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POLICY PAPER

Easing the Pain? Estimating the Economic Impact of Domestic and Global Policy Responses to the COVID-19 Pandemic

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Abstract: The COVID-19 pandemic and the measures put in place to control its spread resulted in a collapse in global economic activity. Both governments and central banks responded to the deep economic crisis with unprecedented policy interventions. In this paper, we use both a global and a domestic structural macroeconomic model to estimate the impact of these exceptional policy supports on the international economy and on Ireland. Our analysis seeks to quantify the positive spillovers to the Irish economy from the fiscal, monetary and macroprudential policy interventions introduced globally and describes the transmission channels through which these policy actions affect Ireland. We also estimate the impact on economic activity and the labour market of the unprecedented fiscal packages introduced in Ireland. Our results indicate that the combination of international and domestic policy interventions have helped to substantially reduce the fall in output in Ireland from COVID-19, boosting growth in 2020 by up to 8 percentage points.

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I INTRODUCTION

The coronavirus pandemic continues to inflict a considerable toll on economies around the world, the exact final magnitude of which is still uncertain. In the space of less than three months in early 2020, the outlook for the global economy in the short run changed drastically. While the ultimate economic effects of the pandemic are still uncertain, the virus and the locking down of economies to control its spread has already imposed a substantial economic cost. The latest IMF projections point to a fall in global GDP in 2020 of 4.4 per cent (IMF, 2020). For comparison, the worst fall in global GDP during the financial crisis was 0.1 per cent in 2009.

As a small open economy, the spillovers from this sharp decline in the international economy on their own would result in a significant slowdown in Ireland. On top of the effects from the contraction in global demand, the domestic economy also experienced a deep recession. The clearest indication of this is from the labour market where at the end of May 2020, over 1.1 million people, or around 45 per cent of the labour force, were in receipt of unemployment and other COVID-19 related income supports.[1]

The outlook for the economy has seldom been more uncertain. This is because the current economic crisis stems from a health crisis caused by a new virus whose epidemiological properties are not fully understood. Important questions remain unanswered at present such as how long current containment measures will remain in place, the risks from new mutations of the virus and the pace at which vaccines can be effectively administered to large numbers of the population in Ireland and abroad. These issues will have a key bearing on the progress of tackling the virus and therefore on its economic impact.

In relation to the economic effects of the virus, the closure of some businesses that may not reopen and the possibility of some workers enduring extended periods of unemployment can lead to hysteresis effects that persistently lower the output path of the economy (Blanchard and Summers, 1986). At the household level, an elevated level of uncertainty about future income growth or employment prospects can lead to a corresponding rise in precautionary savings and the postponement of durable consumption and house purchases. At the firm level, uncertainty about future demand raises the real option value of waiting so that investment with high fixed or sunk costs is deferred until business confidence returns. The strength and persistence of these effects will determine whether the recovery trajectory of the Irish economy can be characterised by some variant of a V, U, or L shape.

To help minimise the long-term damage from the crisis and to ensure that economies are placed on a favourable recovery path, central banks and governments around the globe have implemented unprecedented programmes of monetary and

[1] See https://www.cso.ie/en/releasesandpublications/er/lr/liveregistermay2020/, Byrne *et al.* (2020) and Beirne *et al. (*2020) for further details.

fiscal support. For the euro area, the ECB has introduced a wide-ranging package of monetary policy measures designed to preserve the flow of credit to households and firms and to ensure the transmission of monetary policy to bank lending rates for households and firms in all sectors across the euro area (Holton *et al.,* 2020; Lane, 2020a; Makhlouf, 2020). In Ireland, the Government has implemented a range of fiscal measures that aim to protect the incomes of workers affected by the economic crisis. Supports to businesses have also been announced to help ensure that firms can survive through the crisis and are in a position to restart their operations when the virus passes.

In this paper, we carry out an assessment of the extent to which these global and domestic policy measures may mitigate the economic losses from the coronavirus pandemic. The paper builds on an existing literature that attempts to quantify the impact of fiscal and monetary stimulus measures introduced in response to COVID-19. For the US, Bayer *et al.* (2020) find that transfer payments to US households reduce the output loss due to the pandemic by up to 5 percentage points. For the EU27, Pfeiffer *et al;* (2020) focus on the impact of short-term work schemes and government guarantees and estimate that these supports reduced the output loss from COVID-19 by around one-quarter. Allen-Coughlan *et al.* (2020) assess the impact of a fiscal stimulus in Ireland taking into account the monetary policy measures introduced by the ECB in response to the pandemic on Irish government bond rates. IFAC (2020) considers the macroeconomic impact of a hypothetical €10 billion stimulus to support the economic recovery from COVID-19.

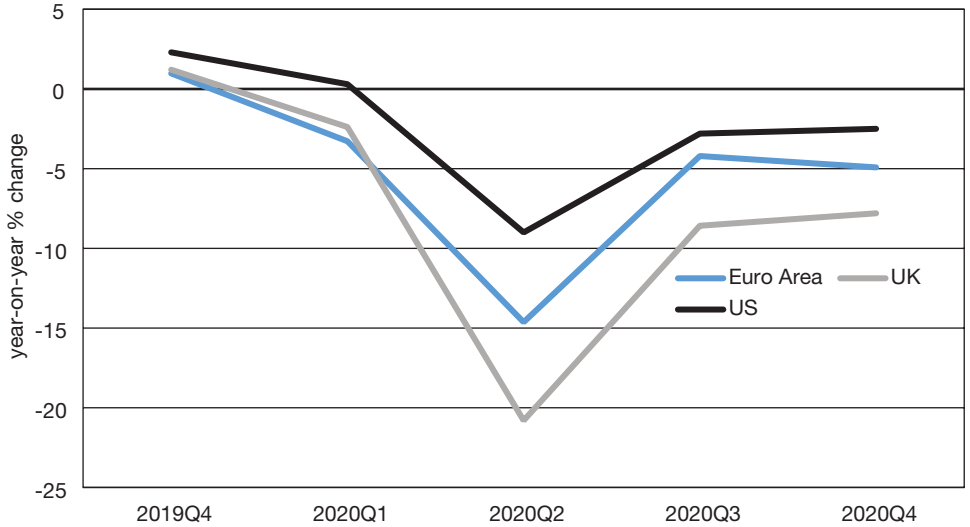
This paper adds to the existing literature in a number of ways. In particular, it is the first to provide an assessment of the impact of COVID-19 fiscal, monetary and macroprudential policy responses on the international economy and the spillovers to the Irish economy from the stimulus measures abroad. Secondly, it estimates the impact of domestic fiscal and macroprudential supports. Combining the two effects provides an estimate of the overall impact on the Irish economy of the full range of policy interventions by central banks and governments around the world in response to COVID-19.

The paper is organised as follows. In Section II, we provide an overview of the performance of the Irish economy and its key trading partners in 2020, to provide the economic context in which the exceptional policy measures by central banks and governments were introduced. In Section III, we describe the main fiscal and monetary actions implemented internationally and present our estimates of their impact on Ireland's key trading partners and on activity in the Irish economy. In Section IV we analyse the impact of the fiscal supports implemented by the Irish Government. We combine these with the estimated effect of the international policy actions to provide an evaluation of the overall impact of all domestic and international COVID-related policy measures on the Irish economy in 2020 and 2021. Section V concludes.

II BACKGROUND

The COVID-19 pandemic and the containment measures introduced to control its spread caused a collapse in economic activity in all of the major global economies and in Ireland during the first half of 2020. On a year-on-year basis, GDP growth in Q2 2020 contracted by 9 per cent, 15 per cent and 21 per cent in the US, euro area and UK respectively (Figure 1). Services sectors such as travel, tourism and entertainment that are most affected by social distancing and containment measures experienced the largest falls in output. Growth partly recovered in the second half of the year; however global activity at the end of 2020 remained well below pre-pandemic levels. In the euro area, quarterly GDP increased by 12.5 per cent in the third quarter of 2020, having decreased by 11.7 per cent in the previous quarter. Despite this being the sharpest increase observed since the series started, the rebound in the third quarter did not offset the loss registered in the first half of the year, with GDP still decreasing by 4.3 per cent compared with the same quarter of the previous year (Figure 1). The resurgence of the virus in Q4 and the re-imposition of restrictions across the euro area meant that the recovery stalled, resulting in GDP in Q4 being 5 per cent lower than the same quarter in 2019. In December, the euro area average unemployment rate was 8.3 per cent, down from July's high of 8.7 per cent but 1.2 percentage points higher than it was in February.

Figure 1: GDP Growth in Euro Area, UK and US, Year-on-Year % Change

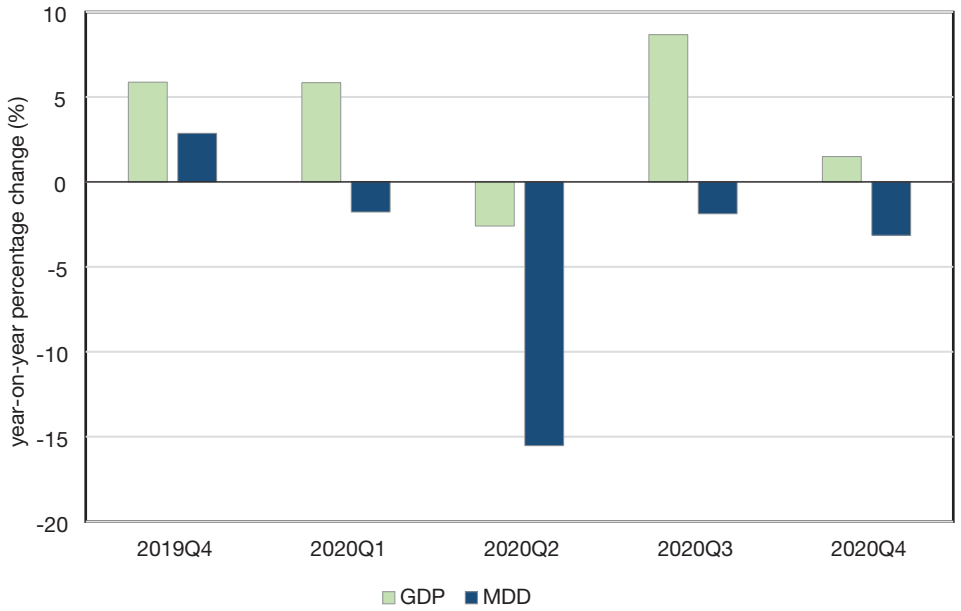


Source: Eurostat (NAM_Q_10 GDP) and US BEA.

Similarly, the arrival of COVID-19 to Ireland in March and the subsequent implementation of related public health restrictions caused a sharp drop in economic

activity, albeit with some differences in the scale and composition of the output decline relative to the euro area and other trading partners. Modified domestic demand contracted by 1.8 per cent in Quarter 1 2020 compared to the same quarter in the previous year, and by 15.5 per cent in Quarter 2 (Figure 2). Ireland recorded the sharpest decline in consumption and underlying domestic demand and the strongest rise in savings in the EU in Q2. In contrast, industrial output held up better than other EU countries, due to some key MNE-dominated exporting sectors. This meant that Ireland recorded one of the largest declines in modified domestic demand in the euro area in the first half of 2020, but one of the smallest GDP falls.

Figure 2: GDP and Modified Domestic Demand (MDD), Year-on-Year % Change



Source: CSO (NQQ45, NQQ46).

National Accounts data show that economic activity recovered sharply during the third quarter of 2020 following the sharp contraction in Q1. Real GDP rebounded, growing by 21.2 per cent quarter-on-quarter while modified domestic demand increased by 11.8 per cent. After a strong third quarter of recovery, the move to Level 5 restrictions from late October to early December prompted a renewed weakening of real-time data, with GDP and domestic demand contracting on a quarter-on-quarter basis in Q4. For the year as a whole, modified domestic demand declined by 5.6 per cent in 2020.

It is against this turbulent economic backdrop that governments and central banks around the globe introduced a series of exceptional policy measures in 2020

in an effort to stabilise markets and to limit the negative impact of the pandemic shock on households and firms. The main aim of this paper is to evaluate the impact of these policies on economic activity; in particular, to estimate how much did fiscal, monetary and macroprudential policy actions contribute to economic growth in 2020 and 2021. Although sharp declines in economic output were recorded in Ireland and in its main trading partners in 2020, the analysis will shed light on the extent to which the contractions in economic activity could have been even larger in the absence of policy actions of governments and central banks.

III INTERNATIONAL POLICY RESPONSE

The policies implemented across countries to cushion the economic and financial impact of the pandemic have been swift and on an unprecedented scale. Importantly, the response of fiscal, macroprudential and monetary authorities has been complementary, with fiscal transfers and credit guarantees preserving the supply of credit to the real economy, and asset purchases helping to contain concerns about public debt sustainability (Cavallino and DeFiore, 2020). These interventions have supported output across countries with NIESR (2020b), for example, estimating that the fiscal policy measures taken to November 2020 mitigated the fall in global GDP by approximately 30 per cent.

In this section, we examine the extent to which spillovers from these policies have boosted the Irish economy. Our analysis differs from NIESR (2020b) in three respects. First, we update the NIESR analysis to include international policy measures announced in the fourth quarter of 2020. Second, we model the international monetary response, paying particular attention to the calibration of both conventional and unconventional policies. Finally, and as far as we as aware, we are the first to model the cross-country macroeconomic impact of the capital-based macroprudential policy measures that have been introduced by regulatory authorities in response to the pandemic.

Our methodological approach comprises two stages. In the first, we calibrate and simulate the impact on the global economy of the various international policy measures using NIESR's model of the global economy, NiGEM.[2] In the second, we incorporate the macroeconomic effects of the measures on Ireland's trading partners into a structural model of the Irish economy, COSMO, and simulate their impact.[3]

[2] NiGEM is a model of the global economy, with detailed country-level models for approximately 60 countries. The latter includes features such as sticky prices, forward-looking consumption and investment, and rules for the policymaking behaviour of both fiscal and monetary authorities. It also incorporates a wide range of macro-financial linkages. See Hantzsche *et al.* (2018) for details.

[3] COSMO is a semi-structural model of the Irish economy with three sectors at its core: a traded sector that depends mainly on external factors, a non-traded sector that is primarily driven by *continued overleaf*

3.1 International Fiscal Response

Regarding the international fiscal policy responses, we model the impact of these in NiGEM based on shocks to government consumption and investment, transfers and changes in taxation. The size of the specific fiscal shocks in each country are based on those calibrated in NIESR (2020a) and updated to November 2020 using the IMF's Policy Responses Tracker.[4] The impact of these discretionary policy shocks reinforces the impact of automatic fiscal stabilisers, which cause government revenue and expenditure to fluctuate according to the cyclical position of the economy.

Table 1 presents the key elements of the fiscal response by several large economies. A particular focus of the measures implemented has been the use of transfers and wage subsidies to preserve the link between firms and workers. In broad terms, the fiscal policy response has included a combination of income supports, tax rebates, business grants, and increases in government consumption and investment.

The pressure on countries' health systems arising from the pandemic precipitated a need for higher public expenditure in terms of purchasing medical equipment and supplies, as well as expanding hospital infrastructure and personnel. Italy, for example, introduced fiscal measures worth €7.5 billion (0.4 per cent of GDP) to enhance healthcare provision, while Spain introduced measures worth close to €5 billion (0.4 per cent of GDP) to protect health services. In the UK, the government, through a series of successive measures, has increased current funding to the health system by approximately Stg £40 billion (1.8 per cent of GDP), with Stg £4 billion allocated for investment in healthcare infrastructure. The US has provided an additional US$ 100 billion (0.5 per cent of GDP) for hospitals and testing facilities, along with US$ 16 billion for medical equipment. In NiGEM, we calibrate the expenditure on additional healthcare workers, medical supplies and virus testing as an increase in government consumption, while the investment in healthcare infrastructure is treated as an increase in government investment.[5]

In most countries, the most sizeable outlays have been in terms of furlough schemes and direct payments to workers suffering pandemic-related job losses. In Germany, the expansion of the "Kurzarbeit" programme will result in estimated additional payments of almost €24 billion (0.7 per cent of GDP). In France, the

[3] (*continued*) domestic economic conditions; and a government sector that grows in line with the rest of the economy in the absence of exogenous policy changes. The model also incorporates detailed linkages between the banking sector and the real economy. See Bergin *et al.* (2017), Conefrey *et al.* (2018) and McInerney (2020) for details. This paper uses the Central Bank's version of the COSMO model.

[4] See https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-toCOVID-19. As highlighted by Christine Romer at the 2020 annual AEA meetings, deciphering between actual new fiscal policy measures and repackaged old policy measures is a difficult task during COVID-19.

[5] For China, there are few details on how the total fiscal package of CNY ¥4.8 trillion is being allocated. Accordingly, we allocate the expenditure based on the information that is available from IMF Policy Tracker and distribute the remainder evenly across the categories.

"chômage partiel" programme is likely to cost €31 billion (1.3 per cent of GDP) in payments to furloughed workers. In the case of the UK, the government established the Coronavirus Job Retention Scheme in which companies that have been severely affected by the pandemic can furlough employees and avail of a grant covering 80 per cent of their monthly wage costs, initially up to Stg £2,500 per employee. The estimated cost of this scheme is Stg £53 billion (2.4 per cent of GDP). We calibrate the fiscal cost of these job retention schemes across countries as an increase in public transfer payments.

The third component of the international fiscal response has been in the form of tax rebates and VAT deferrals. In June 2020, the German government announced a three percentage point reduction of the VAT rate for the duration of the year with an expected cost to the German Exchequer of €20 billion (0.6 per cent of GDP). Similarly, in France the government has postponed social security and tax payments for companies and accelerated the refund of tax state tax credits. In Italy, certain tax exemptions have been targeted at the hospitality and tourism sector, which has been severely affected by the pandemic. The tax element of the US fiscal response has focused on deferring the payment of payroll taxes and incentivising firms to retain employees through tax credits. We treat these tax measures in NiGEM as a reduction in corporate tax and VAT that are calibrated to reduce revenue on these tax heads by the estimated amounts presented in Table 1.

The remaining component of the fiscal response is of a more conditional nature, with governments in many countries introducing supports in the form of guarantees for loans to firms and the broader banking system. For example, the US designed a package worth US $510 billion (2.4 per cent of GDP) as part of the Cororavirus Aid, Relief and Economy Security (CARES) Act that provides loans and guarantees to firms to prevent bankruptcy. Similarly, Germany has implemented liquidity and guarantee measures worth €400 billion (11.6 per cent of GDP) through its Economic Stabilisation Fund, while Italy is guaranteeing €380 billion (21.1 per cent of GDP) of corporate loans. However, calibrating the impact of policies such as loan guarantees across countries is inherently difficult given differences in the particular details of each guarantee, the extent of the fiscal liability, and uncertainty regarding how much support will likely be drawn down and how exactly it will affect businesses given the incentives they face. Accordingly, we exclude the impact of contingent business loans and loan guarantees from the international component of our analysis.

Finally, we note that as the final details of the European Commission's Next Generation EU (NGEU) recovery programme are yet to be concluded, the potential impact of the policy package on EU countries including Ireland is excluded from our analysis. However, as the package will potentially comprise €750 billion of loans and grants over the period 2021 to 2026, or 5 per cent of EU GDP, the impact on EU Member States could be significant. For example, using a DSGE model of the euro area and global economy and making assumptions about how the funds

Table 1: Fiscal Policy Response to COVID-19 by Selected Countries

	% of GDP	*Gov. Consumption and Investment*	*Transfers*	*Tax*
France	5.1	€8bn pandemic related health expenditure;€5.3bn "France Relance" Programme; €20bn support for automotive, aeronautical and tourism sectors	€31bn job retention scheme (chômage partiel); €8bn firm subsidies from Solidarity Fund	€25.5bn tax deferrals and cancellation of tax and social security contributions; €21.5bn reimbursement of state tax credits
Germany	8.4	€20bn for health insurance and health system; €100bn firm recapitalisation fund; €18bn grants to self- employed and micro-enterprises	€23 bn for Kurz-arbeitergeld programme; €7.7bn additional child allowance payments and income support; €25bn for distressed companies	€20bn for temporary VAT rate from 19% to 16%; Corporate tax deferrals
Italy	3.4	€7.5bn healthcare spending; €6.2bn business grants	€35.4bn employment supports	€8bn reduction in business taxes; €3bn tax exemptions for tourism sector; VAT deferrals
Spain	4.3	€5bn pandemic-related health spending	€18bn for temporary employment scheme; €5.34bn extraordinary allowances	€9.1bn payroll tax waiver
China	4.9	CNY ¥1.8trn pandemic-related spending and investment	CNY ¥1trn transfers to households	CNY ¥1trn cut in payroll taxes; CNY ¥900bn fee and tariff cuts for utility and infrastructure usage
UK	8.3	Stg £42bn for health system; Stg £16.5bn small business grant; Stg £4bn capital spending	Stg £53bn Coronavirus job retention scheme; Stg £21bn Self-Employed Income Support Scheme	Stg £12bn business rate deferral; Stg £8bn tax credits; Stg £3bn VAT cuts and deferrals
US	9.1	US$117bn healthcare expenditure; US$100bn for hospitals and virus testing; US$16bn for medical stocks	US$600bn direct payments to citizens; US$193bn jobless aid; US$32bn support for airlines	US$50bn employee retention tax credit; US$492bn payroll tax deferral

Source: IMF Policy Responses Tracker and Bruegel Fiscal Responses database.

are used, Bankowski *et al*. (2021) find that the NGEU package could increase real euro area output by around 1.5 per cent over the medium term. Ultimately, its impact will depend on the take-up of the loans and grants that are available and the composition of the associated spending, which are both difficult to forecast ex ante.

3.2 International Monetary Policy Response

Deteriorating financial conditions, rising uncertainty and a perceived increase in counterparty risk can impede the smooth functioning of financial markets and the banking system. This can inhibit access to credit by both the private and public sector, thereby suppressing household consumption, corporate investment and government spending. In this context, the response of monetary authorities to the economic disruption generated by the pandemic has been aggressive and multi-faceted in an effort to mitigate a procyclical tightening of financial conditions. In addition, in the case of the ECB the policy supports have been designed to prevent medium-term inflation from deviating from its target of below, but close to, 2 per cent (Schnabel, 2020).

Table 2 outlines how central banks across the world have used a variety of policy instruments to provide monetary, financial and liquidity supports in their respective economies.[6] The monetary response has comprised both conventional and non-conventional measures, depending on whether the effective lower bound on policy rates was a binding constraint. Non-conventional measures have included the purchase of both government debt and corporate securities and have sought to mitigate the impact of market stress on the yields of these securities. Finally, central banks have deployed a range of liquidity tools with the aim of stabilising bank-intermediated credit conditions in the real economy. In the euro area, the announcement of measures such as new asset purchases in the Pandemic Emergency Purchase Programme (PEPP) and easing the conditions on the targeted long-term operations (TLTROs) have led to a narrowing of government bond spreads across member countries and to more accommodative bank lending conditions (Lane, 2020a).

To assess the impact of the international monetary policy measures on the Irish economy, we first simulate the effects of these measures using the NiGEM model. In terms of conventional measures, we implement in the model changes to policy rates that have been announced in those countries that are not constrained by the effective lower bound. As shown in Table 2, the cuts to policy rates have been particularly large in some countries, such as the United States and Canada, which in the model will not only have a domestic impact in those economies, but will also lead to significant international macroeconomic and financial spillovers.

[6] Our calibration of the international monetary measures includes those that have been announced up to December 2020.

Table 2: Policy Responses to COVID-19 by Selected Central Banks

Central Bank	*Conventional Policy*	*Asset Purchases*	*Other (selected) Interventions*
ECB	Deposit facility rate maintained at –0.5%.	€120bn through Asset Purchase Programme; €1,850bn through PEPP.	Forward Guidance; Collateral easing; measures TLTRO III and PELTRO programmes; foreign currency swap lines.
Federal Reserve	Federal funds target range lowered 150bps to 0-0.25%.	Announcement US$500bn Treasury purchases (currently US$80bn per month).	Forward guidance; Purchases of MBS; US$750bn Primary and Secondary Market Corporate Credit Facility.
Peoples Bank of China	One-year prime rate reduced from 4.15% to 3.85%		Reserve requirement ratio (RRR) reduced by 50-150bps; One-year Medium-term Lending Facility rate lowered to 2.95%.
Bank of Japan	Overnight call rate maintained at –0.1%.	Purchases conditional on achieving 0% target for sovereign ten-year yield (currently rate of JPY ¥20trn p.a.)	JPY ¥12trn annual purchases of Exchange Traded funds; JPY ¥180bn per month of Japanese REITs.
Bank of England	Bank rate lowered from 0.75% to 0.1%	Stg £200bn additional purchases of government and corporate bonds.	Expansion of Treasury account, liquidity support to firms through COVID Corporate Financing Facility.
Reserve Bank of India	Policy repo rate lowered by 115bps to 4%	INR ₹400bn rupees of government bonds with maturities up to 9 years	RRR reduced by 100bps to 3%; Reverse repo rate reduced by 130bps to 3.35%.
Bank of Canada	Overnight lending rate cut by 150bps to 0.25%.	Minimum C$5bn per week of government bonds, conditional on economic outlook.	Purchases of C$10bn corporate bonds and C$50bn regional government bonds.
Central Bank of Brazil	Policy rate lowered by 225bps to 2%		RRR reduced by 600bps; US$20bn liquidity support for households and firms.
Bank of Russia	Policy rate lowered by 175bps to 4.25%		RUB ₽500bn bank liquidity supports through repo auctions.

Table 2: Policy Responses to COVID-19 by Selected Central Banks (Contd.)

Central Bank	*Conventional Policy*	*Asset Purchases*	*Other (selected) Interventions*
Bank of Korea	Base rate lowered by 75bps to 0.5%		Bank Intermediated Lending Support Facility limit raised to KRW ₩35 trn.
Reserve Bank of Australia	Target for cash rate lowered by 50bps to 0.25%	Purchases conditional on achieving 0.25% target for three-year sovereign yield.	Forward guidance for cash rate; AUD $90bn Term Funding Facility for banks at 0.25%.

Source: Central Banks, various regions.

The second dimension of the monetary policy response we consider relates to asset purchases. As shown in Table 2, several central banks have implemented asset purchase programmes as part of their response to the pandemic. These purchases reduce the overall supply of government bonds in the market, thereby putting upward pressure on the prices and corresponding downward pressure on the yields of the bonds (Schnabel, 2020). Moreover, asset purchases support the economic recovery by relaxing balance sheet constraints on financial institutions, which stabilises financial markets, and by easing financial conditions, which stimulates interest-sensitive spending (Kiley, 2020).

In NiGEM, the impact of asset purchases on the economy can be simulated by calibrating the expected impact of the purchases on the term premium component of long-term sovereign yields and then solving the model with these term premium shocks imposed. To calibrate the impact on yields in each country, we use estimates from the empirical literature on the effects of previous purchase programmes, detailed below.[7]

In terms of the euro area, the ECB has announced that it will purchase €120 billion of government bonds through the Asset Purchase Programme (APP) and €1,850 billion of both government and corporate bonds through the newly established PEPP, specifically to counter the effects of the virus (Lane, 2020b). Based on recent data on ECB purchases through these programmes, we assume that approximately 80 per cent of asset purchases through the APP and 93 per cent of purchases through the PEPP comprise government bonds.[8] We use estimates from Rostagno *et al*. (2019) and Chadha and Hantzsche (2018) of the effects of previous ECB asset purchase programmes to inform the calibration of the impact of the new programmes on euro area yields in NiGEM.[9] Based on these estimates, (GDP) weighted-average euro area yields would be 80 basis points (bps) lower over the horizon of the APP and PEPP programmes than in the baseline case, which assumes no exogenous change in the monetary policy actions of central banks.

Our estimates for the impact of asset purchase announcements on US long-term yields are based on Gagnon *et al*. (2011) and Krishnamurthy and Vissing-Jorgenson (2011). Broadly, these studies find that US $600 billion of large scale asset purchases lower ten-year Treasury yields by 15 to 25 bps. We scale these results based on the assumption that the Federal Reserve purchases securities at a rate of US $80 billion per month until the third quarter of next year.

In terms of the UK, the Bank of England has committed to purchasing Stg £200 billion of assets through its Asset Purchase Facility. To calibrate the impact

[7] For the purposes of this exercise we abstract from potential issues underlying the structural relationship between central bank asset purchases and government bond yields such as non-linearities and state dependence.

[8] https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html and https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html.

[9] Broadly similar estimates are contained in Eser *et al.* (2019).

of these purchases on UK government bond yields, we scale the estimates from Meaning and Warren (2015) who find that the first Stg £375 billion of purchases of UK government bonds under previous programmes by the Bank of England lowered long-term yields by 25 bps. In the case of Japan, the current rate of purchases is approximately JPY ¥20 trillion per annum. To calibrate the impact on sovereign yields in Japan, we scale the estimates from Lam (2011) and Ueda (2012) who show that the announcement of a JPY ¥5 trillion quantitative easing programme lowered long-term government bond yields by approximately 8 basis points.

Both the Reserve Bank of Australia (RBA) and Bank of Canada have also implemented asset purchase programmes. We assume that the RBA conducts purchases to meet the 25 basis points target reduction in the three-year government bond yields so that longer term yields fall by a similar amount. In the case of Canada, we assume the initial rate of purchases continues until the end of 2021. As Canada has not previously conducted an asset purchase programme, there are no empirical estimates with which to calibrate the likely impact of the purchases on Canadian government bond yields. We therefore calibrate the impact to be proportionately similar to that of the Federal Reserve purchases on US Treasury yields.

In addition to these bond purchases by advanced country central banks, central banks in emerging market economies (EMEs) also launched local currency asset purchases programmes to address bond market dislocations.[10] These interventions were followed by a marked decline in bond yields, which had spiked at the onset of the pandemic (Arslan *et al*., 2020).[11] To calibrate the impact of the purchases on the sovereign yields of EMEs, we rely on the event study results of Hartley and Rebucci (2020) which estimate the response of each country's yields to the purchase programme announcement.[12] In their study, the average impact of the purchase programmes across EMEs was to reduce yields by 42 bps. In our simulations, we assume that the estimated reduction in yields for each country continues until the end of 2021.

In addition to purchases of sovereign bonds, some central banks have also announced that they will purchase corporate securities, including commercial paper. Estimates of the impact of these purchases on corporate spreads are relatively

[10] These include Chile, Colombia, Hungary, India, Indonesia, Korea, Mexico, the Philippines, Poland, Romania, South Africa, Thailand and Turkey.

[11] The objectives of pandemic-related bond purchase programmes in EMEs are qualitatively quite different from those in advanced economies. Whereas purchase programmes in advanced economies are mainly designed to create the accommodative monetary and financial conditions in the context of an effective zero lower bound on nominal interest rates, those in EMEs address market dislocation caused by investor risk aversion and are not explicitly targeted at monetary or credit easing (Arslan *et al*., 2020).

[12] Event study analysis uses the change in the value of a particular asset, or in this case sovereign yields, within a short window around the announcement of a new policy, such as a new round of QE, to isolate the effects on financial markets of those announcements (Hartley and Rebucci, 2020).

scarce. However, for the euro area we can use the estimates reported in DeSantis *et al*. (2018), who find that the €150 billion of corporate bond purchases under the ECB's Corporate Security Purchase Programme (CSPP) since 2016 has lowered corporate bond spreads by approximately 20 basis points. If we assume that 20 per cent (€24 billion) of the APP and 7 per cent (€130 billion), of the PEPP not used to purchase government bonds is instead used to purchase corporate securities, corporate spreads in the euro area could fall by over 20 basis points as a result of these purchases. In NiGEM, we implement this fall in debt costs as a similar reduction in the risk premium component of the user cost of capital.

Finally, Table 2 also outlines other important innovations by central banks in response to the pandemic including cuts to reserve requirement ratios and liquidity facilities. In most cases it is not possible to incorporate the impact of these interventions, as either that element of the transmission mechanism is not present in the model, or it is not possible to calibrate the instrument with any certainty due to the absence of empirical evidence on its impact. Accordingly, we focus only on modelling the impact of the third key element of the ECB's monetary response: the TLTROs and pandemic emergency longer-term refinancing operations (PELTROs) programmes.[13] These programmes are designed to funnel monetary easing through the banking system to firms and households. Although the actual rate paid by banks in some of these operations will be conditional on their lending behaviour, we assume that the average effect will be to reduce banks' funding costs by a weighted average of 40 basis points across both types of liquidity operations.[14] In NiGEM we implement this as a corresponding reduction in short-term funding rates, which is passed through to the real economy in the form of lower lending rates.

3.3 International Macroprudential Policy Response

The third component of the international policy response to the pandemic relates to the interventions of macroprudential authorities, which aimed at enhancing the resilience of the banking system to the real and financial impact of the pandemic shock. In this context, the containment measures introduced to suppress the spread of COVID-19 resulted in a sharp fall in income for many firms and households, with a consequent deterioration in their debt servicing capacity (McCann and O'Malley, 2020; Gourinchas *et al*., 2020). The associated decline in credit worthiness and the potential for a surge in non-performing loans increased the risks for banks' balance sheets. This can lead to a spike in lending spreads and to a tightening of credit conditions.

[13] PELTROs allow banks with loans not eligible for TLTROs, such as mortgages, or banks that have exhausted TLTRO limits, to access cheaper sources of funding from the ECB. See Holton *et al.* (2020) and Lane (2020a; 2020b) for an overview of the TLTRO-III and PELTRO programmes.

[14] Funding cost relief from TLTROs applies also to banks that do not bid in the operations, as they benefit from the general reduction in demand for liquidity in financial markets, which reduces the cost of market financing for all banks.

In response to these risks, macroprudential authorities across countries relaxed several policy tools to enable the financial system to absorb stress arising from the shock and to maintain the supply of credit to the real economy. By supporting the flow of credit to households and firms, these interventions have sought to mitigate adverse macro-financial feedback effects that may amplify the impact of the pandemic on the economy. These interventions included a lowering of required capital and liquidity buffers, and a loosening of borrower-based instruments such as loan-to-value and loan-to-income ratios (Lewrick *et al*., 2020).

In this article, we focus on the economic impact of the reduction in capital requirements, as the transmission mechanisms of other instruments are not widely modelled in NiGEM and because the empirical literature on the impact of these instruments is still relatively sparse.[15] In particular, we examine the impact of the release of counter-cyclical capital (CCyB) and systemic risk (SyRB) buffers. The release of these buffers enhances the capacity of the banking system to absorb losses and to prevent a contraction in banks' balance sheets (Nier and Olafsson, 2020). While the CCyB and SyRB differ in terms of their objectives, their real impact on the economy in terms of their effect on lending spreads and economic growth can be treated as equivalent (McInerney *et al*., 2020). The fall in required capital holdings reduces the level of retained earnings that banks must generate to maintain the lower capital ratio. For a given level of costs, this allows banks to reduce lending rates, which stimulates borrowing by both households and firms and raises economic activity.

Table 3 shows the countries that have reduced either the SyRB or CCyB in response to the disruption caused by COVID-19. In most countries, the size of both buffers was relatively low at the onset of the pandemic, reflecting the relatively recent introduction of these requirements. Consequently, this curtailed the extent to which their release could strongly support other policy levers in maintaining the provision of credit to the real economy.

To calibrate the impact of the cut in the CCyB and SyRB, we first calculate the effect of changes in capital requirements on lending rates using estimates from the literature. Column 3 in Table 3 shows the estimated impact of a one percentage point reduction in capital requirements on average lending rates, while column 4 provides the source for the estimate. In the case of those countries for which a country-specific estimate is not available, we use the average effect of 13 bps from the BCBS (2019) survey of the literature. The range of estimates is relatively narrow, which obviates concerns about using survey rather than country-specific estimates. To calculate the impact of the pandemic-related falls in capital requirements on lending rates, we multiply columns 1 and 2 by column 3. These values are then imposed in NiGEM as a corresponding reduction in the user cost of capital in each country.

[15] We also do not consider the impact of reliefs given to borrowers in the form of payment breaks. See Gaffney and Greaney (2020) and Duignan and McGeever (2020) for an overview of payment breaks availed of by Irish households and firms during the pandemic.

Table 3: Macroprudential Policy Responses to COVID-19

	Capital Instrument		*Impact of 1pp Fall in Capital Requirements*	
	CCyB (pp)	*SyRB (pp)*	*Lending Rates (bps)*	*Source*
Australia		–2.5	–13	BCBS (2019)
Belgium	–0.5		–15	Roger and Vlcek (2011)
Bulgaria	–1		–13	BCBS (2019)
Czech Rep.	–1		–13	BCBS (2019)
Denmark	–2		–10	Mikkelsen and Pedersen (2017)
Finland		–1	–11	Kilponen *et al*. (2016)
France	–0.5		–15	Roger and Vlcek (2011)
Germany	–0.25		–15	Roger and Vlcek (2011)
Hong Kong	–1		–4	HKMA (2018)
Ireland	–1		–11	McInerney *et al.* (2020)
Lithuania	–1		–13	BCBS (2019)
Netherlands		–1.5	–14	Berben *et al*. (2010)
Norway	–1.5		–12	Akram (2014)
Poland		–3	–13	BCBS (2019)
South Africa		–1.5	–13	BCBS (2019)
Sweden	–2.5		–16	Almenberg *et al*. (2017)
UK	–2		–10	Brooke *et al*. (2015)

Source: Capital instrument data taken from listed Central Banks' websites.

3.4 Results

Based on this calibration of discretionary fiscal, monetary, and macroprudenital policy changes across countries, we simulate the NiGEM model to quantify the extent to which they have supported growth in the global economy. In all cases, we simulate the models including the policy support measures and compare the results to a counterfactual baseline where the support measures are excluded. In particular, the baseline scenario (excluding policy supports) is derived by taking projections for exogenous variables and then solving the endogenous variables in the model consistent with these values. The results are then presented as deviations from this baseline scenario.[16]

In terms of fiscal policy, the shocks to government investment, consumption, taxes and transfers in NiGEM are transmitted through the economy in different ways.[17] Government consumption and investment directly raise aggregate output as they are part of GDP. Government investment also boosts capital accumulation

[16] An alternative approach to generating a baseline scenario would be to project forward unchanged the values of all exogenous variables and to impose the policy support changes on top of this baseline. Testing of the model has indicated that the results of shocks to the model do not change significantly regardless of the choice of baseline used.

[17] See Carreras *et al.* (2016) for a discussion of these channels in NiGEM.

and has a similar short-term effect on output as government consumption. Income tax and transfers affect disposable household income and thus household consumption, while changes to VAT affect the real level of the latter through consumer price inflation. Changes to corporate tax rates or deferrals affect firm profits, and thus the resources available for investment. It should also be noted that fiscal multipliers in the model are higher from government spending than tax shocks, as the former boost spending directly while the latter can be saved.

The monetary policy responses outlined in Section 3.2 are implemented in NiGEM as shocks to policy rates, in the case of conventional measures, and to sovereign term premia in the case of unconventional measures. Both types of measures are transmitted to the real economy in a similar way. The reduction in sovereign yields lowers interest payments on public debt, which improves the General Government Balance and thus lowers the accumulation of debt. The fall in sovereign yields also reduces the user cost of capital for firms and households, which stimulates consumption and investment. Lower interest rates also boost asset prices by lowering the discount rate, which further boosts private sector demand.

Finally, as discussed in Section 3.3, we implement the changes to macroprudential capital requirements in NiGEM as a reduction in financing costs for firms. Accordingly, the transmission of the macroprudential measures will be qualitatively similar to that of the monetary measures. In particular, the reduction in capital requirements reduces firms' user cost of capital, which raises private investment.

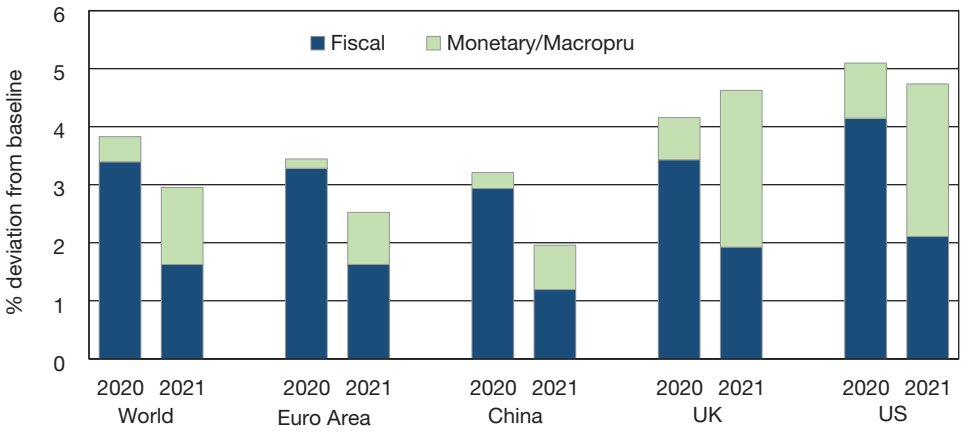
Figure 3 illustrates the impact of the policy interventions on output in a selected number of countries. The total impact on output can be decomposed into a component attributable to the fiscal measures and a component due to the monetary and macroprudential measures. We combine the contributions of the latter as the macroeconomic impact of the reduction in capital requirements is relatively small, a finding which is consistent with the literature (BCBS, 2019; McInerney *et al*., 2020).[18]

Our results suggest that both fiscal and monetary policies are playing a large role in cushioning the impact of the pandemic on economies. In particular, we find that fiscal policies strongly supported output growth in 2020, raising world output by almost 3.5 per cent relative to baseline. The impact of the policy measures has been quite similar across countries. For example, the fiscal stimulus in the euro area boosted output by over 3 per cent relative to baseline last year, while output was 3, 3.5 and 4.2 per cent higher relative to baseline in China, the UK and US, respectively. It is important to note that the estimated impact of the fiscal component of the policy response depends on a number of factors including the overall size of the package, as well as the multipliers associated with each type of spending.[19]

[18] The average impact of the reduction in capital requirements on output in our simulation is less than 0.1 per cent.

[19] For example, output multipliers associated with transfers tend to be lower than those associated with government consumption and investment.

Figure 3: Impact of Policy Measures on Output, % Deviation from Baseline



Source: Authors' calculations using NiGEM.

Figure 3 also indicates that fiscal policy will continue to boost output in 2021, with its impact approximately half that in 2020. While some of this impact reflects carry-over from the initial stimulus in 2020, it also reflects assumptions about how the measures are distributed between the two years, and when the measures are expected to taper. Following from the assumptions underlying our calibration, the impact of the fiscal interventions on output in 2022 will be negligible.

The contribution of monetary and macroprudential policies to output growth varies across countries and years. On aggregate, these policies raised global output by almost 0.5 per cent relative to baseline in 2020 and they are projected to raise output by over 1.3 per cent in 2021. Our simulation results suggest that countries such as the UK and US that implemented large changes to both conventional and unconventional monetary policies should experience the largest impetus to growth from the stimulus measures. The latter contributed 0.7 and 0.9 per cent to UK and US GDP, respectively, in 2020. This is projected to rise to over 2.5 per cent in both countries in 2021. For China and the euro area, the contribution of monetary policy is approximately one-third of that in the US and the UK in both 2020 and 2021. In the case of China, this partly reflects smaller cuts in policy rates. In term of the euro area, while the ECB has pursued the most aggressive asset purchase programme and the impact on GDP in 2021 is sizeable, it was more constrained in using conventional tools to counteract the economic impact of the pandemic due to the zero lower bound on nominal interest rates.

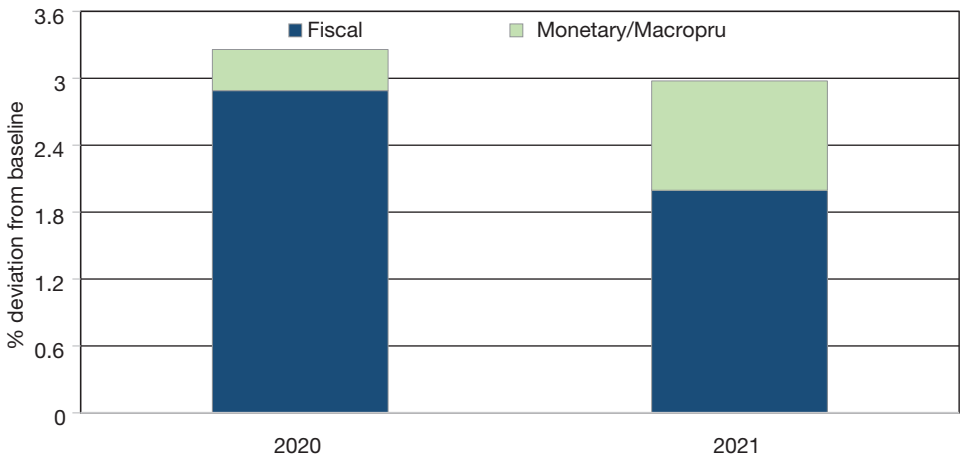
In all countries, the contribution of the monetary measures is larger in 2021 than 2020, while the opposite holds for the fiscal measures. This primarily reflects the "long and variable" lags in the transmission of monetary policy from financial markets and the banking system to the real economy (Havranek and Rusnak, 2013). In contrast to the impact of fiscal policies, these lags in the transmission mechanism,

along with our assumption of the gradual removal of monetary accommodation, means that the impact of pandemic-related actions by central banks on output in 2022 will be broadly similar to their impact in 2021.

Overall, our results for the impact of fiscal policies on the global economy are consistent with those in NIESR (2020a and 2020b). In particular, they find that the policy measures introduced by governments in response to the pandemic mitigated the fall in global GDP in 2020 by approximately one-third. In their analysis, this corresponds to an increase in world output of about 3 per cent relative to a 'no policy intervention' baseline. While we find the impact of fiscal policies on output in 2020 was slightly higher at 3.4 per cent, this mainly reflects the inclusion in our simulations of additional fiscal interventions that were introduced in the last quarter of 2020.

We now examine how the impact of the policies implemented in other countries may spill over to the Irish economy and the contraction in activity due to the pandemic. We first incorporate the results from NiGEM into a semi-structural model of the Irish economy, COSMO, as shocks to the path of external variables in the model. We then simulate the model to assess the contribution of each type of policy to the dynamics of Irish macroeconomic variables.

Figure 4: Impact of International Policy Measures on Irish Output, % Deviation from Baseline



Source: Authors' calculations using COSMO.

Figure 4 illustrates the impact of international policy interventions on Irish output. We find that fiscal measures raised Irish output by almost 3 per cent relative to a no policy change baseline in 2020 and are projected to raise output by 2 per cent in 2021. Note that these are broadly similar magnitudes to those found for the direct and indirect impact of fiscal policy measures on euro area output. This is also the

case for the impact of monetary and macroprudential policies. We find that the announced measures raised Irish output by close to 0.4 per cent relative to baseline in 2020 and are projected to boost output by close to 1 per cent in 2021.

The large positive effect on the Irish economy due to spillovers from international policies reflects the openness of the Irish economy and comes through the following channels. The fiscal expansion in Ireland's trading partners supports demand in those economies both directly, through higher government expenditure, and indirectly through the impact of fiscal multipliers on the aggregate economy.[20] Higher levels of economic activity in those countries also generate higher demand for Irish exports, thereby supporting the output and employment recovery in Ireland.

On the monetary and macroprudential side, reductions in policy rates and capital requirements lower borrowing costs for firms and households and thus incentivise consumption and investment in Ireland's trading partners. In addition, lower interest rates are associated with higher asset prices, which can further support these components of demand. Lower sovereign yields due to asset purchases enhance the government's fiscal position and reduce firms' user cost of capital.[21] Finally, the ECB's targeted operations lower banks' funding costs and therefore support bank lending to the economy. Each of these channels raises global aggregate demand and, thus, demand for Irish goods and services. The concomitant derived demand for labour subsequently lowers the Irish unemployment rate.

The impact of the policies on the labour market is shown in Figure 5. We find that international fiscal policy changes in response to the pandemic lowered the Irish unemployment rate by approximately 1.3 percentage points relative to baseline in 2020, with its impact falling to half a percentage point in 2021.[22] We also find that monetary and macroprudential policies are likely to have a sizeable impact on the unemployment rate, particularly in 2021 when these measures lower the unemployment rate by over one percentage point.

Finally, Figures 4 and 5 highlight how different policies can have proportionately heterogeneous effects on output and the unemployment rate. For example, monetary and macroprudential policies have a proportionately larger impact on the unemployment rate, particularly in 2021. This is mainly due to the differential impact of each policy on the composition of Irish output. In the models utilised here, the international fiscal policies implemented in response to the pandemic primarily affect the Irish economy through the trade channel, by raising Irish exports and thus output in the relatively less labour-intensive traded sector.

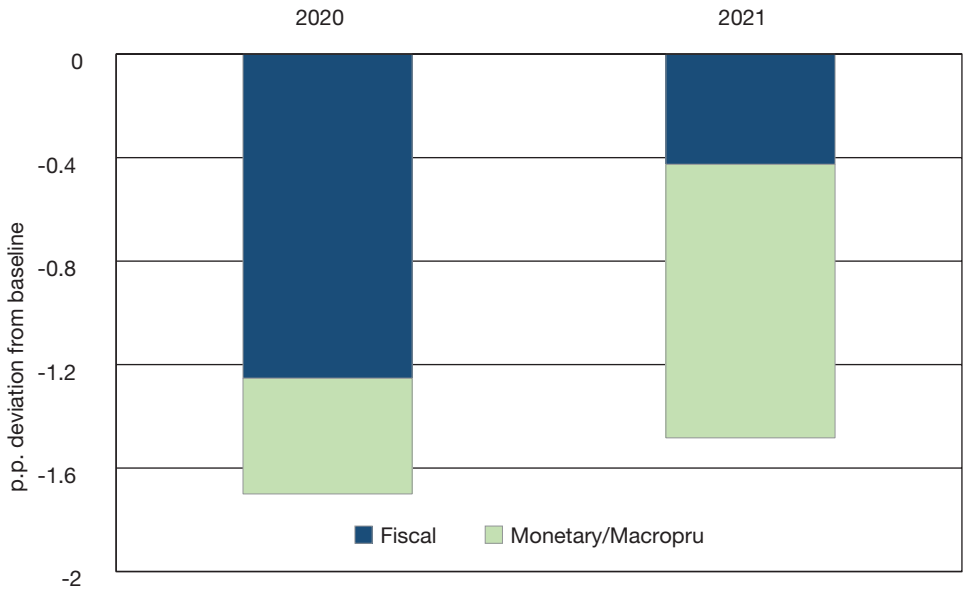
[20] The euro area, UK and US each account for approximately 30 per cent of the rise in Irish output from international policy measures, with the remaining 10 per cent distributed among Ireland's other trading partners.

[21] Long-term government bond rates act as the reference risk-free rate in most loan and capital asset pricing models.

[22] The baseline unemployment rate in COSMO refers to the ILO measure of unemployment and is therefore not COVID-adjusted.

This subsequently stimulates activity in other parts of the economy further raising aggregate output.

Figure 5: Impact of International Policy Measures on Irish Unemployment, Deviation from Baseline



Source: Authors' calculations using COSMO.

In contrast, while the international monetary and macroprudential policies also stimulate Irish exports and traded sector output through the rise in foreign demand, the impact is dampened by exchange rate movements. For instance the simulated monetary response in the UK and the US is slightly larger than in euro area, due mainly to cuts to policy rates in the former. This leads to a small appreciation of the euro vis-à-vis the dollar and pound which reduces Irish competitiveness and moderates the demand for output from the Irish traded sector from those countries.[23] At the same time, the monetary policy response in the euro area lowers the cost of non-deposit funding for Irish banks, which results in lower lending rates for Irish firms and households. In COSMO, demand for non-traded sector output is more interest-sensitive than for the traded sector so that the decline in interest rates due to the monetary measures will have a larger impact on the former. As the non-traded sector is more labour-intensive than the traded sector, both of the exchange rate and interest rate factors will mean that the monetary policy actions will have a proportionately greater impact on the unemployment rate than aggregate output.

[23] The appreciation of the euro relative to these currencies is approximately 5 per cent in both 2020 and 2021.

IV DOMESTIC POLICY RESPONSE

In the second stage of our analysis, we estimate the effect of domestic policy measures introduced during the pandemic. We include in the domestic policy response the fiscal measures introduced by the Irish Government as well as the direct impact of ECB monetary policy actions on financing conditions in Ireland.

Starting with the latter, along with the international channels through which the policy actions of different central banks will indirectly affect the Irish economy (as examined in the previous section), the programmes announced by the ECB in response to the pandemic will have a direct effect on the Irish banking system and market for Irish sovereign debt. To calibrate the impact of the PEPP and APP asset purchases on Irish government bond yields, we again use the estimates of the impact of previous ECB asset purchase programmes from Rostagno *et al.* (2019) and Chadha and Hantzsche (2018). Based on these estimates, we assume that the asset purchase programmes will lower long-term Irish government bond yields by over 70 basis points.

COSMO also has a detailed banking sector so that changes to ECB actions that affect banks' funding costs can be directly incorporated in the model.[24] Similar to the calibration in NiGEM, we assume that the average effect of the TLTRO-III and PELTRO programmes will be to reduce non-deposit funding costs by approximately 40 basis points.[25] In COSMO, this reduction in the weighted average cost of capital will be passed through to households and firms in the form of lower lending rates.

In terms of macroprudential policy, one of the key responses of the Central Bank of Ireland to the pandemic was to reduce the CCyB by one percentage point to zero. The rationale for this action was to allow banks to use the released capital to lend to the real economy (DeNora *et al*., 2020). In COSMO, macroprudential policy affects the economy through bank lending spreads. Similar to the mechanism described in Section III, when the central bank lowers capital requirements, banks respond by reducing lending spreads as less retained earnings are needed to meet the lower level of capital requirements. The reduction in lending rates thus reduces the user cost of capital for firms and households and stimulates demand for credit to finance consumption and investment.

In response to the fall in output and rise in unemployment due to the pandemic, the Irish government implemented an extensive range of fiscal supports during 2020. The measures mainly consisted of direct expenditure but also included tax changes and conditional guarantees. The direct expenditure measures introduced in 2020 and planned for 2021 are outlined in Table 4. In total measures amounting to just under €16 billion were implemented in 2020 with just under €12 billion for 2021. Expenditure on social protection accounted for the majority of the

[24] See McInerney (2020) for details on the banking sector in COSMO.

[25] The impact of these programmes will be influenced by the level of take-up by financial institutions in Ireland which has been low to date.

spending in 2020. Total tax changes amount to €3.4 billion in 2020 and €0.7 billion in 2021. The most significant provisions include tax warehousing, loss relief measures as well as a reduction in the VAT rate for the hospitality sector.

To assess the impact of the fiscal response to the pandemic, we calibrate a series of fiscal shocks in COSMO based on the government's announced expenditure measures as shown in Table 4 and the tax changes noted above. In relation to the expenditure changes, the majority of the supports to households are modelled as an increase in transfers arising from the Pandemic Unemployment Payment (PUP) and the Temporary COVID-19 Wage Subsidy Scheme (TWSS), with a smaller rise in government consumption and investment to account for the additional spending in health and education areas. The expenditure allocated to the Recovery Fund in

Table 4: COVID-19 Direct Expenditure Measures, € billion

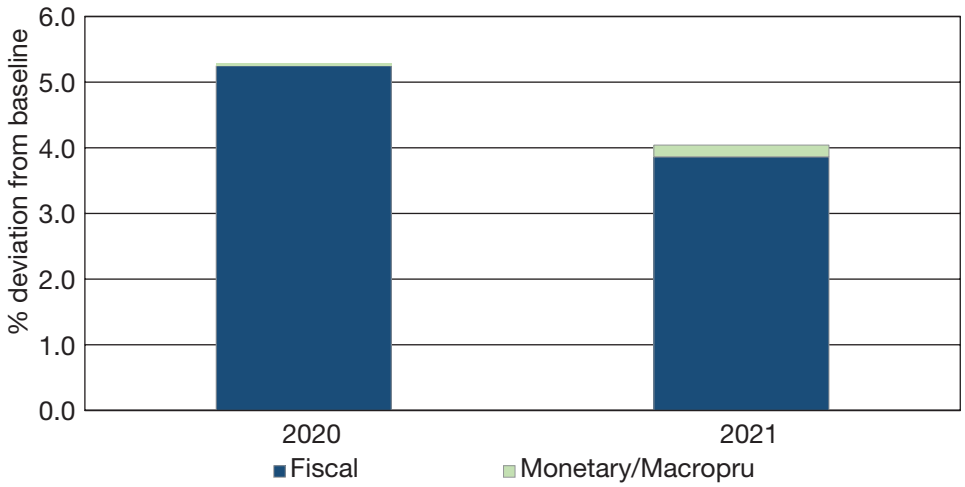
Expenditure Measures		*2020* *€ billion*	*2021* *€ billion*	*Total* *€ billion*	*% GNI*
Social Protection		**10.37**	**3.18**	**13.55**	**6.7**
of which:	Pandemic Unemployment Payment	5.09	0.65		
	EWSS/TWSS	4.53	1.20		
	Other (illness benefit, activation measures, etc.)	0.75	1.33		
Health		**2.54**	**1.88**	**4.42**	**2.2**
of which:	Capacity, equipment, PPE, testing	2.54			
Education		**0.32**	**0.23**	**0.55**	**0.3**
of which:	Roadmap for Reopening Schools	0.14			
	Further and Higher Education	**0.32**	**0.17**	**0.49**	**0.2**
Business, Enterprise & Innovation		**0.94**	**0.10**	**1.04**	**0.5**
of which:	Liquidity supports and Business Restart Grants	0.49			
	July Stimulus including additional funds for Restart Grants	0.45			
Housing, Local Government and Heritage		**1.10**	**0.05**	**1.15**	**0.6**
of which:	Commercial Rates Waiver	0.90			
Transport/Tourism/Sport		**0.57**	**0.40**	**0.97**	**0.5**
of which:	Public Service Obligation	0.46	0.39		
Other		**0.64**	**0.38**	**1.02**	**0.5**
Total allocated		**16.78**	**6.39**	**23.17**	**11.4**
Contingency			**2.10**	**2.10**	
Recovery Fund			**3.40**	**3.40**	
TOTAL DIRECT EXPENDITURE		**16.78**	**11.89**	**28.67**	**14.1**

Source: Department of Finance (November 2020).

2021 (Table 4) is not included in the simulations as no details have yet been announced as to how this additional spending will be allocated or in relation to the timing of the spending. The majority of the tax changes are modelled as reductions in corporation tax (to account for tax warehousing and deferrals) as well as a cut to the VAT rate.

Along with the direct expenditure and tax supports, other initiatives to assist businesses were implemented by the Government in 2020 and we also include these indirect measures in the simulations. The impact of the €2 billion Irish Strategic Investment Fund (ISIF) Pandemic Stabilisation and Recovery Fund is proxied by an increase in investment in the private sector. The effect of the €2 billion Credit Guarantee Scheme is modelled as a 50 basis point reduction in the risk premium component of the corporate lending rate.[26]

Figure 6: Impact of Domestic Policy Measure on Irish Output, % Deviation from Baseline



Source: Authors' calculations using COSMO.

Based on this range of assumptions, we estimate the economic impact of the domestic fiscal, macroprudential and monetary policy measures that have been introduced since early 2020. Figure 6 shows the estimated overall impact of the domestic policies on output. The results indicate that the domestic measures are estimated to boost output by close to 5 per cent in 2020 and 4 per cent in 2021 (Figure 6).

[26] Assessing the impact of both the Pandemic Stabilisation and Recovery Fund and the Credit Guarantee Scheme is difficult ex-ante due to the demand-driven nature of the supports. We assume that there is full take-up of the Recovery Fund which translates into higher investment than in the baseline. We calibrate the impact of the Credit Guarantee Scheme on risk premiums based on NIESR (2020a).

The majority of the increase in output is driven by the direct expenditure measures which in turn account for the bulk of the fiscal stimulus. Tax changes, the credit guarantees and the reduction in interest rates have a small effect on overall output. The latter monetary and macroprudential measures have a relatively small impact on overall output. This mainly reflects the difficulty of disentangling the impact that is due to the domestic transmission of monetary measures implemented by the ECB and the impact originating from the euro area. As the ECB's liquidity operations affect inter-bank liquidity for all banks in the euro area and its purchase programmes lower the euro area risk-free rate, typically represented by German Bund yields, isolating the impact of monetary policy on individual member countries is fraught with challenges. Accordingly, the impact of monetary-macroprudential measures on Ireland shown in Figure 6 should be coupled with that shown in Figure 4 when interpreting how the ECB's actions during the pandemic have affected Irish output.

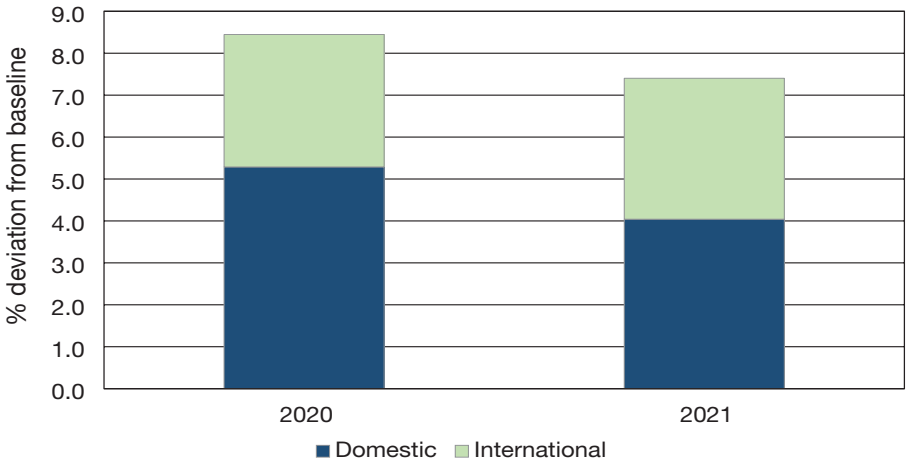
The increase in output from the domestic fiscal measures comes about through a number of channels. The expenditure on social protection boosts household incomes and, although the savings rate also increases, consumption and domestic demand rise. The tax changes as well as the credit guarantees stimulate investment and activity in the non-traded sector. The fiscal measures which boost government consumption (predominantly the additional spending in health) lead to an increase in public sector employment and stimulate demand in the non-traded sector. It is worth noting that domestic fiscal measures also increase Irish demand for imports from our trading partners, which supports the recovery in those countries.

In the model, the expenditure measures which result in an increase in government consumption have a larger impact on output than higher government spending on transfers. This is because an increase in government consumption leads directly to a rise in public sector employment, which in turn boosts disposable income and consumption. With an increase in transfers, there is no direct impact on employment and some of the additional income is saved which results in a smaller indirect effect on consumption and overall output. The larger multiplier for government consumption than transfers means that although the majority of the fiscal measures in 2020 consisted of transfers, the smaller increase in government consumption still accounted for a significant proportion of the overall effect on output.

To show the impact of the full range of the fiscal, monetary and macro-prudential policies introduced in Ireland and abroad, Figure 7 combines the estimated impact of the international measures from Section III with the effect of the domestic policies described above. The results show that the unprecedented international and domestic policy response to the pandemic is estimated to have had a meaningful impact in reducing the severity of the COVID-19 crisis. Our estimates suggest that these measures reduced the scale of the decline in output in Ireland by around 8 per cent and 7.5 per cent in 2020 and 2021 respectively

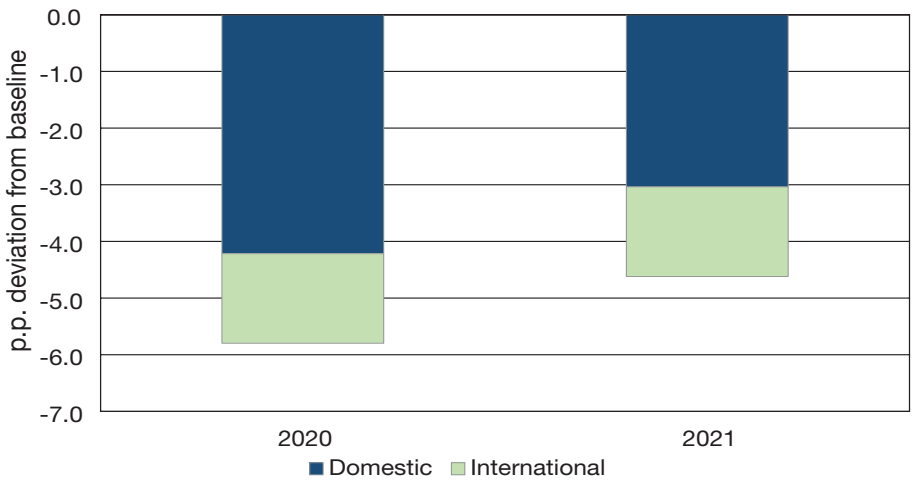
(Figure 7). By increasing output, the measures also boosted employment and reduced the unemployment rate below where it would have been in the absence of the measures. Figure 8 shows that the combined domestic and international policy actions reduced the unemployment rate by around 5.5 percentage points in 2020 and 4.5 percentage points in 2021. Around two-thirds of the impact on unemployment is estimated to be driven by the domestic fiscal measures.

Figure 7: Combined Impact on Irish Output of Domestic and International Policy Measures, % Deviation from Baseline



Source Authors' calculations using COSMO.

Figure 8: Combined Impact on Unemployment of Domestic and International Policy Measures, P.P. Deviation from Baseline



Source: Authors' calculations using COSMO.

While these are large, estimated effects, they must be considered in the context of the scale of the actions implemented by governments and central banks. The fiscal measures in Ireland for 2020 and 2021 amount to 14 per cent of GNI*, while the international policy actions include monetary easing by the central banks in Ireland's three key trading partners the US, UK and euro area, to an extent never previously observed. The supportive monetary policy stance has been combined with large-scale fiscal expansions in the same regions. For example, the fiscal packages announced by the UK and US are of the order of over 8 and 9 per cent of GDP, respectively, excluding the additional stimulus which will be generated from the large-scale credit guarantee and liquidity measures they have implemented.

V CONCLUSIONS

The coronavirus pandemic caused a major collapse in economic activity in Ireland and around the globe. With strict lockdown measures still in place in many countries to control the spread of the virus, and uncertainty over its future evolution and the timing of vaccine rollouts, the recovery path from the COVID-19 crisis is still unclear and prone to setbacks. To prevent a more extreme decline in economic activity and to minimise the risks of long-term scarring, governments and central banks have responded to the COVID-19 crisis by implementing extraordinary programmes of fiscal and monetary support.

Our analysis shows that international and domestic policy interventions (expansionary fiscal policy and accommodative monetary policy) are likely to play an important role in reducing the loss of output and employment from the COVID-19 crisis. As an open economy highly interconnected with the global system, Ireland benefits from the positive effects of monetary and fiscal policy measures implemented abroad. Our assessment of the combined effects of domestic and international policy supports indicates that the interventions will help to meaningfully reduce the scale of the output loss in Ireland from the pandemic. It is important to bear in mind that while the models we use capture key transmission channels, they are approximations of reality. Due to the novelty of some of the fiscal and monetary policy measures that have been introduced during COVID-19, our simulations may not capture the full impact of the policy response. Our models do not take account of potential non-linearities or state dependencies that could influence the response of the economy to different policy changes.

In relation to the fiscal measures introduced by governments to counteract the effects of the pandemic, our analysis has focussed on the impact of these supports on economic activity and the labour market. The cost of these measures has resulted in a sharp rise in public debt in Ireland and around the world. While the current low interest rate environment in the euro area has created favourable financing conditions and reduced the cost of servicing this new debt, further analysis is needed

to assess the long-term implications for the public finances of rapid increase in government debt during COVID-19.

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