



THE UNITED KINGDOM

SELECTED ISSUES

July 2023

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SELECTED ISSUES

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THE ENERGY PRICE SHOCK—IMPACT, POLICY RESPONSES, AND REFORM OPTIONS¹

The surge in energy prices due to Russia's war in Ukraine inflicted a sharp terms of trade shock on the UK economy. While energy prices have since declined, the future energy price path remains uncertain, with futures-implied prices substantially above their levels prior to October 2021, when Russian natural gas imports to Europe began to be curtailed. In this context, section I analyzes the impact of the energy price shock on UK households and firms; section II describes the energy support measures introduced by the UK government; and section III provides staff's assessment of these measures and sets out some options to optimize the policy response to a possible resurgence in energy prices. These include structural measures to ensure energy security and raise resilience to spikes in energy prices, and options to refine, especially the targeting of, support measures that could be introduced in response.

A. Impact of High Energy Prices on the UK Economy

1. Wholesale prices for gas and electricity surged in 2021 and 2022 due to Russia's invasion of Ukraine.² Despite having limited direct imports from Russia, the UK was exposed to volatility in regional gas prices as a net importer of gas (Figure 1 and Box 1), which rose more than seven-fold between January 2021 and August 2022 (Figure 2). Wholesale electricity prices have also seen a six-fold increase over the same period, as they are linked to the marginal cost of electricity generation, with gas-fired power plants acting as the marginal supplier when electricity demand is high and/or when cheaper electricity imports are curtailed.³ While gas and electricity prices have since come down substantially, futures contracts indicate they are expected to remain about twice as high as their early 2021 levels in the coming years.

¹ Prepared by Anil Ari and Carlos Mulas Granados (both EUR).

² This paper focuses on gas and electricity and does not cover petroleum and other transport fuels.

³ Notably, shortfalls in France's generation capacity have reversed inflows of electricity from France, leading the UK to become a net exporter of electricity in 2022 (see Figure 1.2 in Box 1).

Figure 1. Sources and Uses of Natural Gas and Electricity in the UK

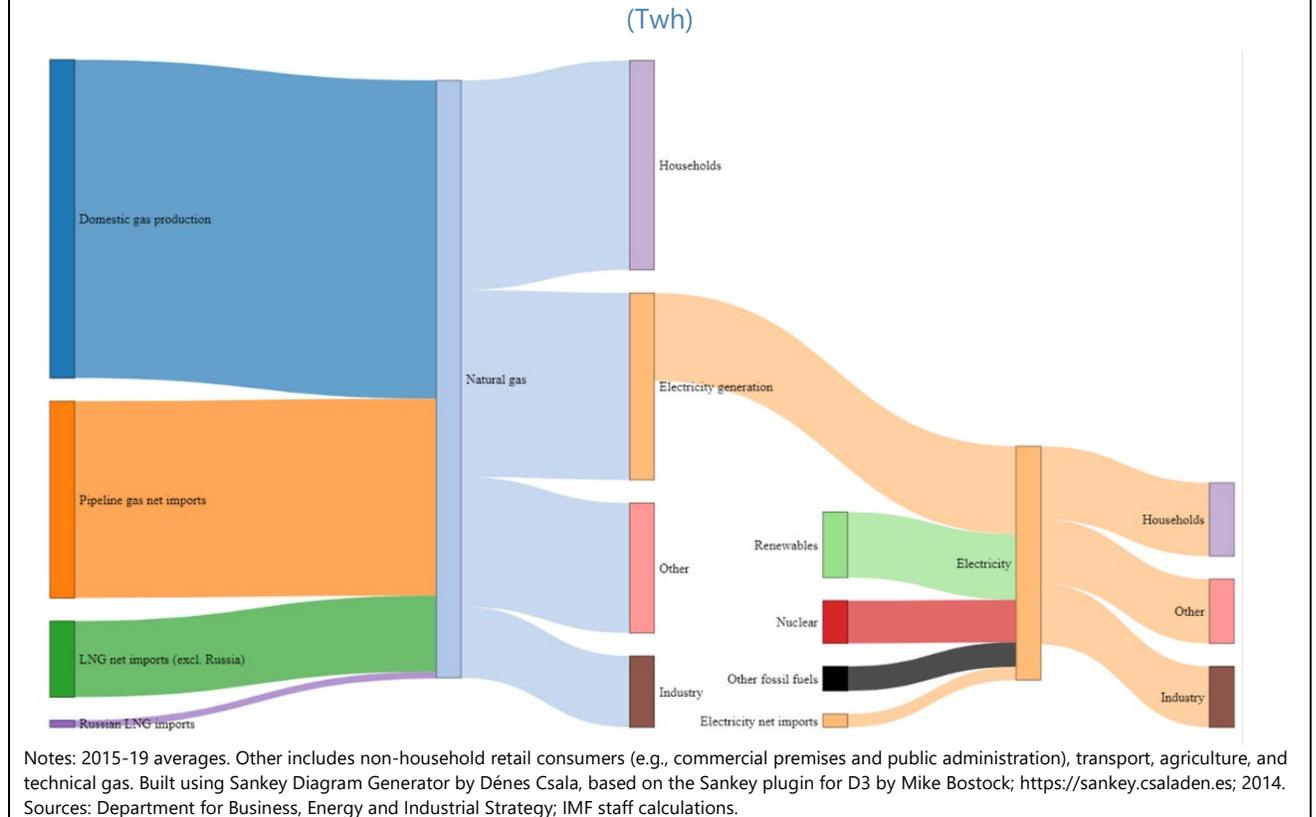
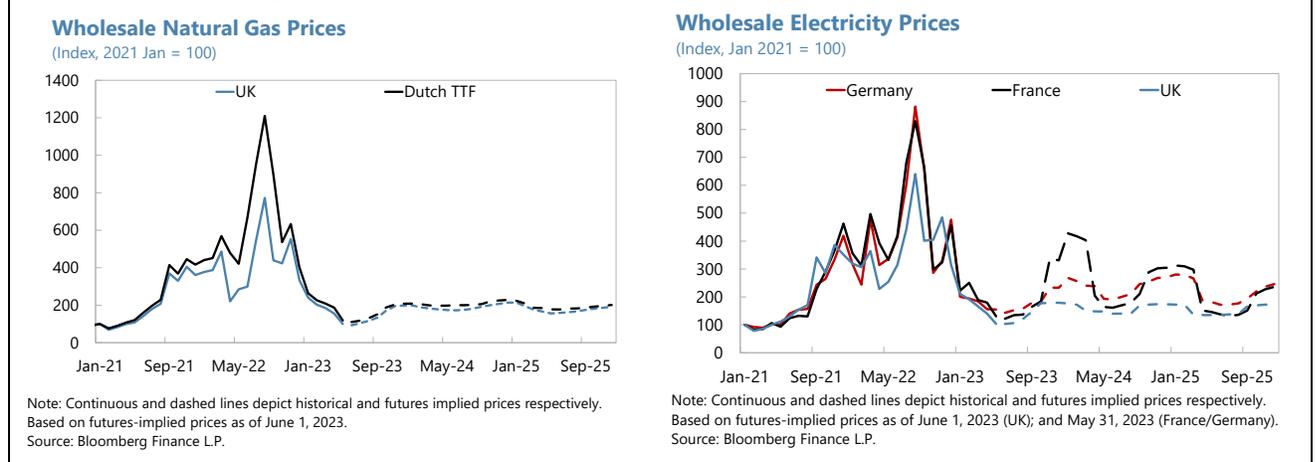
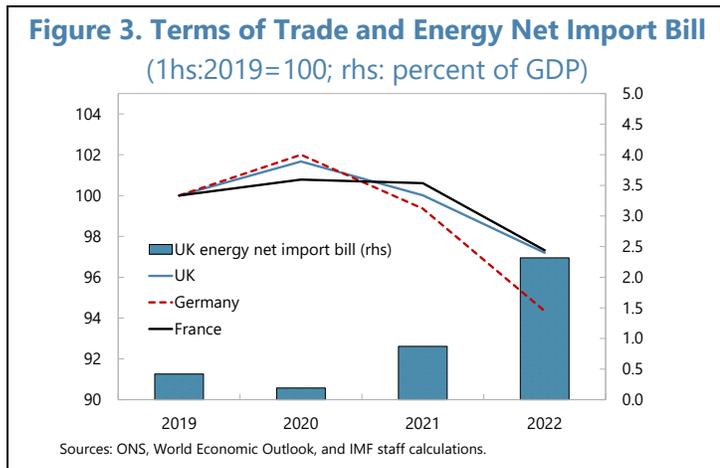


Figure 2. Wholesale Natural Gas and Electricity Prices in Europe



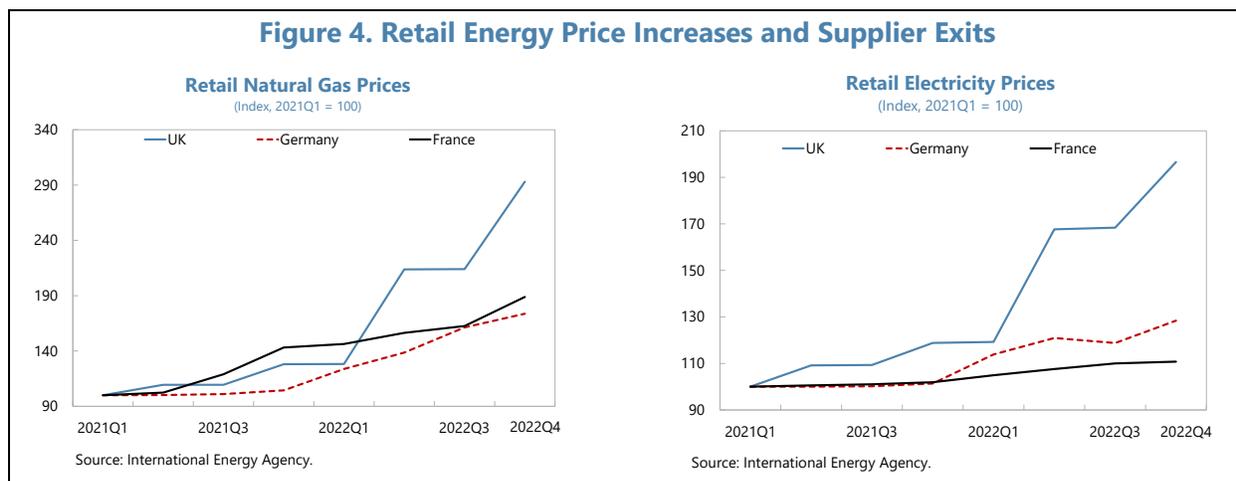
2. Surging energy prices have inflicted a sharp terms-of-trade shock on the UK economy.

The UK's net import bill for energy increased five-fold from 2019 as a percent of GDP, leading to a 3 percent deterioration in the terms of trade (Figure 3). A sizable portion of this shock is expected to persist over the medium-term, given natural gas and electricity futures prices.

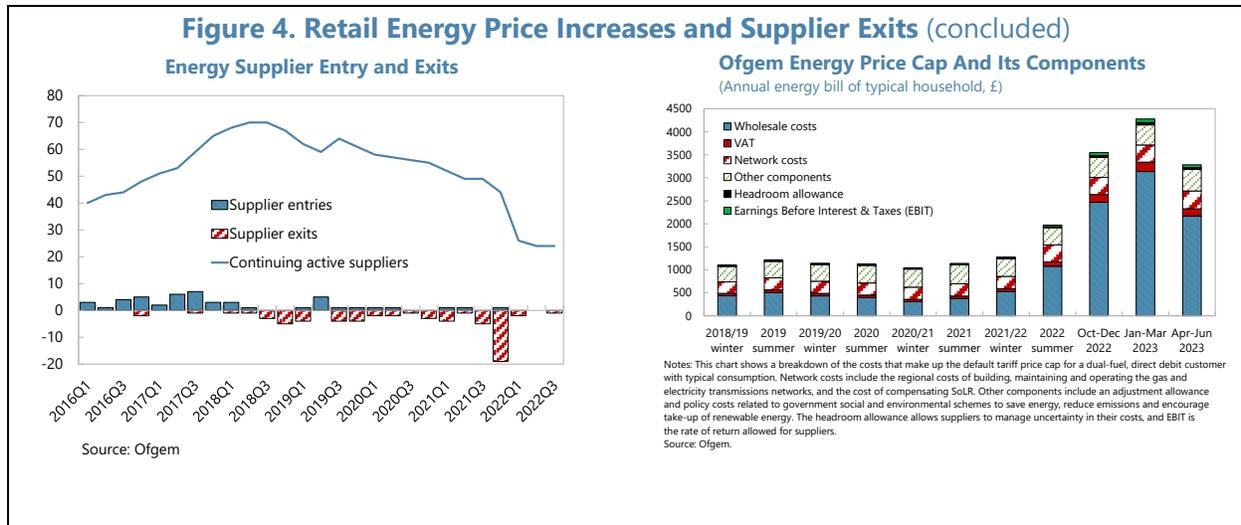


3. Retail energy prices in the UK have seen greater pass-through from wholesale prices than in regional peers (Figure 4).

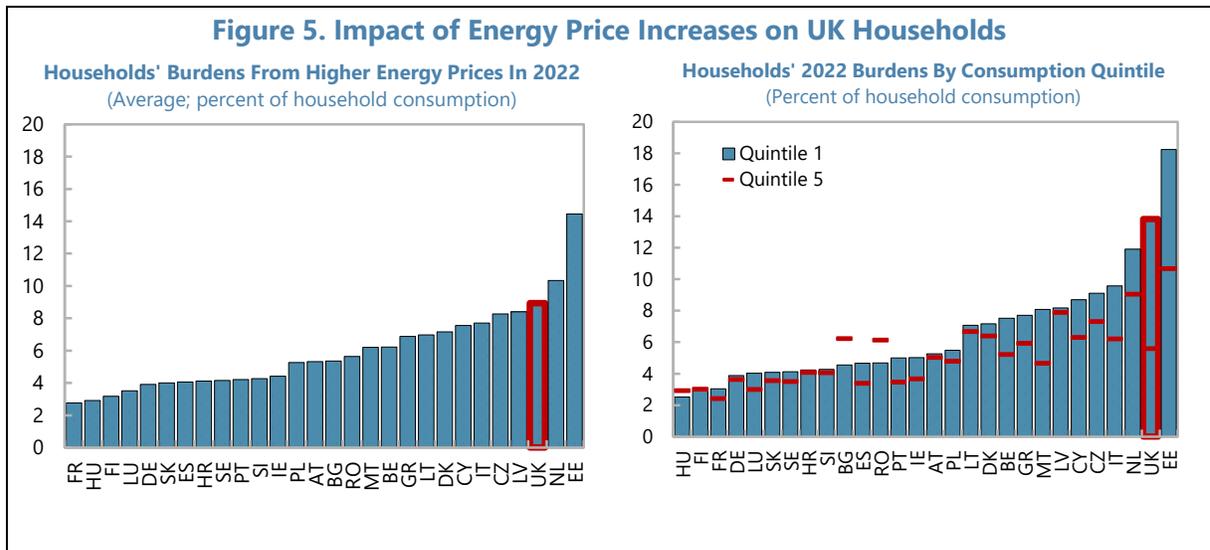
Regulated retail energy prices were updated every 6 months by the Office of Gas and Electricity Markets (Ofgem) to reflect changing costs for retail energy suppliers until the rollout of the Energy Price Guarantee (EPG) in October 2022 (see Box 1). Nevertheless, infrequent adjustment of the cap left suppliers with a structural exposure to fluctuations in wholesale prices. As wholesale prices surged, a number of suppliers which had inadequately hedged their positions and/or held insufficient buffers, have failed, with Suppliers of Last Resort (SoLR) appointed by Ofgem to take over their customers.⁴



⁴ The additional costs incurred by SoLR in the process have been recovered from network charges payable by all suppliers that use electricity and gas networks, causing a (further) increase in retail energy prices through the “network costs” component when the energy price cap is revised.

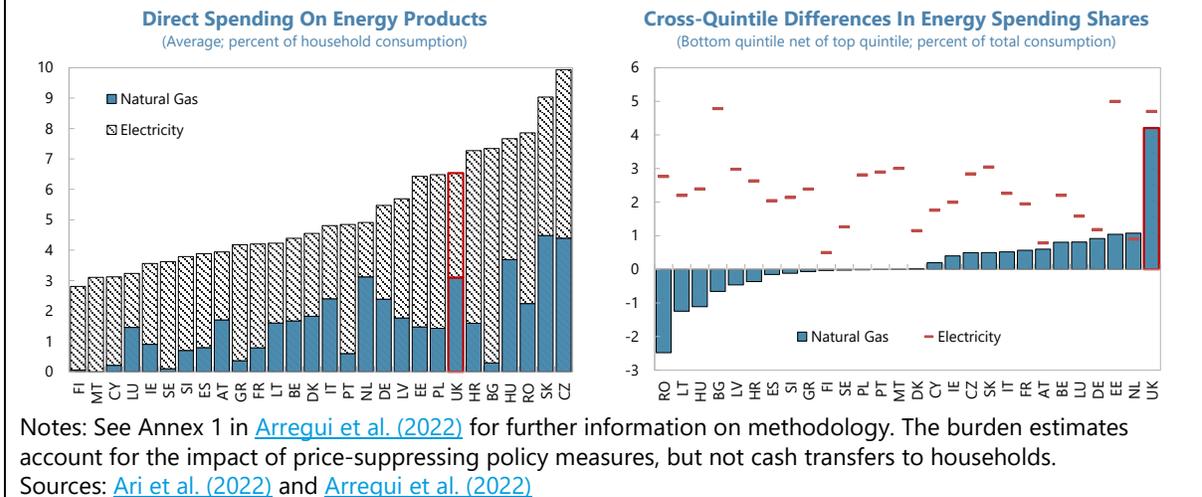


4. Household balance sheets were hit hard, especially at lower income levels. The burden on UK households in 2022 was estimated at about 9 percent of total consumption, and at 14 percent for households in the lowest consumption quintile (Figure 5). This impact was one of the largest among European economies, owing to relatively high pass-through to retail energy prices and a large spending share on electricity and natural gas in the UK, especially for lower income households. This is in part due to geographic factors, with lower income regions in the north of the UK typically experiencing colder winters than the European average, as well as weaker insulation in the UK’s housing stock than in some other European countries.⁵



⁵ A [study](#) on 80,000 residential buildings by home climate management company tado° has found that the UK’s housing stock loses heat significantly faster than houses in other advanced economies in Europe, controlling for differences in outside temperature. Only 43 percent of UK homes had an [Energy Performance Certificate](#) rating of C or above in 2021 ([Climate Change Committee, 2022](#)).

Figure 5. Impact of Energy Price Increases on UK Households (concluded)



5. Firms suffered a sizable cost-push shock, leading to higher core inflation, reduced activity, and increased business failures. With energy costs amounting to over 10 percent of total costs in nearly a quarter of UK businesses (with greater exposure among small businesses), pass-through from high energy prices to domestic goods and services is estimated to have added about 1 p.p. to core inflation in 2022 (Figure 6). Moreover, greater energy intensity at industry level is associated with a higher share of businesses reporting decreased activity or closures, indicating that the cost-push shock from high energy prices has weighed on the supply-side.

Figure 6. Impact of Energy Price Increases on UK Firms

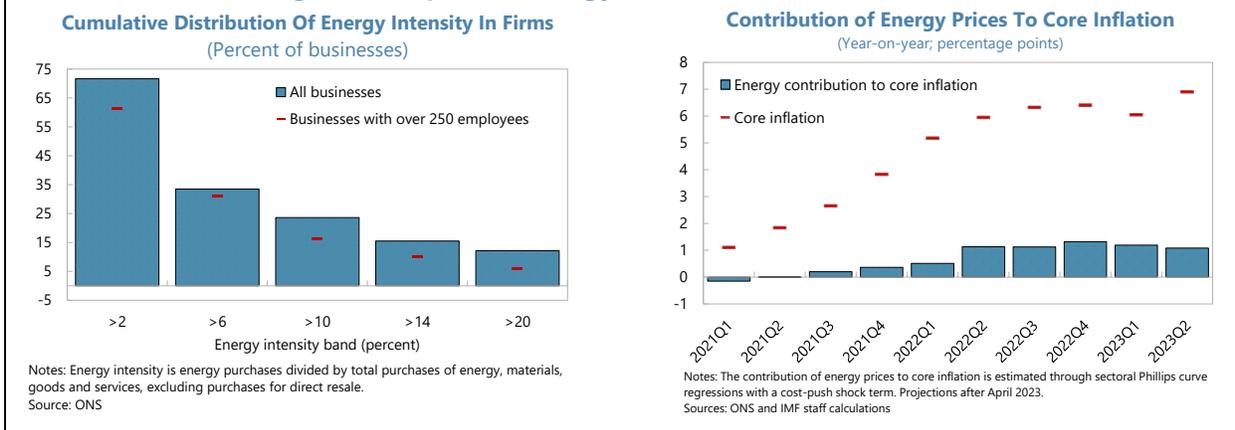
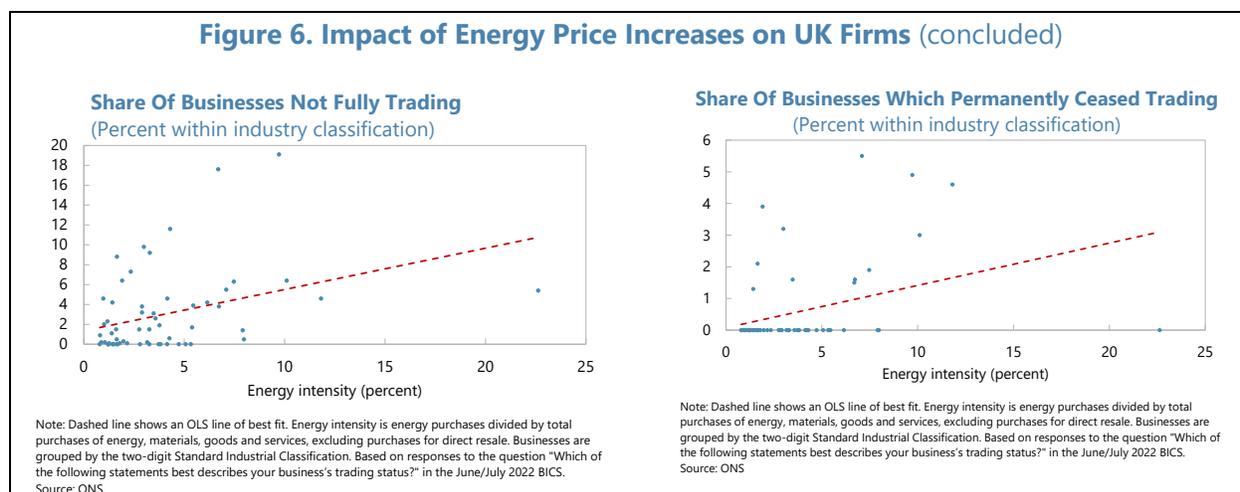


Figure 6. Impact of Energy Price Increases on UK Firms (concluded)

B. Energy Support Schemes Introduced by the UK Government

6. The authorities provided several rounds of support measures since energy prices surged (Table 1). These combined both universal and targeted measures to support households, as well as business support measures:

- Household support measures:* In February 2022, the authorities rolled out the first set of measures, consisting of a universal household support package (EBSS) with a discount to £200 on their energy bills and a more targeted £150 Council tax (CT) rebate for households in specific tax bands.⁶ In March, the authorities reduced the fuel duty rates for petrol and diesel and raised National Insurance Contribution thresholds. In late May, the energy bill discount was increased to £400 for all households, and new direct payments to pensioner households (£300) and the disabled (£150) provided additional targeted support.⁷ In September, the government introduced an Energy Price Guarantee (EPG) which capped gas prices below market-implied levels for all households until March 2024 (see Box 1 for further details). In November, the government announced that the EPG cap would be increased by 20 percent in March 2023, while providing a new round of targeted support to the same vulnerable groups included in the May package. In March 2023, the rise in the EPG cap was postponed by a quarter in the context of declining wholesale energy prices.
- Support for firms in energy markets:* The authorities bailed out the failed energy supplier Bulb, which is currently under special administration. In response to this and other energy supplier failures, Ofgem switched from semi-annual to quarterly revisions of the energy price cap and began to account for suppliers' backwardation costs in January 2023. The Bank of England and HM Treasury also introduced the 'Energy Markets Financing Scheme' (EMFS) to provide loan

⁶ The EBSS bills discount benefited about 28 million households and the CT rebate benefited around 20 million households in council tax bands A-D. For more details see: <https://www.gov.uk/government/publications/52022-council-tax-information-letter-24-february-2022/council-tax-energy-rebate-information-leaflet-for-households-in-council-tax-bands-a-d>

⁷ The lump sum transfers to pensioners, the disabled and people on means-tested-benefits targeted about 8 million households. For more details see: <https://www.gov.uk/government/publications/cost-of-living-support/cost-of-living-support-factsheet-26-may-2022>

guarantees to commercial banks for additional lending to energy firms facing large and unexpected margin calls.⁸ As wholesale gas prices declined, the scheme closed with no guarantees issued due to a lack of applications.

- *Broader business support measures:* The EPG was accompanied with the Energy Bill Relief Scheme (EBRS) which capped energy tariffs for businesses at the same level through March 2023. The EBRS was then replaced with the Energy Bills Discount Scheme (EBDS) which provided per-unit discounts to business energy bills for a period of 12 months, with more generous discounts offered to firms facing higher energy prices and firms in energy and trade-intensive sectors.⁹

7. The fiscal costs of UK's energy support measures were substantially above the European average (Figure 7). Amongst the measures directed at households, a sizable amount was either untargeted (71 percent) or had a distortionary impact on energy prices (45 percent). This elevated the fiscal cost of these measures above the amounts needed to fully compensate vulnerable households for the rise in their energy bills.

Table 1. United Kingdom: Fiscal Costs of Energy Support Measures

Fiscal year	£bn			Percent of GDP		
	2022-23	2023-24	2024-25	2022-23	2023-24	2024-25
Feb. 2022 Energy Bills Support Scheme	9.05	-	-	0.36	-	-
Fuel Duty measures 1/	2.45	4.85	2.61	0.10	0.18	0.10
May 2022 Cost of Living Package	15.53	1.21	1.21	0.61	0.05	0.04
Reversal of NIC rate increase 2/	7.07	16.69	16.54	0.28	0.63	0.60
Energy Price Guarantee	23.00	4.00	-	0.91	0.15	-
Nov. 2022 Cost of Living Package	-	12.37	1.49	-	0.47	0.05
Other energy support measures 3/	-	0.88	-	-	0.03	-
<i>Total household support measures</i>	57.10	39.99	21.84	2.26	1.51	0.80
Energy Bill Relief Scheme	7.30	-	-	0.29	-	-
Bailout of Bulb Energy	3.00	-	-	0.12	-	-
Energy Bills Discount Scheme	-	0.55	-	-	0.02	-
<i>Total energy support measures</i>	67.40	40.54	21.84	2.66	1.53	0.80

1/ Fuel duty measures refer to a 5p cut in Fuel Duty rates and suspension of the increase in line with RPI inflation in FY2022-23 and 2023-24.

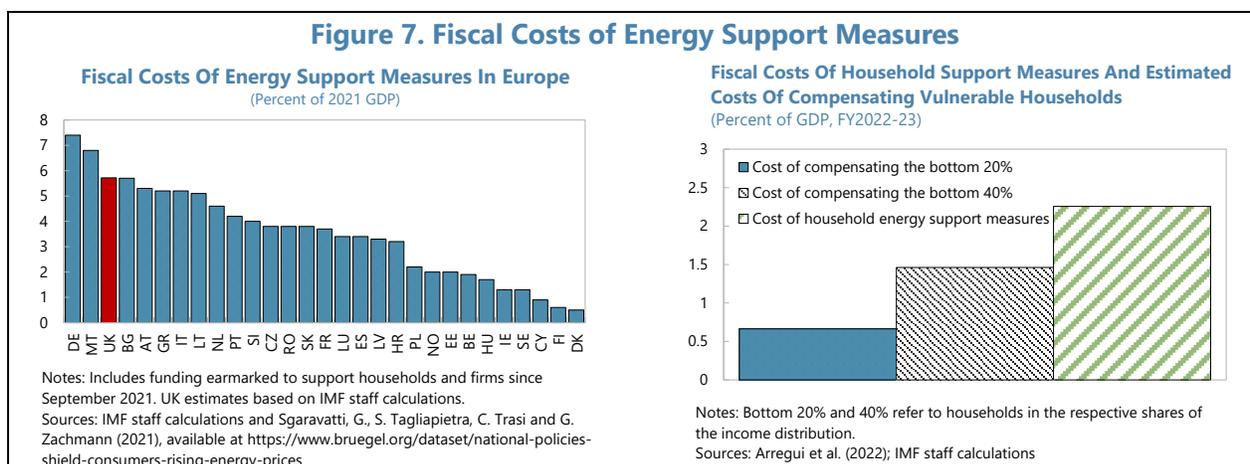
2/ NIC refers to National Insurance Contribution.

3/ These include fixed payments for users of alternative fuels for heating and a further discount for households in properties served by heat

Sources: HMT; OBR; IMF staff calculations.

⁸ The scheme was open between 17 October 2022 to 27 January 2023 to firms of good credit quality with a significant role in UK energy markets and provided 100 percent government-backed loan guarantees for a period of up to 12 months. In the event of guarantee claims from a commercial lender, HM Treasury would settle the claim with the BoE acting as an agent in the payment, while fully indemnifying the BoE for losses arising from EMFS. For more details on this scheme, please see <https://www.bankofengland.co.uk/news/2022/october/energy-markets-financing-scheme-opens-today>.

⁹ See <https://www.gov.uk/guidance/energy-bills-discount-scheme> for further information on this scheme.



C. Options to Optimize the Policy Response

8. The measures implemented by the authorities had reasonable elements, but there are aspects that could be improved. Given lingering risks of resurging energy prices and/or supply disruptions, refining the energy support toolkit would prove useful in case support needs to be extended or, if it has expired, to be re-introduced.

9. Policy responses should aim to preserve the price signal (Box 2). Temporary measures that suppress retail energy price increases—such as the EPG—had the advantage that they could be implemented quickly and were easy to administer and be communicated to the public. However, price-suppressing measures have several drawbacks. Notably, they:

- *impede the adjustment to energy supply shocks* (including through energy-conserving behavior and energy efficiency investments) by reducing the marginal unit of energy used below the market price, thereby impeding the adjustment to energy supply shocks.
- *are not cost-effective.* Since the supply of natural gas is inelastic in the short run, measures that impede demand adjustments also help maintain the pressure on energy prices. Moreover, suppressing the demand adjustment to higher energy prices when energy markets are tight can also raise the risk of potential energy supply disruptions.
- *can be politically difficult to withdraw and generate adverse spillovers;* as more countries implement price-suppressing policies, others come under pressure to take similar measures.

In view of these considerations and taking into account the likely persistent nature of the energy price shock (see Figure 2), new policy measures that mute the price signal should be avoided and measures that have already been introduced should be wound down in a timely manner.

10. Targeted transfers are the best way to protect vulnerable households while facilitating a reduction in demand for energy and containing fiscal costs. Staff supports the targeted support measures deployed by the UK authorities but sees scope for design improvements. Ideally, support measures would target households below a certain point of the income distribution and be

phased out progressively. While the authorities have used existing social safety nets (SSNs) to provide support quickly, they have been constrained by fragmented systems, which have also had insufficient coverage given the magnitude of the increase in energy prices (i.e., a portion of vulnerable households may not have been covered by safety nets as they do not qualify for existing benefits). For future rounds of support (in the case of a new spike in energy prices), it would be desirable to expand SSNs (e.g., by inviting people to apply for the support through a dedicated online platform) and complement them with other measures (e.g., by combining income data with utility bill information to provide targeted discounts). In the meanwhile, it would be preferable to bridge the gap with other forms of less targeted relief that preserves all or some of the price signal, rather than broad-based price caps. Options include:

- *A lump-sum bonus for households*, linked to past energy consumption or other household characteristics such as household size, and the difference between the current and a reference price for energy (price wedge). The price wedge formula could be linked to the utility contract, inheriting characteristics such as frequency of payments and fixed/variable pricing. This mechanism does not tailor support by incomes but does not distort price signals, regardless of its generosity. It therefore keeps the incentive to cut consumption in relation to prices.
- *Further rounds of uniform lump-sum transfers*, can be an option when linking the support to income levels is not possible. Such measures do not distort price signals, but they could entail high fiscal costs and prove difficult to calibrate. Subjecting these transfers to progressive income taxation would help partially recoup fiscal costs and achieve a degree of targeting.
- *Block pricing*, which is a viable but less preferable option. Under block pricing, energy consumption below a minimum subsistence level would be subsidized at a guaranteed price, while consumption above that level is based on market prices. The subsistence level of consumption could be set at an absolute level or a fraction of last year's consumption volume (to capture household size). The threshold and pricing could then be calibrated to strike a balance between protecting households, safeguarding fiscal space and reducing demand.
- *Energy tax reductions—such as the fuel duty cut*—are not a desirable response as they are fiscally costly and have all the distortionary effects associated with price-suppressing measures.¹⁰

11. Firms with a critical role in importing and distributing energy could be supported on energy security grounds. The surge in energy prices has imposed financial strains on firms that purchase gas on wholesale markets and supply it to retail consumers. Firms that were unable to pass on high purchasing costs due to infrequent adjustments to the Ofgem energy price cap and/or had previously contracted delivery obligations have made cash losses, and those with insufficient capital

¹⁰ While energy price increases may have raised revenues from ad valorem taxes, reducing these taxes or replacing them with specific taxes is similarly undesirable. It would be preferable to, instead, recycle the additional revenues through more targeted and less distortionary support measures.

buffers and/or hedges against energy price volatility were driven into insolvency (see Figure 4). In view of these developments:

- *Maintaining cost-reflectivity in regulated prices (or compensating any deviations from it) is key to ensuring the solvency of critical energy companies and averting energy shortages that would entail sizable economic losses. Staff therefore supports Ofgem’s switch from semi-annual to quarterly price cap revisions. While this does not impact pass-through from wholesale to retail prices until the Ofgem price cap falls below the EPG or the EPG expires, it reduces deviations between suppliers’ costs and the compensation they receive from the government.*
- *Liquidity support may also be appropriate to enable energy providers to meet their margin calls while continuing energy purchases on wholesale markets. At the same time, support should be structured in a way to prevent moral hazard by management and investors. Particularly, firms which have come under financial strain due to high energy prices (including those constrained by pre-existing price regulations) have foregone past opportunities to build sufficient capital buffers and hedge their exposure to volatile in energy prices. To avoid the perception that these firms have been “rewarded” by support—which could incentivize further risk-taking at the expense of energy security—support could be conditional on appropriate hedging going forward or accompanied with more stringent regulations on the sector. Accordingly, staff supports schemes such as the EMFS which help ensure that suppliers of good credit quality do not fail due to liquidity shortfalls.*

12. Broader business support should be targeted at viable but financially vulnerable firms and focus on limiting scarring while facilitating the adjustment to higher energy prices. The rationale for schemes—such as the EBRS and the EBDS—that use taxpayers’ money to help firms cope with higher energy prices rests on the arguments that (i) part of the increase in prices is temporary and (ii) providing support during the adjustment to the permanent component of the increase in prices can help reduce scarring of productive potential by limiting damage to the balance sheets of viable energy-intensive firms and avoiding a wave of bankruptcies. However, determining which firms are at risk due to the energy price spike but viable in the long run is highly challenging in practice—not least because the energy supply outlook remains highly uncertain—and supporting non-viable firms risks impeding the reallocation of resources and ultimately raising the costs of adjustment, as well as being fiscally costly.

13. Given these considerations, in case of resurgent energy prices, future rounds of business support should have the following design elements:

- *Support should be targeted at firms which are most affected, financially constrained, and systemically important (i.e., in energy intensive industries embedded in supply chains with upstream/downstream externalities). Notably, most large, energy-intensive firms have access to working capital and can absorb or pass along a temporary cost shock. There could also be a case for supporting firms which are unable to pass-through their costs to customers due to pre-contracted prices, or competition from abroad which benefits from subsidized energy prices. In*

the latter case, however, the benefits from providing support should be weighed against the risk of generating adverse spillovers (e.g., retaliatory subsidies from trade partners).

- *Support should be strictly temporary and maintain the price signal to facilitate the exit of unviable firms* once the temporary component of the energy price surge dissipates.
- *Support should maintain incentives for energy efficiency and mitigate moral hazard.* Ideally, support measures would take the form of temporary liquidity assistance with private sector involvement (e.g., partial loan guarantees), and be conditional on hedging energy price exposures going forward and converging to industry best practices in energy efficiency and carbon emissions. In certain cases, grants and subsidies may also be appropriate due to debt overhang. Such support should not be proportional to contemporaneous energy usage (which can limit the adjustment to high energy prices) but should ideally be offered on a lump-sum basis (or linked to past energy intensity) to incentivize energy savings.

14. A range of structural measures could be adopted to better cope with high energy prices and tight energy markets. These include:

- *Delivering on the Net Zero Strategy and speeding up the green transition.* In response to a High Court ruling, the government published at the end of March 2023 a set of documents detailing how it intended to meet the Net Zero targets. Quantifiable measures included in those documents added up to 92 percent of the emission reductions needed to meet the UK's 2030 Paris Agreement goal, and 97 percent of the emission reductions needed to meet the UK's 6th Carbon Budget, a key milestone on the path to net zero by 2050.¹¹ Going forward, the authorities could provide more incentives for the green transition (e.g., by expanding the grant program for low-income households' heat pump installations and home insulation) and remove existing supply bottlenecks, including by setting out longer-term plans to attract private investment and streamlining planning regulations for green projects. The tax system should also help, not hinder, the transition to a low-carbon economy; some of the additional investments in energy efficiency initiatives could be financed by revenues from the windfall tax (Energy Profits Levy) as discussed in a research paper by the House of Commons Library. Also, authorities could consider the potential benefits of introducing a low-carbon investment allowance for electricity producers paying the new temporary windfall tax, so that renewable energy generators benefit from the same type of tax relief as high-carbon oil and gas installation investments. The ongoing decline in natural gas and electricity prices (as the temporary component of the energy supply shock dissipates) also provides a (political) window of opportunity to strengthen carbon taxation while maintaining a declining energy price profile.
- *Increasing gas storage capabilities* to better ensure security of supply in future heating seasons. Energy security is bolstered by the UK's status as a leading LNG hub and electricity interconnections with neighboring countries. However, the UK remains vulnerable to a "twin shock" of unforeseen supply shortfalls (e.g., due to disruptions to electricity or pipeline gas

¹¹ See <https://www.ft.com/content/c70d8e9e-e815-400b-a059-bbb78795f711>

inflows, or adverse weather conditions) and tight LNG markets (which would make it difficult to expedite additional gas imports). While measures to raise energy efficiency and increase renewable and nuclear energy generation would help limit this vulnerability, the UK is expected to become more dependent on natural gas imports as domestic gas production declines with the depletion of the North Sea basin (see Box 1). Enhancing the UK's natural gas storage capabilities, which are currently one of the lowest in Europe, would help ensure energy security both in the near and medium-term.

Reforming electricity markets to de-link infra-marginal electricity generation prices from gas prices. Although gas-fired power plants account for less than half of the electricity supply, wholesale electricity prices closely track natural gas prices due to pricing at the cost of marginal supply (as gas-fired power plants often act as the marginal supplier). Reforming electricity market price-setting so that prices for baseload power generation by renewable and nuclear energy sources more closely reflect costs would help curtail volatility in electricity prices and excess profits in electricity generation. However, these market reforms must be carefully designed to maintain sufficient incentives to invest in renewable and nuclear electricity generation capacities.

Box 1. Electricity and Gas Markets in the UK: Market Structure, Energy Mix and Outlook

Domestic production accounts for about half of the UK's natural gas consumption (Figure 1.1). The remaining half is imported, largely from Norway via pipeline and as LNG from Qatar and the USA. LNG imports from Russia, which have historically amounted to less than 4 percent of total gas supply, have been eliminated following the Russian invasion of Ukraine. The main segments of gas consumption are electricity generation, households (amounting to a third of total demand each) and industry (amounting to just above 10 percent of total). Gas consumption has declined in 2022 as prices have risen, with most of the adjustment falling on the household segment. Gas storage capacity is limited to only about 30 TWh, or 4 percent of annual gas consumption.¹

Natural gas is a key component in the UK electricity generation mix. More than a third of electricity generation is fueled by natural gas, which has replaced coal-powered generation in recent years. Renewables and nuclear power plants are the other major sources of electricity, amounting to approximately 40 and 15 percent of total electricity supply respectively. Historically, only about 6–7 percent of the electricity supply is imported, with France as a major source (along with Netherlands, Belgium and Norway as lesser sources). Households and industry account for 40 and 30 percent of electricity consumption respectively, with households accounting for most of the decline in consumption in 2022.

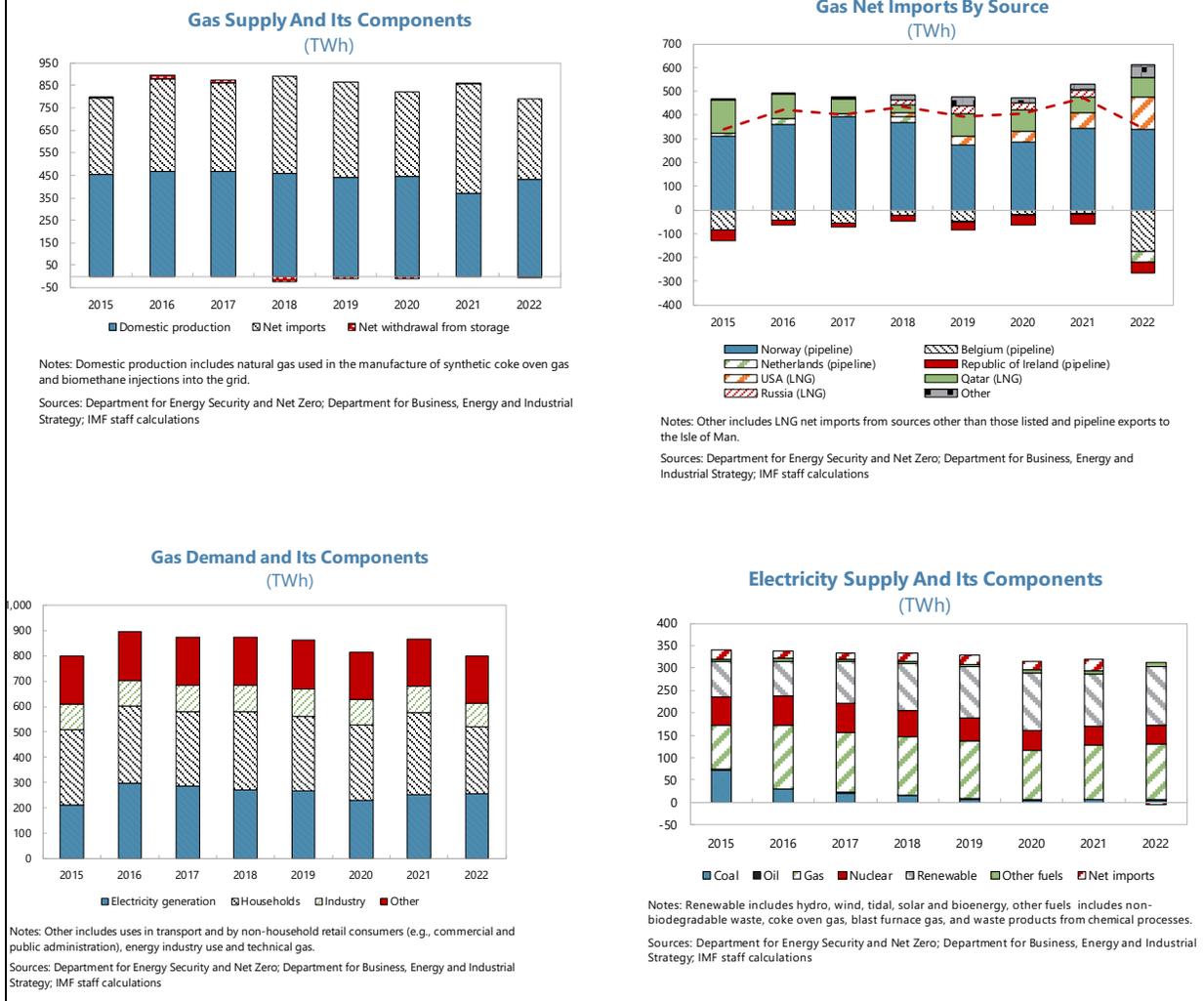
Retail energy prices are regulated but had been cost-reflective until October 2022. In view of market concentration and other barriers to entry in retail energy markets,² the Domestic Gas and Electricity (Tariff Cap) Act 2018 established a cap on retail electricity and gas tariffs, with the Office of Gas and Electricity Markets (Ofgem) responsible for reviewing the cap at least once every six months to reflect changing costs for providers.³ In October 2022, the government introduced an 'Energy Price Guarantee' (EPG) which capped retail energy tariffs for households at a level consistent with a typical annual household bill of £2,500

Box 1. Electricity and Gas Markets in the UK: Market Structure, Energy Mix and Outlook
(continued)

(about 35 percent lower than the Ofgem energy price cap for October 2022–January 2023) and an accompanying ‘Energy Bill Relief Scheme’ that capped energy tariffs for businesses at the same level as the EPG until March 2023. The government also compensated energy providers for the difference between the tariff caps under these schemes and the cost-reflective Ofgem energy price cap. While the EPG will remain in place until April 2024, declining wholesale energy prices are expected to reduce the Ofgem energy price cap to a lower level from July 2023.

The Net Zero Strategy envisages a shift in the UK’s energy mix from fossil fuels to renewables. The Net Zero Strategy, as recently affirmed by the ‘Powering up Britain’ policy papers, entails a decline in carbon emissions through increased energy efficiency and replacement of fossil fuels with low carbon energy sources. These include hydrogen and increased electrification of industry, transportation and heating, which are projected to reduce natural gas consumption projected by about half by 2035 (Figure 1.2). Nevertheless, the UK’s reliance on imported natural gas is expected to rise (to about 80 percent of consumption) as the depletion of the North Sea basin reduces gas domestic production.

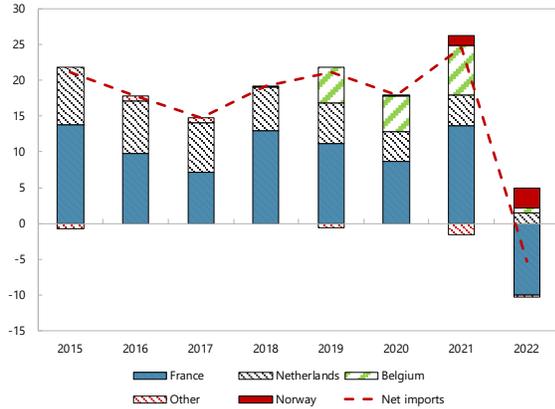
Figure 1.1. Supply and Demand of Gas and Electricity in the UK



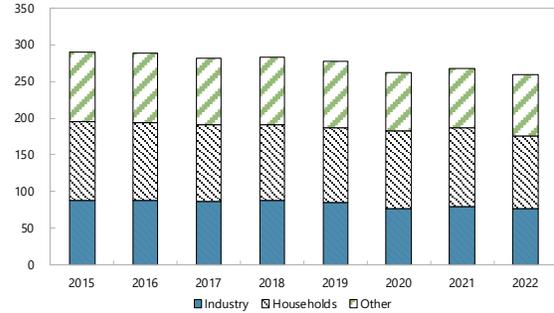
Box 1. Electricity and Gas Markets in the UK: Market Structure, Energy Mix and Outlook
(concluded)

Figure 1.1. Supply and Demand of Gas and Electricity in the UK (concluded)

Electricity Net Imports By Source
(Twh)



Electricity Consumption and Its Components
(Twh)



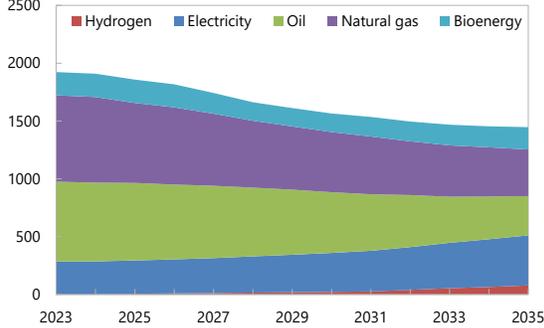
Notes: Other includes commercial premises, public administration, transport and agriculture; industry includes manufacturing industry, construction, energy and water supply industries.

Sources: Department for Energy Security and Net Zero; Department for Business, Energy and Industrial Strategy; IMF staff calculations

Sources: Department for Energy Security and Net Zero; Department for Business, Energy and Industrial Strategy; IMF staff calculations

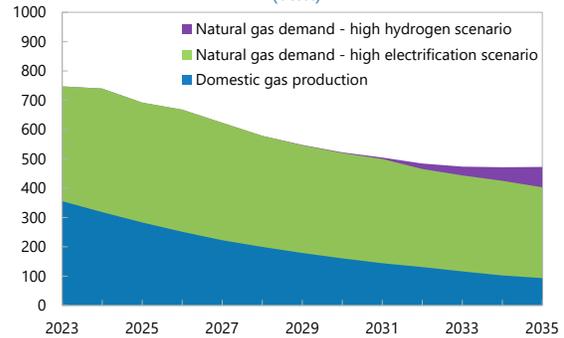
Figure 1.2. Energy Sector Outlook Under the Net Zero Strategy

Indicative Pathway For Energy Supply
(TWh)



Source: Department for Business, Energy and Industrial Strategy.

Indicative Pathways For Gas Supply and Demand
(Twh)



Source: Department for Business, Energy and Industrial Strategy.

¹ Based on data from [Ofgem](#) and accounting for the reopening of the Rough gas storage facility.

² In 2021, the aggregated market share of the largest 3 retail suppliers was 49 percent in electricity markets and 41 percent in gas markets. Less than 10 suppliers accounted for over 80 percent of the market in both gas and electricity ([Energy Trends, September 2022](#)).

³ Ofgem reviewed the cap every six months until October 2022, when it raised the frequency of reviews to quarterly intervals.

Box 2. Design Principles for Energy Support Measures

The design of support measures needs to balance several objectives. These include:

- **Protecting vulnerable households.** Policies should aim to protect poor and vulnerable households, which spend a greater share of their incomes on energy expenses (see Figure 5) and are likely to experience substantial hardship when their costs of living spike.
- **Facilitating adjustment to the energy supply shock.** The surge in energy prices is likely to have a persistent component (see Figure 2), necessitating an adjustment in energy consumption, including through a re-allocation of production of towards less energy-intensive activities. This also constitutes an adverse terms-of-trade shock for the UK economy (see Figure 3), which will cause a decline in real incomes that economic agents need to adjust to. Adjustments to the persistent component of the energy price shock are inevitable, and policies cannot, and should not aim to postpone or offset them, as attempts to do so would likely worsen the terms-of-trade shock.¹ While policies can attempt to smooth the short-lived component of the shock, in practice delineating between the short-lived and persistent components is likely to prove difficult due to the exceptional uncertainty about the energy supply outlook.
- **Mitigating scarring.** Abrupt surges in the energy costs may damage firm balance sheets, which can impair new investments and lead to bankruptcies of otherwise viable firms, leading to long-term scarring. Economic adjustments to high energy prices may also inflict long-lasting structural damage on regions with concentrations of energy-intensive industries, contributing to regional inequality. Policies should aim to mitigate these without impeding adjustment to the energy supply shock (including through the exit of unviable companies).
- **Preserving fiscal space.** In view of limitations to the fiscal space available to the UK government—and recognizing that it may also be needed to address future shocks given heightened uncertainty about the economic outlook—relief measures should be cost-effective. This places a premium on providing time-bound and targeted (rather than broad-based) support and financing it through revenue-raising measures rather than debt issuance.
- **Maintaining incentives for energy efficiency and de-carbonization.** Given the UK's Net Zero Strategy and concerns about energy security, policies should preserve and support incentives for energy conservation and transitioning away from fossil fuels.
- **Supporting a policy mix that is consistent with bringing inflation back to target in a timely manner.** Policy measures should be designed with broader macro-policy objectives in consideration. Particularly, in view of currently elevated inflation rates, policies should not contribute to aggregate demand and resultant pressures on monetary policy, which faces long transmission lags and may have financial stability implications.

¹For example, undermining the adjustment in natural gas consumption would further increase the UK's energy import bill.

LESSONS FROM THE UNITED KINGDOM'S LIABILITY-DRIVEN INVESTMENT (LDI) CRISIS¹

Liability Driven Investment (LDI) funds were at the center of the severe stress that emerged in the UK gilt market in the aftermath of the September 2022 UK "mini-budget". The episode, after the "Dash for Cash" and "Archegos" crises in the previous two years, highlights underlying vulnerabilities in the large and diverse non-bank financial institution (NBFI) sector. This paper seeks a deeper understanding of the factors that amplified the gilt market turmoil which ultimately led the Bank of England (BoE) to undertake temporary gilt purchases on financial stability grounds in late September/early October 2022 to restore orderly market conditions and allow LDI funds some time to build their capital positions. With the gilt market stress and the BoE's purchases now fully unwound, this paper identifies the key reasons for the success of the BoE's intervention. Then, drawing also on findings of the 2022 UK Financial Sector Assessment Program (FSAP), the paper discusses key gaps and policy issues related to the monitoring of financial stability risks in the broader NBFI sector for both individual jurisdictions and international standard-setting bodies.

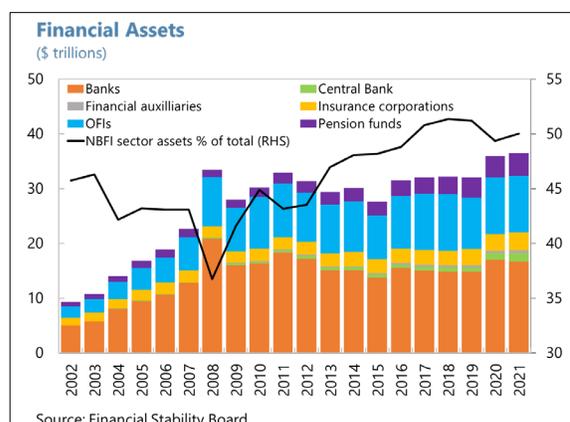
A. Introduction

1. Market stress centered on Liability-Driven Investment (LDI) funds following the UK "mini-budget" announcement in September 2022 has once again cast a spotlight on vulnerabilities in the non-bank financial institution (NBFI) sector. The sharp increase in gilt yields after the "mini-budget" forced defined benefit (DB) pension funds with leveraged LDI strategies to quickly raise a large amount of cash to meet margin and collateral calls, contributing to fire-sales of longer-dated gilts. The effect was compounded by rising long-term interest rates in the preceding 10 months, in response to which some pension schemes and LDI funds had failed to adjust their available liquid resources. Imminent financial stability risks forced the Bank of England (BoE) to intervene in the gilt market in a temporary and targeted way to restore orderly market conditions while allowing the LDI funds time to recapitalize. At the core of the turmoil were the leverage, liquidity mismatches, and concentrated positions of the LDI strategies. Over the past several years there were several instances where similar risk factors triggered market stress to either originate in the NBFI sector or be amplified within the NBFI sector.

2. In the UK, the relative weight of NBFIs in the financial system has risen, with an attendant increase in interconnectedness that could amplify and spread financial stress. NBFI lending has expanded domestically and across borders, especially in the commercial real estate (CRE) and small and medium-sized enterprise (SME) sectors (37 percent in total non-financial corporate lending), and in specific mortgage products (11 percent in total mortgages) and unsecured consumer credit (52 percent). The 2022 UK Financial Sector Assessment Program (FSAP) pointed out that some non-bank lending, such as buy-now-pay-later schemes and corporate loans, remain outside the regulatory perimeter and lack granular data for an in-depth risk analysis, including

¹ Prepared by Ruo Chen (EUR) and Esti Kemp (MCM).

interconnectedness to key market segments such as the gilt market. Moreover, certain non-bank lenders rely heavily on bank funding and securitization, creating interlinkages with the rest of the financial system, including banks, that could amplify contagion. For instance, nearly half of the funding of UK finance companies comes from banks. Significant linkages exist among various NBFIs and also between NBFIs and the banking system, and these links have become stronger over time. Such links are not limited to domestic



entities, and balance sheet linkages exist with overseas banks and asset managers as well. The FSAP also highlighted that liquidity mismatches in the internationally active NBFIs were the main source of risk in core sterling markets, namely equity, corporate bonds, commercial papers, and gilts.

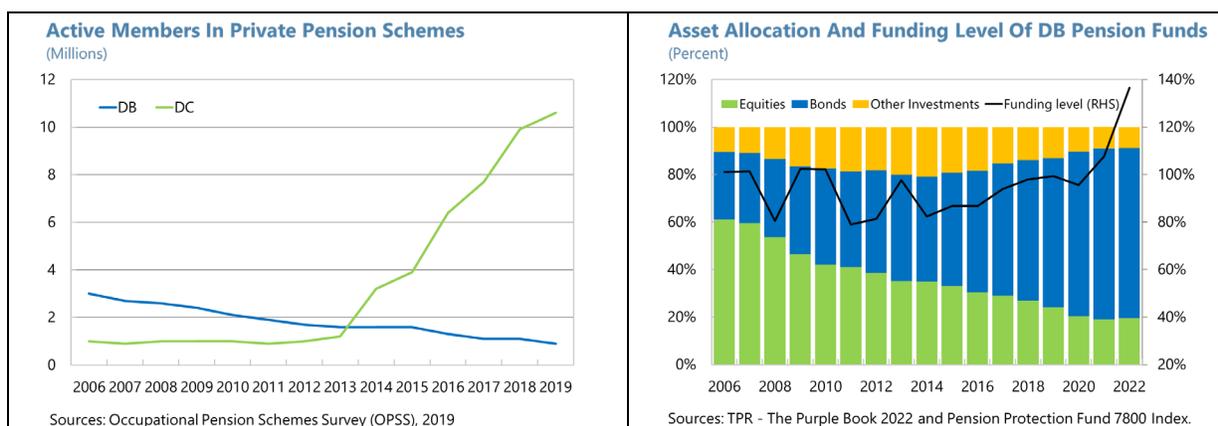
3. In this context, this paper aims to draw lessons from the LDI stress episode for mitigating and managing financial stability risks associated with the broader NBFIs sector. We seek a deeper understanding of what drove the market turmoil during the LDI stress episode and resulting financial stability risks. We then document the BoE's financial stability intervention and the factors – such as coordination, instrument choice, and communication – that led to its success. We also explore whether there are limits to the regulation and supervision of pension funds and assets managers of LDI strategies. Drawing on the experience from this episode and findings of the 2022 UK FSAP, the paper then proposes some takeaways for monitoring and mitigating financial stability risks associated with the NBFIs sector. While the LDI episode has passed, a close analysis could help reduce the likelihood of similar events occurring in the future, and enable authorities, including in other jurisdictions, to strengthen their crisis preparedness and response in case such events occur.

4. The remainder of this paper is organized as follows: Section II provides the historical background for the popularity of LDI strategies among UK's defined-benefits (DB) pension funds and its implications for the gilt market. Section III details our understanding of the unfolding of the LDI crisis and the BoE's financial stability interventions, based on discussions with market participants and BoE staff. Section IV summarizes key takeaways. We stress that the underlying vulnerabilities revealed in the LDI crisis are not unique to UK pension funds and are shared by the wider NBFIs sector, including in other countries. Therefore, the lessons drawn should be beneficial to prudential regulators and supervisors worldwide.

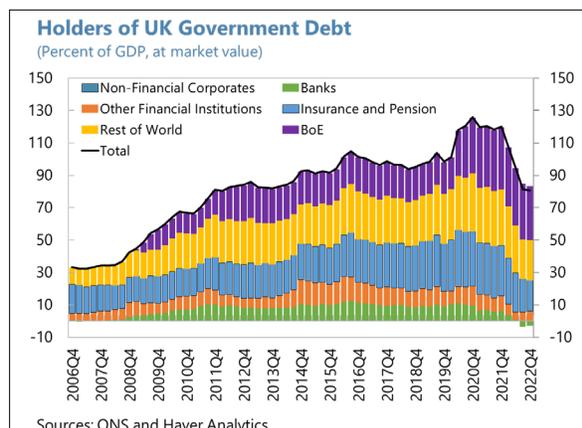
B. The Lead-Up to the LDI Crisis

5. Regulatory and demographic changes since the late 1990s have led many defined benefit (DB) pension funds in the UK to close to new members and to shift their investments from equity to fixed income. Changes to accounting standards since the late 1990s required corporates to recognize the full cost of their pension liabilities, discounted using market-based

interest rates, on their balance sheets.² With increasing life expectancy, which means that pension schemes need to pay out retirement income for longer periods, most employers closed their DB schemes to new members and switched to defined contribution (DC) schemes. Active members of private pension funds decreased from 3 million in 2006 to 0.9 million in 2019 in DB schemes, while active members in DC schemes increased from 1 million to 10.6 million. Still, DB schemes held close to 90 percent of total private pension funds' assets as of mid-2022. Without intergenerational saving channels, the DB pension funds have been managed only to serve the existing members with finite time horizons, like annuities. Accordingly, their risk appetite has decreased. The share of equity investment in DB fund assets declined from about 61 percent in 2006 to about 20 percent in 2022, while the share of fixed-income investments increased from 28 percent to 72 percent.



6. To reduce DB pension fund deficits, which could pose risks to corporate balance sheets, DB pension plans increasingly used LDI strategies, sold by asset managers, to match the present value of their assets to the present value of their liabilities. DB pension funds guarantee future pension payments to members, typically linked to inflation. The use of leverage under the LDI strategy through repo and swaps allows the pension fund to obtain a higher exposure to long-term gilts and to hedge the interest rate and inflation risk in their liabilities, while also freeing up resources to invest in growth assets.³ The basic principle of these schemes was as follows: if interest rates fall, the LDI strategies return a profit, which helps to offset the rise in the present value of pension liabilities. If interest rates rise, the declining present value of pension liabilities bolsters solvency (by decreasing liabilities), but the LDI strategies themselves incur losses which need to be covered by



² In the late 1990s changes to the accounting standards FRS17 and IAS19 required corporates to include pension deficits on corporate balance sheets.

³ Leverage requires collateral (generally a combination of cash and gilts) to be posted against repo or derivative contracts.

pension funds through provision of collateral or cash margins. Persistently declining long-term interest rates over the past 15 years had led to the popularity of LDI. From 2011 to 2020, the amount of UK pension fund liabilities hedged through LDI strategies grew from £400 billion to a very sizable £1.5 trillion (about two-thirds of UK GDP), according to the Investment Association, with a large concentration in the gilt market.

7. LDI is a highly concentrated market. The top three LDI managers occupy roughly 70 percent of the LDI market. During the early days, the LDI strategy was only available to large pension funds with their own accounts and managed by designated asset managers, also called segregated accounts. The asset managers often also have access to other assets held by the relevant pension schemes, which can be used to meet margin calls. As the popularity of the LDI strategy rose, asset managers launched “pooled” LDI funds, open to small pension funds, with a more cost-effective hedging solution compared to the segregated accounts (see Northern Trust 2008). Such “pooled” pension funds make up between 10-15% of the LDI market and are managed by a few asset managers, but often have very large numbers of pension fund investors.⁴ When existing liquidity buffers run out, LDI fund managers send margin calls to pension funds’ trustees, who need to raise cash by selling other assets (often requires approval from the board of governors and takes one to two weeks). Otherwise, their positions will be liquidated by LDI fund managers, which involves selling underlying gilts.

C. The LDI Crisis and Bank of England’s Financial Stability Intervention

The Unfolding of the LDI Crisis

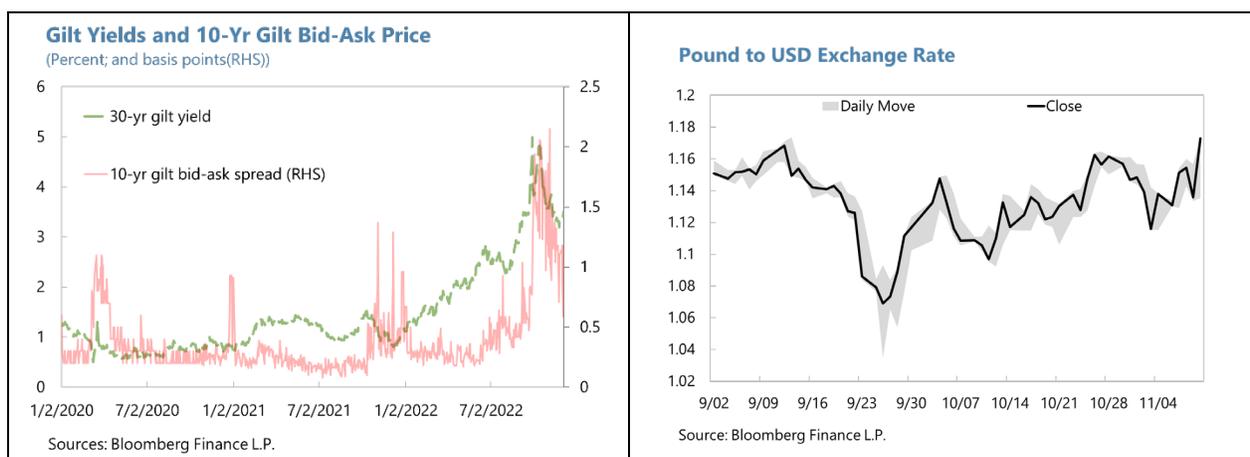
8. The September 23 “mini-budget” unnerved the UK’s core financial markets. While aimed at promoting growth, the £45 billion unfunded tax cuts were delivered against the backdrop of historically high inflation. In addition, unlike a standard budget, the “mini-budget” was not accompanied by an assessment by the Office for Budget Responsibility (OBR), the fiscal watchdog. The market’s concerns about fiscal sustainability, skepticism around growth objectives/impact, and increased uncertainty around how inflation would be brought down, triggered a swift selloff in UK assets. By the following trading day, the pound fell to its lowest-ever level on record (1.03) against the dollar, while gilt prices collapsed. Most strikingly, the 30-year gilt yield jumped 140 basis points over three days, an historic increase (this reflected also the impact of the pension funds’ forced sell-off of long-dated gilts—see below).

9. The sharp increase in gilt yields after the “mini-budget” saw the net asset value of LDI funds fall significantly and forced funds to raise cash quickly to post additional collateral on secured borrowing and to meet higher margin calls. While higher yields improved pension funds’ solvency ratios, they also meant losses for the LDI funds, who had to either rebalance their portfolios, for example by asking their pension fund investors for more capital, or had to deleverage. Pension funds generally have several days or weeks to raise cash to top-up their collateral in their

⁴ According to the Pension Regulator, there are about 175 pooled LDI funds with about 1800 pension schemes participating.

LDI positions. However, the sudden and unprecedented move in gilt yields after the "mini-budget" required pension funds to raise a significant amount of cash before the opening of next business day. While segregated LDI funds had ready access to additional assets and cash, pooled LDI funds with a large number of small DB pension fund investors faced operational challenges in mobilizing extra liquidity. Without cash to meet the margin and collateral calls, pooled LDI funds had to sell gilts, to raise liquidity and deleverage, contributing to the fire-sale dynamics.

10. The concentrated nature of pooled LDI funds' exposures meant that their forced selling behavior represented a sudden and profound shift in supply-demand dynamics in the gilt market. Large quantities of gilt sales, particularly in long-dated and inflation-linked varieties, in an increasingly illiquid market pushed yields even higher, and further increased the required collateral payments. Other assets, including MMFs and investments in open-ended funds, were also liquidated. While MMFs were able to meet redemptions, some real estate funds had to suspend redemptions. Disorderly conditions became evident in the gilt markets, with an increasing risk of spreading to other market segments.



The Bank of England's Financial Stability Intervention

11. With imminent and growing financial stability risk, the BoE announced a temporary and targeted purchase of long-term gilts on September 28. The Bank described that "multiple LDI funds were likely to fall into negative net asset value," which risked the fire-sale of a large amount of gilts, leading to "a self-reinforcing spiral and threatening severe disruption of core funding markets and consequent widespread financial instability." To restore orderly market conditions, the BoE announced that it would buy up to £5 billion daily in 20-year or longer-term gilts over 13 business days ending October 14 (implying a maximum of £65 billion in total). With the daily turnover in the long-term gilt market of around £12 billion, this appeared to provide a sufficient liquidity backstop. The market calmed immediately, with the 30-year gilt yield dropping more than 100 bps on the first day of the intervention (although yields rose again in the days that followed and did not durably come down until markets' concerns regarding fiscal policy had been addressed – see below).

12. While the intervention constituted an emergency action of the BoE to stabilize markets, it was supported by close coordination among key stakeholders, including overseas regulators. The Bank Executive (overseeing the delivery of BoE’s mission and strategy), following the recommendation from Financial Policy Committee (FPC), decided to intervene in the market and designed the intervention approach. HM Treasury was in close communication ahead of the operation and provided full indemnification. The Prudential Regulation Authority (PRA), the Pensions Regulator (TPR), and the Financial Conduct Authority (FCA)—regulating bank counterparties of LDI funds, pension funds, and delegated portfolio managers, respectively—together with the BoE, were closely monitoring the rebalancing progress of LDI funds. Regulators in Ireland and Luxembourg, where some LDI funds are domiciled, were also in close contact to ensure that the LDI funds used the opportunity of the intervention to build their resilience. At the same time, the Monetary Policy Committee (MPC) of the BoE was informed of the targeted and temporary nature of the operation, along with the assessment that it would not shift the underlying inflation dynamics or interfere with monetary policy operations.⁵

13. Market intelligence provided vital information that informed the design and timing of the intervention. Once stress erupted, market intelligence confirmed that leverage was already high, that fund managers were struggling to sell assets into a thin market, and that a swift intervention from the BoE was needed. Neither the LDI funds nor pension funds have access to BoE’s liquidity facilities. BoE’s liquidity support is mainly through intermediaries (i.e., banks). Given the heightened uncertainty, banks’ willingness to access BoE’s liquidity facilities for their clients would be significantly lower during stress episodes. More importantly, the LDI funds needed to deleverage, not re-leverage; thus, a repo facility with LDI funds was ruled out, and targeted gilt purchases were seen as the best option to provide orderly market conditions while allowing the LDI funds to build resilience. Moreover, a repo facility would have only provided funding liquidity, not market stability, which was at the center of the stress at the time. In particular, the operation was conducted using backstop pricing, focusing on removing the liquidity premium without distorting market prices.⁶ However, markets were unfamiliar with backstop pricing and some participants interpreted as quantitative easing (QE) at the very beginning of the intervention (see WSJ, 2022). At the end of the first week of intervention, some market participants expected that the BoE would expand and extend the purchase facility (see New York Times 2022).

14. Given the possibility of heightened gilt-selling pressure during the last week of its emergency operation, the BoE expanded its financial stability measures on October 10 and 11. The Bank stated that “pooled LDI funds – which have a large number of smaller investors—are likely to take longer to raise capital” and greater clarity on the size of asset sales would only come in the week of October 10 “because of the underlying volatility of the market.” The Bank was informed that “the planned asset sales were large in aggregate and involved substantial quantities of index-linked gilts, a market which is smaller and less liquid than the conventional (nominal) gilt market.”

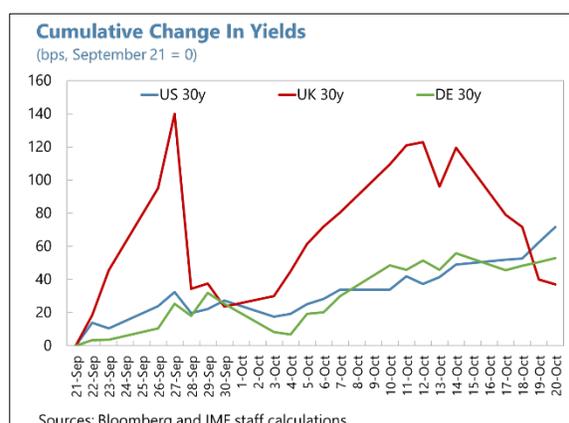
⁵ The start of active gilt sales was postponed by one month.

⁶ Backstop pricing, also called reserve pricing, refers to the price ceilings (in particular, relative to market mid-pricing) for asset purchases of central bank interventions to restore market functioning and act as backstops.

Therefore, the BoE increased the daily maximum auction size to £10 billion on October 10 and later split equally for conventional long-term gilts and index-linked gilts when it widened the gilt purchases to include index-linked gilts on October 11.⁷ In addition, the BoE announced a Temporary Expanded Collateral Repo Facility (TECRF) for banks through November 10 with expanded collateral, adding corporate bonds with credit quality of Baa3/BBB- or above, committed to maintaining liquidity support through its regular Repo operations.

15. Approaching the end of the intervention period, markets became increasingly anxious about the October 14 expiration “cliff edge.” Despite the increased daily limit of BoE’s gilt purchases at the beginning of the second week of intervention, some market participants remained concerned about the realism of solving the LDI problem by the announced end-date of the intervention and worried about a major sell-off ahead of the expiration date (see the Guardian 2022). However, unconditionally supporting the market could have led to moral hazard and reduced the incentives of the LDI funds and pension funds to accept the losses and rebalance their books. As such, Governor Bailey communicated clearly that the intervention would end as planned and urged pension funds to rebalance their positions by expiration. Moreover, the BoE firmly insisted on the temporary nature of the intervention and worked with the LDI funds and relevant regulators during the period of the intervention to build resilience so that the operations could be ended as planned.

16. The reversal of key “mini-budget” measures that was announced by the fiscal authorities during October 3–17 also proved beneficial to calm the market. The start of the BoE intervention on September 28 calmed the market, and bid-ask spreads on gilt yields narrowed. Moreover, gilt yields dropped sharply, but resumed an upward trend again between September 30 and October 12. It was in this context that the then-PM Truss dropped her plan of removing the planned corporate tax rise and appointed Jeremy Hunt as the new chancellor (October 14). The following Monday (October 17), the new chancellor scrapped most of the remaining tax cuts in the “mini-budget,” and markets staged a major (and sustained) rally in response to what they perceived as a renewed commitment to fiscal discipline.



17. In sum, the BoE’s financial stability intervention, together with the aforementioned fiscal policy reversals, successfully restored orderly market conditions in the aftermath of the “mini-budget” and enabled the LDI funds to build their resilience. The intervention was indeed temporary and targeted. Its operation lasted for 13 days and bought a total of £19.3 billion in long-

⁷ Given the specific dynamics in the index-linked gilt market, the BoE set a minimum yield for its index-linked gilt purchases.

dated gilts (£12.1 billion in conventional and £7.2 billion of index-linked gilts). In total, DB pension schemes and LDI funds sold an estimated £37 billion in gilts over this period; this is smaller than the estimated total margin and collateral calls these entities faced over this period (roughly £70 billion), reflecting the fact that LDI funds and pension schemes were also able to sell assets other than gilts (such as equities or corporate bonds) and use existing cash buffers in order to meet these obligations as well. Market intelligence suggests LDI funds also raised tens of billion pounds in capital from end-investors, which also reduced their leverage. The BoE also successfully unwound all its financial stability gilt purchases by January 12, 2023, just three months after the end of its stability intervention.

D. Key Takeaways

We conclude by focusing on the key lessons from the LDI crisis for mitigating and managing NBFIs vulnerabilities more broadly: (i) the need to address regulation and information gaps, (ii) enhancing NBFIs' liquidity management and oversight of leverage, (iii) when and how central banks should provide backstops to NBFIs, or act as the lender of last resort; and (iv) how to strengthen overall surveillance of the NBFI sector.⁸

Regulatory and Information Gaps

18. Visibility of some parts of the NBFI sector has improved, but the LDI episode showed that UK regulators have limited visibility and regulatory oversight of pooled and single client funds and that leverage and liquidity data are not readily available. Whilst the Prudential Regulation Authority (PRA) regulates bank counterparties of LDI funds, the BoE does not directly regulate pension funds, LDI managers, or LDI funds. Pension schemes and LDI managers are regulated by TPR and the Financial Conduct Authority (FCA) respectively. Moreover, while pension funds are typically based in the UK, the investment funds operating their LDI strategies are largely based in Ireland and Luxembourg. Therefore, UK regulators have to rely on other jurisdictions to provide information on these funds. Data gaps were also highlighted by the FCA, which noted that limited data were available on the use of LDI strategies, leverage, and collateral. More broadly, the BoE should consider how to collect information that fully matches its broader financial stability mandate.

19. Information gaps around NBFI activities and exposures, and lack of systemic oversight have been common threads in all recent crises involving NBFIs. For example, the Basel Committee on Banking Supervision (BCBS) highlight vulnerabilities and deficiencies in the risk management of banks related to NBFIs following recent stress episodes such as Archegos. These deficiencies include insufficient information collection on clients' positions and exposures, together limited efforts to understand and assess clients' investing strategies, and were again demonstrated with the LDI stress.

⁸ There are also non-NBFI related lessons to be drawn from the LDI episode, such as the need for coherent policy packages to address macroeconomic imbalances, the heightened sensitivity of financial markets to policy missteps (including circumvention of important institutions and processes), and the perceived and actual interactions between monetary policy and financial stability. However, we abstract from these for this paper which is more narrowly focused on NBFIs.

20. Closing these data gaps would support a holistic overview of NBFIs vulnerabilities, but in itself would likely be insufficient to assess and respond to financial stability risks. The FSAP recommended the authorities collect or systematize the collection and reporting of data for all Sterling holdings by all investors. Such data could help to enhance the analysis of the concentration of NBFIs investors in key sterling markets, including holders of various gilt maturities with similar business models and their behavior in stress together with resulting implications for liquidity in these markets. These data would also be critical for proper NBFIs supervision and designing appropriate backstop facilities.

21. All data collection efforts need continued international coordination, but the authorities should continue to take the lead in this area. The UK NBFIs sector is internationally connected thus information collection and supervision would require international cooperation. In this respect, the UK authorities should continue strengthening information sharing with relevant third-country authorities, including monitoring and supervising internationally active NBFIs. For example, European Systemic Risk Board (ESRB) uses the Alternative Investment Fund Manager Directive (AIFMD) reporting to help analyze and monitor NBFIs risks. According to ESRB (2023), all the UK pooled LDI fund managers are domiciled in the EU, and their information can be accessed through the AIFMD data. The UK authorities should seek regular access to the AIFMD data through a bilateral agreement with the EU authorities and explore other sources for higher frequency data. In this regard it is worth noting that the FCA is reportedly receiving information from LDI managers on a more frequent basis now.

NBFIs' Liquidity Management and Oversight of Leverage

22. Liquidity shortages, leveraged positions, and a high level of interconnectedness provide the vehicle through which financial stability vulnerabilities crystallize and risks amplify. The leveraged positions taken on by funds, liquidity shortages that they faced as a result of margin calls and the impact that their selling of gilts had on the broader market demonstrated how quickly financial stress can amplify and spread. Against this backdrop, the LDI stress event was not completely idiosyncratic: the Archegos and Nickel events are also examples where leverage, a liquidity shortage and interconnectedness generated financial stability risks, particularly where markets were intermediated by dealers.

23. Strengthening NBFIs' liquidity management is key, as part of an effort to strengthen oversight of the NBFIs sector. This includes enhancing liquidity regulation of NBFIs holding leveraged exposures in core markets, in order to reduce risks of future disruption as well as the need for central bank backstops. Recent events demonstrated that stress tests were too mild and that mandated liquidity buffers for NBFIs should be reevaluated and strengthened if required. In terms of measures taken by LDI funds in the immediate aftermath of the crisis, funds have been strengthened considerably and secured an average yield buffer ("headroom") of around 300–400 bps. Moreover, ongoing work on liquidity mismatches in investment funds is important – with money market and open-ended fund regulation to be enhanced in line with recent FSB proposals. For MMFs, policy proposals include measures to reduce liquidity transformation (i.e., hold a higher share of liquid assets) or move the cost of redeeming to those investors that redeem (i.e., swing pricing for

example). Moreover, there is a need to ensure that open-ended funds use adequate liquidity management tools.

24. Ex-ante liquidity facilities for NBFIs, such as contingent liquidity lines with banks, could be pre-negotiated. The repo window that the BoE set up, which would have involved banks, did not work during stress episodes. This reveals that banks are unlikely to play the role of providing liquidity to NBFIs during a crisis, partly as a result of the more stringent regulations that they have been subject to since the GFC. In this case, ex-ante liquidity facilities for the NBFIs with banks could be negotiated, for example, contingency liquidity lines. There is precedent for this in Denmark.

25. The UK authorities have recommended stronger safeguards and operational resilience to both pension funds and LDI managers. Following the FPC recommendations and Bank of England staff proposals on indicative resilience standards (see BoE, 2023), TPR set out a minimum liquidity requirement for pension funds investing in LDI strategies (as part of a steady-state level of resilience) to withstand a 250 bps move in long-dated gilt yields,⁹ substantially higher than the 140 bps increase in long-term yields seen in a few days during the LDI crisis. FCA and TPR also set out further guidance on enhancing resilience in LDI funds, including realistic contingency planning, applying appropriately designed stress tests, and ensuring clients can deliver collateral within five days.

Central Bank Liquidity Backstops for Systemic NBFIs

26. The design of BoE's financial stability intervention greatly benefited from timely information provided by Market intelligence which helped to tailor the BoE's response to LDI stress. For example, once stress emerged, market intelligence confirmed that leverage was already high and that a swift intervention from the BoE was needed, thus after consideration a repo facility for LDI funds was ruled out and targeted gilt purchases were seen as the best option.

27. While the BoE's intervention also involved gilt purchases, the implementation was quite different during the dash for cash episode where monetary policy was expected to loosen. Typically, central bank asset purchases contribute towards monetary easing and accompanies situations where central banks are lowering interest rates. In the case of the LDI stress event, the BoE had already set out its plans for quantitative tightening – first by stopping reinvestments from March 2022 and then also announced plans for active gilt sales i.e., selling gilts, against a backdrop of interest rate hikes to tame inflation. When the BoE intervened, it paused the planned start of active gilt sales.

28. Given the potential perceived tensions between price stability and financial stability, transparency and clear communication are critical for conducting effective market interventions during stress episodes. Policies such as opening central bank liquidity support to NBFIs may make achieving price stability complicated if it involves asset purchases, while raising moral hazard concerns. For example, purchasing sovereign bonds to improve market functionality

⁹ The TPR guidance requires trustees to invest only in leveraged LDI arrangements where there is a buffer of at least 250 bps to withstand severed market stress together this an additional operational buffer.

while raising policy rates and conducting quantitative tightening could create implementation challenges. In such a scenario, clear communication by the central bank becomes even more important, especially if such measures are prolonged and untargeted (see GFSR April 2023). In this context, BoE's firm communication with markets on the temporary and targeted nature of the intervention and with pension funds on the need to recapitalize their funds swiftly was proven critical, despite some market participants initially perceiving tensions.

29. At the same time, backstops for the functioning of core markets such as gilts should be strengthened, whilst minimizing moral hazard, as recommended by the FSAP. For entities for which data are collected and analyzed, and which are subject to appropriate supervision and systemically interconnected, consideration could be given to grant access to a BoE liquidity backstop. The inclusion of certain NBFIs in the BoE's operational framework could improve the BoE's options in future stress situations – for example allowing appropriately regulated and systemically interconnected NBFIs possible access to some liquidity support from the BoE's facilities would widen the range of options available to counteract future market-wide stresses. The FSAP stressed that such support should be focused on maintaining the functioning of the core markets (such as gilts and gilt repos). Expanding the toolkit would be especially important as the BoE is currently in a monetary tightening phase. The design of facilities accessible to NBFIs should reflect their diverse nature and safeguards would need to be in place to avoid moral hazard.

Overall Surveillance of the NBF Sector

30. The FPC's stress analysis of the risks from leverage in the NBFIs was not as extreme as market stress experienced during the LDI crisis which exceeded previous historical moves. An assessment conducted by the FPC in 2018 concluded that most non-banks (including pension funds) had sufficient liquid assets to meet margin calls under an interest rate shock as big as 100 bps; the report claimed that "a 100 bps increase over a single day, or a single week has never been experienced in 10-year sterling swap rates looking back to 1990." But the actual move in late September was bigger, and liquidity shortfalls increased exponentially. The analysis saw a £1.4 billion shortfall with a 100 bps increase in interest rates faced by NBFIs with total assets around £1.8 trillion.¹⁰ During the recent market turmoil, pension funds raised £40 billion in cash, whereas the total LDI investment was about £1.5 trillion. In addition, the FPC cautioned that pension funds did not pay sufficient attention to liquidity risks.

31. In this context, the FPC's plan to conduct a system-wide exploratory scenario (SWES) exercise focused on NBF risks is a welcome step towards improving the understanding of NBF-related vulnerabilities. The focus will be on both key entities (banks and NBFIs, including those domiciled abroad) and core markets. This exercise, which is voluntary, but intended to cover most systemic NBFIs and their links to banks, should help identify and possibly quantify the various risks, including hidden leverage, and channels of systemic risk propagation. The exercise should also

¹⁰ The NBFIs in the FPC's analysis included the largest UK insurers, the biggest derivatives users among UK pension funds, UK investment funds, and hedge funds reporting to the FCA, amounting to over 100 institutions.

help close some NBFIs data gaps and is an important step toward stronger regulation and supervision of NBFIs and ultimately toward mitigating systemic financial stability risks.

32. Nevertheless, continued horizon scanning is a prerequisite for identifying NBFIs vulnerabilities and responding to stress in the NBFIs sector. The NBFIs sector comprises a set of diverse institutions with different business plans and levels of risk taking. Moreover, the NBFIs sector is continuously evolving and adapting. Hence, continued monitoring and improvements in assessments are required.

E. Conclusions

33. The LDI stress episode was not completely idiosyncratic, echoing NBFIs vulnerabilities in past stress episodes—including liquidity stress, leverage, and interconnectedness. While the BoE intervention on financial stability grounds successfully restored market functioning and provided LDI funds time to build more resilient positions, more can be learned through this experience.

34. This episode was triggered by a fiscal event resulting in historical moves in gilt yields, exceeding any standard stress test parameters. This illustrates the importance of macroeconomic policy coordination, but it also challenges the assurance from standard stress tests. In this context, reverse stress testing can be used as a complementary tool. The purpose of reverse stress testing is to identify extreme events or circumstances that could potentially cause significant financial stability risks. By identifying these scenarios, the authorities and financial institutions can develop contingency plans and risk mitigation strategies to ensure resilience.

35. Second, while the urgent need to close data and information gaps was demonstrated, the role of market intelligence was underscored even when data might be available but might not be timely. Enhanced data availability helps identify potential vulnerabilities building. Market intelligence could play a key role in the real-time decision-making process of authorities' crisis response. The ongoing SWES exercise could also contribute to this end.

36. Third, given the cross-border nature of NBFIs activities, international coordination to address NBFIs vulnerabilities is key. NBFIs domiciled and possibly regulated in one jurisdiction are often marketed in other jurisdictions, creating cross-border links and the potential for stress spillovers. Moreover, an international response to regulatory changes is required to avoid the possibility of regulatory arbitrage.

37. Finally, the episode demonstrated the importance of communication among regulators, but also to the public. Given the various roles of the authorities in NBFIs regulation and oversight, clear and regular communications between regulators are key, not only in monitoring NBFIs vulnerabilities but also in times of stress. Moreover, given potential perceived tensions between monetary policy and financial stability, it is of utmost importance that the authorities communicate clearly and in a timely manner to the public, so that market participants understand the purpose of the actions taken.

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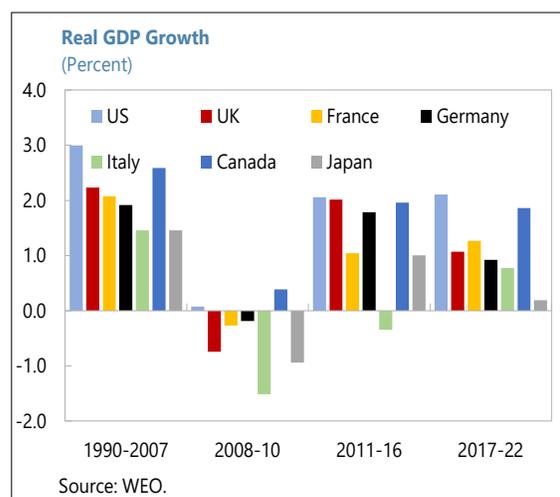
ENHANCING BUSINESS INVESTMENT IN THE UNITED KINGDOM¹

Why has business investment in the United Kingdom (UK) been weak? The paper addresses this question by analyzing aggregate investment trends in the UK and other G7 peers, and investment drivers for UK firms. Data show that business investment has been structurally low in the UK, and likely the key driver of the UK's relatively weaker growth performance since the middle of the last decade. Econometric investigations confirm a negative impact of Brexit-related uncertainty, the importance of financing constraints on firms, and a complementary role for public capital.

A. Introduction

1. There are both conjunctural and structural reasons to focus on business investment in the UK.

Pre-GFC, the UK was the third fastest-growing G7 economy after the United States and Canada. But this momentum was sequentially lost, first with the GFC, then with the Brexit referendum (which saw business investment level off), and finally with the pandemic (which has been accompanied by a rise in labor inactivity). The present conjuncture, following the energy shock due to Russia's war in Ukraine, with high inflation and weak growth, therefore, provides a strong motivation for focusing on expanding the UK's supply potential, including through higher business investment. Moreover, as will be shown below, even before these events, the UK recorded a relatively low level of business investment compared with other G7 peers, pointing, potentially, to structural impediments.



2. Against this backdrop, the paper examines patterns and drivers of UK business investment since 1990 with a view to identifying key impediments that policy could address.

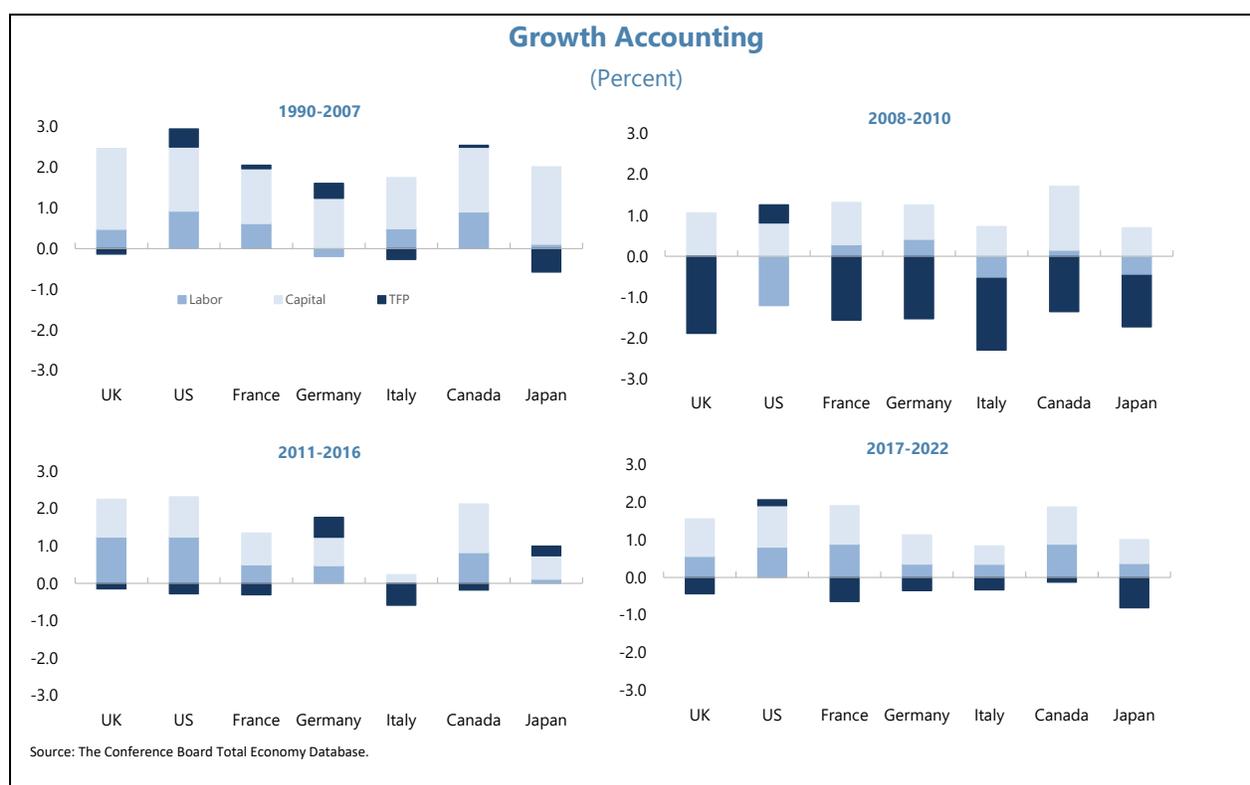
The paper explores various factors that could potentially influence investment decisions, such as uncertainty, borrowing costs, access to term finance, and profitability expectations of firms. The paper also examines the role of public investment in driving private investment. The empirical results then provide a basis for identifying suitable reforms. The rest of the paper is structured as follows: section B lays out some high-level trends in macro data on investment and growth, comparing the UK with G7 peers; section C sets out the econometric exercises based on a two-fold

¹ Prepared by Agnese Carella, Ruo Chen (both EUR), and Xiaobo Shao (INV).

approach, using macro and micro (firm) datasets to identify drivers of business investment; and section D discusses policy implications.

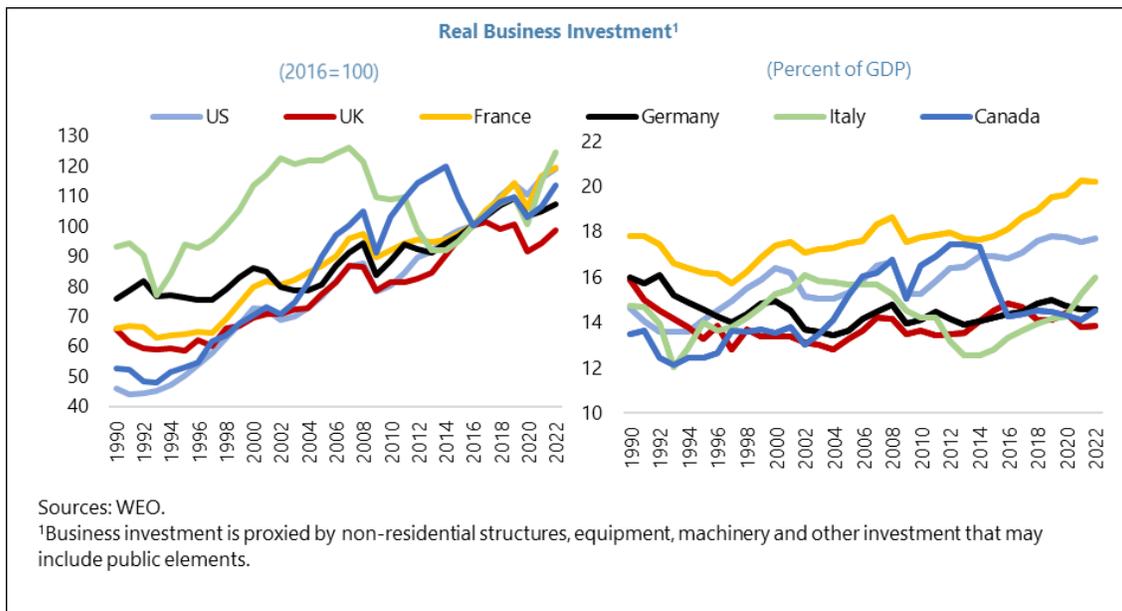
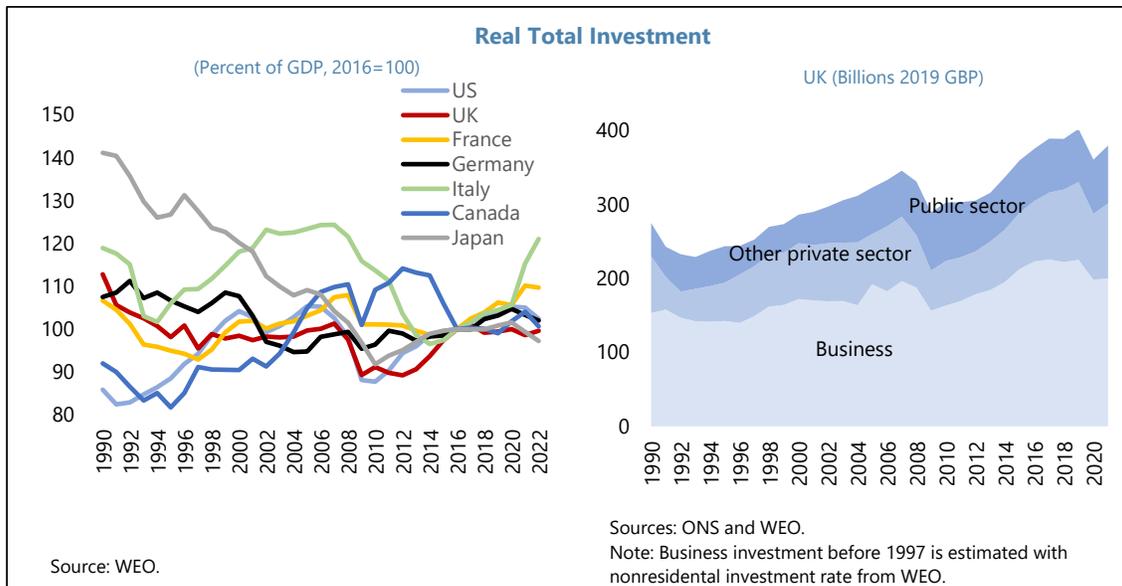
B. Level and Growth Contribution of Business Investment in the UK

3. Trends in business investment have been a key driver of UK growth performance since 1990. Capital accumulation (grey bars) in the UK was robust in the years preceding the GFC, leading the country's strong economic performance relative to other G7 economies. But the rate of capital accumulation almost halved in 2008–2010, and never fully recovered to pre-GFC levels. In fact, the post-GFC economic rebound (i.e., 2011–2016) was mainly driven by a surge in labor participation (light blue bars), aligning with trends observed in the US. In 2016, the share of labor contribution to the UK growth exceeded 50 percent, nearly triple that observed before the GFC. But, more recently, during 2017–22, the contribution of labor has declined too, in both absolute and relative terms, thus failing to compensate for the weaker contribution from capital and productivity.



4. Business investment in the UK has been low compared to G7 peers for some time. UK total investment, as a share of GDP, has been 4 percentage points below (on average) compared to other G7 economies since 1990. Business investment, which accounts for the bulk of investment and about 13 per cent of UK GDP, has also been relatively low for long and has deteriorated further during the GFC; non-residential investment has been below the average for G7 peers by an average of 36 percent since 1990; and the same pattern emerges in percent of GDP comparisons. The post-GFC recovery in business investment was sluggish, falling behind other advanced economies; and the momentum was further disrupted after the Brexit referendum which was associated with substantial

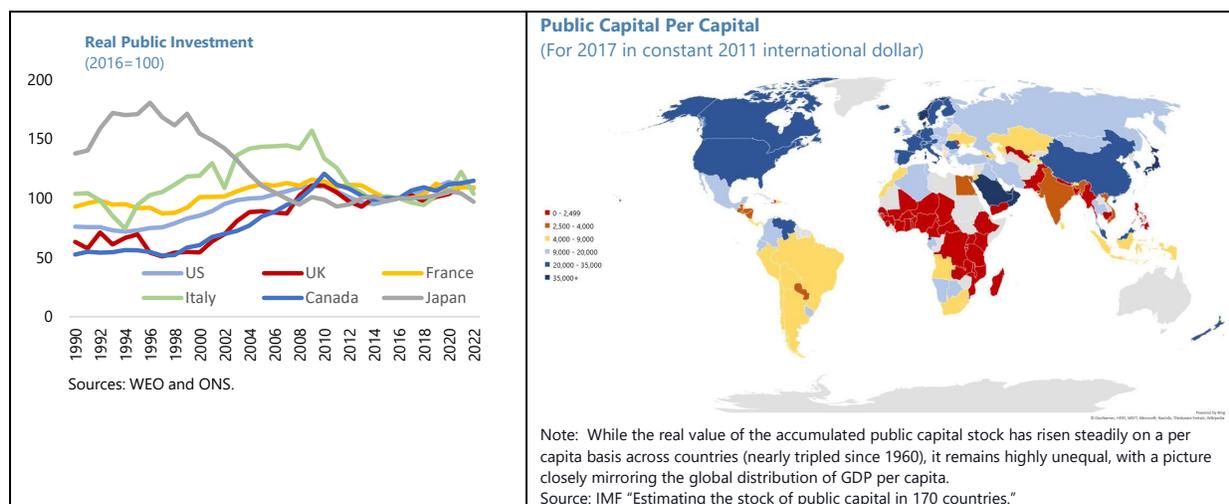
uncertainty for businesses. Subsequently, throughout the pandemic, real business investment in the UK failed to keep pace with its peers and has settled at a slightly lower level in 2022 than in 2016 (while other G7 economies experienced a 14 percent increase on average over this period).



5. Low business investment (and its consequences for productivity²) might also reflect the UK’s relatively low public investment and public capital stock. Public investment in the UK

² As noted in the accompanying SIP on the labor market, UK labor productivity is second-lowest in the G7.

has historically been lower than in G7 peers (left chart below). Xiao and Le (2019)³ show that the UK stands out among advanced economies with a low capital stock (right chart below). There is a large literature on the complementarity of public and private capital and the catalyzing effect of public infrastructure on business investment, and public investment more generally on innovation and human capital (which further catalyze business investment).⁴



C. Drivers of UK Business Investment: Two Econometric Analyses

Fixed Effect Regressions on G7 Macro Panel Data

6. The objective of the macro exercise is to explore macroeconomic indicators that could explain differences in UK business investment with respect to other G7 countries. The following macro investment model is estimated using annual panel data for G7⁵ economies, over the period 1980–2022:

$$\Delta I_{i,t} = \alpha_0 + \beta_1 X_{i,t} + \beta_2 \sum_{n=1}^3 \Delta Y_{i,t-n} + \beta_3 \text{Brexit}_t + \beta_4 \text{Covid}_t + \mu_t + \nu_i + \varepsilon_{i,t} \quad (1)$$

where i denotes the country and t the year; and

- $\Delta I_{i,t}$ is the growth rate of non-residential investment⁶

³ "Estimating the stock of public capital in 170 countries (August 2019 [update](#))."

⁴ See also "Public Investment for the Recovery" (IMF, 2020) and Huntley (2021).

⁵ Japan is excluded from the analysis due to lack of data.

⁶ Non-residential investment is used as a proxy of business investment. It includes non-residential structures, equipment, machinery, and other investment, which might include some public elements. Other proxies were considered based on private investment excluding residential, which yielded with similar results.

- $X_{i,t}$ is a vector of lagged macro variables: non-financial corporation debt (as a measure of credit or financing constraints), short-term interest rate (as a proxy for borrowing costs), market capitalization (to capture future profit expectations), public investment growth (to capture possible crowding-in/out effects), credit to households (to control for possible crowding out effects on firms), and $\Delta Y_{i,t-1}$ is the growth rate of GDP with lags up to three years (to capture the prevailing economic environment)
- $Brexit_{i,t}$ is a time dummy equal to one for the UK during 2017–2022 (to capture the uncertainty effect following the Brexit referendum) and $Covid_{i,t}$ is a time dummy equal to one after 2019.
- μ_t and v_i are time and country fixed effects, respectively, and $\varepsilon_{i,t}$ is the idiosyncratic shock.

Data are from the World Economic Outlook, the Bank for International Settlements, the National Statistics, and the World Federation of Exchanges. The variable definitions are provided in Table 1.

7. Table 3 shows the results from the macro panel regression on equation (1):

- Column (1) indicates that business investment is inversely related to lagged **non-financial corporate debt** (as a share of GDP): high levels of debt create financial constraints and limit the firm's ability or willingness to secure additional financing for investment purposes (ECB, 2023). On the other hand, the coefficient on the aggregate interest rate is not significant, which suggests that the level of interest rate in the economy by itself may not be a major deterrent to investment.
- Moreover, business investment is positively associated with firms' growth expectations, as reflected by **market capitalization**. The positive market sentiment, from investors placing a higher value on future earnings potential, provides firms with greater access to fundings and incentives to optimize resource allocation (Baker et al., 2003; Leitner, 2007).
- Column (2) examines the complementarity between public and private capital and finds a positive relationship. The coefficient on **public sector investment** is positive and significant, corroborating the hypothesis of a crowding-in effect and the narrative that government spending, especially on public good and infrastructure, can serve as a catalyst for stimulating private sector activity and fostering sustainable economic growth⁷ (Xu et al., 2014; World Bank, 2007; Commission on Growth and Development, 2008; IMF, 2010, 2020; Huntley, 2021).⁸
- Column (3) accounts for the role of **Brexit-related uncertainty**, controlling for the potentially conflating effects of the Covid pandemic. A prolonged period of uncertainty followed the 2016

⁷ A 10-percentage point increase in public investment growth would correspond to a nearly 1 percentage point increase in business investment growth.

⁸ Note that earlier studies on the relationship between public investment and growth have not provided definitive results (IMF 2004 and IMF 2005), and some have concluded that public investment is neutral (Aschauer, 1989) and that growth disparities are better explained by total factor productivity, rather than capital accumulation (Easterly and Levine, 2001).

referendum that lasted until December 2020, when a deal was eventually reached with the EU. Over this period, the lack of clarity regarding post-Brexit trade relationships with the EU created a challenging economic context, which was further compounded by disputes over the Northern Ireland Protocol and the retention of EU laws. According to the recent literature, the instability and potential disruptions associated with this have generated a large and long-lasting increase in uncertainty, and a less favorable business environment in the UK, which has led to cautious investment behavior and subdued capital spending (Górnicka, 2018; Bloom et al., 2019; Anayi et al., 2021; Faccini and Palombo, 2021). Traditional policy uncertainty indicators (such as Bloom's 2013) fail to capture this effect, as they do not show persistence beyond 2016. Instead, the paper adopts a time dummy for UK in the years after Brexit. Consistent with this, the coefficient on the Brexit uncertainty dummy is found to be negative and statistically significant. Moreover, business investment was found to further deteriorate during **Covid**; although the Covid dummy was insignificant, the year fixed effect for 2020 had a negative significant coefficient.

Micro-econometric Analysis Using Firm-level Data

8. The microeconomic investment model is estimated using annual firm-level panel data for a sample of about 5,000 UK listed companies over the period 1984–2022. Following IMF (2014), the estimation methodology is based on the GMM-System estimator proposed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). The GMM-System estimator addresses potential endogeneity issues and measurement errors in autoregressive models with high persistence (frequently seen in firm-level panel data) by using lagged explanatory variables as instruments. The model specification loosely follows the choice of variables in the previous exercise plus some additional, as follows:

$$\frac{I_{i,j,t}}{K_{i,j,t-1}} = \gamma_0 + \delta_1 \frac{I_{i,j,t-1}}{K_{i,j,t-2}} + \delta_2 Z_{ijt-1} + \delta_3 \text{Brexit}_t + \delta_4 \text{Covid}_t + \tau_t + \eta_i + \varphi_j + \omega_{ijt} \quad (2)$$

where i denotes the firm, j the industry, and t the year. $I_{i,t}$ is capital expenditure, $K_{i,t}$ is net capital stock, $Z_{i,t}$ is a vector of controls, including annual sales growth relative to historical mean, return on assets, the effective interest rate, retained earnings and long-term capital. $\text{Brexit}_{i,t}$ is a time dummy equal to one after 2016 (Brexit referendum), $\text{Covid}_{i,t}$ is a time dummy equal to one after 2019; τ_t , η_i and φ_j are time, firm and industry fixed effects, respectively, and ω_{ijt} is the idiosyncratic shock. Data are from the Worldscope database. The variable definitions are provided in Table 2.

9. Table 4 presents the micro regression results from equation (2).

- The coefficient on **sales growth** is positive and statistically significant, as firms are more inclined to invest when they anticipate higher prospects for final demand.
- The coefficient on the **return on assets** is also positive as expected, indicating that profitability provides firms with the necessary resources, confidence, and competitive advantage to invest more.

- The coefficient on the **effective interest rate** faced by firms is negative and statistically significant, as expected, suggesting that higher borrowing costs reduce the desired stock of capital among firms. Moreover, firms with higher levels of **retained earnings** are more likely to engage in investment activities, in line with the pecking order theory of prioritizing internal financing over external debt and equity financing (Myers, 1984) and with recent empirical evidence for the UK (McCafferty, 2014).
- External financing continues to play a significant role, nonetheless (IMF, 2014; EC, 2014). The coefficient on **long-term debt** is positive and statistically significant, meaning that UK firms with higher access to long-term financing undertook higher investment.
- Column (2) investigates the impact of **Brexit** (as before proxied by a time dummy for the Brexit referendum) on investment decisions of UK firms, controlling for Covid confounding effects. Findings confirm a substantial decline in business investment following Brexit, which persists after accounting for industry variation and the detrimental impact of the subsequent **Covid** pandemic shock (the Covid dummy had a negative and significant coefficient). The result is in line with the prevailing narrative that both the UK's decision to leave the EU and the Covid pandemic have generated an unexpected, large, and persistent uncertainty shock, as well as a scenario characterized by businesses caution and reluctance to commit to long-term investment projects (Bernanke, 1983; Arellano et al., 2018; Bloom et al, 2019; Anayi et al., 2021).
- Column (3) investigates **industry patterns**. By including industry fixed effects, the analysis allows to rank sectors based on their investment levels and to identify the high-investment ones. Findings reveal that firms operating in specific sectors, specifically advanced manufacturing, transportation, communications, health services, education, and research and development, tend to have higher levels of investment, which might be indicative of greater dynamism.

D. Main Results and Policy Implications

10. The main findings of the econometric analyses are as follows. First, Brexit-related uncertainty appears to have been a key driver of low business investment after 2016, and the pandemic has added further to the drag. Second, there is a significant crowding-in effect of public investment on private investment. It is noteworthy that this result obtains over a sample period (1980–2022) where G7 government yields averaged over 5 percent. Third, UK firms with higher retained earnings or external long-term capital have been able to invest more. Thus, access to finance matters. Fourth, certain sectors are more dynamic in terms of investment (such as advanced manufacturing, health, education, transport, communications, R&D). Although it is not clear whether these sectors would continue to be leading investors going forward, or how productive their investments would be, continued attention to addressing market failures in these and other sectors appears warranted. Fifth, high levels of firm indebtedness constrain investment; this may be less of a concern today, as non-financial corporate debt is significantly below its pre-GFC peak.

11. The UK authorities are taking measures to address some of the inhibitors to UK business investment identified above. The Windsor Framework agreement with the EU and the

more measured approach to reviewing retained EU laws, should help reduce Brexit-related uncertainty. On public investment, while the last two budgets have sought to protect near-term investment spending, the public investment-to-GDP ratio is still set to decline after 2025. On access to finance, the authorities are seeking options to unlock the UK's large pool of pension and insurance savings to finance high-return investments. Finally, the Chancellor's 4Es strategy (focusing on enterprises, education, employment, and everywhere) seeks to target high-productivity growth areas, such as advanced manufacturing, life sciences, and clean energy; and the three-year capital allowances introduced in the 2023 Spring budget seek to remove tax as an obstacle to investment.

12. Additional reforms should build on these steps. First, although recent developments related to post-Brexit uncertainty have been encouraging, these need to be consolidated, including through timely implementation of the Windsor Framework and careful review of retained EU laws. Second, accelerating well-targeted public investments (e.g., for the green transition and the delivery of network and healthcare infrastructures) can lower costs for businesses and crowd-in private investment. Third, firms' access to external finance (ideally equity capital) could be enhanced by unlocking pension and insurance savings.⁹ However, any reform in this space should not undermine financial stability. Fourth, improved R&D incentives, permanent (and broader) capital investment allowances, and measures to alleviate skills shortages can address market failures and fuel expansion in new industries and technologies.

Table 1. United Kingdom: Macro Variable Definitions

Variable	Definition	Source
Real non-residential investment	Sum of the non-residential structure, equipment, machinery, and other investments ^{1/}	World Economic Outlook (WEO)
Credit to households (%GDP) [-]	Credit to households and nonprofit institution serving households (NPISHs) adjusted for breaks through standard statistical techniques	Bank for International Settlements (BIS)
Interest rates [-]	Short-term interest rate	WEO
Outstanding debt (%GDP) [-]	Outstanding debt to nonfinancial corporations (NFC)	National statistical authorities
Public investment [+/?]	Real public investment	WEO
Market capitalization (%GDP) [+]	Stock exchange market capitalization	World Federation of Exchanges; Nikkei.

^{1/} This might include public elements. For robustness, other proxied have been considered based on available data.

⁹According to ONS data financial assets of pension funds and insurance corporation in the UK amounted to 5 trillion GBP in 2022, double the size of the country's GDP.

Table 2. United Kingdom: Micro Variable Definitions

Variable	Definition	World scope codes
Investment to capital (logarithm)	Capital expenditures as the ratio of lagged net capital stock (property, plant, and equipment)	WC04601/WC02501
Sales growth [+]	Net sales or revenues minus a firm's historical mean.	WC01001
Return on assets (logarithm) [+]	Return on assets	WC08326
Effective interest rate (logarithm) [-]	Interest expense as the ratio of total debt	WC01251/WC03255
Retained earnings to capital (logarithm) [+]	Retained earnings as the ratio of lagged net capital stock	WC03495/WC02501
Long-term capital (logarithm) [+]	Long-term debt as the ratio of lagged net capital stock	WC03251/WC02501

Table 3. United Kingdom: Real Business Investment and Macro Indicators ^{1/}

VARIABLES	(1)	(2)	(3)	(4)
	Business Investment Growth			
Lagged Credit to Household	-0.0734 (0.0461)	-0.0219 (0.0609)	-0.0322 (0.0597)	-0.0322 (0.0632)
Lagged Interest Rate	-0.540 (0.449)	-0.383 (0.507)	-0.683 (0.516)	-0.683 (0.460)
Lagged Debt to NFC	-0.101* (0.0577)	-0.127* (0.0648)	-0.139** (0.0636)	-0.139 (0.0876)
Lagged Market Capitalization	0.0286** (0.0136)	0.0286* (0.0147)	0.0247* (0.0145)	0.0247 (0.0146)
1-year lag GDP Growth	0.387 (0.306)	0.528 (0.393)	0.313 (0.398)	0.313 (0.285)
2-year lag GDP Growth	-0.0283 (0.328)	0.0760 (0.414)	-0.129 (0.416)	-0.129 (0.154)
3-year lag GDP Growth	-0.387 (0.414)	-0.726 (0.555)	-0.583 (0.547)	-0.583 (0.845)
Lagged Public Investment Growth		0.0961** (0.0434)	0.0989** (0.0424)	0.0989* (0.0362)
Brexit (UK and year>2016)			-4.616** (2.217)	-4.616*** (0.570)
Covid (year>2019)			-0.257 (4.973)	-0.257 (1.810)
Time fixed effects	Y	Y	Y	Y
Country fixed effects	Y	Y	Y	Y
Observations	143	120	120	120
Adjusted R-squared	0.516	0.484	0.508	0.528
Room Mean Square Error (RMSE)	3.473	3.671	3.586	3.511
Column 1-3: standard errors in parentheses; Column 4: robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				
^{1/} Business investment is proxied by the sum of non-residential structures, equipment, machinery and other investment (which might include public elements). Other proxied were considered, based on private investment excluding residential component, which yielded largely similar results.				

Table 4. United Kingdom: Determinants of Business Investment on Firm Level ^{1/}

VARIABLES	Investment to 1-year Lag Capital		
	(1)	(2)	(3)
Lagged Investment to Capital	0.285*** (0.0270)	0.289*** (0.0266)	0.288*** (0.0266)
Sales Growth	0.231*** (0.0707)	0.259*** (0.0728)	0.259*** (0.0728)
Lagged Return on Assets	0.0821*** (0.0115)	0.0983*** (0.0112)	0.0980*** (0.0112)
Effective Interest Rate	-0.0403*** (0.0136)	-0.0147 (0.0132)	-0.0145 (0.0132)
Retained Earnings to Capital	0.214*** (0.0114)	0.200*** (0.0107)	0.199*** (0.0107)
Long-term Debt to Capital	0.0791*** (0.00750)	0.0807*** (0.00743)	0.0806*** (0.00742)
Brexit Dummy		-0.184*** (0.0295)	-0.181*** (0.0294)
Covid Dummy		-0.431*** (0.0378)	-0.431*** (0.0377)
High Investment Sectors ^{2/}			0.102*** (0.0261)
Time fixed effects	Y	N	N
Firm fixed effects	Y	Y	Y
Industry fixed effects	Y	Y	Y
Observations	14,263	14,263	14,263
Number of firms	2,248	2,248	2,248
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			
^{1/} System GMM specifications, with lagged values of repressors used as instruments.			
^{2/} High investment sectors are those characterized by higher regression coefficients. These include advanced manufacturing, transportation, communications, health services, education, research and development.			

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THE RECENT DECLINE IN UNITED KINGDOM LABOR FORCE PARTICIPATION: CAUSES AND POTENTIAL REMEDIES¹

The post-pandemic decline in labor force participation in the UK has puzzled analysts and concerned observers and policy makers alike. While a recent decline in inactivity among students has partially alleviated the problem, the UK is still underperforming other advanced economies, with potentially adverse consequences for potential growth. Retirement and long-term sickness seem to have been the main drivers of this post-pandemic inactivity spike, with chronic illness remaining a lingering distinctive factor vis-a-vis peer countries. While the government has recently adopted a battery of measures to increase labor force participation, more could be done to improve health outcomes and increase the participation of the long-term sick and the disabled, keep older workers in the labor force, increase female labor force participation, and improve the skills and productivity of both domestic and foreign workers that join the workforce.

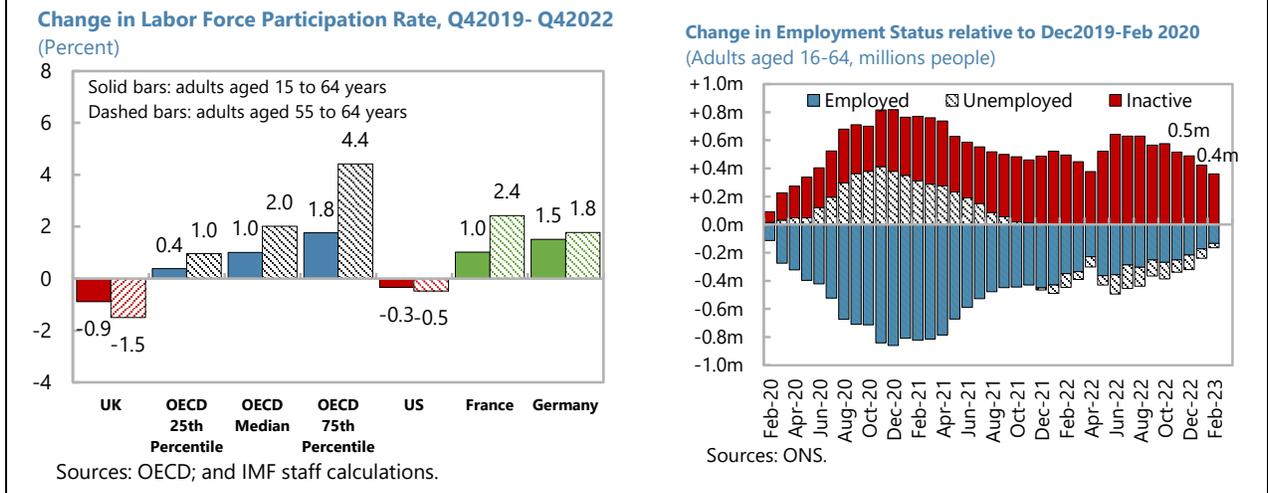
A. What is the Issue and Why Does it Matter?

1. The UK saw a distinctive rise in inactivity, notably among elderly and male workers, during the pandemic. Between end-2019 and end-2022 about half a million people (0.8 percent of the working age population) became inactive, while labor force participation increased in other advanced economies (Figure 1, left chart). Breaking down by age, older workers (50–64) experienced the highest growth in inactivity (mostly due to illness and retirement), followed by the youngest cohort of workers (16–24), many of whom became university students during the pandemic. Inactivity amongst the middle-aged group (25–49) increased only slightly, partly thanks to the success of the furlough scheme in maintaining workers tied to their companies during restrictions. This overall spike in inactivity in the UK coexisted with a historically tight labor market (Figure 1, right chart) that has complicated the authorities' efforts to bring down high inflation. While the number of economically inactive people has decreased since the start of 2023 (mainly due to more graduate students rejoining the labor force) the UK still has weaker labor force participation today than before the pandemic (by about 250 thousand workers). This spike in inactivity has been more acute among men than women.²

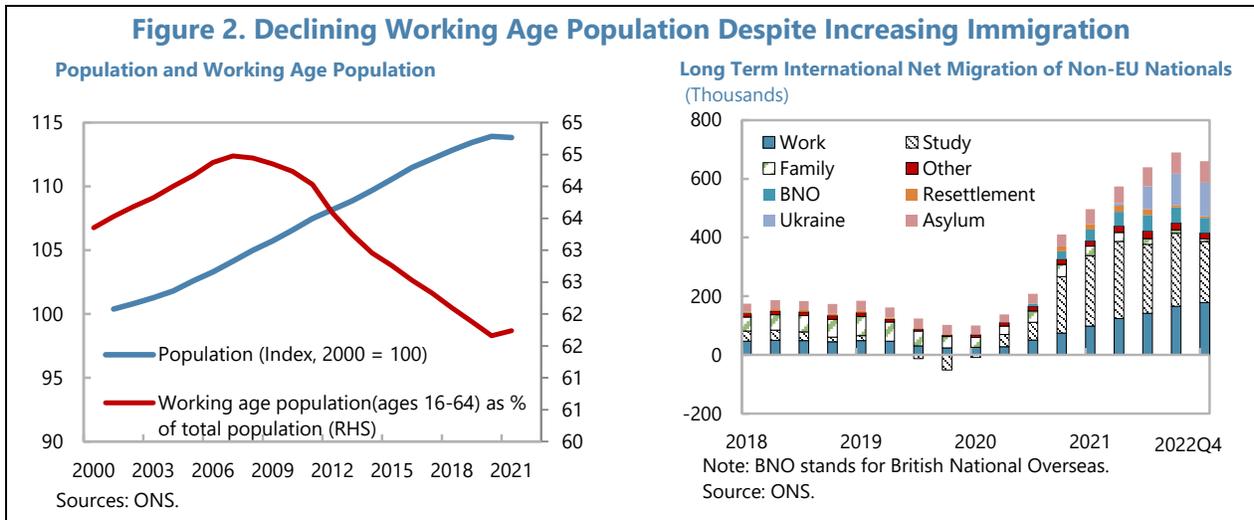
¹ Prepared by Gloria Li and Carlos Mulas Granados (both EUR).

² This is representative of a long-term trend in the UK and other advanced economies of decreasing inactivity among women and increasing inactivity among men. Specifically, the UK's average pre-COVID (i.e., 2019) inactivity rates for men and women aged 25–34-year-olds were 6.8 percent and 18.3 percent, respectively. Within this age group, the inactivity rate for women had fallen to 15.4 percent by 2023Q1, but that for men had increased to 8 percent. In the age group 35–49, trends were similar, but the magnitude of the difference was smaller.

Figure 1. Rising Inactivity in a Tight Labor Market



2. This spike in inactivity has occurred against the backdrop of a declining working population. During the last two decades, the UK’s working age population has declined, even as the population continued to increase (Figure 2, left chart). The trend has begun to reverse in the last three years, coinciding with the increase in immigrants from outside the EU and notwithstanding the fact that many of these were arrivals motivated by humanitarian or political reasons (Ukraine) and students and via BNO channel (Hong Kong SAR) (Figure 2, right chart).³



3. The UK’s post-pandemic inactivity spike contrasts with developments in other major advanced economies. Between end-2019 and end-2022, inactivity grew twice as much in the UK

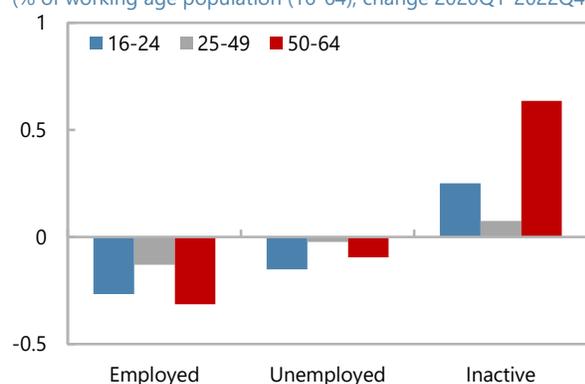
³ By end-2022, students from non-EU countries account for approximately 34 percent of the net migration from these countries into the UK. The proportion of those arriving for humanitarian reasons rose to a combined 28 percent by end-2022.

than in the US, especially among older workers (50–64), while in the US inactivity was more concentrated in middle-aged workers (25–49). Developments in Germany and France during the same period were markedly different. Inactivity in Germany remained unchanged during the same period and only among younger workers (15–24) there was a mild decline. Instead, in France inactivity decreased significantly across all age groups (Figure 3). It is worth noting that historically, the inactivity rate in the UK has been lower than in peer countries, and remains relatively low.

Figure 3. Post-Pandemic Inactivity Spike in Comparative Perspective

UK: Change in Employment Status by Age

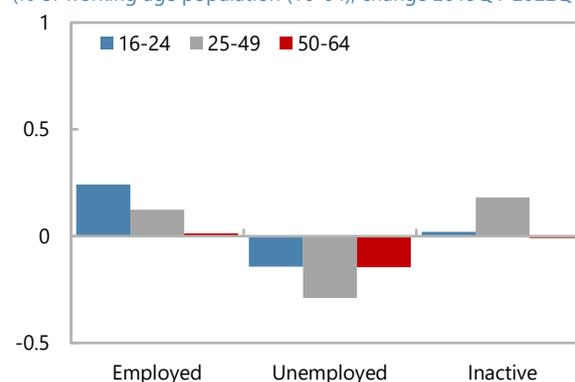
(% of working age population (16-64), change 2020Q1-2022Q4)



Sources: ONS; Haver Analytics.

US: Change in Employment Status by Age

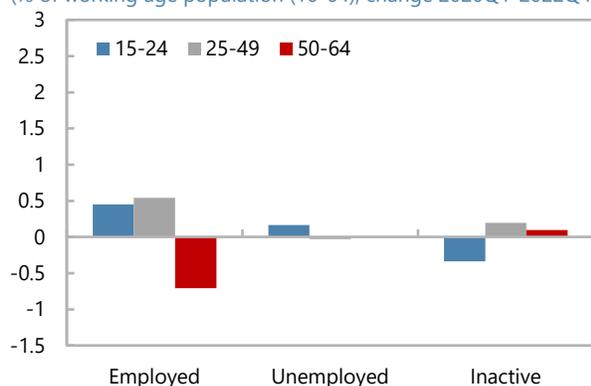
(% of working age population (16-64), change 2019Q4-2022Q4)



Sources: BLS; and Haver Analytics.

Germany: Change in Employment Status by Age

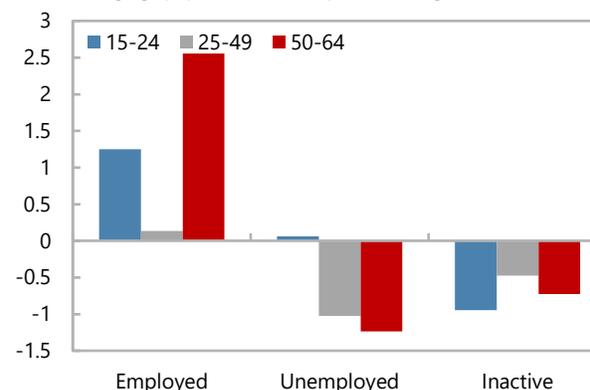
(% of working age population (16-64), change 2020Q1-2022Q4)



Sources: Eurostat; Haver Analytics.

France: Change in Employment Status by Age

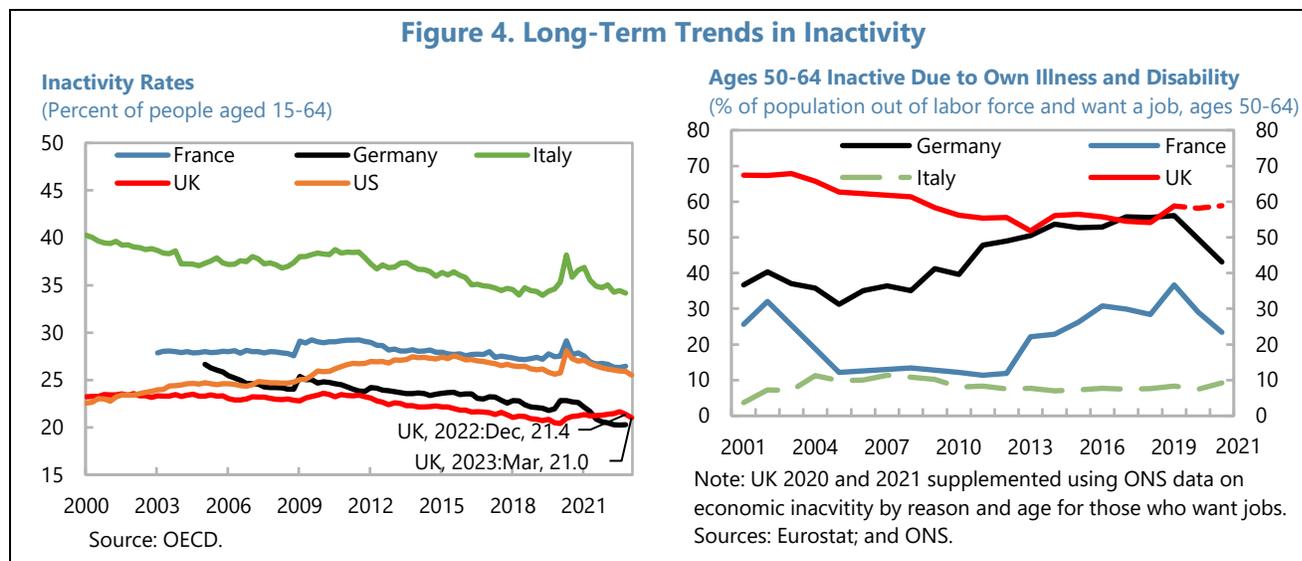
(% of working age population (15-64), percent change 2020Q1-2022Q4)



Sources: Eurostat; and Haver Analytics.

4. High inactivity due to illness has been a distinctive feature of the UK, despite a relatively low inactivity rate in level terms. Survey data shows that UK has had one of the lowest inactivity rates among peers since 2000, and it was on a further declining trend between the GFC and the start of the pandemic. Despite the recent pandemic-induced rise, the UK's inactivity rate (at 21 percent) is much lower than in the US or France, and only slightly above Germany's (Figure 4, left). However, when looking at long-term drivers of inactivity, the link with long-term sickness seems a distinctive problem for the UK (Figure 4, right).

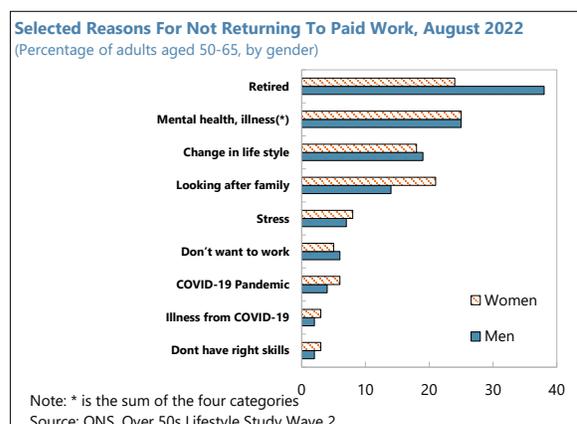
Figure 4. Long-Term Trends in Inactivity



5. If inactivity became structural, it could reduce labor supply and affect medium-term growth. A sustained increase in inactivity could weaken the potential growth of labor supply. In such a scenario, even if productivity grew twice as fast as in the pre-pandemic decade, medium-term potential output would mechanically be lower than otherwise.⁴ Additional consequences of inactivity and weak labor supply are: (i) it exacerbates labor market tightness, pushing up wages and inflation; (ii) complicates the fiscal challenges associated with aging (e.g., pensions, health and social care spending); and (iii) prevents significant parts of the population from reaching their potential, thus exacerbating income disparities.

B. What Explains the Recent Increase in Inactivity?

6. Retirement, health issues and caring for family were the most cited reasons for not returning to work after the pandemic. For those surveyed when the economy reopened fully in the summer of 2022, retirement was the main reason for not having returned to work (especially among men).⁵ Illness and worsening health conditions, not only Covid-related, was the second most important factor mentioned by both men and women. Importantly, looking after family members was the third main driver of inactivity for women.⁶ Income



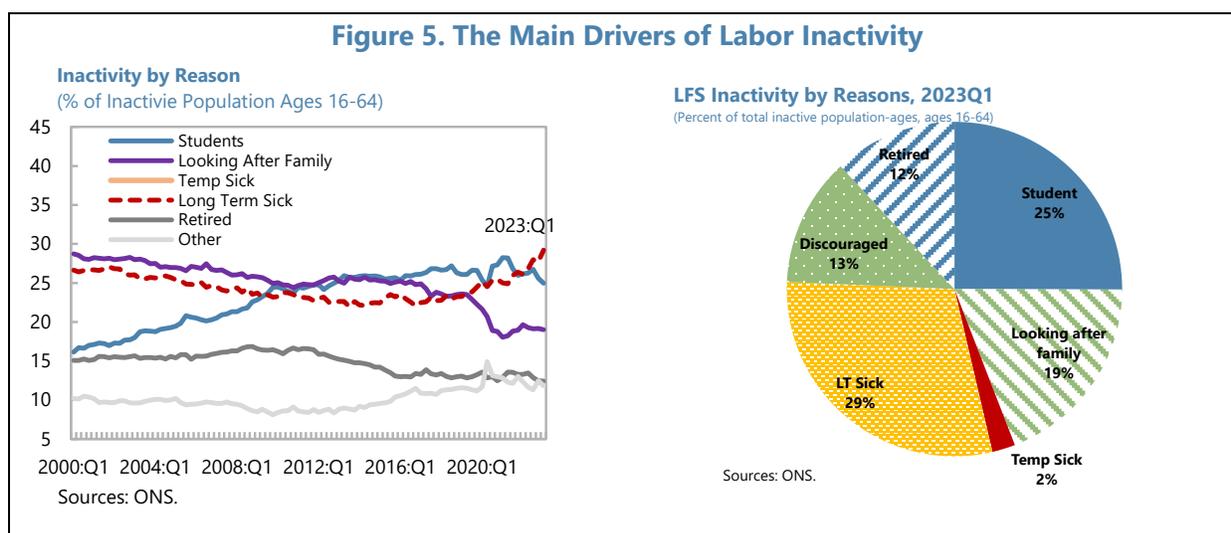
⁴ See: <https://www.bankofengland.co.uk/monetary-policy-report/2023/february-2023>, Table 3A.

⁵ <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/reasonsforworkersagedover50yearsleavingemploymentsinthetstartofthecoronaviruspandemic/wave2>

⁶ <https://www.ons.gov.uk/employmentandlabourmarket/peoplenotinwork/economicinactivity/articles/halfamillionmorepeopleareoutofthelabourforcebecauseoflongtermsickness/2022-11-10>

status may have been partly associated with these different reasons for abandoning the labor market during the pandemic.⁷

7. Long-term sickness has become the leading reported factor of inactivity at the start of 2023. More recent data from the 2023Q1 labor survey shows that long-term sickness and disability has surpassed other traditional leading factors of inactivity such as studying or caring for family, and is now the single main driver of lingering inactivity in the UK for 1 in 3 inactive workers (Figure 5).⁸ Survey data also shows that the younger and middle-aged cohorts are increasingly reporting sickness. Among these age groups, the largest overall increase in people with long-term sickness was due to mental illness (a 24 percent increase since before the pandemic), and the second was for progressive illnesses (a 69 percent increase) such as cancer.



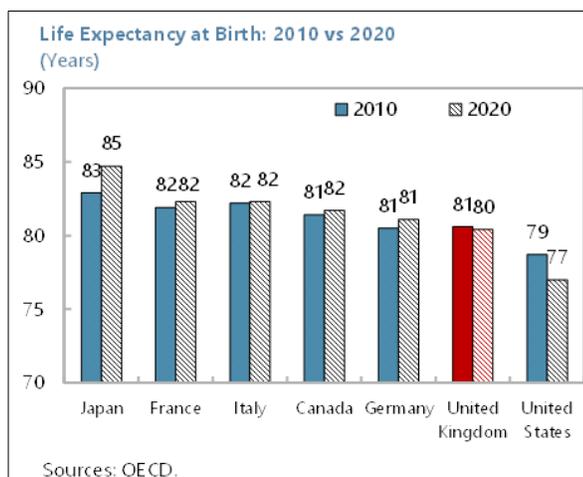
⁷ For example, over 50 percent of economically inactive 50–65-year-olds lived in poor-income households (and most of them were inactive due to sickness), while inactivity was three times lower in higher-income households (and mainly driven by retirement). Relatedly, 2/3 of those who left the labor market since the start of the pandemic owned their homes outright and half funded their retirement through a private pension. See Resolution Foundation (2023) “Post-Pandemic Participation: Exploring Labour Force Participation in the UK: from the Covid-19 Pandemic to the Decade Ahead” <https://www.resolutionfoundation.org/publications/post-pandemic-participation/>

⁸ In Q4 2022, 28 percent of inactive people were full time students. But since January 2023, inactivity due to study has gone back to previous trend, and the employment rate of people aged 18-24 has largely recovered to its pre-pandemic level at 63 percent.

8. The UK's distinctive long-term illness-induced inactivity could potentially reflect increasing pressures on the NHS and social care system, amid declining health indicators.

Rising inactivity might be just one manifestation of stresses in the healthcare system. Health experts point to organizational challenges (including the lack of interoperable IT infrastructure)⁹, funding levels for the NHS¹⁰, labor shortages¹¹ and the relatively low number of hospital beds¹² as some of the main factors that have led to recent backlogs and much longer-waiting times.¹³ They also point to life expectancy as a key health

outcome indicator in which the UK stagnated between 2010 and 2020, while most advanced economies improved.¹⁴ As possible reasons, experts mention that the UK has a high rate of premature mortality due to preventable conditions (e.g. pulmonary disease, diabetes, asthma and obesity) linked to smoking, poor diet, physical inactivity, and alcohol abuse.¹⁵



⁹ See, for instance, <https://blogs.deloitte.co.uk/health/2023/01/the-facts-and-figures-about-the-challenges-facing-the-nhs-in-2023.html>. For organizational challenges more broadly, see https://journals.lww.com/healthcaremanagerjournal/Abstract/2015/10000/Organizational_Failure_in_an_NHS_Hospital_Trust_A.13.aspx.

¹⁰ According to the Institute for Fiscal Studies: the NHS “would require around £4 billion of additional funding in 2024–25 to undo the remainder of the real-terms hit to NHS spending plans”. See: <https://ifs.org.uk/publications/nhs-funding-resources-and-treatment-volumes>

¹¹ Also, ONS data shows that since 2019, General Practitioners’ workloads have increased by 18 per cent and the full-time-equivalent (FTE) workforce has fallen by nearly 700 with each FTE GP now caring on average for an extra 120 patients. See: <https://www.rcgp.org.uk/News/Workforce-ONS-GP-Patient-Ratio>

¹² For example, in the latest edition of the OECD (2022) *Health at a Glance* report, the reported number of hospital beds per 1000 people in Germany was 7.8, in France was 5.7 and in the UK was 2.8. For more details, see: <https://www.oecd-ilibrary.org/docserver/507433b0-en.pdf?expires=1686760108&id=id&accname=guest&checksum=9600AEC13E032816489D3833CBCCDC1>.

¹³ Latest data reported by the British Medical Association in April 2023 shows a median waiting time for treatment of 13.8 weeks, which is almost double the pre-COVID median of 7.2 weeks (in April 2019). See: <https://www.bma.org.uk/advice-and-support/nhs-delivery-and-workforce/pressures/nhs-backlog-data-analysis#:~:text=Waiting%20times%20have%20rocketed,stood%20at%2031%2C494%20in%20May>

¹⁴ <https://www.kingsfund.org.uk/publications/whats-happening-life-expectancy-england>.

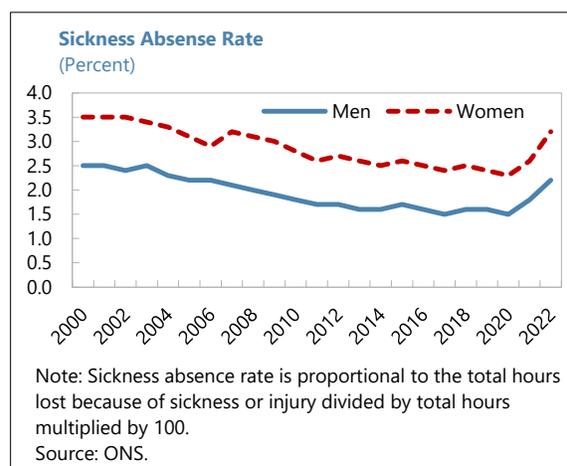
¹⁵ Around 40 percent of premature mortality in the UK is caused by preventable cardiovascular disease, diabetes, cancer, and chronic obstructive pulmonary disease. See: <https://publications.parliament.uk/pa/ld201617/ldselect/ldnhssus/151/15109.htm#:~:text=Around%2040%25%20of%20premature%20mortality,determinants%20of%20avoidable%20chronic%20conditions>

C. What Are the Potential Remedies?

9. A combination of policies could help reduce inactivity and strengthen other areas of the labor market. Below, staff discuss several policy options that could help alleviate the recent increase in inactivity, but also consider measures that could strengthen the labor supply, enhance labor market flexibility, and increase productivity, more generally.

Improving Healthcare

10. Poor health can also affect those who remain employed, causing absenteeism and low productivity. Long waiting times for referrals and diagnosis have coincided with an uptick in the number of employees calling off sick from work, reversing 3 decades of downward trend (though there are other potential factors, including post-pandemic behavioral shifts). In 2022, the sickness absence rate (the percentage of working hours lost because of sickness or injury) increased to 2.6 percent, up 0.7 percentage points from its pre-pandemic 2019 level, reaching its highest point since 2004. Sickness absence was more prevalent among women, public sector workers and part-time employees. About a third of large employers perceived sickness absence as a barrier to productivity in their organizations, especially in sectors such as manufacturing and construction.¹⁶



11. The government has made reducing waiting times one of his five priorities, and the government has approved new measures to address inactivity, including due to long-term sickness and disability. The 2022 Autumn Statement included additional budgetary allocations (about 0.3 percent of GDP per year) until 2025 for the health and social care systems. In the Spring budget, the government added a battery of initiatives to help remove barriers for those who are inactive due to long-term sickness. It introduced a Universal Support program to match people with disabilities and long-term sickness with jobs and provide support and training. A suite of measures to address the leading causes of ill health related inactivity included tailored employment support in mental health and musculoskeletal health services and expanding access to digital resources and health checks.

12. But more funding and structural reforms to the health and social systems may be needed soon. Last Fall, the NHS signaled the need for additional funding to meet expenditure pressures through up to 2025.¹⁷ Structurally, health already absorbs 38 percent of government

¹⁶https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003911/sickness-absence-and-health-in-the-workplace-report.pdf

¹⁷ <https://www.england.nhs.uk/wp-content/uploads/2022/10/item-4.2-public-board-meeting-financial-position-and-the-future-financial-outlook-.pdf>

spending, but the UK still spends less on health care than countries like France and Germany as a share of GDP. The gap is especially large in capital spending, with the UK at the bottom of the OECD in terms of health investment per person. Experts emphasize that a different composition of spending is needed, especially if Integrated Care Systems are to succeed as envisioned by the 2022 Health and Care Act, since today most resources are tilted in favor of hospitals at the expense of primary care, prevention and public health policies.¹⁸ Addressing shortages of doctors and nurses, including through better working conditions and higher pay to make up the decade-long decline in real pay¹⁹ could help reduce waiting times and backlogs. Going forward, funding to hospitals should be focused on health-outcomes and innovation instead of top-down metrics based on activity. Short-term funding pressures in the social care system also remain intense despite the extra money in the 2022 Autumn Statement. Wider system reform of social care is also needed to address the other fundamental problems, including high levels of unmet need, chronic workforce shortages and a fragile provider market.²⁰

13. New incentives for occupational health could have a positive impact on workers' health. Improved employee health and wellbeing can benefit employees, employers, and the wider economy by reducing ill-health related job loss, sickness absence, presenteeism, and improving productivity. However, previous research shows that whilst most employers recognize their role, many face multiple barriers to investing in health and wellbeing support, such as lack of expertise, time constraints and cost. There is also wide variation in the support provided by employer size, with small and medium-sized employers significantly less likely to invest in formal health and wellbeing initiatives than large employers. Joint work by the departments of Health and Social Care and Work and Pensions shows that a new scheme of financial support and supplementary advice could increase the take up of occupational health initiatives by SMEs and potentially reduce sick absences and/or inactivity due to long-term sickness.²¹ The 2023 Spring Budget already announced an expansion of the SME occupational health subsidy pilot scheme. Going forward, staff recommends that the government builds on this and other evidence-based initiatives that help firms invest in the health of their workforce.

Keeping Older Workers Employed

14. While a significant part of the post-pandemic inactivity spike was due to retirement, bringing back retirees into the labor market is particularly challenging. Independent research shows that people who are economically inactive due to long-term sickness or disability are consistently more likely to return to employment than early retirees. For example, among those who have been out of work for less than three months, about 22 percent of those with long-term

¹⁸ <https://www.kingsfund.org.uk/publications/integrated-care-systems-explained>

¹⁹ <https://www.nuffieldtrust.org.uk/resource/chart-of-the-week-what-has-happened-to-nhs-staff-pay-since-2010>

²⁰ <https://www.kingsfund.org.uk/publications/health-and-social-care-england-myths>

²¹ <https://www.gov.uk/government/publications/incentivising-sme-uptake-of-health-and-wellbeing-support-schemes/incentivising-sme-uptake-of-health-and-wellbeing-support-schemes-summary>

sickness flow back to employment each quarter, compared to just 6 percent of retirees aged 50–64. The chance of re-entering work gets even lower over time: the chances of a retiree aged 50–64 returning to work are three times lower for those who left their last job between two and three years ago (i.e., during the summer of 2020) than those who left work less than three months ago.²²

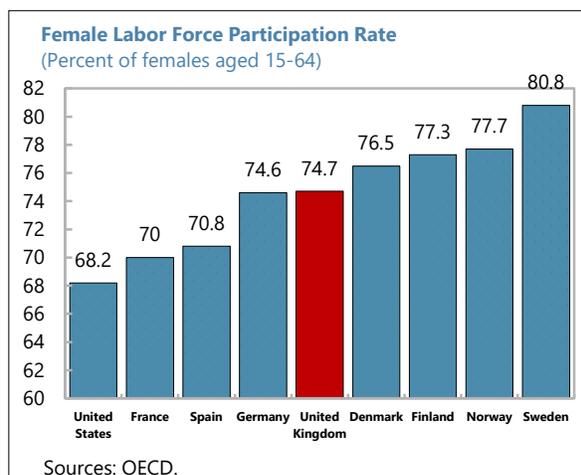
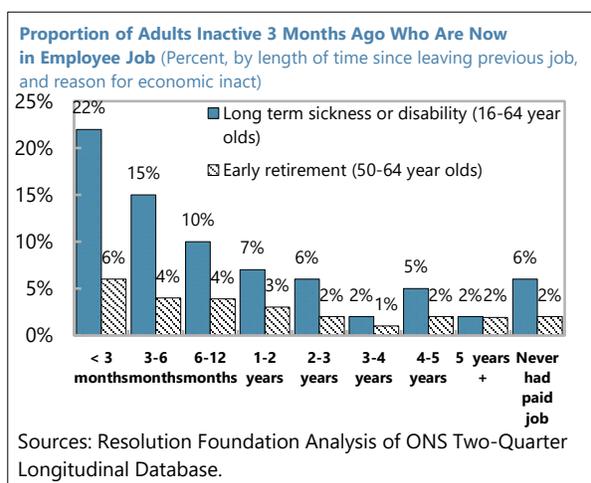
15. Policy should therefore focus on keeping older workers in the labor market.

Matching the older workers’ participation rate of Sweden, would add about 1 million of workers to the UK’s labor market, enough to compensate by itself the loss incurred due to the post-pandemic inactivity spike. To attract older workers into work, the Spring budget included a targeted pension tax reform aimed at removing disincentives to work more hours; and a new program of ‘returnships’ for elder workers. Other options that could be considered include: (i) increasing the State Pension retirement age from 66 to 68 earlier than planned to retain older and experienced workers in the labor force; (ii) deepening employment support tailored towards the needs of older people and in the sectors more likely to hire older workers; and (iii) expanding the network of work advisers specifically trained to deal with the full range of older jobseekers, including those from managerial or professional backgrounds.

Strengthening Female Labor Participation

16. Despite significant improvements in female labor force participation in the last decades, there is still room for improvement.

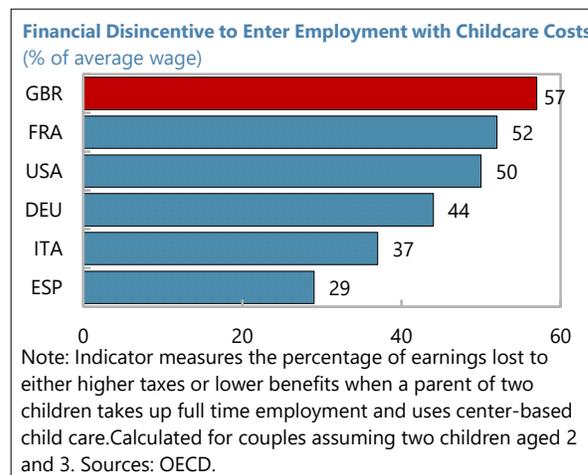
The female labor force participation rate in the UK has increased in the past two decades by 6 percentage points and is higher than G7 peers, but it is still below the Nordic countries. For example, increasing female labor participation rates to the levels of Denmark could add about another million female workers to the UK’s labor force. Despite recent increases in overall female participation, the participation gap between men and women in ages 25–34 is still significant



²² See Resolution Foundation (2023) “Post-Pandemic Participation: Exploring Labour Force Participation in the UK: from the Covid-Pandemic to the Decade Ahead” <https://www.resolutionfoundation.org/publications/post-pandemic-participation/>

(93 percent for men vs 81 percent for women) and there are sizable differences in labor force participation rates between prime-aged women with and without children.

17. Recent policy decisions to expand free childcare go in the right direction. The financial disincentives faced by mothers to enter employment with rising childcare costs are significantly higher in the UK than in other advanced economies, given that the cost of childcare rose by 60 per cent in cash terms between 2010 and 2021—twice as fast as average earnings.²³ Recent government initiatives aim at directly addressing this problem. The Spring budget included a significant expansion of childcare policies, by providing 30 hours a week of free childcare for 38 weeks a year, for eligible working parents of children aged 9 months to 3 years. This is expected to be rolled out gradually over the next three years and comes in addition to the 30 hours a week already provided for eligible working parents of 3 to 4-year-olds. To encourage the supply of childcare, the government announced that it would uplift the hourly funding rate paid to providers and launch a new scheme to support the expansion of school-based childcare provision. Additionally, support for childcare costs in Universal Credit would be made available upfront and the maximum potential benefit for parents is expected to increase. This battery of policy measures, once fully implemented, is likely to have a positive effect on female labor participation.



18. Other complementary policy initiatives could be considered. For example, increasing the hours per day when childcare is available and adding free part-time childcare options could help parents with longer schedules. The expansion of the social care infrastructure could also help support people who care for the elderly and the disabled. Investing in tailored retraining programs for caregivers, who are mostly women, could also help them return to work after long periods of inactivity.

Addressing Skills Shortages

19. Businesses have been experiencing a shortage of workers. The percentage of businesses experiencing a shortage of workers since end-2021 until now has ranged between 13 and 17 percent. Shortages seem especially acute among small businesses, with 80 percent declaring last year that they had difficulties in recruiting applicants with suitable skills.²⁴ The industries with the highest

²³ HMRC (2021) Tax-Free Childcare: barriers to sign up: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1062615/HMRC_research_report_630_Tax_Free_Childcre_barriers_to_sign_up.pdf

²⁴ See: <https://commonslibrary.parliament.uk/research-briefings/cdp-2023-0001/>; <https://www.fsb.org.uk/resource-report/scaling-up-skills.html>

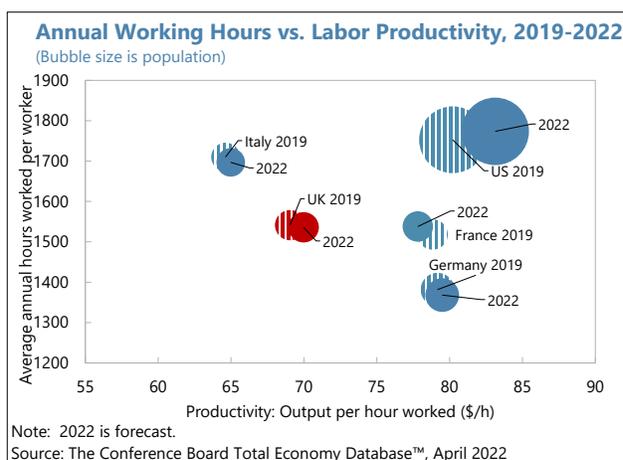
percentage of businesses experiencing worker shortages are accommodation, food services and construction. Experts point to different factors explaining these labor shortages, including a faster-than-expected post-pandemic growth in the demand for labor that has also affected other countries, “recruitment difficulties in low-wage industries resulting in part from longer-term problems such as unattractive pay or working conditions”, and the end of free movement linked to Brexit which according to the latest independent research, appears “to have exacerbated these existing problems employers have faced”.²⁵

20. Enhancing retraining programs and encouraging more open immigration arrangements could help address labor and skills shortages.

While the level of immigration a country chooses to allow is ultimately a political matter, a well-designed immigration system can bring important benefits. For instance, in ageing economies, immigration can increase labor supply in those specific sectors and skills where businesses are experiencing shortages. The UK system already tries to link immigration flows with labor market needs, but it could further refine its responsiveness to specific sectoral requests by increasing the frequency by which it revisits its lists of shortage occupations. Domestic workers adequately retrained through some of the reskilling programs introduced during the pandemic, could also alleviate those shortages.²⁶ These measures would unlock economic growth and tax revenues that could then be used for public services and needed infrastructure investments. Moreover, a well-designed immigration system can also enhance labor market flexibility, which can help alleviate inflationary pressures.

Enhancing Labor Productivity

21. In the long run, productivity is essential. When capital and labor are at their maximum potential, long-term GDP growth relies on productivity growth. Whether measured as total factor productivity or labor productivity (product-per-hour worked), the UK has been performing weakly in the decade before the pandemic. The UK’s average annual productivity growth between 2009 and 2019 growing was 0.7 percent, between 0.2 and 0.4 weaker than in the US, France, or Germany. During the pandemic the UK reduced slightly the annual average of hours worked and increased productivity slightly, but not enough to catch up with those three peers.



²⁵ See: <https://migrationobservatory.ox.ac.uk/resources/reports/how-is-the-end-of-free-movement-affecting-the-low-wage-labour-force-in-the-uk/>

²⁶ See: <https://commonslibrary.parliament.uk/research-briefings/cbp-8965/>

22. The last few years have seen numerous policy initiatives to improve education and reskill the workforce. The 2021 Spending Review announced the use of the UK Shared Prosperity Fund to improve public services in education and skills in struggling regions, including a strong focus on improving adult numeracy. It also introduced a Lifetime Skills Guarantee to give access to education and training throughout lives, including free courses at upper secondary level in economically valuable areas and skills bootcamps linked to job vacancies in growth sectors. The 2022 Autumn Statement and the 2023 Spring budget confirmed existing funding for traineeships and apprenticeships programs, expanded Youth Offer and work coach support, and introduced the ‘Supported Internships Pilot’.

23. Going forward, some additional measures could be considered by the authorities to further enhance skills and labor productivity. Introducing a national work-study apprenticeship system (similar to Germany’s approach) to connect students with private firms could reduce young inactive population and facilitate the first transition into the labor market; additional funding for on-the-job training could help in this regard. A crucial aspect of policies to increase productivity is consistency over time, so it will be important to identify the most successful programs and concentrate resources to grow them faster over the medium-term.