INSTITIÚID TAIGHDE EACNAMAÍOCHTA AGUS SÓISIALTA
ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

Working Paper No. 798

The Impact of Deglobalisation and Protectionism on a Small Open Economy - The Case of Ireland

March 2025

Paul Egan*[a,b] and Fionn Roche[c]

Abstract

The decline in international trade following the financial crisis suggests a shift in globalisation and a transformation of the international economic order. Protectionist trade policies have gained prominence as certain major economies increasingly implement tariffs to safeguard domestic industries and promote import substitution. This paper utilizes the National Institute of Economic and Social Research's Global Econometric Model (NiGEM) and the ESRI's macro-econometric model (COSMO) to explore the implications of de-globalisation and protectionist trade policies for the Irish economy. Given Ireland's small, open economy, it faces greater risks from protectionist shocks compared to larger, diversified economies. The paper examines various protectionist shocks, revealing that both tariff and non-tariff measures could significantly impact the Irish economy, particularly the traded sector. The resulting economic shifts may adversely affect the labour market, consumption, and public finances, with potential declines in personal, indirect, and corporation tax receipts.

a: Economic and Social Research Institute, Ireland. b: Department of Economics, Trinity College Dublin, Dublin, Ireland. c: Department of Finance, Dublin, Ireland. *: Corresponding author
Acknowledgements: This paper was funded by the Department of Finance/ESRI Joint Research Programme. The authors would like to thank members of the Steering Group for comments and suggestions. Finally, the authors would like to thank Adele Bergin, Martina Lawless, Kieran McQuinn and Conor O'Toole of the ESRI and Ian Power and Luke Rehill from the Department of Finance for comments on a earlier draft.

Non-Technical Summary

In this paper, we use scenario analysis to assess the macroeconomic impact of deglobalisation and protectionist policies on the Irish economy. We carry out this analysis using NiGEM, a global economic model developed by the National Institute of Economic and Social Research (NIESR), which is linked to the ESRI's model of the Irish economy, COSMO. Given the uncertainty around protectionist policies, we consider both unilateral tariffs, where the US imposes tariffs on the rest of the world and the EU without a response, and bilateral tariffs, where the rest of the world and the EU responds with reciprocal or 'tit-for-tat' tariffs. In addition, we also examine the potential impact of non-tariff barriers imposed by the US on the rest of the world. This would include measures such as changes in US regulatory requirements which would restrict market access opportunities for Irish and global exporters.

The results presented in this paper show that the imposition of a 10% tariff by the US on imports from the rest of the world would have a significant negative impact on the Irish macroeconomy. The model simulations presented show that this unilateral protectionist policy could potentially cause Gross Domestic Product (GDP) and Modified Domestic Demand (MDD) to fall by as much as 2.5% and 1.3% below the no tariff baseline. The decline in GDP and MDD could be as much as 3.2% and 1.7% below the baseline respectively in the event of a 10% bilateral, or 'tit-for-tat', scenario.The paper also presents results of a scenario where both a 25% unilateral and bilateral tariff between the US and the EU is imposed. The results show that the impact to the Irish economy of these 25% US-EU tariffs are broadly similar to those of the 10% US-rest of the world tariffs, although the negative impact is marginally greater in the US-EU case with GDP and MDD falling from the baseline by as much as 3.7% and 1.8% in the bilateral tariff scenario. Finally, the paper shows that a 10% increase in non-tariff barriers from the US to the rest of the world would also have a significant negative impact on the Irish economy, with MDD falling by as much as 3.1% and 1.6% below the no barrier baseline respectively.

The results presented indicate that the traded sector of the economy is likely to be disproportionally impacted by these protectionist measures due to its strong linkages with the global economy, with production in the sector falling by as much as 4% from the no protectionist policy baseline. This is compared to a 2% fall in domestic sector production for the same scenario. This has the potential to further negatively impact the overall economy, given the fact that those employed in the traded sector tend to be more educated and better paid than the workforce as a whole, making them an important source of aggregate demand and income tax receipts. In addition, the paper notes that if US protectionist measures were to target specific industries, this could lead to a greater decline in the traded sector, and the macroeconomy as a whole, than could be generated by our scenario analysis.

Finally, the results show that the macroeconomic impact of the protectionist policies are also likely have an adverse impact on Ireland's public finances. The paper shows that these macroeconomic impacts alone could cause personal, indirect and corporation tax receipts to fall by as much as 1.6%, 2.5% and 3.2% relative to the no protectionist policy baseline. The paper highlights, however, that the concentrated nature of corporation tax revenue in Ireland makes it difficult to accurately forecast in any model where receipts are based on overall macroeconomic conditions only. Protectionist policies therefore that target specific sectors that are important to the Irish economy, would have a disproportionate negative impact on tax receipts. This can be viewed as an additional risk to Irish public finances.

1 Introduction

Economic globalisation has contributed significantly to raising living standards and reducing poverty over the past 50 years, with increased international trade and capital flows being a major source of the unprecedented growth seen globally in the post-war period (IMF 2002)[39]. The downward trend in international trade post 2008 would, however, suggest that the direction of globalisation is changing, bringing with it a transformation to the international economic order. The economic literature has highlighted the growing global trend toward "de-globalisation", characterized by rising trade protectionism (see for example He et al. (2020)[36], Bekkers (2019)[8] and Robinson & Thierfelder (2019)[59]). Shocks such as Brexit, the COVID-19 pandemic and Russia's invasion of Ukraine have further tested international relations and increased scepticism about the benefits of globalisation (IMF 2023)[37]. This has led to an increased perception for the need to reduce reliance on other countries' supply chains and discussions of re-shoring, near-shoring and friend-shoring have become more widespread.

Concerns about a slowdown in globalisation first emerged in the wake of the global financial crisis (GFC), when trade volumes failed to bounce back in line with the recovery in economic activity (James 2018)[42]. At first glance, Figure 1 which plots the movement in global trade as a percentage of world GDP both pre and post GFC, would appear to support this argument. This led some observers to draw parallels with the 1930's, when a global economic downturn led to the widespread adoption of protectionist policies and produced a steep fall in global trade volumes (Eichengreen & O'Rourke 2010)[28]. The majority of the literature which examines the decline in trade in the post GFC period would seem to downplay the role played by protectionist trade policies and deglobalisation however. Examining the period between 2008 to 2015, Constantinescu et al. (2020)[21] attribute half of the decline in trade seen in the immediate post-financial crisis period to short-term cyclical factors, with structural factors, especially a fall in vertical specialisation in the US and China, accounting for the remainder. In contrast, they argue that protectionist trade policies are unlikely to have played a significant role in explaining the reduction in the world trade elasticity and, hence, in the current trade slowdown. Looking at a similar time period, Ollivaud & Schwellnus (2014)[56] attribute more of an impact to cyclical factors, arguing that most of the post-crisis weakness in global trade can be attributed to weak global demand rather than structural changes and suggest that protectionism played a negligible role in the slowdown. Boz et al. (2014)[16] similarly argue that trade barriers played a very minor role in depressing cross-border goods flows. The concern that governments would embrace protectionism as a policy response to the recession therefore appears, in retrospect, to have been misplaced.[1]

Trade barriers, however, began to play a much larger role in the period between 2015 and 2020, a period which saw a lurch towards protectionism on the world stage epitomised by events such as the Brexit referendum in the UK in 2016, and the publication by the Chinese government of the Made in China 2025 industrial policy strategy.[2] During this period, governments in a number of countries adopted policies which fit broadly into 'economic nationalism', a political impulse which seeks to combine economic growth with self-sufficiency. Governments seeking to reconcile these contradictory goals often turn to tariffs and other

[1] This is not to downplay the importance of the recession in the move towards protectionism that would later emerge, but such a long-term political reaction should be differentiated from an immediate policy response.

[2] Made in China 2025 is a strategic plan signed by the Chinese Government in 2015 that seeks to make China dominant in global high-tech manufacturing. The program aims to use government subsidies, mobilize state-owned enterprises, and pursue intellectual property acquisition to catch up with,and then surpass, Western technological prowess in advanced industries.

protectionist policies as a means of protecting domestic industries and encouraging import substitution (Suesse (2023)[62] and MacIsaac & Duclos (2020)[50]). As Bown et al. (2024)[15] point out, reciprocity is a well-established norm within trade policy, legitimised by World Trade Organisation (WTO) rules that allow states to respond in kind to the imposition of trade barriers. When a country imposes tariffs, its trading partners frequently respond with their own countermeasure, thereby exacerbating trade disputes and increasing uncertainty and economic inefficiencies. This dynamic played out most visibly in the trade war between the US and China, which began in March 2018 when the US imposed tariffs on imports of steel and aluminium and led to an escalating cycle of retaliations estimated to have reduced GDP in the US and China by approximately 1.4% each (Itakura 2020)[41], and lowered US imports of targeted goods by 2.5% (Fajgelbaum et al. 2020)[29]. However, this trade war with China was just one of a series of disputes which eventually lead China, the European Union, Mexico, Turkey, Russia, Canada, Switzerland, Norway, India, and South Korea to all file cases against the US at the World Trade Organisation (Amiti et al. 2019)[2]. Neither was the impact of politics on trade confined to the US, with the volume of exchange between the UK and the EU, for example, being similarly affected by Brexit (Kren & Lawless 2022)[46]. Thus while global demand conditions remained relatively weak between 2016 and 2020, it was clear to observers by the end of 2019 that the proliferation of protectionist measures, and thus the deglobalisation pressures described by O'Rourke (2019)[55], was playing a much larger role in depressing trade flows than had been the case in the immediate post-recession period (e.g. UNCTAD (2019)[64]; IMF (2019)[38]).

These deglobalisation pressures intensified further during the Covid-19 pandemic, which highlighted some of the risks produced by globalised forms of production and legitimised the use of trade and industrial policy among political movements and institutions which had previously been committed to free trade. The re-election of President Trump in November 2024 brought global protectionist policies into particular focus. During his election campaign, President Trump indicated that a blanket increase in tariffs on imports to the US would be applied. This included 60% tariffs on all imports from China and between 10 to 20% tariffs on imports from the rest of the world. While considerable uncertainty remains as to which tariffs will be applied where, US trade policy represents a clear and significant risk to international macroeconomic conditions, in particular within the targeted countries, and has the potential to significantly weigh on global growth.

With these arguments in mind, this paper uses the ESRI's macro-econometric model, COSMO, to examine the potential implications of global fragmentation and protectionist trade policies to the Irish economy. While deglobalisation would likely have a significant impact on the majority of economies around the world, a shock of this nature has the potential to have a larger effect on Ireland, due to the small open nature of the economy. Ireland is also likely to be disproportionately affected by US trade policy, given that 16.3% of Irish exports went to the US in 2023. Compared to larger, more diversified economies, Ireland's small, highly integrated economy is more vulnerable to shocks emanating from the global trade environment.

The results of this paper will show that both tariff and non-tariff barriers have the potential to significantly impact the Irish economy, with adverse impacts on investment and production, particularly in the traded sector, the labour market, consumption and the domestic economy as a whole. The findings will also show that the macroeconomic fall out due to protectionist trade policies have the potential to have an adverse impact on Ireland's public finances.

The paper is structured as follows. Section 2 outlines the channels by which de-globalisation and protectionist policies may affect a small open economy such as Ireland; Section 3 out-

lines some of the key mechanisms in COSMO, with an emphasis on those relevant for the shocks applied in this paper; Section 4 discusses the calibration of shocks related to the protectionist policies and also presents the simulation results; 5 discusses the fiscal impacts in more detail as well as some potential impacts to the Irish economy not covered by the COSMO framework; Finally, Section 6 concludes.

2 Protectionism & Deglobalisation - An Irish Context

The structure of the Irish economy means that it has the potential to be disproportionately affected by the process of de-globalisation and the escalation of protectionist trade policies. As is often stressed, Ireland has been one of the key beneficiaries of globalisation and has benefitted enormously from opening itself up to free trade and foreign investment (Fitzgerald & Honahan (2023))[31]. However, its level of integration with the world market also makes the Irish economy more vulnerable to the effects of a rise in protectionism and a slowdown in global trade. In addition, because trade policy is an EU level competency, Ireland may be caught in a position in which tariffs are imposed on both imports and exports as the EU responds to US policies. Such an outcome would affect the Irish economy through a number of channels.

The most obvious mechanism through which a slowdown in exports would affect the domestic economy is through unemployment. As Brazys & Regan (2017)[57] and & McQuinn & Varthalitis (2019)[52] point out, Ireland's recovery in the aftermath of the GFC was driven primarily by employment growth in export-dominated sectors, and these industries remain a key driver of economic activity. For instance, two of Ireland's largest export industries, ICT and Manufacturing, make up 6.5% and 12% of total employment respectively. While these workers are put directly at risk of unemployment by a rise in protectionism and a slowdown in trade, a downturn in these sectors would also create an important indirect effect on employment in industries producing for the domestic market. Those employed in exporting firms in the Irish economy tend to be more educated and better paid than the workforce as a whole (Lawless et al. (2017)[48]), making them an important source of aggregate demand in the Irish economy and giving them a disproportionate economic impact. A fall in employment in the export-oriented sectors is therefore likely to also have an important secondary effect on employment in industries producing for domestic consumption.

A slowdown in trade will also impact the Irish economy through a loss in economies of scale. Many models of economic growth emphasise the importance of increasing returns to scale as a driver of economic performance (e.g. Romer (1986)[60]; Barro & Sala-i-Martin (1995)[6]). One of the fundamental problems facing a small economy such as Ireland is that its limited market size prevents firms from growing sufficiently large to benefit from these dynamics. As Krugman (1979)[47] shows, this also holds at the firm level, with productivity growth being hindered by the constraint imposed upon the extent of the division of labour by the small market size. Small states try to overcome this issue through integration into the world economy and the cultivation of export markets, which gives firms scope for returns to scale beyond that provided by the domestic economy alone (McIntyre et al. (2018)[51]), which helps to explain why exports tend to make up a larger share of GDP for smaller economies (Long 2022)[49]. Ireland is no exception in this regard, with exports making up 136% of GDP in 2023, compared to 33% for France or 32% for the UK. A global increase in protectionist measures is therefore likely to negatively affect the Irish economy by depriving Irish firms of access to export markets, and thus limiting their ability to accumulate economies of scale.

Irish firms benefit from free trade not just through access to export markets, but also through the availability of cheaper and more varied inputs. This improves economic performance through three main mechanisms. First, cheaper inputs increase competitiveness by allowing a given level of output to be produced for a lower price. Second, access to higher quality intermediate goods may allow for the production of higher quality outputs. Third, the ability to import inputs rather than produce them domestically frees up resources that can instead be used in forms of production with a higher value added content. Consistent with these ideas, a large body of literature suggests that a reduction in tariffs on inputs and intermediate goods can produce increases in firm productivity (Yu (2014)[65]; Goldberg et al. (2010)[32]; Feng et al. (2016)[30]), while, similarly, access to a wider variety of foreign inputs is also associated with stronger firm performance (Bas & Strauss-Kahn (2014)[7]; Kasahara & Rodrigue (2008)[45]; Halpern et al. (2015)[35]). An increase in the cost of foreign inputs due to a rise in tariffs or other protectionist policies could be expected to have the opposite effect, resulting in a fall in productivity and competitiveness.

An increase in protectionism would also lower the competition faced by Irish firms, potentially reducing their productivity and incentive to innovate. In the framework outlined by Arrow (1962)[3], investment in R&D is the means through which firms escape competitive pressures and gain an advantage over their rivals. Because the benefit of escaping these pressures are greater in a highly competitive market, competition and innovation should be positively related. Bloom et al. (2013)[13] expands upon this relationship, arguing that competition lowers the opportunity cost of assigning workers to R&D activities and so facilitates innovation. Medina (2022)[53] makes a similar argument, suggesting that factor mobility frictions incentivise firms to reallocate workers towards R&D and other high value added activities rather than to dismiss them in the face of competitive pressures. In line with these theories, import competition has been shown to be positively related to innovation in a number of different countries and regions, including Europe (Bloom et al. (2016)[12]), Latin America (Medina (2022)[53]), and China (Gu et al. (2024)[34]). This mechanism is likely to be particularly important for Ireland, given that investment in R&D boosts the capacity of domestic firms to absorb positive productivity spillovers from the MNEs located in Ireland (Di Ubaldo, Lawless and Siedschlag (2018)[63]). A fall in R&D investment caused by a decrease in import competition would therefore have a doubly negative impact on productivity in Ireland, decreasing both domestic innovation while also undercutting the ability of Irish firms to absorb the innovations developed abroad.

Protectionist policies may also lower productivity by transferring resources away from highly productive industries, towards those which are less productive. This occurs because tariffs raise the cost of imported goods, incentivising firms to switch consumption away from these imports and towards domestically produced goods and services. This shift in consumption patterns allows consumers to minimise the losses to real income produced by the introduction of the tariff, and, to the extent that consumers switch to goods manufactured by the Irish traded sector, may help to compensate for the loss to export markets produced by the slowdown in trade. However, a proportion of this redirected consumption is likely to flow into the non-traded sector, which produces exclusively for domestic consumption and whose output has been made comparatively cheaper by the introduction of the tariff. This non-traded sector includes industries such as catering and hospitality, which are characterised by low potential for economies of scale and which tend to have relatively low productivity in Ireland (CSO 2024)[23]. The supply side response to this increase in demand will draw capital and labour into the non-traded sector. To the extent that these resources would otherwise have been left inactive, for instance workers affected by the unemployment discussed above, this may help to mitigate the impact of the trade slowdown on

the domestic economy. However, because the traded sector is more productive, and because export-based industries tend to have strong potential for economies of scale, an increase in the size of the non-traded sector at the expense of the traded sector will result in a decrease in aggregate productivity.

Finally, it is likely that de-globalisation and de-fragmentation through protectionist policies would also impact the state's fiscal position through a number of channels. First, the increase in unemployment discussed above would produce a fall in income tax receipts. This effect could be proportionally greater than the fall in employment, given that the Irish taxation system is relatively progressive by international standards (see O'Connor et al. (2016)[54] and Roantree (2020)[58]) and those employed by multinationals are disproportionately well paid (Lawless, Siedschlag and Studnicka (2017)[48]). Indirect taxes on consumption would also be affected as the fall in employment impacts on consumption and aggregate demand. We would also expect to see pressure on the state's fiscal position from the expenditure side, as transfers to households increase in response to the rise in unemployment. The effect of each of these channels are accounted for in COSMO's existing fiscal block, which allows macroeconomic fluctuations to impact on government revenue and expenditure. However, modelling the impact of deglobalisation on corporation tax receipts is more problematic due to the degree to which this revenue stream is affected by the internal decision-making of a small number of firms. On the aggregate level, corporation tax receipts will fall, as trade barriers and lower domestic demand affect the profit margins of firms in the traded and non-traded sectors respectively. However, the Irish Fiscal Advisory Council (2024)[22] calculates that just three firms accounted for 43% of all corporation tax receipts in 2022. This means that "idiosyncratic developments often dominate economic fundamentals in explaining year-to-year movements in corporation tax receipts" (Casey and Hannon 2016)[19], with the internal structure and product mix of a small number of firms often playing a disproportionate role in determining the size of the revenue inflows. Recognising this issue, the Department of Finance has made a concerted effort in recent years to identify the corporation tax receipts that fall in excess of what can be explained by economic fundamentals and which should instead be attributed to firm-specific decision-making. In 2023, for instance, these windfall corporation tax receipts were estimated to amount to 11.2 billion euro or about 9% of government revenue. The potential impact that protectionist policies will have on the tax receipts will be discussed in more detail in Section 5.

3 Methodology

The methodological approach employed in this paper is two fold. Firstly, we examine the macroeconomic impacts of increased protectionism on the Irish economy through the ESRI's macro-econometric model, COSMO. In this paper, COSMO's baseline scenario is built using exogenous global variables including the global demand for Irish exports, exchange rates, foreign bond prices, interest rates and the oil price from the National Institute of Economic and Social Research's Global Econometric model (NiGEM). We then apply various protectionist shocks to NiGEM which will ultimately change the path of these exogenous variables, thus providing various scenarios. Secondly, we provide a separate analysis, informed by the results from the econometric simulations, to discuss the impact of such measures on the more idiosyncratic elements of the Irish economy which do not yet fit neatly into the structure of COSMO. As part of this analysis, we will also discuss the impact of Ireland's public finances in more detail.

While outlining all of COSMO's equations in detail is beyond the scope of this paper,

below we outline the main structure and some of the key mechanisms of the model while highlighting some of the more important channels for a global shock of this nature.

3.1 Core structural model of the Irish economy (COSMO)

First outlined in Bergin et al. (2017)[9], COSMO is a macro-econometric model of the Irish economy designed for both economic projections and policy analysis (for examples of its uses see Egan, Kenny & O' Toole (2023)[26], Bergin, Economides, Garcia- Rodriguez, & Murphy (2019)[10] and Conefrey, O'Reilly, & Walsh (2018)[20]). In recent years, COSMO has also undergone a number of modifications to areas such as the models macro-financial linkages (see Egan, McQuinn & O' Toole (2022[27], 2024[26]) and the addition of a construction sector (see Egan & Bergin (2022[24], 2023)[25]).

COSMO represents the neoclassical synthesis by integrating theoretically based long-run relationships that are static optimisation conditions with empirically supported short-run dynamics. The supply-driven long-term equilibrium is established by the total factor productivity and the available factors of production. The long-run properties of the model, as derived from optimisation, exert their influence through the error correction structure. This anchors the model and ensures that although there are short-run dynamics the variables do eventually converge to their long-run path as specified by theory.

COSMO initially focuses on production relationships, and then examines the downstream expenditure and income consequence. Sections 3.2-3.7 below briefly outlines the main blocks within COSMO, beginning with the production side, as well as highlighting how the global exogenous variables from NiGEM interact with the domestic economy. These sub-sections provide a broad overview of the mechanisms in COSMO relevant to this particular paper and includes descriptions of both key estimated and identity equations.[3]

3.2 COSMO - The Supply Block

The supply block of the model is concerned with the production side of the economy. It is disaggregated into four sectors, *traded (tr), domestic (dm), construction (ct)* and *government (gv)*, owing to the heterogeneous nature of the influences on each sector. The traded sector contains a high concentration of multinational firms which are primarily influenced by global factors. The domestic and construction sectors, by contrast, primarily contain firms operating in the national economy for which domestic conditions are of primary importance. The model underlying the supply-side for each sector is a 3-factor normalised nested constant elasticity of substitution (CES) production function. This is estimated for each sector using the approach of Barrell and Pain (1997)[5]. The nested CES production function for sector i[4] is given as:

$$y_i = \gamma_{1,i}\left[\delta_{1,i} z_i^{-\rho_{1,i}} + (1-\delta_{1,i})\left(h_i e^{\lambda_i t}\right)^{-\rho_{1,i}}\right]^{-1\rho_{1,i}} \quad (1)$$

Where y is output measured as a sectors gross value added, l is labour measured as total hours worked, λ is labour augmenting technological progress, δ_1 is the elasticity of substitution between labour and the capital-energy bundle, γ is a constant term that centres the function around the level of actual output, and z denotes a composite of capital, k, measured as the net productive capital stock and energy, e, measured as fossil fuel consumption. The composite of capital and energy is assumed to take the CES form and is given by;

[3]For a more detailed account of the various components and blocks of COSMO see Bergin et al (2017)[9], Egan & Bergin (2022)[24] and Egan, McQuinn & O' Toole (2022[27], 2024[26]

[4]For simplicity, the sectors tr, dm, ct and gv are represented by i in Equations 1 and 2.

$$z_i = \gamma_{2,i}\left[\delta_{2,i}k_i^{-\rho_{2,i}} + (1-\delta_{2,i})\,er^{-\rho_{2,i}}\right]^{-1\rho_{2,i}} \tag{2}$$

Where δ_2, i is elasticity of substitution between capital and energy. The levels of demand for the factors of production are determined by the profit maximising condition of firms. The demand for labour, for example, is given as:

$$lnl_i = c + lny_i - \frac{1}{1+\rho_{1i}}ln\frac{w_i}{p_i} - \frac{\rho_{1i}}{1+\rho_{1i}}\lambda_{it} = c + lny_i - \sigma_{1i}ln\frac{w_i}{p_i} + (\sigma_{1i}-1)\,\lambda_{it} \tag{3}$$

Where c is a constant term and $\frac{w}{p}$ is the real wage. This implies that in the long-run the demand for labour in each sector depends on the real wage, technological progress and level of output. The elasticity of substitution between labour and the capital energy composite is identified through the labour demand side. The long-run demand for capital in each sector follows a similar framework to that of labour. This long-run demand will move in tandem with the economy as a whole while also reacting to changes in its price, represented by the user cost of capital. The user cost of capital is in turn influenced by the interest rate on corporate credit, price changes as measured by the GVA deflator and, for the traded, domestic and construction sectors, the effective corporate tax rate. The aggregate production function is the sum of the sectoral production functions and this determines the long run level of output. With the long-run level of output generated in the model an output gap can thus be calculated.

These long-run relationships among the variables as defined by first order conditions are used in the short-run equations to guide the error correction structure. This structure can be seen in the short-run dynamic equation for labour which is given as

$$\begin{aligned}\Delta logl_{it} = \beta_1^l + \beta_2^l\sigma_{1i}(log(w_{it-1}/p_{it-1}) + ((1-\sigma_{1i})/\sigma_{1i})\lambda_{it} - (1/\sigma_{1i}) \\ log(y_{it}/l_{it})) + \beta_3^l\Delta logl_{it-1} + \beta_4^l\Delta\lambda_{it} + \beta_5^l\Delta logy_{it} + \beta_6^l\sigma_{1i}\Delta log(w_{it}/p_{it})\end{aligned} \tag{4}$$

In the long-run labour (l) converges to a path where labour productivity equals the real wage (w/p), however in the short-run dynamics are influenced by output growth (Δy), technological progress ($\Delta\lambda$), real wage growth ($\Delta w/p$) and a lagged dependent variable.

The mechanism by which convergence of the actual and long-run factor levels is achieved is termed the wage-price system. This system has an error correction structure and is a complete system that delivers the equilibrium levels of the input factors. In the labour factor market, the nominal wage will adjust to align the first order condition. This process also occurs for the other factors on the production side. When a 'production gap' exists between the real price and productivity of an input this will feedback through the nominal price to guide capacity utilisation to that required by the first order condition. Through aligning all factors of production this wage-prices system also guides the overall economy towards its potential level of output. Producer prices are an important component of the wage-price system. The dynamics of this variable in the three sectors are modelled with an error correction structure and are influenced by differential factors. In addition to their own lagged values, in the domestic and construction sectors it is a function of the GDP deflator, in the traded sector it is a function of the deflator on imported goods and the deflator of private consumption. This is due to the traded sectors links to the outside world. In the government sector, which is influenced primarily by domestic factors, there are consumption and investment deflators these are functions of lagged values and, in the case of consumption, wages and the GDP deflator and, for investment, the house price deflator.

3.3 COSMO - The Demand Side

Aggregate demand is determined by the national income identity and is divided into nine categories:

$$yer_t = pcr_t + ipr_{t,dm} + ipr_{t,ct} + ipr_{t,tr} + ipr_{t,gv} + gcr_t + xtr_t - mtr_t \tag{5}$$

Where yer is real GDP. Personal consumption of goods and service, pcr, is a key equation on the demand side and is given as;

$$\begin{aligned}\Delta log(pcr_t) = \beta_1 + \beta_2\ (log(pcr_{t-1}) - \beta_3\ log(pdr_{t-1}) - \beta_4\ \ log(\ nfah_{t-1}/pcd_{t-1}) \\ - \beta_5\ log(khn_{t-1}/pcd_{t-1})) + \beta_6\ \Delta\ log(\ pdr_t) + \beta_7\ \Delta\ log(\ nfah_t/logpcd_t) \\ + \beta_8\ \Delta\ log(\ khn_t/pcd_t)\end{aligned} \tag{6}$$

This equation states that in the long-run personal consumption grows in line with personal disposable income pdr, and wealth. Wealth, is this equation, has two components, housing wealth, khn, and net financial assets, $nfah$. For the consumer the value of each of these components of total wealth are assessed relative to price of personal consumption goods and services, pcd. Personal consumption itself is determined in COSMO by

$$\begin{aligned}\Delta log(pcd_t) = \beta_1 + \beta_2\ (log(pcd_{t-1}) - \beta_3\ log(mtd_{t-1})) - \beta_4\ \ log(\ tsnx_{t-1}) \\ - \beta_5\ (log(ypd_{dm,t-1})) + \beta_6\ \Delta\ log(\ mtd_t) + \beta_7\ \Delta\ log(\ tsnx_t) \\ + \beta_8\ \Delta\ log(\ ypd_{dm,t})\end{aligned} \tag{7}$$

where mtd is the price of imports, $tsnx$ is the personal tax rate and ypd_{dm} is the domestic sector deflator.

In the identity for aggregate demand shown in Equation 5, each component of investment is modelled separately, necessitating that investment be broken out into a number of subcomponents to reflect the differing determinants of various investment categories. Therefore, there are equations for real traded, domestic, construction and government investment ($ipt_{tr}, ipr_{dm}, ipr_{ct}$ and ipr_{gv}). Investment in the government sector,ipr_{gv}, is driven by the potential output in the economy as is government spending, gcr . The equations for investment for the the remaining three sectors can be written as;

$$\begin{aligned}\Delta log(ipr_{i,t}) = \beta_1 + \beta_2\ (log(ipr_{i,t-1}) - \beta_3\ log(yer_{t-1}) - \beta_4\ \ (\ rpr_{i,t-1})) \\ + \beta_5\ \Delta\ log(\ yer_t) + \beta_6\ \Delta\ (\ rpr_{i,t})\end{aligned} \tag{8}$$

where $rpr_{i,t}$ represents the risk free rate is sector i. Finally, real exports (xtr) and imports (mtr) are modelled as;

$$\begin{aligned}\Delta log(xtr_t) = \beta_1 + \beta_2\ (log(xtr_{t-1}) - \beta_3\ log(ypr_{tr,t-1})) \\ + \beta_3\ \Delta\ log(\ ypr_{tr,t})\end{aligned} \tag{9}$$

$$\begin{aligned}\Delta log(mtr_t) = \beta_1 + \beta_2\ (log(mtr_{t-1}) - \beta_3\ log(pcr_{t-1} + ipr_{t-1} + gcr_{t-1}) - \beta_4\ \ log(\ mtd_{t-1}/pcd_{t-1})) \\ + \beta_5\ \Delta\ log(pcr_{t-1} + ipr_{t-1} + gcr_{t-1}) + \beta_6\ \Delta\ log(\ mtd_t/pcd_t)\end{aligned} \tag{10}$$

where ypr_{tr} is production in the traded sector and mtd is the import deflator.

The problems with interpreting Ireland's national accounts, and GDP in particular, due to the many facets of the globalisation process have been well documented (see for example Fitzgerald 2018[31]). As a result, one key development in the area of Irish macroeconomic research post 2015 has been the departure from the traditional reliance on GDP as a key indicator of economic activity. To better capture the underlying dynamics of the Irish economy, the Central Statistics Office publishes a number of alternative metrics such as Modified Domestic Demand (MDD) and Modified Gross National Income (GNI*). Given the significant shortcomings with headline measures of activity, these modified metrics are the go-to measures in understanding underlying economic developments in Ireland. With this in mind, COSMO has satellite equations for these alternative measures of Irish economic activity. For MDD, the results of which will presented in this paper, we tested a number of different options until the best fit for historical data was found. This included a similar make-up to the aggregate demand equation presented in Equation 5, with adjustments made for the contribution of the traded sector, and a number of error correction models where MDD was determined by macro variables estimated within COSMO itself.

3.4 The Labour Market

The long-run behaviour of real wages is determined by the profit maximization condition. However, in the short-run a wage bargaining framework is incorporated into the wage equation to allow a richer and more realistic set of dynamics. Employers and employees bargain over the net real consumption wage as this is the wage employees are ultimately interested in. The taxes are netted off the gross real consumption wage as paid by the employer. The relative strength of the two bargaining parties also determines the outcome; this is captured through the inclusion of the unemployment rate. This is a proxy for the strength of employees in a wage negotiation. The labour market also displays rational expectations behaviour as in the wage bargaining process as employees in the model also consider future price of consumption goods. The wage equation is thus given as:

$$\begin{aligned}\Delta log w_{i,t} = \beta_1 + \beta_2(log(w_{i,t-1}/p_{i,t-1}) + ((1-\sigma_{1i})/\sigma_{1i})\lambda_{i,t-1} - (1/\sigma_{1i})log(y_{i,t}/l_{i,t})) + \beta_3(log(w_{i,t-1}/ypd_{t-1}) \\ - \beta_4 urx_{t-1} - \beta_5 dthx_{t-1}) + \beta_4 \Delta log(pcd_{t^e})\end{aligned} \tag{11}$$

Where ypd_i is the sectoral production deflator, urx is the unemployment rate and $dthx$ is the personal effective tax rate and pcd^e is the expected value of the consumption deflator. The supply of labour is determined by demographics, the participation rate and migration. Male and female participation decisions are modelled separately and are functions of after-tax real wages and the unemployment rate. Emigration is determined by the relative attractiveness of alternative labour markets. The equation representing the labour force, lfn is written as:

$$lfn_t = (paxf_t * p15f_t) + paxm_t * (p15n_t - p15f_t) \tag{12}$$

where $paxf * p15f$ is the female labour force participation rate times the population of females of over the age of 15 and where $paxm * (p15n - p15f)$ is the male labour force participation rate times the population of males over the age 15 $(p15n - p15f)$. This represents the key demographic channel in COSMO, which in turn feed into the various blocks via both

the supply and demand side of the economy with changes in the labour market impacting on both the production sectors and households, as outlined in Sections 3.2 and 3.3.

3.5 The Government Sector

The key equation describing the government sector in COSMO is the nominal general government balance, *ggbn*, and is given as:

$$ggbn_t = dth_t + dte_t + tsn_t - gcn_t - ipn_t, gv - thn_t - inp_t \tag{13}$$

This models the difference between the components of the governments revenue and expenditure. Government revenue has three components, taxes on personal income, *dth*, corporation tax, *dte* and taxes on products (or indirect taxes), *tsn*. The revenue from each of these taxes is the product of the average effective tax rate and the tax base in each case. These are represented by Equations 14 to 16 below;

$$dth = dthx * pin \tag{14}$$

$$dte = dtex * cpn \tag{15}$$

$$tsn = tsnx * pcn \tag{16}$$

Where *dthx* is the personal tax rate, *pin* is the level of personal income, *dtex* is the corporation tax rate, *cpn* is the domestic trading profits of companies, *tsnx* is the indirect tax rate and *pcn* is nominal personal consumption of goods and services. An important consideration when modelling Irish corporation tax, *dte*, relates to the level of windfall tax receipts. As discussed in Section 2, over the last number of years, windfall tax receipts have provided a major boost to Ireland's public finances. These receipts are well in excess of those explained by standard macroeconomic indictors. It is estimated that around half (47%) of Ireland's corporation tax are as a result of these 'excess' receipts Irish Fiscal Advisory Council (2024)[22]. The addition of these windfall corporation tax receipts has a significant difference on the key fiscal measures and ratios. For example, in 2023, Ireland's general government balance including excess corporation tax receipts amounted to a surplus of €8.3 billion. On the other hand, removing these windfall receipts resulted in a deficit of €2.9 billion. As these receipts are highly concentrated and come from a relatively small group of multi-nationals, modelling them based on the profits of domestic trading firms as in Equation 15 may not be appropriate. Therefore, the estimation and simulations in this paper will involve corporation tax revenues *minus* this windfall element. The impact of the shocks through this fiscal channel will be discussed in detail in Section 5.

On the expenditure side, government spending is divided into two components, nominal investment, ipn_{gv}, and nominal consumption, *gcn*. As a behavioural rule, government consumption and investment are modelled as rising in line with the economy's potential output. The transfers component of government expenditure, *thn*, is a function of the total number of people unemployed and of inflation.

$$thn \;=\; (pnan + urx \;/\; 100 * lfn) \;+ pcd \tag{17}$$

Where *pnan* is the dependent population, *urx* is the unemployment rate, lfn is the labour force and *pcd* is the personal consumption deflator. Finally, the final component of expenditure, the interest payments on the national debt, *inp*, is modelled as a function of long term interest rates (lrn)[5] and the national debt (*ggdn*). The deficit flows onto the debt stock.

[5]Where $lrn = lrn(-1) + (lrn_{ge} - lrn_{ge})$ with lrn_{ge} being the 10-year German government bond yield from NiGEM

3.6 The Financial Block

COSMO allows for an analysis of macro-financial relationships and links these back into the real economy. The critical importance of appropriately assessing macro-financial linkages in any assessment of macroeconomic stability and financial resilience has been clearly demonstrated by the global financial crisis in 2007. A recent update to the suite of macro-financial linkages in COSMO has developed new mechanisms for financial distress, non-financial credit, house prices and housing supply as well as strengthening the interlinkages between the construction sector, the financial block and the real economy. While a full description of COSMO's updated financial block and its interlinkages with the real economy through the construction sector can be found in Egan, McQuinn and O'Toole (2022[27], 2024)[26] and Egan and Bergin (2022[24], 2023[25]), below we provide an overview of some of the key mechanisms relevant for this paper.

COSMO's financial block represents a key transmission channel between changes to the ECB's monetary policy stance and the domestic Irish economy. The protectionist shocks applied through NiGEM are likely to cause significant changes in Eurozone economic activity, including changes to price levels, resulting in an appropriate monetary policy response. The result of this response will first be felt through COSMO's financial block. This occurs through the equation for residential mortgage rates, rmt and lending rates for non-financial corporations, $ncrat$. In modelling rmt, we follow the marginal cost pricing model outlined by Rousseas (1985)[61] and specify retail lending rates as a function of the cost of funds and a mark-up, which is typically referred to as the interest rate spread. The marginal lending rate is taken to be representative of the ECB's policy rate, $ecbint$. The equation for rmt also includes a variable which measures the ratio of capital amongst Irish financial institutions to their holdings of risk weighted assets, measured by the Central Bank of Ireland's banking sector capital ratio, $bscr_t$. The latter can be considered as an exogenous policy lever and won't be impacted through the shocks applied in our paper. Therefore, rmt is modelled simply as;

$$\begin{aligned}\Delta(rmt_t) = \beta_1 + \beta_2\ (rmt_{t-1}) - \beta_3\ (ecbint_{t-1})) \\ + \beta_4\ \Delta\ (\ ecbint_t)\end{aligned} \tag{18}$$

This residential mortgage rate is a key variable within COSMO's financial block and directly impacts the equations for affordability and mortgage arrears while indirectly impacts house prices, mortgage demand and housing supply. This in turn will impact the real economy through COSMO's macro-financial linkages, for example, a change in house prices would impact consumption through the housing wealth channel, as outlined in Equation 6 and a change in housing completions would impact the real economy through the construction sector (see Egan and Bergin 2023[25] for details).

The non-financial corporation rate, $nfcrt$, is modelled in a similar way as that of the residential mortgage rate as show below;

$$\begin{aligned}\Delta(nfcrat_t) = \beta_1 + \beta_2\ (nfcrat_{t-1}) - \beta_3\ (ecbint_{t-1})) \\ + \beta_4\ \Delta\ (\ ecbint_t)\end{aligned} \tag{19}$$

The non-financial corporation rate influences a number of important variables within both the financial block and the real economy. For example, in the financial block, it directly impacts the level of credit to the non-financial corporations, the level of corporate insolvencies and the level of new housing completions. It also plays a key role in the production side

of the economy. As outlined in Equation 8, investment across the three main productions sectors of the economy, traded, domestic and constriction, is determined by the risk-free rate for each sectorrpr which itself is determined by;

$$rpr = (nfcrat/100 - pcdx/100) + 0.09/(1 - dtex) \tag{20}$$

where *pcdx* is the inflation and *dtex* is the corporation tax rate. This represents another key macro-financial channel within COSMO.

3.7 COSMO's Exogenous Global Variables

COSMO is linked to the National Institute of Economic and Social Research's (NIESR) Global Econometric model (NiGEM) through 15 exogenous global variables. These enter COSMO through a number of different channels which are outlined in a simplified schematic in Figure 2. COSMO's link with NiGEM, which provides future paths for these global macro economic variables, represents one of the key advantages of COSMO. This approach is essential when modelling Ireland's small open economy. Figure 2 highlights the three broad areas which are impacted by these exogenous global variables, namely financial, demographic and production.

The ECB's policy rate, *ecbint*, enters the financial block through the interest equations outlined in Section 3.6, that is rmt and $nfcrat$. This is turn feeds into the real economy's production sectors via COSMO's macro-financial linkages. The other financial variables, namely the trade weighted effective exchange rate (een), US equity prices (eqd_{us}) and the 10-year government bond yields for both the US and Germany (lrn_{us} and lrn_{ge}) influence variables within COSMO such as household assets (fah_t), which in turn enters the demand side of model through *pcr* as outlined in Equation 6.

Given the strong historic economic links between Ireland and the UK, COMSO also includes a number of exogenous variables related to the UK economy. This includes UK employment, unemployment, wages, price levels, and personal tax rates. The Australian unemployment rate is also used to determine the emigration levels given the strong movement of Irish to Australia over recent times. These are used to estimate the level of emigration (ema) and by extension is used to determine the labour force (lfn_t) as outlined in Equation 12.

The exogenous global variables extracted from NiGEM play a particularly important role in the demand side of COSMO, outlined in Section 3.3. For example, import prices, (mtd), which drives overall domestic prices, *pcd*, as shown in Equation 7, are determined by the relative price of goods from Ireland's competitors (cpx) as well as the price of oil (poe) as outlined by;

$$\begin{aligned}\Delta log(mtd_t) = \beta_1 + \beta_2\ (log(mtd_{t-1}) - \beta_3\ log(cpx_{t-1}/rex_{t-1}) - \beta_4\ \ log(\ (poe_{t-1}/rex_{t-1})) \\ + \beta_5\ \Delta\ log\ (cpx_{t-1}/rex_{t-1}) + \beta_6\ \Delta\ (poe_{t-1}/rex_{t-1})\end{aligned} \tag{21}$$

Export prices, xtd, are also determined by the relative price of competitor goods as well as the domestic production deflator,ypd, as show in;

$$\begin{aligned}\Delta log(xtd_t) = \beta_1 + \beta_2\ (log(xtd_{t-1}) - \beta_3\ log(cpx_{t-1}/rex_{t-1}) - \beta_4\ \ log(\ (ypd_{dm,t-1}) \\ + \beta_5\ \Delta\ log\ (cpx_{t-1}/rex_{t-1}) + \beta_6\ \Delta\ (ypd_{dm,t-1})\end{aligned} \tag{22}$$

The variables cpx, poe and rex_{us} used in Equations 21 and 22 above all emanate from NiGEM.

As shown in Equations 9 and 10 while imports are largely driven by domestic factors and the price of imports, exports are determined by the traded sector's output (ypr_{tr}). Traded sector output is contingent upon domestic factors along with a number of exogenous global factors, as outlined below;

$$\begin{aligned}\Delta log(ypr_{tr,t}) = \beta_1 + \beta_2\ (log(ypr_{tr,t-1}) - \beta_3\ log(wn_{tr,t-1}/cpx_{t-1}/rex_{t-1}) - \beta_4\ \ log\ (wdy_{t-1})) \\ + \beta_5\ \Delta\ log(\ (wn_{tr,t-1}/cpx_{t-1}/rex_{t-1}) + \beta_6\ \Delta\ (wdy_{t-1})\end{aligned} \tag{23}$$

The above equation shows that production in the traded sector is determined by wages in the sector in relation to foreign competitor trade prices ($wn_{tr}/cpn/rex_{us}$) and the degree of global demand for Irish exports (wdy). Equation 23 above therefore represents the key transmission channel between the global economy and the domestic Irish economy with ypr_{tr} impacting key macro variables such as profits, wages and employment at the aggregate level.

Finally, as discussed in Section 3.2, on the supply side, fossil fuel consumption, er, is determined by factors such as the level of capital stock (kr) and user cost of capital in the sector (rpr) as well as exogenous global factors including the price of oil expressed in euros (poe/rex_{us}).

4 Simulations

Section 4.1 presents a brief overview of the shocks and various scenarios that are applied to NiGEM while Section 4.2 will look at the simulated impact of the protectionist scenarios to the Irish economy via COSMO.

4.1 Overview

NiGEM is a global macro-econometric framework which includes separate models of most advanced economies and key emerging market economies using a common theoretical structure estimated separately for each country. The model is based around a 'New Keynesian' framework with the long-run properties of the equations imposed so as to be consistent with theory. Responses to shocks are demand-driven in the short-term, but determined by the supply side of the economy in the long-term, with spillovers between economies determined by trade volumes and prices, asset prices, commodity prices and competitiveness. Different dynamic adjustment patterns and parameter values for each country and region are based on estimates from historical data. The model contains forward looking financial markets and liquidity constraints, with myopic behaviour and nominal rigidities slowing the full adjustment to shocks (see Barrell, Blake and Young (2018)[4] for more details of the foundations and development of NiGEM).

In this paper, we apply a number of shocks related to trade protectionism to the recently developed NiGEM *v2.24 Tariff model*. This model is an extension to the standard NiGEM *v2.24* and includes the added directionality of trade between the US and the rest of the world. The tariff model introduces new import price equation between the US and all the other countries within NiGEM, splitting prices into two components, - price of imports (tariff) and relative price of imports (non-tariff). This in turn allows the import volumes within the global model to be split between tariff and non-tariff, with a trade weighted sum being used to calculate the total import volumes. This essentially isolates import volumes that have been impacted by the tariffs imposed. A similar mechanism operates for export volumes. This feature allows for import tariffs to be applied by the US and to the US, as

well as other direct non-tariff trade barriers.[6]

As highlighted by Bordo (2017)[14], the reduction in tariffs, along with other trade barriers, has been one of the defining characteristics of increased trade and levels of globalisation of the post-war world economy. By contrast, as discussed in Section 1, the past ten years have seen an increase in protectionist measures playing a role in depressing trade flows globally. With this in mind, the scenarios applied in this paper will examine the impact to the Irish economy of a slowdown in global trade as a result of increased protectionism, following the trends evident globally over the last number of years. More specifically, the shocks are particularly relevant to the protectionist policies outlined by the US Government in 2025. As these developments are subject to a large degree of uncertainty, given that they relate to specific US trade policies which themselves are subject to change over the course of a four year presidential term, as well as a more structural shift away from an integrated global economy, we provide a number of different scenarios.

The protectionist scenarios we apply in this paper can be therefore be categorized into two broad groups, tariff and non-tariff barriers. In addition, within these two groups, we also examine the impacts under temporary and permanent protectionist policy scenarios. In the temporary scenario, we assume a one-quarter return to base after 16 quarters where prices adjust to the removal of the protectionist policy. On the other hand, a permanent shock assumes the policy remains and that prices adjust only through world linkages to a new equilibrium level. Within NiGEM, the difference between temporary and permanent shocks of this nature is an important one as monetary policy will react more to offset the more persistent change in prices, thus resulting in a larger negative impact to the economy from a permanent shock. The specific calibration of both the tariff and non-tariff barriers, both permanent and temporary are outlined below.

Tariff Barriers: We apply four US-rest of the world tariff scenarios[7]as well as two additional US-EU tariff scenarios. The US-rest of the world scenarios includes a unilateral 10% tariff imposed by the US on the rest of the world as well as a 10% bilateral, or 'tit-for-tat', tariff in which the rest of the world responds with a proportionate response.[8] The US-rest of the world tariff scenarios can therefore be summarised as;

- A permanent 10% US unilateral tariff is applied on imports from the rest of the world.
- A temporary 10% US unilateral tariff is applied on imports from the rest of the world for 16 quarters before returning to a no tariff base.
- A permanent 10% US-rest of the world bilateral tariff.
- A temporary 10% US-rest of the world bilateral tariff for 16 quarters before returning to a no tariff base.

While the 10% magnitude applied in these tariff scenarios may at first seem like an arbitrary choice, we believe that this approach provides a very useful "ready-reckoner" as to the impact of global protectionist policies on a small open economy. In addition, it should be noted that the actual tariffs themselves have been subject to considerable uncertainty over the last number of months. For example, during the 2024 US Presidential Campaign,

[6]For an example of an application of NiGEM's tariff model, see Bernard et al. 2024[11]

[7]In addition to the four main US-rest of the world tariff barriers scenarios (unilateral permanent, unilateral temporary, bilateral permanent and bilateral temporary) we also perform two separate sensitivity analyses. These are described in more detail in Section 4.2

[8]For all bilateral or 'tit-for-tat' scenarios we assume that the US first applies a tariff in $t0$ and the second party responses one quarter after in $t + 1$.

President Trump vowed to impose 60% tariffs on Chinese imports. This was considerably more than the actual tariff applied by the new administration in February 2025. As part of the preliminary simulations to this paper, we applied more severe scenario, including a 60% tariff on Chinese goods, the results of which will be discussed briefly in Section 4.2.

In addition to the US-rest of the world tariff scenarios outlined above, we also attempt to isolate the impact to the Irish economy of tariff measures imposed between the US and EU. This scenario is motivated by comments made by the new US administration during its first Cabinet meeting on February 26th 2025 in which they vowed to impose 25% tariffs on goods imported from the EU.[9] Under these scenarios, we also assume that the EU responds proportionally to the tariff imposed. Therefore, the scenarios can be summarised as;

- A permanent 25% US unilateral tariff is applied on imports from the EU.
- A temporary 25% US unilateral tariff is applied on imports from the EU for 16 quarters before returning to a no tariff base.
- A permanent 25% US-EU bilateral tariff.
- A temporary 25% US-EU bilateral tariff for 16 quarters before returning to a no tariff base.

Due to the global nature of NiGEM, the above US-EU tariff scenarios will not only highlight the direct impact to the Irish economy of increased protectionist policies between the US and EU, but also the indirect impact of the fall in global trade as result of these policies.

Non-Tariff Barriers: The second category of scenarios relate to non-tariff barriers. These shocks attempt to mimic protectionist policies other than tariffs, including measures such as legislation which reduce trading links between countries. For example, the non-tariff barrier could act as a proxy for regulatory requirements, such as country-specific product standards, that are found to restrict market access opportunities for exporters. This shock will restrict trade of goods and services between the US and other countries and essentially reduces the importance of the US for the rest of the world's exports, thereby reducing trade globally. The non-tariff barriers we apply can be summarised as;

- A permanent 10% US trade barrier with the rest of the world, reducing the rest of the world's trade with the US by 10% permanently.
- A temporary 10% US trade barrier with the rest of the world, reducing the rest of the world's trade with the US by 10% for 16 quarters before returning to a no trade barrier base.

We limit our non-tariff barrier scenario to a 10% unilateral US to the rest of the world non-tariff barrier given that these measures have been discussed by the US administration in response to actions *already* in place by its trading partners such as the European Union's Value Added Tax (VAT) and the activities of state-owned firms in China that enjoy extensive subsidies from the Chinese Government.

Finally, an important point to note is that this paper focuses on the downside risks to the Irish economy only. We do not assume any upside scenario resulting from protectionist policies and therefore do not make any assumptions regarding increases in trade or investment due to 'friend-shoring' or 're-shoring'. For example, Ireland could benefit from more

[9] See https://www.ft.com/content/2f0288f6-3f6a-4334-b666-3f0122981842

'friend-shoring' of US trade and investment, depending on how tense US-China relations are in comparison to US-EU relations. In addition, significant physical investment of US firms in Ireland, notably in some high-tech sectors, also presents opportunities to maintain trade and investment connections between the two countries (Central Bank of Ireland 2024[40]).

4.2 Results

The simulations we present run for a total of 28 quarters. The path of selected global exogenous variables from NiGEM in the scenarios outlined in Section 4.1 can be seen in Figures 3, 4 and 5.[10] Figure 3 shows that the imposition of 10% tariffs between the the US and the rest of the world has a significant impact on the exogenous global variables in NiGEM. This includes a tightening of monetary policy in the Euro zone and US (shown directly by the ECB policy rate and indirectly by the increase in US government bond yields), an increase in global trade prices and oil prices. In addition, all four US-rest of the world tariff scenarios lead to a significant fall in the demand for Ireland's exports, ranging from a fall in the baseline by as much as -1% (temporary 10% unilateral) to -2.5% (permanent 10% bilateral).

Figure 4 plots the paths of the exogenous global variables for the 25% unilateral and bilateral tariffs between the US and the EU. The figure shows that the path of the six variables is broadly similar to those from the 10% US-rest of the world tariff scenarios. There is however a slightly stronger monetary policy response from the central bank, as highlighted by the higher ECB policy rate as well as a marginally stronger fall in the demand for Irish exports, ranging from a fall in the baseline by as much as -1.3% (temporary 25% unilateral) to -3.2% (permanent 25% bilateral). This fall in demand for Irish exports is due to the combination of weaker demand in the US and EU as a direct result of tariff measures and indirectly through the weaker global environment from the same measures.

Finally, Figure 5 plots the path of the exogenous global variables owing to a 10% non-tariff barrier shock. As discussed in Section 4.1, this represents a proxy for protectionist policies such as introducing legislation or regulations which restrict market opportunities to exporters in other countries. These policies do not directly impact import prices like tariff measures. Therefore, as shown in Figure 11, the disruption is seen in the movements in effective exchange rate as well as a significant fall in the global demand for Irish exports. The latter would be driven directly by a reduction in demand for Irish exports due to the US non-tariff policy and by the slowdown in global trade generally caused by the same policy.

The corresponding results of our COSMO simulations, expressed as the deviation from a no protectionist policy baseline, are presented in graphical form in Figures 6 to 12 and in tabular form in Tables 1 to 5[11]. Figure 6 and Tables 1 and 2 intuitively show that both the 10% unilateral and bilateral tariffs have a significant negative impact on the volume of both Irish imports and exports. While initially the deviation of import prices from the baseline is positive, it begins to turn negative between $t + 12$ and $t + 16$. As outlined in Equation 7, overall price levels in COSMO, are determined by both import prices and the deflator of domestic sector production. While prices initially rise above the baseline, they begin falling between $t+12$ and $t+16$. Disposable income falls below the baseline, returning to the pre-shock level for both temporary scenarios but remaining below the baseline in the permanent scenario. Personal consumption falls below the baseline for the entire simulation period in response to both the unilateral and bilateral tariff and across the permanent and

[10] While COSMO uses 15 NiGEM variables, we only present the 6 most relevant to this particularity study in the interest of brevity.

[11] The impact to investment in the traded and domestic sector provided is in tabular form only

temporary scenarios.

On the production side of the economy, the decline in the traded production sector is much stronger than that of the domestic sector, with a fall from the baseline that is almost double across all four tariff scenarios. This is due to the former's strong linkages with the global economy as highlighted by Equation 23. An important caveat to note when viewing the results for production in the traded sector is that COSMO models the sector at an aggregate level. Therefore, it does not account for industry specific dynamics within sectors which, due to their nature, would be impacted to a greater extent by these protectionist shocks. For example, it does not distinguish between large foreign owned multinational enterprises (MNEs) and domestic firms within the sector.[12]

Both investment in the domestic and traded sector also fall significantly (see Tables 1 - 2. Similar to the production sector, investment is impacted more severely in the traded relative to the domestic sector. The strong role that the traded sector plays in the Irish labour market is evident from the significant adverse impact on the level of employment. The negative impact to the overall domestic economy can be seen by the fall in both GDP and MDD. There is also an increase to government debt resulting from the contraction or the macroeconomy. In terms of magnitude across the four scenarios, the simulations from the most severe shock, which corresponds to permanent 10% bilateral tariffs between the US and the rest of the world, show the domestic economy, measured by MDD, falling by as much as 1.7% from the no tariff baseline over the simulation period, with GDP falling by 3.2% below its baseline. Over the same simulation period, the level of employment also falls by over 2.5%, largely driven by a decline in employment in the traded sector.

In addition to the four simulations presented in Figure 6, we also carry out a number of sensitivity checks around the US-rest of the world tariff scenarios. One limitation of our paper is that the version of NiGEM used in our simulations does not distinguish between the import and export of goods and services versus goods only. As, generally speaking, tariffs relate only to goods and not services, the shocks presented may overestimate the impact of such a protectionist policy, given that the 10% tariff is applied to measures of both goods and services in the econometric framework. While the main set of simulations we present in this paper use tariffs applied to goods and services as per NiGEM version[13], we feel it prudent to also make attempt to adjust for this shortcoming, With this in mind, we make a simplistic adjustment by multiplying the percentage tariff by the goods share of total exports for each country using 2023 trade data from the WTO. For example, in 2023, China's goods exports made up 91% of total exports while for the US the figure was 66%. Therefore, a 10% bilateral shock between US and Chinese good imports would 10% x 91% = 9.1% and 10% x 66% = 6.6%. The results of this technique applied to the most severe shock, that is a permanent 10% US-rest of the world bilateral shock, are presented in Figure 7 and Table 3 along with the non adjusted estimation. The results show that while the impact is not as a severe as the results from the main simulations, there is still a significant negative impact on the Irish economy.

As discussed, there is a large degree of uncertainty as to the size of tariffs to be applied across countries. Therefore, as an additional sensitivity check, we increase the size of the tariff by 10 percentage-points, from 10% to 20%, once again applying the sensitivity to the permanent 10% US-rest of the world bilateral scenario. Figure 8 shows the movement in

[12]For example, if protectionist measures were to target specific activities in some high-tech sectors, this could lead to much steeper falls in exports than could be generated by scenarios through any macroeconomic framework.

[13]We adopt this approach in line with similar papers which have used NiGEM for similar exercises e.g. Bernard et al. 2024[11])

deviations from a 10% to 20% tariff. The results show that the higher bilateral tariffs have a significant impact on the Irish economy with the domestic economy, measured by MDD, falling by around 1.4% further from the no tariff baseline than the 10% tariff, while GDP falls by almost 3% further. The results would suggest that the Irish economy is highly sensitive to an escalation in protectionist tariff measures.[14] What is interesting about this sensitivity is that the results seem to indicate that the simulations are broadly linear, given that the increase from 10% to 20% results in an additional movement from the baseline that is similar to the 10% tariff shock. This is useful for scaling up or down the impact of the tariffs.

Next, we examine the impact of the 25% unilateral and bilateral tariffs between the US and the EU as outlined in Section 4.1. The results of these simulations are presented in Figure 9 and Tables 5 and 7. The results show that the impact to the Irish economy is quite similar to that of the 10% US-rest of the world shock. This indicates that, broadly speaking, a 25% US-EU tariff would have a similar impact to the Irish economy as a 10% US-rest of the world tariff. The negative impact to the economy of the US-EU tariffs is marginally greater, however. For example, in the more severe scenario, where the US and EU impose bilateral 25% tariffs on imports, MDD and GDP fall by as much as 1.9% and 3.9%, as opposed to the 1.7% and 3.2% falls seen with the 10% US-rest of the world tariff. Although the differences are small, the reason for this can be traced back, in part, to the impact in the traded sector of the economy. In the US-EU tariff scenario, production in the traded sector falls by 4.5% below its no tariff baseline, as opposed to the 3.8% in the US-rest of the world tariff scenario. The reasons for this include the importance of the US and the EU in the context of demand for Irish exports as well as the increased cost of investment and production owing to higher interest rates from the more severe monetary policy response from the ECB. As with the 10% US-rest of the world tariffs, we also make an adjustment to account for the fact that the version of NiGEM used in our simulations does not distinguish between goods and services and goods only. We therefore apply the same goods export share adjustment as outline above for the permanent 25% US-EU tariff. The results of these simulations are presented in Figures 10 and Table 6. Similar to the US-rest of the world tariff scenario, the results once again indicate that while the impact using the goods only adjustment is certainly less severe, there is non the less a significant negative impact across all the macroeconomic variables presented.

Finally, we examine the impact of non-tariff shocks as outlined in Section 4.1. These are considered to replicate barriers to trade such as legislation which will reduce trade links between countries - in this case between the US and the rest of the world. The simulation results presented in Figure 11 and Table 7 show that non-tariff barriers imposed by the US on its global trading partners, effectively reducing US trade with the rest of the world by 10%, will also have a significant pass through to the Irish economy. Similar to the tariff shocks, the non-tariff shocks have a strong negative impact on the volume of imports and exports, reflecting the direct (from less trade with the US) and indirect (from a general global slowdown) impacts of the protectionist policy. The deviations from the baseline are broadly similar to that of the tariff shocks for consumption, the productions sectors and domestic demand. There is however a noticeable difference in the path of both import prices and overall prices. This can be explained by looking at the path of the exogenous

[14] As part of our preliminary simulations, we increased US import tariffs of 60% on imports from China and 10% on imports from all other economies, with subsequent retaliatory tariffs from US trading partners in line with work done by Bernard et al. (2024)[11]. The results showed that, depending on retaliation, MDD and GDP fell by around 3-4% and 6-7.5% from the baseline respectively. This is broadly in line with results in Bernard et al. (2024)[11], which showed a similar impact for a group of some small open economies.

inputs from NiGEM (Figure 3 for tariff and Figure 4 for non-tariff). The figures show a much milder response in terms of changes in the ECB's policy rate in the case of the non-tariff shock. This is due to the fact that the non-tariff policy does not directly impact the pricing mechanism as with the tariff shock. In addition, the temporary non-tariff shock has a faster return to baseline than the temporary tariff shock. This is again related to the fact that the non-tariff shock is not adjusting over time through the pricing mechanism.

In summary, the simulations presented in this section show that protectionist policies, both tariff and non-tariff, have the potential to significantly impact the Irish economy, with the traded sector being disproportionately affected. This, in turn, has a significant impact on the labour market, consumption and the domestic economy as a whole.

The results in this section have shown the potential impact that protectionist policies will have on the Irish economy through the main macroeconomic mechanisms modelled within COSMO. There are, however, some channels not currently in the modelling framework which are also likely to be impacted by these policies. Informed by the macroeconomic outcomes presented in this section, Section 5 discusses how protectionist policies are likely to impact other more complex areas of the Irish economy.

5 Other Impacts of Protectionism on the Irish Economy

As shown in the previous section, the modelling approach used in this paper allows us to capture some of the main impacts of increased global protectionism on the Irish macroeconomy. However, as a small open economy Ireland is strongly integrated in the global system making it particularly vulnerable to changes in global trade shifts. Therefore, any move towards deglobalisation or protectionism is likely to impact the Irish economy through a complex variety of mechanisms. As no macro econometric framework can model all of these mechanisms simultaneously, this section gives a brief overview of some of the additional channels through which these policies would be expected to affect the Irish economy as well as examining the impact to the public finances in more detail.

One channel not covered by the COSMO framework is the impact on innovation and R&D, both of which are closely linked to competitive pressures and, as a result, are likely to be negatively affected by an increase in protectionism. The literature discussed in Section 2 highlights the positive impact that trade has on innovation and R&D. Therefore, the disruption to trade as highlighted by the simulations in Section 4 are likely to have a negative impact on the level of innovation. This would impact on the Irish economy through three distinct mechanisms. First, is the direct channel as Irish firms reduce R&D spending in response to the fall in competition. This channel would be particularly acute if the EU were to respond to tariffs imposed by the US. Second is the supply chain effect, as lower innovation and productivity growth among foreign suppliers leads to higher input costs being passed on to Irish firms. The final channel is through a reduction in the productivity spillover effect. As documented in a significant body of literature, innovation by a single firm tends to produce an increase in productivity for the economy as a whole, either due to horizontal spillovers as the firm's competitors adopt the innovation (see Görg & Strobl (2001)[33]), or vertical spillovers as the innovation spreads downwards through the firm's supply chain (Javorcik 2004)[43]. In either case, a fall in global innovation due to lower competition would be expected to impact on Irish firms through a reduction in such spillovers. Further, Di Ubaldo, Lawless and Siedschlag (2018)[63] show that R&D spending increases the capacity of firms located in Ireland to absorb knowledge spillovers from MNEs. A fall in R&D investment caused by a decrease in import competition would therefore have a doubly

negative impact on productivity in Ireland, decreasing both domestic innovation while also undercutting the ability of Irish firms to absorb the innovations developed abroad.

The impact of protectionist policies on investment in both the traded and domestic sector was discussed in Section 4.2. As outlined in Equation8 of Section 3.3, investment in COSMO is a function entirely of economic conditions. Unlike investment from domestic firms, FDI flows are very sensitive to changes in the policy environment, and are so heavily affected by geopolitical factors that are not fully captured by COSMO's modelling approach. For instance, Ireland's position as a bridge linking the EU and US has played an important role in attracting the large FDI inflows seen over the last two decades (Regan and Brazys 2017[57]). As such, these investment flows are likely to be highly sensitive to changes in the geopolitical relationship between the two trading blocks. In particular, the tendency for tariffs to provoke retaliation and escalation means that the introduction of such policies is likely to create the expectation that trade relations will deteriorate further in the future. These expectations may then deter FDI in a manner independent of the policy measures themselves. Similarly, tariffs are often introduced as part of a more general industrial policy strategy that also incorporates subsidies and other supports for domestic firms (Juhász, Lane and Rodrik 2024[44]). These policies, or the expectation that these policies will be implemented in the future, may therefore shape firms' decisions regarding where to locate investment projects.

A slowdown in trade is likely to impact the Irish economy through a loss in economies of scale. Authors such as Romer(1986)[60] and Barro and Sala-i-Martin (1995)[6] the importance of increasing returns to scale as a driver of economic performance. The existence of such dynamics suggest that firms located in large countries enjoy lower costs than their equivalents in small countries, as their larger market size allows them to reap the benefits of the increasing returns to scale. This also holds at the firm level, with productivity growth being hindered by the constraint imposed upon the extent of the division of labour by the small market size (Krugman, 1996)[47]). In reality, however, the size of a state's population is often less important than the number of consumers that a country's firms can easily access, creating a strong role for trade policy that would allow firms to access foreign markets (Casella, 1995)[18]. Small states therefore often try to integrate as much as possible into the world economy (McIntyre et al., 2018), so that "openness can substitute for a large domestic market" (Alesina, 2005)[1]. Ireland is no exception in this regard, and Irish firms have benefitted significantly from the free access to European markets provided by membership in the European Communities from 1973 onwards. O'Rourke (2016)[55] highlights the transformative nature of membership for the Irish economy, pointing out that the Irish economy only began to grow in-line with convergence model predictions after gaining membership, while Campos et al (2014)[17] found that membership boosted Ireland's income per capita growth by almost 2 per cent. While the common market rules mean that exports to other EU member states cannot be threatened by tariffs or protectionism, Irish exporters have increasingly diversified into other markets. Goods exports to the US, for instance, went from being 17% of total goods exports in 2000 to 28% in 2023, with the Chinese figure rising from 1% to 5% over the same period. These exports have allowed Irish firms to develop economies of scale that would not have been possible had they been producing solely for the domestic market, and the lower costs generated by these economies of scale are highly threatened by an increase in tariffs and protectionism.

As shown in Section 4.2, an increase in protectionist policies is expected to impact the state's fiscal position, with COSMO's simulations showing an increase in Government Debt across all scenarios considered. This fiscal impact is driven by a number of factors, spread across both the income and expenditure side of the ledger. First, the fall in employment

discussed in Section 4.2 would lead to a decrease in income tax receipts. This effect could be proportionally greater than the fall in employment, given that the Irish taxation system is relatively progressive by international standards and those employed by multinationals are disproportionately well paid as discussed in Section 2. Indeed, Revenue (2023)[15] estimate that employees of MNEs contribute €25.6bn in combined income tax, USC and PRSI. Indirect taxes on consumption would be impacted as the fall in employment impacts on consumption and overall consumer spending, while corporation taxes would be similarly affected as profits are squeezed by higher input costs and lower aggregate demand. We would also expect to see pressure on the state's fiscal position from the expenditure side, as transfers to households increase in response to the rise in unemployment, and automatic fiscal stabilisers take effect. Most of these channels are accounted for in some form in COSMO's Government Sector (see Section 3.3), which allows macroeconomic fluctuations to affect government revenue, with the impact being broken down into the three subcomponents of personal taxes (dth), indirect taxes (tsn) and corporation taxes (dte). Figure 12 plots the deviation from the baseline in the sub-components and the total government revenue for the permanent 10% US-rest of the world bilateral tariff outlined in Section 4.1. The figure shows the significant impact that this protectionist shock has on Irish government revenue as a whole, and across the three headings, with the fall in corporation tax the most pronounced.

While these simulations in COSMO provide a useful benchmark as to the impact of tariff and non-tariff shocks on Ireland's public finances, the results must come with an important caveat. As previously mentioned, a key consideration when modelling Ireland's public finances relates to the level of windfall tax receipts, particularly with regard to corporation tax. Over the last number of years, windfall tax receipts have provided a major boost to Ireland's public finances. These receipts are well in excess of those explained by standard macroeconomic indicators. The addition of these windfall corporation tax receipts has a significant impact on the key fiscal measures and ratios. As outlined in Equation 12 corporation tax (dte) estimates in COSMO are based on the profits of domestic trading firms (cpn). This approach is based upon the assumption that corporation tax receipts are sufficiently broad-based to fluctuate in-line with the economy as a whole. However, the nature or Ireland's corporation tax means that idiosyncratic developments within a small number of firms often dominate economic fundamentals in explaining yearly fluctuations in corporation tax receipts, with the result that forecasts made by structural macroeconomic models may not be appropriate. While the concentrated nature of corporation tax revenue in Ireland makes it difficult to accurately forecast in any model where receipts are based on overall macroeconomic conditions only, it should be highlighted that, due to this concentrated nature, there is a possibility that deviations from the baseline corporation tax receipts, and by extension total government revenue, would be considerably larger that those presented in Figure 12. This can be viewed as an additional risk to Irish public finances, outside the macroeconomic impacts modelled in Section 4, and would fall under a scenario where higher tariffs imposed caused large multinationals which have contributed to corporation tax receipts to repatriate or re-shore to the US. Protectionist policies therefore that target specific sectors of the Irish traded sector would have a disproportionate negative impact on Irish public finances.

[15] https://www.revenue.ie/en/corporate/documents/research/ct-analysis-2023.pdf

6 Conclusion

The period in the wake of the financial crisis saw a breakdown in the link between growth in economic activity, and the expansion of trade, creating the impression that the structure of the world economy was changing and that the progress of globalisation had stalled. This impression was heightened in the period after 2016, as protectionist trade policies began to play a much larger role in the global economy and governments turned to tariffs and other protectionist policies as a means of protecting domestic industries and encouraging import substitution. These deglobalisation pressures intensified further during the Covid-19 pandemic, which highlighted some of the risks produced by globalised forms of production and legitimised the use of trade and industrial policy among political movements and institutions which had previously been committed to free trade. The policies outlined by the new US administration have brought global protectionist policies into particular focus. While considerable uncertainty remains as to the details of the new administration's trade policy plans, the measures announced so far represent a clear and significant risk to the world economy, in particular to the affected economies, and have the potential to significantly weigh on global growth.

With these arguments in mind, this paper combines NIESR's Global Econometric Model (NiGEM) and the ESRI's macro-econometric model (COSMO) to examine the potential implications for the Irish economy of an escalation in protectionism and trade barriers. While a protectionist shock of the size being discussed by officials in the new US administration would likely have a significant impact on the majority of economies around the world, a shock of this nature has the potential to have a larger effect on the Irish economy due to its openness and size. Compared to larger, more diversified economies, Ireland's small, highly integrated economy is likely to be disproportionately affected by disruptions to the international trading system.

This paper applies a number of protectionist shocks, relating both to tariff and non-tariff barriers. Both unilateral and bilateral tariff scenarios between the US, the rest of the world and the EU are examined. In addition, the impact of non-tariff barriers imposed by the US on the rest of the world are also accounted for. The simulations presented show that these policies have the potential to significantly impact the Irish economy, with the traded sector disproportionately affected. This in turn leads to a significant impact on the labour market, consumption and the domestic economy as a whole, with MDD potentially falling by around 1.5% to 2% below its no protectionist policy baseline. In addition, our results show that the impact of protectionist policies are likely to have a negative impact on Ireland's public finance, with the macroeconomic impacts alone causing falls in personal, indirect and corporation tax receipts. The paper also discusses how corporation tax in particular could be adversely impacted in a scenario where the imposition of protectionist policies causes large multinationals to move production to the US. This can be viewed as an additional risk to Irish public finances, outside the macroeconomic impacts simulated in the modelling approach of the paper.

Tables and Figures

Table 1: Tariff Shock: 10% US Unilateral Tariff to Rest of World

	After 1 Year		**After 4 Years**		**After 7 Years**	
	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.
Imports	-0.5	-0.3	-3.1	-1.8	-3.8	-1.5
Exports	-0.4	-0.2	-2.5	-1.5	-3.4	-1.5
Import Prices	0.7	0.6	-0.1	0.2	-1.1	-0.6
Prices	0.4	0.3	0.1	0.3	-0.5	-0.1
Disposable Income	-0.7	-0.5	-1.2	-0.6	-0.7	0.2
Consumption	-0.4	-0.3	-1.8	-0.8	-1.6	-0.2
Production (Traded)	-0.4	-0.2	-2.2	-1.3	-3.0	-1.3
Production (Domestic)	-0.2	-0.1	-1.4	-0.7	-1.5	-0.3
Investment (Traded)	-0.5	-0.3	-2.6	-1.6	-3.5	-1.4
Investment (Domestic)	0.1	0.1	-1.8	-1.0	-2.8	-1.2
Employment	-0.1	-0.1	-1.6	-1.2	-2.2	-1.4
GDP	-0.3	-0.2	-1.9	-1.1	-2.5	-1.1
MDD	-0.2	-0.1	-1.	-0.6	-1.3	-0.5
Government Debt	0.1	0.0	0.7	0.3	1.1	0.4

Table 2: Tariff Shock: 10% US-Rest of World Bilateral

	After 1 Year		**After 4 Years**		**After 7 Years**	
	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.
Imports	-0.8	-0.6	-4.0	-2.9	-4.8	-2.0
Exports	-0.6	-0.5	-3.2	-2.4	-4.3	-1.9
Import Prices	0.5	0.5	-0.2	-0.2	-0.9	-1.2
Prices	0.3	0.3	0.2	0.3	-0.3	-0.5
Disposable Income	-0.8	-0.7	-1.7	-1.2	-1.2	0.1
Consumption	-0.5	-0.4	-2.4	-1.7	-2.3	-0.8
Production (Traded)	-0.6	-0.5	-2.8	-2.1	-3.7	-1.7
Production (Domestic)	-0.3	-0.2	-1.8	-1.3	-1.9	-0.9
Investment (Traded)	-0.7	-0.6	-3.4	-2.5	-4.3	-1.9
Investment (Domestic)	-0.2	-0.2	-2.1	-1.5	-3.2	-2.0
Employment	-0.2	-0.1	-1.9	-1.6	-2.6	-1.7
GDP	-0.5	-0.4	-2.5	-1.8	-3.2	-1.4
MDD	-0.3	-0.2	-1.3	-0.9	-1.7	-0.7
Government Debt	0.1	0.1	0.9	0.7	1.5	0.8

Note: The above tables show the percentage difference (levels) from a no tariff baseline. The simulations have been converted to annual from quarterly and show deviations for periods of 1, 4 and 7 years after the initial shock.

Table 3: Tariff Shock: Permanent 10% US-Rest of World Bilateral
Goods & Services vs. Goods Only

	After 1 Year		**After 4 Years**		**After 7 Years**	
	Goods & Services	Goods Only	Goods & Services	Goods Only	Goods & Services	Goods Only
Imports	-0.8	-0.6	-4.0	-2.9	-4.8	-3.6
Exports	-0.6	-0.5	-3.2	-2.4	-4.3	-3.2
Import Prices	0.5	0.4	-0.2	0.1	-0.9	-0.6
Prices	0.3	0.2	0.2	0.3	-0.3	-0.1
Disposable Income	-0.8	-0.6	-1.7	-1.2	-1.2	-0.8
Consumption	-0.5	-0.4	-2.4	-1.7	-2.3	-1.5
Production (Traded)	-0.6	-0.4	-2.8	-2.1	-3.7	-2.8
Production (Domestic)	-0.3	-0.2	-1.8	-1.3	-1.9	-1.4
Investment (Traded)	-0.7	-0.5	-3.4	-2.9	-4.3	-3.6
Investment (Domestic)	-0.2	-0.1	-2.1	-1.7	-3.2	-2.7
Employment	-0.2	-0.1	-1.9	-1.6	-2.6	-2.1
GDP	-0.5	-0.4	-2.5	-1.8	-3.2	-2.4
MDD	-0.3	-0.2	-1.5	-1.1	-1.7	-1.2
Government Debt	0.1	0.1	0.9	0.6	1.5	1.0

.

Note: The above tables show the percentage difference (levels) from a no tariff baseline. The simulations have been converted to annual from quarterly and show deviations for periods of 1, 4 and 7 years after.

Table 4: Tariff Shock: 25% US Unilateral Tariff to EU

	After 1 Year		**After 4 Years**		**After 7 Years**	
	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.
Imports	-0.6	-0.4	-3.5	-2.3	-4.1	-1.9
Exports	-0.5	-0.3	-2.8	-1.8	-3.7	-1.7
Import Prices	0.4	0.3	-0.7	-0.5	-2.2	-1.6
Prices	0.2	0.2	-0.3	-0.1	-1.1	-0.7
Disposable Income	-0.7	-0.6	-1.2	-0.7	-0.5	0.3
Consumption	-0.4	-0.4	-2.1	-1.6	-1.8	-1.1
Production (Traded)	-0.5	-0.3	-2.4	-1.6	-3.2	-1.5
Production (Domestic)	-0.2	-0.2	-1.6	-1.2	-1.6	-1.0
Investment (Traded)	-0.6	-0.5	-2.5	-1.9	-3.6	-1.7
Investment (Domestic)	-0.2	-0.1	-1.9	-1.0	-2.9	-1.0
Employment	-0.1	-0.1	-1.7	-1.4	-2.2	-1.6
GDP	-0.4	-0.3	-2.1	-1.4	-2.7	-1.3
MDD	-0.3	-0.2	-1.3	-1.0	-1.3	-0.7
Government Debt	0.1	0.1	0.8	0.5	1.3	0.7

.

Table 5: Tariff Shock: 25% US Bilateral Tariff to EU

	After 1 Year		**After 4 Years**		**After 7 Years**	
	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.
Imports	-1.1	-0.9	-4.7	-3.7	-5.6	-2.8
Exports	-0.8	-0.7	-3.9	-3.1	-5.0	-2.7
Import Prices	0.3	0.3	0.1	0.2	-0.9	-1.2
Prices	0.2	0.2	0.3	0.3	-0.3	-0.4
Disposable Income	-0.9	-0.8	-2.1	-1.6	-1.6	-0.2
Consumption	-0.5	-0.4	-2.8	-2.1	-2.8	-1.2
Production (Traded)	-0.8	-0.7	-3.4	-2.7	-4.4	-2.3
Production (Domestic)	-0.4	-0.3	-2.1	-1.6	-2.3	-1.2
Investment (Traded)	-0.9	-0.7	-3.5	-2.8	-4.8	-2.5
Investment (Domestic)	-0.4	-0.2	-2.2	-1.7	-2.5	-1.4
Employment	-0.2	-0.2	-2.2	-1.9	-3.0	-2.1
GDP	-0.6	-0.6	-3.0	-2.3	-3.7	-2.0
MDD	-0.4	-0.3	-1.8	-1.3	-1.8	-0.8
Government Debt	0.1	0.1	1.1	0.9	1.8	1.1

Note: The above tables show the percentage difference (levels) from a no tariff baseline. The simulations have been converted to annual from quarterly and show deviations for periods of 1, 4 and 7 years after

Table 6: Tariff Shock: Permanent 25% US-EU Bilateral
Goods & Services vs. Goods Only

	After 1 Year		**After 4 Years**		**After 7 Years**	
	Goods & Services	Goods Only	Goods & Services	Goods Only	Goods & Services	Goods Only
Imports	-1.1	-0.7	-4.7	-3.0	-5.6	-3.7
Exports	-0.8	-0.5	-3.9	-2.5	-5.0	-3.3
Import Prices	0.3	0.3	0.1	0.3	-0.9	-0.3
Prices	0.2	0.1	0.3	0.3	-0.3	0.1
Disposable Income	-0.9	-0.6	-2.1	-1.3	-1.6	-1.0
Consumption	-0.5	-0.3	-2.8	-1.7	-2.8	-1.6
Production (Traded)	-0.8	-0.5	-3.4	-2.2	-4.4	-2.9
Production (Domestic)	-0.4	-0.2	-2.1	-1.3	-2.3	-1.4
Investment (Traded)	-0.9	-0.4	-3.5	-1.9	-4.8	-2.9
Investment (Domestic)	-0.4	-0.2	-2.2	-1.3	-2.5	-1.7
Employment	-0.2	-0.1	-2.2	-1.6	-3.0	-2.2
GDP	-0.6	-0.4	-3.0	-1.9	-3.7	-2.4
MDD	-0.4	-0.2	-1.8	-1.1	-1.8	-1.1
Government Debt	0.1	0.1	1.1	0.7	1.8	1.0

Note: The above tables show the percentage difference (levels) from a no tariff baseline. The simulations have been converted to annual from quarterly and show deviations for periods of 1, 4 and 7 years after

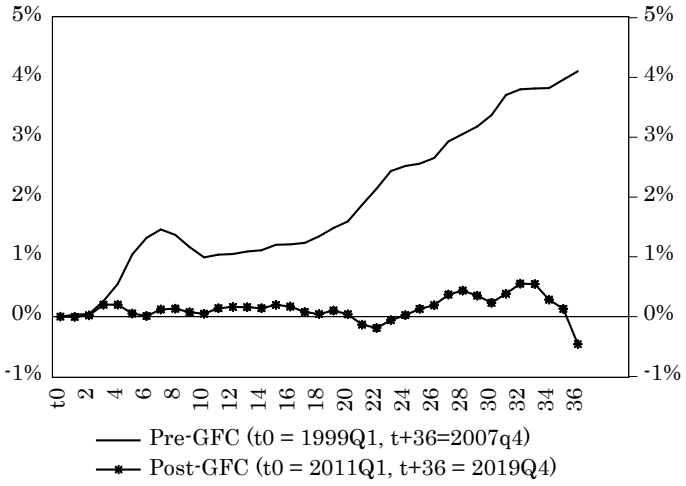
Table 7: Non-Tariff Shock: 10% Non-Tariff Barrier from US to Rest of World

	After 1 Year		**After 4 Years**		**After 7 Years**	
	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.
Imports	-1.6	-1.6	-4.0	-3.8	-4.6	-0.9
Exports	-1.4	-1.4	-3.6	-3.5	-4.3	-1.1
Import Prices	-0.4	-0.4	-1.0	-0.9	-1.0	-0.1
Prices	0.1	0.1	0.3	0.1	0.5	0.2
Disposable Income	-0.9	-0.9	-1.7	-1.5	-1.4	0.2
Consumption	-0.5	-0.5	-1.5	-1.4	-1.5	-0.2
Production (Traded)	-1.3	-1.3	-3.1	-3.0	-3.8	-1.0
Production (Domestic)	-0.9	-0.9	-1.9	-2.0	-2.4	-0.5
Investment (Traded)	-1.5	-1.5	-3.6	-3.5	-4.2	-1.0
Investment (Domestic)	-0.4	-0.4	-1.2	-1.1	-1.3	-0.3
Employment	-0.3	-0.3	-2.0	-1.9	-2.5	-1.5
GDP	-1.0	-1.0	-2.6	-2.5	-3.1	-0.8
MDD	-0.6	-0.6	-1.4	-1.3	-1.6	-0.4
Government Debt	0.3	0.3	0.9	0.9	1.3	0.7

.

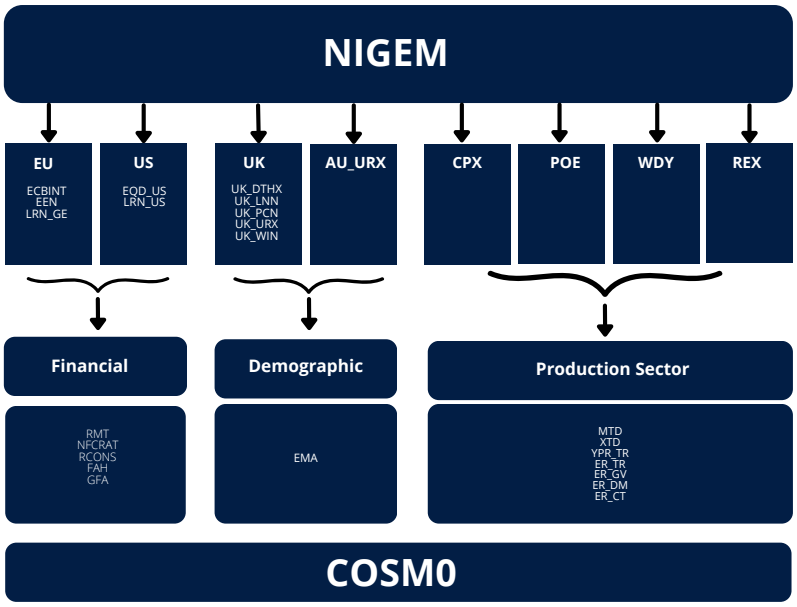
Note: The above tables show the percentage difference (levels) from a no tariff baseline. The simulations have been converted to annual from quarterly and show deviations for periods of 1, 4 and 7 years after.

Figure 1: Movement in Trade as Share of World GDP over time



.

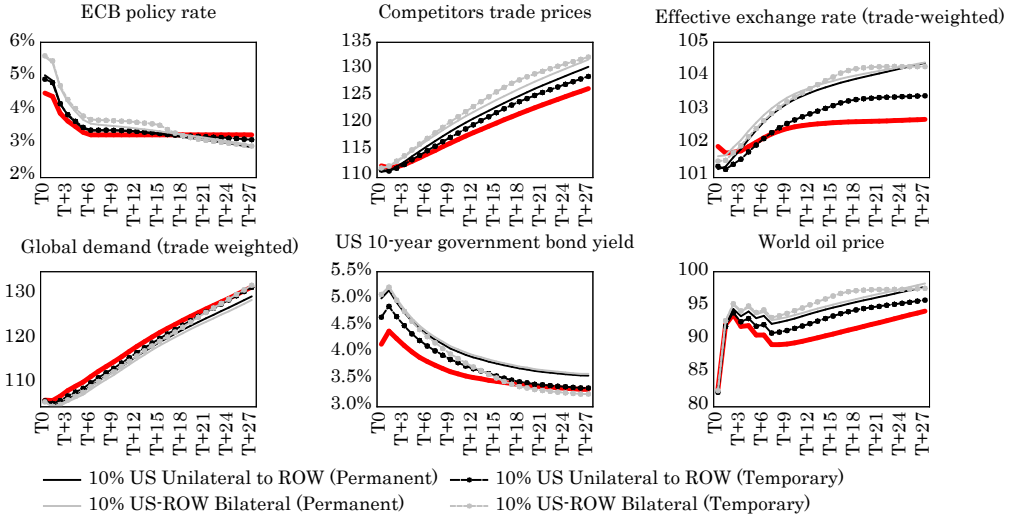
Figure 2: Schematic of NiGEM Global Variables in COSMO



NiGEM: *ecbint* is ECB marginal lending rate; *een* is effective exchange rate (trade-weighted); lrn_{ge} is 10-year Government bond yield; uk_{dthx} is UK personal tax rate; uk_{lnn} is UK employment; uk_{pcn} is UK price levels; uk_{urx} is UK unemployment rate; uk_{win} is UK wages; au_{urx} is Australian unemployment rate; *cpx* is competitors trade prices; *poe* is world oil prices; *wdy* is Global demand (trade weighted); *rex* is Dollar-Euro exchange rate

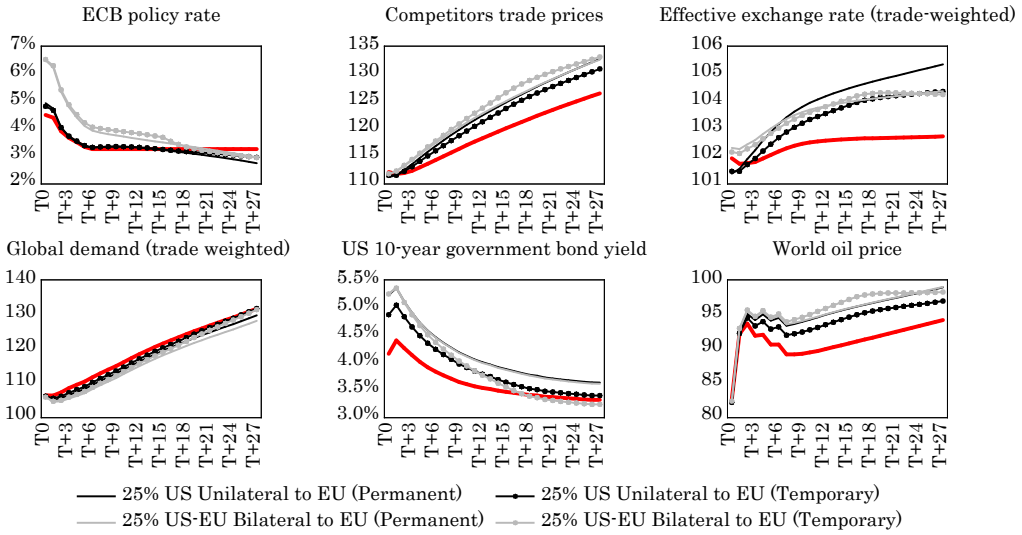
COSMO: *rmt* is residential mortgage rate ; $nfcrat$ NFC lending rate; fah household financial assets; gfa is total foreign assets; *ema* is emigration; *mtd* is import prices; *xtd* export prices; ypr_{tr} is production in the traded sector; $er_{tr,gv,dm,ct}$ is fossil fuel consumptions across the traded, government, domestic and construction sectors

Figure 3: COSMO's Exogenous Inputs from NiGEM (Selected)
10% US-Rest of World Tariff Scenarios



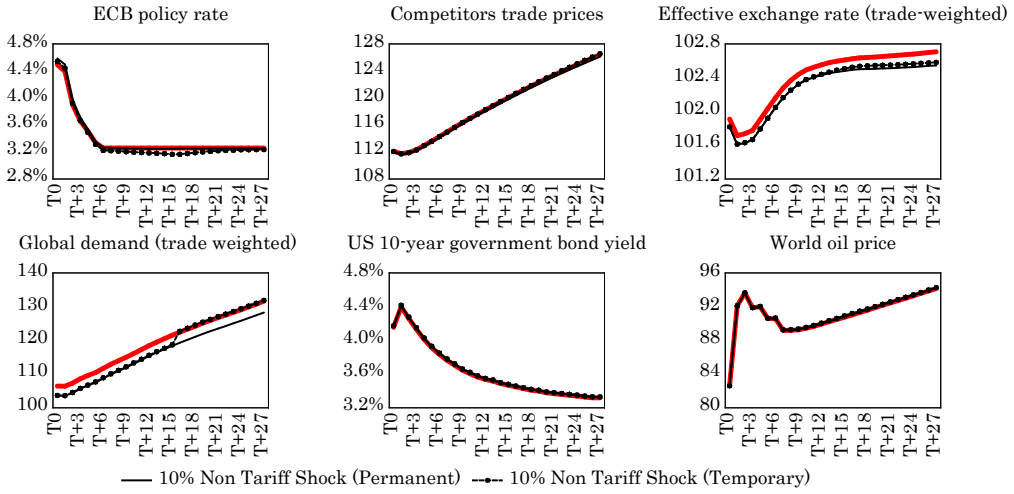
Note: The above figure shows the path of the exogenous global variables from NiGEM enter COSMO as outlined in Section 3.7. The solid red line represents path of NiGEM's baseline. Global demand refers to global demand for *Irish* exports.

Figure 4: COSMO's Exogenous Inputs from NiGEM (Selected)
25% US-EU Traiff Scenarios



Note: The above figure shows the path of the exogenous global variables from NiGEM enter COSMO as outlined in Section 3.7. The solid red line represents path of NiGEM's baseline. Global demand refers to global demand for *Irish* exports.

Figure 5: COSMO's Exogenous Inputs from NiGEM (Selected)
Non-Tariff Barrier Scenarios



Note: The above figure shows the path of the exogenous global variables from NiGEM enter COSMO as outlined in Section 3.7. The solid red line represents path of NiGEM's baseline. Global demand refers to global demand for *Irish* exports.

Figure 6: 10% US-Rest of the World Tariff Scenario
Deviation from No Tariff Baseline

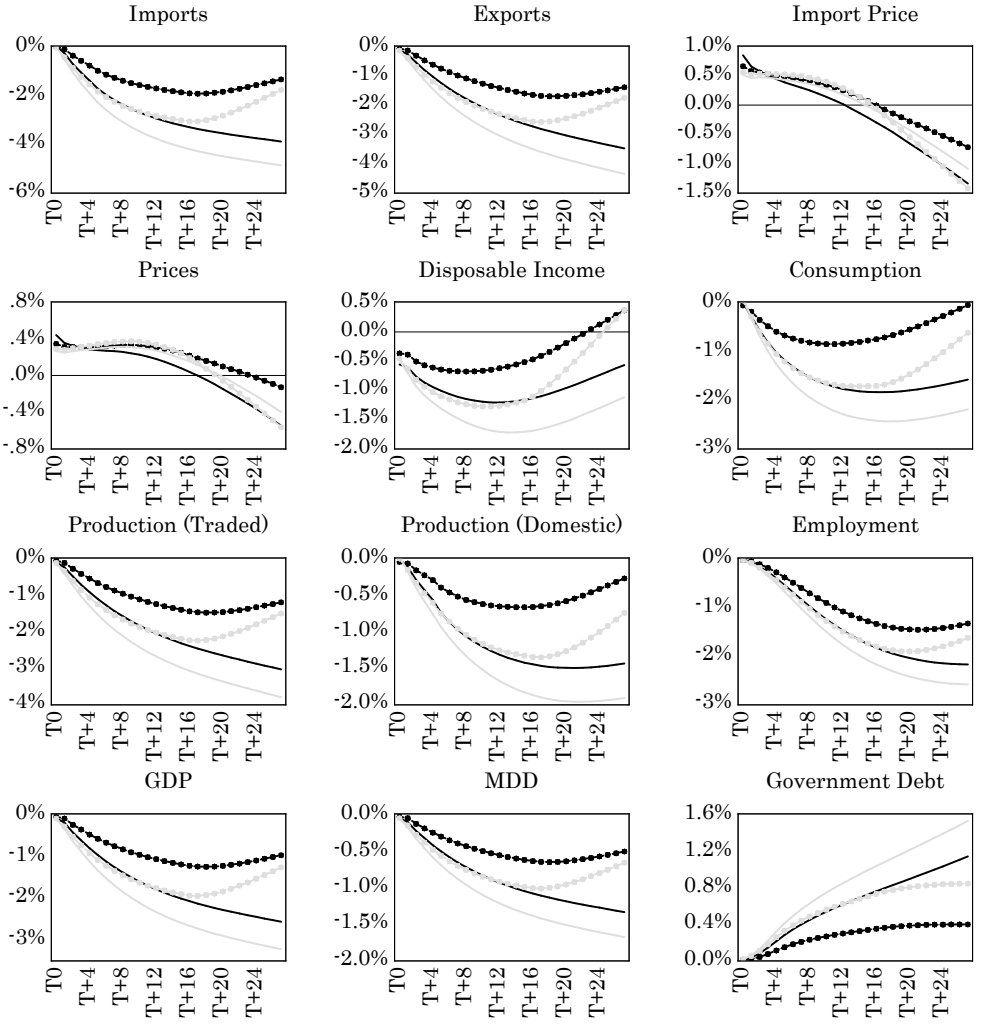


Figure 7: Sensitivity
10% US-Rest of World Tariff on Goods & Services vs. Goods Only

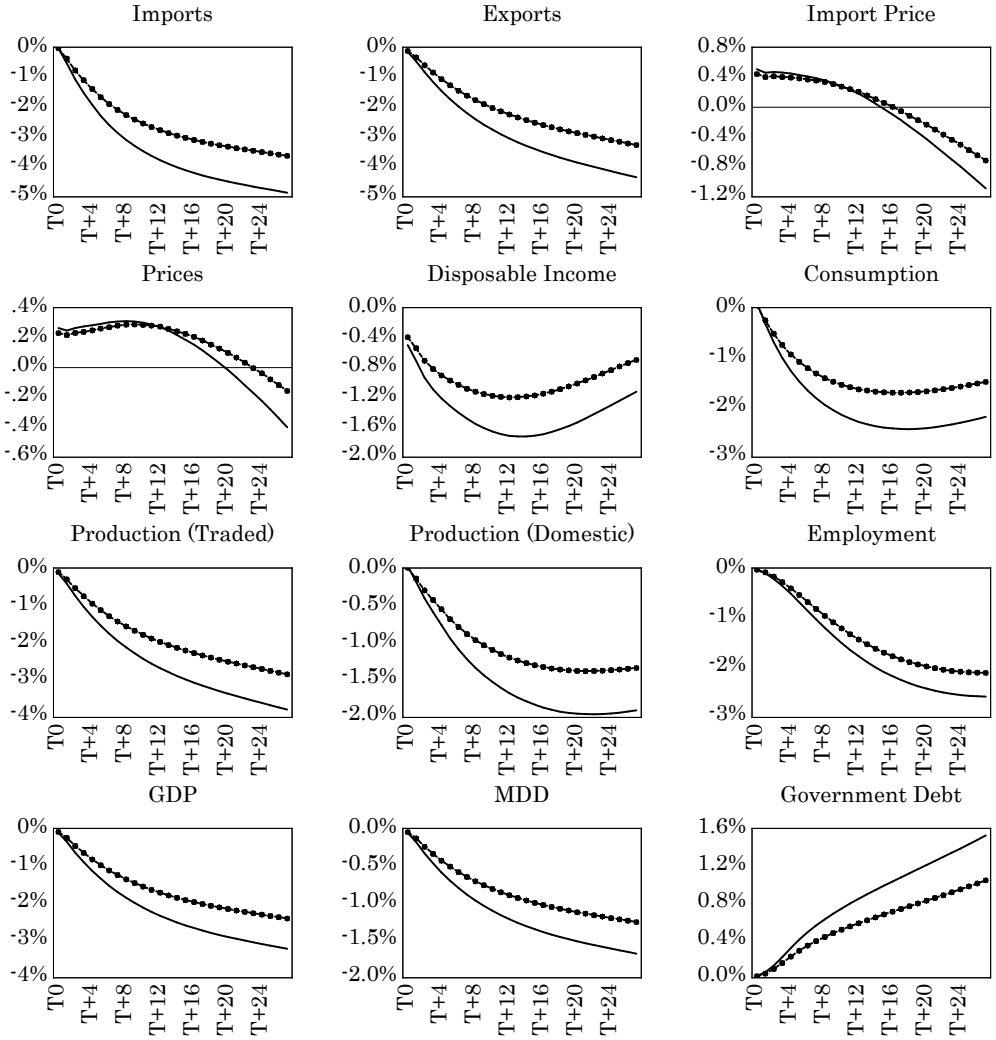
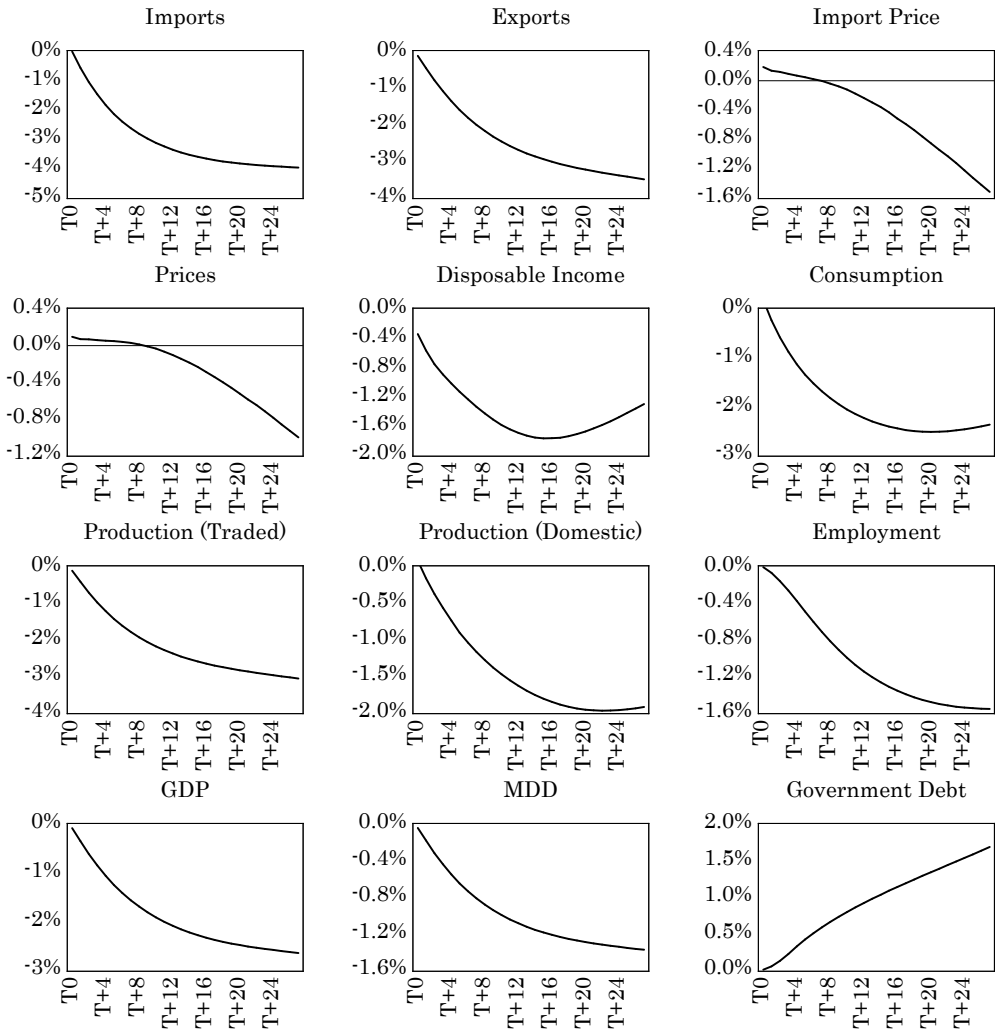


Figure 8: Sensitivity
Difference in Impact of US-Rest of World Tariff increasing from 10% to 20%



—— Additional fall from baseline due to increase in tariff from 10% to 20%

Figure 9: 25% US-EU Tariff Scenario
Deviation from No Tariff Baseline

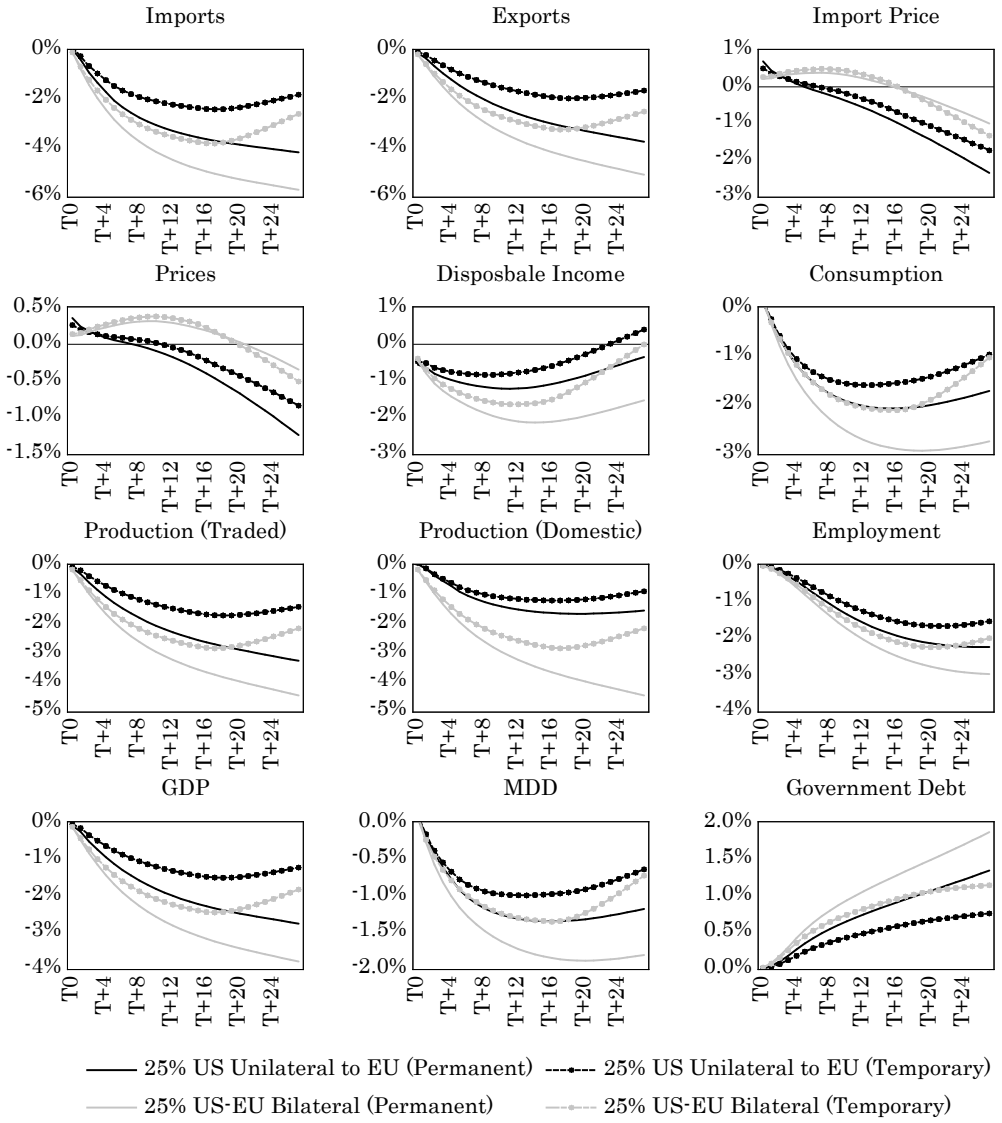


Figure 10: Sensitivity
25% US-EU Tariff on Goods & Services vs. Goods Only

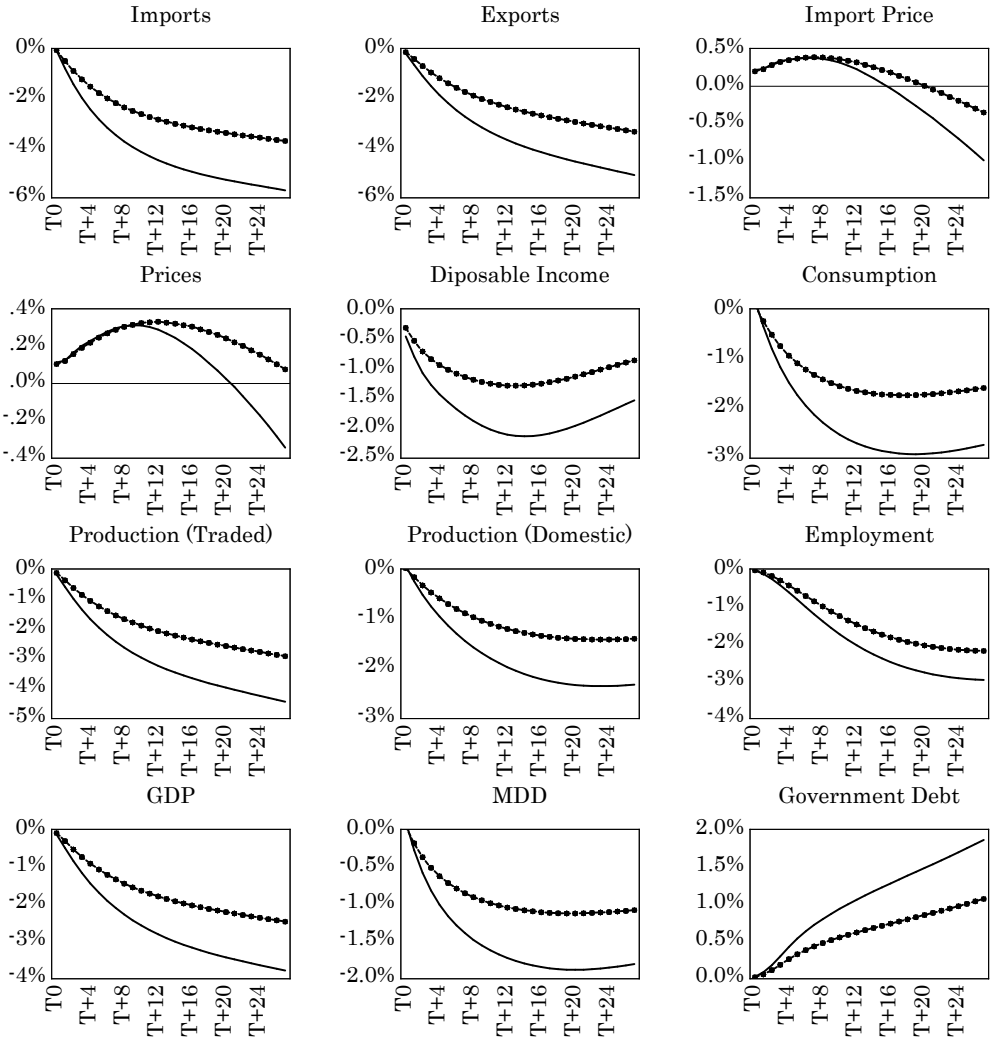


Figure 11: 10% Non-Tariff Trade Barrier Scenario
Deviation from No Barrier Baseline

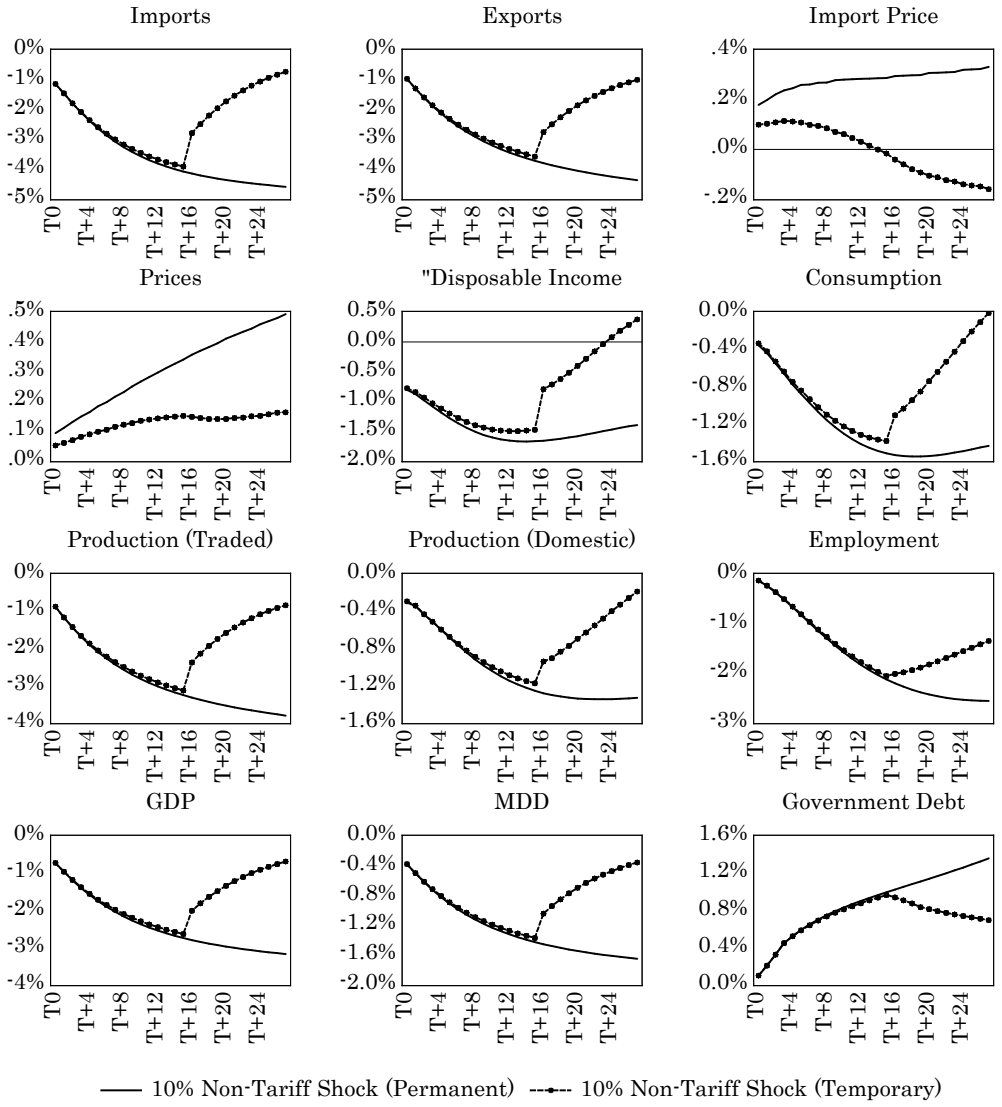
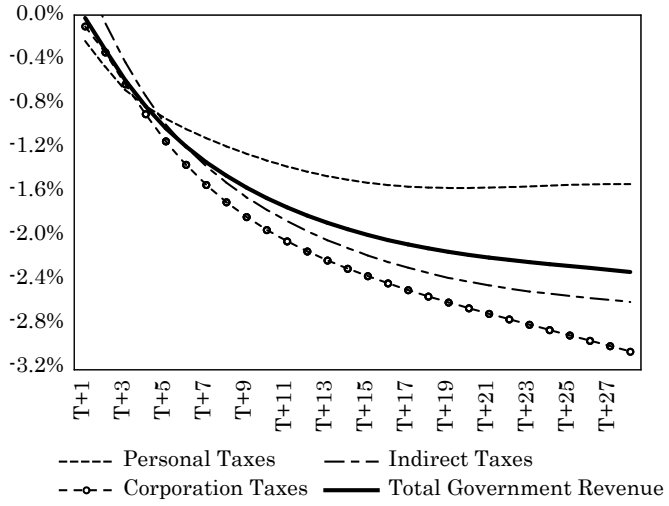


Figure 12: Impact on Government Revenue and its Components (Based on the Permanent 10% US-Rest of World Bilateral Tariff Scenario)



References

[1] Alberto Alesina, Enrico Spolaore, and Romain Wacziarg. "Trade, Growth and the Size of Countries". In: *Handbook of Economic Growth* 1.1 (1995), pp. 1499–1542.

[2] Mary Amiti, Stephen Redding, and David Weinstein. "Who's Paying for the US Tariffs? A Longer-Term Perspective". In: *AEA Papers and Proceedings* 110 (2020), pp. 541–546.

[3] Kenneth Arrow. "Economic Welfare and the Allocation of Resources for Invention". In: *National Bureau of Economic Research Chapters* (1962), pp. 609–626.

[4] Ray Barrell, Andy Blake, and Garry Young. "Macroeconomic Modelling at the Institute: Hopes, Challenges and a Lasting Contribution". In: *National Institute Economic Review* 8.1 (2018), pp. 134–144.

[5] Ray Barrell and Nigel Pain. "Foreign Direct Investment, Technological Change, and Economic Growth Within Europe". In: *The Economic Journal* 107.445 (1997), pp. 1770–1786.

[6] Robert Barrow and Xavier Sala-I-Martin. "Technological Diffusion, Convergence, and Growth". In: *Journal of Economic Growth* 2.1 (1997), pp. 1–26.

[7] Maria Bas and Vanessa Strauss-Kahn. "Input-trade liberalization, export prices and quality upgrading". In: *Journal of International Economics* 95.2 (2015), pp. 250–260.

[8] Eddy Bekkers. "Challenges to the trade system: The potential impact of changes in future trade policy". In: *Journal of Policy Modeling* 41.3 (2019), pp. 489–506.

[9] Adele Bergin et al. "COSMO: A new COre Structural MOdel for Ireland". In: *ESRI Working Paper* 553 (2017).

[10] Adele Bergin et al. "Ireland and Brexit: modelling the impact of deal and no-deal scenarios". In: *QEC Special Article, Spring 2019* (2019).

[11] Shama Bernard et al. "The effects of higher US tariffs". In: *National Institute Global Economic Outlook* 16.B (2024).

[12] Nicholas Bloom, Mirko Draca, and John Van Reenen. "Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity". In: *The Review of Economic Studies* 83.1 (2016), pp. 87–117.

[13] Nicholas Bloom et al. "A Trapped-Factors Model of Innovation". In: *The American Economic Review* 103.3 (2013), pp. 208–213.

[14] Michael Bordo. "The Second Era of Globalization is Not Yet Over: An Historical Perspective". In: *National Bureau of Economic Reseaech Working Paper* 23786 (2017).

[15] Chad Bown et al. "Reciprocity and the China Shock". In: *National Bureau of Economic Research Working Paper* 32835 (1997), pp. 219–237.

[16] Emine Boz, Mathieu Bussiere, and Clement Marsilli. "Recent Slowdown in Global Trade: Cyclical or Structural". In: *CEPRArticle* (2014).

[17] Nauro Campos, Fabrizio Coricelli, and Luigi Moretti. "Economic Growth and Political Integration: Estimating the Benefits from Membership in the European Union Using the Synthetic Counterfactuals Method". In: *IZA Discussion Paper* 8162 (2014).

[18] Alessandra Casella. "Large countries, small countries and the enlargement of trade blocs". In: *European Economic Review* 40.2 (1996), pp. 389–415.

[19] Eddie Casey and Andrew Hannon. “Challenges Forecasting Irish Corporation Tax”. In: *Irish Fiscal Advisory Council Analytical Note* No. 10 (2016).

[20] Thomas Conefrey, Gerard O’Reilly, and Graeme Walsh. “Modelling External Shocks in a Small Open Economy: The Case of Ireland”. In: *National Institute Economic Review* 244.1 (2018), pp. 56–63.

[21] Cristina Constantinescu, Aaditya Mattoo, and Michele Ruta. “The Global Trade Slowdown: Cyclical or Structural?” In: *The World Bank Economic Review* 34.1 (2018), pp. 121–142.

[22] Irish Fiscal Advisory Council. “Fiscal Assessment Report - A growing need for a strong domestic fiscal framework”. In: *Fiscal Assement Report* June 2024 (2024).

[23] CSO. “Productivity in Ireland”. In: *Retrieved from Central Statistics Office* April 2024 (2024).

[24] Paul Egan and Adele Bergin. “Adding a Construction Sector to COSMO: Structure and Policy Analysis”. In: *ESRI Working Paper* 738 (2022).

[25] Paul Egan and Adele Bergin. “The impact of government spending on Ireland’s housing and residential market – Targeted vs economy-wide stimulus”. In: *Journal of Policy Modeling* 45.3 (2023), pp. 553–569.

[26] Paul Egan, Eoin Kenny, and Conor O’ Toole. “The potential impact of the war in Ukraine on the Irish economy”. In: *ESRI Working Paper* 759 (2023).

[27] Paul Egan, Kieran McQuinn, and Conor O’Toole. “A Revised Financial Satellite Model for COSMO”. In: *ESRI Working Paper* 737 (2022).

[28] Barry Eichengreen and Kevin O’ Rourke. “A tale of two depressions-What do the new data tell us?” In: *CEPRArticle* (2010).

[29] Pablo Fajgelbaum et al. “The Return to Protectionism”. In: *The Quarterly Journal of Economics* 135.1 (2019), pp. 1–55.

[30] Ling Feng, Zhiyuan Li, and Deborah L. Swenson. “Trade policy uncertainty and exports: Evidence from China’s WTO accession”. In: *Journal of International Economics* 106 (2017), pp. 20–36.

[31] John Fitzgerald. “National Accounts for a Global Economy: the Case of Ireland”. In: *Trinity Economics Papers* TEP0418 (2018).

[32] Pinelopi Goldberg et al. “Imported Intermediate Inputs and Domestic Product Growth: Evidence from India”. In: *The Quarterly Journal of Economics* 125.4 (2010), pp. 1727–1767.

[33] Holger Gorg and Eric Strobl. “Multinational Companies and Productivity Spillovers: A Meta-Analysis”. In: *The Economic Journal* 111.475 (2001), pp. 723–739.

[34] Grace Gu et al. “Worker reallocation, firm innovation, and Chinese import competition”. In: *Journal of International Economics* 151 (C 2024).

[35] László Halpern, Miklós Koren, and Adam Szeidl. “Imported Inputs and Productivity”. In: *American Economic Review* 105.12 (2015).

[36] Ling-Yun He, Xi Lin, and Zhong-Xiang Zhang. “The impact of de-globalisation on China’s economic transformation: Evidence from manufacturing export”. In: *Journal of Policy Modeling* 42.3 (2020), pp. 628–660.

[37] IMF. “Geoeconomic Fragmentation and the Future of Multilateralism”. In: *IMF Staff Discussion Note* SDN/2023/001 (2023).

[38] IMF. "Global Manufacturing Downturn, Rising Trade Barriers". In: *World Economic Outlook, October 2019* October 2019 (2019).

[39] IMF. "Globalization: Facts and Figures". In: *IMF Policy Discussion Paper* PDP/01/4 (2001).

[40] Central Bank of Ireland. "Geoeconomic risks to the outlook: The possible impact of escalating trade tensions, alternative tariff and tax regimes on the Irish economy". In: *Quarterly Bulletin* 2024.Q4 (2024).

[41] Ken Itakura. "Evaluating the Impact of the US–China Trade War". In: *Asian Economic Policy Review* 15.1 (2020), pp. 77–93.

[42] Harold James. "Deglobalization: The Rise of Disembedded Unilateralism". In: *Annual Review of Financial Economics* 10 (1997), pp. 219–237.

[43] Beata Smarzynska Javorcik. "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers Through Backward Linkages". In: *American Economic Review* 94.3 (2004), pp. 605–627.

[44] Réka Juhász, Nathan Lane, and Dani Rodrik. "The New Economics of Industrial Policy". In: *Annual Review of Economics* 16.16 (2023), pp. 213–242.

[45] Hiroyuki Kasahara and Joel Rodrigue. "Does the use of imported intermediates increase productivity? Plant-level evidence". In: *Journal of Development Economics* 87.1 (2008), pp. 106–118.

[46] Janez Kren and Martina Lawless. "How has Brexit changed EU-UK trade flows". In: *ESRI Working Paper* 735 (2022).

[47] Paul Krugman. "Increasing returns, monopolistic competition, and international trade". In: *Journal of International Economics* 9.4 (1979), pp. 469–479.

[48] Martina Lawless, Iulia Siedschlag, and Zuzanna Studnicka. "Irish enterprise exporting patterns in goods and services". In: *ESRI Research Bulletin* 2017/2/4 (2017).

[49] Tom Long. "Small States in a Global Economy". In: *A Small State's Guide to Influence in World Politics* (2022), pp. 112–143.

[50] Samuel MacIsaac and Buck C. Duclos. "Trade and conflict: trends in economic nationalism, unilateralism and protectionism". In: *Canadian Foreign Policy Journal* 26.1 (2020), pp. 1–7.

[51] Arnold McIntyre et al. "Economic Benefits of Export Diversification in Small States". In: *IMF Working Paper* WP/18/86 (2018).

[52] Kieran McQuinn and Petros Varthalitis. "How openness to trade rescued the Irish economy". In: *ESRI Working Paper* 608 (2018).

[53] Pamela Medina. "Import Competition, Quality Upgrading, and Exporting: Evidence from the Peruvian Apparel Industry". In: *The Review of Economics and Statistics* 106 (July 2022), pp. 1–45.

[54] Brendan O'Connor et al. "Searching for the Inclusive Growth Tax Grail: The Distributional Impact of Growth Enhancing Tax Reform in Ireland". In: *Economic and Social Review* 47.1 (2016), pp. 155–184.

[55] Kevin Hjortshøj O'Rourke. "Economic History and Contemporary Challenges to Globalization". In: *The Journal of Economic History* 79.2 (2019), pp. 356–382.

[56] Patrice Ollivaud and Cyrille Schwellnus. “Does the post-crisis weakness of global trade solely reflect weak demand?” In: *OECD Journal: Economic Studies* 2015.1 (2015), pp. 269–267.

[57] Aidan Regan and Samuel Brazys. “Celtic Phoenix or Leprechaun Economics? The Politics of an FDI-led Growth Model in Europe”. In: *New Political Economy* 23.2 (2018), pp. 223–238.

[58] Barra Roantree. “Understanding Income Inequality in Ireland”. In: *Journal of the Statistical and Social Inquiry Society of Ireland* XLIX (2020).

[59] Sherman Robinson and Karen Thierfelder. “US-China Trade War: Both Countries Lose, World Markets Adjust, Others Gain”. In: *Peterson Institute for International Economics Policy Brief* PB19-17 (2019).

[60] Paul Romer. “Increasing Returns and Long-run Growth”. In: *Journal of Political Economy,* 94.5 (1986), pp. 1002–1037.

[61] Stephen Rousseas. “A markup theory of bank loan rates”. In: *Journal of Post Keynesian Economics* 8.1 (1985), pp. 134–144.

[62] Marvin Suesse. “The Nationalist Dilemma: A Global History of Economic Nationalism, 1776-Present”. In: *Cambridge University Press* (2023).

[63] Mattia Di Ubaldo, Martina Lawless, and Iulia Siedschlag. “Productivity spillovers from multinational activity to indigenous firms in Ireland,” in: *ESRI Working Paper* 587 (2018).

[64] UNCTAD. “Trade and Development Report, 2019:Financing A Global Green New Deal”. In: *United Nations publication* E.19.II.D.15 (2019).

[65] Miaojie Yu. “Processing Trade, Tariff Reductions and Firm Productivity: Evidence from Chinese Firms”. In: *Economic Journal* 125.585 (2015), pp. 943–988.