# *NOTES ON THE TRANSFORMATIONAL GROWTH OF DEMAND*[*]

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*Understanding the Growth of Demand*

At present, neither conventional nor alternative approaches to economic theory provide much help in understanding the growth of demand, either in the aggregate, or for specific markets and sectors. 'Growth of demand' refers here to repeated, continuing expansion of demand (either at a steady rate or at a fluctuating rate with a persistent average), where the expansion is not offset by contraction elsewhere. Such growth of markets, and expected growth of markets, will be important in making business decisions, and will be an object of study by marketing divisions.

Yet explaining such growth has not been an objective of theorists. Indeed, from a 'real-economy', or barter exchange, perspective it might seem that any growth of demand has to be based on a corresponding growth of supply. For if a new demand for a certain set of goods is to be *effective* in real terms, there must be an expanded supply of some other goods with which to pay for the newly demanded set. Explaining the growth of supply has therefore seemed adequate.

But this is a way of thinking that overlooks the role of finance. Finance breaks the link between demanding one set of goods and paying for them with another; once finance is in the picture, goods can be demanded even if the other goods needed to pay for them have not yet been produced. With finance, growth of demand can be separated from the growth of supply.

But for the most part, growth models have been held in thrall by the 'real-economy' perspective, and so have tended to focus on the supply-side, assuming implicitly or explicitly that the growth of supply will generate an equivalent growth of demand, a sort of long-run Say's Law. Both Solow and Kaldor, for example, assumed that in the long run Investment would reflect the 'natural rate of growth'. Their models differed in that Solow assumed that the warranted rate would adjust to the natural through a process of substitution between capital and

[*] Many thanks to Duncan Foley, George Argyrous and Mark Setterfield for helpful comments and suggestions. These Notes develop the discussion in *The General Theory of Transformational Growth,*

labor, whereas Kaldor assumed that the adjustment would come about through changes in income distribution resulting from variations in demand pressure. In both, however, the natural rate - a supply side variable - determines the long run course of Investment, a Keynesian expenditure variable.

Yet this has to be considered implausible. Surely plans to spend on the expansion of productive capacity will not be developed without a prior expectation of an appropriate growth in demand. For the Keynesian separation of Investment from Savings to hold, there has to be finance available. So the growth of demand will not be constrained by the growth of supply and cannot be inferred from supply-side considerations. A demand-side account is required.

1. It is often thought that, at the macro level, the growth of demand is explained by the Harrod-Domar model. The 'warranted rate of growth' is that rate at which the growth of demand just equals the growth of capacity. But in fact this model equates the current *level* of expenditure, as determined by the multiplier, with the current capacity output of the capital stock, in accordance with the productivity of capital (inverse of the capital-output ratio). There is no necessary connection with growth.

To see this consider an example which substitutes Government Spending for Investment (Nell 1998, pp. 599-600). Let G be Government spending, K be the capital stock, v the capital-output ratio, K/Y; assume all profits, P, are saved and all wages consumed. Then z = 1-wn = P/Y, where w is the wage rate, and n =N/Y.

G/z = K/v tells us that aggregate demand equals capacity output, and this implies G/K = z/v = r

The formula, analogous to the Harrod-Domar condition, states that the ratio of government spending to capital must equal the ratio of profits' share to the capital-output ratio in order for capacity to be fully utilized. But the latter ratio reduces to the rate of profit; the condition is analogous to the Golden Rule.

Now let the productivity of capital depend on the level of G. Suppose that higher levels of G lead to higher productivity (lower v.) Then if G/z > K/v, it would appear that capacity is too low, so 1/v should be increased, and the way to do this is to increase G. Similarly, if G/z < K/v it would appear that the appropriate move would be to reduce G. The Harrod-Domar 'knife-

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especially Chapter Ten.

edge' results are reproduced – there is only one level of G at which there will be equilibrium, and it is unstable[1]. Any movement away from it will be reinforced. Although the model is static, the Harrod-Domar results have been reproduced. Growth does not figure into it at all. The Harrod-Domar relationships do not offer an account of the growth of demand.

The multiplier-accelerator model suffers from a related disability.[2] The accelerator comes into play because output, responding to demand, is pressing on capacity. So more capacity should be built. But the multiplier only works if there is some flexibility in employment; then additional workers can be hired, and their spending will increase demand. But if there is flexibility in employment, there is unused capacity. So why should more capacity be built? The answer that is usually given is that there is a 'normal' or 'desired' level of capacity, which can be exceeded, but only at higher cost. As it is exceeded, demand will increase, but so will costs. To keep the latter down, additional capacity will be built. But this just pushes the problem back one step - how is desired or normal capacity set?[3] And it is still the case that when the multiplier works best, the accelerator will not be in play, and when accelerator effects are most obviously called for, the multiplier is questionable, because capacity is limited and costs are rising. In short the multiplier-accelerator may have a role to play at points in the business cycle, but it is difficult to see how this relationship can give a reliable and long-term account of the *growth of demand.*

2. The problems of the Harrod-Domar account of the growth of demand surely cannot be found in the "Cambridge" growth model in the form developed by Robinson (Robinson, 1956, 1963; also cf. Kaldor, 1960, 1963). But a related difficulty emerges. This

[1] Rather than being an account of growth, the Harrod-Domar formula might be considered a dividing line between two divergent *modes of operation* of a Mass Production economy. (Nell, in Nell and Semmler, 1990; Nell, 1998.) One is an excess capacity regime, in which demand always has a tendency to fall short of capacity, or rather, in which capacity is always running ahead of demand. The other is an excess demand regime, in which capacity is always running short. The first is typical of modern capitalism, the second of Soviet-style socialism.

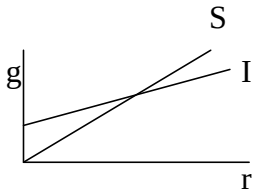
[2] The multiplier-accelerator model is very close to the Harrod-Domar, but differs in that it includes *time-lags* in formulating its investment and saving functions. (Allen, 1965; Matthews, 19 )

[3] Normal capacity will be built to service the expected normal level of demand; so new capacity will be added in the light of expected demand growth. It is the latter which calls for explanation. The crucially important implication of the multiplier-accelerator analysis, however, is that the aggregate demand - aggregate capacity balance tends to generate *an unstable cumulative process.* That is, given the normal growth of demand to which normal capacity is adapting, a deviation from this in either direction will tend to set up a self-sustaining process that will continue moving in that direction. Expansion of capacity will

approach determines growth by balancing the saving and investment respectively induced by the rate of profits[4]. A simple version (modifying the treatment in Ch 10 of Foley and Michl) can be illustrated on a diagram with the growth rate on the vertical axis and the profit rate on the horizontal. Two functions are then defined.

--The first shows the growth rate made possible by the saving out of various levels of the profit rate. This starts from the origin and rises with a slope that represents the propensity to save out of profits.

--The second shows the growth rate determined by the investment called forth by the expectation of a rate of profit. This will normally have a positive intercept, indicating that some investment, and therefore growth, would take place even if profits were expected to be zero (due to competition, especially for innovations). Higher expected profit rates stimulate investment, but not excessively, so this line will rise with a flatter slope than that of the saving function. The two lines will intersect, as shown in the diagram below.




Both g and r refer to the current period and they are determined together.

The first relationship is based on the Classical Saving Function. While this has limitations they are well understood, and it is surely a reasonable first approximation. But the second relationship is more problematical. Profits, business earnings, are a withdrawal.[5] How can investment depend on a 'withdrawal' variable? (That is akin to saying that Saving

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generate even greater expansion of demand; contraction in investment will further contract demand. This is central to understanding macroeconomics, but it offers no help in explaining the *normal* growth of demand.

[4] In the Cambridge view, short run models of effective demand have Investment determining Profits and so that the level of activity is demand-determined. But in the long run, they allow that Profits may determine Investment, so that supply determines demand. (New Keynesians would agree, substituting 'Saving' for 'Profits'.) The argument here suggests that the direction of causality assumed in the short run is also correct for the long run.

[5] Strictly speaking, there can be no 'consumption out of profits'. Consumption is spending by households, whereas profits are the income of business. Business must *distribute* a portion of profits to households, e.g. as dividends; then households may consume all or a fraction of that dividend income. In the case of the self-employed, a portion of the apparent profits must be designated as salary. Unusually large draws must be considered on a par with dividend payments.

determines Investment). Putting it another way: why should we build more capital for tomorrow's markets in proportion to the rate of earnings of today's capital? The current rate of profit tells us how well capital is doing today; but today's investment spending will not come on line until tomorrow. Today's profit helps to *finance* today's investment (as accounted for in the first equation). But it provides no *reason* to build more capacity.

Even interpreting the variable as an *expected* future rate of profits does not help, (quite apart from the fact that the rates in the two equations would refer to different time periods)[6]. Suppose the rate of profits is expected to rise; why should that lead to building more capacity? The rate of profit on current capital will have risen without doing anything. On the other hand if the rate in question is the expected rate of profit *on the newly built capacity*, after it comes into operation, then it is a *marginal* rate, and is not comparable to the rate which figures in the Classical Savings equation. If it is the expected future rate on *all* capital – present plus new investment - the question still arises, why does a higher rate induce more investment now? (Kurdas)

The correct answer, it will be argued here, requires first making an important distinction – between investment *decisions* and investment *spending* (to carry out those decisions). Then what induces decisions to invest, to build more capacity, is the anticipated growth of markets. If markets are growing strongly, decisions to invest will be made readily, even if expected profitability is low. If markets are sluggish, however, even though profitable, there will be little reason to build more capacity, and decisions to invest will be few. Capacity is planned to service demand. *Spending* on capacity construction, however, requires considering another variable – the cost and availability of funds. But this affects the timing of capital construction, not the decision whether the capacity should be built.[7]

3. Neither equilibrium – determinateness – nor stability can be established for prices (in Mass Production markets) unless the growth of demand equals the growth of supply. Suppose current supply and demand are equal, but while new markets are opening up, firms are not building new capacity (for whatever reason). Future prices will start to rise, and this will

[6] This would restrict the model to consideration of steady growth, in which variables were unchanged from period to period.

lead to an increase in current demand for stockpiling, upsetting the current equilibrium. (Even if future prices were sluggish, or the futures market undeveloped, stockpiling in the light of anticipated shortages would be a good idea.) The same results follow in reverse if supply is expanding with no growth of markets in sight.[8]

By contrast suppose current demand lies below current normal capacity, but new markets are opening up at the same rate that new capacity is being built. Current demand and supply can be brought into line by raising the scrapping or lowering the replacement rate. The same holds if current demand is above current normal capacity; scrapping can be postponed, or replacements enhanced. These are one-shot adjustments. But when current demand and supply are equal but the *growth rates* are out of line, no one-shot adjustment can restore the balance. If the growth of demand and supply are not equal, the market cannot reach equilibrium, but if growth is in balance, and current levels are not, capacity is easily adjusted to bring them into line.

The significance for theory lies in the fact that prices are important long-term factors influencing the growth of supply, on the one hand, and the growth of demand on the other. Given unit costs, higher prices, relative to money wages, increase profit margins, and thus provide both internal finance and borrowing power, making it possible to underwrite the construction of additional capacity. (Wood; Eichner; Milberg, Harcourt and Kenyon) On the other hand, higher prices (relative to money wages) make it harder, lower prices make it easier, to break into and develop new markets (Nell, 1992; 1998, Ch 10). So we can define a positive or rising relationship between long-term or 'target' prices and the planned growth of capacity, and an inverse or falling relationship between such prices and the growth of demand[9].

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[7] Of course the two interact, but separating them makes it possible to isolate the influence of demand growth, clearly a long-run question, while showing at the same time that interest costs are a short-run matter. (Kalecki, ; Nell, 198 , l998, Ch 10, 11)

[8] For a related argument see Hicks, 1989, pp.10-11, *et passim.* Hicks' point is that Marshall's *flow* equilibrium for a particular period is inadequate; in most markets both suppliers and demanders may be interested in stocks, which requires admitting speculation over a sequence of periods. The point here is that the anticipated balance *over* time has to be considered in determining the best course of action at any *given* time. But the argument here concerns the growth of capacity, which is different from the holding of stocks. Current supply and demand are flows, and growth of supply and growth of demand refer to rates of change of flows. Stock-flow arguments may be superficially similar, but should be kept separate.

[9] But it does not follow that the long run will be characterized by steady proportional growth. On the contrary, in a class society there is good reason to think that, in general, steady proportional growth will not be attainable. (Nell, 1986, 1991, 1998) A very simple argument shows this: Suppose there are only two classes, a wealthy class and a poor class, but both work and both own property. (The first group would be 'owner-operators' in early capitalism, receiving 'wages of superintendence' as well as profits; in a later era they would be professional managers owning stock. The second would be workers with pensions and savings.) The rate of interest will be the same on capital whoever owns it. But the possession of wealth

However, while this approach will help in understanding the practice of modern corporations in managing their markups, it sheds little light on why new markets are opening up in the first place. Corporations can lower their prices, and attract more business; that is simply static demand. It becomes dynamic only in a limited sense, when conjoined to the income distribution. In a class society with a hierarchical income distribution, as price falls relative to the wage new groups can progressively incorporate the good into their budgets. Such 'incorporation effects' are fully accounted for in the 'lifestyle' approach to the household, discussed below. A function can be derived showing the expansion of markets with each lowering of the price. This is an important step. Yet it is no more than the expansion of an already existing good into new areas; innovation and social change are not involved, suggesting that more fundamental forces remain to be explored.

4. Utility theory, and the principal versions of the mainstream theory of consumer behavior, seek to determine choices in static terms. Not only are preferences given, agents are assumed to know their preferences without having to learn or experiment. Skills and information are likewise given without regard to learning. And, of course, endowments of resources, including labor, are assumed to be known and available. The theory then determines current levels of household expenditure, but it contributes nothing to explaining how this level might change or grow in a systematic way.

--However, household budgets do present serious choice problems, but these must be considered in a programming format, as, for example, in the work of Lancaster, where consumers are understood not to want goods for their own sake, but for what they offer, their 'characteristics'. That is, we want apples for taste, nutrition, or to complement other foods. Bananas also offer taste, nutrition, and (different) complementarities. We choose the bundle of *goods,* apples and bananas, that offers us the best deal for the *desired characteristics*, taste, nutrition, etc., for example,.the minimum cost bundle that provides a given level of the characteristics, or the highest fulfillment of desire for a given cost.

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will confer advantages in the earning of salaries; the wealthier will be in a better position to acquire skills and influence. So salaries will be higher than wages, in proportion to the difference in per capita wealth. The wealthy will be in a better position to save and to invest in human capital. Under these conditions the wealth of the richer class will tend to grow faster that the wealth of the poorer, thereby ensuring that the gap between the gap between the salaries of the managerial class and the workers also widens. Given that

--But Lancaster leaves his 'characteristics' floating free. They need to be fitted into a larger picture, in which certain 'characteristics' will be desired because they are part of a 'lifestyle', which in turn reflects class and social pressures. (Nell, 1998, pp.470-3)

--This then will allow for choices of goods and services to achieve the standards imposed by a lifestyle (Nell, 1998, Ch 10). Demand functions can be developed; they will show stretches of unresponsiveness to price changes alternating with large rapid responses. "Composition' effects – changing the proportions of categories of goods in the budget - and 'incorporation' effects – including new goods, dropping others - can be distinguished and their causes studied. (Nell, 1998, pp. 474-5)

--Certain lifestyles will call for self-improvement, and for competition to rise to in social status. Self-improvement and rising in status will also tend to increase productivity. The social pressures generating this kind of competitive career and social climbing are likely to be class-related. Responding to such pressures will tend to lead to setting aside part of the household budget for investment in education, training and other efforts directed to achieving promotions and rising in social status. It will also call for labor-saving innovation in household tasks, since more *time* will be needed for household members to engage in the new activities. This will open the door for new products.

--Setting out on such a path might be associated with reaching a certain level of real wages, a level associated with lifestyles in which achievement is measured in terms of income and status. That is, a certain level of real wages might be associated with investment in self-improvement, and so with increases in productivity and growth in incomes. Investment in self-improvement is likely to lead to changes in the composition of demand. Growth of productivity and income, of course, will tend to lead to growth of demand. Let's explore this.

*The Emergence of New Markets*

5. We saw previously that a price-expansion of demand function could be derived on the basis of a given class structure and income distribution. But this did not take into account or explain *innovation.* It examined the growth of demand in terms of the expansion of existing (more or less mature) markets, leaving to one side the emergence and development of new ones.

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the consumption patterns of the rich and the poor will differ, the markets serving the rich will be expanding faster than those serving the poor.

(Set population growth to one side – growth following population expansion has been studied extensively. Changes in the age composition of a population, however, are related to changes in the composition of demand, one of the themes here. Nevertheless our focus will stay chiefly on changes in the class structure and the resulting effects on demand.)

--New markets must first be *created*, in some process of innovation. This might result from the development of a new product. Or, the route explored here, it could be part of a larger movement, the effort of a fraction of the working class to rise in the world, through a competitive process of self-improvement. Self-improvement, in turn, as we saw, requires restructuring household budgets, and will have to draw on sources of finance.

--Once they have established a foothold, new markets will develop following a more or less sigmoid-shaped path, starting slowly, then expanding at an accelerating pace, then slowing down and finally stagnating. The latter stages, of course, are the stages of expansion for mature products.

--Existing markets tend to expand in line with Engel curves; increases in the incomes of existing customers will not be spent in the same proportions. Instead households will typically introduce new elements into the household budget. So existing markets, depending on a set of regular customers, are likely to expand at a slower pace than the incomes of their customers, unless these markets are stimulated by some major innovation. (An obvious implication is that, *cet. par.*, growth will slow down as markets mature; sustaining a growth rate requires the development of new markets).

--But existing markets can be stimulated very simply. A cost-cutting innovation may allow a drop in price that will bring the product into the affordable region for a whole new class of potential customers. This will set off a new competitive sales drive and expansion for the firms in the industry. Indeed, this suggests a regular relationship between price and the expansion of a market. In a similar way, a product innovation may make the product useful or more useful, or simply more attractive, in a number of ways, thereby creating a new pool of customers.

-- Cost-cutting and product improvement, and specialization of product design, will continually bring new groups into the market, until all potential customers have been attracted. At this point the market will have become mature, and will normally begin to stagnate.

--So the expansion of existing markets may largely reflect aspects of the life cycle that each market passes through, from its small, early beginnings through a phase of rapid expansion, to maturity and stagnation. (Penrose, 1956; )

--The growth of demand then can be broken into two parts: the study of the emergence of new markets on the one hand, and the life-cycle of their development on the other.

-- Without the emergence of new markets, existing markets would tend eventually to stagnate.

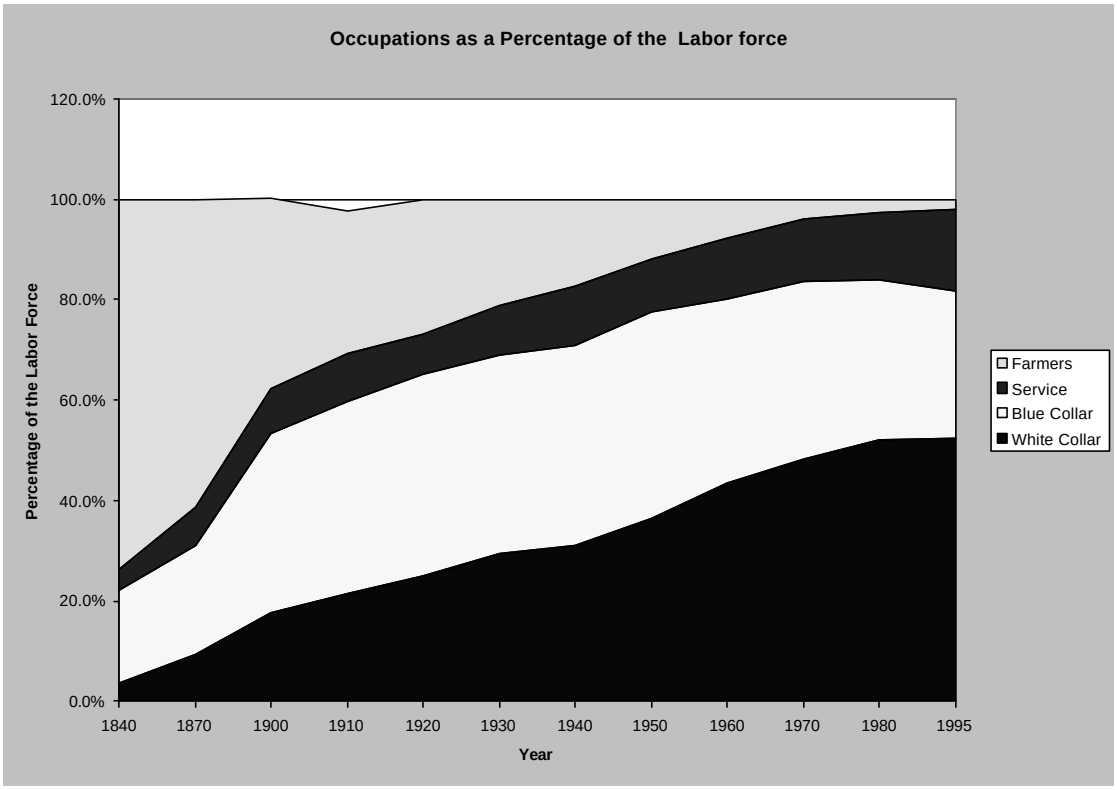
6. What has to be explained therefore, at the outset, is the emergence of new markets. (Remember that throughout most of history new products and new markets were rare. Most people's lives closely resembled those of the grandparents - and also those of their grandchildren.) New markets develop when a number of Households change the composition of their budgets, add new products to their consumption patterns / lifestyles, and in particular come to 'invest in human capital'. New markets emerge as a result of households re-configuring their budgets. Demand grows because of a certain kind of change in its composition – a characteristic feature of Transformational Growth.

This may take place as follows:

--A certain culturally or socially determined fraction of Households develop the desire to rise in station. The reasons for this are complex, and grounded in the changes in culture as the social system develops from a one of tradition and 'natural order' to one of 'regular progress'. (Nell, 1998, pp. 9-19)

--A precondition for a widespread development of the desire to rise in station is that the labor in agriculture should decline and families move from the countryside to the city. This breaks the traditional bonds that tie families to their social station. It also puts people in direct contact with opportunities and alternative ways of life and work.

--A further fundamental precondition is that the workplace and home living space be separated. If they are not then the whole family will tend to be fully involved with the trade, and the children will not be able to learn a different or better way of life.




--This separation of living space from working space will take place as energy is brought into play to drive machinery. Steam power is dirty and dangerous and loud. Children cannot be near it. Electricity is dangerous, and electric power equipment needs to be treated with circumspection. So as equipment comes to be driven by steam and electricity, the home and the workplace must be separated.

--Households seeking to rise in station will typically seek to do this by providing a better education and better opportunities for their children. These households will invest in self-improvement, more for their children than for themselves, but very often in order to provide better conditions for their children they will have to improve themselves. (We might call this the 'Horatio Alger Effect'.) Funds that formerly went for entertainment and for drink will now go to education and self-improvement, and preparing the children for a better life.

--An important element in the effort for self-improvement will be time-saving in the household. Households should be considered production units, producing the lifestyle, by preparing food, making and mending clothing, performing daily tasks of washing, ironing, cleaning and so on. Innovations such as detergents, improved cleaning fluids, vacuums, washers and dryers, gas and electrical heating and lighting, cut down on the time required to run the household, and thereby provided time that could be spent on self-improvement. Looked at from the other side of the market, the movement for self-improvement opened the door to labor-saving innovations in the household.

--When a household decides to rise in the world, it adopts an *investment strategy*. It begins to invest in human capital development, especially education and training, and the development of communications skills. It will come to require more flexible transportation. And it will have to rearrange its living quarters, to provide space for the new activities of learning and acquiring new skills.

--For this to happen banks and financial companies willing to underwrite such investment have to develop. The household then commits a portion of its income to debt servicing, enabling it to borrow the capital necessary to reorient itself and develop the skills of its members.

--When a sizable number of households adopt this strategy, they will begin to benefit from interacting with each other. Even though they are competing, they will also provide support for each other. These 'network effects' will increase the effectiveness of the efforts at self-improvement.

--Then as more and more households seek to rise there will be new markets created, for products that contribute to self-improvement. Much of this will be education – courses, classes, night schools, and books, newspapers, and other media. Communications will become increasingly important, as will all forms of education. In turn, these will require inputs, which will be supplied by capital goods industries[10].

*Processes of Demand Growth*

7. Here we have the development of a process, a set of linkages running from households changing their understanding of their social position and life options, to redesigning their budgets to allow for investment in self-improvement, leading to the emergence of new markets. To make this effective on a large scale will require finance, so it also offers opportunities for financial institutions to develop. These changes in household spending patterns then lead to additional demand for capital goods to make it possible to supply the emerging markets, with the effects then running back to the productivity of households.

--So first demand changes composition, leading to the emergence of a new market. This new market has to be supplied, leading to new investment. (The shift in demand, of course, also

[10] Think of the increase in education at all levels in the early years of the 20th Century, the emergence of night schools (like the New School), the popularity of books on self-improvement, the development of Guidance and Vocational Education in the public schools, the rise of new professions like Personnel Management. All of this was part of the emergence of a new middle class.

leads to a falling off of demand for some traditional products, with falling prices and profits in those industries. But that frees up resources to shift capacity to the new area). The new investment will embody the latest technology, so is likely to be more productive than the old. This will provide the first increase in income, leading to increased demand, which in turn will lead to increased investment.

--A direct consequence of successful self-improvement will be a rise in the productivity of labor, especially of supervisory and managerial labor. Hence there will be a second increase in income, also resulting in an increase in demand, in turn calling for additional investment. (Some families who seek self-improvement and to rise in the world may fail. But this failure will not affect the development of the market. It merely means that their productivity and income will not increase.)

--As is evident, this develops into a *cumulative process*, each round of self-improvement expanding the new markets, leading to new investment, which raises industrial productivity, while the self-improvement raises labor productivity. Both give rise to higher incomes, which lead to further investments in self-improvement.

--As the new group of successful families emerges, it will become aware of itself, and increasingly develop a new *lifestyle.* This will be partly functional, that is, will help to consolidate the productivity gains, but it will also partly be a display of class position and privilege. But whichever, it will mean further development of new markets, for products especially designed to play a role in this new lifestyle. Once again, as these further or subsidiary markets develop, there will be a need for investment, so for new capital goods, to build up the capacity to produce for these markets.

8. Clearly this account could be combined with the earlier discussion of the firm or of corporate markets. But this would still remain in the realm of market analysis. It is important now to consider the economy as a whole.

To do this we combine a relationship between the real wage and the growth of demand with the well-established real wage – rate of profit tradeoff, cf. Nell, 1998 pp. 477-8. The model has four variables:

--growth of demand,

--growth of output,

--growth of productivity,

--and the real wage.

There is an equilibrium condition, that growth of demand equal growth of output, and then we can define three behavioral relationships.

First there is what Joan Robinson called the 'wage-accumulation' curve, the wage-profit tradeoff adjusted by the saving ratio. This relationship is inverse, and following the argument in Nell, 1998, it is likely to be linear. It will shift with changes in productivity.

Second there is the wage rate – growth of demand relationship already discussed, which includes an effect on productivity. This will be an increasing function, with a sigmoid shape. At low levels of the wage there will be some growth of demand, but it will be low, and increase only slowly; then at higher levels it will accelerate, and rise steeply, leveling off at still higher levels.

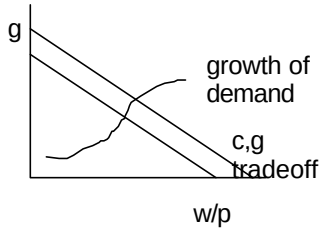
And thirdly, we can adopt some form of Verdoorn-Kaldor relationship, relating productivity growth positively to growth and real wages. This gives us three equations:

$g = g(w/p, x)$, $g'_w < 0$, $g'_x > 0$, assumed linear

$w/p = w(g, x)$, $w'_g > 0$ , $w'_x > 0$, assumed sigmoid in shape

$x = x(g, w/p)$, $x'_g > x''_g < 0$, $x'_w > 0$ up to a point, then $x'_w < 0$

For a given $w/p$ it is assumed, plausibly enough, that there is some level of g beyond which x will no longer increase. It is also assumed that, for a given g, at some level of the real wage, x (productivity) will reach a maximum and begin to decline. These assumptions effectively bound the level of x, and so ensure that the system of equations will have a solution. Given a few reasonable restrictions it can be shown that these three behavioral equations have a



unique, positive solution, which is stable by normal criteria[11].

But this needs some explaining. How can a *level* of the real wage support a *growing* demand? This should not be considered so surprising. Note the analogy with businesses where each level of earnings is associated with a rate of growth of spending on capital goods. Higher earnings mean higher profits, so resulting in a higher *rate of profits*, giving rise to a higher rate of growth. The same holds here. The real wage – growth of demand function tells us that for each level of the real wage there will be a corresponding level of investment in self-improvement leading to a corresponding rate of growth of demand by households. (Note that in constructing this function we are holding capital technology constant – only improvements in worker skills are considered - so a higher wage rate will normally imply a higher wage share.) Households invest in self-improvement; because they are doing so, they are eligible for credit and can increase their spending, particularly their spending on self-improvement. The function is economy wide. At higher levels of the real wage there will be higher rates of growth of demand for two reasons. First, demand growth will be higher because each household may be able to sustain a larger investment in self-improvement, and second, because more households can be drawn into the effort to rise in the world.

We must be careful about the interpretation: the solution to these equations is not a *long-period* equilibrium. Far from it; the reason that demand is growing is that families are trying to improve themselves. Innovation is taking place. On the other hand is not short-run; it covers a long enough stretch for training and education to result in higher levels of productivity. So the time periods might perhaps be a full business cycle.

9. This model can be used to explore an important question in the history of growth and technology. If new innovations have been introduced simply because they reduce costs, we would expect them sometimes to be labor-saving, sometimes to save on equipment and capital goods. Overall, there would seem to be no reason to expect any particular bias. In fact, there has

[11] Here is a simple, linear version:

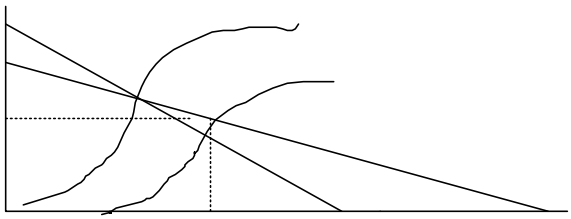
$$g + G - aw/p + hx$$
$$g = bw/p + jx$$
$$x = cg$$

where a, b, c, h, j > 0, and G is the maximum growth rate. The solution is :

$$w/p = G(1-jc)/ [a(1-jc) + b(1-hc)]$$

been a very pronounced bias: technical development has been overwhelmingly labor-saving, but capital-using. That is, machinery and equipment has been substituted for labor. The model can be used to suggest why. [12]

Start with a stripped-down version, leaving productivity growth to one side. Then consider the diagram, with the wage rate-growth of demand curve rising from the origin. As household investment takes place and wages rise, lifestyles will develop and the basic wage and expected standard of living will increase. So the wage-growth of demand curve will shift out to the right. The wage will rise; but the effect will be to lower the growth rate. That is, when the wage rate increases, consumption increases *pari passu* and this leaves less available for investment. From the point of view of the individual firm, the rise in wages means lower profits. But this can be offset by replacing workers with machinery, if the technology is available or can be developed. If machinery is substituted for labor, not only will the rise in the wage will lead to less of a decline in the growth rate, it will also permit an even higher rise in the wage rate.



(Alternatively, the shift to mechanization can be said to permit a larger increase in the real wage for a given decline in the growth rate.) Household investment, leading to enhanced lifestyles, sets up continuing incentives for business to invest in mechanization, which, in turn permits a higher growth of demand than would have been possible under the old techniques. Productivity increases will then continually shift the wage-accumulation lines up and out.

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and it is sufficient for $w/p > 0$ that c, h, j < 1.

[12] This analysis should be thought of as a study of *incentives to innovate*, not as an examination of the *choice of technique*. (Nell, 1998, Ch. 8.) The wage-accumulation functions are assumed to be straight lines as suggested in Nell, 1998, in keeping with the results of input-output studies. But it would not matter if they have some curvature, as long as it was not excessive.

Household investment interacts with business capacity construction in more complex ways than this indicates, however. When household income expands and households undertake self-improvement, new consumer goods markets are likely to emerge, especially when there have been innovations in consumer goods. (For example, allowing time-saving in household activities.) But when there are new consumer goods to be supplied, there will have to be investment in the capital goods sector. But an expansion of capital goods investment will require first, investment in *capital goods itself*, to build up the capacity it needs to supply the increased demand for capital goods from the consumer goods sector. (Lowe, 1954, 1976; Nell, 1976; Hagemann, ). New cost-cutting inventions in the capital goods sector will lead to a flurry of new investment; but it will be a once-for-all expansion.

The macroeconomic growth of demand can be further developed by considering the interaction of markets in various phases of their life-cycles, some new, some passing through expansionary phases, others mature and stagnating.

*Collective Goods and the Rise of Government*

10. The desire of a set of households to rise in the world leads them to change the pattern of their consumption. More particularly it leads to investment in education and training and to spending on communications. It will tend to lead to households re-locating, especially moving to suburbs. One consequence is to lead businesses to invest more. But another takes the economy in a new direction. For it means that the spending of increases in income will now be chiefly directed to what may be called *collective* goods and *inter-active* services. It is not just that markets grow, but new *kinds* of markets develop, generating new kinds of problems. So far we have considered only two players, Households and Businesses, both private. Now the implications bring in a new player, Government.

That is, one person can eat a sandwich, or wear a shirt, without significantly affecting or involving anyone else, apart from the normal market processes. But for education there must be not only teachers and students, but subjects and disciplines. Indeed, there must be right and wrong answers and that implies a collectivity of minds. For a writer there have to be readers – and vice versa - but also there must be subjects and styles. No one can make a telephone call

unless someone else answers. No one can travel without a destination. My health and yours are inter-connected in regard to communicable diseases. Normal market processes, for these goods, involve multiple consumers acting in coordination, or even organized into networks, and there may also be networks of suppliers. As a result these goods tend to call for more intensive Government regulation, and draw more intensively on Government services.

This should not be confused with the familiar idea of *public goods.* These latter are defined as goods or services which are non-rivalrous, (and/or non-depletable, not quite the same thing),and non-excludable.[13] A lighthouse is a good example. If one ship uses it, that doesn't prevent another from doing so. Nor does it use up the lighthouse, leaving less for later ships. And once put in place and working no ships can be excluded, that is, prevented from using it. A bridge or a roadway is non-rivalrous (at least within limits) and non-depletable, but toll barriers can be erected, permitting exclusion.

But collective or interactive goods often do not meet these criteria. If I'm using the telephone line, or the access to the Internet, you can't; if I use up the allotted time, others can't. And access can easily be denied , so fees can be charged. Similarly with education: access to the class can be denied; and at a certain point the classroom is full; if this person is in the class, that one can't be. (Although it is not true that the more one person gets from the class the less there will be for the others; on the contrary, the more some students get, the more the rest are likely to benefit.) One ship can use the lighthouse, whether or not any others do; one person can cross the bridge alone. (Although both bridge and lighthouse are means to a *destination*.)

But no one can make a telephone call alone, or travel without going somewhere. Commuter travel, in particular, moves between the places of home and work, each socially defined. No one can take a class or learn a subject without participating in an enterprise of many minds. No one can use money without others also doing so. No one can take out insurance unless others do so. Education, communications, transportation, FIRE[14] and entertainment – and even aspects of health - are *collective* experiences.

[13] 'Non-rivalrous' and 'non-depletable' tend to be considered the same, since both imply that the marginal cost of serving an additional customer is zero. But zero marginal cost is a supply side criterion; whereas rivalry is a matter of demand. The Neo-Classical concern is that public goods lead to market failures; the exact nature of the goods is not significant. By contrast, the issue for Transformational Growth is that an increase in collective goods changes the proportions and character of the economy.

[14] FIRE stands for finance, insurance and real estate, all of which are collective, the latter involving 'positional goods'.

Collective goods, as these examples show, are often cooperative. But they can also be competitive, as with what Hirsch called 'positional goods'. Seats at a sports game, or in the theater are positional; those with a better view are more desirable and command a higher price. The same is true of rooms in a hotel, travel packages, and desirable real estate. Location is everything, and these goods are therefore rivalrous, may be depletable - this year's World Series will never happen again - and are certainly excludable. Positional goods meet none of the criteria for being public goods, but they are clearly collective goods, and, as we shall see, like cooperative collective goods, call for more intensive government regulation, and interact strongly with other collective goods and with Government services.

Let's consider some of the implications:

--Food, Clothing and Shelter, and many forms of Energy are goods that can be consumed privately, by individuals or households, That is to say, the act of consuming these goods need not necessarily involve or require the cooperation of other individuals or households. (This is also true of some traditional public goods.) When per capita incomes are lowe, the greater part Household budgets will be devoted to these goods. But Education, Entertainment, Communications, Transportation and most forms of modern Health Care *do* necessarily involve or require the coordinated cooperation of others. (Nell and Majewski, forthcoming, Ch 4) When per capita incomes increase, Household spending will tend to shift to these categores.

--These kinds of goods often, perhaps usually, have *network externalities.* That is, the more members who join a network, the greater will be the benefits to each. A typical case is a telephone exchange. Service stations are another. Governments may need to supply or at least to regulate such goods, in order to make sure that pricing for private profit does not result in an inadequate supply.

--Such goods, collective goods, also typically require regulation. They involve coordinated action by numbers of people, and regulation may be needed to ensure coordination. Moreover, the technology may be complicated or dangerous. Government oversight may be necessary. For all these reasons, such goods call for more Government spending.

--Government economic activity in general responds to, or provides a foundation for, private economic activity. Private activity rests on public infrastructure – roads, bridges, harbors, sewers) and on basic collective services (usually with network externalities) like public

health, police, justice, defense and education. The Government may provide these services and infrastructure directly or it might simply underwrite them and contract them out.

--In either case, the amount of Government *spending* required will stand in some kind of proportion to the amount and nature of the private activities. Define a *coefficient of Government spending* as the amount of G called for *per unit* private economic activity. Then the general claim being suggested is that collective goods have a higher coefficient of Government spending than private goods, so that the shift from a Craft Economy to Mass Production has resulted in the rise in the ratio of G to Y. (Nell and Majewski, forthcoming, Ch. 4) (Of course, rather than regulating private production of collective goods, Governments may undertake their provision. In that case G/Y would increase even more.) That is, as private businesses and households shift to collective goods and interactive services, Government will not only do likewise, but it will in general be called on to spend more in a variety of ways.

11. Let's look at this more closely, for there is another feature of collective goods that contributes to the rise in G/Y. Among the major categories of Government activity that have been affected are education, defense, police and justice, medical services, pensions and social security, and transportation. These tend to *interact* strongly with private sector collective goods and with each other. The analytical point here is that interactions increase with the *square* of the number of actors. For example:

--Mass Production leads to urban concentration; this increases interactions between people and requires increased policing and courts, and also increased attention to public health. If there are ten additional urban workers potential interactions increase by one hundred (*actual* interactions will normally be fewer); costs of policing and public health will then increase in proportion to the number of interactions, rather than the number of actors.

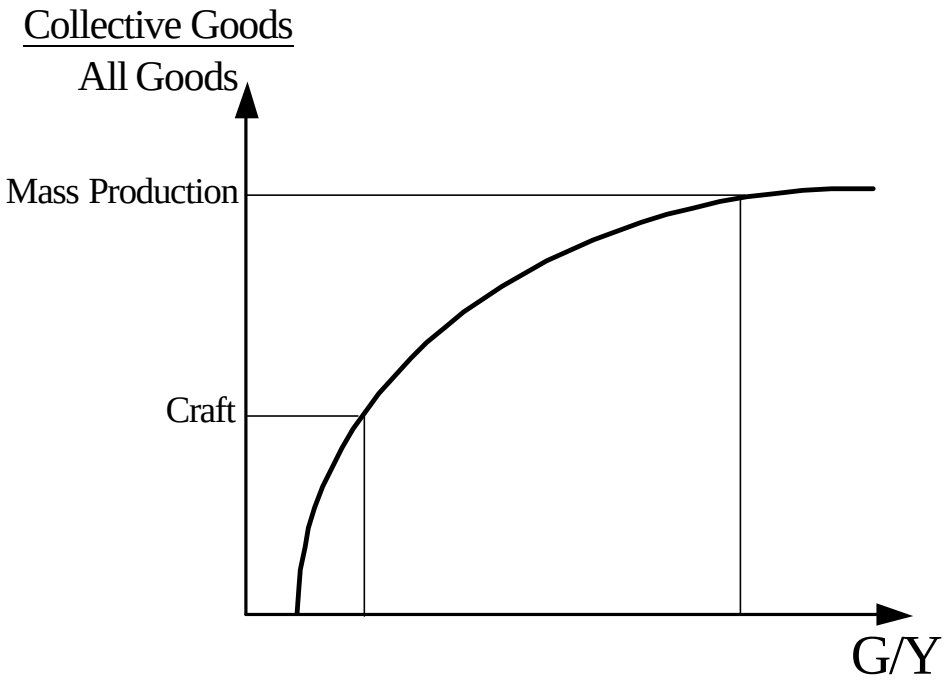
--More travel both requires and facilitates better communications; more travel requires better education - and contributes to it. Better communications lead to better education and vice versa, and both stimulate the desire to travel. Better communication, and better transport leads to wider choice of places to live and locations of workplaces, so that the real estate market develops.

--Better education leads to higher productivity and to more rapid technical change, which, in turn, reduces the ability of the family to provide education, and so requires a further increase in public education.

--As people live longer and learn more, they demand better health and medical services; they also need pensions and social security, especially as they leave the land and move to the cities.

--All of these interact with Government services; increased transportation requires more and better traffic control, communications calls for regulation, as does education; urbanization requires public health measures, and so on.

In the Craft Era the ratio of private sector collective goods to all goods was low. As it increased interactions increased faster, but the initial impact on Government was not large. As the Craft Economy developed into Mass Production, however, the ratio of collective goods increased greatly. The interactions both between private sector collective goods, and between such goods and Government services, increased exponentially, so that G/Y rose dramatically. This is portrayed in the diagram. In the early stages even a large rise in the collective goods ratio leads to only a small increase in G/Y. But later, as the Mass Production era unfolds, even a modest increase in the collective goods ratio will bring a large rise in G/Y.



12. Finally, the rise in Government also can provide - and has provided - a significant contribution to the growth in demand.[15] As we have seen the same process that leads to growth in household demand, competition among households to rise in the world through investment in self-improvement, leads to a shift in the composition of expenditure, in which collective goods increase in proportion to private goods. This in turn leads to further interaction with Government services.

Note that two distinct patterns of interaction can be defined. The first is between activities requiring collective goods; these interact, which means that an increase in the number of such activities implies an increase in demand that is proportional to the square of the increase in activities. The second is between such activities and Government services, likewise implying a multiplicative increase in demand. Together these changes require a larger size of Government in relation to total output. The relative increase in government spending then raises the overall growth of demand.

*Conclusions*

Neither conventional nor alternative approaches offer much help in understanding the growth of demand. Indeed, most contemporary thinking does not even recognize the phenomenon or the need for an explanation. In the long run, it is held, supply determines demand. That is why growth theory has so strongly emphasized the supply side.

But when finance is available, demand can develop separately from supply. Moreover, as households see the possibilities of self-improvement, they will develop their skills and innovate. This will both change the composition of demand and lead to the formation of new markets, and to expansion of demand generally. This growth needs explaining.

There are two parts to an explanation. The easiest is the explanation of the growth of demand in a market, following the introduction of a new product. This follows a sigmoid path,

[15] Government growth proceeded at a higher rate than GNP growth during the first half of the Post-war period, tending to pull the economy up. All-government purchases of goods and services grew at 4.24% from 1948-73, compared to GNP growth of 3.67%, and all-government employment grew at 3.62%, compared to civilian labor force growth of 1.57%. This was the "Golden Age" of the modern economy. By contrast, in the second half of the Post-war era, up until the Clinton Boom, Government growth was slower than that of GNP, 1.80% from 1973-93, compared to GNP growth of 2.36%. The Government labor force also grew at 1.8%, slower than the approximately 2% growth of the civilian labor force.. So in the later period the Government tended to act as a drag on the economy's growth. [Walker and Vetter, pp. 80-81, table p. 170.]

tracing out the product cycle as it moves through the income distribution. But more important is the introduction of new products, changes in the composition of demand. New products that service existing desires are easily explained, drawing on the programming approach to household budgets. Explaining changes in the composition of demand is more challenging.

Here the clue comes in understanding the changes in household budgets. The most important are those which occur when a fraction of households begin to try to rise in the world. These would-be Horatio Algers invest in self-improvement and thereby change the composition of demand. Since the change in composition stimulates investments, this in itself leads to demand growth. But the effect of self-improvement is to increase productivity, and so incomes, leading to further demand growth.

As these Horatio Algers develop, they shift their demand more and more to collective goods, as these are the goods that will help them to rise in the world. Collective goods, in turn, interact; network externalities tend to prevail in them. But these goods, in turn, require more and more Government services; they have a higher Government service coefficient than purely private goods. Further they interact with Government services, which further intensifies the demand for Government. Hence as the ratio of collective goods to private rises, the ratio of G/Y will rise even faster. But a higher level of G/Y, in turn, tends to raise the rate of growth. A higher rate of growth in turn can be expected to increase real wages, leading to still further changes in household budgets, as households seek even greater self-improvement. This is a long-term cumulative process, leading both to perpetual demand growth and to higher productivity.

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