INVESTMENT AND SAVING IN A DYNAMIC APPROACH

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1. Introduction

In the early 1980s Asimakopulos (1983) criticised both Kalecki and Keynes for the way they had dealt with the problem of the multiplier effects of investment. More precisely, Asimakopulos criticised Kalecki and Keynes because they had not paid enough attention to the process in time through which the multiplier effect of investment brings the economy to a higher equilibrium, where investment and saving return to equality after an initial shock ΔI_0. As a consequence, both economists, especially Kalecki, tended to underestimate the importance of the financing of investment projects. If this issue is taken into due consideration, it appears that the economy's propensity to save plays some role in the determination of the conditions under which firms can carry out their investment plans.

Asimakopulos's article received some attention, but most of the comments on his contribution focused on issues different from the main point that Asimakopulos had made and, in several cases, they misinterpreted his position. The present paper does not enter into the debate on Asimakopulos's contribution that took place at the time.[1] The main objective of this paper is to present Asimakopulos's view, with which we largely agree, in a more formal way and to develop the analysis of some of the implications of a dynamic approach to the multiplier effects of investment, that is to say by taking explicit account of the time dimension.

The paper is organised as follows. Section 2 is devoted to a brief exposition of Asimakopulos's criticism of Kalecki and Keynes; the section looks at Robertson's position on the issue of saving and investment. In fact, Robertson approached the problem along lines that, from a methodological point of view, are similar to those suggested by Asimakopulos. Section 3 presents a simple formalisation of the multiplier process which explicitly considers its time dimension. Section **??** concludes by considering some implications of a dynamic approach to the multiplier process.

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[1]For the discussion on Asimakopulos's 1983 article, see Snippe (1986), Richardson (1986), Terzi (1986) and Asimakopulos (1985, 1986).

2. Saving, investment and credit: Criticisms of Kalecki's and Keynes's approaches

For Asimakopulos, neither Keynes nor Kalecki 'paid sufficient attention to the time required (...) for the multiplier effects of a higher level of investment to be worked out' (Asimakopulos, 1983, p. 222). Kalecki is criticised for not having paid enough attention to the time dimension of the multiplier process and for having virtually ignored the problem of the conversion of firms' initial short-term debt into long-term debt. Keynes is criticised both for having ignored the time dimension of the multiplier in *The General Theory* and for having dealt with the problem of the debt conversion in an unsatisfactory way later on in 1937.

For Asimakopulos, Kalecki (1935) rightly argued that an increase in the level of investment necessarily requires an expansion of credit. The credit granted to firms by banks is part of a circular flow that returns to the lenders in one period, so that the banks' liquid position can be restored (Asimakopulos, 1983, p. 223) In order that Kalecki's circular flows closes it is necessary that desired saving increase by the same amount as investment. In other words, it is necessary that the multiplier process started by the increase in investment fully operates and the new higher equilibrium is reached. Asimakopulos observes: 'Since Kalecki assumes that the increase in saving is equal to the increase in planned investment by the end of the year, he is assuming that the full multiplier effect is completed within that period' (Asimakopulos, 1983, p. 224).

Apart from the acceptableness of the hypothesis that the full operation of the multiplier takes only one period (year), Kalecki's approach implies that no attention is given to the problem of the firms' necessity to convert their initial short-term debt with banks into longer-term liabilities: 'Kalecki's treatment of finance, investment and saving was also flawed because of his neglect of the need for long-term financing. Investing capitalists should replace their bank loans by long-term bonds that are a better "match" for the expected life of the capital assets that they have acquired. Borrowing "short" to invest "long" can be very dangerous for a business enterprise' (Asimakopulos, 1983, p. 225).

As for Keynes, it is well known that, in *The General Theory*, he ignored the problem of the finance requirements to expand investment. The multiplier is regarded as a logical concept rather than a process in time.[2] Keynes, however, returned to deal with the problem a year later (Keynes, 1937), when he introduced the 'finance motive' among the arguments of the demand for money.

Nevertheless Keynes, like Kalecki, retains the hypothesis that the circular flow resolves itself in one period. Asimakopulos concentrates on Keynes's 1937 article

[2]In *The General Theory*, Keynes's attention is focused on the final equilibrium produced by a larger investment, i.e. 'on the logical theory of the multiplier which holds good continuously without time-lag, at all moments of time' (Keynes, 1936 [1973], p. 122).

and argues that Keynes's approach remains largely unsatisfactory. Keynes's position, argues Asimakopulos, is even more extreme than Kalecki's, as it is based on very special assumptions. Keynes holds that the initial liquidity positions are restored as soon as the investment is made (Keynes, 1937, pp. 247-248), which implies that 'the full multiplier operates instantaneously, with a new situation of short-period equilibrium being attained as soon as the investment expenditure is made' (Asimakopulos, 1983, p. 227).[3]

Keynes's approach is made even more problematic by the fact that he, differently from Kalecki, devotes some attention to the firms' conversion of the bank short-term loans into longer-terms debts by issuing liabilities in the financial market. Since it is rational for firms to match their long-term commitments generated by their investment projects, they 'must be assured about the availability of long-term, as well as short-term, finance before committing themselves to investment decisions' (Asimakopulos, 1983, p. 229). In this respect, financial intermediaries ('speculators') play a crucial role by buying the firms' long-term liabilities: 'They could thus provide the investing firms with long-term finance *before* the full multiplier effects of the increase in investment have been completed by purchasing their long-term bonds with the proceeds of short-term loans from the banks (...) After the full multiplier has operated, following a maintained increase in the rate of investment, there is an increase in desired saving that can, if directed to the purchase of long-term securities, relieve the pressure on these intermediaries (speculators) to support this higher rate of investment' (Asimakopulos, 1983, p. 229).

There arises, however, the question concerning the terms at which intermediaries are willing to buy the firms' long-term liabilities: 'Is the spread between the short- and long-term rates that they require sufficiently small so as not to discourage investment?' (Asimakopulos, 1983, p. 229) On this issue, Asimakopulos recalls Kaldor's criticism of Keynes's analysis (Kaldor, 1960). Kaldor argues that Keynes's position is based on 'on the implicit assumption that speculators would absorb the new issues of long-term securities (obtaining the necessary funds by borrowing at short term) until the increased saving became available for this purpose, without any noticeable change in the term structure of interest rates' (Asimakopulos, 1983, p. 229).

For Kaldor, provided that the required increase in speculative stocks is not too large with respect to the market dimension, the effect of this sort of operation would not be an increase in the short and long-term interest rates (Kaldor, 1960, p. 50), so that 'the degree of price-stabilising influence, though not perhaps infinite, is very much larger in the case of long-term bonds than for any other commodity; and this means that the Keynesian theory, though a "special case", gives, nevertheless, a fair approximation to reality' (Kaldor, 1960, p. 52). For Asimakopulos, however,

[3]Asimakopulos also points out that this is a necessary but not sufficient condition for restoring the initial liquidity positions. For the reasons why it is a necessary but not sufficient condition, see Asimakopulos (1983, pp. 227-228).

Kaldor's conclusion was significantly influenced by the economic situation of the time when he wrote the article, which was characterised by large unemployment, the existence of unused productive capacity and stable prices and wages.

In situation characterised by (actual and expected) inflation, there can be downward pressures on the prices of the firms' long-term liabilities (Asimakopulos, 1983, p. 230). In such situations, which a general theory should contemplate, a higher propensity to save can contribute to reduce the pressure on the prices of the firms' liabilities. Thus, in conclusion, 'The independence of investment, and the finance that makes investment possible, from saving is not as robust as Keynes stated. The investment market *can* become "congested through shortage of saving" ' (Asimakopulos, 1983, p. 230).

In the preface to the 1949 edition of *Banking Policy and the Price Level* citeprobe-1949 Robertson points out a crucial difference between his own methodological approach to the relation between saving and investment and Keynes's in *A Treatise on Money* and *The General Theory*. By referring to the 1926 first edition of his book, Robertson observes: 'While Keynes must at the time have understood and acquiesced in my step-by-step method, it is evident that it never, so to speak, got under his skin; for in his two successive treatment of the savings-investment theme in his two big books he discarded it completely' (Robertson, 1926[1949], p. xi). For Robertson, Keynes's multiplier 'forgets' the period of transition between the initial increase in investment and the realisation of the final equilibrium, at which investment is necessarily equal to saving.[4]

Robertson acknowledged that Keynes made some steps forwards in the correct direction in 1937 by introducing the finance motive, which implies accepting, to a certain extent, his own sequential analytical method. However, for him, Keynes's analysis remains unsatisfactory with respect to the definition of the money supply and the process through which the initial liquidity positions are restored.[5]

[4]Here it is not possible to give a detailed exposition of Robertson's contribution to the topic and his polemic with Keynes. It will suffice to refer to Presley's clear exposition of the differences between Robertson and Keynes in this respect: 'The finance required for investment to take place is instantaneously provided by voluntary saving, so there is no need either for the banks to create credit to finance the investment or for forced saving to be imposed on the public. Indeed, in Keynes' thesis there is no such thing as forced saving. Even if credit is created by the banks, prices need not rise significantly so long as unemployed resources exist. In the forced saving doctrine prices rise even at less than full employment. Given the multiplier, and a static approach, the equality of saving and investment is guaranteed' (Presley, 1978, p. 86). See also Leijonhufvud (1981) and Ingrao and Sardoni (2019, chapter 3).

[5]See (Robertson, 1937, pp. 432-433) and Robertson and Keynes (1938, p. 319). See also Asimakopulos (1983, p. 228n) and **?**, chapter 3.

3. A formalisation

Consider a closed economy with no public sector in which, at time $t = 0$, firms increase investment by ΔI_0. The timing of the process triggered by investment is the following:

(1) At time $t = 0$, firms finance their investment by borrowing short from banks an amount $\Delta B = \Delta I_0$ at the short-term rate $r_{b,0}$, which for now we take as given and constant.[6]
(2) After one period, at $t = 1$, firms convert their short-term debt ΔB into a long-term debt. To do so firms must repay their short-term debt with banks, which amounts to $\Delta B(1+r_{b,0})$; therefore they must obtain liquidity from the market by selling long-term liabilities for the same amount.
(3) Firms will make new investment decisions when the multiplier process started by the increase in investment ΔI_0 at time $t = 0$ has completed, i.e. when income has increased by $\Delta Y = \frac{1}{s}\Delta I_0$, s being the economy's marginal propensity to save.

Let us denote the firms' demand for liquidity by[7]

$$L_{d,1} = (1 + r_{b,0})\Delta B \tag{1}$$

If we assume that M is the stock of money (bank deposits) at $t = 0$, total liquidity at $t = 1$ is equal to $M + s\Delta I_0$, where s is the economy's marginal propensity to save and ΔI_0 is the increase in income at $t = 1$ produced by investment.

Total liquidity, however, is not necessarily used entirely used for the purchase of the firms' liabilities. The portion of total liquidity 'offered' to firms depends on the economy's liquidity preference, which in turn is a decreasing function of the long-term interest rate at $t = 1$, $r_{l,1}$. The portion of total liquidity made available to firms can be expresses, for simplicity, as

$$l = l(r_{l,1}) = \alpha r_{l,1} \tag{2}$$

$$\text{with } l = 0 \text{ for } r_{l,1} = 0 \text{ and } l = 1 \text{ for } r_{l,1} = \frac{1}{\alpha}$$

The supply of liquidity at $t = 1$, therefore, is

$$L_{s,1} = l(r_{l,1}(M + s\Delta I_0 0 = \alpha r_{l,1}(M + s\Delta I_0) \tag{3}$$

It is now time to look at investment in a more detailed way. Firms' investment decisions depend on a number of variables, among which there are both the short and the long-term interest rates. For now, we concentrate on the interest rates and we write the investment function as

$$\Delta I_0 = h(r_b, r_l) \text{ with } \frac{\partial \Delta I_0}{\partial r_b} < 0 \text{ and } \frac{\partial \Delta I_0}{\partial r_l} < 0$$

[6]Firms, therefore, finance their investment entirely with external funds.If part of ΔI_0 were financed with internal funds, this would not affect the analysis below in any significant way.

[7]We ignore the demand for liquidity generated by the increase in income.

Since r_b is taken as given and constant, the crucial variable is the long-term interest rate. We first make the hypothesis that firms make their investment decisions at $t = 0$ on the basis of the long-term interest rate at that time, $r_{l,0}$ so that we can write the investment function as

$$\Delta I_0 = h(r_{l,0}) \tag{4}$$

In this case the demand for liquidity at $t = 1$ is

$$L_{d,1} = (1 + r_{b,0})h(r_{l,0})$$

which can be written as

$$L_{d,1} = (1 + r_{b,0})\bar{H}_0 \tag{5}$$

($\bar{H}_0 = h(r_{l,0})$, which is a given constant at $t = 1$).

The equilibrium condition for the financial market at $t = 1$, $L_{d,1} = L_{s,1}$, from (3) to (5) can be written as

$$(1 + r_{b,0})\bar{H}_0 = \alpha r_{l,1}(s\bar{H}_0 + M) \tag{6}$$

which can be easily solved for $r_{l,1}$

$$r_{l,1} = \frac{1}{\alpha}\frac{R_{b,0}\bar{H}_0}{(s\bar{H}_0 + M)} \tag{7}$$

with $R_{b,0} = 1 + r_{b,0}$. The equilibrium interest rate $r_{l,1}$ is decreasing in s, the economy's marginal propensity to save. We can consider a more general case in which investment at $t = 0$ is a function of the expected long-term interest rate at $t = 1$, $E[r_{l,1}]$. Given the expected interest rate, which can be equal, larger or smaller than $r_{l,0}$, the analysis above does not change.

As we saw, in all cases the equilibrium long-term interest rate is a decreasing function of the propensity to save, s. s is the economy's average marginal propensity to save. If we make the hypothesis that there are only two classes, workers and capitalists, which have different marginal propensities to save and, in particular, that it is $s_w = 0$ and $0 \leq s_k \leq 1$ (s_w is the workers' propensity to save and s_k the capitalists' propensity to save), then s is the weighted average of s_w and s_k:

$$s = \frac{s_w\Omega + s_k\Pi}{Y} \tag{8}$$

(Ω is the wage share and Π is the profit share). It then follows that s is increasing in the profit share. In conclusion, therefore, we have that the higher is the profit share, the higher is s and, hence, the easier is for firms to obtain their required long-term funding.

So far, for simplicity, we assumed that firms repay their short-term debt at the end of the first period. This hypothesis can be easily lifted and it can be assumed

that the repayment of the short-term debt occurs at the $n-th$ round of the multiplier process, when firms have reimburse banks for the amount $(1+r_b, n)\Delta I_0$.[8]

In such a case, the demand and supply functions of liquidity become respectively

$$L_{d,n} = R_{b,0})h(r_{l,0}) \tag{9}$$

$$L_{s,n} = \alpha r_{l,n}[M + (1-c^n)\bar{H}_0] \tag{10}$$

Therefore, the equilibrium condition is

$$R_{b,0})\bar{H}_0 = \alpha r_{l,n})[M + (1-c^n)\bar{H}_0] \tag{11}$$

The solution for $r_{l,n}$ is

$$r_{l,n} = \frac{R_{b,0}\bar{H}_0}{(1-c^n)\bar{H}_0 + M} \tag{12}$$

which is still decreasing in s.

We can now return to the simple case as expressed by equation 7 to consider the dynamics of the long-term interest rate r_l. At time $t = 0$, the equilibrium long-term interest rate must be

$$r_{l,0} = \frac{1}{\alpha}\frac{R_{b,0}\bar{H}_{-1}}{(s\bar{H}_{-1} + M)} \tag{13}$$

where $\bar{H}_{-1}$ denotes the investment decisions made at time $t = -1$.

Since $r_b, s,$ and M are taken as given, it obviously is

$$r_{l,0} = r_{l,1} \text{ if and only if } \bar{H}_{-1} = \bar{H}_0$$

that is to say if the amount of investment that firms decide to make at times $t = 0$ and $t = 1$ remains constant.

If, for whatever reason, it is $\bar{H}_0 \neq \bar{H}_{-1}$ then the long-term interest rate changes from $t = 0$ to t=1, and

$$r_{l,1} > r_{l,0} \text{ for } \bar{H}_{-1} < \bar{H}_0$$
$$r_{l,1} < r_{l,0} \text{ for } \bar{H}_{-1} > \bar{H}_0$$

More in general, the dynamics of the equilibrium long-term interest rate can be expressed by a first-order difference equation which, depending on the values taken by the several parameters of the functions above, can yield a cyclical, explosive or convergent behaviour of r_l. However, the solution for such difference equation is rather complex and difficult to interpret; therefore, in the Appendix, we present the results for some simulations based on different values given to the parameters.

4. Conclusions

From the analysis above some general considerations derive.

[8]In other words, we assume that the maturity of the bank loan is equal to the time span t from 0 to n.

4.1. **The role of the propensity to save.** A higher marginal propensity to save affects the equilibrium long-term interest rate. The magnitude of this effect depends on the parameters of the several functions.

A higher marginal propensity to save contributes to reduce the pressure on the financial markets when firms must convert their short-term debt into longer-term liabilities. The long-term interest rate that is determined in the market at the time of the debt conversion does not affect the investment decided and made in the past, but it can affect future investment decisions. The lower is the long-term interest rate at the time when the maturity of the firms' debt is lengthened, the larger will future investment be.

In this sense, a higher propensity to save plays a positive role in the multiplier process triggered by investment. Thus, the conventional Keynesian view that the lower is the propensity to save the larger is the impact of investment on income must be qualified.

If the analysis is carried out by not considering the timing of the multiplier process and the problem of financing investment, the negative effect of a higher propensity to save is evident and obvious. If the analysis is carried out by explicitly considering the timing of the process and, hence, also the problem of the firms' debt conversion, a lower propensity to save can play a positive role. Although it does not affect past investment, the associated lower long-term interest rate can positively affect future investment, with positive effects on the economy's rate of growth.

4.2. **The complexity of the multiplier.** Regardless of the magnitude of the impact of the propensity to save on the interest rate and investment, a dynamic approach to the multiplier process shows that it is a complex process, which can generate different growth paths for the economy.

An initial increase in investment can give rise to complex dynamics, characterised by a cyclical, explosive (implosive) or convergent behaviour of investment and, hence, of the rate of growth.

4.3. **Policy implications.** An important implication of a dynamic approach to the multiplier is that policies should not simply aim to favour the expansion of aggregate demand through measures that induce larger investment. Such measures should be accompanied by other interventions that help eliminate, or reduce, the pressure on the financial markets generated by the increase in investment.

Similar considerations apply also to policy measures that aim to change the income distribution in favour of workers. While a distribution of income more favourable to workers generally has a positive 'short-term' effect on the multiplier, it can generate negative 'long-term' effects if the lower (average) propensity to save implies higher interest rates, with negative effects on future investment, growth and employment.

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