What do negative policy rate economies have in common?[*]

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Abstract

Nominal interest rates fell to record low levels globally in the decades prior to the pandemic. Five economies, Denmark, the euro area, Switzerland, Sweden and Japan, stand out by having adopted negative interest rate policies (NIRP). In this paper, we document that these economies have high levels of private and in most cases also public savings, not matched by investment, relative to other high-income non-NIRP OECD economies. We also show that high savings in NIRP economies are likely to be associated with prudent public finances and population ageing. The structure of pension systems might also play a role, although this is not clear cut. In the years following the financial crisis and leading up to the pandemic, NIRP economies experienced particularly subdued inflation compared to other advanced economies. This could reflect that equilibrium real interest rates are lower in NIRP economies due to higher savings, making the effective lower bound constraint on monetary policy rates more binding.

1. Introduction

Prior to the outbreak of the Covid-19 pandemic and the Russian invasion of Ukraine, global nominal interest rates had been trending downward for decades. This culminated in historically low interest rates across the advanced economies with nominal interest rates in some cases becoming negative. In the wake of the pandemic and the invasion, inflation rose markedly across the advanced economies, prompting central banks to raise nominal interest rates. Currently, there is uncertainty as to where interest rates will go once the battle against inflation is definitively over.

The decline in nominal interest rates since the 1980's reflects a combination of a decline in structural equilibrium real interest rates and, until the pandemic, a decline in inflation. Figure 1 shows short-term nominal and (ex post) real interest rates as well as inflation for the median OECD country from 1870 to 2017. Like nominal rates, real interest rates have been falling since 1980, with the real interest rate for the median OECD country turning negative around 2010. It is not the first time in history that real interest rates have been negative. However, while earlier episodes have been associated with surprise increases in inflation, the recent episode leading up to the pandemic is unusual by coinciding with an extended period of subdued inflation. Inflation was particularly subdued following the global financial crisis (GFC) in 2008. Low real interest rates combined with subdued inflation led to nominal interest rates reaching record lows in the years leading up to the pandemic.

Figure 1:
Unlike previous episodes, negative real interest rates following
GFC reflected low nominal rates and not high inflation
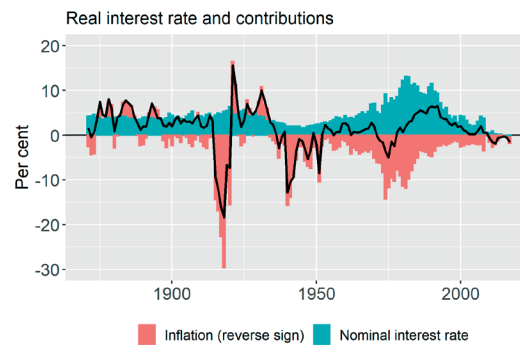
Note: Short term nominal interest rate, realized yearly inflation, and (ex post) real interest rate for the median country. Note that the three variables are not necessarily for the same country. The figure is based on the yearly data from 1871 to 2017 for all countries in the dataset from Jorda et al. (2019). The variables used are the short term interest rate (STIR) and inflation is based on the CPI index. Real rates are calculated as the difference.

Source: Jorda et al. (2019) (Macrohistory).

Five economies stand out by having adopted negative interest rate policies, NIRP, since the global financial crisis, cf. figure 2. Denmark was the first country to adopt NIRP in June 2012. The adoption of what was at that time an unprecedented policy measure reflected the monetary policy regime in Denmark of an exchange rate peg to the euro, and strong capital inflows during the sovereign debt crisis in a number of euro area countries. Moving the policy rate into negative territory was necessary to sustain the peg. Sweden, Switzerland, Japan and the euro area followed suit in subsequent years, with negative policy rates being introduced as a means of providing stimulus to demand in order to achieve their inflation targets. Denmark and Switzerland have ventured furthest into negative territory with policy rates reaching -0.75 per cent in early 2015.

Figure 2:
Five economies have experienced negative policy rates

Denmark — Euro area — Japan — Sweden — Switzerland
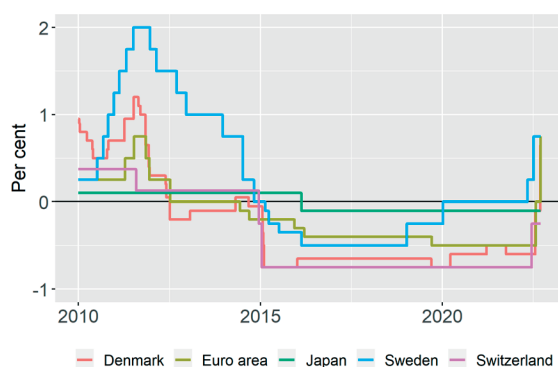
Note: Policy rates are the central bank leading interest rate for monetary purposes. In periods where central banks have employed target ranges for money market rates, the middle of the range is used. Latest observation is 12 September 2022 (the recent interest rate hike from the ECB is shown, although first with effect from 14 September 2022).

Source: Refinitiv Datastream.

The NIRP has come to a close, at least for now. In December 2019, the Swedish Riksbank became the first central bank to exit from NIRP. The European Central Bank abandoned NIRP in July 2022 amid sharply rising inflation in the euro area. Subsequently, Denmark and Switzerland followed suit, with Japan being the last country to exit from NIRP in February 2024. As the episode of exceptionally low interest rates has come to a close, we investigate the commonalities of the economies having employed NIRP. While there is considerable uncertainty around the future course of interst rates, some of the factors that have been pulling down on equilibrium interest rates are likely to persist, such as ageing populations and relative slow productivity growth. This suggests that NIRP could again become relevant as a monetary policy tool in the future. The implica-

tions of NIRP have been analysed in a large number of studies, see e.g. Brandao-Marques et al. (2021) for a survey.

This paper looks at what macroeconomic and structural factors have distinguished NIRP economies from comparable advanced economies that did not adopt NIRP. The analysis allows for three overall conclusions regarding drivers and consequences of low interest rates in NIRP economies.

First, we find that the NIRP economies tend to be characterised by high levels of private and in most cases also public savings. In contrast, investment in physical capital does not deviate markedly from levels seen in other advanced economies. In a textbook closed economy without access to international capital markets, savings will always be equal to investments, and a stronger desire to save would yield a lower equilibrium real interest rate, $r*$. In an economy with open and frictionless capital markets, on the other hand, realised savings can exceed realised investment for a given interest rate, resulting instead in a current account surplus. Between the two extremes of fully closed and fully frictionless open economies, the excess savings in NIRP economies are likely to lead to a combination of a lower local $r*$ relative to a global $r*$, and current account surpluses and capital export. Indeed, savings and investment patterns suggest that local factors exercising a potential downward pressure on $r*$ have been especially strong in the NIRP economies.

Second, we argue that high savings, potentially driven by a combination of demographic factors, pension systems and prudent fiscal policies, may imply a particular low $r*$ in NIRP economies. We consider the main candidate causes of recent declines in $r*$ pointed to in the literature and show that NIRP economies tend to have experienced more rapid population aging and exhibited more restrained fiscal policies in recent decades. Incentive structures for saving built into pension systems are hard to compare across countries. With this caveat in mind, available data are consistent with pension system structures in some NIRP economies potentially having played a role. However, modest pension savings in other NIRP economies suggest that the conslusion is not clear cut. Other candidate causes considered in the literature, such as rising inequality and market power, that may have played a role in driving global interest rates down, are not distinct features of NIRP economies relative to other economies.

Third, the potentially lower $r*$ in NIRP economies could mean that monetary policy space may have been more limited in these economies in recent decades, in turn potentially having contributed to relatively subdued inflation rates prior to the pandemic. $r*$ is a benchmark for the monetary policy stance implied by policy rates. Thus, a given level of the policy rate is less stimulating when $r*$ is lower, all else equal. As a consequence, economies with lower $r*$ by definition hit the lower bound on policy rates earlier than countries with a higher $r*$. This implies that monetary policy space has been more constrained by the effective lower bound in NIRP economies (Koester et al. (2021), Lis, Nickel, and Papetti (2020)).

While NIRP has been used to counter the constraints of the zero lower bound, the proximity to an effective lower bound may still have constrained monetary policy in the inflation targeting NIRP economies. Such lower bound constraints are consistent with the low inflation rates and the downward drift in medium to longer term inflation expectations observed in NIRP economies as compared with other advanced economies, in recent decades.

This paper is structured as follows. The next section presents some key stylized facts on macroeconomic and structural characteristics of NIRP economies relative to a panel of comparable advanced economies which have not employed NIRP. Underlying candidate causes of the high saving rates in NIRP economies are considered in the subsequent section, while Section 4 discusses the link to monetary policy space and low inflation in NIRP economies. The final section concludes and discusses implications for the years ahead.

## 2. Stylised facts: Savings and investments in NIRP economies

The widespread decline in real interest rates in recent decades reflects a fall in r^*. This has been well documented in the literature, where r^* has been estimated across economies (Rachel and Summers (2019), Brand, Bielecki, and Penalver (2018), Holston, Laubach, and Williams (2017), Fiorentini et al. (2018), Grossman et al. (2019), Pedersen (2015), Armelius, Solberger, and Spånberg (2018), Arena et al. (2020), Brand, Goy, and Lemke (2021), Fries et al. (2017)). r^* can be defined as the real interest rate that equates savings and investments in a world without frictions – or alterna tively, the real interest rate that is consistent with inflation on target and production at its potential (Woodford (2003)).[1] The decline in r^* globally reflects underlying structural factors that have either led to an increase in the desire to save or a reduction in the desire to invest in physical assets. Whereas the trend in r^* is clear, the estimated levels of r^* are highly uncertain, making it difficult to compare estimates across economies.

In an open economy, r^* will to a large extent reflect global conditions since large discrepancies in r^* across countries will tend to result in capital flows towards countries with a high r^*, thereby causing the gap between country specific r^*'s to narrow. However, capital mobility is not perfect, implying that local factors, and hence local savings and investment rates, can play a role in affecting local r^* levels even in highly open economies. Also, country-specific shocks may cause time varying cross-country differentials in r^* (Clarida (2019)). As r^* can be seen as a benchmark for the monetary policy rate, we examine in the following

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1. The concept of the natural rate of interest can be ascribed to Knut Wicksell, see Wicksell (1936). Hence, it is also occasionally referred to as the Wicksellian rate.

whether the factors responsible for the decline in r^* have been especially pronounced in the NIRP economies relative to other advanced economies

NIRP economies are generally characterised by high levels of national savings. Figure 3 shows that average savings rate for the NIRP economies as a whole is higher than the OECD average. The OECD is the relevant benchmark as the NIRP economies are all high-income market economies. At the individual level, savings rates vary across NIPR as well as non-NIRP economies, cf. figure 4. Noticeably, the NIRP economies have relatively high savings rates compared to large high-income OECD economies such as Australia, Canada, the United Kingdom and the United States. At the same time, investment in physical capital is not generally higher in NIRP economies relative to other advanced economies, cf. figure 5. As a consequence, Denmark, Sweden, Switzerland, and Japan have persistently been running current account surpluses at least since 2000, see figure 6. The euro area has had a current account surplus each year from 2012 to 2021, albeit with a substantial degree of heterogeneity between the member countries.
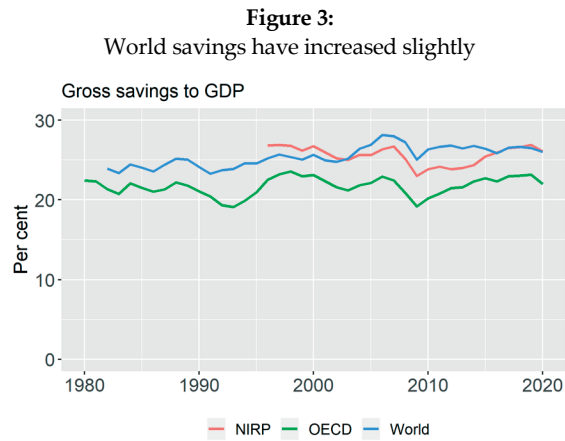
Figure 3:
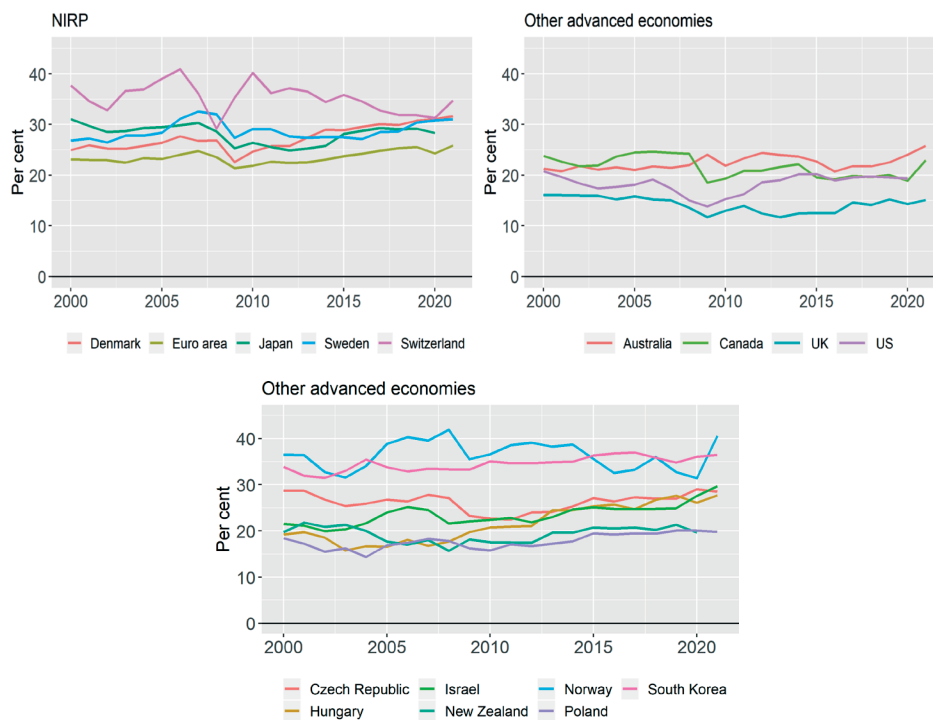World savings have increased slightly

Note: Gross savings rate to GDP. Gross savings are calculated by the World Bank as gross national income minus total consumption plus net transfers. The aggregation method is a weighted average. We have calculated the series for NIRP by weighting individual NIRP economies gross savings rate with nominal GDP. Due to missing data for Japan's savings rate in 2020, we use the value from 2019.
Source: Refinitiv Datastream and own calculations.

Figure 4:
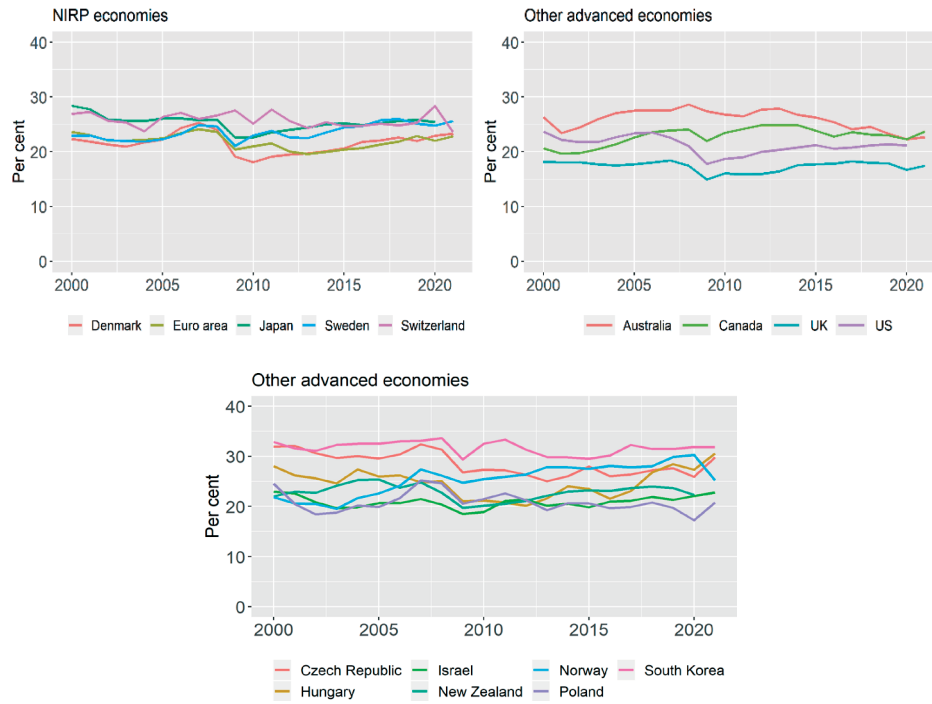Savings rates are high in negative-rate economies

Note: Gross savings rate to GDP. Gross savings are calculated by the World Bank as gross national income minus total consumption plus net transfers. The aggregation method is a weighted average.

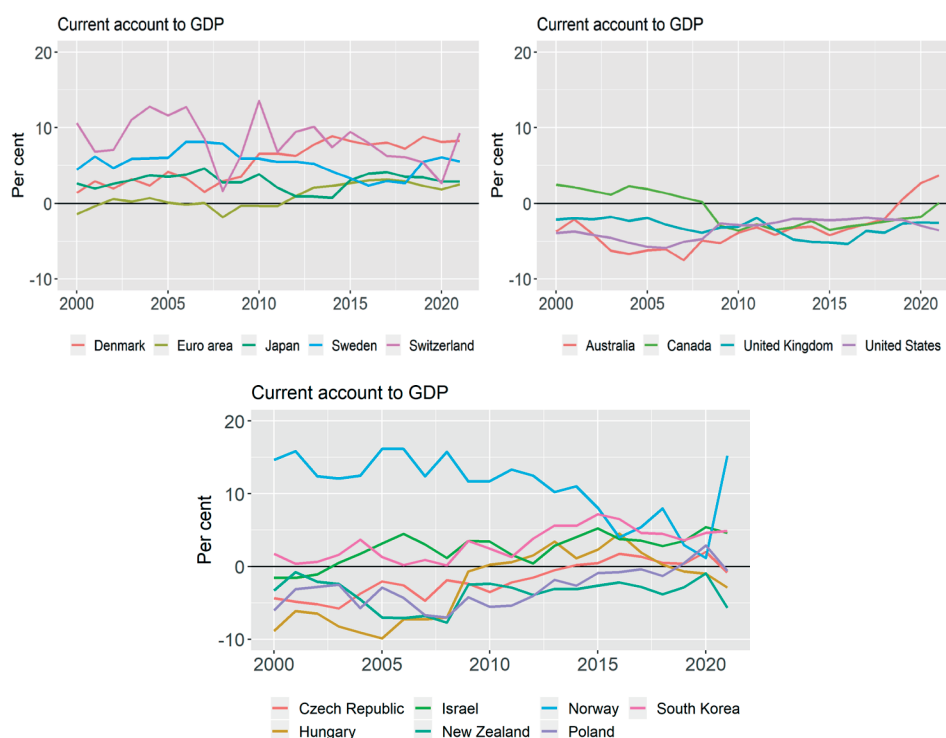Source: Refinitiv Datastream.

Figure 5:

Real investments in NIRP economies are similar to other advanced economies

Note: Gross capital formation to GDP.
Source: Refinitiv Datastream.

Figure 6:
Negative-rate economies are net savers

Note: Current account surplus to GDP.
Source: Refinitiv Datastream.

The current account surpluses could indicate that in NIRP economies, a strong desire by households and firms to save relative to their desire to invest has been pushing down structural real interest rates to a larger degree than in other advanced economies. As r^* is a benchmark for policy rates, this suggests that negative policy rates in the NIRP economies could reflect very low levels of r^* in these economies. Among the other high-income OECD countries, Norway and South Korea stand out by being characterised by high savings rates, yielding persistent current account surpluses like in the NIRP economies. Norway is arguably a special case due to its large possessions of oil. In the remainder of this paper, we compare the NIRP economies to a reference group consisting of the United States, the United Kingdom, Australia, and Canada, i.e. four large high-income, OECD economies that distinguish themselves from the NIRP economies by being characterised by relatively low levels of savings.

Higher aggregate savings in NIRP economies are driven by the private as well as the public sector. Table 1 shows average net lending by sector before and after the GFC for the NIRP economies and the reference group. For all of the

NIRP economies, private sector net lending has on average been positive since the mid-1990s. This has been particularly pronounced since 2009, i.e. in the decade following the GFC. Following the crisis, private sector net lending also increased in the countries in the reference group, but not nearly to the same level. Fiscal policies asssessed on the basis of net lending of the public sector have been relatively restrained in Denmark, Sweden and Switzerland, cf. Table 1. For the euro area as a whole, public-sector borrowing has also been substantially lower than in the United Kingdom and the United States since 1995, albeit with considerable heterogeneity across the currency area. The fiscal response to the GFC was a case in point. The GFC triggered a large and sustained fiscal response in the US. While euro area governments initially also eased fiscal policy in response to the GFC, subsequent concerns about fiscal solvency and rising risk premia on government debt led a number of euro area governments to revert course and tighten fiscal policies early.

Table 1:
Large private savings and prudent public finances in NIRP economies

		Government		Private sector	
		1995-2008	2009-2019	1995-2008	2009-2019
NIRP	Denmark	1.16	-0.26	1.10	7.65
	Sweden	0.08	-0.41	4.63	4.88
	Euro area	-1.93	-3.38	1.41	5.13
	Japan	-5.63	-6.28	8.52	8.98
	Switzerland	-0.67	0.23	8.39	6.95
Other	US	-3.55	-8.23	-0.06	6.24
	UK	-5.05	-7.61	3.12	3.80
	Australia	0.25	-3.72	-5.16	1.33
	Canada	0.16	-2.49	0.82	-0.86

## 3. Why are private sector savings high in the NIRP economies?

The literature has identified a number of structural factors that influence savings and r^*. In the following, we discuss the extent to which these factors are likely to have been supporting savings in the NIRP economies more than in comparable non-NIRP countries.

NIRP economies, and in particular Japan, have seen faster aging and older populations than other economies, cf. figure 7. A number of studies have found ageing to be a key factor behind larger savings and thus the decline in r^* since the

1980s (Rachel and Smith (2017), Carvalho, Ferraro, and Nechio (2016), Arslanalp, Lee, and Rawat (2018), Fiorentini et al. (2018), Gagnac, Johannsen, and López-Salido (2021), Ferrero, Gross, and Neri (2017), Brand, Bielecki, and Penalver (2018), Bielecki, Brzozo-Brzezina, and Kolasa (2018), Eggertsson, Mehrotra, and Robbins (2019), Gagnac, Johannsen, and López-Salido (2021), Papetti (2021), Fujita and Fujiwara (2021)).

Overlapping generations (OLG) models suggest that ageing have the potential to affect *r* via three channels (see e.g. Kreuger and Ludwig (2006) and the discussion in Brand, Bielecki, and Penalver (2018)). First, a reduction in the share of working age population increases the capital to labour ratio, thereby reducing the marginal return on capital and hence investment demand. Second, longer life expectancy tends to increase desired savings for retirement. Finally, retirees draw down their savings. While the first and second channels tend to reduce *r**, the third channel tends to increase it.[2] So demographics may be a factor behind high savings in the NIRP economies.

Figure 7:
NIRP economies have a slightly larger share of population above 65
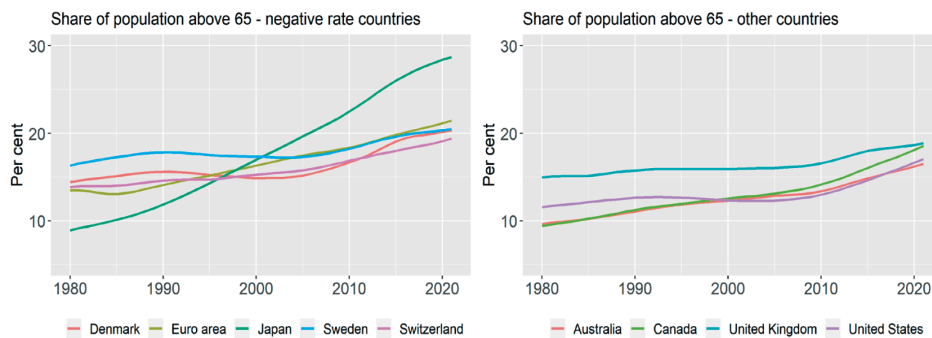


Source: Refinity Datastream.

Savings for retirement are likely to depend not only on demographics but also on institutional factors. While theory suggests that a pay-as-you-go (PAYG) pension system reduces the incentive for households to save for their retirement, a fully funded system would increase aggregate savings to the extent that pension savings do not simply crowd out other savings (Bloom et al. (2007)).[3] Howe-

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2. The so-called retirement-consumption puzzle suggests that the third channel is less pronounced than what a simple mode would suggest, see e.g. Olafsson and Pagel (2018).
3. In a PAYG system, pensions for current retirees are being financed by tax paid by the current working-age polulation. In contrast, in a fully funded system, pensions are financed by savings that retirees have accumulated during their working life. These can be either mandatory of supported by tax incentives.

ver, the empirical evidence is less straightforward. Studies based on data for a large number of advanced economies suggst that the correlation between PAYG systems and national savings as given by the current account surplus is either negative (Davoine (2019)) or insignificant (Koomen and Wicht (2022)). Cross-country evidence also suggsts that fully funded schemes are likely to have contributed to increasing aggregate savings (Davoine (2019), Koomen and Wicht (2022)). The impact may depend on the schemes being mandatory, as evidence for Denmark suggests that savings in voluntary tax-favoured pension schemes almost fully crowd out other savings (Chetty et al. (2014), Andersen (2018)).

During the past decade, pension savings have increased substantially across the OECD countries, both in nominal terms and as a share of GDP (see figure 8). In the OECD, the ratio of pension assets to GDP has increased from roughly 60 per cent in 2010 to around 100 per cent in 2020, reflecting an increase in almost every country. The increase in pension savings has been driven by a combination of mandatory pension schemes as well as favourable tax treatment as most OECD countries provide an incentive for savings in pension funds (OECD (2021)). Among the OECD countries, Denmark has the largest pension savings relative to GDP (OECD (2021)). In Sweden and Switzerland, the ratio of pension assets to GDP also exceeds the OECD average. However, the same holds true for the four countries in our reference group, i.e. Canada, United States, Australia and the United Kingdom. In other NIRP economies including Germany and France, pension assets constitute a substantially smaller share of GDP compared to the OECD average.[4]

Figure 8:
Pension savings are increasing globally
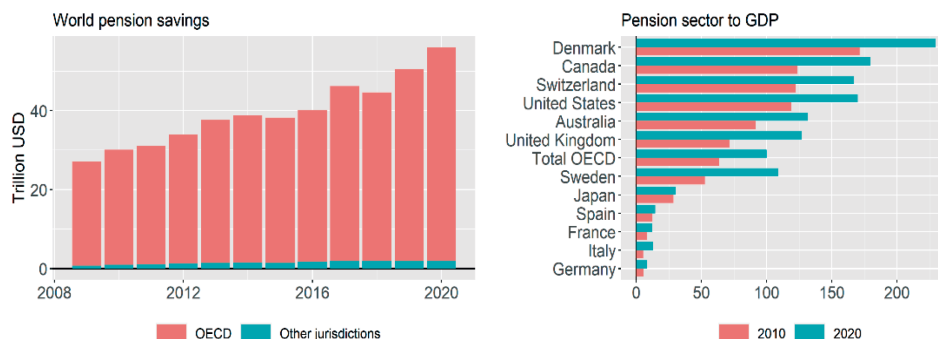
Source: OECD (2020) and OECD (2021).

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4. It should be noted that some retirement plans are missing from the data. Missing data is particularly pronounced for Germany.

In some NIRP economies, mandatory fully funded pension systems have potentially contributed to national savings. Koomen and Wicht (2022) have constructed indicators for the coverage and replacement rates of PAYG and compulsory fully funded pension schemes for a large number of countries. Of the NIRP economies, Denmark (since 1999), Sweden (since 2003), Switzerland (since 1997) operate mandatory fully funded pension schemes with Denmark and Switzerland also having relatively generous replacements rates and wide coverage. The same holds for the Netherlands (since 2003), whereas most euro area countries only have PAYG systems in place.[5] In our reference group, only Australia (since 1999) is operating a mandatory fully funded system. Summing up, the evidence suggests that while the structure of pension systems might play a role in explaining differences in policy rates, the impact of differences in pension systems is not clear cut.

The literature has proposed a number of additional factors as potential explanations for the increase in desired savings relative to investments. These include increased income inequality (Summers (2014), Rachel and Smith (2015), Mian, Straub, and Sufi (2021)), a decline in productivity growth (Eggertsson, Mehrotra, and Robbins (2019)), rising market power (IMF (2019), Eggertsson, Robbins, and Wold (2018), Farhi and Gourio (2018), Traina (2018), De Loecker and Eeckhout (2018) and Diez, Leigh, and Tambunlertchai (2018)), and increased precautionary savings due to weak social safety nets (Carvalho, Ferraro, and Nechio (2016), Caballero, Farhi, and Gourinchas (2017), Vlieghe (2017), Del Negro, Giannoni, and Tambalotti (2017), Hartzmark (2016)).

It is not clear that these additional factors have been particularly pronounced for the NIRP economies. Although income inequality has risen within the NIRP economies, the levels of inequality as measured by Gini indices are lower than in the reference group, cf. figure 9. Neither the increase nor the level of inequality in NIRP economies would support lower $r*$ in these countries relative to global levels. Also, while productivity growth has been lower since the turn of the century compared to the previous decades, it is not obvious that the reduction in productivity growth has been more pronounced in the NIRP economies, cf. figure 10. Concerning precautionary savings, social safety nets are relatively strong in the NIRP economies, cf. figure 11. Finally, comparing markups in NIRP economies to those of other advanced economies does not paint a clear picture, cf. figure 12.

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5. The fully funded pension systems in Denmark, Sweden and the Netherlands are compulsory only for those working in specific institutions. However, as they have wide coverage, they are caterorised as compulsory by Koomen and Wicht (2022).

Figure 9:
Lower inequality in NIRP economies
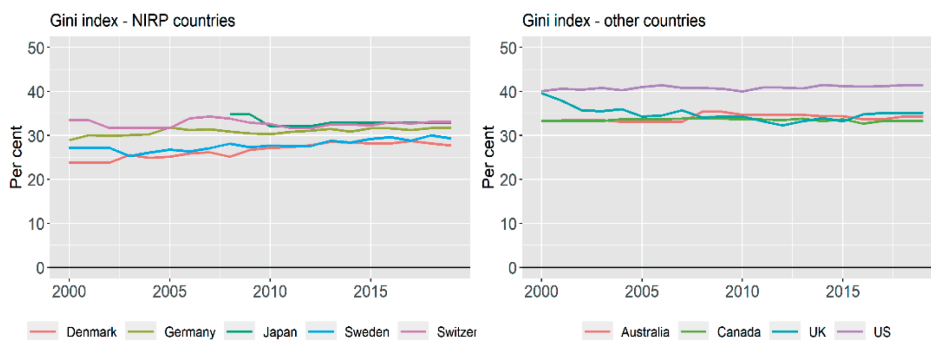
Note: Gini coefficients are not available every year for all countries shown. When no data is available, the observations from the previous year are used.

Source: Refinitv Datastream.

Figure 10:
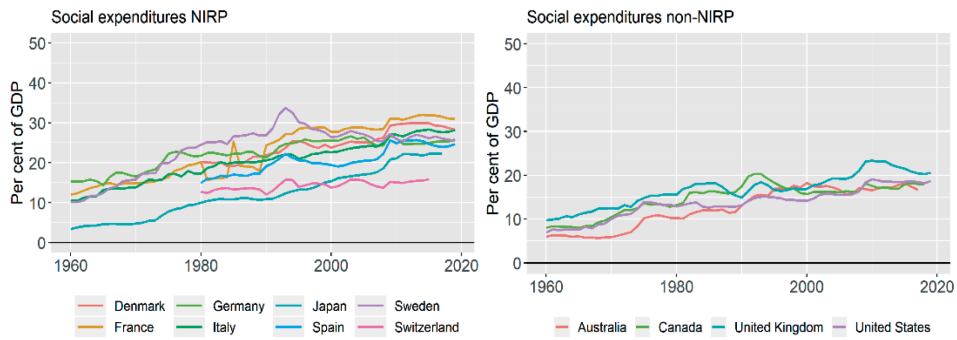Productivity growth has declined in advanced economies

Note: Average yearly growth in productivity. Productivity is measured as GDP per hours worked.

Source: OECD.

Figure 11:

Public social expenditures are higher in NIRP economies

Note: Public social expenditures to GDP. Public social expenditures cover a large range of public support for citizens, including child education and care, health care, old age care, support in case of incapacity, unemployment benefits, active labour market programmes etc.
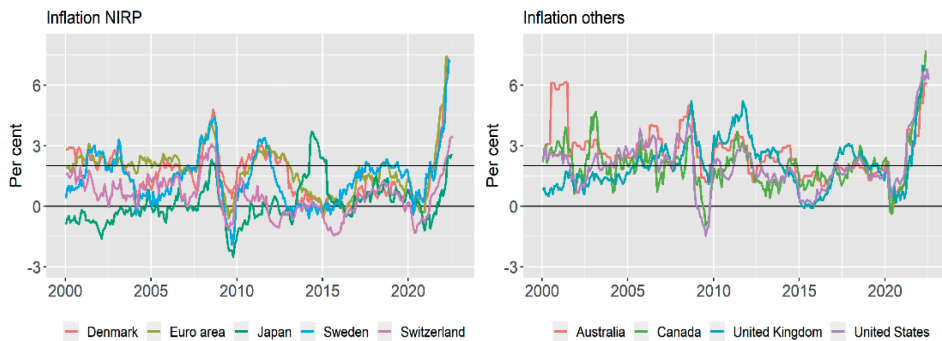
Source: OECD Social Expenditure Database.

Figure 12:

Firm markups are higher in some NIRP economies
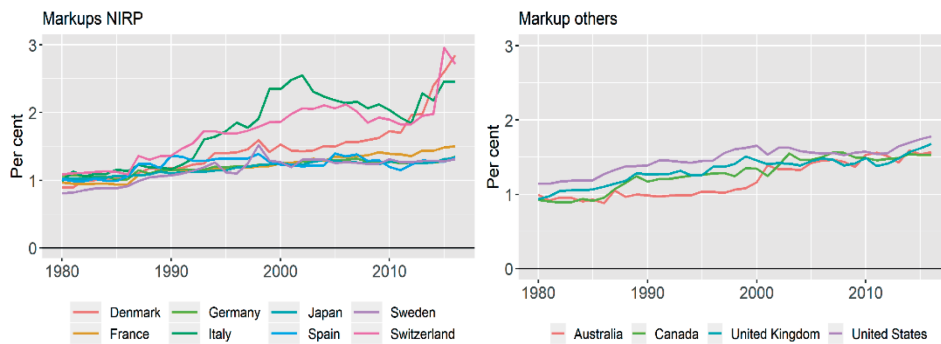
Note: Average firm markup in selected economies.

Source: De Loecker data and code library.

Figure 13:
Inflation has been lower in NIRP economies

Note: Year-to-year inflation in selected countries. For Denmark and the euro area, the inflation rate is based on the Harmonized Index of Consumer Prices (HICP). For the United States, the Personal Consumption Expenditure (PCE) index is used. Remaining countries are based on the Consumer Price Index (CPI).
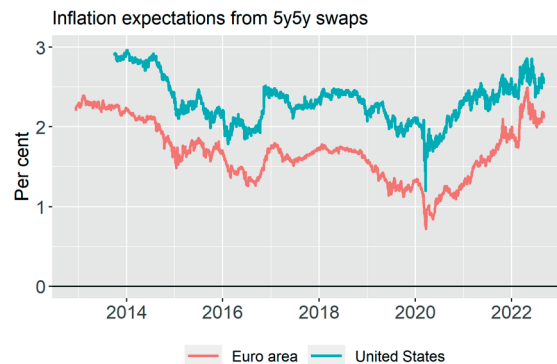
Source: Refinitv Datastream.

4. Inflation and monetary policy

Inflation has been persistently more subdued in NIRP economies following the global financial crisis and leading up to the pandemic. In the period between the GFC and the economic rebound during the Covid-19 pandemic, the average rate of inflation has been well below the typical inflation targets of around 2 per cent in all NIRP economies, cf. figure 13. Inflation also declined in other advanced economies, but not to the same degree. This difference is also reflected in market-based inflation compensations in the largest economies of the two groups, the euro area and the United States, see figure 14.[6] Hence, the NIRP economies have likely been perceived to be more at risk of a de-anchoring of inflation expectations to the downside than for example the United Kingdom and the United States in the years between the global financial crisis and the pandemic.[7]

6. In addition to expectations of future inflation, inflation swaps also reflect risk premia for inflation risk and liquidity. Moreover, while US inflation swaps are based on CPI, the Federal Reserve's preferred measure of inflation is PCE, which generally has lower annual increases.
7. Due to the policy of pegging the Danish krone to the euro, low inflation was only indirectly a factor behind the adoption of NIRP by Danmarks Nationalbank.

Figure 14:
Inflation compensation has been lower in NIRP economies

Inflation expectations from 5y5y swaps

Note: The fixed-rate leg in 5y5y inflation swaps. Note that besides inflation expectations, this rate also captures for instance the inflation risk premium.
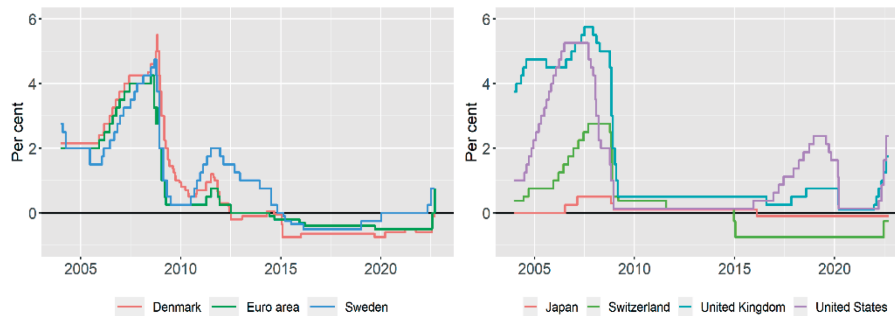Source: Refinitv Datastream.

A particularly low *r** may have constrained the monetary policy space in NIRP economies more than in other economies and driven down inflation in the decades prior to the pandemic. As argued in the previous sections, NIRP countries' large savings are likely to reflect that their *r** is lower than in comparable countries. By definition, economies with lower *r** hit the lower bound on policy rates earlier than countries with a higher *r** (Koester et al. (2021), Lis, Nickel, and Papetti (2020)). For an extended period of time, zero was considered the lower bound for interest rates. Hence, before eventually cutting policy rates into negative territory, NIRP economies were constrained by the perceived zero lower bound (Grisse, Krogstrup, and Schumacher (2017)). Moreover, by adopting NIRP, central banks entered unchartered waters, leading to small cuts into negative territory compared to previous interest rate cuts. The proximity to the effective lower bound is thus likely to have limited the policy space of NIRP central banks, and may have resulted in a tighter monetary policy stance than otherwise. This could have contributed to the lower inflation rates as well as the observed downward drift in medium to longer term inflation expectations in NIRP economies as compared with other advanced economies, in recent decades.

Other factors may also have led to lower inflation in the NIRP economies. First, the fiscal response to the GFC was smaller in NIRP economies compared to other advanced economies (recall table 1). Second, NIRP central banks cut policy rates more gradually during the crisis, cf. figure 15, and while the ECB, the Riksbank and the Bank of Japan have all employed different variants of quantitative easing (QE) and forward guidance (FG) in addition to NIRP, the Federal Reserve and the Bank of England were substantially quicker in resorting to such quantitative measures, cf. figure 16. While these differences in policies may reflect that the GFC affected countries differently, they may also have contributed to a larger decline in inflation in the NIRP economies. Finally, some central banks may have

been reluctant to adopt NIRP for reasons related to the structure of the country's financial sector. For instance, the large money market mutual fund industry in the United States has been pointed out as a cause for concern in relation to negative interest rates, since a possible withdrawal of deposits could endanger the health of the financial system (Neely (2020)).

Figure 15:
Different policy responses to the financial crisis

Note: Policy rates are the central banks leading interest rate for monetary purposes. In periods where central banks have employed target ranges for money market rates, the middle of the range is used.
Source: Refinitiv Datastream.

Figure 16:
Unconventional monetary policy has expanded central bank balance sheets
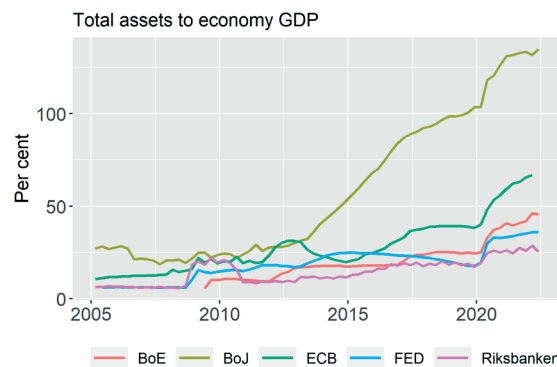
Note: Selected central banks total balance sheet to economy GDP. Quarterly data.
Source: Refinitiv Datastream.

5. Conclusions

In this paper, we have assessed how the economies of the five central banks that adopted NIRP during the previous decade stand out from other advanced economies. We document that the NIRP economies are characterised by high le-

vels of national savings, not matched by high levels of real investments. This could indicate lower equilibrium real interest rates in NIRP economies compared to other high-income OECD economies. Demographics, the structure of pension systems and prudent public finances are potential drivers of the high propensity to save in NIRP economies, but the exact drivers of the high private savings in NIRP economies are not easy to pinpoint. In fact, there may be forces at play that we have not identified and looking deeper into this could be an avenue for future research. In addition to high savings, inflation has generally been lower in NIRP economies compared to other advanced economies, constraining the ability to stimulate the economy using conventional monetary policy tools.

As economies with high savings are more likely to experience low *r*, the central banks of these economies are more likely need unconventional monetary policy tools. Such tools can provide monetary policy easing, when conventional monetary policy interest rates are constrained by their lower bound. In addition, fiscal policy can be activated in order to stimulate demand in situations where monetary policy is constrained.

Recently, we have seen a spike in inflation and a sharp rise in market yields across the advanced economies. This suggests that at least for now, the period of exceptionally low (nominal) interest rates has come to an end. Part of the increase in yields reflects that the pick-up in inflation has led to higher inflation expectations among private sector agents, implying that medium to longer-term real interest rates remain at modest levels. The future path of interest rates in the longer term is highly uncertain, but it cannot be ruled out that NIRP will be employed in the future as well.

Looking ahead, interest rates will depend crucially on what happens to *r**. However, future developments in $r*$ are clouded in uncertainty. Evidence suggests that demographic developments, which have been a key factor behind the decline in $r*$, are likely to continue contributing to $r*$ being low in the years to come (Auclert et al. (2021)). Factors such as investment in support of the green transition and military rearmament in a number of countries following the Russian invasion of Ukraine may cause $r*$ to rise. This may be a direct consequence of higher global demand, but if these factors lead to an increase in productivity growth, this can further contribute to the rise in $r*$. However, productivity growth could also decline if climate-related concerns imply that some existing technologies will no longer be used. This illustrates the huge uncertainty associated with the future path for interest rates. More research is clearly needed on the impact of recent structural change on $r*$.

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