What is driving the global trend towards lower real interest rates?

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In recent decades, real interest rates have fallen considerably in almost all advanced economies and in many emerging market economies. This downturn applies to interest rates on loans with both short and long maturities. Many studies find that structural changes can explain why real interest rates have shown a falling trend around the world. Such changes include the age and life expectancy of the population, the potential growth rate of the economy and the premiums that investors are prepared to pay for assets that are considered safe. In addition, China and several other emerging market economies have increasingly been integrated into the global economy and have long had remarkably high levels of saving. All of these structural changes may affect real interest rates. But there is disagreement over which of them are quantitatively significant for interest rate formation. For example, economic theory predicts a positive correlation between real interest rates and potential growth rate, but several empirical studies find that the correlation is weak. There is then stronger overall support for the hypothesis that real interest rates have been affected by demographic changes and a high level of saving in Asia.

1 Introduction

In January 2020, both the federal government of the United States and US households and companies could take out loans at interest rates approximately 6 percentage points lower than the interest rates prevailing in February 1990. This gap indicates that, over the last three decades, it has become significantly cheaper to borrow and that returns on saving have fallen to a corresponding degree. However, the fact that inflation in the United States was higher in 1990 than it is today must also be taken into account, for the comparison to be fair. The general price level increases over time and anybody lending a sum of money must therefore bear in mind that the same sum, when it is repaid, will have lost value. *The real interest rate*, which is roughly equal to the interest rate minus average inflation over the loan's maturity period, is therefore a better measure of the cost of borrowing if comparisons are to be made over time. In January 1990, the annual rate of increase in the US consumer price index (CPI) was just over 5 per cent, compared with 2.5 per cent in January of this year. The real interest rate had then fallen by about 3.5 per cent, less than the nominal interest rate, but a considerable decrease nevertheless.

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This article was written before the outbreak of the coronavirus pandemic. The potential effects of the pandemic on rate-setting has therefore not be considered. However, the global trend towards lower real interest rates, observed in recent decades, affects the prevailing conditions for conducting effective economic policy and will probably continue to be important going forward.

In countries with inflation targeting policies, it is normal for the central bank to raise the interest rate during economic booms to prevent the economy from becoming overheated and inflation from becoming too high. Similarly, the policy rate is usually cut in recessions to stimulate demand and prevent inflation from falling too far below the inflation target. Over the last 30 years, the US policy rate has also been raised and cut in line with changes in the economic outlook and inflation prospects in a more or less predictable manner. However, at the same time, real interest rates – independently of the economic cycle – have shown a downward trend, so that the average real interest rate over a cycle has gradually become lower. This development is not specific to the United States: similar gradual downturns in real interest rates have taken place in almost all advanced economies and in many emerging markets and developing countries. Today, real interest rates and, in many cases, nominal interest rates are negative, so that borrowers get paid for borrowing money.

The aim of this article is to provide an overview and critical discussion of parts of the literature analysing global trends in real interest rates. The focus is on probable explanations for the negative trend that has been under way for a couple of decades and that is considered to be making a strong contribution to the current low level of interest rates. How did we end up in a situation in which many central governments and companies are being paid to borrow money, while many households are simultaneously prepared to save a significant proportion of their incomes even though the real interest rate is negative?

According to economic theory, the real interest rate is affected both by long-term, structural changes and by cyclical shocks. An example of a structural change affecting the real interest rate, which we will discuss in this article, is provided by shifts in the age structure of the population. Such demographic processes often take place over several decades and can give rise to slowly acting trends in the real interest rate. However, cyclical shocks also have effects on the real interest rate. Frequently, the most important channel for these effects is the central bank's decisions on the policy rate and expectations on the fixed-income markets concerning future policy rate decisions. We mentioned earlier that central banks conducting inflation targeting policies normally react to changes in the economic outlook by raising or cutting their policy rates. When this happens, the real interest rate on the market for loans with short maturities is often also affected. This is partly because the nominal interest rates for short-term borrowing usually follow the central bank's policy rate quite closely. But it is also because both inflation and inflation expectations tend to be more sluggish than nominal interest rates. As the real interest rate is approximately equivalent to the nominal interest rate minus inflation, the consequence becomes that the central bank also affects the real interest rate when reacting to changes in economic activity via the policy rate. Even if cyclical developments are mostly less long-lasting than demographic changes, for example, it can nevertheless take quite a lot of years for cyclical shocks to wear off completely.

The effect of cyclical shocks on real interest rates makes it difficult to determine exactly which changes in the real interest rate should be ascribed to trends and which ones are cyclical fluctuations. In addition, sometimes the world economy is affected by unusually severe and long-lasting recessions, and the effects on the real interest rate may then become both large and relatively prolonged. One relevant example concerns the period from the mid-2000s on, when the world economy was affected by two unusually heavy shocks: the global financial crisis, with the subsequent deep recession of 2009–2010, and the European sovereign debt crisis of 2010–2012. In conjunction with both of these crises, many central banks made unusually large cuts to their policy interest rates. In addition, several of them started purchasing bonds on the secondary markets to push market rates down further. In several earlier cases, the recovery from financial crises has been slow and it has taken many years before resource utilisation in the most badly affected economies has returned to normal levels. It is therefore particularly difficult at present to determine what forms a normal level for the policy rate in different countries and how the trend in the global real

interest rate has developed since the mid-2000s. The first section of the article therefore discusses the results of a number of different studies that have estimated global trends in real interest rates. Following this, it presents a simple conceptual framework for the various structural factors that can explain the global, negative trend. The conceptual framework, which has been used in other literature reviews, is primarily a tool to create an overview of various mechanisms and the probable effects they have on real interest rates, saving ratios and investment levels.

The following sections discuss four different factors raised in the literature as important structural driving forces behind the current low level of interest rates:

- low long-term growth prospects
- demographic changes
- high saving levels in Asian emerging market economies
- an upturn in the premiums that investors are willing to pay for safe assets

This list is not exhaustive. Several other structural changes have been put forward as possible explanations for the negative trend in real interest rates. The selection made here is primarily based on different assessments and estimates of the factors that have been quantitatively most important for developments in recent decades.[1] The article ends with a concluding discussion.

The results of three different estimates indicate that, in recent decades, there has been a global downward trend in real interest rates of between two and three percentage points. But there is considerable uncertainty in these estimates. The different studies also reach different results regarding both how large the downturn is and exactly when it started. On the other hand, they all indicate that the trend level of global interest rates has been close to zero in recent years.

According to standard macroeconomic models, there is a close relationship between a country's real interest rate and the growth rate of its economy. However, several empirical studies indicate a weak or non-existent correlation between trend changes in both variables. There are certainly reasons to interpret these results with caution. The body of data that can be used to study slowly acting, global trends is fairly small, for natural reasons.

Both economic theory and correlations in the data suggest instead that demographic changes, such as shifts in the age composition of the population, are significant for real interest rates. The mechanisms behind these correlations are certainly complex. Overall, however, there is comparatively strong empirical support for the existence of a correlation between trends in real interest rates and the age composition of the population as well as the supply of labour.

An analysis of the current accounts in different countries points fairly clearly towards there also being a correlation between falling real interest rates in the western world and the remarkably high levels of saving in China and other Asian emerging market economies from the end of the 1990s and on. Asia's exports of savings to the west can explain why saving has fallen in several advanced economies at the same time as real interest rates have fallen around the world.

A further factor that has probably contributed towards pushing real interest rates down is an increase in premiums for those assets considered safe. Higher premiums on safe assets,

1 Examples of other factors mentioned in the literature include falling relative prices for investment goods, a more uneven distribution of income among households and lower public investment. Rachel and Smith (2015) and Bean et al. (2015) provide non-technical overviews of the literature. Rachel and Smith's original study was published as a working paper by the Bank of England in 2015 and a shorter version was published two years later (Rachel and Smith, 2017). Lunsford and West (2019) use a substantial amount of data and long historical time series to investigate the degree of covariation in the data between, on one hand, the real interest rate in the United States and, on the other, a large number of variables that have been linked in the literature to the trend in recent decades towards lower interest rates. The results of this study provide weak or no support for the hypothesis of a link between trend changes in the real interest rate and trend changes in the relative price of investment goods. The study also indicates that there is only weak support for the hypothesis of a link between the real interest rate and measures of inequality in income distribution.

such as government bonds, mean that the yields for these bonds are becoming lower. But the increase also has the consequence that the return on higher-risk assets, such as equities, is falling less than the downturn in government lending rates.

2 Data and estimations of trends

Yields on treasury bills and government bonds are significantly lower in most advanced economies today than they were at the start of the 1990s. In many countries, this means declines of 10–15 percentage points. A large part of this downturn in nominal interest rates can be explained by the transition from high to low-inflation regimes that took place in the 1980s and 1990s. But returns on loans have fallen, even after adjustment for expected or actual inflation. Real interest rates are currently significantly lower than they were 30 years ago in virtually all advanced economies and the same is true for many emerging market economies. However, the average (GDP-weighted) decrease is smaller in emerging market economies. The dispersion in real interest rates is also greater between countries in this group than it is between advanced economies. Households and companies are currently facing significantly lower real interest rates than they did 30 years ago, even if real interest rates in general have fallen less than interest rates on government loans.[2]

The upper graph in Figure 1 shows the median of the real interest rate on government borrowing with short maturities (corresponding to treasury bills) and the yield for government bonds with long maturities, respectively, in 16 advanced economies. The real interest rate is calculated as the difference between the nominal return on each debt instrument minus the expected inflation measured using the GDP deflator.[3] We can see a pattern in the graph in which real interest rates initially show a rising trend from the decades after the Second World War until the beginning of the 1990s. They subsequently fall in the period from the 1990s onwards. According to these two measures, the global real interest rate on government borrowing has fallen by between 6 and 7.5 percentage points since 1990.

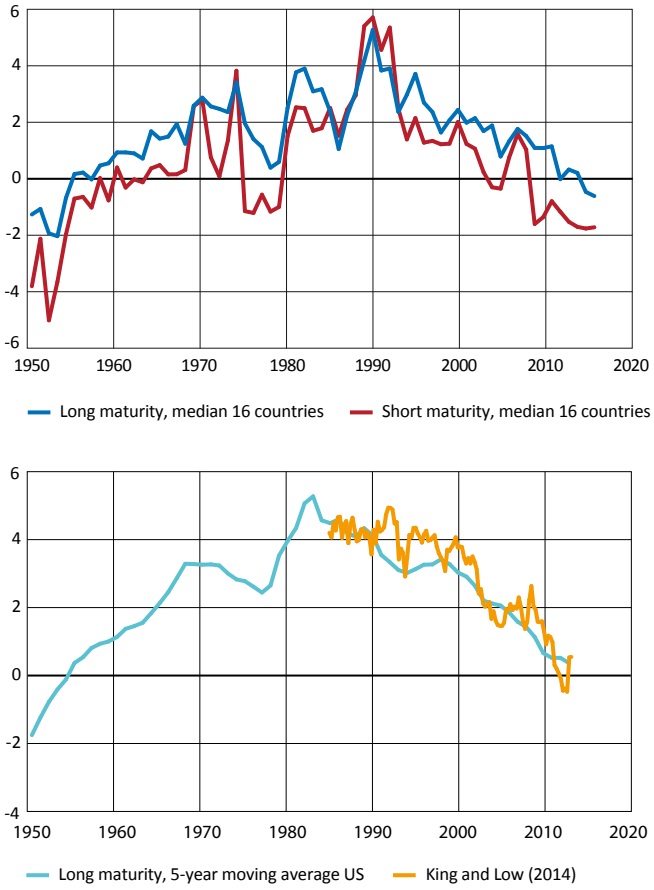
Exactly when the trend turns from rising to falling varies according to the country studied and the method used to calculate real interest rates. There is therefore reason to consider several different measures from different countries and groups of countries in order to obtain a fair picture of developments. In the lower graph in Figure 1, the turquoise line shows a five-year centred moving average of the real interest rate for US government bonds with long maturities. This shows that the real interest rate in the United States had already reached its highest level by the early 1980s. This peak coincides with the tightening of monetary policy by the US central bank to combat the high rates of price increase established in the 1970s. Following this, the real interest rate in the United States gradually started to fall and the downturn continued over the rest of the period covered by the graph.

King and Low (2014) report a measure of the global real interest rate that is interesting for a couple of different reasons. Firstly, they use data from trade in inflation-indexed (real) government bonds and they can therefore calculate a measure of expected inflation among the investors trading in the bonds. Secondly, King and Low (2014) only use data from countries with high credit ratings and they strive to calculate measures of the real interest rate that are comparable from country to country. King and Low's (2014) measure of the 'world' real interest rate is shown as the orange line in the lower graph in Figure 1. There, we can see that the downturn in the 'world' real interest rate is smaller than the downturn in

2 See Rachel and Smith (2015), sections A and D6.

3 Figure 1 presents four different measures of real interest rates in advanced economies. Three of these measures (the blue, red and turquoise lines) have been calculated using data for nominal interest rates and inflation in 16 countries taken from Jordà et al. (2019). In all three cases, an average of a forecast from a simple autoregressive model, AR(1), and inflation over the 5 previous years is used as a measure of expected inflation. The parameters of the AR(1) model are estimated separately for each country and year in the sample. King and Low (2014) use prices for inflation-indexed government bonds in Canada, France, Germany, Japan, the United Kingdom and United States to calculate a measure of the 'world' real interest rate.

Figure 1. The real interest rate for government borrowing, 1950–2016
Per cent



Note. For an explanation of the different measures of real interest rates shown in the figure, see the text of the article and footnote 3. Data in the lower part of the figure ends in 2013.
Sources: Jordà et al. (2019), King and Low (2014) and own calculations

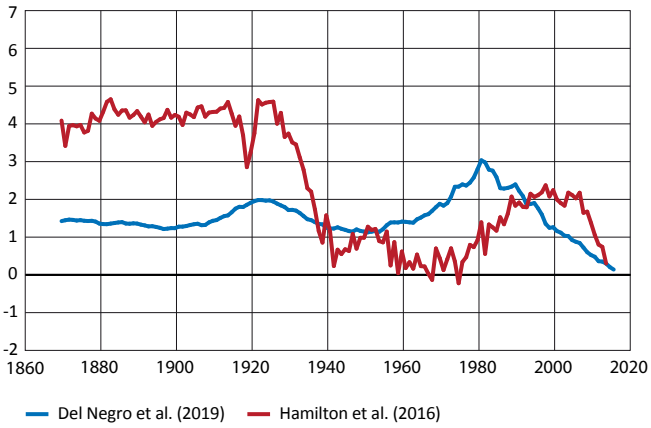
the measures based on the group of 16 countries shown in the upper graph. The figure also shows that a clear downturn in the global real interest rate, according to this way of calculating it, first started at the end of the 1990s or beginning of the 2000s, more than ten years after real interest rates in the United States had started to turn downwards. According to King and Low's (2014) calculations, the global real interest rate has fallen from a level of around 4 per cent in the mid-1990s to a level of around zero in 2013.

Depending on the choice of calculation method and samples of countries, quite different conclusions can be reached concerning the size of the downturn in real interest rates. The different measures discussed here indicate a downturn since 1990 of between 4 and 7.5 percentage points in the real interest rate that governments pay for their borrowing.

2.1 How large is the global trend downturn?

In the previous section, we saw that the downturn in real interest rates was between 4 and 7.5 percentage points depending on the choice of calculation method and sample of countries. But how large a proportion of this downturn forms a trend change in real interest rates and how much can be ascribed to less long-lasting or cyclical factors? Over the last 15 years, a great many studies have been published which use various methods to estimate trend or equilibrium levels for real interest rates. Most focus on individual countries or groups of countries, where the equilibrium level in each individual country is estimated independently of developments in other countries. Here, we focus instead on three studies that estimate a global trend or a global time-varying equilibrium level.

Figure 2. Estimates of global trends in real interest rates, 1860–2016
Per cent



Note. The blue line shows the estimate of the trend in the global real interest rate from Del Negro et al. (2019) and the red line shows the estimate of the long-run world real rate from Hamilton et al. (2018).
Sources: Hamilton et al. (2016) and Del Negro et al. (2019)

Three different types of method dominate the literature on trends and equilibrium levels for real interest rates.[4] The first of these uses comparatively simple statistical models to distinguish between trends and more cyclical or temporary changes in the real interest rate. In most cases, this means univariate statistical models, where only a single time series over the real interest rate is used as measurement data. As they use univariate models, these methods, strictly speaking, can only be used to estimate trends for one country at a time. Hamilton et al. (2016) use this kind of method, together with long, historical data series from 17 different advanced economies, to estimate 17 country-specific trends for the real interest rate on loans with short maturities. In several cases, the data and the estimated trends stretch all the way back to the 1860s. For each of the years in the sample, the authors then calculate the median of the trend level in the various countries and use it as a measure of a global trend level. The result, shown as the red line in Figure 2, indicates that the most recent global trend towards lower real interest rates first started in conjunction with the outbreak of the financial crisis in 2007. According to this estimate, the trend level falls from just over 2 per cent in 2007 to between 0 and 0.5 per cent in 2014.

One possible objection to the trend estimation in Hamilton et al. (2016) is that their method does not explicitly take account of how the interest rate in one country can be affected by interest rates in other countries. After all, in this case, the estimation is made for one country at a time. Del Negro et al. (2019) use a more advanced method in this respect and simultaneously estimate trends for seven different countries. They use data for nominal interest rates with different maturities together with inflation data from each of the countries, among other variables. Unlike the earlier trend estimation made by Hamilton et al. (2016), Del Negro et al. (2019) also use certain simple economic conditions of no-arbitrage between assets in various currencies when motivating their model specification. This study is an example of the second of the three types of method mentioned earlier: it uses information from interest rates of different maturities to estimate one or more common trends and the extraction of trend and cycle relies, to a certain extent, on conditions derived from economic theory. The blue line in Figure 2 shows the trend in the global real interest rate as estimated by Del Negro et al. (2019). This differs in several important respects from the trend estimated by Hamilton et al. (2016). For example, the trend from Del Negro et al. (2019) shows less variation over time, at the same time as the most recent negative trend starts earlier. Another striking result is that the current low trend level is the lowest for the

4 The discussion in this section is partly based on Kiley (2019).

entire period, which runs from the second half of the 1800s until 2016. Between the years 1981 and 2016, the trend level falls from three per cent to close to zero.

An important difference between the estimation in Hamilton et al. (2016) and the one in Del Negro et al. (2019) is thus that the latter study assumes that the fixed-income markets in different countries are interlinked and that there is a global, common trend for the real interest rate. This seems to be a highly reasonable starting point from which to describe today's internationally integrated capital markets, in which assets can be moved rapidly and at a low cost between different countries and currency areas. Is this difference an argument for relying more on the estimate from Del Negro et al. (2019) than on that from Hamilton et al. (2016)?

The answer is not obvious. The reason for this is that the degree of international economic integration has varied considerably over the long period investigated in both studies. Put simply, it could be said that the capital markets in the world's advanced economies were deeply integrated from the final decades of the 1800s until the outbreak of the First World War. During this period, the leading industrialised countries used the gold standard as a basis for their monetary systems. The gold standard implied an arrangement with fixed exchange rates and comparatively free and rapid capital movements between different countries and currency areas. During this period, the international goods trade grew rapidly. This changed when transformative crises impacted the world economy between 1914 and 1945: the two World Wars, the Wall Street Crash of 1929 and the subsequent Great Depression. After the Second World War, a new international economic policy regime was created, based on the agreement made in Bretton Woods in the United States, with fixed but adjustable exchange rates and trade in goods that again started to grow rapidly. However, unlike the earlier period with the gold standard, the Bretton Woods system involved comparatively strict regulation of international, private capital movements. It was not until the end of the 1960s that this system gradually started to be liberalised. In some respects, it would take until the end of the 1990s or start of the 2000s for the world economy to reach the same high degree of globalisation as existed in the heyday of the gold standard 100 years previously.[5]

It is thus not obvious which of the two studies, Hamilton et al. (2016) and Del Negro et al. (2019), which makes the most appropriate assumptions when modelling trends in real interest rates. The assumption in Del Negro et al. (2019) of a common, global trend has its obvious advantages for those periods in which international capital movements have been deregulated and there have been clear tendencies towards convergence between real interest rates in different currency areas. But for estimations that cover the half century or so from 1914 until the 1970s, the method in Hamilton et al. (2016) may have its advantages, as the assumption of a common global trend is significantly harder to justify for this period.[6]

The third method of estimating trends or equilibrium levels utilises more guidance from economic theory than the other two. It uses data on interest rates, inflation, GDP and possibly other variables, together with equations from theoretical models. According to modern theory of monetary policy, there is a link between, on one hand, resource utilisation in the economy and, on the other, the difference between the actual real interest rate and the level for the real interest rate usually referred to as the natural interest rate. This link forms the core of a large number of studies that estimate a time-varying equilibrium level for

5 Obstfeld and Taylor (2003) analyse the long-term lines of this development and note that the world's leading capital markets were most tightly interlinked in two historical periods: the decades before the First World War and the most recent decades. Eichengreen (2019) describes in more detail how the international monetary system has developed over the last 150 years and explains how the different systems, such as the gold standard, functioned. Ahamed (2009) focuses on a period that is particularly interesting in this context – the interwar period – and on the central bank governors in France, Germany, the United Kingdom and the United States who took centre stage in efforts to revive the gold standard.

6 It should, however, be pointed out that free international capital movements are not a necessary condition for real interest rates in different countries to converge. Ohlin (1933) showed that the price of production factors in different countries tends to even out through trade in goods. See also Krugman and Obstfeld (2003), chapter 4.

the real interest rate. The best known of these is the specification that was introduced by Laubach and Williams (2003) in their estimation of the United States' natural interest rate. This specification has, in turn, inspired a large number of studies that use variations of it to estimate time series for the natural interest rate in different countries.

Laubach and Williams (2003) model the United States as a closed economy and this has also been the starting point for most of the subsequent studies.[7] The results of these studies generally show significant trend downturns. Kiley (2019) provides an interesting exception in the group of studies inspired by Laubach and Williams (2003). The reason for this is that Kiley (2019) expands the model to simultaneously estimate the natural interest rate in 13 advanced economies. It is assumed that the natural interest rate in each separate country is partly determined by a common, global trend.[8] For most of the countries in the sample, data stretches from the mid-1960s until 2019. The assumption of a common, global trend is therefore less problematic in this study than in the study by Del Negro et al. (2019). The results of the estimation in Kiley (2019) indicate that the median of the natural interest rate in the various countries fell from around two per cent in the mid-1990s to around zero in 2019.

The three studies cited here thus indicate that the estimated trend in the global real interest rate appears different depending on the method and data used. The results in Del Negro et al. (2019) indicate that a negative trend has affected the real interest rate ever since the 1980s but, according to Hamilton et al. (2016), the trend does not clearly change until the second half of the 2000s. The estimation in Kiley (2019) indicates that the global trend towards lower real interest rates started around the year 2000. The magnitude of the estimated downturn varies from almost two to three percentage points. At the same time, it is worth noting that all three studies conclude that the trend level of the global real interest rate has fallen significantly in recent decades. In addition, all three studies indicate that the level of the global trend, or alternatively the level of the global natural interest rate, is close to zero in the middle or in the second half of the 2010s.[9]

3 Possible explanations for the downturn in real interest rates

Most studies attempting to explain the negative trend in real interest rates concentrate on structural changes that have affected supply or demand for savings. When it comes to supply, there is often a focus on household saving, although central government saving is also discussed. In practice, saving in the corporate sector is also relevant. Demand refers to total demand for investment. The idea is that supply and demand must be balanced at the prevailing real interest rate and that there is a long-term equilibrium level at which the economy is in a cyclical balance that defines the real, long-term equilibrium interest rate.[10]

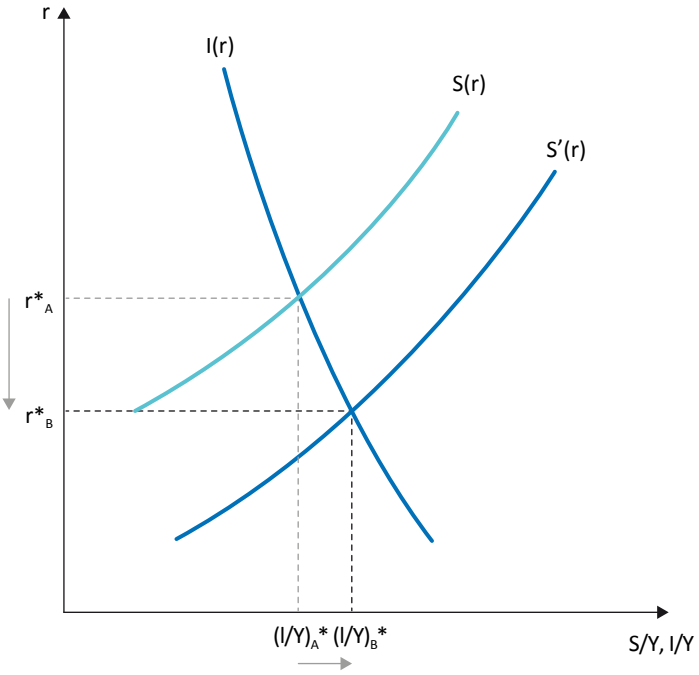
7 See Holston et al. (2017) for examples of this type of estimation and for references to other similar studies. Armelius et al (2018) estimate the neutral interest rate in Sweden with the help of a model that is similar to the one used in Laubach and Williams (2003) but that in some respects incorporate the fact that Sweden is a small, open economy.

8 In Kiley (2019), the natural interest rate in each separate country is affected by shocks that are specific to that country and by a global shock that is common to all 13 economies in the sample. Correspondingly, resource utilisation in each individual country is affected both by cyclical shocks that are specific to that country and by a global cyclical shock. The 13 countries in the sample are Australia, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, South Korea, Spain, Switzerland, the United Kingdom and the United States.

9 Alongside the results that are discussed in the main text and which are based on a model inspired by Laubach and Williams (2003), Kiley (2019) also presents results from estimations based on simpler methods. Also in this case, the data comes from the group of 13 advanced economies (see the previous footnote). One of these estimations uses comparatively simple, univariate statistical methods resembling those used in Hamilton et al. 2016. Another uses a term structure model that has several similarities to the model used by Del Negro et al. (2019). The result of the approach using univariate models, which does not explicitly take account of the interconnection between countries, indicates a trend downturn in the median of real interest rates in the various countries of just over one percentage point from the mid-1990s to 2019. The corresponding results from the term structure model indicate a downturn of about two percentage points.

10 See Borio et al (2017) for an example of an alternative view on the driving forces of the trend towards lower real interest rates.

Chart 1. Effects on the global real interest rate of a higher global supply of savings. A schematic illustration.



Note. Schematic illustration of a global, long-term equilibrium in which the supply of savings, *S(r)*, and demand for investment, *I(r)*, become balanced at the interest rate *r**. The horizontal axis measures the world's total saving and investment as a proportion of the world's GDP, denoted as *Y*. The vertical axis measures the real return on saving and investment. The chart shows an increase of the global saving ratio which causes investment's share of GDP to increase and the long-term real interest rate to fall.

In the previous section, we discussed the fact that the degree of international economic integration has varied significantly over the last 150 years. However, at least from the 1990s and on, there is reason to talk about a global market for capital and a real interest rate that is determined on a global level. Chart 1 shows a schematic illustration of a global equilibrium in the supply and demand of savings. Total supply in the world, *S(r)*, is assumed to increase as the global interest rate, *r*, becomes higher. This is because a higher interest rate means a higher return on savings. Correspondingly, it is assumed that demand for investment, *I(r)*, is negatively dependent on *r*. The vertical axis shows the level of the real interest rate. The horizontal axis shows saving and investment as a proportion of the world's total GDP. For individual open economies that have deregulated their capital markets, there is no reason to expect domestic saving to correspond to total domestic investment. But for the world as a whole, total investment must correspond to total saving. Equilibrium is originally at the level of the real interest rate equivalent to r^*_A, where supply *S(r)* equals demand *I(r)*. The figure illustrates how supply shifts outwards, from *S(r)* to *S'(r)*. The higher supply leads to the equilibrium interest rate falling, from r^*_A to r^*_B.

Of course, this conceptual framework is very simple and is primarily intended to act as support for a structured discussion of which mechanisms may have contributed towards creating trends in the real interest rate. For the moment, we will disregard the fact that households and companies face other (often higher) interest rates than those that apply to central governments. We will return to this matter later; at present, we can imagine a simplified situation where these premiums are constant over time and thus are not of decisive importance for how equilibrium is determined.

3.1 Lower potential growth

What kind of structural changes could then lead to increasing global saving? One example that is often emphasised is that trend growth fell in the mid-2000s and that there is reason to expect growth to remain comparatively low in the coming decades.[11] According to standard macroeconomic models, expected growth is an important factor when households choose how much of their income to save. Several economists have also linked worsened growth prospects and persistent low interest rates (Fischer 2016 is an example that is often referred to). A large number of studies based on Laubach and Williams' (2003) method also find that lower potential growth forms an important driving force behind the negative trend in real interest rates.

Why then should the real interest rate be affected by a deterioration of long-term growth prospects? According to macroeconomic theory, there is, as already referred to, a close relationship between the level of expected growth and the level of the real interest rate. The assumption is that most households take careful, forward-looking decisions about consumption and saving and that they realise the importance of the real interest rate for these decisions. The higher the real interest rate is, the more households will be able to increase their purchasing power in the future if they save a little more now. One important assumption here is that most people try to avoid having the level of their consumption vary heavily over time. Households therefore make plans for their private economies, for example by saving for their pensions, when incomes usually become lower, and building up buffers for unexpected events.

But how is this trade-off between consumption and saving affected if growth prospects worsen? The answer depends on what lies behind the worsened growth prospects and how this affects variables important for households. One initial important distinction can be made between changes in GDP growth due to changes in the supply of labour, on one hand, and ones that are due to changes in labour productivity, on the other. In this section, we focus on changes in the trend, long-term growth of labour productivity.[12]

If productivity is expected to rise at a lower rate, average real wages will also increase more slowly and most households will thereby have lower expected real lifetime incomes. Young households, which often have fairly low or even negative savings, will then have reason to change their behaviour. For example, a mortgage of a given size will be more difficult to repay if real wages increase more slowly over a working life, and many households may perhaps decide to purchase less expensive homes if they expect lower real wage growth. Correspondingly, it can be imagined that a great many households will spend less money on car purchases and holidays. If many households change their behaviour in this way, aggregate consumption will be lower and the saving ratio higher. A higher saving ratio, due to lower long-term growth prospects, is an example of a structural change leading to an increased global supply of saving, as illustrated in Chart 1 above. Assume that households originally believe that growth prospects are fairly good and that the total supply of saving is given by $S(r)$. Demand for saving, $I(r)$, is in turn determined by the size of investment that households, companies and authorities decide to undertake, given that the real interest rate is r. Supply and demand are in balance at the original real equilibrium interest rate r^*_A. But when households realise that the long-term growth prospects are less favourable than they had originally believed, they increase their saving for each given level of the real interest rate.

11 Different economists have different opinions on the future, long-term growth prospects. According to the US economist Robert J Gordon, there are several factors indicating that growth in the United States in the coming decades will probably be lower than the average growth rates recorded during the 20th century. See, for example, Gordon (2015).

12 Several other accounts discuss the effects of lower growth on companies' willingness to invest and on demand for savings (Rachel and Smith 2015, Kiley 2019). Here, however, the focus is on household saving. In a macroeconomic model with forward-looking households, households' saving behaviour can formally be analysed via what is known as the Euler equation. The equation describes a relationship between the individual household's expected consumption growth, the real interest rate and other factors that affect saving behaviour. See Lundvall and Westermark (2011) for a description of a simple macroeconomic model that includes long-term growth but that disregards capital and thus companies' willingness to invest.

The global supply of saving then shifts outwards, from *S(r)* to *S'(r)*. For the sake of simplicity, we assume that the change in households' expectations of future growth does not affect demand for saving. The result is that the real equilibrium interest rate falls, from r^*_A to r^*_B.

Rachel and Smith (2015) assess the effects of worsened growth prospects in the United States on the global real interest rate. This is because productivity growth in the United States is often seen as an indication of the level of productivity growth it may be possible for other countries to achieve, as the United States is seen as a leading country for innovation and development. Rachel and Smith (2015) note that average growth per capita was relatively stable from the 1980s until the financial crisis. It therefore seems difficult to point to worsened growth prospects as an explanation for the fall in real interest rates ahead of the financial crisis, based on measured, actual growth rates. After the financial crisis, however, growth per capita has been lower and several influential economists predict that future growth will probably also be lower than during the decades leading up to the financial crisis. Lower potential growth could thereby explain part of the downturn in real interest rates occurring during and after the financial crisis.[13]

The previous section discussed a method of estimating trends developed by Laubach and Williams (2003). A central equation in their model is derived from assumptions concerning the trade-off between consumption and saving made by households. The estimates of the model made by Holston et al. (2017) indicate that the potential annual growth rate in the United States was about 2 percentage points lower in 2015 than at the end of the 1990s. Based on theory, the model postulates a relationship between potential growth and equilibrium interest rate that entails a correspondingly large negative effect on the real interest rate of minus 2 percentage points.

Rachel and Smith (2015) and Holston et al. (2017) are thus examples of studies that find that worsened growth prospects have led to lower real interest rates. However, it is important to note that, in these studies, no empirical test has been carried out of the theory's prediction that lower growth leads to lower real interest rates.[14] Instead, this prediction forms a starting point for the conclusions. In recent years, however, a number of studies have been published that analyse the relationship in the data between trend or average growth and trend changes in real interest rates. These studies generally indicate that the relationship is weak and that the strength of the link can vary considerably, depending on which countries and periods are included in the data material. The conclusions apply to both the real interest rate's connection to GDP growth and to the growth in GDP per capita. As we are focusing on the relationship between the real interest rate and productivity growth in this section, we are concentrating on the results applicable to growth in GDP per capita.[15] This is because trend changes in growth in GDP per capita can be seen as a rough measure of trend changes in productivity growth.

Goldman Sachs (2014) calculates a measure of the real discount rate in a sample of 19 countries. In most cases, data goes back to the first half of the 1800s. For each of these 19 countries, the long period is divided into 13 time intervals and, for each time interval, the median of the real interest rate and growth in GDP per capita is calculated. These observations are then used in a simple regression analysis (in which the median for each period and country forms one observation), in order to estimate the correlation between

13 Based on a review of several studies, Rachel and Smith (2015) make the assessment that productivity growth over a fairly long time period can be expected to be about 0.5 percentage points lower than it was in the United States in the decades prior to the financial crisis. They argue that it is therefore reasonable to expect that the real interest rate will persistently be between 0.5 and 1 percentage point lower than prior to the crisis.

14 Rachel and Smith (2015), however, base their work on Havranek (2015), who conducts a metastudy of a large number of empirical studies estimating households' intertemporal consumption elasticity. According to economic theory, this elasticity is of decisive significance for the connection between expected growth and the real interest rate. However, the majority of the studies analysed by Havranek (2015) use either monthly or quarterly data. It is thus unclear whether the results from their studies can be used to draw any conclusions on the relationship between changes in long-term (trend) growth prospects and real interest rates.

15 Bosworth (2014) and Hamilton et al. (2016) analyse trend changes in real interest rates and GDP growth and both studies find that the relationship between the two variables is weak.

real interest rates and growth, among other variables of interest.[16] The results do not indicate any statistically significant relationship between the real interest rate and growth.[17]

Lunsford and West (2019) focus on the real policy rate in the United States and investigate the correlation between a large number of domestic and international variables that, according to economic theory, can affect the real interest rate. The authors use data that, in some cases, goes back to the 1890s and here they study the relationship over different periods. Lunsford and West (2019) investigate the relationship between the real interest rate and US growth per capita in both GDP and consumption, as well as growth in total factor productivity (TFP). In addition, they complement the investigation with an analysis of the real interest rate in the United States and growth per capita in about 20 other countries. The results indicate a weak correlation between the real interest rate and GDP growth and a comparatively clear, negative correlation between the real interest rate and US TFP growth.[18]

The findings of these two studies are based on comprehensive data and thus indicate a weak correlation between trends in the real interest rate and trend growth in GDP per capita. In addition, the study by Lunsford and West (2019) indicates a negative correlation between real interest rates and trend TFP growth. The results raise questions around assessments and model estimates that assume the existence of a relationship between real interest rates and productivity growth, and thereby also around the above-mentioned studies that give lower potential or trend growth as a reason for a lower real equilibrium interest rate.

At the same time, there are reasons to interpret these results with caution. One such reason is that individual trends often last for several decades. Consequently, there is only a limited amount of information on the relationship between trends in different variables, even in long historical time series. In the macroeconomic literature, it is therefore common to study covariations between factors in several different countries, to make use of experiences from each country. However, in the question being analysed here, and which concerns the determinants for the global real interest rate, this is hardly a possible way forward.[19]

Both average productivity growth and real interest rates have been low in many countries over the last ten years. However, based on the studies we have reviewed here, it is unclear whether the enduring downturn in real interest rates since the financial crisis can really be linked to the worsened growth prospects.

3.2 Demographic factors

Changes in the age composition of the population are significant for many macroeconomic variables, such as labour supply, potential growth, companies' willingness to invest and households' average saving ratio. Demographic changes could thereby conceivably affect the real equilibrium rate via several different channels.

One such channel, which is often discussed in the literature and the public debate on economic policy, is linked to how inclined households are to save. It has been well documented that there exists a clear correlation on the individual level between age and

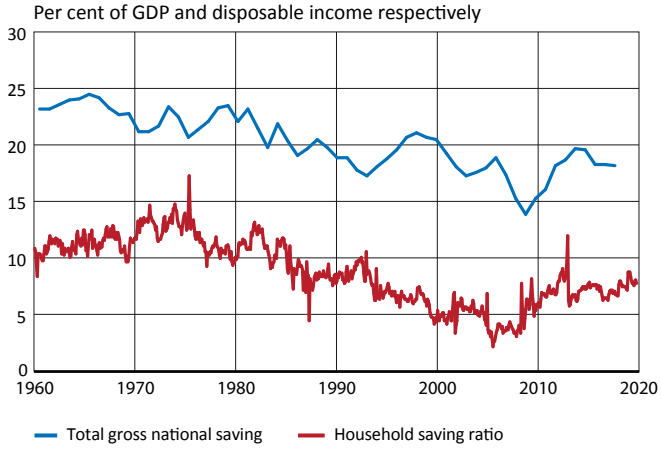
16 The authors also allow for country-specific fixed effects and they control for the level of inflation, the public debt ratio, the occurrence of crises in the banking system and of war.

17 The point estimate from the regression indicates the following relationship: if growth in GDP per capita falls by one percentage point, the real interest rate will fall by 0.10 percentage points.

18 Another study that analyses the connection between trends in real interest rates and GDP growth is Leduc and Rudebusch (2014). The authors note that the US expert authority, the Congressional Budget Office, and some members of the Federal Reserve's monetary policy committee, the FOMC, made downward revisions of their forecasts for the long-run real interest rate in conjunction with their downward revisions of potential growth in 2014. Leduc and Rudebusch (2014) investigate corresponding forecasts from the private sector and find, perhaps surprisingly, that these forecasts do not show any discernible correlation between potential growth and the long-run real interest rate.

19 In addition, Kiley (2019) points out that the downturn in global growth took place at the same time as we have observed slow changes in other possible explanatory factors, for example those linked to demographics. Under such circumstances, it may be difficult to distinguish which of these factors affect the real interest rate.

Figure 3. Saving in the United States, 1960–2019
Per cent of GDP and disposable income respectively



Note. The blue line shows the United States' total national gross saving as a percentage of gross national income. The red line shows the average household saving ratio, expressed as a proportion of disposable income.
Source: NIPA table 5.6, Bureau of Economic Analysis

saving in most countries, where young people, for natural reasons, consume significantly more than they save, while middle-aged people usually save a significant proportion of their incomes. Older people often have relatively high consumption, as expenses for health and medical care are also counted as part of consumption in economic terms. Persons aged 65 or older also have comparatively low average employment incomes. Taking account of consumption taking place via public or private insurance systems (including expenses for health and medical care) it becomes clear that older people are contributing to restraining society's total saving.[20]

In many of the world's countries, significant changes have been occurring in the age composition of the population for several decades. The proportion of people in the ages 40–64 has increased quite rapidly and their share of the world's total population had increased to a good bit over 30 per cent by 2010. This can be compared with around 25 per cent in the 1950s. The percentage of older people in the population has also increased, albeit at a significantly slower pace. One important reason for this shift in the age composition is the unusually large number of children born after the Second World War (see Bean et al. 2015).

A high proportion of middle-aged people should lead to a high average saving ratio. As the share of middle-aged people in the population has increased, it could therefore be expected to lead to a gradual outward shift in the supply of savings (compare with Chart 1). Several studies have therefore indicated that changes in the age composition of the United States and other large economies can probably explain part of the downturn in interest rates. A related phenomenon, which should also contribute towards a high level of saving, is that life expectancy in recent decades has increased at a significantly faster pace than the average age at which people retire. Being a pensioner for a longer proportion of your life requires you to save more while you are working.

One problem with this reasoning, however, is that saving ratios have fallen in several western countries over the same decades as the real interest rate has shown a falling trend. For example, Figure 3 shows total gross saving in the United States, expressed as a percentage of gross national income. We can see that saving was comparatively high at the end of the 1960s and in the 1970s, when the trend in the US real interest rate was upward (compare with Figure 1). During the period when the real interest rate in the United States was showing a falling trend, from the start of the 1980s until 2010, the saving ratio in the

20 See, for example Rachel and Smith (2015), section D.

United States instead showed a clear downward trend. A similar picture emerges from an examination of total saving in the G7 countries. Figure 3 also shows that the downward trend in total saving in the United States was partly due to households saving less.

The fact that the saving ratio has fallen in several large, advanced economies shows that the link between the age composition of the population and real interest rates is not as clear and intuitive as is sometimes claimed. So what other channels are there through which demographic changes can affect the equilibrium interest rate? We mentioned earlier that the supply of labour affects companies' incentive to invest. Demographic changes often affect the supply of labour and there is therefore reason to expect that such changes will affect demand for savings, via companies' investment decisions.

In periods of unusually low growth in the supply of labour, it is often optimal for companies to choose a lower rate of growth in the capital stock, for a given interest rate level. Chart 1 above provides a schematic illustration of the equilibrium on the market for saving and investment. A lasting downturn in the labour supply would lead to an inward shift of demand for investment for each given level of the real interest rate. In equilibrium, both the real interest rate and the investment ratio would thereby be lower.[21]

A conceivable explanation for the falling saving ratio in many countries is therefore that demographic changes have simultaneously led to a higher supply of savings and a lower demand for investment, and that this second effect has dominated. According to this hypothesis, the saving ratio should certainly have increased for each given level of the real interest rate (an outward shift in the supply curve *S(r)*). At the same time, however, the lower willingness to invest should have led to an inward shift in demand for savings, *I(r)*. If the shift in the *I(r)* curve is large, the equilibrium interest rate may fall so far that the household saving ratio falls, even though the *S(r)* curve has shifted outwards. Once circumstance in favour of this hypothesis, alongside the falling saving ratio, is that the ratio of investment to GDP has also fallen in several advanced economies. Among the G7 countries, the ratio of total investment to GDP fell from a level close to 25 per cent at the end of the 1980s to a level around 20 per cent in 2010.[22]

To analyse and quantify the effects demographic changes have on interest rate formation, economists often use overlapping generation models (OLG models). These models allow economists to account for changes in the birth rate, life expectancy and other demographic variables and to use simulations to calculate the effect of these variables on the economy's general equilibrium. Gagnon et al. (2016) use an OLG model to analyse the macroeconomic effects of post-war demographic changes in the United States. As has already been mentioned, birth rates in the United States and several other western countries were high in the decades after the Second World War, the so-called baby boom. When these children reached adulthood, which happened between the years 1965 and 1985 in the United States, the labour force grew rapidly. The effect was reinforced by women in this generation having significantly fewer children and working to a greater extent than women in previous generations. Gagnon et al. (2016) carefully reconstruct these demographic trends in the OLG model and then carry out simulations to quantify the effects on the real interest rate, among other variables. The total effects of a lower birth rate, a higher employment rate and increasing longevity can explain a trend decrease in the real interest rate corresponding to about 1.25 percentage points.

21 A standard result from macroeconomic theory is that the marginal return on capital, and thereby the average company's incentive to invest, is closely linked to the average ratio between the number of hours worked and the amount of available capital. If the labour supply is unusually low over a period, the ratio of labour to capital will be low when the capital stock is adjusted to the new, lower level of the labour supply. In turn, such a development will push down the marginal return on capital, thereby dampening companies' incentive to invest in new capital.

22 This refers to gross capital formation as a share of GDP in the G7 countries, calculated as a GDP-weighted average of the shares of the individual countries. The weights refer to GDP at PPP. Own calculations based on data from the IMF's World Economic Outlook Database, October 2019.

In this and similar studies, one of the most important mechanisms seems to be companies' incentive to invest. According to the simulations, the higher labour supply from the baby boom generation led to the ratio of labour to capital rising in the 1960s and 1970s. This ratio then fell heavily from the mid-1980s on. In the models, the marginal return on capital is closely linked to the real return on savings, and the real interest rate therefore rises in the 1960s and 1970s, before falling markedly between 1985 and 2020.[23]

One interesting result from the simulations is that the household saving ratio is at its highest around 1980, when the real interest rate is also at its highest, and that it then falls significantly until 2020, at the same time as the real interest rate falls over the entire period. It therefore seems as though the effects of a reduced labour supply, and thereby lower demand for investment, on the equilibrium interest rate dominate the effects of a changed supply of saving. During the period from 1960 until 2020, the real interest rate is at its lowest in 2020, at the same time as the saving ratio, according to the simulations, also reaches its lowest level.[24]

Simulations from the OLG models thus seem to be able to explain why the saving ratio in the United States fell over the same period as the real interest rate showed a falling trend, from the mid-1980s until 2010. Unfortunately, criticism can also be levelled at this interpretation of the reasons behind the trend decline of real interest rates. This is because the real interest rate on savings is closely linked to the marginal return on capital in the OLG models: a low marginal return on capital means a low real return on savings and vice-versa. In turn, this means that the average return on capital is also closely linked to the real return on savings. If the interpretation of the OLG models is correct, the average return on capital in the United States should have fallen over the same period in which real interest rates fell. But studies calculating the return on capital in the United States do not indicate any such trend. These instead show that the real return on capital in the US private sector has been stable or has increased slightly since 1980.[25] All calculations of the average return on capital presume quite a lot of assumptions, each of which can be questioned, and the results reported in the literature should therefore be interpreted with some caution. But there is nothing to indicate that the return on capital in the United States should have fallen in the decades when the real interest rate was showing a falling trend.

Objections can thus be raised concerning the OLG models' predictions on the relationship between the real interest rate and demographic changes. However, despite these objections, there is quite strong empirical support for a relationship between the real interest rate and various demographic factors. For example, several studies find that the real interest rate in the United States has been comparatively low in periods when an unusually high proportion of the population have been in the ages of 40 to 65. Some studies also indicate a correlation between real interest rates and the proportion of the population which is either young or over 65, known as the dependency ratio.[26] In addition, one of the studies mentioned in the

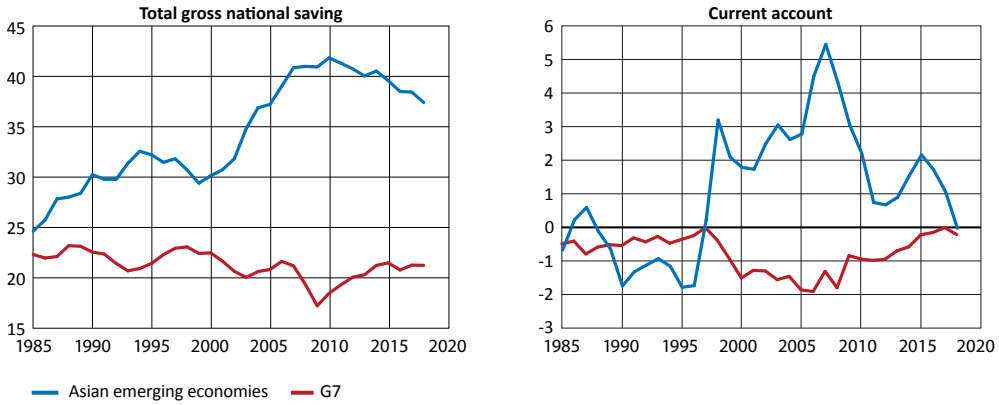
23 The households and companies in the model expect these effects on the marginal return on capital long before the effects actually arise. Gagnon et al. (2016), like most other studies of this kind, assume that households and companies are forward-looking, that they have correct expectations of how different variables affect the equilibrium of the economy and that there is no uncertainty over the future development of the economy.

24 Krueger and Ludwig (2007) provide another example of a model with overlapping generations, where a changed age composition leads to downturns in both the real interest rate and the saving ratio. In this case too, the effects on the equilibrium interest rate seem to be dominated by the supply of labour and its effects on the ratio of labour to capital. See also the related studies by Geppert et al. (2016) and by Lisack et al. (2017).

25 A common assumption in OLG models is that households only have access to one kind of asset for saving, namely capital. Simulations of the models are often made under the assumption of perfect foresight, meaning that future economic developments are known to all households and companies when they take their decisions. Consequently, there is no possibility in these models to distinguish between assets whose return is risk-free and assets whose return is associated with risk. For calculations of the return on capital in the United States, see Caballero et al. (2017b), Gomme et al. (2011) and Koh et al. (2018).

26 Favero et al. (2016), Fiorentini (2018), Lunsford and West (2019), Poterba (2001) and Rachel and Smith (2015) are examples of studies that investigate the correlation between trends in real interest rates and the age composition of the population. The proportion of the population between 40 and 64 years of age is closely related to, but not exactly the same as, the dependency ratio. Lunsford and West (2019) use both variables in their analysis. They define the dependency ratio as the proportion of the population that is either younger than 20 or older than 64 years.

Figure 4. Saving and current accounts in G7 countries and in Asian emerging market economies 1985–2018
Per cent of GDP



Note. Within each group of countries, both total saving and the current account have been weighted with GDP at purchasing power parity (PPP).
Sources: IMF World Economic Outlook Database and own calculations

last section, Lunsford and West (2019), reports a remarkably clear, positive correlation between trends in the real interest rate and the trend growth in the number of hours worked in the United States.

To summarise, it can therefore be said that both economic theory and correlations in data suggest that demographic changes are important for real interest rates. The mechanisms behind these correlations are certainly complex. The macroeconomic models that include demographic variables often cannot explain why the return on different types of assets develops in different ways. Overall, however, there is nevertheless comparatively strong empirical support for the theory's prediction of a correlation between trends in real interest rates and the age composition of the population and supply of labour.

3.3 High levels of saving in Asian emerging market economies

Several studies of real interest rates focus on developments in the United States and other advanced economies in the western world. But as has already been pointed out, there are strong arguments suggesting that trend changes in interest rate levels must be understood from a global perspective. One compelling argument is that capital markets in several countries were deregulated in the 1970s and 1980s and that since then, it has been possible to move financial assets freely between countries and continents. In addition, a growing number of emerging market economies, especially in Asia, have become increasingly integrated with the advanced economies since the 1990s, partly as a result of increased trade.

In a speech in 2005, the US economist, and later chairman of the Federal Reserve, Ben Bernanke mooted the idea that the growing current account deficit of the United States must be seen in the light of a high level of saving among emerging economies, especially in Asia, and large current account surpluses among the world's oil-exporting countries. As an explanation to the high level of saving in Asia, Bernanke (2005) pointed to a desire among many Asian governments to build up substantial currency reserves and to promote export-led growth. Other economists have instead emphasised such factors as a rapidly ageing population and poorly developed financial markets as the most likely explanations for the high level of saving among Asian countries.

Figure 4 shows total gross national saving among Asian emerging market economies.[27] The corresponding saving ratios among G7 countries are shown as a comparison. We see that the average saving ratio among G7 countries fell by a few percentage points from the mid-1980s up until the outbreak of the global financial crisis in 2007. During the same period, the saving ratio rose sharply among Asian emerging market economies, from about 25 per cent in 1985 to around 40 per cent in 2007.

But to understand how the high level of saving in Asia has affected the global real interest rate, it is not enough just to study how saving has developed in different countries. The level of domestic investment must also be taken into account. From the definitions of the balance of payments and the national accounts, an identity is obtained according to which a country's total net foreign saving, the current account, is equal to the difference between total national saving and domestic investment:

$$(1) \qquad \frac{Current\ account}{GDP} = \frac{S}{GDP} - \frac{I}{GDP}$$

Chart 2 shows the link between the global equilibrium for saving and investment, which we discussed previously, and the equilibrium in an individual country. To the right is an example of an individual country in which domestic investment is greater than the total national saving. The current account is therefore negative. In what is known as an autarchy equilibrium, in which no foreign trade is possible, the real interest rate would be higher with higher domestic saving and a lower investment ratio. However, to the extent that capital, goods and services can be moved freely across borders, the domestic equilibrium adapts to the interest rate that applies on international capital markets. At the global equilibrium rate, some countries will have a current account deficit, where investment exceeds saving, and others will have a surplus on the current account.

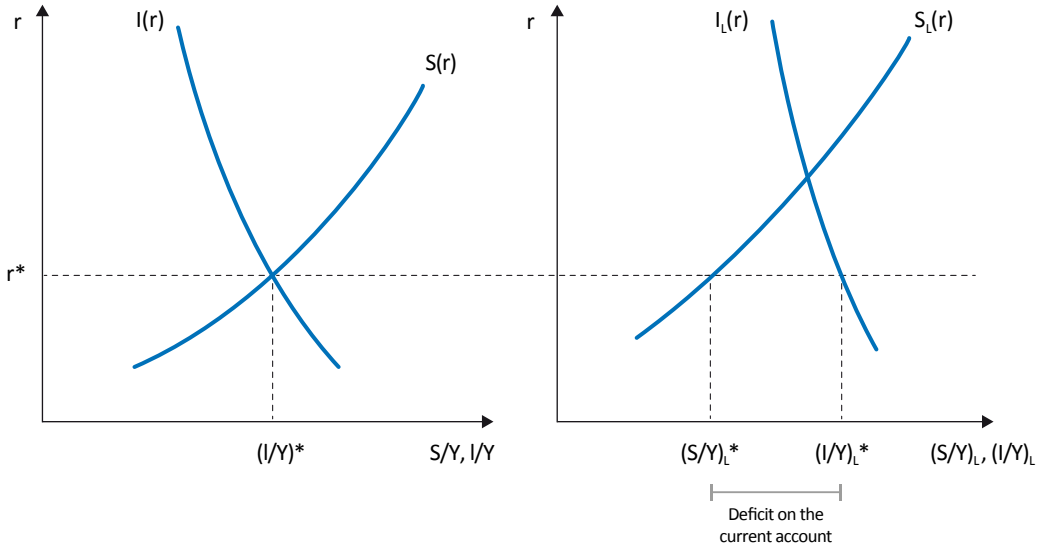
How then have the current accounts in the G7 countries and the Asian emerging market economies developed over the period in which saving in Asia increased sharply? The right-hand graph in Figure 4 shows the GDP-weighted current account in both groups of countries. At the start of the 1990s, the rapidly growing countries in Asia had an overall deficit in their payments vis-à-vis the rest of the world. These relatively small deficits coincided with the period when China, through growing trade, became more and more integrated with Japan and the advanced economies in the West.

But this deficit changed rapidly into a surplus in conjunction with the financial and currency crises that affected many Asian countries in the second half of the 1990s. This fairly abrupt development is one of the circumstances that Bernanke (2005) pointed to and that has been linked to a changed attitude to the need for public saving. After the financial and currency crises, many countries in Asia started to compile significant foreign exchange reserves, partly so that they would be able to dampen the effects of an unexpected and sudden flight of capital.

At approximately the same time, fairly large current account deficits were created in several advanced economies. From the end of the 1990s until the outbreak of the financial crisis in 2007, the GDP-weighted current account of the G7 countries fell by the equivalent of almost two per cent of GDP. The United States was one of the G7 countries where the deficit became large – in 2006, the US current account deficit was equivalent to almost 6 per cent of

27 Saving is expressed here as the GDP-weighted average of the saving ratios in the different countries (China, India, Indonesia, Malaysia, Pakistan, the Philippines, South Korea, Taiwan and Thailand). The saving ratio of each individual country is in turn calculated as the ratio between total gross national saving and GDP.

Chart 2. Supply and demand for saving in an open economy. A schematic illustration.



Note. Schematic illustration of a global, long-term equilibrium in which the supply of savings, *S(r)*, and demand for investment, *I(r)*, balance at the interest rate *r**. On the left-hand side of the illustration, the horizontal axis shows the world's total investment and saving as a proportion of the world's GDP, denoted *Y*, and the vertical axis measures the real return on saving. The right-hand side of the illustration shows the corresponding equilibrium in an individual country, denoted *L*, with capital and product markets that are open for trade with the rest of the world. In an open economy, there is no reason to expect domestic saving, $(S/Y)_L$, to balance domestic investment, $(I/Y)_L$. The illustration shows an example where investment in the individual country is greater than the level of saving and where the current account is therefore negative.

the country's GDP. These large capital flows from emerging to advanced economies must chiefly be understood in the light of changes in saving.[28]

Chart 2 illustrates the situation that prevailed in the G7 countries from the end of the 1990s until very recently, if these countries are seen as a consolidated economy. During these years, the GDP-weighted current account in the G7 countries was negative. But it is difficult to assess which effects these international capital flows have had on the real interest rate. Bean et al. (2015) point out that the downturn in the G7 countries' real interest rates started in the second half of the 1990s and coincided with the emergence of significant global imbalances in saving and investment, with large current account surpluses in emerging market economies and correspondingly large deficits in the advanced economies (compare Figure 1, lower graph, and Figure 4, right graph). Coeurdacier et al. (2015) show, in model simulations that include China and the United States, that the combination of high growth and extensive loan restrictions in China can explain both why saving increased in China and why the return on saving decreased by several percentage points. According to these model simulations, the downturn in the interest rate simultaneously led to saving falling in the United States.

3.4 Higher premiums on risk-free assets

Most of the studies we have cited so far focus either explicitly or implicitly on trends in real policy interest rates and in government borrowing rates in the United States and other advanced economies. This is thus a matter of interest rates on loans that are generally considered to be associated with very low risk. Most investors consider bills and bonds

28 The pattern in these capital flows are otherwise the exact opposite of what could be expected, based on classic economic theory on international trade. Households in emerging economies with rapid growth should, according to standard theory, save less when their countries are opened up for trade with more advanced countries, that grow at a comparatively slower pace. The high growth rates in emerging countries should, at the same time, push up the real interest rate on the global market and lead to a capital flow from advanced countries to emerging countries. But this did not happen. See Gourinchas and Jeanne (2013).

issued by the governments of the United States and Germany, for example, to be safe assets, where the risk of default is very low. In recent years, increasing numbers of studies have analysed the spread between yields on such safe assets and the real return on higher-risk investments. Rachel and Smith (2015) analyse a large number of assets in several different countries and conclude that the average compensation for risk may have risen by as much as 1 percentage point since the 1980s.

The conceptual framework illustrated in Charts 1 and 2 does not explicitly take into account that both lenders and most borrowers, as a rule, face different interest rates than those central governments face. If the spreads between different interest rates were constant over time, they would not affect the analysis to any significant extent either. But if the spreads in return vary over time, they will affect the real equilibrium interest rate, even for so-called safe assets. It is relatively easy to extend the simple conceptual framework so that it includes interest rate differentials on different types of loan. The intuition behind the results is straightforward, however, and we therefore confine ourselves to describing it verbally.

Let us assume that the difference in interest for two different loans depends on the probability of default being greater for one of the loans. For example, this could be due to one borrower being a government with well-functioning institutions, and the other a company with uncertain future prospects. Assume now that a change takes place over time meaning that lenders, for some reason, become less willing to grant high-risk loans at each given interest rate level.[29] Assume too that both the overall supply of savings and the overall demand for loans otherwise remain unchanged. At a given interest rate, both the state and the company wish to borrow as much as they did before the lenders changed their willingness to take on risk.

One reasonable consequence of such a change is that the interest rate for the government loan falls slightly and the interest rate for the corporate loan rises slightly. The reason is that the company must offer the lenders slightly greater compensation for the risk they run in providing the corporate loan. At the same time, the government, for its part, can borrow at a slightly lower interest rate than previously, as households value the security in the government loan more. In equilibrium, the interest rate on safe loans has thus fallen, at the same time as the return on high-risk assets has risen.

In the example, we assumed that households had become less willing to take on risk, without specifying why. However, one hypothesis that has gained great attention in the research literature in recent years focuses on a specific reason for greater spreads in returns between higher and lower risk loans. In a number of studies, Ricardo Caballero, Emmanuel Farhi and Pierre-Olivier Gourinchas have highlighted and attempted to explain why the return on capital has fallen significantly less than return on loans with comparatively low risk, such as the yield on US government bonds. It is worth pointing out that Caballero et al. (2017a) and Caballero et al. (2017b), for example, focus on the estimated return on capital and on the return on equities, respectively. Consequently, this is not a matter of comparing the interest rate on different types of loan, such as the difference in rate between a government bond and a corporate bond or a bank loan. Instead, the discussion focuses on comparing the safe yield with a return that is wholly or partly linked with ownership.[30]
Put very simply, one starting point for the hypothesis is that global demand for so-called

29 Such a changed attitude toward risk may be due to many different causes. One example is that the average saver has become older and that the remaining time to pension, when savings will be used, has become shorter. The shorter the time horizon a saver has for their saving, the stronger reasons that saver will have, in general, to save in safe assets.

30 The hypothesis of a shortage of safe assets is one of several possible explanations for the phenomenon of larger differences in return between more and less safe assets. Marx et al (2018) put forward another possible explanation, namely that uncertainty over future economic developments may have increased. Marx et al (2018) use a model with overlapping generations in which the risk premium, which constitutes the difference between the return on capital and the real interest rate for risk-free loans, is a variable that is determined in equilibrium. Simulations of the model indicate that recent years' increases in risk premiums are due to increased uncertainty over future, aggregate productivity growth. However, the results are based on the assumption of remarkably high risk aversion in the household sector.

safe assets with low perceived risk grows at a rate that is approximately proportional to the growth rate of the world's total GDP. At the same time, it is assumed that only a limited number of countries and organisations have the institutional credibility and underlying financial strength needed to create safe assets, such as government bonds with low risk. Examples of such institutions are the western states considered to have the highest credit ratings and legal systems characterised by a high degree of independence and professionalism, for example the United States. According to the theory, the problem is that most of these states and organisations can be found in economies that, on average, are growing more slowly than the global economy. As these institutions have reason to increase their borrowing at approximately the same rate as their own economies are growing, a chronic shortage of safe assets is created. In turn, this shortage implies that the price of safe assets shows faster trend growth than the price for higher-risk assets. As the return on a bond, for example, is partly determined by its price and becomes lower as the price gets higher, this chronic shortage of safe assets entails a negative trend in the return on those same assets.

4 Concluding discussion

Real interest rates for government borrowing have fallen by several percentage points over the last 30 years, in advanced economies. Today, households and companies can also generally borrow at a significantly lower real cost than in the 1990s. The results of three different estimates indicate that, in recent decades, there has been a global downward trend in real interest rates of between 2 and 3 percentage points. But there is considerable uncertainty in these estimates. Different studies also reach different results regarding both how large the decline is and exactly when it started. They all indicate, however, that the trend level of global interest rates has been close to zero in recent years.

According to standard macroeconomic models, there is a close relationship between a country's real interest rate and the growth rate of its economy. But several empirical studies indicate a weak or non-existent correlation between trend changes in both variables. One such study even points to a negative correlation between trends in real interest rates and trends in productivity growth in the United States.

There are certainly reasons to interpret these results cautiously. The body of data that can be used to study slowly acting, global trends is fairly small, for natural reasons. A reasonable assessment is that we have observed only two such global trends in real interest rates in the post-war period. It is therefore uncertain if researchers will be able to draw any firm conclusions on the driving forces of the trends, based on this material.

To gain access to a larger body of data, some studies use time series stretching all the way back to the 19th century. But the interpretation of such data is made more difficult by the fact that at several times over the last 150 years, the world's leading industrial nations have radically changed the conditions for international trade in goods, services and capital. Periods of more or less free international capital movements, for example during the halcyon days of the gold standard at the end of the 19th century up until 1914, have been interrupted by periods of strictly regulated capital movements. Can such revolutionary changes explain the absence of a clear correlation between growth and real interest rates? Or does the negative result instead depend on macroeconomic theory simply giving too much weight to the real interest rate in households' choice between saving and consumption?

Both economic theory and correlations in the data suggest instead that demographic changes, such as shifts in the age composition of the population, are important for real interest rates. The mechanisms behind these correlations are certainly complex. The macroeconomic models that include demographic variables often cannot explain why the return on different types of assets develops in different ways. Overall, however, there is

nevertheless comparatively strong empirical support for the theory's prediction of a correlation between trends in real interest rates and the age composition of the population and supply of labour.

An analysis of the current accounts in different countries points fairly clearly towards there also being a connection between falling real interest rates in the western world and the remarkably high levels of saving in China and other Asian emerging market economies from the end of the 1990s and on. Asia's exports of savings to the west can explain why saving has fallen in several advanced economies at the same time as real interest rates have fallen around the world.

One further factor that has probably contributed towards pushing real interest rates down is an increase in premiums for those assets considered safe. Higher premiums on safe assets, such as government bonds, imply that the yields for these bonds are becoming lower. But the increase also has the consequence that the return on higher-risk assets, such as equities, is falling less than the downturn in government lending rates.

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