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# Secular stagnation, bubbles, fiscal policy, and the introduction of the pill

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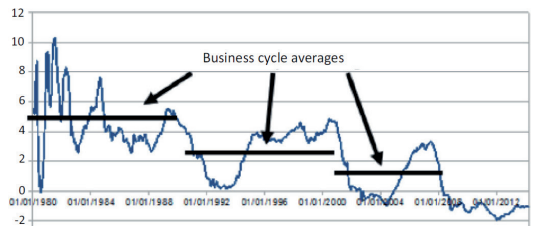
The long-run decline in the real interest rate, often dubbed Secular Stagnation, can be well explained by the introduction of the contraceptive pill in the developed world. Its implications were particularly marked in Germany, where the cohort born in 1995 is half the size of that born in 1968. This leads to excess savings and a fall in the real interest rate, until just before the retirement of the large pre-pill cohort. Hence, demography, not central banker's policy is the ultimate cause of the fall in interest rates. Low interest rates will persist for another 15 years. This might lead to bubbles, e.g. in house prices, which would increase financial instability. Sovereign debt should increase to avoid this. In the Eurozone, this runs counter to the Stability Pact. Since Japan's demography leads that of Europe by 15 years, it provides a laboratory for what awaits Europe, though the impact in Europe might be even more severe.

The negative real and nominal interest rates in several countries during the recent episode have led to intense policy debates. Some observers hold ultra-lax monetary policy to be responsible. Others, in particular Paul Krugman, Olivier Blanchard, and Larry Summers, claim that this monetary policy is merely a policy response to low aggregate demand in the aftermath of the Great Recession and the problems in the Eurozone, a phenomenon dubbed Secular Stagnation by Larry Summers – see Coen Teulings and Richard Baldwin (2014) for an overview of the debate.

Figure 1. The downward trend in the real interest rate since 1980




Source: Krugman in Teulings and Baldwin (2014)

In fact, the decline in interest rates is a trend that starts around 1980, dating back to well before the onset of the financial crisis; see Figure 1. The combination of low real interest rates and sluggish demand has created the problem of the Zero Lower Bound (ZLB) for monetary policy: nominal rates cannot be reduced sufficiently to accommodate the negative Full Employment Real Interest Rate (FERIR). This raises two questions:

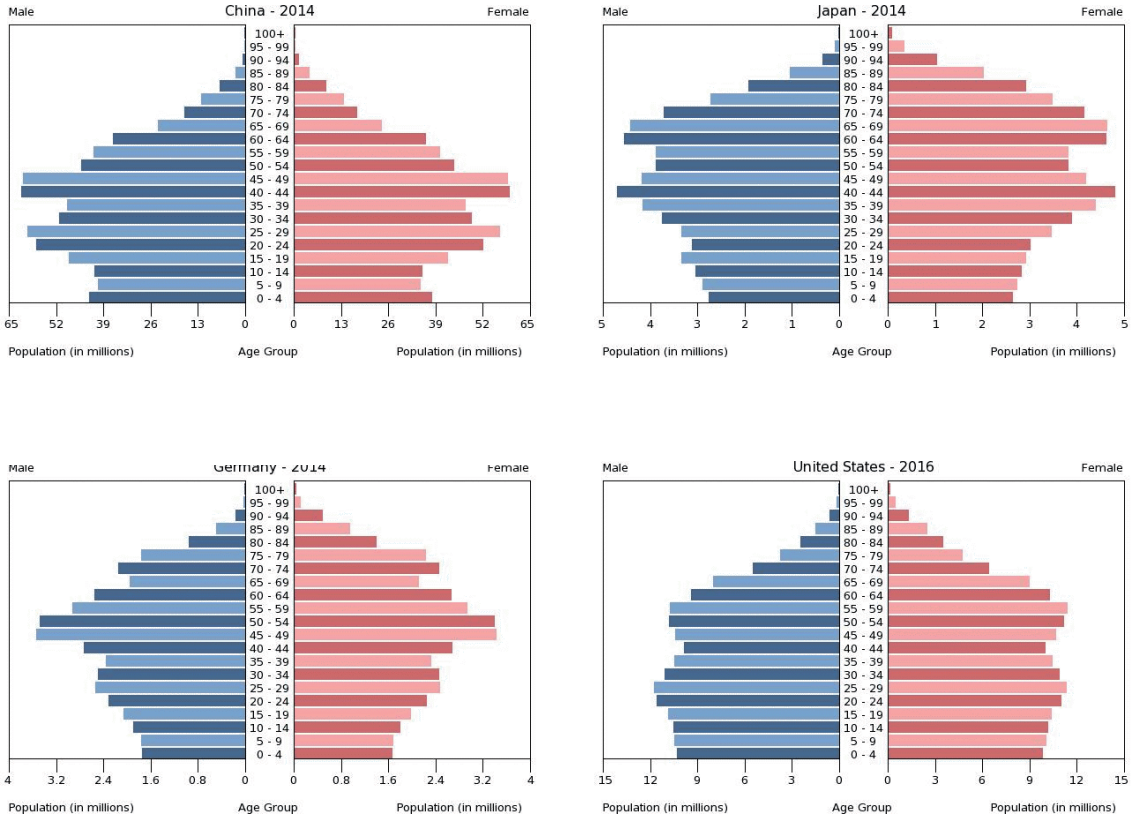
1. How long can we expect the low FERIR to persist?

2. In the meantime, what is the proper policy response? Can monetary policy deal with the problem, or should fiscal policy step in?

We argue that there are good reasons to expect the FERIR to remain low or negative for the next 15 years, in particular in the Eurozone. This expectation is motivated by a common pattern in the demography of most developed countries due to the introduction of the pill. Leaving fiscal policy as it is, this pattern can be expected to lead to bubbles, in particular in real estate as we indeed witness.

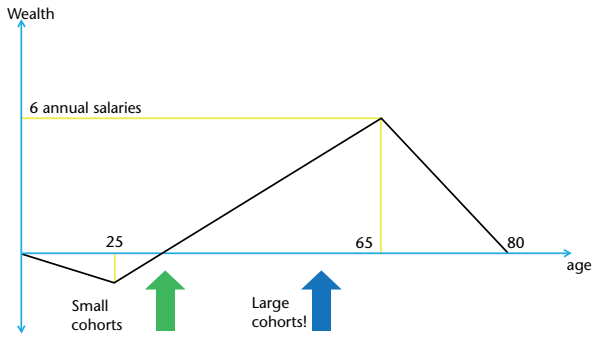
Figure 2 shows the age pyramids for the world's four largest economies – the US, China, Japan, and Germany – in 2014. Apart from the US, where cohort size is rather stable, these graphs reveal a strong demographic imbalance caused by the introduction of the pill. Its effect on fertility, which has been documented by Claudia Goldin and Larry Katz (2002), was most clear in Germany, where total fertility rates dropped by 40%, from 2.5 in 1967 to 1.4 in 1970. There is an echo effect 25 years later, when the first, smaller, post-pill cohort of women starts giving birth themselves. A cohort born in 1995 is just half the size of a cohort born in 1968. The current age structure is far apart from that along any balanced growth path; the cohort born just before the introduction of the pill being far greater than the cohorts born before or after. In Germany, the large cohort is currently between 45 and 55 years of age.

Figure 2. The age structure of the population in the four largest economies




The life cycle model of savings and consumption provides the link between this population structure and the FERIR.

Figure 3. Savings and the life cycle




People borrow to finance their education at the start of their career; next, they first repay this debt and then save for their retirement; finally, they deplete these savings. Hence, the aspired level of assets is at its maximum at the date of retirement. The large cohort born in the late 1960s will approach that age in the next 15 years. Their savings will flood the capital market during this episode.

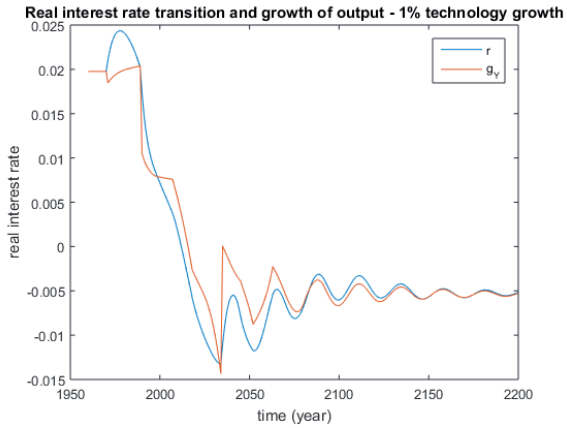
## Demography and interest rates

The interrelation between the growth rate $g$ and the real interest rate $r$ in context of OLG models was first explored by Paul Samuelson (1958) and Peter Diamond (1965). In a world with a constant rate of population growth $g$, there exists an equilibrium that clears the product market with $r = g$, the so called Golden Growth Rule (GGR). There may be other equilibria, but we focus on this equilibrium. While GGR relates to a world with constant population growth, our current environment is widely different. In particular, the large cohort born before the pill distorts the structure of the population towards saving cohorts approaching retirement. The transition to lower population growth leads to temporary deviations from GGR.

Figure 4 shows our calculation of the response of the interest rate to the sudden decline in fertility. This calculation presumes that individuals live for 75 years, start working at the age of 20, and retire at the age of 65. Women are taken to give birth between 18 and 28. Consistent with the data on Germany, the fertility rate before 1970 implies a steady state population annual growth rate of 1%, while the fertility after 1970 implies a long

term decline of 1.5% per year. We account for 1% productivity growth. In the GGP benchmark, the real interest rate starts at 2% (1% population growth + 1% productivity growth) and converges to a new GGP rate of -0.5% (1% productivity – 1.5% population) in the far future.

Figure 4. The evolution of the real interest rate after the introduction of the pill




The interesting part of the graph is the transition path. After a short initial increase, the interest rate starts falling, altogether by some 4%. It reaches a trough around 2035, when the large cohort born in the 1960s is retiring. From that moment on, the large cohort starts depleting its stock of savings and hence the interest rate starts increasing. During this transitory phase, small cohorts of workers have to produce the consumption goods for a large cohort of retirees, making consumption during this period more expensive and hence raising the reward for postponing consumption. The response of interest rates depends critically on the elasticity of intertemporal substitution in consumption and the substitution elasticity between labour and capital. The lower are these elasticities, the larger is the effect. We use standard references for these, see Robert Chirinko, Steven Fazzari, and Andrew Meyer (2004) and Tomas Havranek (2015). Previously, Gregory Mankiw and David Weil (1989), Gurdip Bakshi and Zhiwu Chen (1994), Ishaq Nadiri and Ingmar Prucha (1996), Charles Goodhart and Philipp Erfurth (2014) and Carlos Carvalho *et al.* (2016) have analyzed the effect of demography on the real interest rates. We are the first to offer a full analysis of the transition dynamics.

The current decline in the real interest rate can therefore be easily explained by the transition dynamics towards a world with much lower fertility due to the introduction of the pill. The ultra-lax monetary policy is not the culprit. The low interest rate is here to stay for the next 15 years. In fact, the savings glut out of China that flooded the American housing market during the first decade of the 21st century might also be a consequence of this fertility shock. The low interest rate set by the FED during this period was the necessary policy response to the fall in the FERIR, rather than a policy mistake that created the conditions for the credit boom leading to the Great Recession.

## Stores of value and bubbles

The GGP equilibrium cannot always be attained on a balanced growth path. The simplest way to understand the problem is to consider a hypothetical world where cohorts live for just two periods and where there is no capital to store current output for future consumption.

Consider the case that a cohort works during the first period and retires during the second. The working cohort wants to save for its retirement in the second period. However, it cannot lend to the elderly cohort, since that cohort will have passed away when time has come to repay the loan. The only generation who can pay the current workers their pension is the future cohort. However, this generation is not yet born, so it cannot borrow the money. There is an asset shortage: there are insufficient assets – stores of value – in which savers can invest, so as to store their income for future consumption. In that case, the interest rate will be lower than the growth rate: $r < g$.

There is also an opposite case, where a generation spends the first period at school and works during the second period. This is the case of savings shortage. In this case: $r > g$. Any balance growth path is characterised by either asset or saving shortage. The equality between savings and assets is a knife-edge case. Is the real world in a situation of saving or assets shortage? Andrew Abel et al. (1987) find that there is no asset shortage. More recently, Francois Geerolf (2013) presented evidence to the contrary. Coen Teulings (2016) shows that in a world with uncertainty, there can be trade in bubbly assets even when $r > g$ "on average", as long as the risk free interest rate is smaller than $g$, which is usually the case.

The discussion below focusses on the case of asset shortage, when $r < g$. In that case, rational bubbles might appear, see Jean Tirole (1985). A bubbly asset yields no return. Its only value is its future resale value. Workers are prepared to buy bubbly assets from retirees because they can resell them during the next period to the next generation of workers. The retirees use the receipts of the sale of their holding of bubbly assets to finance their retirement. Workers buy these assets because they can use the next period's receipts from the resale of these assets to pay for their retirement. The volume of trade in bubbly assets increases till $r=g$, moving the economy back to GGP. In this way, trade in bubbly assets makes up for the asset shortage.

Bubbles have a negative connotation. They are considered to be a signal of irrationality. The previous analysis, however, suggests that trade in bubbly assets can actually increase efficiency – everybody is better off. In the extreme case of the simple two period OLG model, people could not consume at all during their retirement without trade in bubbly assets. Bubbles can resolve this issue.

## What happens to bubbles during the transition to low population growth?

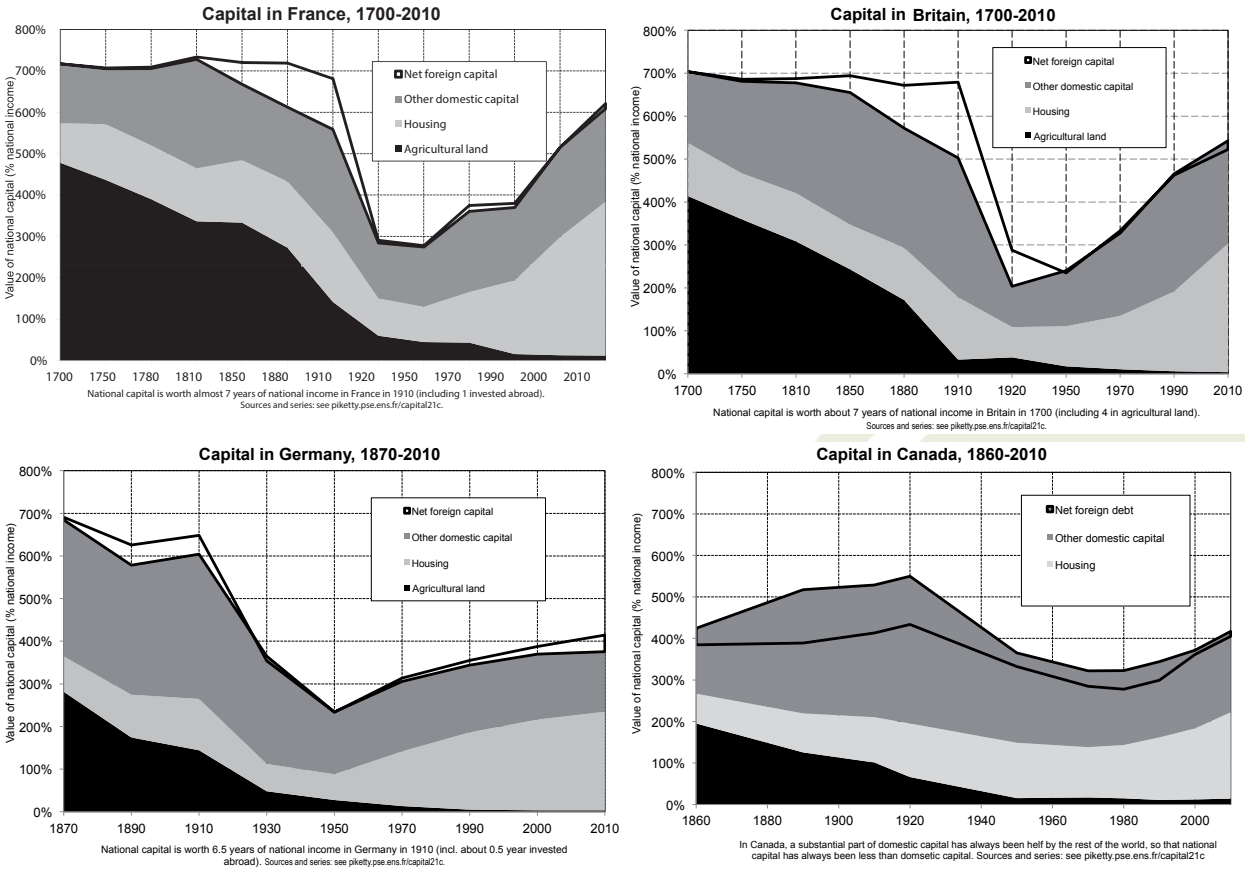
What happens to the volume of trade in bubbly assets during the transition phase after the introduction of the pill? The period from the introduction of the pill up to the retirement of the last large pre-pill cohort in 2035 is characterised by a relatively large supply of labour and a small group of retirees. Hence, this is a period of relative resource abundance. During the first half of this period the price of bubbly assets increases, inducing people to postpone consumption up to the middle of the episode of resource abundance. During the second half, the price of bubbly assets can be expected to decline, inducing people to consume, again during the period of resource abundance. Fluctuations in the price of bubbly assets help, therefore, to clear the commodity market, first by encouraging people to postpone their consumption until the period of resource abundance, and then by discouraging them to do so beyond that period.

This phenomenon can explain the large increase in house prices in many OECD countries since 1970, as documented by Thomas Piketty (2014), see Figure 5, and by Katharina Knoll *et al.* (2014). During the transition phase, the shortage in assets – greater than in the new GGP – yields price increases for bubbly assets, which, in turn, provide a temporary increase in the supply of stores of value that is required to clear the capital market. Without this additional supply, a further decline in the real interest rate would be the only way to achieve market equilibrium.

## Bubbly assets, Pay-As-You-Go, and the Eurozone's Stability Pacts

Trade in bubbly assets is not the only way in which an economy can solve its problem of a shortage of assets. In an economy with perfect foresight, bubbles, PAYG, and sovereign debt are perfect substitutes for trade in bubbly assets. Whether resources are transferred from the young to the old by the trade of bubbles, by a government enforced PAYG pension scheme, or by a government that sells bonds to the young to repay the last period's bonds held by the old, the outcome is the same in all three cases.

Figure 5. The share of housing in total wealth increased sharply after 1970



For example, one effect of bubbles is to raise the FERIR by absorbing some part of the excess saving supply, see Jason Lu (2016). When the economy is in the situation of a liquidity trap, as is the case in a Secular Stagnation recession, monetary policy cannot eliminate the output gap, since it is constrained below by the ZLB. By raising the FERIR, bubbles make the ZLB less constraining, which has the desirable effect of reducing the output gap. While bubbles can increase output, they are associated with financial instability – bubbles may burst. Fiscal policy in the form of PAYG or sovereign debt may be able to achieve the same desirable outcome as bubbles, without their associated financial instability.

Likewise, bubbles and sovereign debt are no longer perfect substitutes in a world with uncertainty; see Coen Teulings (2016). The price of bubbly assets becomes more volatile, depending on the expected return on investments in physical capital. When these returns are low, investment will also be low and savers turn instead towards bubbly assets, pushing up their price. This makes bubbly assets risky – they reduce financial stability. However, a society can try to share this risk efficiently between cohorts. The characteristics of bubbles and sovereign debt differ in this regard. Bubbles put all the risk onto the shoulders of the elderly, who hold the bubbly assets and hence bear the risk. Sovereign debt allows broader risk-sharing, where both the young and the old share the risk. Hence, to avoid the financial instability associated with a high volume of trade in bubbly assets, sovereign debt should be increased.

The Eurozone's current Stability Pact runs counter to this. The pact asks for a structural deficit of 1%. Assuming a 3-4% nominal growth of GDP (2% inflation, 1-2% TFP), this implies that the level of sovereign debt should converge to 25-33% of GDP, much lower than is currently observed in most countries. Hence, the Stability Pact may not allow member states to provide sufficient stores of value in order to avoid bubbles. If it goes unchanged, this makes the financial system more unstable during the next decades.

## Japan as a laboratory for Europe's future

There is a simple way to vindicate the relevance of this analysis of the economic impact of demography, through looking at Japan's economic history since 1990. As Figure 2 shows, Japan leads Europe's demographic structure by 15 years. Where Germany's large cohort is now between 45 and 55 years of age, Japan's large cohort is now between 60 and 70. Japan's real interest rate has been extremely low since 1990. Based on Figure 3, one would expect the interest rate to increase gradually over the next 10 years. Furthermore, based on Figure 4 and on the Japanese experience, one can expect the real interest rate to remain low for at least 15 years in the Eurozone and the U.S. After the collapse of its real estate bubble in 1990, Japan could only cope with the excess of saving by increasing its sovereign debt. Likewise, one would expect Europe to be forced to raise its sovereign debt level so as to clear its capital market. From that perspective, there is one piece of bad news: the population structure in Germany is much more distorted than that in Japan. Hence, one can expect the consequence to be even more pronounced in Germany and, in general, in the Eurozone, than in Japan.

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His current research focuses on understanding the causes behind the depth and the persistence of the Great Recession since 2008. In one paper he finds that the collapse of the housing bubble in 2007 likely played an important role in worsening the constraint of the Zero Lower Bound for monetary policy. Another project, joint with Professor Coen Teulings, shows that demography can explain the fall in the Full Employment Real Interest Rate since the early 1980s.