



Structural causes of low interest rates

Interest rates have been trending downward since at least 1980s in developed economies, including the euro area. In fact, real rates (the real rate is the interest rate adjusted for inflation) are now at historically low levels.

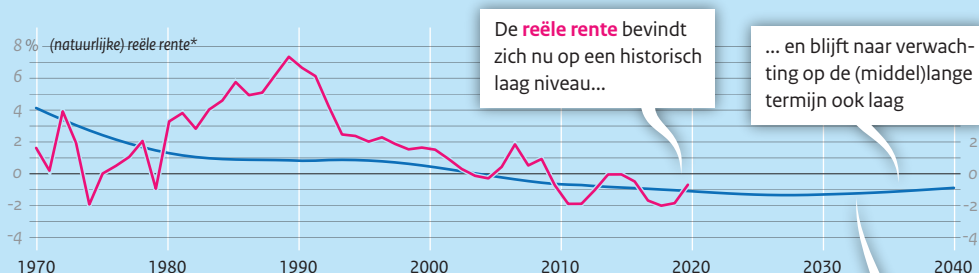
We conclude in this publication that structural factors such as the increasing life expectancy and lower productivity growth rates are driving this downward trend.

Although nominal interest rates (the interest rate before correcting for inflation) have recently started to rise, current projections of the structural factors indicate that real interest rates may remain low in the medium to long run.

CPB - July 2022

Oorzaken structureel lage rente

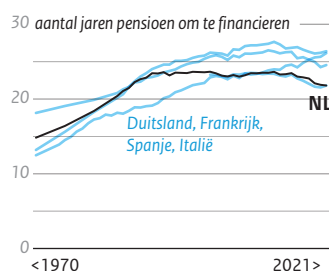
Sinds de jaren tachtig vertoont de rente in ontwikkelde economieën een neerwaartse trend. In het eurogebied wordt deze vooral veroorzaakt door traag veranderende structurele factoren zoals demografie en productiviteit.



* rente die bepaald wordt door het evenwicht op de spaar- en beleggingsmarkt wanneer de inflatie zich op de streefwaarde bevindt

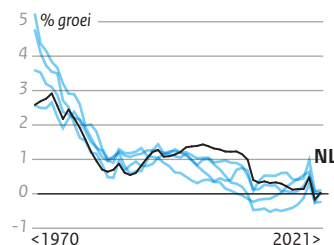
Demografie

- **hogere levensverwachting** huishoudens sparen nu meer voor hun pensioen dan vroeger
- **lagere geboortecijfer** lager arbeidsaanbod beperkt productie en vermindert investering



Productiviteit

- **lage productiviteitsgroei** maakt investering minder winstgevend
- **lagere prijs voor investeringsgoederen** maakt investeringen goedkoper (ten opzichte van consumptiegoederen)



Natuurlijke reële rente gesimuleerd met een overlappende generaties model

Overig

Andere factoren die bijdragen aan de lage rente

- de groeiende rol voor immaterieel kapitaal
- de toegenomen vraag naar veiliger activa
- de grotere ongelijkheid tussen huishoudens
- de grotere marktmacht van bedrijven

Factoren die de neerwaartse trend tegenwicht hebben geboden:

- hogere overheidsschulden
- flexibelere leningcondities (die bv. hebben geleid tot de financiële crisis)



Monetair beleid bij stijgende inflatie

Bij hoge inflatie kan de nominale rente worden verhoogd. Maar wanneer een nieuwe recessie uitbreekt is de effectiviteit van monetaire beleid weer beperkt.

Gevolgen lage rente: trager herstel van recessie

Omdat de nominale rente niet veel lager dan 0 kan zijn, is monetaire beleid beperkt in hoeveel stimulans kan gegeven worden tijdens recessies en duurt het langer voordat de economie hersteld is van een recessie.

Summary

Interest rates have been trending downward since at least 1980s in developed economies, including the euro area. In fact, real rates (the real rate is the interest rate adjusted for inflation) are now at historically low levels. We conclude in this publication that structural factors such as the increasing life expectancy and lower productivity growth rates are driving this downward trend. Our focus is on the long-run determinants of the real interest rate in the euro area. Although the nominal interest rate (the interest rate before correcting for inflation) has recently started to rise, current projections of the structural factors indicate that real interest rates may remain low in the medium to long-run.

An important implication of a low nominal interest rate over the medium to long-run is that it diminishes the ability of monetary authorities to stimulate the economy. During recessions the monetary authority must substantially lower its policy rate in order to stimulate the economy and reach its inflation target. However, it may not be able to do so. This is because monetary authorities cannot set their policy rate substantially lower than zero as this would induce substitution of bank deposits for cash. In this case monetary policy has to rely on unconventional policies with uncertain efficacy. This will tend to make recoveries from recessions slower and periods of low growth more persistent.

The downward trend in the interest rate in the euro area is mainly caused by slowly changing structural factors. For example, households now save more for their pensions than in the past due to a higher life expectancy after reaching pensionable age. In emerging markets, savings rates have also increased due to rapid economic growth. This has led to a larger worldwide supply of savings and a lower trend interest rate. In addition lower productivity growth has decreased the demand for savings, because investment in new technologies is less profitable. The decline in the price of capital goods relative to consumption goods has also had the same impact, because less savings is required to finance a given quantity of capital.

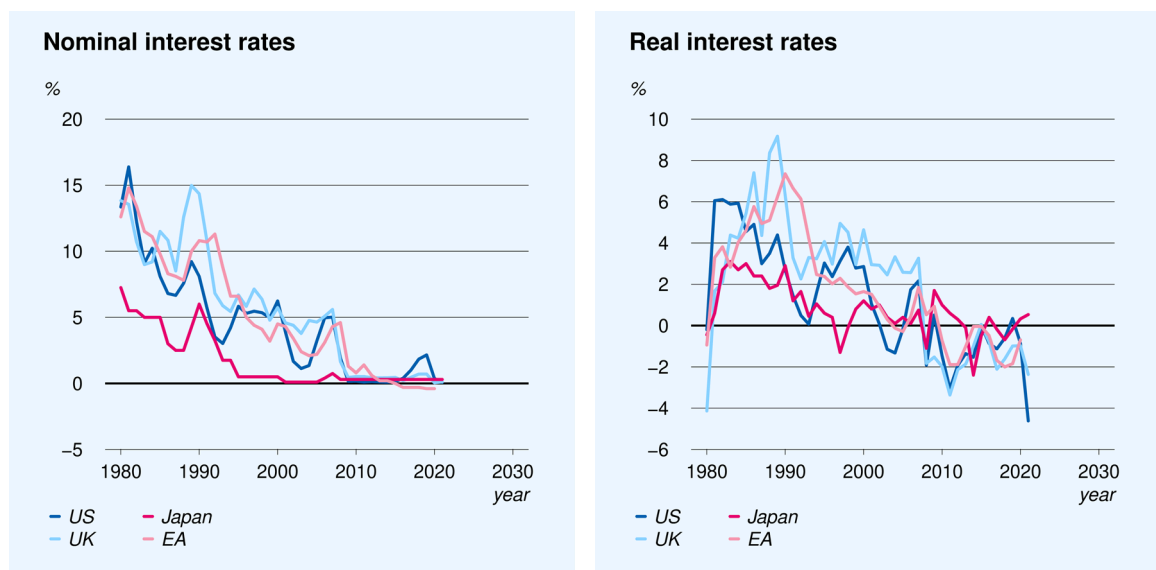
Other factors have at times counterbalanced the downward trend in interest rates. In the euro area fiscal policy provided more social security and issued additional government debt between 1970 and the mid-1990s. This diminished the amount of savings in the economy, putting upward pressure on interest rates. Borrowing constraints also loosened after the 1980s up until the beginning of the financial crisis in 2007. This also increased the demand for loans during this period.

Current projections of the persistent structural factors indicate that real interest rates may remain low in the medium to long-run. The current projections of the persistent factors indicate that the trend level in the interest rate is unlikely to reverse substantially. For example, population projections from United Nations and Eurostat predict that fertility rates are expected to only slightly increase in the euro area, while life expectancy will continue to rise. Low fertility implies that young working-age cohorts will remain small, constraining production and lowering the demand for investment. Higher life expectancy ensures that households will continue to increase their savings in order to finance a longer retirement, unless the retirement age increases sufficiently to offset this effect. Population ageing is also projected to accelerate in many emerging countries leading to higher savings and a lower interest rate on a global level. Furthermore, future productivity growth is expected to see modest gains from its current low level.

1 Introduction

Although interest rates have recently started to rise, they have been trending downward since the mid-1980s. This can be seen in the left panel of Figure 1.1 where we show the key monetary policy rate¹ for a number of developed economies, including the euro area. The same trend is visible in the real rate, i.e. the nominal rate adjusted for inflation (Figure 1.1 right panel). According to our analysis, a number of persistent structural factors are driving this phenomenon.

Figure 1.1 Nominal and real interest rates in developed countries have been on a downward trend since mid-1980s



Data source: FRED. We compute the real interest rate as the key monetary policy rate minus the year-on-year inflation rate.

In this publication we focus on the structural factors such as demographics and productivity that determine the risk-free real interest rate over the long-run. We summarize the findings in the literature regarding these persistent factors that have induced the downward trend in interest rates in the euro area. We also discuss their expected future developments and what this implies about future rates in the medium and long-run. We then quantify the impact of these factors on the risk-free real interest rate in the euro area using an overlapping generations model.² In our analysis, we concentrate on the real interest rate because it plays an important role in determining the decisions of households, firms and policy makers.³ In the long-run, the nominal and real rates are both influenced by the underlying factors given the ECB inflation target of 2%.⁴

An important implication of low interest rates is that they diminish the effectiveness of monetary policy in dampening the business cycle. In an environment with structurally low real interest rates, monetary policy generally has less room to manoeuvre during recessions because inflation is then typically low, which in turn

¹ We use this rate as a proxy for the risk-free interest rate.

² The details regarding the model and accompanying analysis are presented in the CPB (2022).

³ The notion of the long-run value of the risk-free real interest rate is frequently referred to as the natural real rate of interest in the economic literature. This natural rate can be thought of as the rate given by the equilibrium in the savings and investment market when the inflation rate is at its target value.

⁴ Other interest rates such as interest rates on corporate or government debt are also influenced by their differing degrees of perceived risk, as well as by how liquid they are. The perceived risk of these other forms of debt results in investors demanding a higher interest rate. This difference above the risk-free rate is called the risk premium. Less liquid forms of debt similarly receive a liquidity premium. These premia are economically important, but their development is more difficult to explain. Hence, we will not discuss their development.

implies that nominal rates are also low. Central banks cannot set nominal interest rates much below zero because holding cash would then become more attractive than deposits. This constraint on monetary policy is referred to as the “effective lower bound”. In this case, monetary policy has to rely on unconventional policies with uncertain efficacy and possibly undesirable side-effects. Having to rely on less effective policy instruments can make recovery from recessions slower and periods of low growth more persistent (Erceg et al., 2021). Japan’s experience of being at the zero lower bound for most of the last 30 years provides a good example of this problem (see the box).

Low interest rates also have other important economic consequences. Together with unconventional monetary policies, they have been implicated in the formation of asset price bubbles (Bonchi and Lucidi, 2020), risky lending behaviour (CPB, 2020) and sustaining unproductive zombie firms (Acharya et al., 2019). Lower interest rates cause higher asset prices, including house prices (Sommer et al., 2013, Lisack et al., 2017). Higher asset prices exacerbate the inequality between groups in society, such as between older people who own houses and younger people who do not, and richer households who have savings in asset markets, while poorer households save mainly through bank accounts (Arrondel et al., 2014). Finally, lower interest rates have a heterogeneous impact on economic participants. While on the one hand borrowing to finance consumption and investment is cheaper, on the other hand savers receive less income from their savings. For example, governments are more easily able to finance their expenditures and service their debt, but pension funds will see a lower return on their government and corporate bond holdings. As a result, financing retirement becomes more difficult (Ciurila et al., 2020).

This publication is structured as follows. In section 2 we summarize the literature about the structural factors of low interest rates. We explain the mechanisms through which these structural factors have influenced the real interest rates in the medium and long-run. Based on the current forecasts of these structural factors, we discuss the possible future developments of the real interest rate in the euro area. We present an assessment of the quantitative impact of these structural factors on the medium term euro area real interest rate in section 3.

Japan: A glimpse into Europe's future?

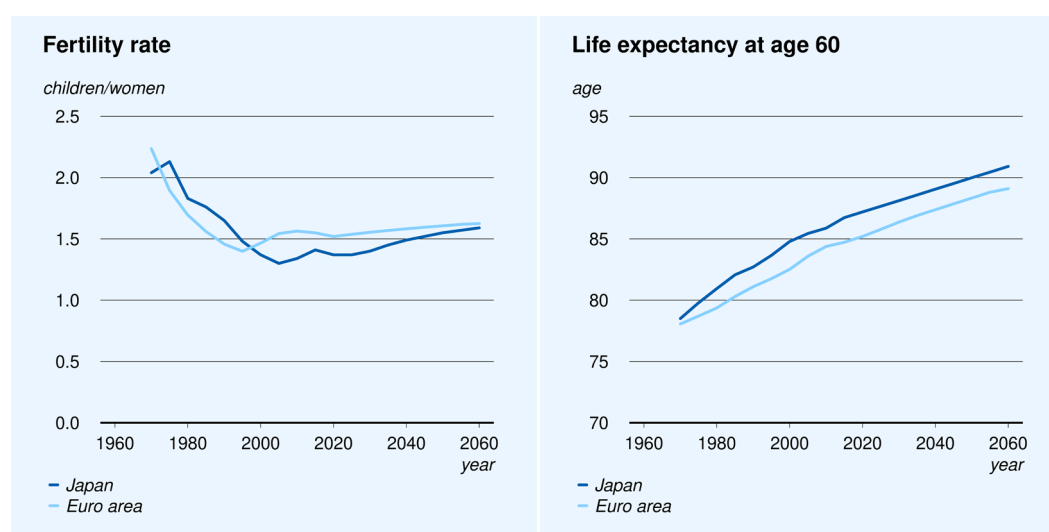
In the development of some of the most important structural factors determining real interest rates, especially demographics, Japan leads the Netherlands and the euro area by about 15 years. As such, Japan gives us a window on what the future might hold for interest rates and the economic policy environment that follows. As **Figure 1.2** in the introduction shows, nominal interest rates in Japan hit zero a decade before the euro area and they have remained there ever since.

Both monetary and fiscal policy have tried to stimulate the economy. The Bank of Japan was the first central bank to lower interest rates to zero in 1999. Subsequently, in the early 2000s it was also the first to employ quantitative easing: the buying of assets in the hope of lowering long-term interest rates and increasing inflation and GDP growth. Fiscal authorities have also implemented various policies, although these have been hampered by concerns about debt sustainability. Furthermore, the government promised structural reforms to increase the labour force, for example by encouraging women to work more. Policies were somewhat effective: persistent deflation ended (until the corona pandemic struck) and multifactor productivity growth rose after a period of stagnation. However, inflation has consistently been hovering only slightly above zero and has only just hit the 2% target due to the energy crisis, whilst the nominal interest rate is still at the zero lower bound. Hence, monetary policy remains constrained.

Figure 1.2 below shows how Japan's demographic situation leads the euro area. Japan's population structure has aged significantly due to increasing life expectancy, low birth rates and an almost complete lack of immigration. Currently there are 50 pensioners per 100 working people, which is projected to increase to around 80 by 2050. In the Netherlands, the equivalent number is 30, but this is projected to increase to about 50 in 2050. Other underlying factors in Japan are similar to the Netherlands and the euro area: productivity growth has been consistently low and income inequality is comparable.³ Even Japan's towering government debt hasn't moved interest rates away from the zero lower bound. Although the definitive cause of Japan's inability to escape the zero lower bound is still subject to debate, Japan demonstrates some of the policy issues we may face as the euro area follows similar demographic developments as the recent ones in Japan.

a) See OECD data ([link](#)) for an overview of these statistics.

Figure 1.2. Japan's population has aged faster than in euro area



Source: Eurostat and United Nations

2 Structural determinants of real interest rates

In this section, we summarize the literature regarding the persistent factors causing changes in the supply and demand of savings. Business cycle fluctuations induce short-run changes in real interest rates. For example, negative aggregate demand shocks temporarily reduce firms' incentives to invest and lower the demand for savings. Persistent factors, such as ageing, affect the level of savings for longer. We present past and projected developments of some of these persistent factors and illustrate the direction in which they are expected to move the real rate of interest in the medium and long-run. These qualifications are of course conditional on the currently available projections of the persistent factors.

Although monetary authorities are responsible for setting the interest rate, their decisions must take into account the short- and long-run factors affecting savings. Only by correctly incorporating the influence of these factors on interest rates can monetary policy achieve its objectives, i.e. to keep inflation at its target in the case of the ECB. However, this is often a difficult task because the exact change in these factors and the exact size of their impact on interest rates is difficult to measure. On the one hand, if monetary authorities set the interest rate too high, the economy will slow down too much causing the inflation rate to drop below its target value. On the other hand, if they set the interest rate too low, the economy will become overheated which in turn will drive the inflation rate above its target.

In recent decades, most structural factors have increased the supply of savings and lowered the demand for savings, putting real interest rates on a downward trend. Among these factors, demographic changes, persistently slower technological progress, the lower price of capital goods and a surge in the supply of savings coming from rapidly growing emerging markets have often been cited in the literature (Eichengreen, 2015, Rachel and Smith, 2017, Rachel and Summers, 2019). The efforts to reduce the amount of private debt (*deleveraging*) and the tightening of borrowing constraints following the Great Recession have further contributed to the decline in real interest rates. Table 2.1 lists the main factors that have been proposed as drivers of structurally low real interest rates. Many of them are interconnected. For example, ageing has been tied to lower output growth and investment (Aksoy et al, 2019), while the rise in intangible capital has likely triggered not only a lower demand for loans but also a decline in business dynamism, an increase in market power and a decline in aggregate productivity (de Ridder, 2019).

Table 2.1 Medium- and long-run determinants of the real interest rate

	Mechanism	Sign of impact on real interest rates	References
Supply of savings			
Demographics - Life expectancy	Due to the increase in life expectancy people need to save more to finance retirement	-	Aksoy et al. (2019), Bielecki et al (2020), Carvalho et al. (2016), Papetti (2021), Lunsford and West (2019)
Demand for safe assets, Risk aversion	A shift in preferences towards holding safe assets lowers risk-free rates (interest rates) relative to the return on capital	-	Marx et al (2021), Gourinchas and Rey (2016), Caballero et al (2017)

Savings from emerging countries	Higher growth rates in countries with underdeveloped financial markets and social safety nets increases the quantity of precautionary savings globally	-	Summers (2014), Auclert et al (2021), Coeurdacier et al. (2015)
Income and wealth inequality	High income households save more than lower and middle income households.	-	Straub (2019), Rachel and Summers (2019), Auclert and Rognlie (2018)
Demand for savings			
Demographics - fertility	Less demand for loans due to smaller young cohorts Relatively fewer working age people lowers the labour force and therefore the marginal product of capital	-	Aksoy et al. (2019), Bielecki et al (2020), Carvalho et al. (2016), Papetti (2021), Lunsford and West (2019)
Productivity	Lower productivity growth reduces the number of new profitable projects and makes investment goods embodying older technology competitive for longer	-	Rachel and Smith (2017), Rachel and Summers (2019)
Price of capital goods	Less savings are required to finance a given quantity of capital goods if investment goods are cheaper	-	Summers (2014), Rachel and Smith (2017), Rachel and Summers (2019)
Rise of intangible capital	Intangible capital is less easily used as collateral for loans, reducing the effective demand for credit	-	Farhi and Gourio (2018), Caggese and Perez-Orive (2017)
Market power of firms	Higher market power increases firm mark-ups, hence less investment is necessary to achieve the same amount of profit.	-	Farhi and Gourio (2018), Eggertsson et al (2021)
Borrowing constraints	The easing of borrowing constraints from the 1970s until the Great Recession increased the demand for loans	+	Eggertsson et al (2019)
Fiscal policy	Higher public debt increases the demand for household savings An increase in social security provided by the government between 1970 and mid-1990s reduced the need for savings	+	Eggertsson et al (2019), Carvalho et al (2016), Rachel and Smith (2017), Rachel and Summers (2019)

Demographics is one of the major factors behind the structural decline in the interest rate. Life expectancy increased substantially in euro area countries between 1970 and 2010. Consequently, people will typically need to finance a longer retirement and, hence, need more savings (Figure 2.1, right panel). Furthermore, fertility rates have declined substantially in euro area countries since the 1970s (Figure 2.1, left panel). Lower fertility rates mean fewer young adults who borrow at the start of their adult lives and, hence, a lower demand for savings. At the same time, declining fertility rates mean a declining working age population. In time, this constrains production and also leads to less demand for capital investment.⁵ Both channels imply that lower fertility rates put downward pressure on real interest rates. Moreover, the higher life expectancy and the lower fertility rates lead to a higher proportion of older people in the population. Although we expect retirees to spend their savings as they get older, they do so less than our models predict (CPB, 2019). In fact, in most European countries pensioners typically do not spend all of their pension income.⁶ Consequently, they leave bequests to their children and this results in a delay when these savings are spent. This results in a higher aggregate amount of savings

⁵ Goodhart and Pradhan (2020) argue that the decline of the workforce worldwide but especially in China will put upward pressure on wages in the future. This will spark inflation and higher nominal interest rates. However, this does not necessarily imply also higher real interest rates and the authors make no prediction about it. As we mention above, a declining work force is more likely to constrain production and investments, hence putting downward pressure on demand for savings and therefore real interest rates.

⁶ Eurostat data show that across Europe, pensioners continue to save part of their disposable income ([link](#)).

Figure 2.1. In most euro area countries people have fewer children (lhs) and finance a longer retirement period (rhs)

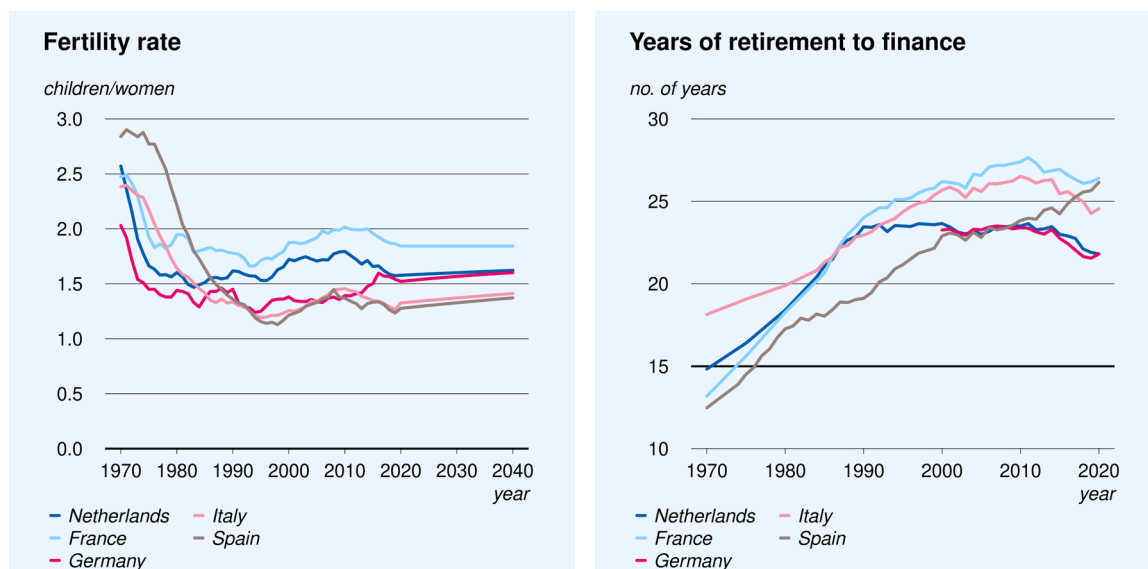


Figure note: The fertility rate (historical data and projections) comes from Eurostat. The number of years of retirement to finance is computed as life expectancy at the age of 65 years (from Eurostat) and the effective retirement age (from OECD). For more information see the CPB Background document (Ciurila et al., 2022).

Some fundamental factors have lowered the amount of savings demanded to finance investment. The left panel of Figure 2.2 shows that productivity growth in euro area countries has fallen significantly since the 1970s. The same is true for the international price of investment goods relative to consumption goods (Figure 2.2, right panel). Lower productivity growth implies less demand for investment because it becomes less profitable.⁷ Lower productivity growth may also implicitly reduce its depreciation rate thereby also reducing investment demand. The fact that investment goods have also become much cheaper relative to consumption goods implies that less savings are required to finance a given quantity of capital. Furthermore, the increasing share of intangible capital in total capital may have played a role. Intangible capital is less easily accepted as collateral for bank loans. As such, firms often finance investment in intangible capital from retained earnings. In effect, firms finance intangible capital by saving first, rather than borrowing, thus also reducing the demand for credit (Caggese and Perez-Orive, 2017).

Higher savings in emerging economies contributed to lower interest rates. Many emerging economies invest their savings internationally. This phenomenon, called the “global saving glut”, is due to the fact that incomes in emerging economies have been growing quickly over the past 30 years and their populations are typically ageing, both factors leading to more savings. Households in emerging markets also face increasing income risk that is not matched by higher public insurance of these risks (see Chamon et al., 2013 for an analysis about China). Therefore, they also tend to save more for precautionary reasons.

⁷ The cause of the lower productivity growth and lower investment rates since the 1970 is still highly debated. A part of the literature argues that lower productivity growth may stem from a mismeasurement of output due to the difficulty to quantify improvements in the quality of goods or from the mismeasurement of investment in intangible capital. Consequently, actual productivity growth would be higher (see Syverson, 2017, Brynjolfsson et al., 2021).

Figure 2.2. Firms have less reasons to invest due to lower productivity growth (lhs) and lower price of capital goods (rhs)

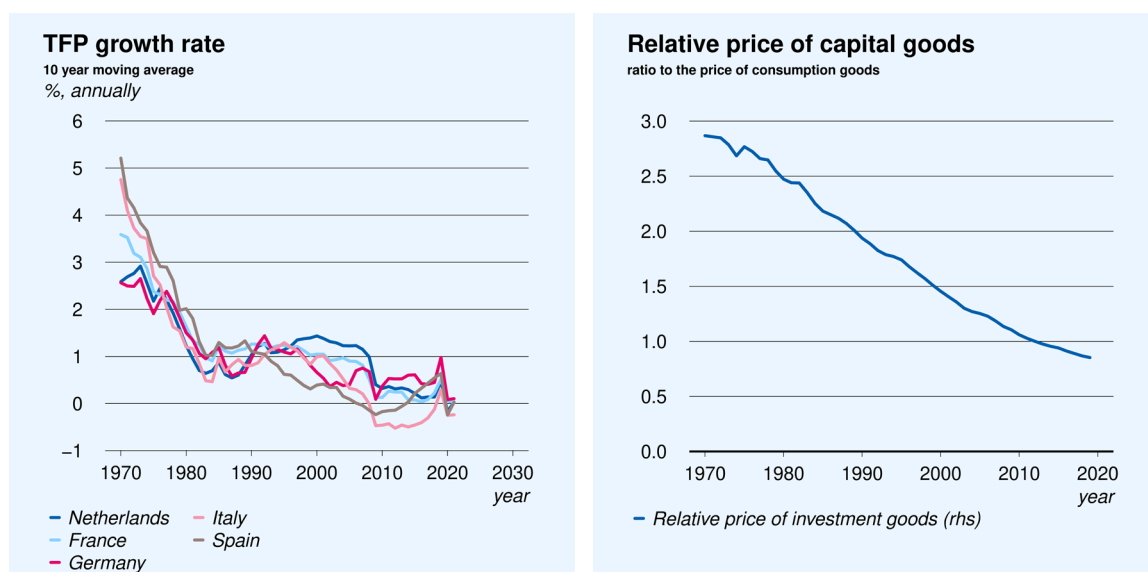


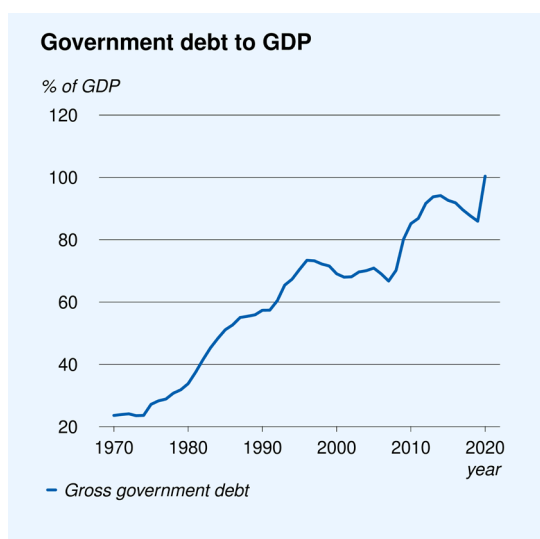
Figure note: TFP growth rates come from AMECO. Relative price of investment goods is obtained from FRED.

Increasing income inequality may have also contributed to a higher level of savings and to a lower interest rate. High income households have a higher propensity to save than low income households. As a larger share of economic growth is accrued by high income households, less of it gets spent and more of it is saved. Hence the aggregate level of savings increases. Moreover, higher income inequality can also be an indication of a higher income risk in the economy. Households would in this case save more than they did in the past for precautionary reasons. Straub (2019) estimates that the increase in income inequality in the US has led to a 1%-point decline of the real interest rate. While there are no similar assessments for the euro area, we can expect the impact of this factor on the real interest rate to be lower. This is because income inequality has increased less than in the US (Blanchet et al., 2021).

Financial factors and changes in the market structure of firms put downward pressure on the interest rate. Complying with the prudential regulations implemented following the financial crisis increased the demand for safe assets (Gourinchas and Rey, 2016). Some papers point towards an increase in risk aversion following the Great Recession, which may also have increased the demand for safe assets thereby further lowering interest rates (Marx et al, 2021). Finally, some research argues that the increasing market power of firms has driven down investment. Higher market power implies higher markups, so less investment is necessary to achieve the same level or profit. This has also lead to lower interest rates (Eggertsson et al, 2019, Farhi and Gouro, 2018).

Some factors have at times counterbalanced the downward pressure on the interest rate. In order to finance the increasing level of aggregate debt since the 1970s (Figure 2.3), governments have absorbed more household savings in the euro area. Moreover, the expansion of pay-as-you-go systems until mid-1980s (Ciurila and Romp, 2015) reduced the necessity to save more for retirement for the cohorts to which these reforms applied. Higher public insurance of private risks (such as healthcare risks) also reduced households' demand for precautionary savings. Finally, financial deregulation after the 1980s up until the beginning of the Financial Crisis in 2007 loosened borrowing constraints increasing the demand for loans.

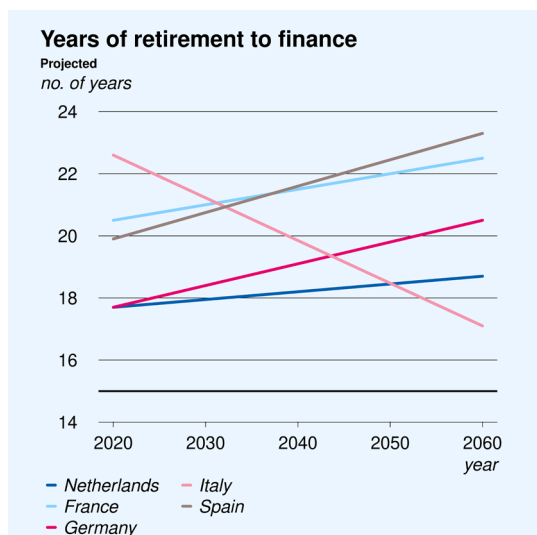
Figure 2.3 Euro area government debt has increased since the 1970s, absorbing a part of the higher savings of households



Source: IMF World Economic Outlook database, own calculations

Most of the structural factors determining the interest rate are expected to keep exerting a downward pressure on real interest rate in the coming decades. Current demographic projections for the euro area from Eurostat and the United Nations indicate that fertility rates will only slightly increase while in most euro area countries the number of years in retirement is expected to keep increasing (Figure 2.4).⁸ In emerging economies, population aging will accelerate according to United Nations' projections. This can result in an increase in the global wealth to GDP ratio and a decline in the global real interest rate throughout the 21st century (Auclert et al, 2021). Although future productivity growth is uncertain, it is unlikely to return to the higher levels seen in the 1970s. The increased importance of intangible capital is likely to continue.

Figure 2.4. In most euro area economies households will continue to finance an increasing number of retirement years



Source: Life expectancy at age 65 from the Eurostat, projected retirement age in the year 2060 from the OECD

⁸ A decrease in the number of retirement years is expected in Italy due to an increase in the retirement age to 71 for the year 2060. This would be by far the highest retirement age in the euro area.

3 The quantitative impact of the structural factors

In order to quantify the relative importance of the structural factors in determining the real interest rate in the euro area, we use an overlapping generations model. We calibrate the model of Eggertsson et al., (2019) for the euro area economy. The model simulates the demand for and supply of savings coming from households that optimise their consumption and savings over the life-cycle. By having many overlapping generations,⁹ the model can illustrate the impact of demographic changes on the interest rate. Other structural factors that affect the real interest rate such as productivity growth, firms' mark-ups, the price of capital goods and the level of government debt are included in the model as well. In this model the resulting equilibrium interest rate is usually referred to as the natural rate of interest.¹⁰ The natural rate can be thought of as the rate given by the equilibrium in the savings and investment market when the inflation rate is at its target value. Other papers use overlapping generation models to assess the natural rate of interest in the euro area: Bielecki et al. (2020) and Pappetti (2021). See the CPB Background Document (Ciurila et al., 2022) for more details.

Simulations of the model are able to replicate the long-term decline of the real rate of interest in the euro area. The model shows a decline in the natural real rate of interest beginning in 1970 (Figure 3.1, left panel). Our estimate of the natural real rate of interest currently prevailing is around -1%. This is within the range estimated by other researchers (see Brand et al., 2018, who find rates between 0.5% and -1.5%). The precise estimate of the natural real rate of interest is sensitive to the calibration of the model. However, its significant decline in the past 40 years and the relatively small increase predicted by the model for the future is a robust result.¹¹ The positive difference between the actual real interest rate and the natural interest rate over the period 1980-2000 is also a robust result. There are a number of possible causes for this positive difference. First, in the period between 1980 and 1990 monetary was more aggressive trying to bring inflation down from its high values in the end of the 1980s. Second, it is a period when financial liberalisation and government debt put an important upward pressure on the real interest rate. It may be that our model underestimates the quantitative influence of these factors. Of course, this positive difference could also be due to other factors which are not in the model.

⁹ We have 98 overlapping generations in the model, for details see the CPB Background Document (Ciurila et al., 2022).

¹⁰ We use this term in line with Eggertsson et al., (2019) and Holston et al., (2017). However, the definition of the "natural interest rate" typically includes shorter-run business cycle fluctuations too. However, in models without business cycle shocks like ours, the natural rate is equal to the equilibrium rate. For a more in depth discussion, see the CPB background document (Ciurila et al., 2022).

¹¹ For further information regarding the robustness of the results of the model see the CPB background document (Ciurila et al., 2022).

Figure 3.1. Natural real rate of interest simulated with an overlapping generations model (lhs) and alternative scenarios based on different developments of the fundamental factors (rhs)

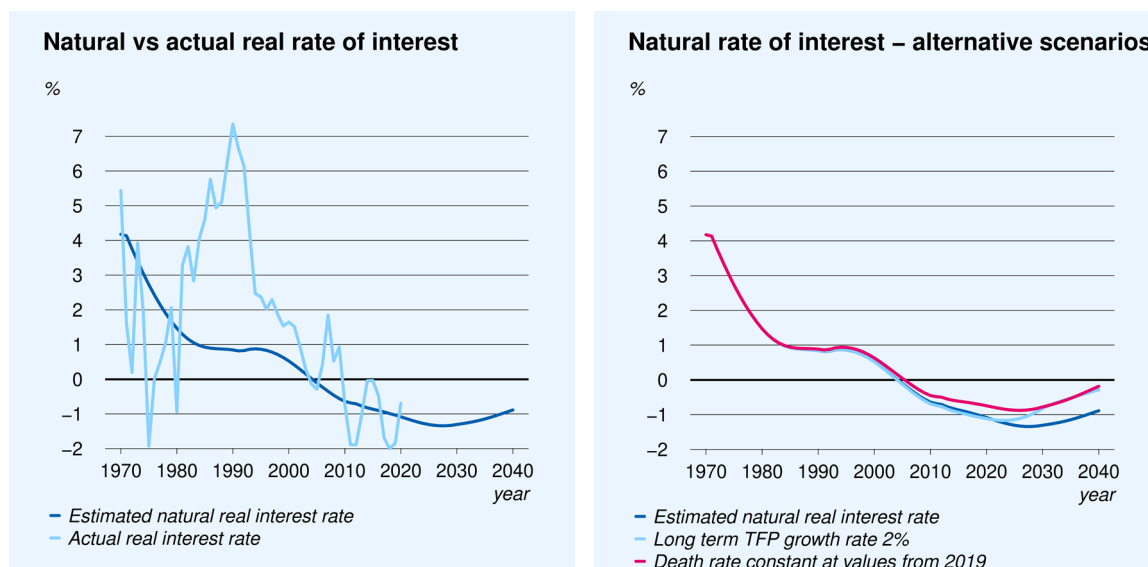


Figure note: The actual real interest rate is computed as the nominal interest rate minus the inflation rate. Nominal interest rate and the inflation rate come from FRED. The model results are based on the overlapping generation model by Eggertsson et al., (2019) calibrated to the euro area. See the CPB background document (Ciurila et al., 2022) for more information.

Historically, increases in life expectancy and the lower productivity growth had the most important quantitative impact on the real interest rate. The counterfactual exercises performed with the model¹² indicate that the natural real rate of interest would have been currently 3%-points higher if life expectancy hadn't improved after the year 1970. If TFP growth rate had remained as high as in 1970, the natural rate of interest would have been currently around 1.5%-points higher. The lower fertility rate has had a lagged impact, pushing the natural rate of interest downward after the year 2000 with around 1%-point. The rest of the structural factors have a smaller quantitative impact (at most 0.5%-point).

Looking into the future, structural factors will put only a small upward pressure on real interest rates, in the absence of business cycle shocks. According to population projections (Eurostat and United Nations), the fertility rate in the euro area will increase slightly in the future, while life expectancy will continue to increase.¹³ As a result, aging will continue to contribute to a decline in the trend of the real interest rate. The small increase in the natural rate of interest predicted by the model is due to the higher contribution rate required in the future by governments in order to rebalance the pay-as-you-go pension systems. A higher contribution paid by working cohorts into the pay-as-you-go pension system implies that they will have a lower net income and hence lower savings.¹⁴

Sizeable increases in the natural real rate of interest could take place but only in the event that there are substantial changes in the projections of the structural factors. For example, current population projections indicate an increase in life expectancy of 6.7 years between 2019 and 2060. However, if we assume that life expectancy makes no gains after the year of 2019, then this results in a natural rate of interest that is almost 1%-point higher (Figure 3.1, right panel). Also, we assume that the productivity growth rate returns to

¹² See Figure 6 ("Robustness checks") from the CPB Background Document (Ciurila et al., 2022)

¹³ Increases in population due to higher migration are not considered in the model. This would lead to a more substantial increase in the natural real rate of interest.

¹⁴ We assume that the debt level remains constant in the absence of temporary shocks at the level from 2019. Hence, the pay-as-you-go system is not rebalanced through a higher level of government debt. Rebalancing the pay-as-you-go systems by increasing the retirement age would have the same overall result. Because they work longer, households need to save less to finance retirement. Consequently, aggregate savings decline.

1% per year by 2030 and remains constant thereafter. The reason for making this assumption is the majority of forecasts do not see productivity growing much in the long and medium term (Cette et al, 2017, PWC, 2017). However, if productivity growth is higher at 2% instead of 1% from 2030, the natural rate will be almost 1%-point higher (Figure 3.1, right panel).

A low natural rate of interest is a sign that the economy is close to a situation of “secular stagnation”. This is defined as a long-term lack of aggregate demand (Hansen, 1938). When the economy reaches the zero lower bound, monetary policy is less able to stimulate aggregate demand and stabilise the economy: a shortage of aggregate demand arises. The lower is the natural rate of interest, the higher the probability that the nominal interest rate will hit the zero lower bound in a recession, leading to higher real rates than required to rapidly bring aggregate demand back to potential. Hence, a long-term lack of aggregate demand arises. However, there is no clear-cut value for the natural rate of interest below which we can definitively talk of a period of “secular stagnation”.¹⁵ Our analysis indicates that the natural real rate of interest is currently negative but higher than -2%. This means in the absence of business cycle shocks and given a 2% inflation target, the nominal rate of interest is just above 0%. This leaves monetary authorities limited room to intervene if a negative shock occurs.

Our analysis does not take into account the additional government debt recently required to finance the stimulus measures to support the euro area economies during the coronavirus pandemic. To the extent that the recent increase in government debt is long lasting, this puts an upward pressure on the natural real rate of interest. Moreover, what happens in rest of the world is also important. If, for example, the plans of the current US administration to implement a substantial increase in government spending on infrastructure and social transfers are mostly funded with debt, this will increase the global demand for savings and put upward pressure on real interest rates. However, our analysis is not able to accurately project the interest rate on government debt because our model does not include a risk premium. This is important because the interest rate on government debt is typically higher than the natural rate due to the fact that there is a risk that the government will default on their debt and therefore it also includes a risk premium.

Uncertainty surrounds the projections of the structural factors. For example, using a procedure that involves the modelling of 250 causes of death, Foreman et al. (2018) find projections of life expectancy for the year 2040 that range between a gain of 7.8 years to a loss of 0.4 years for men and a gain of 7.2 years to essentially no change for women. In addition, future improvements in life expectancy may turn out to be lower than expected due to the covid pandemic. It is also possible that government expenditure may exceed current projections due to increasing costs related to health care (Goodhart and Pradhan, 2020) and the environment. Irrespective of how these extra expenditures are financed (via higher taxes or higher debt), this will reduce households' supply of savings or create an extra demand for savings. Furthermore, a possible reversal of globalization could lead to lower capital mobility. In this case, the higher savings from developing markets would have less of an impact on the interest rate in the euro area. Such developments could push the real interest rate up. Any policies aimed at decreasing income and wealth inequality or the market power of firms will also diminish the supply and increase the demand of savings and, hence, push the real interest rate up.

¹⁵ Blanchard (2021), defines secular stagnation as the situation in which the natural rate of interest is lower than the trend economic growth rate ($r < g$). Eggertsson et al. (2019) argue that an economy is in a “secular stagnation” when the natural rate of interest is lower than minus the inflation target (-2% in the euro area).

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