German Economic Review 15(1): 42–61 doi: 10.1111/geer.12030

Public Debt and Price Stability

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Abstract. *Modernized Austrian capital theory implies: in capital market equilibrium without public debt the average period of production equals the average waiting period of households. In the twenty-first century and for the OECD plus China area, demographic and production parameters are such that capital market equilibrium implies a negative real rate of interest. Price stability implies a non-negative real rate of interest. Prosperity requires capital market equilibrium. Thus, positive public debt is required for price stability under conditions of prosperity. Some conclusions are drawn for actual international macropolicy.*

JEL classification: *E*22, *H*31, *D*91.

Keywords: Public debt; capital theory; saving behaviour; price stability; international macropolicy.

1. INTRODUCTION: THE NEGATIVE NATURAL RATE OF INTEREST PROBLEM

The public debt crisis in the euro area has induced an antipublic debt mood in many electorates, media and the economics profession. In this study I want to explain why I draw different conclusions from recent events. I believe the rich (= OECD) countries jointly with China face a problem of incompatibility between two goals: price stability and low (ideally: zero) government indebtedness. In my opinion in a world without public debt, the natural rate of interest – in the sense Wicksell used this term – would be negative. And reaching this natural rate of interest would then be incompatible with price stability. The nominal rate of interest cannot become negative – and under price stability the real rate of interest equals the nominal rate. Thus, it cannot reach Wicksell's natural rate if the latter is negative.

I do not claim to know whether the present level of public debt in the rich countries plus China is sufficient to overcome the *negative natural rate of interest problem*. My only claim in this study is that a zero public debt in these countries would cause the natural rate of interest to be negative. Yet, if this claim is correct, the debate about public debt would have to change its character. I come back to this point below.

In this study I develop my argument in words. A detailed mathematical model of my thesis is contained in another study of mine (von Weizsäcker, 2011). The model builds on a field of economic theory that nowadays has almost been forgotten: capital theory. It flourished in earlier decades, going back as far as Karl Marx, Eugen von Böhm-Bawerk, Irving Fisher and John Bates Clark. But its final boom (a bubble?) was in the sixties and early seventies of the twentieth century.

The great names then were Paul Samuelson, Robert Solow, Joan Robinson and Piero Sraffa. At that time, I myself participated in this research. I believe that the present macroeconomic discussion suffers from the fact that certain insights of capital theory have been forgotten.

2. DEMOGRAPHICS: THE MAIN REASON FOR A NEGATIVE NATURAL RATE OF INTEREST

Following Wicksell (1898), *I define the natural rate of interest as the equilibrium real rate of interest for an economy with zero public debt.* If there is public debt, it is likely that the equilibrium real rate of interest is higher than the natural rate (as defined here. Alternatively, one could define the natural rate as the equilibrium real rate of interest taking account of government debt. But for the purposes of this study it is convenient to define it as I have done).

Following the tradition in capital theory but also consistent with modern macroeconomics, the natural rate of interest equates the supply of capital (as a stock) and the demand for capital (as a stock). One would normally expect an excess supply of capital if the actual market rate of interest is above the natural rate, and one would normally expect an excess demand for capital if the actual market rate of interest is below the natural rate.

In Wicksell's and Böhm-Bawerk's time, neoclassical economists were convinced that the natural rate of interest was positive. The magnum opus of von Böhm-Bawerk (1889) was written to explain why there was a positive real rate of interest. Wicksell basically followed the reasoning of Böhm-Bawerk and then investigated in detail the relation between the natural rate of interest and the 'money rate of interest' as set by the central bank and, generally, by the financial sector. Given the parameters as they prevailed in the late nineteenth century, it was probably correct to think that the natural rate of interest was positive.

But the twentieth century has changed the relevant parameters in a dramatic way. In rich countries the material standard of living of the median citizen has gone up by a factor of 10 or 20. A large part of that rise has been consumed in the form of shorter working time. Also life expectancy has risen substantially. But, at least for the last 50 years, the higher life expectancy has not led to a rise in the retirement age. This is one major form in which the shortening of working time has been implemented. Therefore, the pension period has risen in a dramatic way. This process is still going on, and we can expect a further lengthening of the period of pension entitlement in the future. In Germany, the average length of time a pensioner of the social security system receives his/her pension has risen from 10 years in 1970 to 17 years in 2010. Thus, until 2010, average pension time has increased by more than two months every year. The corresponding average pension time 120 years ago – when Wicksell and Böhm-Bawerk were writing – was below two years.

How do people provide for the time when they no longer have an earned income from work? Traditionally, and thus at a time when this period was much shorter, the family took responsibility for the old people. Today, the welfare state and private liquid wealth have largely replaced the family's role. Assume, for the moment, that old age provisions are generally done by saving money, for

example, by means of private life insurance. The amount of capital which would be supplied to the economy would be substantially higher than it is today. As it actually is organized, social security (including health insurance) is a pay-as-you-go system.

On the other hand, demand for capital by the production sector of the economy roughly rises in proportion to the level of production, i.e. roughly in proportion to GDP. Marx and also Böhm-Bawerk believed that there was a secular tendency towards an ever-rising ratio of capital to output. Marx talked about the 'organic composition of capital' in this context, which he believed would permanently rise and would cause the profit rate to decline until capitalism collapses. Böhm-Bawerk also thought that in the course of time the roundaboutness of production would rise.[1] It did not happen.

Thus, demand for capital – as a ratio to annual production – did not rise, whereas, due to demographic reasons, 'supply' did – if we thereby mean: the volume of rights to receive money in the future. I write 'supply' because parts of this 'supply' are the result of forced saving within a social security system. We can surmise that without social security people would have acquired a smaller amount of such rights. Whatever the form of accumulating wealth, it *is* the case for the rich countries plus China that private wealth (if we include social security and other pension claims for the future and certain claims on health services financed by *earlier* rather than simultaneous contributions) exceeds the value of capital tied to the production process by far. The gap between the two magnitudes is basically made up of public debt, explicit and implicit. And this not by happenstance, but for reasons which follow from the very social order of rich societies. This will be discussed in Section 4. But before, in Section 3, I point to a very simple arithmetic fact.

3. THE SAVINGS TRIANGLE

Imagine a hypothetical stationary and closed economy with overlapping generations of representative consumers. They start working at their lifetime zero (biological age perhaps 20 years, but for convenience I denote age by biological age −20). They work a years. Then they retire and live another b years. They have to provide for their old age by saving. They save during their working time. Assume their wage remains the same over time. Assume they save the same amount every year until they retire. The rate of interest they get is zero. They want to save enough so as to be able to keep their level of consumption constant in every year throughout their lifetime. Assume this consumption level per year to be unity, i.e. = 1. This then forces them to save enough to own wealth b at their moment of retirement. Only then can they consume one unit per year throughout their retirement period. Given this behaviour, their wealth as a function of their age is a triangle as seen in graph 1 below. The base line of the triangle has

1. It can be shown that Marx' 'organic composition of capital' is identical with the 'average period of production', which Böhm-Bawerk introduced to measure the degree of roundaboutness of production (von Weizsäcker, 1977). In this case, it is the original version of the average period of production, not the modernized version introduced by me (von Weizsäcker 1971).

length $a + b$. The height of the triangle is b. Assuming that each annual age cohort has size one, the area of the triangle gives us the wealth owned by the population of this economy. The area is base line times height divided by 2, hence in this case $(a + b) \times b/2$. But the population of this economy is $a + b$. Thus, society's wealth per person equals $b/2$, which is half the period of retirement times annual consumption per person.

I use the term 'average waiting period' or simply 'waiting period' for the ratio between wealth of society and its annual consumption. Thus, in our simple example, the waiting period is half the period of retirement. The term 'waiting period' is justified because on average the person 'waits' $b/2$ years before she/he consumes her/his wage income. This can be seen by looking at the 'time points of gravity' of wage income and of consumption expenditure of the person. The 'time point of gravity' of wage income is in the middle of the wage earning period, hence it is at $a/2$. The 'time point of gravity' of consumption is in the middle of the consumption period, thus at $(a + b)/2$. 'On average' the person thus 'waits' $(a + b)/2 - a/2 = b/2$ years before she/he consumes her/his wages. It then turns out that the average wealth in society divided by annual consumption equals the 'waiting period'. This is a general property of an economy growing at a constant rate of growth g if the rate of interest is equal to the rate of growth. The ratio of wealth to annual consumption in a society can be understood as the average waiting period in society. For a detailed analysis see von Weizsäcker, 2011 (Figure 1).

4. THE 'DEEP' STRUCTURE OF CAPITAL SUPPLY IN MODERN DEMOCRATIC SOCIETIES

The rapid rise of life expectancy in the rich countries is due to progress in medical science to a certain extent. But in conjunction with this scientific progress, it is also due to the generalized free access of people to health services. In the rich countries there is no longer a financial access barrier to a certain decent minimum of medical services. To put it the other way round: one of the main reasons for a short average life expectancy in earlier times has been that poverty lead to death with high probability. Even though it is still true that there is a positive correlation between economic condition and life expectancy, it is clearly also the

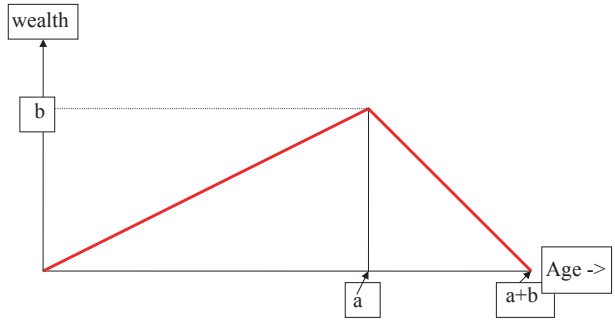

Figure 1 The saving triangle

case that the welfare state has a strong impact on average longevity. There is then some positive feedback mechanism between the expenses of the welfare state and average longevity: the former raise longevity; and the latter – by raising the pension period – raises welfare state expenses.

But this positive feedback mechanism also applies to politics. Pensioners and people who expect soon to be pensioners are voters. The rising longevity, partly due to the welfare state, raises the proportion of pensioner voters in the electorate. This again tends to raise political support for an extensive pension system. Dismantling the welfare state is not a political option. The welfare state is deeply ingrained in the structure of modern society, of modern democracy.

Modern democracies are also market economies. Historically, the capitalist mode of running the economy has turned out to be without a realistic alternative. But market economies need entrepreneurs. It is unthinkable that all production activities are organized in publicly traded companies. The latter's actual share in generating the value added of the production system is below one-third. Principal-agent problems of publicly traded companies are simply too large to be suitable for each and every economic production activity. The market economy can only prosper if a sufficiently strong class of self-employed, sufficiently well-off people exist (in German: 'selbständiger Mittelstand'), who provide jobs for the employed. They provide the equity capital of the small- and medium-sized enterprises. Now, it turns out that entrepreneurs, as a rule, do not consume all their wealth over their lifetime. They tend to leave large fractions of their wealth to their children or to other heirs; frequently they give large parts of their wealth to foundations which are supposed to maintain their capital and only to spend the dividends paid out to them.

The upshot of this is that a lot of savings are kept as wealth over a very long time period and thus are not consumed for a very long time period. This period is not limited by the death date of its 'originator'. The 'average waiting period' then is substantially larger than the one which one derives from provisions for old age only. The latter is of the order of magnitude of half the pension period, thus, – given pension periods for the overall population, not just social security pensioners, of close to 20 years – close to 10 years. This then leads to a guesstimate of the average waiting period in modern societies of 12 years or more.

As I already pointed out, abolition of the welfare state is out of the question. Also, abolition of the market economy with its entrepreneurial class is out of the question. We are then more or less stuck with a will of people to provide for one's own and one's offspring's future in the order of magnitude of 12-year annual consumption – public consumption included. This then is the order of magnitude of the supply of capital.

There are, of course, policy alternatives which may be politically feasible and which may be able to contribute to a certain reduction in the 'waiting period'. But they cannot change the supply of capital by more than a trifle – provided the welfare of the people is maintained. (One could of course start destroying our 'wealth machine' by abolishing property rights one way or the other, thereby destroying incentives to provide for the future altogether, and thus destroying the welfare state altogether. I do not expect this to happen. Nevertheless, if it did happen, the outcome would not be welcomed, except by those who yearn for another 'cultural revolution' – clearly a small minority.) There exist laudable

attempts to generate incentives to postpone the transition from work to retirement. But, given the politics of the welfare state and given, perhaps, also human biology, such postponement will at best be of an order of magnitude which compensates for further rises in longevity to be expected in the future.

Expropriating wealth either during the lifetime or after the death of the owner can be done by tax laws. But then the very incentive to no longer accumulate wealth and to no longer become an entrepreneur and employer would severely damage employment opportunities of those who do not want to become employers. The wealth tax in the long run would be shifted to the workers by reducing real wages. Returns to equity capital before taxes would rise accordingly, and thus returns after taxes would not very much have changed.

'The welfare state providing for the future of workers and the need for equity capital owned by the entrepreneurial class thus are stable characteristics of modern market economies and democracies. Given the modern demographic parameters, the supply of capital in the order of at least 12 years of annual consumption is an unchangeable feature of the kind of societies in which we live'.

5. LIMITS TO ROUNDABOUTNESS OF PRODUCTION: 'THERMODYNAMICS'

Can we expect that at sufficiently low, but still non-negative real rates of interest the roundaboutness of production will be sufficient to absorb the supply of capital equal to 12 years of annual consumption? As I show in the underlying model, capital market equilibrium requires the period of production to be equal to the waiting period. Indeed, the demand for capital approximately equals the period of production times the annual level of consumption. Thus, the 'capital coefficient', i.e. the ratio between capital used and annual consumption goods produced, would have to be 12 years, which is more than double of what it actually is.

The answer to the question is: no. The actual risk-free real rate of interest in the world economy is quite low. It cannot decline much further without becoming negative. The demand for capital by the producing sector is not sufficiently interest elastic to allow such a rise in demand for capital to occur at a still non-negative rate of interest. In the underlying model, I use a kind of generalized production function and then calibrate its parameters. One point is important, and I therefore stress it here: *value added per worker as a function of different capital intensities has a finite maximum.* To the extent that the low real rate of interest – in the tradition of Solow's neoclassical growth theory (1956) – reflects a low marginal productivity of capital, we can deduce that a greater capital intensity of production (i.e. a greater roundaboutness of production) cannot add much to labour productivity. Labour productivity is already near its theoretical maximum – for a given production function. Of course, technical progress may raise labour productivity beyond any known limits. But this is not our issue here.

Why is there a finite maximum of labour productivity as a function of the degree of roundaboutness of production? The answer is: maintenance. It may be true that – if it was not for maintenance – there always exists further potential to

raise output per unit of labour if one is prepared to invest a little more, if one is prepared for another step of 'capital deepening.' But there *is* the need for maintenance. Buildings, which represent the bulk of capital demand in the production sector (including, of course, housing) are a case in point. Buildings do need maintenance. Thus, even at a borrowing rate of interest of zero, it does not pay to let your workers use more and more space. From a certain point onwards, the incremental 'productivity' of workers due to an incremental availability of space is eaten up by the incremental maintenance requirements. The same, basically, holds for both equipment and inventories.

From physics we can invoke the second law of thermodynamics: a building, a piece of equipment or some inventory all lose their designed effectiveness through time due to the fact that they are physically exposed to human activity and natural forces, as everything does due to the law of rising entropy. Only by activities involving an uphill fight against the second law of thermodynamics, i.e. by activities that we collect under the general concept of 'maintenance', these pieces of capital can be kept in a state so that they remain useful in the process of production.

'Because of the second law of thermodynamics, we should expect a maximum labour productivity at a finite level of roundaboutness'.

6. LAND

It was Samuelson (1958) who first suggested that public debt can serve the purpose of allowing people to save beyond the investment potential of the economy. For this purpose, he invented the famous theoretical device of the overlapping generations model. Later, it was in particular Diamond's AER study of 1965 (Diamond, 1965) that focused on this subject using overlapping generations and a Solow production function.

Yet, at different times and in different forms, several economists (Feldstein, 1977; Homburg, 1991 and others) have raised a counterargument against the thesis that public debt may be needed to enhance the potential of individual provision for the future. If land is an essential input and if the quantity of suitable land is fixed, the land receives a Ricardian land rent, i.e. it receives a scarcity price. As the rate of interest converges to zero, the capitalized value of future land rents rises beyond any limit. Thus, at a still positive rate of interest, there is enough real capital and land available to absorb any wish of citizens to provide for the future by saving.

The logic of this counterargument is correct. And it is indeed true that quantitative limits for certain natural resource inputs exist. But there is one problematic assumption needed for this counterargument: security of property rights. If the land owner faces the risk of being expropriated one way or another, the price of land will not go beyond any limits. One way of expropriation is by taxation; land cannot move from one country to another to avoid taxation.

I do not wish to discuss the details of that counterargument here. I just want to point out that economic theory has not well developed a branch of research I would term 'the economics of insecure property rights'. In this context, I point to a book which I believe to be path breaking: North *et al.* (2009). In this

book – among other things – Douglass North and his coauthors try to explain how traditional societies work, how, in particular, they cope with the problem of violence. One important result of their research is that, due to the threat of violence, the ruling class redistributes property among its members according to changing power balances. Insecure property rights are then of the very essence for the peaceful co-existence of people in traditional societies, i.e. in all societies of the world up to 1,800, and in most of present-day societies in less developed parts of the world! The transition to modern societies involves the effective centralization of the use of violence in the hands of the State (Hobbes' Leviathan). It also involves a high degree of security of property and an effective way to collect taxes. Thus, the general traditional insecurity of property is transformed into a greater security of property against encroachments by other citizens, yet a much more effective availability of that property for potential taxation.

Demographics and the welfare state – the very causes that shift the natural rate of interest into the negative – also make it very likely that property that cannot move abroad will be taxed heavily. In any case, owning land is as risky as owning any other property. The price of land must be such as to bear a (taxation-induced) risk premium. *Thus, even at a real rate of interest of zero or below zero, the price of land will not be large enough to fill the gap between the private supply of capital and the private demand for capital.*

7. THE MEANING OF PRICE STABILITY

The prevailing techniques of financial intermediation lead to the result that the risk-free nominal rate of interest cannot be negative. Can we think of a scheme of providing money to the economy such that the possibility of a negative nominal rate of interest does exist? Long ago this question has been discussed and proposals have been made to enable negative nominal interest rates (Gesell, 1916 and others). Assume for the moment that such devices work so that the nominal risk-free rate of interest can become negative. Can the economy then exhibit simultaneously: 1. an excess of the waiting period over the period of production at a zero rate of interest; 2. zero public debt; 3. price stability? In a technical sense the answer could be: yes. By a clever device à la Silvio Gesell, we may find equilibrium at a negative nominal rate of interest with a zero rate of inflation.

Yet, in a deeper economic sense the answer is: no. Why is price stability a goal of economic policy? We want to provide the public with the opportunity to save portions of their current income without the risk of loss, i.e. with a guarantee that the money they have saved keeps the same purchasing power through time. We may then reasonably *define* price stability as the existence of savings instruments which are not exposed to risk, in particular not exposed to the risk of losing purchasing power. But then, under price stability, nobody in his/her right mind will lend at a negative rate of interest because he/she can always earn more using the risk-free saving instrument which is available. Thus, the prevalence of price stability as defined here excludes the possibility for borrowers to borrow at a negative nominal rate of interest. The risk-free market rate of interest, thus, cannot be negative.

8. PONZI AND ALL THAT

Steady-state equilibrium with an interest rate below the growth rate is not a general equilibrium in the usual sense of the word as it is used in economic theory. Such a general equilibrium does not leave any arbitrage possibility for market participants. Yet, at an interest rate below the rate of growth there is a theoretical possibility of arbitrage, which economists know under the name of Ponzi games. Mr Ponzi could borrow money at the going interest rate, serve his debt by raising it at the rate of growth of the system and always consume the difference between the annual debt increase and the annual interest payments on the outstanding debt. Thereby additional consumption would be the result; the interest rate would rise until it reached the rate of growth of the system. At this interest rate and above it, the Ponzi game could not continue forever because eventually Mr Ponzi's debt would be larger than total debt in the economy. All this is well understood among economists.

For practical purposes, private Ponzi schemes can only work as long as lenders of Mr Ponzi have not discovered that they are part of a Ponzi scheme. Mr Madoff's scheme of course collapsed after it was found out to be similar to a Ponzi scheme.

The only practical Ponzi is the government itself. The government's power of taxation makes it possible that on this level Ponzi games remain credible as long as the rate of interest on government debt remains below or at the benchmark rate of growth. This was the implicit assumption in my analysis above. It also conforms to the academic literature (Barbie *et al.*, 2004; Blanchard and Weil, 2001; Diamond, 1965; Gale, 1990; Tirole, 1985; von Weizsäcker, 1979).

9. CROWDING OUT

If the government decides to borrow on the capital market, it does of course compete with other borrowers. In this sense, public debt does always crowd out other debtors. But the real question is: does public debt crowd out debtors who are important for the welfare of society?

In the preceding argument I use the waiting period Z and the period of production T for a characterization of the supply of capital and the demand for capital. The idea then is that public debt 'absorbs' the excess of capital supply over capital demand at a zero real rate of interest. We may express public debt in a way which makes it easily comparable with the waiting period and the period of production. I thus express the steady-state public debt in terms of the ratio between public debt and annual consumption. Let then D be the public debt period: it is this ratio of public debt to annual consumption, or, to put the same thing differently, it expresses the amount of time required for consumption to be equal to the stock of public debt. The equilibrium condition would then be

$$Z - D = T$$

If we work in a neoclassical model of the steady state, the Golden Rule tells us that any rate of interest below the steady-state rate of growth generates 'dynamical inefficiency' and thus additional government borrowing, as discussed in the

previous section (and as is well known in economics), does not crowd out welfare-enhancing private investment. But even in the new growth theory with endogenously determined rates of growth we can expect the following: investments forgone by public debt which cause the rate of interest to rise from the negative natural rate to zero are unlikely to be socially very productive. Assuming that price stability is an important welfare-enhancing goal, we then can conclude that welfare rises rather than declines as the real rate of interest rises from its negative 'natural' value to zero. Because, as discussed above, a negative real rate of interest is inconsistent with price stability.

It is of course well known (Diamond, 1965) that as long as interest on public debt does not exceed the steady-state rate of growth, steady-state taxes are not higher than they would be without public debt. Thus, to use the parameters which I apply in my model for calibration, if the Golden Rule period of production is five years and if at this Golden Rule real rate of interest of 2% per annum the waiting period is 12 years then public debt can be seven years of annual consumption before it becomes a 'steady state burden' for the tax payer.

10. HOW TO VIEW PUBLIC DEBT? PART 1

In this study I do not make specific policy proposals which might follow from the *negative natural rate of interest problem* that I have identified. Obviously, policy proposals need to be justified by more than just a steady-state analysis. Nevertheless, certain conclusions concerning an appropriate view on public debt can be drawn. In this section, I treat the case of an economy with a single government with a view of optimizing the country's own affairs – taking debt activities in other countries as given. If every country acts in this way and without international agreements, then we may find a kind of public debt Nash equilibrium. In the next section, I discuss international cooperation concerning national public debt.

10.1. Public debt – neither black nor white

There is a large fraction of public opinion these days which considers any form of public debt as an evil. Their 'philosophy' derives from the advice of prudence for private households: the less you are in debt, the better for you. This philosophy may be correct for an individual who does not expect to live forever and who therefore eventually will have to pay down all debt. Assuming that all other things are equal, in particular equal private wealth, the philosophy also holds for a government; a low debt level outside of a steady state is better than a high debt level. But, economics tells us that not all other things can remain the same as the level of public debt changes. In a closed economy the following occurs: if private wealth is kept constant, a higher level of public debt implies that real capital (buildings, machines etc.) is smaller. This demonstrates the crowding out of private investments by public borrowing. If real capital is kept constant then more public debt must mean that private wealth is higher. Here, it does not make sense to talk of crowding out. The question then is: what is the realistic scenario: that public debt crowds out real capital formation or that public debt

generates additional private wealth? If it then is the case, as suggested by my analysis, that even at a real rate of interest of zero the waiting period is in excess of the period of production we may say: zero public debt causes a crowding out of price stability – or, perhaps worse: it crowds out the ability of private individuals to save as much as they want under conditions of price stability.

As recent experience has shown, there can be too much public debt. It would be incorrect to derive from a steady-state analysis that, as long as world capital market interest rates are low, the more debt the better. This is because a single sovereign debtor does not control the world capital market risk-free rate of interest. And it must be prepared for deviations from the present, perhaps tranquil, state of affairs. From the point of view of an individual sovereign debtor, it is prudent to maintain the status of a risk-free (AAA) debtor. But this in itself does not yet solve the collective negative natural rate of interest problem.

Whatever the actual state of affairs, it is useful to accept as the benchmark a well-defined steady-state growth path with a given public debt period D rather than a balanced budget as is done in public discussion. The balanced budget with zero incremental public debt implies that the public debt period D declines whenever the nominal value of private and public consumption goes up. If, as argued in this study, at a non-negative real rate of interest Z is structurally larger than T and thus a positive D is needed to enable people to provide at their will and without risk for their own and their offspring's future, the relevant benchmark is not a balanced budget but a constant public debt period D. *The question then is as follows: what is the optimal level of a constant public debt period D?*

10.2. The relevance of the real rate of interest

Rules for public indebtedness like the 60% of GDP rule as defined in the Maastricht criteria do not take account of the market rate of interest. Given the negative natural rate of interest problem, rules like the Maastricht rule cannot be right. Reasonable rules concerning public debt must take into account the level of the market risk-free real rate of interest (RFRRI). That rate is not determined domestically, but it is a world market rate. For a small- or medium-sized country, the RFRRI can be taken as exogenously given. Common sense tells us: the higher the given risk-free real rate of interest, the more restrictive fiscal policy should be.

'At a risk-free real rate of interest which is above the steady-state rate of growth of the economy, the conventional wisdom of frugality is acceptable. It then makes sense to try to reduce the debt period D. At a risk-free real rate of interest below the steady-state rate of growth, the conventional wisdom of frugality may lead us along the wrong track. It may then be reasonable to expand the debt period D. A fortiori this may be advisable at a risk-free real rate of interest below zero'.

This dependence of the optimal debt policy on the rate of interest may be all right in principle. But for a specific rule concerning the functional relation between the risk-free rate of interest and the debt policy one has to take into account the uncertainty about the future real rate of interest and the future growth potential. The greater this uncertainty the weaker should be the reaction upon a change in the rate of interest. But it would be a mistake to be so fearful

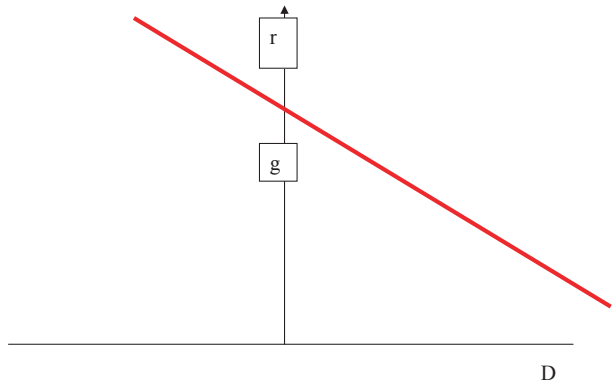

Figure 2 The optimal public debt period D as a function of the RFRRI (r)

of uncertainty that one does not leave any room for an impact of the rate of interest on debt policy (Figure 2).

10.3. Capital exports and imports

A country which is small in relation to the global economy might consider itself in a position similar to a private borrower or lender. Individuals and firms do of course take account of the market rates of interest at which they can lend or borrow. A country at large 'borrows' when it imports more capital than it exports, i.e. when its current account balance is negative. It 'lends' when the opposite is true, i.e. when its current account balance is positive. A small country may not bother about the excess of the waiting period over the period of production of its own economy. It could pursue a policy of zero public debt and simply build up loans to the rest of the world (or other forms of foreign assets). But such policy may or may not be prudent. If the world market risk-free real rate of interest is high, why not lend to the rest of the world and earn interest? But, if the world market risk-free real rate of interest is low, say, lower than the country's own expected real rate of growth, it may not be so advisable to lend money to the rest of the world. Instead, to protect its country's domestic welfare, the government should reduce taxes and raise public debt, thereby reducing the lending to the rest of the world.

But, if among the countries net capital exporters exist, there must be net capital importers as well. To the extent that a net capital importing country also is characterized by an excess of the waiting period over the period of production, the net capital import must be due to public debt. For this country then the inequality $D > Z - T > 0$ must hold. From the point of view of this country alone it may be prudent to reduce public debt. It then appears to be the case that not only the world market rate of interest but also the current account balance should influence national public debt policy. *At low interest rates in particular, it may be best for net capital exporters to raise public debt; yet, depending on specific circumstances, despite low risk-free rates of interest, it may be prudent for capital importers to reduce public deficits.* A country like the United States has a currency which is also the most important world currency. It can borrow money abroad in its

own currency. Thus, the risk of default of its federal government is not so great even when running a large current account deficit. On the other hand, for countries like Greece or Portugal that have lost sovereignty over their currencies, the risk of default of their public debt is quite substantial as long as their balance of payments is strongly negative.

It is important to see that default risk is strongly linked with a negative current account balance. The government of a country with a positive current account balance will be seen by capital markets as a government which essentially borrows from its own tax payers. If things get rougher, the government could always raise taxes to pay for the debt to its own tax payers. The government of a country with a substantial current account deficit borrows large parts of its debt from people abroad who are not its tax payers.

10.4. Measuring the 'RFRRI'

Until now, most government debt is in nominally fixed interest paper. Thus, it is not easy to get reliable information on the real rate of interest, let alone the risk-free real rate of interest. We do observe a rising market section of government debt paper which insures the creditor against inflation. Although economists have talked about such insurance by means of capital market instruments for a long time, the market for such paper has grown only slowly. Many governments may be reluctant to issue such inflation-indexed papers. But the idea seems to be catching on. Whenever this market segment has reached a certain maturity, we will have reliable guidance for the equilibrium real rate of interest and then probably also for the value of the equilibrium risk-free real rate of interest.

10.5. The perception of default risk in capital markets

Recent experience with bonds of certain European sovereign debtors is an example of potential trust instability in capital markets. If certain debtors are considered default risks, the interest rates they have to pay rise and this in itself may make it impossible for them to avoid default. Debtor capacity to honour their obligations depends of course on the debt volume and on the interest rates they have to pay. Even at a risk-free real rate of interest of zero a sovereign debtor may not be able to convince the capital market that their debt papers are free of default risk. Potential creditors will look at indicators which they consider as good predictors of the ability and willingness of the debtor to honour its obligations. Two such indicators are likely to be the inherent growth potential of the economy and thus the tax base of the country, its balance of payments and, of course, the level of its indebtedness, i.e. D, or that part of D which corresponds to explicit rather than implicit debt.

The perception by the capital market of default risk of a particular sovereign debtor also depends on the view potential creditors take on the public debt in general. If the view is one that really public debt is an unnecessary evil and an indication that the present generation consumes at the expense of later generations, the expectation is that real rates of interest will be high in the future – and this makes it more likely that a particular sovereign debtor will default. *If the general view is that a negative natural rate of interest problem exists and that so far public debt in the*

world is compatible with a zero or close to zero risk-free real rate of interest, the expectation is that the risk-free real rates of interest will remain low. This in turn reduces the creditor's subjective probability of default of the debtor. Therefore, it is possible that a mistaken view on public debt ('real interest rates will be high') generates a self-fulfilling prophecy of default of sovereign debtors.

If there is uncertainty concerning the growth potential of a country, this is likely to cause uncertainty about the ability of the government to honour its debt. This may severely restrict the borrowing potential of the government. One possibility to raise the borrowing potential of a state is the introduction of 'GDP shares', or as Robert Shiller (Kamstra and Shiller, 2010) has coined them: 'trills'. The 'dividend' paid on these shares is a linear (not necessarily proportional) function of the country's GDP and thus would in effect be a rising function of tax revenue. It is likely that the government's capacity to 'borrow' could be raised substantially with such instruments like 'GDP shares'.

10.6. Explicit and implicit public debt

Only the smaller part of public debt is explicit debt. Implicit public debt exceeds explicit public debt. Implicit debt, like provisions for future pension payments, generally has the advantage (and disadvantage) that it is not traded on the international capital market. Implicit public debt also has the property that it cannot be exactly calculated. This characteristic is one major reason why official policy does not treat it as 'public debt'. But this may lead to grave mistakes. Public debt as a policy issue can only be handled properly if all state obligations are taken into account, including those obligations that cannot be quantified with full precision.

A large part of implicit public debt is the subject matter of a field of research which is called 'generational accounting' (Kotlikoff and Raffelhüschen, 1999). Researchers in this field try to quantify the implicit public debt arising out of future pension payments net of future contributions and of similar obligations arising from future medical treatment net of future contributions. This is a very important intellectual exercise. *The problem with generational accounting so far is that their method of calculation presupposes a real rate of interest which is higher than the rate of growth of the economy. Thus, generational accounting so far ignores the negative natural rate of interest problem.*

I hope that generational accounting can be generalized to take account of the possibility that the risk-free real rate of interest is below the expected rate of growth. This may be an intellectual challenge because certain budget constraints inherent in the generational accounting approach are no longer valid.

Apart from the items taken account of in generational accounting, there are other forms of implicit public debt like, for example, government guarantees for creditors of certain debtors like banks. Due to the recent financial crisis these 'government CDS' have risen enormously. I am not aware of any serious attempt to quantify the implicit debt arising out of these guarantees.

There is, it seems, consensus that the implicit public debt is much larger than the explicit public debt. Frequently the reaction to this insight is: 'So things are even worse. Thus, it is a fortiori important to reduce public debt.' *Another reaction would be this: 'if public debt is so large, and has been quite large for a long time,*

perhaps we should have an altogether different view on the public debt in general. Perhaps public debt of the order of magnitude that we observe serves an important function. Perhaps it is the case that the optimal public debt period is as large as (or even larger than) the actual public debt period.' My present study is a contribution to this second approach.

Continuing with this approach, I ask the following question: if the actual public debt period D is seven years or thereabouts, if, furthermore, we cannot pinpoint the optimal level of D very well, why should there be so much concern and nervousness in the capital market as the explicit public debt period rises from, say, one year to one and a half years? After all, this amounts to an extension of the public debt period from, say, seven years to seven and a half years, which is an increase of only 7%.

I do not claim to have a clear answer to these questions. *I only insist that we think about public debt taking account of its negative as well as of its positive effects.*

11. HOW TO VIEW PUBLIC DEBT? PART 2

11.1. Suboptimality of the public debt Nash equilibrium

Conventional wisdom says that there is a tendency for excessive public deficits and therefore excessive public debt. The reason given for this hypothesis is the resistance of the electorate against higher taxes and against cuts in public expenditure. Thus, politics seems to encourage excessive public debt if compared with a reasonable standard of social welfare. This tenet of conventional wisdom has led to a movement towards constitutional provisions against public debt. Not long ago, the federal constitutions of Switzerland and Germany have been amended by articles which, after a phase-in period, prohibit budget deficits. Exceptions to this prohibition only are granted for the case of crisis-like circumstances. Germany tries to convince other members of the European Community and in particular other members of the euro area to introduce similar provisions in their national laws or constitutions. Many States of the United States have similar provisions in their constitutions already.

Public debt can be considered to be excessive if in a steady-state growth equilibrium the RFRRI is above the rate of growth of the system. A reduction in D in this case may raise consumption per head. The Golden Rule of Accumulation or a fortiori model in which the steady-state rate of growth of the economy rises with a rising share of net investment in national income point to this proposition. Also, the tax burden is then higher than it would be with a smaller value for D: interest payments on public debt cannot be financed by deficit financing. The primary budget must be in surplus.

If the risk-free real rate of interest generally is above the rates of growth of most countries that participate in the world capital market, we may say that an incremental D of any given country exerts a kind of negative externality on other countries: the higher value of D in the first country causes the world market rate of interest to rise, thereby widening the welfare loss of the public debt of the other countries. In that case the public debt Nash equilibrium generates too much public debt in the world. There may be a case for international cooperation to agree jointly to reduce the level of the public debt period D in each

country. Like the constitutional barrier against government deficits, the case for such joint reduction in D would rest on the idea that there is a politics-induced bias towards too high deficits on a national level, which could be compensated by binding international agreements to jointly reduce the level of the public debt period D.

On the other hand, we do not know for sure whether the RFRRI is above or below the typical rate of growth of the national economies. It could well be that it is below the typical rate of growth. We cannot exclude the possibility that national politics in conjunction with imperfections in the capital markets lead to suboptimal levels of national public debt. Thus, if the perception of the public debt is mistaken, as discussed in subsection 10.5 of the last section, capital markets may be too pessimistic about the ability of governments to honour public debt obligations. This then may force individual states to incur lower public debt than would be optimal for that country. *Capital market failure then would be a reason to cooperate internationally to raise public debt to achieve satisfactory high employment equilibrium between supply and demand on the international capital market*. Such a situation could be particularly relevant if conventional wisdom has not yet grasped the fact that the natural real rate of interest (defined above: the equilibrium real rate of interest in the absence of public debt) of the OECD plus China area is negative because even at a zero real rate of interest the waiting period is substantially above the period of production.

The following graph illustrates my argument. At a *high* world market risk-free real rate of interest r an incremental addition of public debt ΔD of any given country imposes a *negative* externality on other countries. At a *low*, perhaps even negative, world market risk-free real rate of interest r an incremental addition of public debt ΔD of any given country provides a positive externality on other countries (Figure 3).

This graph can of course also be interpreted as a 'demand function' for international agreements to jointly raise public debt. This demand function interpretation led me to put the independent variable on the vertical axis. In this graph the conventional wisdom is at the upper-left part of the curve, except that the conventional wisdom does not recognize the fact that it is only valid at a high RFRRI. The different view is represented at the lower right-hand part of the curve.

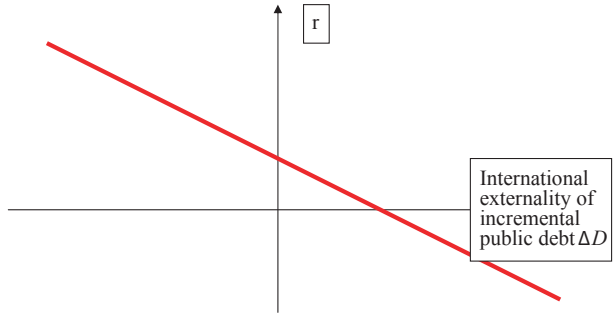

Figure 3 International externality of incremental public debt ΔD as a function of r

11.2. Public debt and current account balance

As we have discussed in the last subsection, failure of politics may lead to excessive public debt, and capital market failure may cause too small levels of public debt. The risk-free real rate of interest is an indicator for which of these opposing failures is more important. Conventional wisdom is at ease with the case of excessive public debt. If the IMF or other agencies of the collective wisdom of the different sovereign states negotiate with a particular sovereign debtor about a bridge loan, its conditionality always involves the obligation of the sovereign debtor to reduce its government expenditures and/or to raise tax revenue. In the following I therefore concentrate on the opposite case: too little public debt, in particular due to a widespread inability to raise loans for sovereign debtors on the international capital market.

In that case the risk-free real rate of interest is low. There are then – as in real life today – substantial differences between states concerning their ability to raise public debt. As discussed before, this ability strongly correlates with their balance-of-payments situation. Net capital exporters tend to have no problem to incur incremental public debt. Given that public debt on average is too low, there is a strong case for an international agreement to the effect that capital exporters raise their public debt period. This would reduce their current account surpluses and thus reduce current account deficits of capital importers as well. Deficit countries would then have a better chance that their austerity programmes will work and enable them to return to the capital market. Obviously, such international agreements to raise public debt in current account surplus countries would go with some kind of 'conditionality' as regards the performance of the deficit countries. But we should note that, given the low RFRRI, it is in the self-interest of surplus countries to reduce their capital exports.

Many people in surplus countries argue against such proposals of rebalancing international trade and capital movements. They say that the current account surplus of their country is due to its superior performance in terms of international competitiveness. Given that there is a productive international competitive race among the national production systems, it would be highly destructive if countries with a good performance in terms of competitiveness were 'punished' by having to give up their trade advantage. From this vantage point it is up to the deficit countries to raise their competitiveness by austerity programmes, wage reductions, opening up markets to competition etc.

'But this counterargument is not correct if we are in our assumed scenario of generally insufficient public debt and low risk-free real rates of interest. If only the deficit countries were to carry the balancing burden, the world average of public debt would decline. This would stand in contrast to the diagnosis that there is too little public debt'.

11.3. Keynes and the negative natural rate of interest problem

The unemployment equilibrium introduced by Keynes has been intensively discussed. It turns out to be difficult to establish a general equilibrium model with underutilized production capacities. New Keynesianism has tried to overcome this problem by the introduction of devices like sticky prices etc. In this study I

have avoided going into this field of research. But the risk of unemployment due to insufficient effective demand on the macrolevel looms beyond the horizon of my capital-theoretic approach.

My approach is the characterization of a full employment competitive steady-state general equilibrium in terms of the waiting period and the period of production. Using calibration according to prevalent twenty-first century parameters, I conclude that in such equilibrium the natural rate of interest is negative. What is the consequence? If we stick to a full employment competitive steady-state general equilibrium, we must conclude that either price stability must yield or zero public debt must yield. A third alternative would be: the full employment competitive steady-state general equilibrium must yield. What would that mean? Keynesian unemployment? Chaotic dynamics, but full employment – that is: a kind of Schumpeterian macroeconomics? I do not know; but my gut feeling is: if such steady-state general equilibrium is not available, then the utilization of available capacities must suffer, i.e. my gut feeling is Keynesian, rather than Schumpeterian. (Moreover, as we know from his work on business cycles, Schumpeter did not cling to any full employment assumption.) A deeper study of the relation between Keynesian ideas and my theory of the negative natural rate of interest might be useful; yet, it is not part of this study.

11.4. Can and should capital be exported to the Third World?

If there is excess supply of capital in the OECD plus China area, could this excess capital be exported to other parts of the world? The standard of living in many of these countries is quite low, and due to lack of capital, many goods are being produced with much less roundaboutness than in the OECD countries. Yet, it is very unlikely that these Third World countries can serve as a sufficient 'sink' for capital from the OECD countries and from China in a scenario without public debt.

Historical experience of the recent decades has shown that there is no positive correlation between the rate of growth of Third World national economies and their net capital imports. The success stories of Third World countries mainly are due to 'export led growth' and tend to go along with net capital exports rather than net capital imports. Think of Japan, South Korea, Taiwan, China itself etc. The average performance record of capital imports by means of government development aid is quite discouraging. It seems that effective aid for development does not consist of government subsidized capital transfers, but rather of opening up markets of the OECD countries for exports from Third World countries. Also, in most of the 'Tiger States' some infant industry protectionism was involved. It was the creation of markets for their products, rather than provision of foreign capital, which caused the growth success stories of (formerly) less developed economies.

Concerning Third World countries we can point to a characteristic which we may call a restricted capacity to absorb (foreign) capital. The major cause of this characteristic is the insecurity of property rights in those countries. This insecurity leads to massive misallocations of any available capital. Foreign investors may to a certain degree be able to successfully invest into enterprises under their own control (FDI). But the skill dexterity and industry accompanying such foreign direct

investments are their limiting factors. In no way could FDI in Third World countries be blown up to a level which would accommodate the excess of savings over investments in the OECD + C area if public debt in that area were zero. Similarly, there is only limited capacity to absorb portfolio investments mediated by local stock markets. Neither do loans to public or private debtors in Third World countries offer a solution because they are exposed to high levels of default risk.

12. CONCLUSION

Modernized Austrian capital theory implies: in capital market equilibrium without public debt, the average period of production equals the average waiting period of households. In the twenty-first century and for the OECD plus China area, demographic and production parameters are such that capital market equilibrium without public debt implies a negative real rate of interest. Price stability requires a non-negative real rate of interest. Prosperity requires capital market equilibrium. Thus, positive public debt is needed for price stability under conditions of prosperity. A balanced view of public debt is required. To reduce public debt is not generally the best policy. International agreements may be necessary to improve on the international public debt Nash equilibrium.

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