c_t - (v_t/ u^n_t) g^e_t - v_t u^n_t d_t - (v_t/ u^n_t - v_t/ u^a_{t-1})] \quad (5)$$

$$m_{t-1} = 1/[1 - c_{t-1} - (v_{t-1}/ u^n_{t-1}) g^e_{t-1} - v_{t-1} u^n_{t-1} d_{t-1} - (v_{t-1}/ u^n_{t-1} - v_{t-1}/ u^a_{t-2})] \quad (6)$$

The equations for the determination of equilibrium output in period t and $t-1$ can then be written in the simple form:

$$Y_t = A_t m_t \quad (7)$$

$$Y_{t-1} = A_{t-1} m_{t-1} \quad (8)$$

to thereby reduce equation (4) to:

$$g^y_t = [A_t m_t - A_{t-1} m_{t-1}]/ A_{t-1} m_{t-1} \quad (9)$$

And solving:

$$g^y_t = g^A_t + \Delta m_t (A_t/A_{t-1}) \quad (10)$$

Then:

$$g^y_t = g^A_t + \Delta m_t (1 + A^y_t) \quad (11)$$

Equation (11) could be called the fundamental equation of this model. It shows that the average growth rate in period t is determined by two major interlocking demand-generating forces: firstly, those that determine the average growth rate of autonomous demand, g^A_t; and secondly, those that cause lasting changes in the super-multiplier, Δm_t. This is significant because in the case of steady-state growth there is implicitly one continuous historical period which rules out any change in the super-multiplier such that the growth rate is simply determined by the growth rate of autonomous demand: $g^y_t = g^A_t$. Hence, in our historical model we are able to account for some important factors with lasting effects on demand growth that determine variations of the super-multiplier which would be ignored in a steady-state demand-led growth model.

One of the most important of these factors is represented by changes in income distribution, which have a considerable impact on the growth of consumption, the largest component of demand. Whilst in our model income distribution can influence autonomous demand,[10] its influence will be overwhelmingly exerted through its determination of the social propensity to consume, c_t., the largest variable of the super-multiplier. Hence, given the propensity to save out of profits is higher than out of wage income, a lasting shift in the distribution of income from profits to wages is likely to increase the

[10] In affluent societies its main channel of influence is on autonomous consumption by affecting the extent to which lower income households can afford the cost of credit to finance the purchase of durable products such as motor cars. A more equitable distribution of a given level of real income is therefore likely to enable more households to obtain credit to finance the purchase of consumer products.

social propensity to consume and contribute to an increase in the super-multiplier and in demand growth; whilst the redistribution of income from wages to profits is likely to have the opposite effect. Indeed, it is conceived that factors such as longstanding government taxation and welfare policies, the interest-rate policy of the central bank and industrial relations laws in conjunction with institutions that influence wage bargaining, all which affect the distribution of income in society, exert an important influence on the growth rate of consumption and, thereby, demand-generated economic growth. On the grounds that lower income earners have generally a higher propensity to consume than higher income earners, when these factors operate to bring about a more equitable distribution of income the social propensity to consume will increase in magnitude and contribute to an increase in the super-multiplier, Δm_t, and in the growth of endogenous demand. In this way our historical model can account for the effects of income distribution on economic growth.

Another of these important factors accounted for in our model has to deal with long-term expectations of demand growth by firms in aggregate that affect capacity-adjusting investment. In our model if the private sector is more optimistic with expectations of higher future demand growth it will induce a higher propensity of capacity-expanding investment and contribute toward a higher super-multiplier, a higher growth rate of endogenous investment and, ultimately, demand growth. If the business sector is pessimistic with expectations of a lower future demand growth then it will contribute to a lower rate of growth. This factor is clearly associated with what has been referred to as 'animal spirits', which is also likely to influence the growth of autonomous investment in our model.

The most important of these factors that can be captured by our model is technological progress, which is commonly thought to be the major cause of increases in income per capita. In the demand-led approach technological progress can only contribute to growth by contributing to demand growth.[11] The *process of developing and adopting* technical innovations certainly contributes to the growth in autonomous demand. In particular, technological progress stimulates autonomous investment as competitive obsolescence induces firms to invest in new efficient means of production and/or in producing better saleable products. Indeed, a significant part of autonomous investment is concerned with research and innovation that actually develops technology. Technological progress can also induce an increase in government capital spending, especially if it re-

[11] The other dimension to technological progress is that it increases the potential productive capacity of economic systems. In particular, technological progress has historically overcome the possible limitations to growth posed by exhaustible natural resources. Indeed, in the development of capitalism over the past two hundred years technology has ensured that the growth of the world's recoverable reserves of exhaustible resources has exceeded the growth in their consumption. It has also contributed historically to ensuring that growth has not been constrained in the long run by a shortage of labour, by enabling the migration of labour to regions of strong economic development and by generating labour productivity. A key point is that whilst technological progress expands potential productive capacity, in the demand-led theory of growth its contribution to growth depends on its contribution to generating demand growth. For a more detailed discussion of this question, see Smith (2012: 556-8, 565-6).

lates to the public provision of transport and communications infrastructure. However, the main contribution of technological progress to demand growth is likely to come *from its effect in generating productivity growth*. As explained in Smith (2012: 565-7), productivity growth augments real income mainly by reducing the normal costs of production and, thereby, the normal prices of final products in general *in relation to* money income so enabling an expansion in consumption. There are various ways in which the process by which the gain in income from productivity growth occurs, which is connected to how income is distributed. For a given normal rate of profit, the process can entail a lowering in the prices of consumption goods in relation to money wages or, alternatively, it can entail a negotiated increase in money wages to capture productivity gains for labour, implying higher price inflation. Experience shows the process usually involves a combination of both money price reductions and money wage increases. If the normal rate of profit increases, then the productivity gain will tend to be distributed in favour of profits and if the normal profit rate declines it will tend to be distributed in favour of the wage share. The taxation and welfare system will also influence how the productivity gain is distributed. In our model this effect of a productivity-induced gain in income on consumption acts through the super-multiplier. We can show this by explicitly incorporating the *effect* of technological progress into our model.

Re-arranging equation (3) we obtain:

$$Y_t = A_t + [c_t + (v_t/u^n_t)g^e_t + v_t\, u^n_t d_t + (v_t/ u^n_t - v_t/ u^a_t - 1)]\ Y_t \tag{12}$$

For simplicity, we denote the propensity to spend as:

$$z_t = [c_t + (v_t/ u^n_t)\ g^e_t + v_t\, u^n_t\, d_t + (v_t/ u^n_t - v_t/ u^a_t - 1)] \tag{13}$$

to re-write equation (12) as:

$$Y_t = A_t + z_t\, Y_t \tag{14}$$

If we suppose that λ_t is the growth in income stemming from the productivity growth of technological progress we obtain the following:

$$Y_t = A_t + z_t\, Y_t\, (1 + \lambda_t) \tag{15}$$

where $Y_t\lambda_t$ is the income gain of productivity growth. Solving for equilibrium income in period t, we get:

$$Y_t = A_t / [1 - z_t\, (1 + \lambda_t)] \tag{16}$$

where the condition $1 > z_t\, (1 + \lambda_t)$ is met for a meaningful solution.

We can call $1/ [1 - z_t\, (1 + \lambda_t)]$ the 'technological super-multiplier'. In this representation technological progress will tend to cause the value of z_t to decline according to the reduction in the capital-output ratio, v_t, and cause the value of λ_t to increase according to the resulting productivity growth. Again, for simplicity, we denote the technological super-multipliers for period t and t–1 as:

$$\delta_t = 1 / [1 - z_t\, (1 + \lambda_t)] \tag{17}$$

$$\delta_{t-1} = 1 / [1 - z_{t-1} (1 + \lambda_{t-1})] \quad (18)$$

where $z_{t-1} = [c_{t-1} + (v_{t-1}/u^n_{t-1})\, g^e_{t-1} + v_{t-1}\, u^n_{t-1} d_{t-1} + (v_{t-1}/ u^n_{t-1} - v_{t-1}/ u^a_{t-2})]$. Based on $Y_t = A_t\, \delta_t$ and $Y_{t-1} = A_{t-1}\, \delta_{t-1}$, the fundamental equation incorporating technological progress for determining the growth rate for period t is:

$$g^y_t = g^A_t + \Delta\delta_t(1 + g^A_t) \quad (19)$$

In equation (19) the main contribution of technological progress to demand growth in period t is represented by its contribution to the change in the value of our technological super-multiplier, $\Delta\delta_t$, according to the productivity growth in income it generates (i.e. λ_t) and to the propensity to spend, z_t, of which the social propensity to consume (i.e. c_t) is the largest variable.

The process by which technological progress is conceived in our model to contribute to demand growth involves two counteracting effects. First, to the extent it is labour-saving it reduces labour employment per unit of output and, thereby, tends to reduce the multiplier effect of existing autonomous demand by tending to lower the social propensity to consume, c_t. In addition, the extent to which technical progress reduces the capital-output ratio, v_t, it reduces capacity-generating investment per unit of output. Second, technological progress tends to augment the growth in consumption through the productivity gain generated in the manner explained above. In turn, the growth in consumption will induce capacity-adjusting investment as well as to validate the investment in the development and dissemination of the new technology. It is significant that this main channel through which technological progress is conceived to promote demand growth is contingent on other factors, in particular, income distribution, which exerts a major influence on the social propensity to consume. Overall, for technological progress to contribute toward demand growth this main channel of augmenting consumption together with that which augments growth of autonomous investment outweighs the negative effect on induced spending of the input-saving process.

As the analysis above shows, whereas in a steady-state model only the effects of technological progress on the growth of autonomous demand can be represented, in our historical model the main way in which it affects the growth of induced demand by affecting the magnitude of long-run changes in our technological super-multiplier, is also represented. In this way, our model can better explain the manner in which technological progress contributes to growth from the standpoint of the demand-led approach.[12]

[12] With regard to the propagation of technical progress, it is conceived to be endogenous to a demand-led growth process that is contingent on a complex range of institutional factors such as laws on patents and intellectual property rights, commercial regulations, the state of development of the research and education system, liberal rights of society and government trade and technology enhancement policies. Generally, stronger demand growth will propagate the greater adoption of productivity-generating technology because the structural change associated with greater changes in the composition of demand provides greater opportunities for profitable investment in the creation and adoption of superior technology. We could, for example, suppose that the income gains from productivity growth are a function of the growth in investment in technological innovation, g^A_λ, including not only direct investment in research and development but also in education and the adoption of superior technology, which can be

Furthermore, the distinction drawn between the role of autonomous demand and that of induced demand of the super-multiplier in the demand-led growth process provides useful insights into understanding the historical pattern of economic development considered in Section 5 below.

4. Classical theory of prices and distribution and the measurement problem in our growth theory

In exploring the contributing causes of demand-led growth the limitations of the explanatory power of our growth model posed by the problems associated with measuring macroeconomic aggregates needs to be considered. This issue is connected directly to the compatibility between the classical theory of prices and distribution of Sraffa (1960) we have adopted and our demand-led growth theory. By way of historical reference to this issue, we recall that though the main object of Adam Smith's *Wealth of Nations* ([1776]1976) was to explain the causes of growth and development, most of 'Book I' was concerned with explaining value and distribution in a decentralized competitive capitalist economy. Adam Smith needed to develop a theory of prices and distribution primarily to identify factors associated with the distribution of income that could help explain the accumulation process as well as to show how the benefits of growth (in income per capita) is shared among different socio-economic classes and, in particular, increases real wages (see Aspromourgos 2009: 207-212). But he also needed a theory of prices and distribution to measure conceptually 'national wealth', 'stock' (i.e. capital stock) and 'universal opulence' (i.e. consumption per head) to formulate his theory of accumulation and its welfare implications. A feature of Adam Smith's theoretical framework, which characterises that of the classical economists in general, is that the determination of the physical social product (i.e. aggregate output) is conceived to be carried out separately from that of its distribution and of (relative) prices, which is entirely consistent with our approach (see Garegnani 1984).

In the classical approach to prices and distribution, as reconstructed by Sraffa (1960), on the assumption of no scarce resources and only single product industries, distribution and relative prices are determined on the basis of the following minimal data: (i) the dominant technique of production in use specified physically for the economic system and (ii) the real wage of labour or, alternatively, the general rate of profit on capital. As is well known, in this theory if the real wage is taken as given the general rate of profit is determined as the residual distributive variable simultaneously with (relative) prices and, alternatively, if the general rate of profit is given the real wage is determined as a residual along with (relative) prices. The simultaneous determination of the distribution

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supposed normally to increase with economic growth (i.e. $\lambda_t = f(g^A_\lambda)$. But we need always to be mindful of how complex the process of technological progress is in augmenting productivity growth and, thereby, contributing to demand growth.

of aggregate income between wages and profits also requires data (iii), consisting of the level of (gross) output and its composition. Hence, prices and the distributive variables can be determined separately of outputs, which is analytically open to the conception that the aggregate level of output is determined by effective demand according to the Keynesian theory of output. Indeed, in the classical approach, the normal output of products in each industry sector is conceived to be determined by the level of effectual demand. To underlie the compatibility of the classical approach to prices and distribution and our demand-led approach to explaining growth, on the assumption of constant returns to scale, for a given technique and real wage or rate of profit, (relative) prices and distribution will be unaffected by output growth. There are nevertheless some issues about the compatibility of our analytical framework that need clarification.

Whereas the determination of prices and distribution is based on the long-period method of classical economics notionally independent of historical time, our historically-based demand-led theory for determining the growth of output is based explicitly on historical time in which the data is dated. In our view this analytical conception is entirely consistent with the approach of the classical economists and Marx who supposed that the level of output at any point in historical time depended for a given technique on the amount of capital stock historically accumulated at that 'stage of accumulation' (Garegnani 1984: 296 fn.12). In classical theory, normal prices and the distribution of income are conceived to be determined on the basis of competition establishing a uniform rate of profit on capital at long-period equilibrium positions for a given level of aggregate output determined at a point in historical time by capital accumulation. This is consistent with our conception that along the growth path there correspond long-period normal prices and distribution for the economic system as determined by data (i), (ii) and (iii) above, with (iii) determined by effective demand according to our demand-led theory along with the composition of demand. In our theoretical framework it is supposed that in each historical period the normal prices and distribution that rule are those based on an average of the data for that period which reflect the persistent and systematic social, economic, and technological forces that determine their normal values consistent with the adjustment and allocation of fixed capital as well as labour to establish uniformity of net profit rates. On this basis the *value* of aggregate output for a general economy producing heterogeneous products in each historical period is determined for a system of prices, distribution, and normal outputs for products, measured either by a single numeraire commodity or in wage units or in monetary terms. This in turn provides the basis for measuring the average growth rate of output in any historical period t over the previous historical period $t–1$.

Before consideration of the implications of some measurement problems for our growth theory, we ought to consider an issue that arises in our analytical framework from proposing that the average utilisation of capacity realized in any historical period normally diverges from normal utilisation upon which normal prices are predicated. This issue essentially turns on the meaning of 'normal utilisation' and its twin role in the gravitation of actual prices around normal prices and in the growth process. The

normal utilisation of capacity that underlies normal prices is best defined as the average degree of utilisation which is *planned* when new capacity is installed on the basis of the *expected range* of demand for products to be accommodated and the spare capacity desired. The range of demand constitutes the expected fluctuations in demand that would correspond to expected fluctuations in utilisation with the expected peak level of demand accommodated around full capacity utilisation (see Ciccone 1986: 23-32). In this conception, normal price is based on the average of the expected costs of production associated with the expected variations in utilisation of capacity for a given technique of production. Because costs per unit can vary differently with utilisation of capacity according to the frequency and amplitude of change in output over the cycle, the expected average cost of production on which normal price is determined will not be the same as the cost of production for the expected average utilisation of capacity which corresponds to a different expected cycle.[13] Hence, there is separability in the determination of normal utilisation from normal price as based on the expected range of demand. This separability underlies the conception of normal utilisation employed, which implies that normal cost pricing will account for and is compatible with a range of effective rates of capacity utilisation. On this basis normal cost pricing can also be conceived to account for the possibility that within limits the long run average utilisation of capacity will actually be different to that expected.

An important feature of this conception is that normal utilisation is not a centre of gravity for actual rates of capacity utilisation in the same way that the corresponding normal prices are centres of gravity for actual prices. The corollary to this is that the gravitation of prices to long period values does not necessitate *the full adjustment* of capacity to demand such as to bring about an effective average utilisation of capacity which is equal to the given normal utilisation. This does not mean that the *tendency* for capacity to adjust to demand in establishing normal utilisation, which is considered to be constantly at work, does not contribute to the establishment of long period normal prices. Rather, the point is that this tendency does not need to establish 'full adjustment' in order for prices to gravitate around their long period values. Indeed, the tendency for capacity to so adjust to demand is considered to be a slower and more complicated process than that associated with the forces of competition which underlie the adjustment to long period normal prices. In our historical growth model exposited in section 3 above, as part of a path-dependent growth process, adjustments in capacity will exert a unidirectional effect on aggregate demand so the achievement of full adjustment can be frustrated for periods of time longer than the 'long period' required for the establishment of normal prices. In this connection the gravitation of prices in the classical approach does not require the whole system of production to have fully adjusted to those positions at which normal prices are defined (see Ciccone 1986: 24-5; Palumbo and Trezzini 2003:

[13] In other words even if the average utilization of capacity in an historical period is exactly the same, average costs of production can vary for a given technique by virtue of a different frequency and amplitude in the cyclical variation of output, and, therefore, capacity utilization over the cycle.

120-22). This means that divergence between average utilisation and normal utilisation of capacity, which characterises this tendency in our growth model, is compatible with the establishment of normal prices. It is in fact a manifestation of the separability between the determination of quantities and the determination of prices which fundamentally characterises the classical approach.

A more substantive theoretical issue is the measurement problem. The measurement problem for growth theory stems essentially from the change in relative prices and in the composition of output which accompanies the growth process in an economic system producing a multitude of products by means of heterogeneous methods. No problem arises in the special case where relative prices and the composition of output remain unchanged. In our model this requires the restrictive assumption that the dominant technique of production as well as the associated normal rates of utilisation and depreciation rates, the distribution of income and the structure of demand all remain unchanged from historical period t–1 to period t. This restriction means that in our model growth depends on the growth of autonomous demand (g_t^A) together with the contingent changes in the super-multiplier ($\Delta m_t(1+ g_t^A)$) attributable to factors essentially *independent of* technological change, changes in the distribution of income and changes in the composition of demand for final products. Indeed, this is the restrictive case usually supposed in steady-state growth models that can implicitly assume the economic system produces only one product because the measurement of growth in theory is precise. However, in the more general case in which our model must account for the contribution of technological change and income redistribution to demand growth, involving a change to relative prices and to the composition of demand and, thereby, the composition of aggregate output, the measurement of the growth of aggregate output in theory cannot be precise. It cannot be precise because it is based on measuring the aggregate *value* of output (income) at different historical periods (i.e. Y_{t-1}, Y_t), the differences of which reflect the change in relative prices and output composition as well as the change in the physical quantity of aggregate output. Hence, the growth of output can only be measured approximately by the construction of a theoretical price index to identify and exclude those changes in the value of aggregate output (or income) attributable to changes in prices and, thereby, residually identify that attributable to a change in production. If we take a given money wage as the numeraire so that normal prices are determined as price-wage ratios and assume the money wage to be constant then a change in the *nominal* constituent of the aggregate value of output measured by a price index is reducible to technological factors, to a change in the rate of interest (profit) affecting distribution and to the effect of a change in relative prices according to the alteration in the expenditure weighting associated with a change in the composition of demand (output). Nevertheless, theoretical precision would require a price index to be constructed to deflate for the change in the nominal constituent of the aggregate value of output attributable to these effects in order to measure the growth rate of output.

Acknowledging this measurement problem in no way undermines our historically-based demand-led theory. It means that in the 'general case' when we account for the

contribution of technological change and changes in income distribution we enter a less precise theoretical dimension in which a degree of approximation is involved with measuring macroeconomic aggregates. Indeed, this *caveat* applies to all growth theories whether they be demand-led or supply-driven theories. But there is a critical difference between the validity of demand-led and supply-driven growth theories. As argued in section 2 above, unless a one-product economy is assumed, the neoclassical supply-driven approach cannot even suppose that for a given technology aggregate demand adjusts to supply-determined output through distribution to establish macroeconomic equilibrium fundamental for a valid growth theory. The measurement problem in our demand-led theory of growth is of a different nature. Within the classical framework our demand-led theory of growth can in the 'special case' of a given technology, income distribution and composition of demand (output) assume a one-product economy for simplification because it is equally valid for a multi-sectoral economy producing heterogeneous products. In the 'general case' our demand-led growth theory for a one-product economy instead remains valid only as an approximation for a multi-sectoral economy.

5. A demand-led interpretation of the historical pattern of growth theory

From the standpoint of the demand-led approach to growth the fundamental problem of economic development for an undeveloped nation is one of generating demand when income is low. The challenge is to develop a complex of institutions that can generate sustained demand growth which raises income per capita and, with it, increases the capacity of the economy to create domestic demand.

A short cut to economic development is for an undeveloped country to obtain access to the markets of rich nations with high levels of income and through an export-led strategy generate foreign demand. Indeed, an appeal to history shows that during the key transition stage of industrialisation the export growth of major developed nations exceeded the growth in their national product. Whilst export growth played an important role in enabling nations in the early stage of industrialization to obtain needed imports, especially of capital goods that embodied modern technology and know-how, foreign demand was an important contributor to growth when low income constrained the growth of domestic demand. Foreign private investment by more advanced countries has also often played a significant role in contributing to demand of a developing country as well as promoting its export industries.[14] The contribution of foreign demand

[14] In the nineteenth century British foreign investment was highly significant in the United States and Western Europe, especially in the financing of railways and other transport infrastructure (see Kenwood and Lougheed 1983: 39-47; and on the history of foreign investment in nineteenth century United States, see Wilkins 1989: esp. 49-167). In the latter part of the twentieth century foreign investment by Japan and the United States was even more important to the rapid development of East Asia, especially of South Korea, Taiwan, and China. A significant feature was that much of this foreign investment consisted of

will however depend on the state of external relations, in particular, on the liberal nature of international trade in giving developing nations access to the market of rich nations. For a large undeveloped nation sustained growth will ultimately depend on developing a complex of institutions with the capacity to generate growth in domestic demand and progressively lift average income per capita.

Besides government, institutions that can play a major role in contributing to demand generation include private enterprises in general, financial institutions, Universities and schools, the legal system, political parties, organised labour and industry interest groups. Within a nation's constitutional legal and conventional framework naturally the government plays a key role in much shaping how these other institutions contribute and interact in society.

By reference to our demand-led model, the growth in autonomous demand depends mainly on government fiscal decisions on its spending, on private enterprises in aggregate determining autonomous investment, especially that concerned with producing new technology, and the financial system, in particular, the central bank through its monetary policy, in facilitating debt-financed autonomous expenditures, including on consumer durables by the household sector. The super-multiplier and changes in it also depend on socio-economic and political-institutional factors. Thus, the propensity to consume, the most important variable determining the super-multiplier, is shaped by social and conventional norms and, among other things, depends on the distribution of income as determined by the relative bargaining power between organized labour and employers, the taxation and welfare system, and longstanding interest-rate policy. The formation of long-term expectations by private (and public) enterprises about future demand growth to determine the amount of capacity-adjusting investment also affects the value of our super-multiplier. In addition, technological progress depends on a range of institutions, on Universities and school education, on government research centres and on private research and development enterprises concerned with developing commercial products. Productivity generating technological progress will depend not only on the development of new superior methods and products but their dissemination among competing enterprises by investment. As discussed in section 3 above, the effect of productivity generating technological progress on demand growth depends much on socio-economic and political-institutional factors determining the propensity to consume.
In concert, a complex of these socio-economic and political institutions are seen to play an orchestral role in the growth process by contributing toward generating demand. By virtue of its influence over the determination of market regulations and, through its fiscal policy, the government is essentially the 'orchestral conductor', influencing how the various institutions play their role in contributing to demand growth.

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direct investment (i.e. FDI) as distinct from portfolio investment (see note 15 below). For a summary account of foreign direct investment in Asia during the late twentieth century, see Goldar and Ishigami (1999).

According to the demand-led approach the task of an economic development strategy is to develop the complex of institutions that maximize a nation's demand growth. The development process is conceived to involve sustained demand growth which, by lifting income per capita, thereby increases a nation's *capacity* to generate domestic demand, principally consumption spending. In this process higher income strengthens the ability of institutions to generate demand. The historical pattern of economic development since the emergence of capitalism in the late eighteenth century provides support for our argument.

An outstanding feature of this historical pattern is that the trend growth rate of later developing countries is generally greater than their predecessors. Indeed, after Britain, the first nation to industrialise, all the large advanced nations which have transformed their economies and achieved the most affluent living standards in human history did so over shorter periods of time with progressively higher sustained rates of growth. Hence, while the average growth rate of Britain over the period 1780-1850, when economic historians commonly believe the first industrial revolution occurred, was just above 2%, the average growth rate of Germany over the period 1850-1913 was higher at over 3% and for the United States it was above 4% over the period 1869-1913, when the economy was transformed into the most industrially dominant. Then, in the twentieth century, when catching up to the living standards of advanced Western countries, Japan grew at an even higher average rate of over 9% over the period 1950-1973; whilst China, in its meteoric economic development has also grown at an average rate of over 9% in the extended period 1976-2012. Evidently, the growth rate potential has progressively increased since the beginning of capitalist development by Britain from the late eighteenth century.

The traditional explanation for this phenomenon, essentially based on a supply-side approach to growth, is that the backward nations were able to catch the leaders mainly through the rapid adoption of the technology developed by the leading nations.[15] Hence, in the twentieth century, developing countries such as China and, before her, Japan, grew faster than historical forerunners because they were relatively more backward technologically and, therefore, had the capability of generating unprecedented higher productivity growth with the successful adoption of the most advanced technology available. However, the ability for a nation to adopt superior technology depends on demand growth since a growing and richer market is necessary to make it profitable for firms to adopt more capital-intensive techniques.[16] Our alternative explanation of the

[15] This view has most persuasively been advanced by Abramovitz (1986) and Gerschenkron (1962), the latter emphasizing the importance of financial innovation by backward nations to technologically catch up to leaders. Most explanations of convergence based on the neoclassical supply-side approach to growth emphasize the importance of backward nations catching-up technologically.

[16] In the case of China the process of development has very much involved foreign investment relocating manufacturing production from an advanced nation (such as United States) to China to meet an established 'foreign' demand in the advanced countries. Hence, adopting the most advanced technology for this foreign-based manufacturing for export was not much constrained by low domestic demand for the product.

phenomenon is that these late-comers have successfully adopted demand-generating institutions demonstrated by leading nations. The progressive development of these institutions has historically increased the capability of developing countries to generate demand growth, especially of autonomous demand. Moreover, as explained above, in a liberal international trading environment late-comers have the benefit of generating foreign demand from leading nations with existing high income per capita. As is the case for a single economy, as income per capita historically increases worldwide, it enables a larger global demand for developing nations to potentially exploit.

In the early stages of industrialization in the late eighteenth and early nineteenth century Britain did not have the benefit of demand generated by exports to richer foreign markets. All other western European nations had lower income per capita than Britain, whilst mercantilism limited the opportunities for international trade.[17] The economic rationale of colonialism for Britain, as for earlier colonial powers, was that it enabled the country to obtain luxury products that could capture a lucrative market in Europe and enable it to expand its international trade largely within an 'empire economy'. As the pioneer of industrialisation Britain relied on forging a national market by building an internal transport network and, by removing out-dated feudal regulations, on promoting the mobility of capital and labour as well as goods to generate sustained demand growth. Together with an expansion in export trade, largely within its 'empire economy', the extension of the domestic market provided conducive conditions for what Adam Smith described as the 'division of labour' in manufacturing and significant technological progress. The institutional emergence of capitalist market competition which came with the opportunity to earn greater income in the form of profits from the sale of manufactured products provided a systematic stimulus to technical innovation and its widespread adoption. Indeed, early British industrialization much relied on productivity gains from technological progress to generate demand given that the growth in private autonomous demand was constrained by the undeveloped state of its credit system to finance large capital expenditures and in which investment was mainly financed internally out of profits by firms. Besides exports, a significant impetus to autonomous demand was provided by British Government deficit-financed war expenditure at times of European and colonial conflict, especially during the long-running French Wars of 1793-1815, which certainly stimulated domestic industry.

Whilst emerging capitalism saw rising incomes among the expanding merchant trade, manufacturing, and retail trade classes, the distribution of income between wage and non-wage incomes remained inequitable largely because of the historical concentration of land ownership originating in feudalism. With the increasing predominance of capitalist-based classes and the emergence of organized labour, income distribution be-

[17] A fundamental factor contributing to mercantilism prior to the nineteenth century is that there was limited benefit to trade among pre-industrial European states because of high transport costs and low income among the mass of working population and because they produced similar products and, on the same regional latitude, experienced similar seasonal climatic conditions that affected their annual agricultural output. For an elaboration of this argument, see Deane (1979: 53-4).

came more equitable in Britain by the middle of the nineteenth century, promoting stronger growth in consumption demand.[18] In this regard, the development of British trade unions in the nineteenth century with wage-bargaining power to obtain a greater share of productivity growth constituted the development of an important demand-generating institution. Another important institutional development for growth occurred in Britain's financial system. The rapid establishment of a regional network of branch deposit-banking from the late 1830s and the maturing of the London Stock market that followed the legalisation of joint-stock companies with limited liability in the 1850s, significantly increased Britain's capacity to finance large-scale capital infrastructure projects and the expansion in fixed productive capacity by firms. No doubt this promoted stronger growth in autonomous demand. This nineteenth-century development of Britain's financial system not only facilitated greater growth in private investment but also facilitated a greater potential capacity for deficit-financed government spending.

A more outstanding historical example of a developing economy creating institutions that facilitated rapid demand generation is given by the pivotal role played by German banking in the nineteenth century. It is well known among historians that railways played a critical role in Germany's industrialisation and, connectedly in its nation building (see Fremdling 1977; Tilly 1967: 176; Trebilcock 1981: 43-5, 55-61). The difficulty for Germany in financing railway investment in the early stages of its development in the 1840s and 1850s was that its multi-state economy was agrarian based with a low level of income from which to generate saving. By the employment of innovative credit instruments German banks developed what has been called 'mixed banking', which combined investment (or industrial) banking with the more usual commercial banking role of funding long-term investment with short-term credit funds. Investment banking involved bankers organizing and underwriting new enterprises on the basis of a relatively small pool of savings mobilised from the mainly mercantile sector where they were concentrated. In this role the German private banks were not only actively involved in financing the enterprise but also in investment decision making and its on-going management. In particular, German banking was adept at credit creation from a small liquidity base, employing bills of exchange, drafts and *giro* facilities as money substitutes and generating bank deposits through their aggressive lending.[19] Importantly, 'mixed banking' enabled the greater concentration of capital required for railway construction and

[18] Another significant factor contributing to consumption growth was the repeal of the Corn Laws in 1846 and the adoption of a 'free trade' policy which enabled the import of cheaper foreign-produced foodstuffs, thereby boosting the real income of the larger British population.

[19] The development of credit-instruments as 'money substitutes' by German private banks occurred endogenously partly as a response to the systematic shortage of official state money in circulation under the control of the Prussian Bank (Tilly 1967: 170-76; Trebilcock 1981: 92-3). Nevertheless, as the Prussian Bank expanded its network of branches across Germany it did provide greater support to the private banks by discounting short–term bills (or credits) and supplying liquidity when required. After unification in 1871 and the establishment of the Reichsbank as the central bank of Germany, discount facilities were liberally provided to the private banks, effectively allowing them to potentially hold riskier asset portfolios (see Tilly 1967: 182-3).

also for other large scale industrial enterprises such as iron production, coal mining and engineering, industries all stimulated by the railways (see Fremdling 1977: 584-93). From private banks, mainly consisting of limited partnerships, German banking evolved by the 1870s into large joint-stock 'Kreditbanks' that formed industrial cartels consisting of a conglomerate of related heavy industries. The distinctive form of innovative German banking, in which bankers became closely associated with investment decision-making and the entrepreneurial promotion of industrial enterprises, enabled the economy to maintain a high rate of investment and, thereby, a strong sustainable growth in aggregate demand, which explains much of the rapid economic development of Germany in the second half of the nineteenth century.[20] Given Germany's low level of income in the early nineteenth century from which in little time it achieved an incredibly high rate of capital accumulation, this historical example provides strong evidence in support of the Keynesian demand-led conception that investment causally generates saving endogenously through the expansion of income and against the traditional neo-classical notion that saving causally generates investment.

Another key institutional development that has historically promoted demand-led growth is the expansion in the role of government and its machinery of macroeconomic policy which occurred in the twentieth century. A major impetus to the expansion of government in advanced nations was the First and Second World Wars in which centralised control and allocation of productive resources by the nations involved was necessary to prosecute war. In particular, government financing of these wars involved a considerable increase in tax revenue raised as well as public debt whose management led to institutional changes in the conduct of monetary policy by central banks and in their monetary systems. Whilst after the First World War there was in the 1920s a return to smaller government, the Great Depression reversed this with an expansion in the role of the central government in the 1930s to deal with the social and economic crisis of high unemployment and poverty. This led to a significant enlargement of government from the late-1930s in the cause of rearmament and war preparation. In the late-1930s and 1940s what is called the 'Keynesian revolution' ushered in institutional changes to the machinery of government policymaking that considerably increased the capacity for macroeconomic policy to promote demand-led growth after the Second World War.[21]

The theory of effective demand developed by Keynes in the *General Theory* ([1936]1973) was critical in enhancing the role of macroeconomic policy in demand generation. In discovering the principles by which aggregate demand determines the level of output and employment of a capitalist society, economic science was able for the first time to inform policymakers of *how* and *why* macroeconomic policy could work to permanently contribute to growth by generating demand. Before Keynes

[20] In reference to data on capital formation of various countries compiled by Kuznets (1961) for the second half of the nineteenth century to 1914, the historian Trebilcock (1981: 62) wrote 'German gross capital formation represented the largest investment effort in relation to national product of the era, easily outpacing that of Britain, France, and even the USA'.

[21] On the making of the 'Keynesian revolution', see Clarke (1988), and also Middleton (1985).

([1936]1973) there was no robust rationale as to why expansionary fiscal measures would be effective in stimulating activity and employment. Hence, whilst a few national governments, with the support of numerous academic economists, implemented public works investment schemes in the Great Depression of the early 1930s to absorb the unemployed and arrest the downturn in activity, there was no robust rationale as to why it might work.[22] The traditional 'sound finance' argument against government spending on public works schemes was that by absorbing a given amount of saving it would only 'crowd-out' private investment.[23] But as is well known Keynes' theory showed that by contributing to greater aggregate demand such schemes would work by generating higher output, income, and employment and, consequently, a greater volume of saving that could finance additional net government spending without affecting any potential private investment. As Keynes theory clearly showed, in a closed economy 'crowding-out' could only occur at full-employment output when income could not be increased and, therefore, saving was maximized.

In our demand-led growth model the long-run elasticity of output associated with changes in utilisation and, thereby, simultaneously, capacity itself, generally enables any expansion in deficit-financed government spending to be accommodated by the saving it generates through the demand-generated expansion in income and employment. Indeed, depending on its nature in relation to the overall situation of the economy, government spending is more likely to have a 'crowding in' effect in the long run, by stimulating private autonomous spending.[24] This does not mean that the growth of debt-financed government spending is unlimited. The essential constraint on the size of public debt and its growth is the capacity of the government over time to service the debt out of its recurrent revenue and, therefore, at the expense of otherwise alternative recurrent expenditures, consistent with meeting social and economic obligations and its political objectives. Given that government taxation revenue is by and large a long run function of national income and that the public debt-servicing cost is determined by the nominal rate of interest, then the nature of the constraint essentially, though not completely, revolves around the relationship between the growth rate and the interest rate. A rule of thumb for public debt sustainability – in the sense that the existing ratio of public debt to national income is stabilized – is that the growth rate of income (and, therefore the growth of tax revenue) is at least equal to or greater than the interest rate on the debt

[22] Well known examples are the work relief programs in the United States under the 'New Deal' policies of the Roosevelt Administration in the 1930s and the large public works program in Germany initially implemented by the last Weimer government in 1932 and then escalated under the Nazis.

[23] Indeed, this traditional argument held by Anglo-American policymakers prevented the adoption of a Keynesian fiscal expansion until the late-1930s when the urgency of rearmament led to greater defense spending by government. Thus, in the case of Britain the government adopted Keynesian policy not because of the persuasive arguments of Keynes but in response to the threat of European war posed by Nazi Germany.

[24] In particular, government capital expenditure on the construction of transport and communications infrastructure is likely to lead to greater profitable opportunities for investment in the private sector by opening up markets and reducing the cost of transporting products. It can also contribute to greater private investment associated with the wider adoption of new technology.

(see Pasinetti 1997). Hence, by lowering interest rates in relation to the growth rate, monetary policy can reduce debt-servicing costs to tax revenue and thereby relieve public debt sustainability pressures. Alternatively, by lowering interest rates in relation to the growth rate, monetary policy can reduce the cost of the debt burden on the budget and provide scope for some fiscal expansion (*via* a larger *primary* budget deficit or smaller surplus) consistent with public debt sustainability.[25]

The other major contribution of the 'Keynesian revolution' was to show how in a fiat-based monetary system the central bank possessed the capacity under certain institutional arrangements to set interest rates for sustained periods to promote demand-led growth. Keynes's ([1936]1973; [1937]1973) monetary theory with its key notion that the rate of interest was a 'monetary phenomenon' subject to institutional determination by the 'monetary authority' provided scholarly support for the long-running low-interest rate policy of the 1930s and 1940s by Britain and the United States. The institutional machinery for prosecuting this monetary policy in fact developed out of desperation by the respective governments to facilitate a recovery from the social-economic crisis of the Great Depression. Besides a belief that low interest rates could stimulate private spending, policymakers came to realize that by reducing the cost of servicing public debt they provided greater budgetary scope for fiscal expansion.[26] By keeping interest rates low the British and United States governments' were able to accumulate large public debts to finance the large military expenditure to prepare for and prosecute the Second World War. The institutional machinery of policymaking by which central banks could maintain relatively low interest rates to promote demand-led growth was in fact maintained for a long period of time in the post-war period. As is well known, Keynes ([1936]1973: 202-4, 372-83; [1940-1946]1980: 388-405) advocated a sustained 'cheap' money policy to foster Britain's post-war recovery on the grounds that: (i) it would tend to support private investment; (ii) minimize government debt-servicing costs to facilitate fiscal expansion in the form of public investment; and (iii) to promote a more equitable distribution of income that would tend to raise the value of the social propensity to consume and, thereby, the multiplier (also see Howson, 1987; and in relation to Keynes's main policy position, see Aspromourgos 2012).

In the analytical framework of our demand-led growth model, consistent with Keynes' unorthodox position, monetary policy is conceived to exert a permanent influ-

[25] For an account of the complexities of public debt sustainability and its various implications for policy from the standpoint of a demand-led approach to growth, see Aspromourgos (2014); and on the capacity of the monetary authorities to set interest rates to alleviate the constraints on fiscal policy posed by public debt sustainability, see Aspromourgos, Rees, and White (2010, esp. 440-46).

[26] Actually this was learnt much earlier by British policy makers in the 1820's when the Liverpool Tory Government pressured the Bank of England in 1822 to lower its discount rate to help stimulate recovery from an extensive recession that occurred after the Napoleonic Wars. The lowering of the Bank's discount rate from 5% to 4% enabled the government in subsequent years to convert a large stock of war debt to progressively lower levels of long-term interest rates. This considerably reduced the debt-servicing cost on the national budget and allowed the government to pursue its policy objective of reducing taxation, especially custom duties on imports (see Smith 1996:39-41).

ence on growth. This stems from the classical 'surplus' approach to distribution we are employing in which the most plausible way of determining distribution between wages and profits is to treat the normal rate of profit as independently *given*, on the basis that it is systematically regulated by the long-run average money rate of interest, so that the real wage is residually determined along with normal prices for a given technique of production (Sraffa 1960: 33; Pivetti 1991: 10-32). It can then be logically sustained that in a fiat-money economy, monetary forces, most especially monetary policy, that determines the long-run average money rate of interest, and, thereby, causally, the normal rate of profit, can exert a lasting influence on economic activity, chiefly through its lasting effect on income distribution.[27] Hence, in accord with Keynes's argument, the longstanding interest-rate policy of the monetary authorities will influence economic growth by influencing the growth of aggregate demand, primarily through its effect on the growth in consumption and its effect on the long running stance of fiscal policy (see Smith 2011: 227-31).

A major institutional development in the twentieth century which underlay the 'Keynesian' policymaking machinery to promote demand growth outlined here was the abandonment of the gold-standard and the adoption of a fiat-money financial system. As a pre-condition to the adoption of a low interest-rate monetary policy and stimulatory fiscal policy in the early 1930s, most advanced countries abandoned the constraints imposed by the gold standard. Under the Bretton Woods international monetary system subsequently established after the Second World War currencies (other than the US dollar) were not convertible into gold and so operated effectively on a fiat-money basis. Bretton Woods was a major institutional contribution to *global* demand-led growth in the post-war era. In particular, greatly supported by United States financial assistance, it opened up multi-lateral trade that was fundamental to post-war recovery of war-ravaged Western Europe and Japan and enabled them to develop competitive export sectors in manufacturing. Indeed, strong export growth, principally to a high income North American market, facilitated by liberal international trade, was a major factor in the unprecedented growth of Western Europe and Japan which saw a convergence in their income per capita to that of the United States in the thirty-year post-war period. In the 'golden age' of 1950-1973 the record historical trend global growth rate was associated with an unprecedented growth in international trade, especially of manufactured products (Armstrong, Glyn and Harrison 1984: 214-26). But whilst the liberalisation of international trade played an important role in the high sustained growth of this age, the key factor was the growth in domestic demand generated in the advanced countries by 'Keynesian' policymaking institutions with the objective of maintaining low unemployment, by institutions in research and industry that drove technological progress and, connectedly, by private enterprise through investment in pursuing higher profitability. The consider-

[27] This notion that the interest rate is determined purely by monetary forces and that interest-rate policy has a lasting influence on activity through demand was essentially adopted by Keynes in the *General Theory* ([1936]1973) and after (see Panico 1988: 102-180; Pivetti 1991: 8-10).

able rise in income per capita that occurred during the golden age progressively increased the capacity of the advanced countries to generate consumption demand that also benefited much of the post-colonial developing world by way of higher export demand.

A liberal system of international trade as well as the globalisation of capital markets over the past fifty years has in particular provided a valuable opportunity for developing nations such Taiwan, South Korea, and China in East Asia to overcome the constraint to demand growth of low domestic income by attracting foreign investment to develop strong export sectors to successfully implement an export-led growth strategy. By adopting a complex of institutions that generate demand which, as discussed above, were previously developed at different historical stages by todays advanced nations, and, by exploiting the opportunities for capturing foreign demand provided by a liberal international economic environment, these Asian economies have achieved unprecedented sustained growth rates.[28] They were assisted by the relatively high income per capita historically achieved by the advanced nations.

But it should not be supposed that maximum trend growth rates will always continue to increase. As has been demonstrated over the past thirty years or so the advanced West European and Anglo-American countries have in a number of ways degraded their demand-generating institutions and, thereby, their capacity to grow. From the late 1970s until the global financial crisis (GFC) of 2008 they fundamentally changed the priority of macroeconomic policy from the objective of full-employment to price stability, reflected by a change in the machinery of policymaking that afforded a greater role to monetary policy to constrain inflation and a lesser role to fiscal policy associated with containing the role of government. By weakening the equity objective built into in their taxation and welfare systems and supporting measures that has contributed to a significant weakening in the bargaining power of organized labour, they have generally facilitated a structural shift in the distribution of income in favour of high-income wealth holders which has considerably reduced the potential for consumption growth and, indirectly, growth of capacity-adjusting investment. Notwithstanding the persistent labour unemployment and underutilisation of productive capacity of most of these advanced countries since the global financial crisis of 2008, fiscal policy has been largely neutered with a few of them adopting austerity policies.[29] Moreover, among many advanced

[28] As illustrated by the example German nineteenth-century innovative banking discussed above, the complex of institutions are nevertheless specifically adapted to overcome problems according to a nation's stage of development. They will also reflect a nation's particular political, social, and economic character. Thus, for example, in China, an authoritarian state, independent trade unions play virtually no role in demand generation through wage-bargaining and help explain the comparatively low level of private domestic consumption as a ratio of its national income and, until recently, a reliance on foreign demand for much of the impetus to its growth (with a high level of exports as a ratio of national income).

[29] Whereas the sovereign debt nations of Greece, Portugal, Spain, and Ireland in the Eurozone were compelled in 2010 to adopt fiscal austerity policies as a condition for obtaining financial bail-outs by the European Union, the United Kingdom (not in the European Monetary Union) adopted fiscal austerity in 2010 as a matter of political choice.

countries free trade has been adopted on the premise of higher foreign demand *as a substitute* for policies to generate domestic demand so in aggregate undermining its possible benefit to global economic growth. This degradation of key institutions which can contribute toward demand-generation largely explains the decline in trend growth of the advanced countries since the afore-mentioned 'golden age'.[30]

6. Conclusion

This paper has argued for the superiority of our demand-led approach to explaining growth on both theoretical and empirical grounds. On theoretical grounds we showed that the neoclassical supply-side approach to growth is only valid in a one-commodity economic system. By contrast, we showed that our demand-led approach to growth within the classical 'surplus' theoretical framework is valid in general for a multi-commodity economic system. Under the restrictive conditions usually supposed of assuming constant returns technology, the distribution of income, the composition of output, the normal utilisation of capacity, and the depreciation rate of the capital stock to be all *given*, our demand-led growth model for a one-commodity economy remains precisely valid for a multi-commodity economy. However, we showed that due to the measurement problem stemming from a change in relative prices and the composition of output, when accounting for the contribution to demand growth of technological progress, changes in distribution, normal utilisation and the depreciation rate accompanied by a change in the composition of effectual demand (output), our one-commodity model is a valid approximation of a multi-commodity economy whereby a more precise approximation requires measuring aggregate income over time by constructing general price indices. Indeed, the measurement problem imposes the same theoretical limitations on any growth theory.

On empirical grounds we appealed to the historical pattern of economic development to demonstrate the explanatory power of our demand led growth theory. It was shown that the demand-led approach provided a quintessential insight into understanding that historical pattern: progressively higher trend growth rates achieved in history by nations

[30] This is clearly shown below in historical trends of the 'Annual Average Growth Rate of Real GDP' of the largest six advanced countries:

	1913-1950	1950-1973	1973-1989	1990-2016*
United States	2.8	3.6	2.7	1.6
United Kingdom	1.3	3.0	2.0	2.0
Germany	1.3	5.9	2.1	1.6
France	1.1	5.0	2.3	1.6
Italy	1.5	5.6	2.9	0.7
Japan	2.2	9.3	3.9	1.1
Average	2.2	5.4	2.7	1.6

Source: Maddison (1991), p. 50; * IMF *World Economic Outlook Database*.

in their transformation from undeveloped to developed economies was primarily a function of the progressive development of a complex of institutions with a greater capacity to generate demand growth. The other insight is that historically, with development and income per capita increasing, the capacity to generate demand growth through consumption increases. As discussed in section 5, in the early historical stages of capitalist development, sustained growth depended on mercantilist policies to extend a nation's market, engender labour and capital mobility by the removal of feudal regulations and to develop its transport and communications network to facilitate technological progress that would generate demand (*via* a ratchetting up of the super-multiplier). The nation's growth of autonomous demand relied mainly on exports and government spending with private investment constrained by the undeveloped state of the financial system. It is chiefly with the creation and development of institutions that increase the capacity to generate growth of autonomous demand that nations have historically been able to raise their trend growth. Hence, the historical development of the financial system to better mobilise and employ saving (existing wealth) to create longer-term credit, enabled greater growth of private autonomous investment as well as capacity-adjusting investment (increasing the super-multiplier). The historical development of the institutional machinery of macroeconomic policymaking by government associated with its increased role in society that was inspired by the 'Keynesian revolution' has also in turn increased the capacity of nations to generate autonomous demand, not only directly through the possibility of greater government spending but in other ways, notably by contributing to health, education, and research, it contributes to technological progress and labour productivity. Moreover, by the establishment of a significant taxation and welfare system governments can effect a more equitable distribution of income that contributes to stronger demand growth by increasing the social propensity to consume (and, thereby, the super-multiplier). By ensuring that employed labour shared in the productivity gains of technological change, trade unions have played a key historic role in promoting stronger consumption to sustain stronger demand growth. In recent history the institutional establishment of an international monetary system that has facilitated multi-lateral liberal trade and led to the greater global integration of capital markets has provided a greater opportunity for nations to generate growth by exploiting the higher income per capita of foreign nations or regions whose economies are advanced to generate foreign demand growth for their exportable products. Besides these key institutional developments in history, a myriad of other institutions can be considered to have played a significant role in the growth process and determining a nation's capacity to generate growth.

The critical insight of the demand-led approach for the economic historian and development economist is that the contribution of these institutions to growth and development is fundamentally based on their role and contribution toward generating demand growth more clearly understood by reference to our historical growth model.

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