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PUBLIC DEBT IN A REGIME OF ZERO INTEREST RATES – SAVING AND INVESTMENT IN FRONT OF DEMOGRAPHIC CHANGE

Abstract

Public debt has two faces, here called the «face of Janus». On one side, it stands in competition with private debt: less public debt reduces the interest rate and creates space for private capital formation and investment («crowding out», where the «Ricardian equivalence» also holds). On the other side, public debt is, in the same amount, private wealth, which must be added to the real wealth of the economy (plus land). In this way, individuals can provide for their old age beyond the capacity of the producing sectors to build up real capital. These two faces are then identified with two different regimes: the «neoclassical regime», where (real) interest rates are equal or higher than the (natural) growth rate of the economy; and the «Keynesian regime», where interest rates are lower than the growth rate. While in the dynamic version of the neoclassical regime the (natural) growth rate is determined by the (exogenously given) growth rates of the labour force and technical progress, the dynamic version of the Keynesian Regime is determined by the investment rate given by the «animal spirits» and the capital-output ratio or

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capital productivity, allowing for inflation and secular stagnation. Therefore, a literature review is undertaken to discuss general and specific reasons for low (or even negative) real interest rates, stressing excess savings and a shift in the investment schedule, resulting in what C. C. von Weizsäcker and H. Krämer call «the great divergence» in their book *Saving and Investment in the Twenty-First Century: The Great Divergence*. The paper comes to the conclusion that, given the low (real) interest rates, public debt fulfils an important task in bringing the (natural) rate of interest out of the negative zone and thus bringing the economic system out of the dangers of permanent under-utilization of resources (or unemployment).

Key Words:

crowding out, natural interest rate, stagnation, technical progress, zero lower bound.

JEL: E21, E22, H63, I100, J10.

3 figures, 17 formulas, 57 references.

I. Setting the Stage

Public debt has a «face of Janus»: on one side, it stands in competition with private debt, where investors demand credit to build up real capital («crowding out»). This aspect may be called the short-term or trade-cycle view. On the other side, public debt is – in the same amount – private wealth which must be added to the real wealth of the economy. In this way, individuals can provide for their old age beyond the capacity of the producing sectors to build up real capital. This aspect then relates to the long-run implications of public debt.

Which face of public debt is more important – also for economic policy issues – can be decided by looking at the (real) interest rate level. If this level is high, then public and private debt compete with each other: less public debt re-

duces the interest rate and, therefore, gives space for private capital formation and investment. However, if – given a low inflation rate – the nominal and hence the real interest rate level is low, then the interest rate cannot fall further because nominal interest rates cannot be negative («zero lower bound»). Hence, reducing public debt has no stimulus effect on private investment; rather, to the contrary: because reducing public debt reduces total demand, investment may even shrink (see von Weizsäcker, 2010). In this situation, fostering technical progress may not be enough, in particular when one takes into consideration the «new waves» (internet, artificial intelligence, etc.) which are not very capital-deepening. Also, an increase in the price of land (as a third and fixed factor in the growth model) cannot solve the problem.

Taking these two situations into closer consideration, one can infer that the «first face» of public debt corresponds with the so called neoclassical world, while the «second face» reflects a Keynesian world.

The determinants of capital supply and capital demand, in particular taking into account the actual demographic developments of most of the industrialized countries, lead to an excess supply even when the interest rate is zero or near zero: (1) ever more individuals must prepare (or will learn to prepare) for old age (like pensions, health, long-term care, risks of climate change); (2) income and wealth distribution move in favour of the rich, who also have a higher propensity to save; (3) investment goods get cheaper – relative to consumption goods – worldwide.

Naturally, one can hope that the low growth rates and the even lower (real) interest rates of this time[1] are simply a temporary or cyclical phenomenon and that high interest rates will appear tomorrow (see Eekhoff et al., 2010). If one does not share this hope, one must look for reasons why the (real) interest rates are so low that there is a new fear of secular stagnation!

Hence, the structure of the following reasoning seems straightforward: In the next section, the two scenarios – the neoclassical and the Keynesian – are developed a bit further to show their differences with respect to interest rates. In the third section, I'll discuss reasons and present some arguments for why interest rates are low. This means that, in the coming decades, the Keynesian regime will dominate. A summary and some remarks with respect to the kind of technical progress and the factor land conclude the paper.

[1] As shown and discussed in particular by Olivier Blanchard (2019) in a very concise theoretical and empirical paper.

II. The Two Regimes—Neoclassical versus Keynesian

(1) Some simple static macroeconomics

In macroeconomics, a pivotal equilibrium condition is written as

$$I = S, \tag{1}$$

meaning that macroeconomic or aggregate demand

$$Y^D = C_P + C_G + I_P + I_G + (X - M) \tag{2}$$

equals aggregate supply Y^S. That is,

$$Y^* = Y^D = Y^S \tag{3}$$

and hence

$$Y^* = C_P + C_G + I_P + I_G + (X - M), \tag{4}$$

where Y is real national income, C is consumption, with subscripts P for private and G for government (or state), I is investment, and $(X - M)$ stands for exports minus imports.

If we define national savings, S, as the part of national income which is not consumed by private households, the state, or exported, then

$$S = Y^* - C_P - C_G - X,$$

and Equation (4) reduces to the equilibrium condition

$$S_P + S_G = I_P + I_G + (X - M). \tag{5}$$

Private households must also pay direct and indirect taxes and receive transfers and subsidies from the state. Then – T^* is defined as taxes minus subsidies/transfers – private savings equal

$$S_P = Y^* - T^* - C_P. \tag{6}$$

The savings of the state are equal to the sum of accumulated monetary and real wealth. Real wealth accumulation is equal to public investment, and monetary wealth accumulation equals the difference between taxes of the State, T^*, and its outlays, $G = C_G + I_G$. Hence, the savings of the state are equal to the sum of state's budget surplus or deficit and investments by the state:

$$S_G = (T^* - G) + I_G. \tag{7}$$

If the external balance is «almost» cleared, then Equations (7) and (5) result in

$$I_P - S_P = (T^* - G) \quad or \quad (G - T^*) = S_P - I_P. \tag{8}$$

Equation (8) shows that the difference between private investment and private savings is equal to the budget surplus or deficit of the state.

(2) A dynamic neoclassical macro model

In macroeconomics, different paradigms exist which give very different answers to the question of which factors (or markets) lead (in the medium or long run) to an equalization between private savings and private investment: $S_P = I_P$! (In the following, I neglect the subscript *P*!)

According to the neoclassical paradigm, the «natural» or «equilibrium» rate of interest is central, because private savings and private investment depend on this interest rate. Take, for example, the «loanable funds» theory: savings come «to the (capital) market» to earn interest, and investments are looking for those «loanable funds» to be invested into successful projects:

$$S(r) = I(r). \tag{9}$$

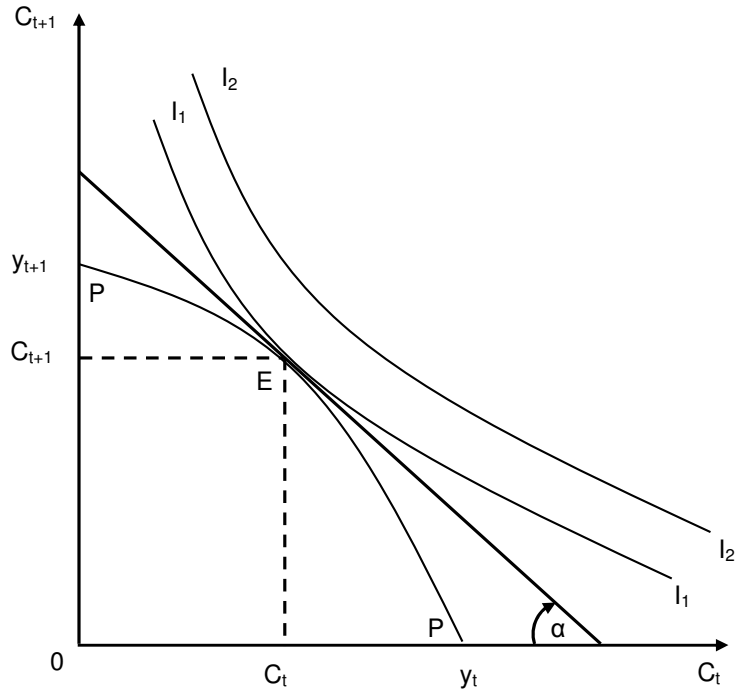
Hence, a sufficiently flexible rate of interest equalizes investment and savings, as clearly shown in the theory of Irving Fisher (1930). On one side, there is the agent's time preference, meaning that (consumption) goods today are worth more (valuable) than (consumption) goods tomorrow; on the other side, there is the productivity of investment. This factor shows up in the production possibility frontier (or investment opportunity curve) in Figure 1: goods today are «transformed» into more goods tomorrow. The time preference is depicted by the indifference curve: its inclination shows that goods today are «better» (more valuable) than goods tomorrow! The (real or equilibrium) rate of interest then shows up in the relative price of consumption goods tomorrow (in the future) and today ($tg\alpha$). Saving or time preference of private households, together with the productivity of investment, determine the rate of interest. This «interest mechanism» ensures that private investments are such that (in the medium or long run) savings equal investments and there is full employment[2].

In a second stage, one can «dynamize» these ideas to get the neoclassical growth theory of Robert Solow (1959), James Mead (1962), and others[3].

[2] In this situation the famous metaphor of James Mead is valid, where «... a dog called 'savings' wag(s) his tail labelled 'investment'» (Mead, 1975, p. 62).
[3] For a summary of the (neoclassical) growth theory see e. g., Jones & Vollrath (2013).

Figure 1

Consumption today vs. Consumption tomorrow



Note: *PP* shows the investment opportunity curve or the productivity of investment (if you invest y_t , you will get y_{t+1} «tomorrow»); *tan α* shows the relation between prices of consumption goods of today and of tomorrow, i.e. the interest rate; the inclination of the indifference curve shows the time preference (the waiting, the postponement of consumption should be honoured). *E* is the equilibrium, where the time preference is equal to the (market) interest rate! Source: made by the author.

Suppose there is a (macroeconomic) production function[4] that combines capital goods (*K*) and labour (*L*) to produce (national) output or income (*Y*):

$$Y = F(K, L).$$

The function *F* exhibits constant returns to scale, so that everything can be expressed in per-capita terms:

[4] A hint on the theoretical problems that such a function exists and can be aggregated must be sufficient, see the Cambridge-Cambridge controversy.

$$Y = LF(K/L, 1) \quad and \quad Y/L = F(K/L, 1),$$

if F is linearly homogeneous, or

$$y = f(k), \text{ with } k = K/L \text{ and } y = Y/L. \tag{10}$$

Let us further suppose that the labour force grows at a given exogenous rate $n = (dL/L)dt$. Because of Say's Law, this labour is employed, and capital and labour are substitutes. The second factor is the rate of (capital) accumulation, determined by the savings rate s from $S = sY$. Since all savings are invested, capital accumulation follows the rule: $\Delta K = I$ and $I = S = sY$.

For $k = const.$ in equilibrium, K and L must grow with the same rate n. Therefore[5] (for $Y/K = \sigma$),

$$\Delta K/K = I/K = sY/K = s\,\sigma = n \text{ or } \boldsymbol{g = n!} \tag{11}$$

Since Solow's «growth accounting»[6], given only these two factors, has led to a huge «unexplained residuum», called technological progress or technical change. This technical change is also growing with an exogenously given rate λ, therefore, labour productivity grows with the same rate. Hence, the so-called «natural rate of growth» is given by the rate of growth of population (see Equation 11) plus the rate of technical change, that is,

$$\boldsymbol{g = n + \lambda}. \tag{12}$$

Furthermore, $f'(k) = r$, and $f(k) - kf'(k) = w$, the marginal productivities of the production factors determine the factor prices! All this is shown in Figure 2.

The most interesting result, however, is that the savings rate influences the growth rate in the neoclassical growth model only «temporarily» because of the substitutability of labour and capital in the production function. In other words, this means only as long as the «interest mechanism» needs to establish the new equilibrium! In the long-run, that is, in the steady state, the rate of growth adjusts to the exogenously given rate of growth of the population or workforce (and technical progress)[7]. A shrinking s means that the economy glides down towards a lower growth path.

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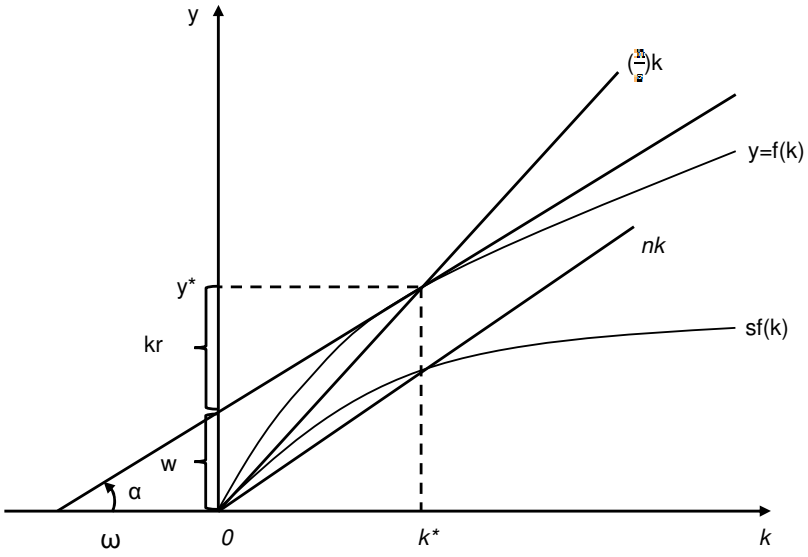
[5] Let us write $(dK/dt)/K = \dot{K}/K$ and $(dLdt)/L = n$, hence $\dot{k} = \dot{K}/K - n = sY/K - n$; and now $\dot{k} = sf(k) - nk$; and for $\dot{k} = 0$, it follows that $f(k^*)/k^* = n/s$. This is shown in Figure 2, where nk equals $sf(k)$, here $\dot{k} = 0$.

[6] See here, in particular, Denison (1962).

[7] It is interesting to note that, given certain plausible parameters to calibrate the model, this «adjustment period» ranges from 30 to 150 years (see Sato, 1963; or Krelle, 1965)! Compare this, however, with Keynes' statement that «in the long run we are all dead»!

Figure 2

The neoclassical growth model



Notes: *k* is the capital intensity, *y* is the income/production per head; *s* is the saving rate, *n* the growth rate of the population/work force, ω is the relation between the interest rate, measured by *tan α*, and the wage rate *w* wage per head, while *k*r* measures capital income per head; (*) denotes equilibrium values! And there is perfect competition on all markets! Source: made by the author.

(3) The Keynesian regime in the static case

Since John Maynard Keynes' *General Theory* (Keynes, 1936), however, an alternative mechanism to equalize investment and savings has been available! *First*, it is not savings that dominate investment; rather, to the contrary, investments driven by innovation, profit, or «animal spirits» play the central role, while savings are only «passive»: «But we have shown that the extent of active saving is necessarily determined by the scale of investment» (Keynes, 1936/1973, *Collected Writings* [Vol.7], p. 374).

There are two arguments to support this statement. On the one hand, in a monetary economy, the banking system can create (money and) credit («fiat money») quasi «out of the air». Therefore, savings are not necessary to finance

investment (as in the loanable funds theory). On the other hand, Keynes develops a «monetary theory of interest», where the interest rate is determined according to his *liquidity preference theory.* Keynes distinguishes three motives for holding monetary balances: transaction demand, precautionary demand (uncertainty), and speculative demand to explain money demand, which depends on the interest rate. This money demand equals the money supply given by the Central Bank and, via the money multiplier, by the banking system, thereby determining the interest rate.

Second, the equalization of investment and savings takes place through changes in aggregate income and production. The adjustment occurs via the *multiplier process*. An increase in investment leads to an increase in the income of workers, and this increase in income leads to an increase in consumption and savings, so that – after some periods – the increased income and, therefore, the increased savings are equal to the (increased) investment:

$$\Delta I \rightarrow \Delta Y \quad \rightarrow \Delta (1-c)Y = \Delta sY \quad \rightarrow \Delta Y = (1/s)\,\Delta I \qquad (13)$$

Even when increased investments (or demand for money or credit) lead to an increase in the interest rate, this leads not by necessity to increased savings. Even if the interest rate could be at the «lower bound» («zero lower bound»)[8], so that the increased savings were held as «hoards», there would still be no interest effect of increased investments.

(4) The Keynesian regime in the dynamic case

The dynamic Keynesian model follows the famous article of Roy F. Harrod (1939)[9]. Harrod's model starts by recognizing the «production increasing effect» or «*capacity effect*» of investment, in addition to the (short-run) *multiplier* or *income effect*. This capacity increasing effect can be formulated either as an accelerator effect or as the capital coefficient (the inverse of capital productivity), or «the relation», as Harrod called it. To produce a certain amount of output, there must exist a certain amount of capital stock; that is, $Y = (1/\beta)\,K$. If demand increases, therefore, the capital stock must increase (otherwise there is idle capacity), which is delivered by increasing investment, $I = \Delta K$, while capital productivity remains constant. Hence,

$$\Delta Y^A = (1/\beta)\,\Delta K = (1/\beta)\,I. \qquad (14)$$

[8] The effectiveness of an expansionary monetary policy is related to this «zero lower bound», because the (nominal) interest rates of the Central Banks practically cannot be below zero.

[9] It is said that Evsey Domar (1946) also developed such a model. However, there are interesting differences between the two approaches.

However, according to the multiplier, $\Delta Y^D = (1/s)\,\Delta I$, therefore,

$$(1/\beta)\, I = (1/s)\,\Delta I,$$

if both effects are to be equal or balanced ($\Delta Y^D = \Delta Y^A$, income demanded equals income supplied). Hence,

$$\Delta I/I = s/\beta, \qquad (15)$$

According to Harrod, the savings rate and the relation (capital coefficient) determine growth. In equilibrium, investment, capital stock, and population (labour force) must grow at the same rate. That is,

$$g = n = s/\beta. \qquad (16)$$

Harrod calls this rate the «natural» rate of growth. A growth rate of technological progress can also be introduced here, relaxing the above mentioned hypothesis that capital productivity remains constant. As before, we construct an «effective» labour force when technical progress is neutral in the sense of Harrod, so that the ratio of the value of capital to the value of output remains constant. Then, the rate of interest also remains constant.

From discrepancies between this «natural» growth rate, the «actual» growth rate and the «desired» (by entrepreneurs) growth rate[10], interesting discussions about long-run problems can start. While his critics, in particular Solow (1959), discuss only a «growth on the knife's edge» and look for remedies, Harrod goes further to discuss inflation or even *stagnation*[11]!

III. Going to the Ground – Some Reasons Why Interest Rates Are So Low!

Some general arguments

From both the dynamic versions of the neoclassical theory and the post-Keynesian theory, we can see that reducing the population growth rate or the rate of technological progress reduces the «natural» growth rate. In neoclassical terms, this implies a relative shortage of labour, higher capital intensity, and hence a shrinking marginal productivity of capital. Edmund Phelps (2016) and also Robert J. Gordon (2012; 2016) have complained about the decreasing rate

[10] As can be seen easily from a comparison of Equation (11) and (16), the neoclassical model talks only about this natural growth rate and not about the real or equilibrium or desired etc. growth rate as in Harrod's model; but this discussion I'll leave out here.

[11] It is important to note here that also Benjamin Higgins (1946, p. 83) pointed to the growing and chronic «gap between the trend of gross national product at full employment and the actual trend of gross national product». This remark is due to H. Hagemann (2021, p. 261).

of technical progress. However, can we conclude from this that the real interest rate must be very low or even zero? For the neoclassical growth model, we can say that because of the assumptions needed for the production function (Inada conditions), capital productivity and hence the real interest rate will fall with increasing capital intensity (k), but never reach zero!

In several places, John Maynard Keynes expressed his belief that highly developed economies would sooner or later be faced «if not with saturation of investment, [then] at any rate with increasing difficulties in finding satisfactory outlets for new investment» (Keynes, 1943, p. 360). That is why Joseph Schumpeter (1954, p. 1172) named Keynes «the father of modern stagnation theory»: «Keynes must be credited or debited, as the case may be, with the fatherhood of modern stagnationism», or even: «Here, then, we have the origin of the modern stagnation thesis» (Schumpeter, 1954, p. 501).

It is this «phase of stagnation» which characterizes modern times: «Today and presumably for the future, the schedule of the marginal efficiency of capital is, for a variety of reasons, much lower than it was in the nineteenth century» (Keynes, 1936, p. 368, but see also p. 371). According to Heinz Kurz (2018, pp.78-117), Keynes discusses three reasons for stagnation. The first relates to Keynes' «fundamental psychological law»: out of higher incomes, there are more savings – a trend which is aggravated by the increasing inequality of income distribution. A growing capital stock and the decreasing of the relative capital shortage, which come together with the decreasing marginal efficiency of capital, form the second reason. The third reason is the «love for money», the liquidity preference of wealth owners: the liquidity trap closes and becomes *a stagnation trap*. I will not discuss this third reason further, but actually, we see that, contrary to Keynes' idea, the nominal and real interest rates can fall even below the «zero bound».

However, J. M. Keynes was not alone, nor was he the first economist to deal with the theme of stagnation[12]. In 1938, nine years after the beginning of the Great Depression, Alvin Hansen delivered his Presidential Address titled «Economic progress and declining population growth» (Hansen, 1939). Here, he stressed: «This is the essence of secular stagnation – sick recoveries which die in their infancy and depressions which feed on themselves and leave a hard and seemingly immovable core of unemployment» (Hansen, 1939, p. 4). He also discussed three fundamental causes of stagnation: declining population growth, changes in the forms of technical progress, and falling-away of territory in the USA. However, even today, more than 15 years after the Global Financial Crisis of 2008/2009 and the extraordinary measures that governments have taken (see Eisen, 2021), the «sluggish» recovery has revived discussion of secular stagna-

[12] For a history of the concept from Alvin Hanson to Summers and beyond see Backhouse and Boianovsky (2016) and Hagemann (2021). For some classical arguments relating to David Ricardo and Karl Marx, see e. g., Kurz (2018).

tion. Larry Summers resurrected the idea in his 2013 speech to the IMF Forum (Summers, 2013) and further elaborated his thinking in the 2014 speech to the National Association for Business Economists (see Summers, 2014a) as well as in several other places[13]. Since then, different books and surveys have appeared discussing this issue[14].

According to Coen Teulings and Richard Baldwin (2014, p. 3), three pillars form the basis of the secular stagnation discussion: First, the diminishing long-run potential growth rate, itself consists of two blocks: (i) «the growth in productive inputs; and (ii) the growth in the efficiency with which inputs are combined to produce output» (Teulings & Baldwin, 2014, p. 4). The second pillar of the stagnation hypothesis «is firmly Keynesian with all its amendments and refinements» (Teulings & Baldwin, 2014, p. 5), in particular relating to the gap between the actual growth rate and potential growth! In principle, it is about the «aggregate demand-shortage» as described by Summers (2013), or about «excess savings», or – as Richard Koo (2014) puts it – about the «balance-sheet-recession»: «When a debt-financed bubble bursts, firms and households simultaneously attempt to pay down their debt. While sensible at the individual level, the result is an enduring lack of aggregate demand. If the new savings fail to find new investment opportunities, GDP may fall and Keynes's paradox-of-thrift can worsen balance sheets, then prolonging the recession» (cited in Teulings and Baldwin, 2014, p. 6)[15]. The third pillar draws on «labour market hysteresis» (Teulings & Baldwin, 2014, p. 7), an issue which I'll not discuss here, but see also Summers (2014c).

In the following, I'll focus on the second pillar, where Paul Krugman also stressed: «Secular stagnation is the proposition that periods …, when even zero policy interest rates aren't enough to restore full employment, are going to be much more common in the future...» (cited in Teulings and Baldwin, 2014, p. 9). Krugman shows that real interest rates «dropped from 5% in the 1980s, to 2% in the 1990s, and to just 1% in the 2000s. Since the Lehman collapse they have averaged about -1%» (Krugman, 2014)[16].

[13] See Summers (2014b, 2014c, 2015, 2016a, 2016b, 2018) as well as Rachel and Summers (2019).
[14] See Teulings and Baldwin (2014), a Panel at the yearly meeting of the American Economic Association in Boston in 2015 (with Eichengreen (2015), Gordon (2015), and Summers (2015)), Kurz (2018), Jackson (2018), and Caspari (2021).
[15] See also Fisher and Keynes on this issue.
[16] Also G. Twaites (2015) shows decreasing real interest rates. Larry Summers (2014b) stresses that low interest rates may foster financial instability: «(i) they increase risk taking as investors reach for yield; (ii) they promote irresponsible lending as coupon obligations become very low and easy to meet; and (iii) they make Ponzi financial structures more attractive» (cited by Teulings and Baldwin, 2014, p. 10).

Specific reasons why interest rates are so low

But why are real interest rates so low? According to Teulings and Baldwin (2014, p. 10), «a bouquet» of reasons can be evoked on the problem why equilibrium or «Wicksellian» interest rates have fallen steadily over the past few decades. Three building stones come into mind: (i) the relative demand for safe versus risky assets; ii) the investment demand schedule; and (iii) the savings supply schedule. Let me consider these determinants in turn.

In the years after the Great Recession of 2008/09, there was a remarkable downward shift in the supply of safe assets. As Teulings and Baldwin (2014, p. 13) note, «the main culprits are the collapse of the market for asset and mortgage-backed securities and the downgrading of sovereign debt». The financial crisis «carved out almost half of the supply of safe assets». An opposite trend hit on the demand side: «Pension funds, banks and insurance companies were forced by regulators to increase their holdings of safe assets. This led to massive excess demand for safe assets. Not surprisingly, the risk-free interest rate dropped to a historic trough» (Teulings & Baldwin, 2014, p. 13). Furthermore, the process of cheap money encouraged increased investment in financial assets – diverting money away from productive investment – as well as encouraged speculative lending, inflating asset prices and increasing income and wealth inequality! As argued by Thomas Piketty (2014), could it be that increased income inequality reduces economic growth, or – just the other way around, as shown after the World War II – that rising economic growth (caused by increasing labour productivity) reduces income inequality (at least until the 1970s)?

With respect to the shift in the investment demand schedule, many experts point to the fact that, on one hand, technological progress (or total factor productivity) has slowed down (see Gordon, 2012; 2016). On the other hand, the «development of high value-added services by Google, Microsoft, Amazon, Facebook, and the like requires relatively little investment» (Teulings & Baldwin, 2014, p. 12). Also Summers (2014b) makes a similar point when writing that WhatsApp has a greater market value than Sony but required nearly no capital investment to achieve it. Or could it be that technological progress has changed its form, from production innovation to product innovation with much less effect on labour productivity? Teulings and Baldwin (2014), however, remark that more «detailed work is needed, but the rough numbers suggest it could be important» (p. 12). I'll come back to this argument later[17].

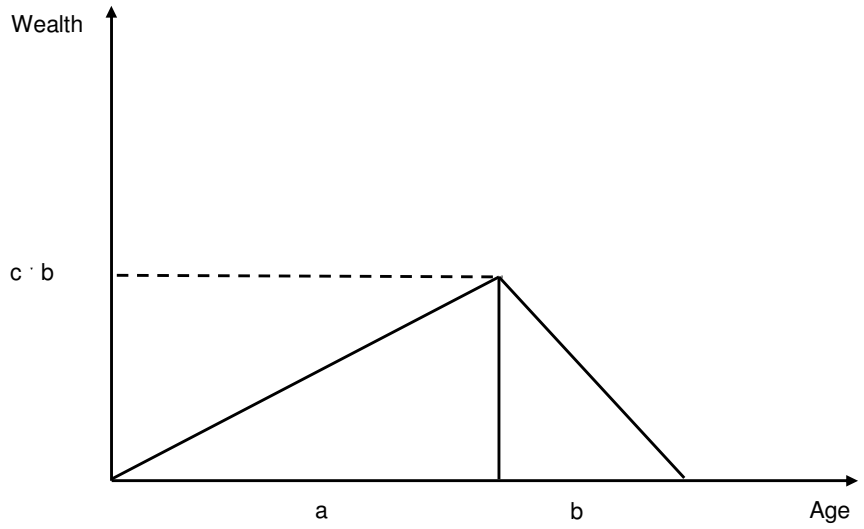
[17] An alternative hypothesis is put forth by Daron Acemoglu and Simon Johnson (Acemoglu & Johnson, 2023, Chapter 8 on «Digital Damage») who argue that in the time after the Second World War together with automation new possibilities for workers in various sectors were created, and the distribution of the economic rents was responsible for the increase in wages, but around 1970 both these pillars crashed. See also Eisen (2024).

In my opinion, the most important factor is the outward shift in the savings supply schedule. This has to do with ageing societies and their will to smooth lifetime consumption. Here, some new work of von Weizsäcker (von Weizsäcker, 2015; von Weizsäcker & Krämer, 2019/2021) is highly relevant[18], and there is an obvious connection with public debt.

To start, let me introduce von Weizsäcker's «savings triangle», which shows the accumulation of savings during working life and the decumulation of this capital stock or wealth during the phase when in retirement. Let me suppose that an average person lives for 80 years: the first 20 years she is nourished by his/her parents (or the state), then he/she works for 40 years, and lives in retirement for the last 20 years. In Figure 3, this is shown by ***a*** as the number of working years, and ***b*** as the number of years retired.

Figure 3

The saving triangle



Notes: *a* shows working years and *b* retirement years; *cb* equals accumulated wealth during working years, which will be spent during retirement! Source: made by the author.

[18] But see also Chapter 10 by G. Eggertsson and N. Mehrota in Teulings and Baldwin (2014), pp. 123-130; and Spahn (2021).

As shown in Figure 3, the average wealth of a person is *b/2*, or ten years of consumption! For a stationary population and a closed stationary economy, the average wealth of the population is then also equivalent to 10 years of (aggregate) consumption, as far as retirement is the sole argument for savings. One gets the same result in a system of growing income as long as the interest rate is equal to the growth rate. However, besides the «retirement motive», there exist other motives for saving. The most important may be the motive of inheritance for children. According to von Weizsäcker (2015), this motive does not significantly increase the savings rate but does increase the stock of wealth. This stock accounts for further two years of consumption.

Together, von Weizsäcker calls this «the waiting period», *Z*, which, expressed in present values, measures the time difference between the (labour) income earned during the working lifetime and the consumption outlays financed by that income for the representative household (individual). On average, this *Z* will be positive. It is interesting to see that this «waiting period» is the mirror image of Eugen von Böhm-Bawerk's «average period of production» *T* (amended by Hicks, 1939): The need for capital of an aggregate production system results from the time difference between the finished product/output in the form of consumption goods and the necessary initial input («labour»). Here too, outputs are produced at later dates then those at which the inputs that give rise to them are utilized. In equilibrium, the wealth of the economy must equal the capital stock of the economy. Insofar as the equilibrium interest rate is equal to the growth rate, then also $Z = T$. The waiting period of the representative individual (household) must be equal to the average period of production (see von Weizsäcker, 2015, p. 239). Here too, the increasing life expectancy, as well as the increasing savings due to the increasing wealth or life standard, leads to the «law of the increasing waiting period *Z*».

If $r > g$ or $r < g$, then in both cases the equilibrium can be shifted to $r = g$ via fiscal measures. Let *D* be the period of public debt (or sovereign debt), defined as the coefficient between the stock value of public debt and the stream value of consumption per year. Then, in equilibrium $r = g$, the following equation holds[19]:

$$Z = D + T. \tag{17}$$

If – *given* $r = g$ – the waiting period is smaller than the production period, then by choosing an appropriate negative public debt period, the $r = g$ – equilibrium can be produced. If – given $r = g$ – the waiting period is larger than the production period, then by choosing an appropriate positive public debt period, the $r = g$ – equilibrium can be produced. The first case represents the Neoclassical Regime, where the Ricardo-Barro theorem is valid (Barro, 1973). The second

[19] In their book von Weizsäcker and Krämer (2019, Chapter 5) also introduce the value of land or the capitalized rent of land. This is an interesting question and will be shortly taken up in the end.

case is the case of «dynamic inefficiency» and can be interpreted as the Keynesian Regime (see also Diamond (1965) for a one-sector model).

According to von Weizsäcker and Krämer (2019, Chapter 4), there are two reasons for the «great divergence» between saving and investment: The first reason, discussed so far, relates – in other words – to the «law of the increasing future orientation of human behaviour with increasing wealth» (von Weizsäcker and Krämer, 2019, p. 233). The higher the wealth, the higher is the relative desire for wealth. This law is the same as the law of the increasing private waiting period.

The second reason relates to a limit of the «incremental productivity of greater roundaboutness of production» in the sense of Böhm-Bawerk. Von Weizsäcker (2015) also calls this the limit of the «incremental productivity of higher complexity». There exists the danger of over-complexity and a «threshold of over-complexity»! Beyond this point, the marginal productivity of capital can become negative! The observed zero or even negative real interest rates can be interpreted as the «price signal» for the «marginal decremental productivity of greater roundaboutness of production» or the «over-complexity of the production system». And here comes in technological progress as the main cause and the arguments discussed above.

Von Weizsäcker (2015) underpins this idea with a conjecture: «there exists, from an aggregate view, for any technological system an adequate optimal degree of complexity, and at any given time optimal degree of labour division» (Weizsäcker, 2015, p. 243). With respect to Böhm-Bawerk's idea of roundaboutness of production, this means that for every economy there is a limit to the incremental productivity of greater roundaboutness in production. This limit may change throughout history, but it always exists (Weizsäcker, 2015, p. 244).

Following von Weizsäcker (2015, p. 248), we can summarize these arguments with the following *Thesis*: The natural (real) interest rate is at the present time negative. Public debt fulfils an important task by bringing the equilibrium interest rate nearer to the growth rate of the economic system, in all cases, however, away from the negative zone!

The Janus-face of public debt

It was shown here that, depending on the ruling regime -- either the Neoclassical Regime, where the economic growth rate is smaller than (or equal to) the interest rate, or the Keynesian Regime, where the economic growth rate is larger than the interest rate -- public debt crowds out private debt, and reducing it gives space for private capital formation, or public debt is necessary to bring the economy out of the inefficient state or an instable macroeconomic equilibrium (see Rachel and Summers, 2019).

The fact that low rates of interest have prevailed over the past almost two decades was shown in a pathbreaking theoretical and empirical analysis by Blanchard (2019). However, as argued, for example, by Homburg (1991; 2014), such an inefficient allocation cannot arise if there is a non-produced, durable asset, such as land, that can serve as a store of value. This means, that the enormous savings shown and explained here can be «absorbed» by a sufficiently high price of land. And as argued by von Weizsäcker and Krämer (2019, Chapter 5), land is an important part of private wealth (see footnote 19). Hence, it is unimportant whether the interest rate on capital is below, was below, or will be in the future below the growth rate, this situation cannot last. Therefore, active fiscal policy via public debt has dangerous and very costly consequences in the future (see Hellwig, 2022, pp. 23-24).

However, as argued by von Weizsäcker and Krämer (2019, p. 118) and in particular by Hellwig (2022, p. 23), «no general statement about the scope for dynamic inefficiency of *laissez-faire* allocations can be made» if «the cost of a transaction is proportional to its value»: If the price of land is sufficiently high, the transaction cost will actually exceed the value of the produce (or other benefit) from land and the real rate of return on land, net of transaction cost, will be negative. Any equilibrium allocation with this property exhibits dynamic inefficiency, that is, there is some scope for a Pareto improvement» (Hellwig, 2022, p. 23)!

Public debt plays a significant role in bringing back a positive interest rate; but this is not the only side of public debt. In the role stressed here, public debt also serves as a vehicle to drive up investment in a positive sense. Furthermore, an increase in public debt seems a very good way to finance additional investment in infrastructure (bridges, roads, school buildings, etc.) and education (see also Eichengreen, 2014, p. 45) – compared to export surpluses, inflation, or depression.

To cope with the fear that public debt may induce governments not to fight against inflation, the assets should be inflation-indexed or even indexed to the real growth rate. In this way, interest payments will go along or in parallel with the tax receipts – a very attractive asset to buy!

Conclusions

In the neoclassical growth model as well as in the «new» growth theory[20], secular stagnation is reduced to exogenous reductions of the growth rate of the labour force (n) or technological progress (λ)! In Keynes' theory of effective demand, the interest rate mechanism doesn't work, and the investment schedule is endogenously determined (via «animal spirits»); therefore, in the dynamic version of Harrod, inflationary processes or even secular stagnation are possible!

Furthermore, here I followed von Weizsäcker in using some ideas which result – via the limit of the incremental productivity of greater roundaboutness in production – in a state of a negative natural interest rate. Using the fact that life expectancy is high and still increasing, I also considered the increasing need to accumulate (private) wealth for retirement consumption. In a closed economy[21], therefore, only the state, via public debt, can «close» the huge divergence between saving and investment. Public debt fulfils – as stated in the Thesis – an important task in bringing the natural rate of interest out of the negative zone and bringing the economic system away from the dangers of permanent underutilization of resources (or unemployment)!

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[20] The contributions of the «new» growth theory will not be discussed for long. Paul Romer (1986) supposes that via R&D outlays of individual firms and the subsequent spill-over effects, technological progress is endogenous. In the model of Robert E. Lucas (1988), this role is taken over by individual investments in human capital. Also here tendencies of stagnation result from exogenous factors!

[21] These arguments are valid only for the world as a whole and not for single countries. But here von Weizsäcker and Krämer (2019) are right in calling for an «international order of fiscal policy» (as also J. M. Keynes was dreaming): Countries with low interest rates and balance-of-payment surpluses must accept public deficits and public debt, while countries with high interest rates and balance-of-payment deficits should reduce public deficits and their public debt!

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