THE UNIVERSITY OF SYDNEY

Economics Working Paper Series

2012 - 15

The New Keynesian view of aggregate demand: some reflections from a Sraffian standpoint

Graham White

November 2012

The New Keynesian view of aggregate demand: some reflections from a Sraffian standpoint

Graham White
School of Economics
University of Sydney

November, 2012

Abstract

The paper contends that the derivation of the aggregate demand curve in the new Keynesian literature is insufficient to provide the theoretical ground for the use to which it is usually put; namely, as a theoretical basis for the claim that long-run wage and price flexibility would push a capitalist economy to the full-employment or "natural" level of output. It is argued that the derivation solely on the basis of the propositions about optimising household consumption expenditures is insufficient to guarantee a decreasing aggregate demand function without circular reasoning. This point is clarified by use of a very simple two-commodity production model of long-run steady states due to Spaventa and Nell. To guarantee a decreasing aggregate demand function, the new Keynesian approach must invoke the kinds of propositions used in more traditional derivations; propositions which themselves are in question on capital-theoretic grounds.

The New Keynesian view of aggregate demand: some reflections from a Sraffian standpoint

1. Introduction

The aim of this paper is to shed some critical light on the new Keynesian derivation of the aggregate demand curve; including the sentiment within the new Keynesian literature that the consumer-optimisation approach underpinning this derivation yields a more sophisticated version of the aggregate demand curve compared with traditional macroeconomic analysis. The argument advanced below is that this sentiment is mistaken and the new Keynesian derivation is no more satisfactory than the more traditional versions and in some respects, less satisfactory.

As is well known, the aggregate demand curve is a means of representing a set of propositions which play a critical role in orthodox macroeconomics; specifically, in underpinning statements about the stability of long-run macroeconomic equilibria associated with full-employment. For example a negative shape to this curve could be used to support the view that an excess of full-employment output over the level of aggregate expenditure, by putting downward pressure on the price level (or alternatively on the rate of inflation) would induce increases in the level of expenditure relative to the level required for full-employment, thereby pushing output in that direction.

In other words, traditionally, the propositions behind the aggregate demand curve's negative shape have provided a theoretical basis for the long-held view (dating from before Keynes *General Theory*) – and a defining feature of orthodox macroeconomic thought about the long-run – that sufficient price flexibility would enable a capitalist economy to converge on a position of full-employment.

One part of the so-called new Keynesian literature of the last 25 years has been to locate this argument within what is perceived to be a more sophisticated theoretical framework, which for the most part appears to mean methodologically individualist with the centrepiece being a representative, optimising consumer-labourer household.

The discussion that follows begins in section 2 with a brief outline of this new Keynesian approach to the aggregate demand curve, briefly contrasting it with the more traditional explanations. Section 3 provides some critical reflection on the use of a choice-theoretic framework to explain consumption as the basis for the aggregate demand curve. It is argued that by itself it is insufficient to guarantee a decreasing relation between current consumption demand and the current price level without engaging in circular argument; in particular by implicitly making assumptions about output which themselves imply a certain shape to the aggregate demand curve.

Sections 4 and 5 explore this contention further, making use of a simple two-commodity model of production due to Spaventa (1970) and Nell (1970). This exercise points to the lack of a systematic relation between steady state consumption and labour employment, where one allows for switches in the technique of production as the real rate of interest changes. The upshot of this result is that one cannot guarantee that the optimising approach used by the new Keynesians would generate results consistent with a negatively sloped aggregate demand curve. Section 6 extends this argument to a growth setting.

Section 7 provides a brief conclusion to the effect that the new Keynesians analysis cannot derive a negatively-sloped aggregate demand curve, purely on the basis of an optimising framework applied to aggregate consumption demand. Other, more traditional propositions must be brought into play in order to guarantee such a result. The dilemma is that these more traditional elements are susceptible to problems of a similar fundamental nature.

2. The traditional and New Keynesian views of the aggregate demand curve

Essentially the history of macroeconomics from the early 20th century has offered three different propositions by which one might argue that sufficient price and wage flexibility in a capitalist

economy would push it to a position where all those seeking to work could find employment, i.e. a full-employment level of output. The two traditional arguments were the "Keynes" effect and "Pigou" effect. In a nutshell, the former (identified by Keynes in Chapter 19 of the *General Theory*) would work through falling wages and prices triggering changes in the real money supply, pushing down the rate of interest and increasing investment demand output and employment. The latter would work through the effect of falling prices on real financial wealth, in turn stimulating consumption (*cf*. Patinkin, 1968).

More recently, as part of the development of new Keynesian economics since the mid-late 1980's, a third proposition has been advanced; and in some cases as a substitute for rather than as a complement to the first two, older propositions. In particular this third proposition has focused on the effect of falling prices – as the economy's output falls below the full-employment level (or "natural" level in more recent parlance) – on household consumption demand. Unlike the traditional Pigou effect, this more recent argument has sought its foundation in the microeconomic analysis of the intertemporally optimising household. This in turn is seen as providing a basis for an "optimising IS equation" (Nelson, 2008: 2-3; Clarida et.al., 1999: 1665). Combined with changes in the price level, this approach is then seen to provide the basis of a negative relation between aggregate expenditure and the price level – i.e. a negatively-sloped aggregate demand curve.

This particular theoretical development can be seen as part of the attempt within the new Keynesian literature of the last two decades to differentiate itself in relation to "the standard Keynesian IS-LM model [through] the introduction of optimizing behaviour of households and firms" (Benigno, 2009: 4). As Taylor puts it, the negative AD relation can be derived from "the first-order condition of an intertemporal maximization problem" (2000: 91).

Our concern is whether the emphasis on optimizing decisions about consumption is by itself sufficient to generate a logically coherent account of the aggregate demand curve, let along one which is conducive to stability of equilibrium consistent with a full-employment output. Our contention is that despite the wish to derive the aggregate demand curve from an optimizing story about households, the analysis cannot escape implicit assumptions about production and by implications the very same capital-theoretic problems which call into question the coherence of the more traditional derivations of the aggregate demand curve.

In order to clarify further the new Keynesian approach, we make use of the simple model outlined in Benigno (2009). According to Benigno's version of the AD curve, the "negative relation between prices and output … [reflects the proposition that] when prices rise, for a given path of other variables and in particular of the nominal interest rate, the real interest rate rises. This prompts households to increase saving and postpone consumption. Current consumption falls along with current production" (p. 13).

The justification for this argument is seen to lie in an optimising approach to the explanation of consumption. The representative consumer-worker-household seeks to maximise their objective function, defined over consumption and hours worked in the present and future, subject to an intertemporal budget constraint. Benigno takes a simple approach in this regard, assuming time consists of two periods – the present and the future, interpreted also in terms of short-run and long-run. Utility, *U*, is increasing in short-run (*C*) and long-run ($\bar{C}$)consumption and decreasing in short-run (*L*) and long-run ($\bar{L}$) hours worked and written as

$$U = u(C) - v(L) + \beta\{u(\bar{C}) - v(\bar{L})\} \qquad \text{..... (1)}$$

where β is the factor by which consumer-worker-households discount future utility. The intertemporal budget constraint consists of the equality of the value of consumption expenditure (price x quantity) – presently (PC) and discount future expenditure ($\overline{PC}$ /(1+*i*)) – and the value of

wages (wage rate x hours worked) - current (*WL*) and discounted future ($\overline{WL}$ /(1+*i*)) – plus any lump-sum transfers, *T*, from government, so that

$$PC + \frac{\overline{PC}}{1+i} = WL + \frac{\overline{WL}}{1+i} + T \qquad \text{..... (2)}$$

The problem for the consumer-worker-household is seen to be one of maximising (1) subject to (2). This leads to a set of conditions which determine the utility maximising allocation of consumption across the two periods and choice between consumption and employment in each period. With respect to the latter choice, in terms of marginal utilities (disutilities) associated with consumption (labour)

$$\frac{u'(C)}{v'(L)} = \frac{P}{W}$$

$$\frac{u'(\overline{C})}{v'(\overline{L})} = \frac{\overline{P}}{\overline{W}} \qquad \text{..... (3)}$$

where *u*'(..)'s refers to the marginal utilities and *v*'(..)'s to marginal disutilities. The interesting point to note here is of course that the choice of hours worked as against consumption will depend on the real wage rate. With respect to the allocation of consumption over time, the utility maximising approach implies that

$$\frac{u'(C)}{\beta u'(\overline{C})} = \frac{P}{\overline{P}} = \frac{(1+i)}{1+\pi^e} = 1 + r_r \qquad \text{..... (4)}$$

Where π^e and r_r refer to the expected rate of inflation between the short and long-run and the real rate of interest respectively. And it is here that Benigno locates the essence of the relation between the current price level, *P*, and current consumption demand and in turn the essence of the negative slope of the aggregate demand function. As the current price falls relative to the future price level, the expected rate of inflation rises and the real rate of interest falls. Utility maximisation requires that

$$\frac{u'(C)}{\beta u'(\overline{C})} \qquad \text{..... (5)}$$

falls. Taking long-run consumption, $\overline{C}$, as given for argument's sake, this requires in turn a fall in *u'*(*C*) and thus a rise in current consumption; or, as Benigno puts it (referring got the opposite case of a rise in the present level of prices), the "negative relation between prices and output … [reflects the proposition that] when prices rise, for a given path of other variables and in particular of the nominal interest rate, the real interest rate rises. This prompts households to increase saving and postpone consumption. Current consumption falls along with current production" (p. 13).

Of course, another way of putting the reasoning above is that a fall in the current price level must raise consumption in the present *relative* to the level of future consumption. But what sets future consumption? As also noted above in relation to the so-called first-order conditions for the maximisation problem above, this will be chosen relative to long-run employment so that conditions (3) hold. A better way of phrasing the second of these conditions, for the purposes addressed here, is that, given the long-run real wage rate, the utility-maximising household chooses the long-run level of consumption *relative* to the long-run level of employment. In other words, given the long-run level of the real wage, and the specifics of the utility function (1), the long-run level of consumption turns on the long-run level of employment.

3. Hours worked: a matter of "choice" ?

The critical question is whether the latter – the long-run level of employment - is a matter of choice, for the household? It appears that it *is* in Benigno's analysis, as it is for orthodoxy in general, including new Keynesians (see also Corsetti and Presenti, 2005: 4). For a given technique of production in the long-run (presumably the cost-minimising technique), there will be a certain level of employment associated with each level of output. For Benigno, as for orthodoxy in general, the long-run or "natural" level of output, is "the level of output that would obtain in a model with flexible prices and a marginal rate of substitution between labour and consumption proportional to the real wage [as in equations (3) above]" (*op.cit*: 8, see also Clarida, et.al, 1999: 1665).

In other words, in this view, in terms of Benigno's framework, $\bar{L}$, is a matter of choice for households, viz., determined through the aggregate of the utility maximising choices of households. Since it is producers as a whole however who makes decisions about labour demand, the quotation therefore implicitly suggests a mechanism by which labour demand and thus the level of output and hence the level of spending adapts itself to the aggregate amount of labour households optimally wish to offer.

One of the worrying aspects of this kind of argument, quite aside from the use of a representative household (*cf*. Kirman, 1989, Rivzi, 1994) and the fact that the analysis moves on the plane of methodological individualism (*cf*. Hodgson, 1986), concerns what appears essentially to be a circular argument.

The " natural level of output" to which Benigno refers, and which accords with the aggregate utility maximising decisions about labour supply, is, at least according to the quotation above, enforced or triggered in some way by the flexibility of prices. In the new Keynesian argument, as well as the traditional neoclassical-Keynesian synthesis, which the former has come to dominate in macroeconomic discussion, the mechanics by which this happens are summarised in the negative shape of the aggregate demand curve.

In other words, it is the shape of this demand curve which provides the analytical backbone to the contention that with flexible prices, the level of output will be the one associated with the aggregate choices of households. In this view, the output deemed optimal by producers and the level of employment associated with that output will adapt itself to this aggregate choice.

Hence explaining the shape of the aggregate demand curve by reference exclusively to an intertemporal choice between consumption and employment appears to implicitly assume to begin with a certain shape for that aggregate demand curve.

In order to avoid this kind of circular reasoning and assume that hours aggregate worked in the long-run are a matter of choice, one would need to provide some additional reasoning as to why the choices of producers about the level of output and employment would be made consistent in the long-run with the utility maximising choices of households about how much labour to supply; where that additional reasoning did not itself assume to begin with that producer's employment has adapted itself to those of households.[1]

[1] But then of course the explanation of the negative shape of the aggregate demand curve would lie in factors other than the optimising consumption behaviour of the household as described for example in Benigno's analysis.

In the absence of such reasoning, the long-run level of employment in the utility function of households should be taken as being determined by producers as a whole, so that for the household the long-run level of employment is not a choice, but is exogenous.[2]

But, as our analysis below demonstrates, in this case, the optimizing analysis of Benigno's no longer guarantees a negative relation between current consumption and the present price level.

4. A simple model of the long-run (steady-state) in a multi-commodity economy

In order to progress the discussion and shed further light on the new Keynesian (as distinct from the traditional) derivation of the aggregate demand curve, we introduce at this point a simplified model of the "long-run" in a growth setting, though one which is able to also capture the long-run case for the stationary economy. We make use of this model to lock-down certain characteristics of the long-run, specifically, the ratio of aggregate consumption to aggregate labour employment for a given growth rate. In particular, it can be shown that this ratio will be fully determined in a steady state position once the growth and technique of production are given and that the latter can be seen as being governed by the real rate of interest.

For this task, we make use of a model first set out by Spaventa (1970) and Nell (1970) during the celebrated debates on capital theory which came to their climax in the late 1960's. It is a simplified two-commodity model – a pure consumption good, corn, and a machine – with labour and the machine used to produce corn and new machines in two separate processes. Consider the quantity side of this economy in a long-period equilibrium which we take for the sake of argument to be the steady state. One can write

$$\begin{aligned} l_m(g+\delta)M_L.l_c + 1.l_c &= \\ a_m(g+\delta)M_L.a_c + M_L.a_c &= M_L \end{aligned} \qquad \text{..... (6)}$$

where l_m and a_m respectively refer to the requirements of labour and new machines in the production of a new machine, while l_c and a_c are the analogous coefficients in the production of a unit of corn. M_L is the stock of machines in place per unit of labour employed in the economy at the end the period we are looking at along the steady growth path. 'g' is the steady state growth rate, and δ the depreciation rate, so that $(g + \delta)M_L$ is the gross investment demand for new machines per unit of labour employed at the conclusion of this production period, in order that production grows at the rate 'g' between this period and the end of the next. If we assume that demand is correctly foreseen by producers in both industries, then $(g + \delta)M_L$ will be the output of new machines supplied to market at the end of this period, per unit of labour employed, and analogously, 'c' will represent the output corn to be supplied to market per unit of labour employed.

One can decompose the equations (6) above so that

$$\begin{aligned} l_m.\frac{Y_m}{L} + l_c.\frac{Y_c}{L} &= 1 \\ a_m.\frac{Y_m}{L} + a_c.\frac{Y_c}{L} &= M_L \end{aligned} \qquad \text{..... (7)}$$

and, in turn

[2] Indeed, one could apply this also to the short-run, and orthodox analysis would indeed suggest that it was more applicable in the short-run in any case, since this is where there may be constraints on employment for the orthodox macro-theorist. But leaving this aside will not substantially alter the substance of the analysis below, so we assume for argument's sake that households can choose their level of labour employment in the short-run.

$$\frac{L_m}{Y_m}.\frac{Y_m}{L}+\frac{L_c}{Y_c}.\frac{Y_c}{L}=1=\frac{L_m+L_c}{L}$$

$$\frac{M_m}{Y_m}.\frac{Y_m}{L}+\frac{M_c}{Y_c}.\frac{Y_c}{L}=M_L=\frac{M_m+M_c}{L}$$

..... (8)

Here, the Y_m and Y_c refer to gross outputs and M_m, M_c, L_m, L_c to absolute quantities of machines and labour employed in the two industries, represented by subscripts '*m*' and '*c*'.

More significantly for the purposes of the present paper, equations above allow for a relation between consumption per unit of labour employed and the rate of growth along the steady state growth path, for a given technology, represented by the '*l*' and '*a*' coefficients. Assuming everlasting machines, so that $\delta = 0$, and

$$\begin{aligned} l_m.g.M_L + l_c.c &= 1 \\ a_m.g.M_L + a_c.c &= M_L \end{aligned} \qquad \text{..... (9)}$$

this relation can be expressed as

$$c=\frac{1-a_m.g}{l_c+g.\left(l_m a_c-l_c a_m\right)} \qquad \text{..... (10)}$$

As is well known there is will also be a relation between the real wage rate and the rate of return on capital or rate of profit analogous to expression (10), reflecting the price system and effectively representing the dual to the quantity system. Assuming that in the long-run, prices of corn and machines (respectively p_c and p_m) are such that each production process generates the same rate of profit, *r*, one can write the system of relative prices for the simple corn-machine model above as

$$\begin{aligned} a_c p_m\left(r+\delta\right)+w_m l_c &= p_c \\ a_m p_m\left(r+\delta\right)+w_m l_m &= p_m \end{aligned} \qquad \text{..... (11)}$$

With corn as the numeraire ($p_c = 1$)

$$\begin{aligned} a_c.p_{mc}.r + w.l_c &= 1 \\ a_m.p_{mc}.r + w.l_m &= p_{mc} \end{aligned} \qquad \text{..... (12)}$$

where '*w*' refers to the corn real wage and p_{mc} the price of new machines in terms of corn, so that the relation between the real wage and rate of profit for this simple system becomes

$$w=\frac{1-a_m.r}{l_c+r.\left(l_m a_c-l_c a_m\right)} \qquad \text{..... (13)}$$

Note the symmetrical nature of expressions (10) and (13). This symmetry allows one to establish a long-run connection between the rate of profit and the level of consumption per unit of labour employment.

As is also well known, the real wage-rate of profit relation provides one way of conceptualising cost-minimizing choice of technique which producers must engage in. For each technique of production, defined as set of two methods of production, one for producing corn and one for producing new machines – and represented by a specific set of coefficients a_m, a_c, l_m and l_c – there will correspond a particular real wage-rate of profit relation. In the two-commodity case considered here this relation will be either strictly concave, strictly convex or linear, depending on the technical coefficients.

Fig. 1

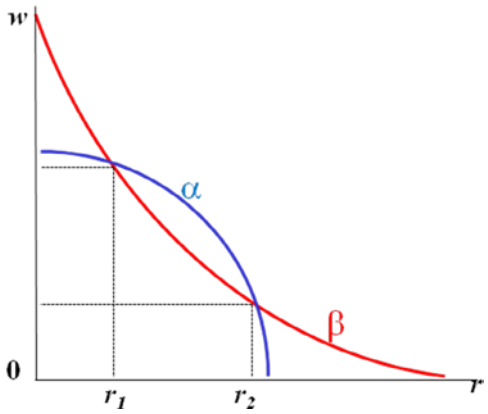
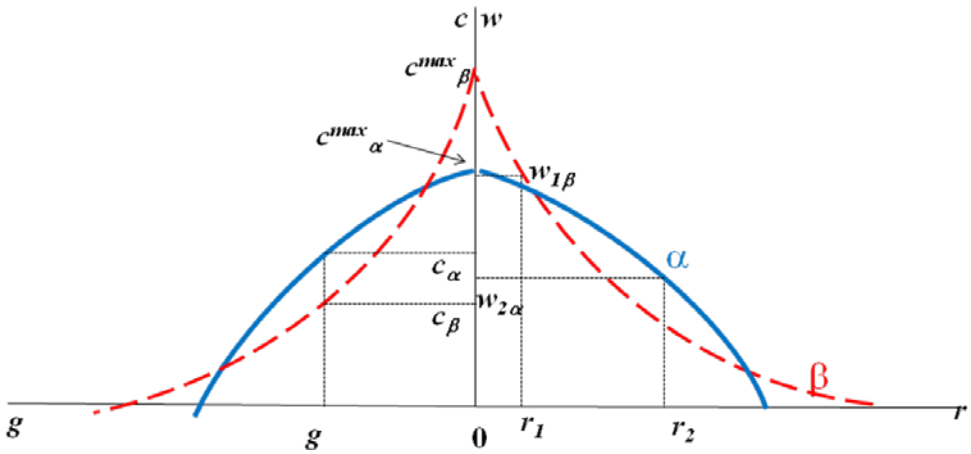


Figure 1 depicts two techniques, α and β and two rates of profit, r_1 and r_2, at which the two techniques are equi-profitable. At these rates of profit, for the same money wage rate, the two techniques would generate the same prices for corresponding commodities. For rates of profit in the range $r_2 - r_1$, technique α would generate lower prices for each commodity, for the same money wage, reflected in the fact that the real wage is higher.[3]

But since the relations (10) and (13) are symmetrical, one can plot them side by side as in Fig. 2 below. The left hand side of the diagram shows the *c*-*g* relations corresponding to techniques α and β. For a given growth rate, *g*, technique α will yield a steady state consumption per unit of labour employed equal to c_α, and respectively c_β for technique β. However, the technique employed will of course be determined by whichever is cost-minimizing. If for example the rate of profit is r_1, technique β will dominate under competitive conditions and the real wage will be equal to $w_{1\beta}$. With technique β in use at the rate of growth *g*, consumption per unit of labour employed in the steady state will be c_β. Alternatively, at a rate of profit equal to r_2, technique α would dominate and at the growth rate *g*, the steady state consumption per unit of labour employed will be equal to c_β.

Fig. 2



Before proceeding any further with this kind of analysis, a qualification is required. For the sake of argument, it is assumed for the moment that the rate of profit and the rate of growth are

[3] Cf. Pasinetti, (1977: Ch. 6).

determined independently of one another. This is at odds with traditional orthodox growth theory (Solow-Swan and endogenous growth models) and with some types of heterodox growth theory (e.g. Cambridge, post-Keynesian-Kaleckian growth models). We shall however consider this question, from an orthodox standpoint (since orthodoxy is the subject of this paper), in more detail below; suffice to say that our interest at this point is with the long-run possibilities with regard to the behaviour of consumption per unit of labour employment, interpreting the long-run as the steady state case.[4]

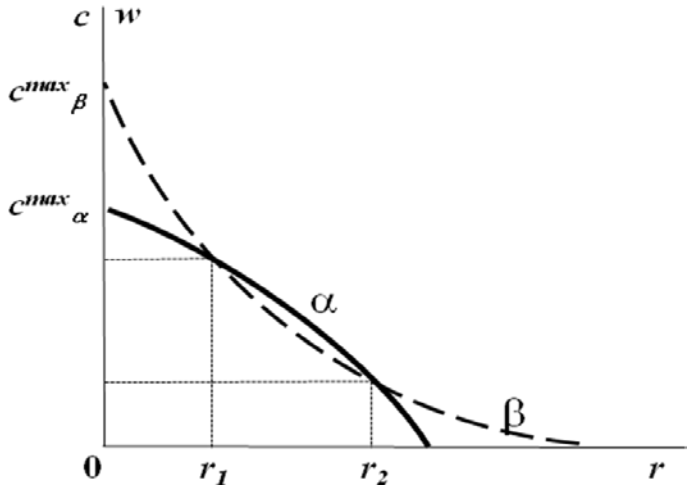
One further assumption we make here concerns the determinants of the rate of profit. In this regard we follow the lead of Pivetti (1985) and argue that the long-run return on production or general rate of profit will reflect the comparable long-term rate of interest plus a margin for risk and illiquidity, where this margin is determined by convention and will in general differ between industries. To simplify, we assume here that the latter margin is zero and that in the presence of a positive expected rate of inflation the rate of profit will converge to the long-run real rate of interest (*cf*. Pivetti, 1985: 100-03). Hence we interpret *r* from this point equivalently as the rate of profit and real rate of interest.

5. The long-run consumption-work "choice" and the real rate of interest

At this point we seek to make use of this model to reflect on the consumption-employment choice suggested in the new Keynesian argument, as outlined in section 2 above. We consider first the case of a stationary economy, viz., where the steady state growth rate is zero. This clearly implies that the steady state consumption per unit of labour employed will be equal to the maximum consumption per unit of labour employed corresponding to the technique in use. In Fig. 2, this will either be $c^{max}{}_{\alpha}$ or $c^{max}{}_{\beta}$ depending on the technique in use.

More significantly, as the real rate of interest and by assumption the rate of profit changes the possibility of a switch in technique arises and thus changes in the long-run consumption per unit of labour employed.

Fig. 3



Consider the case, $g = 0$ in Fig. 3 above. Suppose, starting at a real rate of interest slightly greater than r_1, that the real rate of interest falls. In the vicinity of r_1, a fall in *r* will lead to a switch in

[4] We recognise also that the interpretation of the long-run as referring to steady states would also be a questionable one from the standpoint of many heterodox economists (e.g. Palumbo and Trezzini, 2003).

technique from α to β and hence a rise in the steady state consumption per unit of employment ratio from $c^{max}{}_{\beta}$ to $c^{max}{}_{\alpha}$.[5] If we assume for the moment that the level of labour employed is unchanged in the move to the new steady state technique, then this move must involve a rise in the steady state or long-run level of consumption.

In view of equation (4), taken from Benigno's analysis, the fall in the real rate of interest should be associated with a fall in the ratio of marginal utilities $\frac{u'(C)}{\beta u'(\bar{C})}$. The rise in long-run consumption implied by Fig. 3 will decrease $u'(\bar{C})$, so that the required fall in $\frac{u'(C)}{\beta u'(\bar{C})}$ requires in turn a fall in $u'(C)$ and thus a rise in current consumption *C*. In this case, the switch of technique yields a change in long-run consumption which is consistent with Benigno's analysis, viz., that a fall in the current price level reduces the real rate of interest and in turn generates a rise in present consumption.

However, consider now a falling real rate of interest but from a different starting point, specifically, a real rate of interest greater than r_2. In the vicinity of r_2, a fall in *r* will lead to a switch in technique from β to α and hence a fall in the steady state consumption per unit of employment ratio from $c^{max}{}_{\beta}$ to $c^{max}{}_{\alpha}$. Assuming as before that the level of labour employed is unchanged, then the switch in techniques must be associated with a fall in the steady state or long-run level of consumption.

Again, it is useful to consider how this result stands in relation to Benigno's analysis. The fall in long-run consumption implied in the switch from technique β to technique α will increase $u'(\bar{C})$, so that the required fall in $\frac{u'(C)}{\beta u'(\bar{C})}$ (which Benigno's analysis suggests should accompany the fall in the real rate of interest) could be achieved without a fall in $u'(C)$ and thus without a rise in current consumption *C*.

At the very least, this analysis raises a question about the direction of change in the level of present consumption consequent upon a fall in current prices and a fall in the real rate of interest, even following the logic of Benigno's optimising approach.

The exercise above however assumes that the change between two steady states involves no change in the steady state level of employment. To the extent that, in the case of a fall in the real rate of interest in the vicinity of r_2, this leads to a rise in the long-run level of aggregate employment then a fall in the long-run level of consumption per unit of employment need not entail a fall in the long-run aggregate level of consumption.

However the Spaventa-Nell analysis points to two other effects in this case, which would have to be considered in determining the extent of any effect of a fall in the real rate of interest on the long-run level of employment and hence on the long-run level of consumption.

Considering the economy represented by equations (6) and noting that the value of net output in the growing economy case can be expressed as the sum of wages and profit or as the sum of consumption and investment, then, in expressing consumption and the stock of machines in any period terms of per unit of labour employed in the economy, one can write

$$w + r.p_{mc}.M_L = c + g.p_{mc}.M_L \qquad \text{..... (14)}$$

[5] Note, the fall in the rate of profit means a rise in the real wage. The rise in the real wage and rise in consumption per unit of labour employed would in this case be consistent with the second of equations (3) above.

Rearranging,

$$p_{mc}.M_L\left(r-g\right)=c-w \qquad \text{..... (15)}$$

and, in turn

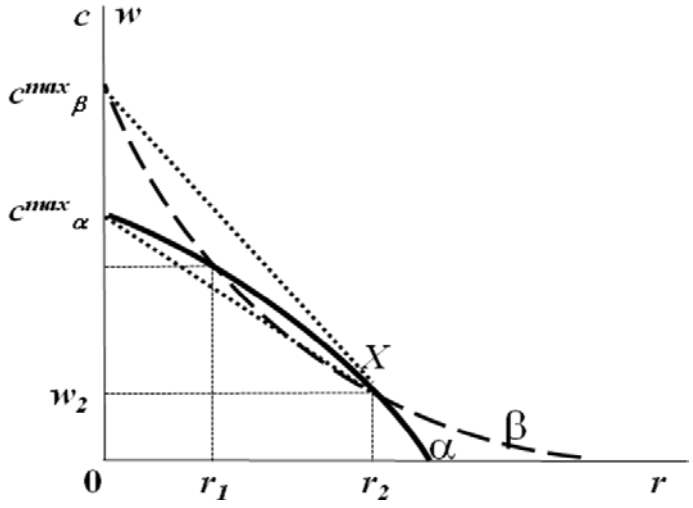
$$p_{mc}.M_L=\frac{c-w}{r-g} \qquad \text{..... (16)}$$

Since p_{mc} is the relative price of machines (in terms of corn), the left hand side of equation (16) represents the value of the stock of capital at a point in time per unit of labour employed in the economy. In other words, it would be the appropriate measure of the capital to labour ratio in a heterogenous capital good world.

The significance of expression (16) is to enable one to depict diagrammatically the capital to labour ratio so-defined. Fig. 4 below depicts the same case as in Fig. 3 but indicates additionally the capital to labour ratios corresponding to the two alternative techniques at the rate of profit r_2. In other words, for the stationary economy case with g = 0, at the profit rate r_2 and thus for both techniques a real wage equal to w_2, the respective values of capital per worker for the α and β techniques, k_α and k_β, are given by

$$k_\alpha=\frac{c_\alpha^{max}-w_2}{r_2} \quad \text{and} \quad k_\beta=\frac{c_\beta^{max}-w_2}{r_2} \qquad \text{..... (17)}$$

Fig. 4



The switch in techniques as r falls in the vicinity of r_2 from β to α will, according to expression (17) will imply a switch to a lower capital to labour ratio, a phenomenon, known in the literature as reverse capital deepening. Interesting this of course goes against the grain of traditional orthodox theory that as the rate of profit falls and the real wage increases, techniques should become less rather than more labour-intensive.

However what this switch implies in terms of the aggregate level of employment is at best ambiguous. While it suggests a move to higher labour intensity and hence some positive effect on employment *ceteris paribus*, there is a counter-veiling effect at work. In particular, as Garegnani has noted, the relation between the rate of interest and the level of investment in a long-period setting reflects the nature of the relation between the desired capital-intensity of production and the rate

of interest (Garegnani, 1970, 1978). In this case, the switch to a lower capital to labour ratio could entail a reduced investment, thus working to push the level of aggregate employment down.

It seems that the effect on aggregate employment of the switch in techniques is at best ambiguous and to the extent there is a positive effect it would appear to be for reasons that contradict the traditional theoretical arguments about the choice of technique.

The more important question is whether anything in the new Keynesian derivation of the aggregate demand curve outlined in section 3 and based around the optimizing representative household offers any insight on the question of the effect of a change in the real rate of interest on the long-run level of employment. More precisely, does this derivation offer any theoretical grounds to suppose that a fall in the real rate of interest generates a sufficient rise in employment such that any fall in long-run consumption per unit of employment (caused by a switch in the technique of production) is consistent with either an unchanged or rising long-run level of consumption; and hence an unchanged or falling $u'(\bar{C})$ and hence a fall (required by equation (4)) in $\frac{u'(C)}{\beta u'(\bar{C})}$ will imply a fall in $u'(C)$ and hence a rise in present consumption?

The answer to this question is surely no. And there are two aspects to this answer. The first aspect is that the only answer analyses such as that of Benigno's offer in order explain changes in employment resulting from changes in the real rate of interest (induced by changes in the current price level) is the proposition that consumption demand in the short-run improves with a fall in the real rate of interest. But this is precisely the proposition which is in question: it is precisely the proposition which the Spaventa-Nell analysis tells us requires an argument about the possible changes in the aggregate level of employment in the first place.

The second aspect is that the analysis of production in Benigno reflects the approach to production in the new Keynesian literature in general; an approach with very little to offer by way of dealing with the possibilities identified in the Spaventa-Nell analysis. In particular, production appears for the most part only in the analysis of aggregate supply rather than aggregate demand and then with little or no attention to the significance of produced commodities as inputs into the production process. This kind of approach clearly rules out any serious analysis of capital and the kind of issues raised in this section.[6]

At the very least, the possibility that a fall in the real rate of interest is accompanied by a fall in consumption per unit of employment cannot be ruled out by Benigno's analysis or its seems by other attempts in the literature to derive an aggregate demand curve solely via consumer

[6] Thus for example in both Benigno and Corsetti and Presenti, 2005, the analysis of production which underpins aggregate supply entails a production function where labour is the only input, though this is nonetheless used to discuss the production of a world of product differentiation – in terms of the existence of a variety of consumer goods. More importantly, the treatment of production in question rules out a serious treatment of investment and by implication derivation of the aggregate demand curve on more traditional grounds via the Keynes effect. In his optimising approach to the IS-LM, Fane (1985) is the exception, though his treatment of production is in terms of a traditional aggregate production function, which, as we know from Garegnani (1970), effectively limits it to the one-commodity case ruling out the kind of effects depicted in Figs. 3 and 4.

A quite amazing justification for the relative neglect of investment in some new Keynesian accounts of aggregate demand is provided by Nelson (2008: 4) who argues that one can accommodate investment, without making it endogenous by assuming "that investment has a random-walk and a stationary component, both exogenous. The exogenous stationary component becomes a further IS shock and can be assumed to be highly variable".

optimisation. By implication, neither can they rule out the possibility that this fall is associated with a fall in the long-run level of consumption and no change in the level of current consumption.

6. The "optimising household", aggregate demand and growth

Finally, it is worth remarking on aspects of the discussion above but in a growth setting. It has been argued so far that an optimising approach to the aggregate demand curve, as represented for example by Benigno's analysis, to the extent that it supposes the long-run level of employment to be a matter of choice of optimising households, could not by itself be used to derive a negatively-sloped aggregate demand curve without engaging in circular reasoning. Additional propositions must be invoked by way of demonstrating why producers would adapt their employment levels in a manner consistent with the choices of households about their supply of labour. Put another way, recourse solely to the intertemporal optimising decisions of households is insufficient to derive a negatively-sloped aggregate demand curve.

The analysis above however has shown that bringing into play propositions about the optimising (i.e. cost-minimising) choices of producers seems to render the arguments by Benigno no less determinate in terms of the behaviour of aggregate consumption expenditure as the price level and real rate of interest change. In fact, the situation appears to be one where the kind of analysis Benigno and others seeks to employ must invoke the more traditional orthodox arguments (i.e. the Keynes and/or Pigou effects) used to derive a negatively-sloped aggregate demand function.

Indeed, a distinguishing feature of these traditional methods of deriving the negatively sloped aggregate demand curve is that the argument is not founded on the kind of choice-theoretic proposition Benigno and other new Keynesians put forth about hours worked, although the new Keynesians undoubtedly view this as a weakness. Rather the traditional approach is to explain how in response to price movements, expenditures are affected independently of any assumption that households are making choices not only about consumption but also about labour effort. As such, the older, traditional approach does not appear to suffer from the kind of circular reasoning which undermines the supposedly more "sophisticated", micro-founded new Keynesian approach.

The problem is that the more traditional arguments are themselves open to theoretical objections at a fundamental level (*cf*. White, 2004); the level in which the discussion has so far moved. In other words, in order to derive a negatively-sloped demand curve, the kind of analysis employed by Benigno must ultimately appeal to more traditional orthodox arguments, which are themselves questionable.

To elaborate on this point, one might pose the following question. What mechanism could be at work in the long-run so as to adjust employment producers are willing to offer in line with the labour which utility-maximising households wish to supply? Clearly, as indicated in section 1, the traditional argument in this regard – for the stationary economy – rests on the Keynes and Pigou effects.

The most well-known argument in a growth setting is that implied by the neoclassical reaction in the 1950's to Harrod's (1939) analysis. As is also well-known, a particularly troubling (for orthodoxy) aspect of Harrod's analysis was the separate determination of the actual, warranted – i.e. equilibrium - and the natural rates of growth, with the latter being the rate required for continuous full-employment. In essence the neoclassical reaction to this – most famously embodied in the work of Robert Solow (1956) and Trevor Swan (1956) – was to suggest that the divergence was the product of an assumed inflexible desired capital to output ratio (*cf*. Dobb, 1973, Ch. 8). Allowing flexibility in this ratio and in particular for it to be determined along traditional neoclassical lines by

relative factor prices, the warranted growth rate would adapt itself to the rate required for full-employment.[7]

Cast in a growth setting therefore, the Solow-Swan growth theory of the 1950's provided the theoretical ground for the view that the long-run behaviour of output would in a growth-setting adapt itself to the long-run decisions of households about labour supply.[8]

But the Solow-Swan mechanism is no less susceptible to the kinds of theoretical difficulties. In order to clarify this point, we make use of the Spaventa-Nell model above, but consider the more general case of a growing economy, albeit, in terms of a comparison of steady states.

Consider a case where the growth rate of output matched that of demand, but that these growth rates were less than the growth rate of the labour force plus the growth rate of labour productivity. The rate of unemployment would rise, the real wage would fall and the rate of return on capital would rise, assuming producers adapt to the cost-minimizing technique of production. The change in the relative rate of return to labour and capital would induce a shift to lower capital intensity of production, specifically a fall in the capital to labour ratio, at least according to traditional theory.

This change in factor proportions improves the (marginal and average) productivity of capital, in turn stimulating the growth of saving and investment until the growth rate of the capital stock and output – and by implication, employment – have risen sufficiently to bring the economy to its natural growth rate.

This can alternatively be looked at it terms of Harrods natural and warranted growth rates, g_n and g_w respectively. For Harrod,

$$g_w = \frac{s}{v} \qquad \text{..... (18)}$$

where s is the aggregate propensity to save and v is the desired marginal capital to output ratio. g_w effectively represents the growth rate of output at which the demand effect of a growing level of investment working through the standard income-expenditure multiplier, just absorbs the output generated by optimal use of a productive capacity, which is growing as a result of those same investment decisions. In this case, optimal use of the productive capacity means utilitizing capacity so that the ratio of output to the capital stock in place at any point along the growth path g_w, is equal to 'v'.

Imagine for argument's sake that output is actually growing at the rate g_w. The effect of g_w being below the rate of growth of output required for full-employment, g_n, is to generate a fall in the real wage, a fall in the cost-minimizing ratio of capital to labour and a rise in the productivity of capital so that v declines, in turn raising g_w in the direction of g_n.

But the Spaventa-Nell framework outlined above is sufficient to dispense with this kind of Solow-type argument about a tendency to full-employment. Figure 5 below depicts the case of reverse

---

[7] The divergence between actual and warranted growth rates in Harrod's analysis, and thus in contemporary terms, a departure of the actual growth rate from the equilibrium path, in turn reflecting a divergence between output and aggregate demand, was in essence a non-issue for both Solow and Swan. As Hahn and Matthews (1964:.790-91) note, the implicit assumption of mechanism in the form of flexibility in the rate of interest adapting investment in line with saving over time was sufficient to take care of this divergence. Interestingly, this was the same mechanism at work in the orthodox static theory which Keynes had sought to reject in the *General Theory*.

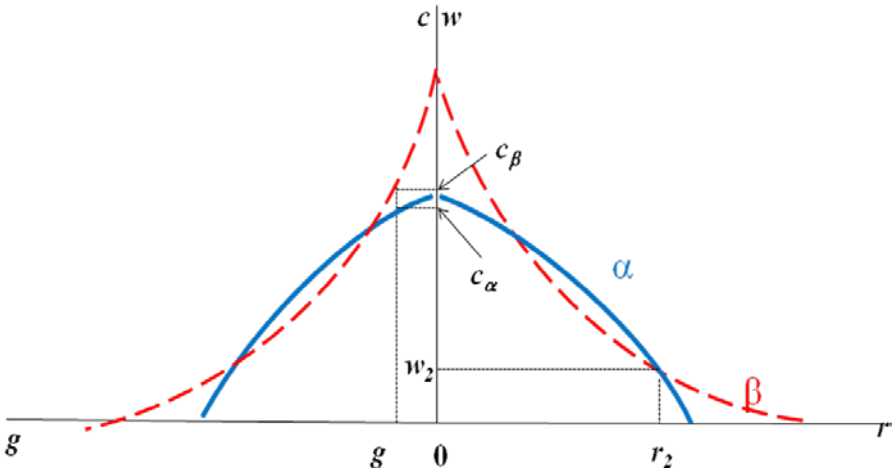
[8] A position seemingly unchallenged in the new or endogenous growth models which have dominated orthodox growth theory since the 1980's.

capital-deepening in a growth context, with the growth rate equal to g and associated consumption per unit of employment equal to c_α and c_β for the α and β techniques respectively. The relation between the associated value of capital per worker ratios at a rate of profit equal to r_2 would, in view of equation (17), be given by

$$k_\alpha = \frac{c_\alpha - w_2}{r_2 - g} \; < \; k_\beta = \frac{c_\beta - w_2}{r_2 - g} \qquad \text{..... (19)}$$

Thus, in the vicinity of r_2, a rise in the rate of profit would generate a switch to a more rather than less capital-intensive technique of production.

Fig. 5



Following the logic of the Solow-Swan arguments, as outlined above for the case where the equilibrium growth rate falls short of the full-employment growth rate, the shift to higher capital-intensity - following a fall in the real wage and rise in the rate of profit - would push down the productivity of capital, in turn pushing down the rate of growth of the capital stock rather than pushing it up towards the full-employment growth rate. In the language of Harrod's analysis, the fall in the productivity of capital increases 'v' rather than reducing it, thus pushing g_w further away from g_n.

The point here is that in a growth setting the notion of employment being a "choice" of households in the aggregate and that producers' profit maximising choices will validate the former is no less problematic than in the stationary economy case.

7. Concluding remarks

The analysis in this paper has sought to shed a critical light on new Keynesian attempts to derive a decreasing relation between price and output, in the form of the aggregate demand curve, independently of more traditional derivations.

The argument advanced above is that such attempts cannot succeed without engaging in an element of circular reasoning, in particular, invoking assumptions about the shape of the aggregate demand curve to begin with. Deprived of such assumptions, the new Keynesian derivation can only guarantee a decreasing aggregate demand function by relying on more traditional arguments for this purpose; arguments which are themselves susceptible to the criticisms of orthodoxy which emerged from the capital debates.

In other words, in their effort to ground their analysis in what is seen as a more sophisticated micro-foundation, the new Keynesian derivation of the aggregate demand curve does not escape the

fundamental theoretical criticisms which can be levelled at the more traditional derivations. In this sense the new Keynesian model offers no firmer theoretical ground for the belief in a long-run tendency to full-employment than does traditional orthodox macroeconomics.

References

Benigno P. (2009) 'New Keynesian economics: an AD-AS view', NBER Working Paper, (14824), March.

Clarida R., Galí J. and Gertler M. (1999) **'**The Science of Monetary Policy: A New Keynesian Perspective', Journal of Economic Literature, 37, (4), December, pp. 1661-1707.

Corsetti G. and Pesenti P. (2005) 'The simple geometry of transmission and stabilization in closed and open economies', NBER Working Paper, (11341), May.

Dobb M. (1973) Theories of Value and Distribution since Adam Smith: Ideology and Economic Theory. Cambridge: Cambridge University Press. Ch. 8 pp.225-229, 232-34.

Fane G. (1985) 'A derivation of the IS-LM model from explicit optimizing behaviour', Journal of Macroeconomics, 7, (4), pp. 493-508.

Garegnani P. (1978, 1979) 'Notes on Consumption, Investment and Effective Demand', Cambridge Journal of Economics, 2, pp.335-53; 3, pp.63-82.

Garegnani, P. (1970) 'Heterogeneous Capital, the Production Function and the Theory of Distribution', Review of Economic Studies, 37, pp. 407-416.

Hahn F. and Matthews R. C. O. (1964) The Theory of Economic Growth: A Survey, Economic Journal, 74, (296), pp. 779-902.

Harrod R.F. (1939) 'An Essay in Dynamic Theory'. Economic Journal.

Hodgson G. (1986) 'Behind methodological individualism', Cambridge Journal of Economics, 10, (3), pp. 211-224.

Kirman A. (1989) 'The intrinsic limits of economic theory: the emperor has no clothes', Economic Journal, supplement, 99, (395), pp. 126-39.

Nell E. (1970) 'A Note on Cambridge Controversies in Capital Theory', Journal of Economic Literature, 8, (1), March, pp. 41-44

Nelson E. (2008) 'IS-LM in modern macro', in Durlauf S.N. and Blume L.E. (eds.) The New Palgrave Dictionary of Economics, 2nd Edition.

Palumbo A. and Trezzini A. (2003) 'Growth without normal capacity utilization', European Journal of the History of Economic Thought, 10, (1), Spring.

Pasinetti, L.L. (1977) Lectures in the Theory of Production. London: Macmillan, Ch.'s 2 (*e-reserve*) and 3.

Patinkin D. (1968) 'Price flexibility and full-employment', in Lindauer J. (ed.) Macroeconomic Readings, Macmillan, US.

Pivetti M. (1985) 'On the Monetary Explanation of Distribution'. Political Economy: Studies in the Surplus Approach, 1, (2).

Rizvi S. A. T. (1994) 'The microfoundations project in general equilibrium theory'. Cambridge Journal of Economics, 18, (4), August.

Romer D. (2000) 'Macroeconomics without the LM Curve', Journal of Economic Perspectives, 14, (2), Spring, pp. 149-169.

Solow R. M. (1956) ‘A Contribution to the Theory of Economic Growth’. Quarterly Journal of Economics.

Spaventa L. (1970) ‘Rate of Profit, Rate of Growth, and Capital Intensity in a Simple Production Model’, Oxford Economic Papers, 22, (2), July, pp. 129-147.

Swan T. (1956) ‘Economic Growth and Capital Accumulation’. Economic Record.

Taylor J.B. (2000) ‘ Modern Macroeconomics at the Principles Level’, American Economic Review, 90, (2), Papers and Proceedings, May, pp. 90-94.

White G. (2004) ‘Capital, distribution and macroeconomics: ‘core’ beliefs and theoretical foundations’, Cambridge Journal of Economics, 28, (4), July, pp.527-547.