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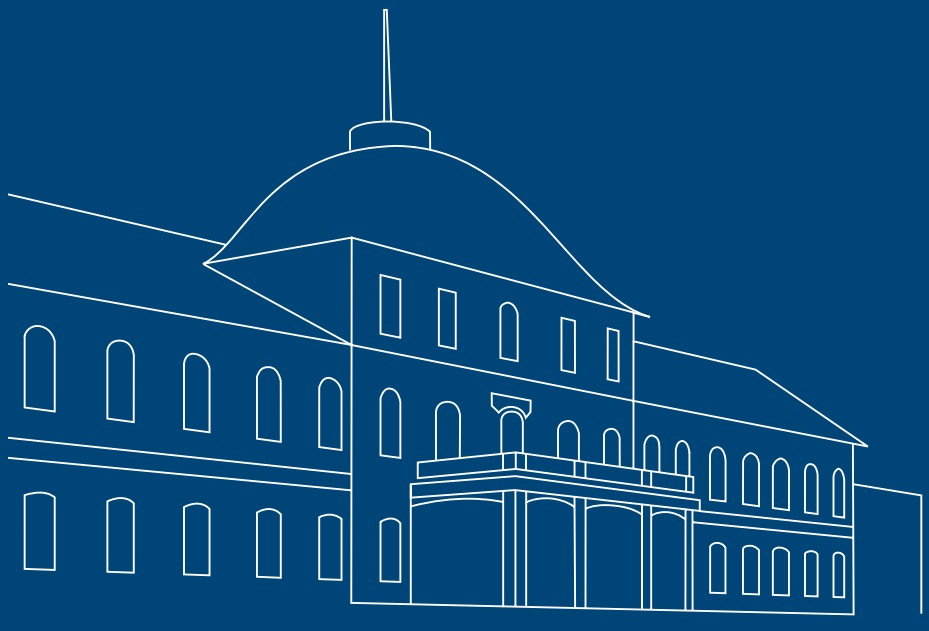
DISCUSSION PAPER 04-2016

POPULATION GROWTH, SAVING, INTEREST RATES AND STAGNATION.
DISCUSSING THE EGGERTSSON-MEHROTRA MODEL

Peter Spahn

University of Hohenheim



State: May 2016

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ISSN 2364-2076 (Printausgabe)
ISSN 2364-2084 (Internetausgabe)

Population Growth, Saving, Interest Rates and Stagnation

Discussing the Eggertsson-Mehrotra Model

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Contribution to the
Meeting of the History of Economic Thought Committee
of the German Economic Association
Karlsruhe, June 2016

Abstract

Post Keynesian stagnation theory argues that slower population growth dampens consumption and investment. A New Keynesian OLG model derives an unemployment equilibrium due to a negative natural rate in a three-generations credit contract framework. Besides deleveraging or rising inequality, also a shrinking population is a triggering factor. In all cases, a saving surplus drives real interest rates down. In other OLG settings however, with bonds as stores of value, slower population growth, on the contrary, causes a lack of saving and thus rising rates. Moreover, the recent fall in market interest rates was brought about by monetary factors.

Keywords

Overlapping generations, zero lower bound, deflation equilibrium, natural versus market interest rates

JEL classification: E12, E21, E43, J11

Introduction: Classifying Stagnation Theories

The drop of interest rates, visible on financial markets since many years, is seen as a manifestation of a persistent slump. Eichengreen (2015) even *defines* stagnation by a tendency of decreasing real interest rates although, looking at traditional investment theories, a period of *high* rates might be regarded as impediment to growth with similar justification.[1] There is no inconsistency between both views: when profit expectations are very low or negative, even a zero interest rate is too high.

However, this mediation cannot bring about a true consensus in the stagnation debate, which was always characterised by a somewhat heretic touch, heterodox and political arguments loomed large (Backhouse/Boianovsky 2015). Nearly each great economist bequeathed a stagnation hypothesis to posterity; of course, it was closely linked to his paradigmatic view of the economic world. "Secular stagnation [...] is an economist's Rorchach Test. It means different things to different people" (Eichengreen 2014: 41). At first glance, we can distinguish two contrary approaches:

(1) Authors who, in a broad sense, can be associated with classical economics emphasised scarce resources and limits to substitution as threatening supply side constraints of economic growth. Ricardo's scenario of a shortage of land, as a factor of production, seemed to vindicate at the onset of the energy crisis. His argument, an irreplaceable resource can only be produced at over-proportionally rising costs, can be found also in related concepts of stagnation: according to Vogt (1973), basic inputs for the macroeconomic process of production that cannot be supplied at profitable prices by market agents are provided by government, but create an ever more pressing financial funding problem.[2] A more sociological generalisation of this approach argues that capitalism, in a historical view, always lived on social and cultural prerequisites that could not be reproduced by its own market forces and institutions (Schumpeter 1942: 219pp, Bell 1973: 351pp).

(2) On the contrary, one might conceive stagnation as a phenomenon of saturation. Economic scarcity appears to be overcome, and there is no further need for economic

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1 The high-interest period in the 1980s also put the stagnation issue on the agenda (Matthews 1982, Streißler 1983).

2 The analytical background is the cost disease model put up by Baumol and Bowen (1966): any producer of these inputs is forced to pay wages that rise with the general level of productivity and thus is trapped in a profit squeeze.

policy action, particularly on the labour market: if people do not want to consume, they do not want to work either; thus any unemployment is voluntary. Keynes (1930) had the early vision that mankind will have solved its basic economic problems within a further century, with the help of capital accumulation and technical progress. In the *General Theory* however, he stressed that potential capital satiation would be impeded by the market effect of a rigid money rate of interest, being itself determined by liquidity preference (Keynes 1936: 183pp, 203, Hayes 2006: 146pp). The prediction of saturation of material wants and of an evolution towards a service society came up very often in economic history.

Both approaches met with fundamental criticism. The picture of threatening scarcity underrates the forces of substitution and technical progress (Streißler 1980), the traditional saturation hypothesis ignores the strength of innovation and evolution (Schumpeter 1942: 185pp, Witt 2001). In the aftermath of the financial crisis, slow growth and low interest rates nevertheless initiated a return to Keynesian theories of stagnation (Summers 2014). One may doubt whether stagnation is a world or a European problem (*Figure 1*), but the drop of interest rates is a global fact. In this context many observers hinted to an excess of saving, which according to a wide-spread opinion is a natural reason of lower rates.

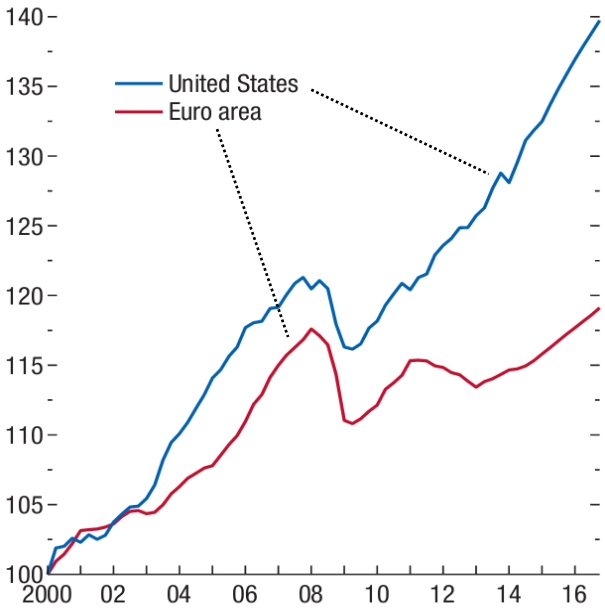

Figure 1: Real GDP, Index 2000 = 100 (IMF 2015: 51)

Slower population growth was regarded as a key explaining factor of waning consumption by Keynes (1937) and Hansen (1939). Taking into account the feedback to the pro-

pensity to invest, one could easily arrive at the hypothesis of secular stagnation.[3] Satiation of consumption wants does *not* imply that problems of macroeconomic stabilisation are absent. Production possibilities rising relative to the size of population will not necessarily be realised; the more elaborated version of the saturation approach of Keynesian stagnation theory – as in the case of short-term analysis – builds on a market failure in the coordination of saving and investment.

Neoclassical and also modern New Keynesian macro theories always had difficulties conceding the possible occurrence of such a market failure. Recently however, interrelations between excess saving and stagnation have been analysed by using micro founded models with overlapping generations (OLG). The approach put forward by Eggertsson and Mehrotra (2014) will be portrayed and discussed in the next Section.

After a look at the path of interest rates in the past decades, the final Section takes up the question whether also New Keynesian OLG theories, which basically are barter models without any essential role for money and finance, confuse a saving glut with a liquidity glut. The issue of an improper distinction between saving und finance has a long tradition in the history of economic thought (Kregel 1984/85). The resumption of this topic aims at a clarification of the relation of market interest rates and the natural rate. Theories of excess saving might be relevant for the latter, but not the former. It can hardly be disputed that particularly the eurozone suffers from demand insufficiency, but it remains an open issue whether its basic source is to be found in private households trying to save for their old age.

Market Failure in Intertemporal Allocation: The Stagnation Model by Eggertsson and Mehrotra

A Comparison With Samuelson's OLG Model

The two basic concepts for understanding stagnation, supply side restraints and coordination failures in markets (or institutions), can be demonstrated also by using the

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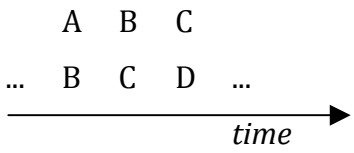
[3] The link between population growth and stagnation in Keynes and Hansen clearly is given by the weakening of consumption demand. Eichengreen (2015: 68) instead postulates a production function nexus (which hardly can be justified by textual history): "Hansen's logic was that slower population growth meant that capital had less additional labor to work with on the margin, resulting in lower returns and lower investment."

framework of modern macro theory, which is distinguished by rigorous microeconomic foundations. But whereas the theory of Real Business Cycles might explain stagnation by referring to a sequence of adverse technological shocks, New Keynesian macroeconomics enables more complex answers due to its more comprehensive analytical setup. Still it poses a challenge to demonstrate a coordination failure because the approach shows a bias towards "well behaved" market solutions. However the zero lower bound that nowadays constraints interest rate policies offers an avenue to an understanding of stagnation emerging as a sub-optimal border solution of an intertemporal optimisation calculus.

The starting point of the theory of Eggertsson and Mehrotra (E&M henceforth) is an OLG model which is able to show that various phenomena like a period of deleveraging, or capital goods become relative cheaper than consumption goods, or rising inequality or slower population growth might lead to a persistent low-employment, constant-deflation equilibrium. Long ago, Samuelson (1958) put up a model inhabited with two generations (A&B, B&C, C&D etc.) in each period where only the young (B, C, D etc.) earn income.

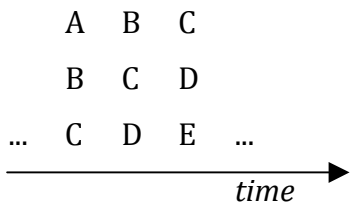


With non-storable resources, old-age consumption can be facilitated through two alternative arrangements:

- Samuelson established an essential role for money by suggesting a kind of social convention where the old receive a fiat money endowment. They buy goods from the young who in turn accept it as means of payment, expecting that they also will be able to finance old-age consumption by spending money. With a constant quantity of money, a shrinking population (i.e. a smaller volume of goods available for the young via endowment or production) implies an excess demand of the old, leading to rising money prices and thus to a negative real rate of interest.
- A perhaps more realistic way is to invest a part of real income in a capital stock that can be traded against consumption goods in the second period, offered by the new young generation. Factor prices are determined as in Solow's canonical growth model, where slower population growth lets capital intensity increase and the real

interest rate decline (Blanchard/Fischer 1989: 91pp).

It is impossible to establish a credit market in simple two-generations models as potential contract parties meet only once; the old debtor generation dies before being able to refund its debt (Weil 2008). Therefore E&M build a model with three generations. A crucial assumption is that the young (C, D, E etc.) have no income; thus they depend on a credit supplied by the middle generation (B, C, D etc.). When old, the latter can increase its consumption by relying on credit redemption, including interest (in the basic model version, the old also earn market or endowment income).



E&M assume an exogenous maximum debt limit D_t for the young (further modified by the real interest rate r_t); bond supply B_t^y of the young (*y*) and thus their consumption C_t^y are constrained:

$$C_t^y = B_t^y = \frac{D_t}{1+r_t} \qquad [1]$$

The middle generation (*m*) uses its income Y_{t+1}^m to refund the debt (plus interest) to their former creditors, now old. Current saving is allocated to bond demand ($-B_{t+1}^m$), i.e. a credit to the young. At the same time, the middle generation (following a logarithmic utility function) makes an optimal choice between current and future consumption, which only depends on relative prices, i.e. the rate of interest and the subjective discount rate ρ.

$$C_{t+1}^m = Y_{t+1}^m - \left(1+r_t\right) B_t^y - B_{t+1}^m \qquad [2]$$

$$C_{t+1}^m = \frac{1+\rho}{1+r_{t+1}} C_{t+2}^o \qquad [3]$$

The old generation (*o*) consumes all its income, plus credit refunding; there are no bequests.

$$C_{t+2}^o = Y_{t+2}^o + \left(1+r_{t+1}\right) B_{t+1}^m \qquad [4]$$

Credit supply and credit demand yield a market clearing real interest rate[4]:

$$1+r_t = \frac{(2+\rho)(1+g_t)\,D_t + (1+\rho)\,Y^o_{t+1}}{Y^m_t - D_{t-1}} \qquad [5]$$

It follows that the rate of interest decreases if

- a more strict debt limit is established (e.g. by way of improved collateral quality) which forces a reduction of credit demand,
- the middle generation earns a higher income (because its amount of saving increases along with consumption),
- the old generation receives a lower income (as this expectation necessitates more saving to maintain a desired consumption level, and thus produces a credit supply shift) or
- population growth g_t is diminished (because in this case fewer agents on the demand side of the credit market meet a constant supply).

In general, a negative real interest rate poses no problem in a barter system of intertemporal allocation, but it does in a monetary economy if the market clearing natural rate cannot be attained due to the zero lower bound of the nominal interest rate and a too low inflation target. The zero lower bound, firstly focused by Krugman (1998) when analysing the Japanese deflation, in the macroeconomic debate now has taken over the role that formerly was ascribed to nominal wage rigidity: a disturbing element that impedes or precludes a return to equilibrium after some kind of shock.

E&M address a monetary economy, the debt instrument is a one-period nominal bond, but rule out active money demand. Thus the provision for old age proposed by Samuelson is not feasible: the active generation is not allowed – in order to avoid negative rates in the credit contract – to sell resources directly to the old, keep the money, and buy goods in the future.

Triggering the Process to Stagnation

The theory of E&M consists, firstly, of an initial shock (e.g. an event taken from the list of the four bullet points above) that pushes the market system into the region of a negative

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[4] See E&M (2014) for the derivation of this and the following equations. Unfortunately the authors use a different sign convention for the variable B^m.

natural rate, and, secondly, of the demonstration of missing adjustment forces that might offer a way back to a full-employment equilibrium at target inflation. With regard to shocks, the topical item is deleveraging. In the aftermath of the financial crisis, debt standards were stiffened, which shifts the credit demand curve of the young generation to the left. In the model, the effect of lowering interest rates continues in the next period because now the middle generation due to its involuntarily smaller debt status enjoys larger net income; therefore its credit supply function moves to the right, and the equilibrium rate could well be deeply located in the negative region.

An initial restraint on credit demand thus is translated into excess credit supply. This might appear as a somewhat unrealistic sequence, but it follows from the assumption of given income. A model variation replaces endowments by wage income $w_t L_t$ (i.e. the real wage times the volume of employment) in a production economy with standard features.[5] Here, as a consequence of a non-realised negative equilibrium interest rate, an unemployment constellation might arise (*see below*) where saving of the active generation is smaller due to involuntary low employment.

In addition to the four points above, another trigger for a drop in interest rates is rising income inequality within the active generation, where high-income households save more. There might be a compensating credit demand effect on the part of other households "needing" more consumption; but this is ruled out by E&M who argue that low-income households are subject to credit constraints.

There is another store-of-value technology in the model, besides writing credit contracts: the middle generation can engage in productive capital accumulation. When old, capital owners finance their consumption by selling the capital stock to the next active generation. Their budget constraint – compared to [2] – is modified by the purchase of capital goods K_{t+1} and their rate of return r^k_{t+1} that accrues in the same period (the relative price of capital goods expressed in units of consumption goods is p^k_{t+1}). The budget of the old likewise is adjusted by taking into account their sale proceeds, given by the market value of capital, corrected by the depreciation rate δ.

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[5] In principle, market income could be earned by all generations, but E&M focus on the case where only the middle generation obtains a variable market income while the young and the old receive no income at all. There is no explicit discussion of a specific important case in Samuelson's model: if the income of the young is so large that they do not need any credit, the plan of the middle generation fails; it is not able to build a provision for old age by way of a credit to the young in the present period.

$$C^m_{t+1} = w_{t+1} L_{t+1} - (1+r_t) B^y_t - B^m_{t+1} - \left(p^k_{t+1} - r^k_{t+1} \right) K_{t+1} \quad [6]$$

$$C^o_{t+2} = (1+r_{t+1}) B^m_{t+1} + p^k_{t+2} (1-\delta) K_{t+1} \quad [7]$$

Some algebra yields a no-arbitrage condition with regard to the rate of return and the credit market rate of interest:

$$r^k_t = p^k_t - p^k_{t+1} \frac{1-\delta}{1+r_t} \quad [8]$$

As the marginal product of capital is positive in general ($f'_k = r^k_t > 0$), with constant capital prices equation [8] implies a limit for the steady-state credit market rate that is determined by the depreciation rate: $r^* \geq -\delta$. If otherwise, savers choose capital investment as the appropriate strategy of old-age provision.[6] A substitution between both strategies is also visible in the credit supply function: "The presence of capital will reduce the supply of savings available in the bond market" (E&M 2014: 30).

$$L^s_t = \frac{1}{2+\rho} \left[Y_t - D_{t-1} - \left(p^k_t + \frac{(1+\rho)(1-\delta) p^k_{t+1}}{1+r_t} \right) K_t \right] \quad [9]$$

This equation also shows that a lowering of capital goods prices p^k (that are assumed as exogenous in the model) induces a right shift of the credit supply function, thus inducing a drop of the credit market rate.

This result appears to contradict a microeconomic finding according to which lower capital goods prices, seen as an isolated effect, *increase* the profitability of capital; and the credit market rate has to adjust in equilibrium. However, it must not be ignored that lower capital goods prices enlarge the scope of investment from a financial point of the view, induce more accumulation, and thus finally lower the marginal productivity of capital. The net effect depends on the type and form of the production function.[7]

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6 E&M mention that the rate of return of other non-producible assets as, e.g., land also might establish a lower bound for the credit rate, as in Homburg (2015), but they do not embark on this issue.

7 "Other things equal, lower capital goods prices *p* raise the return on capital when denominated in consumption goods: a foregone consumption good buys more capital goods, so for a given marginal product of capital, the return on investment [...] is higher. But other things will not be equal – lower capital goods prices will mean that a given volume of savings will finance more of them, pushing down on the marginal product of capital to an extent that depends on the curvature of the production function" (Thwaites 2015: 8).

Market Failure at the Zero Lower Bound

No matter what kind of shock pushes the system into the realm of negative real interest rates – the zero lower bound represents a "trap" from which the market cannot easily escape, particularly not if the central bank's inflation target, relative to the market clearing real credit rate, is too low. The standard Taylor interest rate policy is bound to fail if it requires a negative nominal rate. As a consequence, in this array the goods demand function is *positively* sloped. In the E&M model (looking at the simple version without capital) this segment of the function reads

$$Y = D\left[1+(2+\rho)(1+g)(1+\pi)\right] \qquad [10]$$

The negative segment of that curve as usual is determined by the Taylor Principle of a more than proportional reaction of nominal interest rates to an unwanted level of inflation (π) (*Figure 2*).

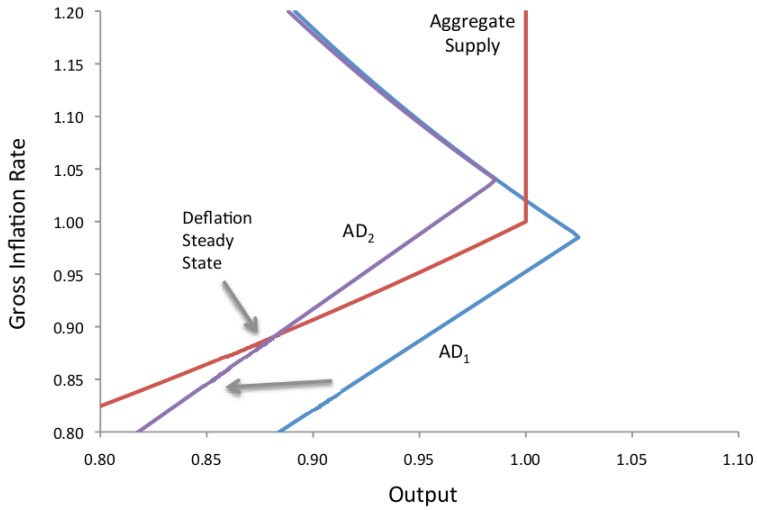

Figure 2: Aggregate demand and supply curves in steady state (E&M 2014: 16)

If nominal wages are perfectly flexible, the supply curve is vertical above the natural-rate level of output. E&M however make the "Keynesian" assumption of wage rigidity so that nominal wages do not adjust immediately to the market clearing level, but are linked to last period's wage by a persistence parameter $\gamma > 0$. This implies that the supply curve also has a positive slope below the benchmark of full employment (α denotes the standard-production-function elasticity with regard to labour). With flexible wages ($\gamma = 0$), we always have $Y = Y^*$.

$$Y = Y^* \left[\frac{1-\gamma/(1+\pi)}{1-\gamma} \right]^{\frac{\alpha}{1-\alpha}} \qquad [11]$$

If goods demand is sufficiently strong, goods market equilibrium at full employment and positive inflation ensues, but following an adverse demand shock ($AD_1 \rightarrow AD_2$) a deflation steady state is a possible market result (a deleveraging shock or a lowering of population growth have the same effect, the demand curve starting from AD_1 steepens and meets the positively sloped branch of the supply curve). The significance of this solution is that the history of macroeconomic thought in the 20th century, under the impression of the Great Depression of the 1930s, often emphasised the cumulative and instable character of a deflationary process (Kindleberger 1986). However, the experience at the end of the 19th century and in Japan since 1990 point to a possible deflation equilibrium.[8]

The specific form of the unemployment equilibrium allows to confirm some market mechanisms that usually have been derided by mainstream macro theory as "Keynesian anomalies":

- A higher propensity to save makes the demand curve shift further to the left so that income, employment and (possibly) the sum of savings decrease (savings paradox).
- A preference shift towards more labour supply, as well as more wage flexibility (γ decreases) let the supply function move downwards, and also have a contractionary effect on macroeconomic activity.

Economic policy recommendations in E&M also follow Keynesian wisdom:

- A considerably higher inflation target even in a deflation scenario (i.e. with demand at AD_2) allows a potential full-employment equilibrium as the demand function moves to the north-east. There is no guarantee of a successful transition to this solution, however.
- Therefore activating expansionary fiscal policy is the first-line therapy, by which the

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8 E&M prove that the demand curve is steeper than the supply curve if Taylor policies are practised. Nevertheless, the dynamic stability of the unemployment equilibrium depends on the specification of the model under consideration. Adding a simple hypothesis of adaptive inflation expectations to the E&M model allows a return to full employment after a small positive demand shock. In general, in case of non-linear supply curves and/or interest rate reaction functions, often multiple equilibria ensue, where stability depends on assumptions on learning behaviour, on the practical implementation of rational expectations and the type of interest rules, e.g. backward looking vs. forward looking (Eusepi 2007, Bullard 2010, Evans 2011).

goods demand curve shifts to the right, and a full-employment equilibrium with positive inflation can be reached.

Discussion

The stagnation theory of E&M attracted much attention (particularly in scientific blogs) because it was able to derive a deflation equilibrium in a micro founded optimisation model – this is a key criterion for sound macro theory since few decades. As usual, the advantage of analytical rigour is obtained at the expense of some bulkiness of the model setup and the use of perhaps questionable assumptions.

In traditional OLG models where a productive capital stock is used as a store of value and a provision for old-age consumption the rate of interest usually is positive. It is determined by the marginal productivity of capital, and in turn by the discount rate and population growth: $r = f_k' = \rho + g$ (Blanchard/Fischer 1989: 100). A shrinking population implies a decreasing rate of interest. This follows from a remuneration of factors of production according to their marginal product, e.g., when using a technology of the Cobb-Douglas type: with a growing scarcity of labour supply a more capital intensive way of production is chosen, which then leads to a lower marginal productivity of capital.

Contrary to this setup, E&M explain a negative real interest rate by referring to supply-demand constellations on the credit market: when population shrinks, the middle generation is able to find only few potential debtors who like to engage in a credit contract; thus the yield paid for saving decreases. One may doubt whether a lack of indebtedness of young people today is a cause of concern. But it is more important to remember a debate on provisions for old age some years ago that proposed an argument contrary to E&M: assume a two-generations model where the old sell (government) bonds to the young to finance their consumption, whereas the young buy these securities as a temporary store of value until they retire from work. With a smaller younger generation, the old can only sell their stock of securities at a loss. Lower bond prices indicate an asset meltdown, which implies rising interest rates (Poterba 2001, Fehr/Jokisch 2006, Spahn 2007).

The argument that an aging society brings about *higher* interest rates can also be based on the evidence of a smaller support ratio of producers versus consumers (Goodhart/Erfurth 2014). If the old save and the retirees dissave, a shrinking support ratio

implies less saving, i.e. a tendency of excess demand on the goods market that according to Wicksell calls for higher interest rates.[9] This seems to be true, particularly because the traditional Keynesian idea of saturation is unconvincing; demand for housing space reacts highly elastic to income growth, and this ought to spill over to investment. Finally, old people provoke higher costs for society (especially in health care) that are not fully covered by individual dues and thus become a burden in the government budget.

Including government bonds in an OLG model changes the "rules of the game" for market agents (and the economist): we have to look at two generations only that use these bonds as store of value and provision for old age. These securities – as money in Samuelson's model – serve as a bubble asset that is bought and hold in expectation of future constant value. There is an important distinction between both these models:

- In Samuelson's setup (as already mentioned above) the real interest rate decreases with the size of population because money yields no interest and an excess demand on the goods market lets prices rise.
- In case of bond transactions a shrinking population brings about an excess supply on the bond market, with falling bond prices and rising nominal interest rates. Smaller bond sale proceeds also dampen nominal excess demand on the goods market, which moderates price increases. Therefore the real interest rate might rise.

A comparison of this two-generations model using bonds and the three-generations model of E&M shows that the interest rate effect in the latter does not result directly from the "classical" problem of old-age provision, but from lacking means to earn a living in an additional young generation. This model setup is far from convincing: in the very case of a shrinking population, parents can pay more transfers to each of their kids so that they become less dependent on incurring more debt. Seen as a whole, the credit transaction pattern in E&M looks a bit artificial.

A provisional appraisal is that a shrinkage of a younger generation, beyond specific models, produces ambiguous results on saving and interest rates. They depend on assumptions on the path of employment and income, and most important, on the pattern chosen for old-age provision. Further determinants include the state of income distribu-

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[9] The inverse relationship between population growth and the rate of interest is indirectly mentioned also in the OLG literature (where the contradiction to the production theoretic aspect of relative factor quantities is ignored): "Population growth [...] implies that the number of young individuals who are likely net savers is larger than the number of dissavers, and thus there is aggregate positive saving" (Blanchard/Fischer 1989: 137).

tion and possible behavioural changes. Will the young want to save more, thus responding to the widely predicted deficiencies of governmental pension systems? Looking at the data, it seems that political campaigns in Germany to induce people to save more for their old age were hardly successful. Here, the saving ratio of private households has decreased by 3 p.p. in the last three decades.

Vanishing Interest Rates

Even if there is no clear finding of a relation between population growth and saving, the trend of decreasing interest rates is a fact. Periods of low interest rates have not been unusual in economic history, without a necessary connection to weak growth. A calculation of a long-run world real rate shows a nearly constant value of about 4% in many decades; it then came down to zero until 1950, rose slowly to 2% in 2000, and finally fell to zero again thereafter. Ex-ante US values show much more volatility, but a similar trend (*Figure 3*).

An alternative calculation elucidates that long-run US real bond yields often have been negative, but mostly due to inflation surprises. The recent decrease however results from a decline of nominal yields since 1980, where the interest rate peak reflected a fight against inflation (*Figure 4*). This is confirmed by the path of real short-term rates that can be taken as signalling monetary policy stance; after a period of negative real rates due to mounting inflation, the Fed turned to a restrictive course at the beginning of the 1980s, followed by a substantial easing up to the present (*Figure 5*). The development in Germany and in the eurozone show a similar picture (*Figure 6*).

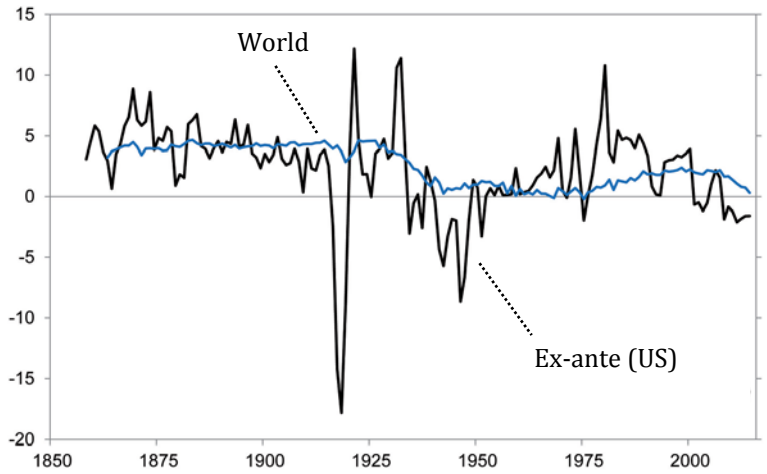

Figure 3: Long-run real interest rates (Illing 2015: 129)

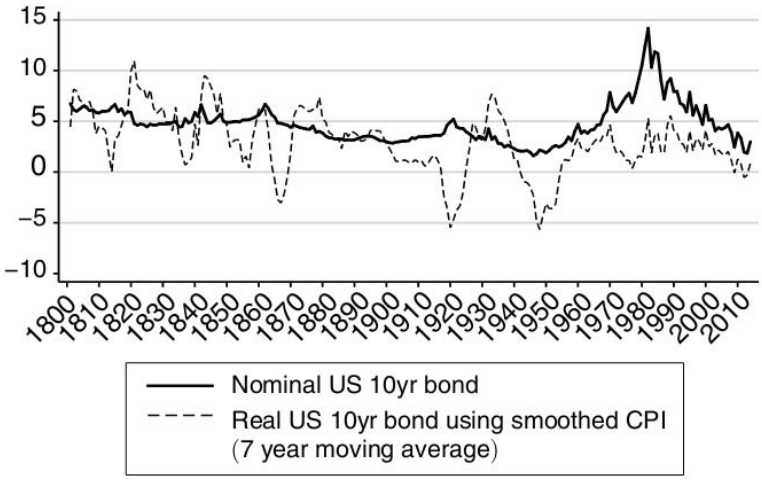

Figure 4: US interest rates (Eichengreen 2015: 66)

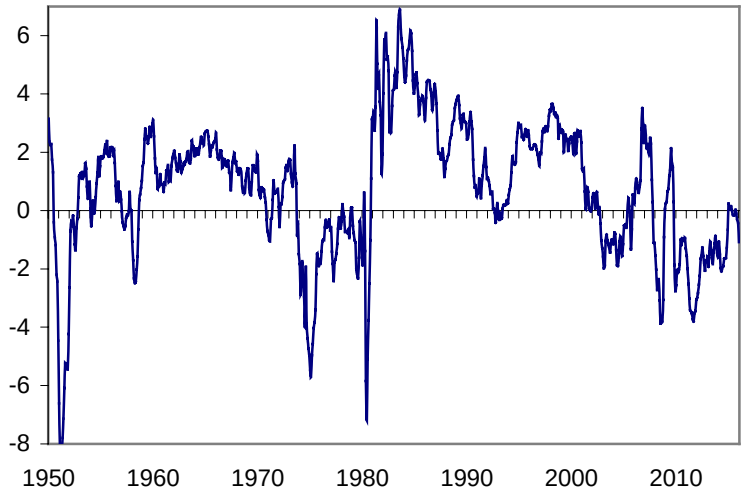

Figure 5: Interest rate on 3-month US Treasury Bills, minus rate of inflation (FRED Economic Data)

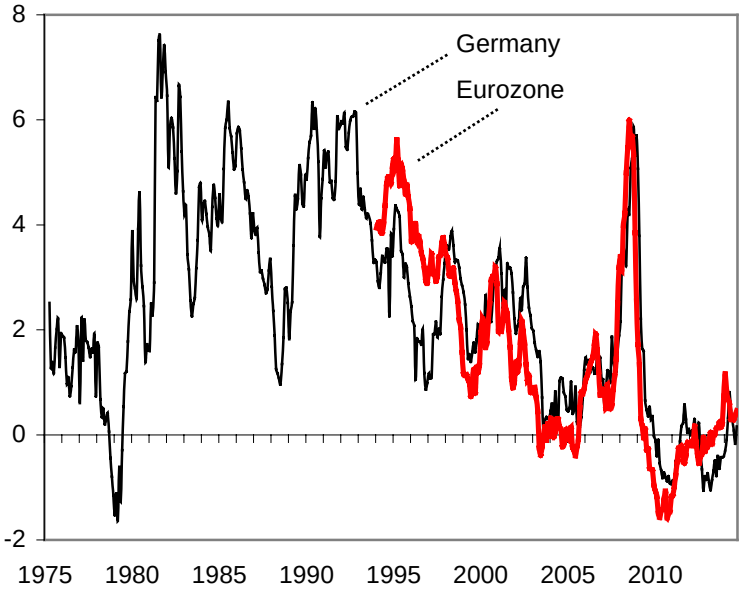

Figure 6: Ex-post real 12-month rate (Data from Sachverständigenrat 2015: 147)

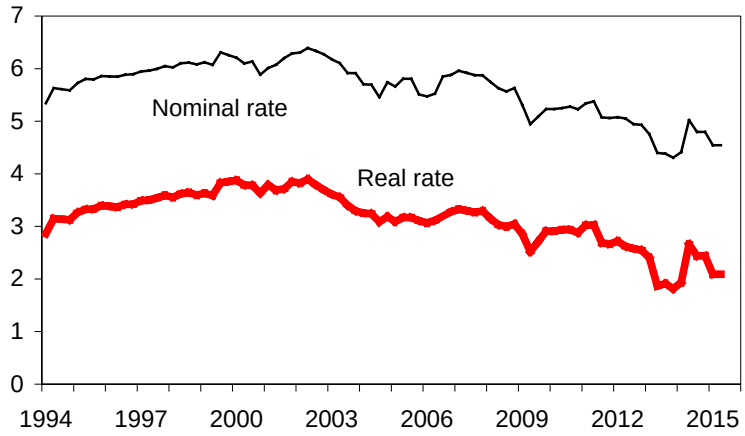

Figure 7: Estimation of long-run US equilibrium interest in a rolling 20-year window based on the Smets-Wouters model (Data from Sachverständigenrat 2015: 150)

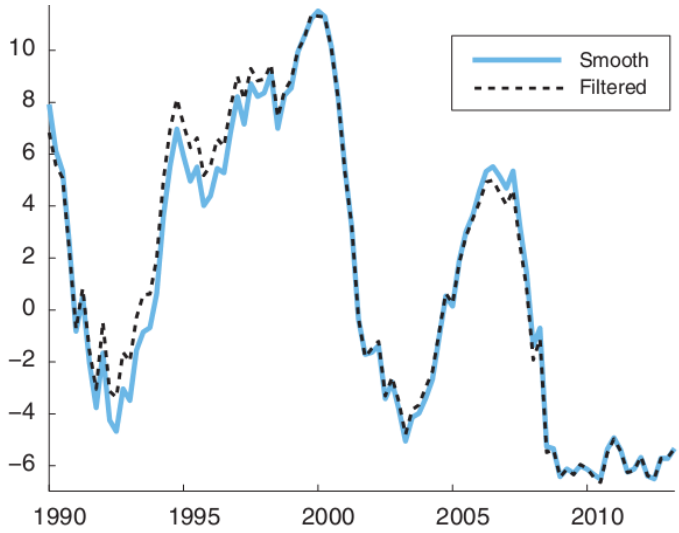

Figure 8: Estimation of annual US natural rate based on a modified Smets-Wouters model (Barsky et al. 2014: 40)

The path of market interest rates is not that informative about macroeconomic conditions in the background. More useful is an assessment of hypothetical equilibrium rates so that the sign of economic tensions can be gauged. The concept of an equilibrium interest rate can be traced back to Wicksell (1898: 11); he defined the natural rate as that rate of interest, which cleared the market of intertemporal loans from savers to investors and thus established a macroeconomic equilibrium in general. This idea is an essential constituent of modern macro theory.[10]

Equilibrium interest rates cannot be observed directly, they are derived by taking

[10] Keynes (1936: 204-5) dissociated from Wicksell's concept because saving and investment coincide at various income levels (including their involuntary components). The interest rate at full employment is denoted by Keynes not the natural but the neutral rate.

(alternative) theoretical models to the data. Based on the widely used New Keynesian model of Smets and Wouters (2007) it can be shown that the equilibrium rate in the US declined slowly since the 2000s, although only down to about 2% (*Figure 7*).

The key drawback of these kind of estimates (just imagine the vagueness encountered when putting a number to a "normal" output level) is readily understood if we realise that a very distinct image emerges after modifying only some elements of the model (e.g. taking account of income expectations in the central bank reaction function and including the effect of forward guidance). Now the equilibrium rate drops deeply into the realm of negative numbers in recent years (*Figure 8*). The different outcome obviously cannot be attributed to the smoothing technique alone that was applied in the firstly mentioned approach.

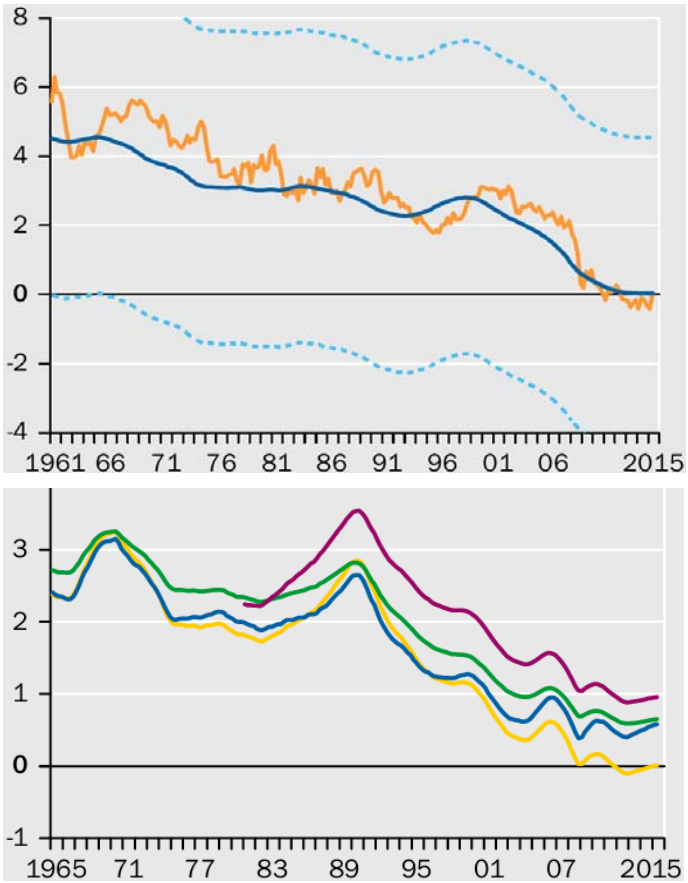

Figure 9: Estimation of medium-term natural rate, based on the Laubach-Williams model for the US (above) and Germany (below, various model specifications) (Sachverständigenrat 2015: 151-2)

Finally, also an estimation of a medium-term equilibrium rate confirms a persistent downward trend for the US and Germany; it is based on the, compared to Smets and Wouters, more simple model of Laubach and Williams (2003) that spares microfounda-

tions and uses reduced macro relations as, e.g. the Phillips Curve, instead (*Figure 9*).

Market Interest Rates and the Natural Rate

Saving Glut or Liquidity Glut?

The apparent similarity of the path of market interest rates and (estimations) of the natural rate must not convey the belief that they are driven by the same set of market forces. Simple OLG models are silent on market rates because they are meant to analyse non-monetary economies where the financial sector has no role to play. True, in the basic Samuelson model, money is passed on from one generation to the next, but it embodies some kind of social contract aiming to solve the problem of old-age consumption, it does not indicate, as e.g. in Clower (1963), an indispensable means of payment in transactions between agents within the same generation. Note again that in the E&M model, there is no proper role for intertemporal money demand.

All those various excess-saving hypotheses, propagated in recent years, should be understood to contribute to an estimation of the natural rate. Following Wicksell, they have a policy orientation by indicating a need to adjust market interest rates if fundamental macro imbalances are to be avoided (Borio/Disyatat 2011). The long-term nominal market rate, on the contrary, is determined – through the term structure mechanism – by central bank policy and market expectations on inflation and future short-term rates. It does not follow automatically the natural rate; this is the basic belief of modern monetary macroeconomics where central banks are urged to stabilise a possibly instable macro system by applying the Taylor Principle. Without this monetary policy intervention, the real market rate, due to the endogenous path of inflation expectations, tends to react inversely to changes of the natural rate.

For this reason, it is difficult to attribute unambiguous macro effects to any ex-ante excess saving. The idea of a saving glut already was in circulation before the 2008 financial crisis, and it was associated in no way with the threat of stagnation, but on the contrary with a fear that it might boost an unsustainable investment boom. According to Bernanke (2005), excess saving in the emerging economies was responsible for current account imbalances between China and the US, and for low US capital market interest rates.

Attributing an impact on monetary interest rates to saving decisions is a fallacy that

has deep roots in the history of economic thought. Basically, it is even not necessary to enter on the contest between liquidity preference theory versus the loanable-funds approach, but rather to insist on the funds being measured correctly. Re-allocating one euro from consumption to saving *including* its investment on the financial market (or in the banking sector) cannot reduce market interest rates or increase asset prices because less consumption diminishes (one by one) money wealth in the entrepreneurial sector and thus creates an additional credit demand.[11]

The unprecedented credit expansion on the part of the international banking system in the recent three decades (*Figure 10*) and, in the aftermath of the financial crisis, an also unprecedented blowing up of central bank balances should be regarded as the key drivers of the decline of financial markets rates. Without monetisation of government debt on a global scale, a vanishing of interest rates most probably would not be an issue. Finally, the epochal phenomenon of a flattening of the world supply curve, brought about by trade liberalisation and technological advances, lets nominal and real interest rates converge at low or even zero inflation.

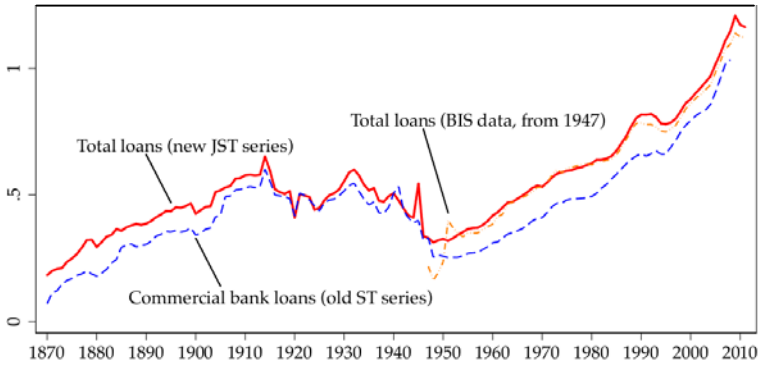

Figure 10: Bank loans to private sector in 17 industrial countries, relative to GDP (Jordà et al. 2015: 5)

New Keynesian macroeconomics is unable to grasp developments of monetary interest rates because this approach sticks to a non-monetary style of analysis even when it

11 "The E[xcess] S[aving] view tends to conflate borrowing and lending, which are financial transactions, with national income accounting concepts, which track expenditures on final goods and services. [...] Saving does not represent the constraint on how much agents are able to spend ex ante. [...] The popular and powerful image that additional saving bids up financial asset prices (and hence depresses yields and interest rates) because it 'has to be allocated somewhere' is misleading. There is no such thing as a 'wall of saving' in the aggregate. Saving is not a wall, but a 'hole' in aggregate spending" (Borio/Disyatat 2011: 7-8, cf. Bibow 2009: 181pp, Dorrucci/McKay 2011).

starts to integrate banks. They are presented as agencies that collect and pass on resources: there is no creation of credit as practised in ordinary banking, no lengthening of balance sheets. Thus asset acquisition mistakenly is depicted as being driven and restricted by non-bank savings although this type of supply constraint does not exist in a modern banking system (Disyatat 2011, Jakab/Kumhof 2015, Spahn 2016: 173pp).

Credit expansion was propelled, firstly, by deregulation and technical progress within banking firms and, secondly, by the changeover to a complete accommodation of base money demand. Banks therefore assumed that a regime of quantity restrictions in central banks' reserve management definitely no longer existed. Note that credit expansion even fell short of total asset growth (*Figure 11*).

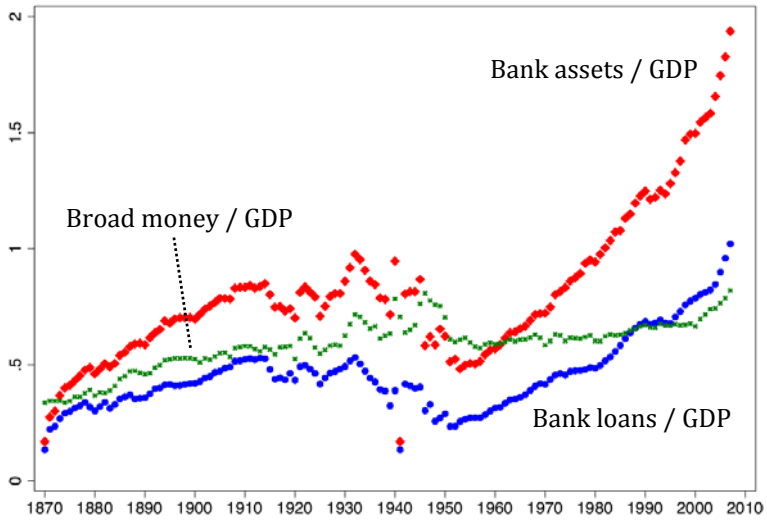

Figure 11: Bank assets and money in 14 industrial countries, relative to GDP (Taylor 2012: 9)

Once again: Saving and Investment

Of course, the finding that monetary forces caused the decline of market interest rates in no way contradicts the hypothesis that saving behaviour brought about a lowering of the natural rate. Rather, the decisive question is whether the latter hypothesis is sufficient or convincing. Demographically induced changes of saving behaviour motivated by considerations about provisions for old age can persuasively be founded on theoretic terms (Weizsäcker 2014, 2015); but from an empirical point of view it remains an open issue whether saving ratios actually increase and, if yes, the old-age motive is vital. An alternative argument for explaining weak consumption and, as a spill-over, weak incen-

tives to investment is rising inequality in wealth and income.

There is still another factor that empirically seems to be important, also mentioned in E&M: investment goods became cheaper relative to consumption goods in recent decades (*Figure 12*). By updating Kuznet's data, Eichengreen (2015) confirmed the finding of Thwaites (2015) for the US. Taking into account quality changes US values already decline since 1950 (*Figure 13*).

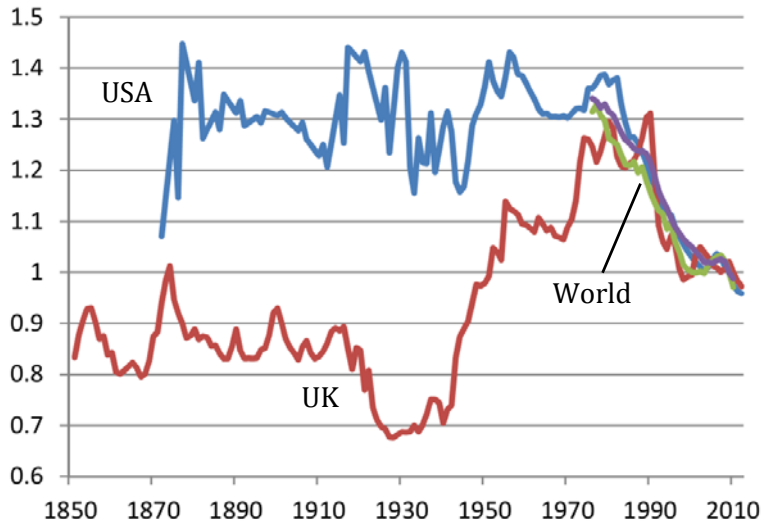

Figure 12: Index of investment goods prices, relative to consumption goods (Thwaites 2015: 55)

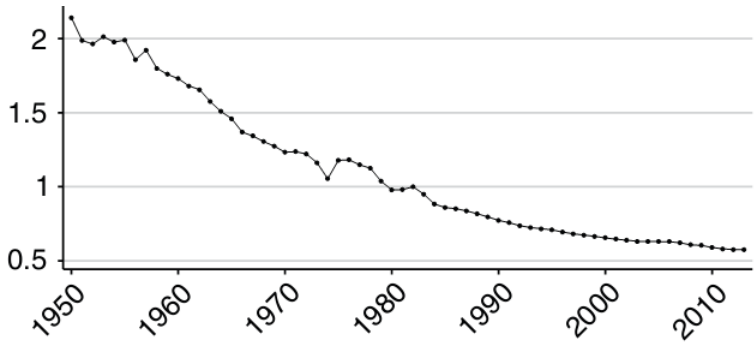

Figure 13: Quality adjusted relative investment prices in the US, Index 1982 = 1 (Eichengreen 2015: 68)

This relative-price effect thus might contribute to the explanation of shrinking net borrowing in some countries' firm sectors; also the weakness of nominal investment spending might give a biased image of real capital accumulation. Even with unchanged credit supply behaviour, the cheapening of capital goods results in a relative excess of financial funds. The price effect has an impact on market interest rates as well as on the natural rate because opportunity costs of investment decline, which taken by itself allows for more consumption. "With less investment spending chasing the same savings, the result

can be lower real interest rates and a chronic excess of desired saving over desired investment" (Eichengreen 2015: 67).

Goods demand from both consumption and investment decisions currently fall short of potential production, particularly in the eurozone. It is hard to prove that reluctance to consume, motivated by considerations to make provisions for old age, is the basic reason. In any case an increase of public investment spending is advisable for supply-side and growth reasons if real interest rates are lower than growth rates (Weizsäcker 2014). In light of already high stocks of government debt, however, additional public investment should not be financed by new obligations but through monetisation or "helicopter money", also favouring private households (Turner 2015).

Summary

Since the 1930s, declining population growth is seen as a possible factor that explains a demand side tendency of stagnation. Keynes emphasised that excess supply in this case not necessarily signals the ideal of economic satiation, but might be accompanied by involuntary unemployment. The basic reason – that nowadays attracts much attention when interest rate policy hits the zero lower bound – is a market failure where it is impossible to realise a negative equilibrium real interest rate, neither by way of market adjustment forces nor by monetary policy operations.

A reformulation of this stagnation scenario by using an overlapping-generations framework recently was presented by Eggertsson and Mehrotra. Here, the middle generation offers a credit contract to a young generation without sufficient income, which in turn agrees to deliver funds to their creditors when they are old. Besides a shrinking of the young generation, further factors (as e.g. debt restraints) are able to bring about an excess of saving on the part of the active generation. The result may well be a negative equilibrium rate on the credit market, and, as a consequence, a persistent interest rate gap if it is impossible to realise the negative natural rate via the nominal bond rate and the rate of inflation.

The declining effect of dwindling population growth on interest rates however is only unambiguous in this type of model. In a two-generations model where the old sell government bonds to the young in order to finance old-age consumption a smaller young generation implies an excess supply on the bond market so that interest rates will rise. The analytical relation between demography and saving thus is far from being ob-

vious. Also there are no clear-cut empirical signs that indicate a rise of saving ratios motivated by old-age considerations.

Moreover, the widely observed interest rate decline on financial markets cannot immediately be ascribed to a rise in saving. Such a change of behaviour has an impact on the natural rate, but market rates primarily are driven by monetary policy and the banking system where credit supply is not limited by private saving. The confusion of a saving glut with a liquidity glut rests on a well known error in the history of economic thought.

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