



An Roinn Airgeadais
Department of Finance

Forecasting GNI*

- detailing the Department of Finance approach

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Executive Summary

As has been well documented, the information content of conventional measures of aggregate economic activity – GDP, GNI, balance of payments – is extremely limited in an Irish policy context. While compiled in line with international standards, the internationalisation of the Irish economy has given rise to a significant disconnect between many of these standard economic metrics and fundamental developments such as consumer spending and employment levels.

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. Indeed, the Department of Finance's bi-annual macroeconomic forecasts are primarily based on these modified indicators.

This paper sets out the Department's 'bottom-up' approach to forecasting GNI*, the most comprehensive modified measure of underlying activity. This method, which has been used by the Department in its spring and autumn 2021 forecasts, builds upon an approach originally developed by the *Irish Fiscal Advisory Council*.

Constructing medium-term projections for GNI* is a crucial part of the Department's work. Various fiscal ratios – debt-income, deficit-income, interest payments-income – are more meaningful when GNI* is used as the income variable. Understanding how these variables are likely to evolve over the medium term requires the construction of internally-consistent GNI* forecasts.

The CSO produces estimates of GNI* on a 'top-down' basis, which involves first estimating GNI and then removing several globalisation-related distortions (e.g. depreciation on intellectual property and aircraft related to the leasing sector). In contrast, the 'bottom-up' approach outlined in this paper builds up directly from expenditure components of GNI* (e.g. public and private consumption, modified investment). As a result, it does not require projections for the globalisation-related GNI* adjustments, which are both highly volatile and not strongly linked to other variables in the domestic economy. It also allows for the sources of growth from an expenditure perspective to be better identified.

The starting point of this approach is MDD, which is forecast separately by the Department. The next step is to project the difference between MDD and GNI*. Changes in this difference can be proxied by changes in 'domestic' net trade. This, in turn, is forecast by approximating series for exports and imports which exclude MNC-dominated trade.

The bottom-up approach makes it easier to assess the contribution to growth from 'domestic' net trade and modified domestic demand (and its components). Despite some outliers particularly during the crisis period, there is generally a reasonably good fit using this approach. Overall, this methodology has a strong conceptual underpinning and is a significant improvement on the top-down approach.

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Section 1: Introduction

As has been well documented,² the information content of conventional measures of aggregate economic activity is extremely limited in an Irish policy context. While compiled in line with international standards, the internationalisation of the Irish economy has given rise to a significant disconnect between many of the standard economic metrics – GDP, GNI, balance of payments – and fundamental developments such as consumer spending per capita and employment levels.^{3 4}

To better capture the underlying dynamics of the Irish economy, the *Central Statistics Office* (CSO) publishes a number of alternative metrics. The two most useful are modified domestic demand (MDD) and modified gross national income (GNI*).⁵

The former essentially measures domestic demand but excludes volatile components of investment spending which have very little impact on the domestic economy; it is available on a quarterly basis and with considerable granularity. The latter is a more comprehensive measure but is less timely and unavailable on a quarterly basis. Accordingly, the Department's preferred measure of economic activity, for short-term conjunctural analysis, is MDD.

However, GNI* is an essential complementary indicator as MDD does not take into account the import content of domestic expenditure, the contribution to 'underlying' growth from trade and does not allow for a comprehensive assessment of productivity trends. GNI* also provides a meaningful denominator for fiscal ratios such as debt-income, deficit-income, or interest payments-income. Overall, the two metrics are broadly consistent and can be considered to be 'first cousins' amongst aggregate economic metrics.

For these reasons, the Department of Finance produces forecasts of both of these modified metrics. While forecasting MDD did not require any significant amendments to the Department's pre-existing forecasting methodology, GNI* requires more globalisation-related adjustments and as a result presents greater challenges. Specifically, forecasting GNI* in a way that is fully consistent with the estimation process used by the CSO involves first forecasting GNI, and then projecting a number of highly volatile globalisation-related variables that are removed from GNI. This 'top-down' methodology, despite its limitations, was employed by the Department of Finance to forecast GNI* prior to 2021.

This paper considers an alternative bottom-up approach for forecasting GNI* originally proposed by the *Irish Fiscal Advisory Council* (Fiscal Council) and further developed by the Department for its spring and autumn 2021 forecasts.⁶ Section 2 discusses the rationale for GNI* and the limitations of GDP/GNI - the conventional measures of activity - in more detail. Section 3 outlines the top-down methodology for forecasting GNI* and describes the logic underlying the Department's new bottom-up forecasting methodology. Section 4 describes the forecasting process and assesses the results of the approach. Section 5 explores some of the remaining issues with this methodology. Finally, section 6 concludes.

² See Budget 2022 Economic and Fiscal Outlook Box 1, available here: <https://www.gov.ie/en/publication/7599a-budget-publications/>

³ For more detailed discussion of this issue, see the Central Bank's Economic Letter *Is Ireland Really the Most Prosperous Country in Europe?* (2021), available here: <https://www.centralbank.ie/docs/default-source/publications/economic-letters/vol-2021-no-1-is-ireland-really-the-most-prosperous-country-in-europe.pdf?sfvrsn=25>

⁴ This is discussed in more detail in the Department of Finance's explanatory note *GDP and 'Modified GNI'* (2018), available here: <https://assets.gov.ie/4910/181218123252-71a2c297f26b419fa3696d7349e3e788.pdf>

⁵ This was recommended in the Economic Statistics Review Group December 2016 Report, available here: [https://www.cso.ie/en/media/csoie/newsevents/documents/reportoftheeconomicstatisticsreviewgroup/Economic_Statistics_Review_\(ESRG\)_Report_Dec_2016.pdf](https://www.cso.ie/en/media/csoie/newsevents/documents/reportoftheeconomicstatisticsreviewgroup/Economic_Statistics_Review_(ESRG)_Report_Dec_2016.pdf)

⁶ See Fiscal Assessment Report of May 2020 Box E, available here: <https://www.fiscalcouncil.ie/wp-content/uploads/2020/06/Fiscal-Assessment-Report-May-2020.pdf>

Section 2: Limitations of GDP/GNI and rationale for GNI*

The information content of standard macroeconomic aggregates such as GDP and GNI is extremely limited in an Irish policy context as these measures are artificially inflated by a number of globalisation-related distortions. In particular, exports of goods produced abroad under license ('contract manufacturing'), the foreign profitability of companies that have re-domiciled to Ireland and the depreciation of Irish-based, foreign-owned capital assets such as intellectual property (IP) and leased aircraft distort the conventional measures of activity and complicate the interpretation of trends.⁷

As a result, there is a significant disconnect between GDP/GNI and underlying indicators of economic activity in Ireland such as MDD and employment (**figure 2a**). GDP, for instance, has overstated the income of those living in Ireland since the 1980s. This is a result of the significant multinational footprint in Ireland, which has grown as the pace of globalisation accelerated and Ireland became more embedded in global supply chains. An important consequence of this is that a significant part of the income arising from the production of goods and services in Ireland – or in the case of 'contract manufacturing' outside of Ireland – accrues to the foreign owners of these firms. Hence, the GDP aggregate overstates the living standards of Irish residents.

For this reason, GNP (a broadly similar concept to the better-known GNI) was previously seen as a better macroeconomic indicator, as it excludes the profit streams that flow to the foreign owners of Irish-resident capital. Over the past decade, however, and in particular following the exceptional growth rate recorded in 2015, even GNP/GNI statistics have become disconnected from underlying measures. This is primarily due to substantial on-shoring of IP assets by the multinational sector in recent years, which has led to a massive increase in the consumption of fixed capital i.e. depreciation, and hence GDP. The return on these assets also inflated GNI as it was not (fully) offset by profit outflows (as these are recorded on a net basis i.e. after depreciation⁸).

Developments since the pandemic have widened the divergence with headline indicators growing solidly last year (GDP and GNP increased by almost 6 and 3½ per cent, respectively) despite a substantial contraction in domestic activity. This was driven by the unexpected resilience of exports in a small number of mainly foreign-owned sectors, in particular ICT and the pharmaceutical sector.

Preliminary data for 2021 indicate that GDP and GNP continue to significantly overstate underlying growth with annual increases of 16 and 9 per cent recorded in the first half of this year. This was driven by *inter alia* a massive rebound in 'contract manufacturing'. While this activity inflates Ireland's exports, it has almost no impact on Irish living standards as it generates little or no domestic activity/employment. As a result, the level of GDP this year is projected to be almost double that of GNI*.

On foot of the exceptional growth rate recorded in 2015, as well as the growing disconnect between GDP/GNI and actual income levels, the CSO developed an alternative measure of Irish economic activity, so-called *modified gross national income* or GNI*. This measure is designed to remove globalisation-related distortions while still including the contribution to underlying growth from the multinational sector in Ireland (e.g. through employment and tax receipts). It excludes the following from GNI (the full walk from GDP to GNI* is shown in **figure 1** below):

- retained earnings of firms that have re-domiciled their HQ to Ireland
- the depreciation of intellectual property assets located in Ireland and R&D service imports; and,

⁷ For further discussion of these globalisation-related distortions, see *The Balance of Payments in Ireland: Two Decades in EMU* (2019), available at: <https://assets.gov.ie/27044/76703b33310041eaa98fa0c6052f3d1f.pdf>

⁸ GDP and GNI are both gross measures of income, i.e. they include the cost of depreciation.

- the depreciation of aircraft owned by aircraft-leasing companies

Figure 1: Top-down walk from GDP to GNI*

A:	GDP
	plus
B:	net factor income from abroad
	equals
C:	gross national product (GNP)
	plus
D:	net EU subsidies and taxes
	equals
E:	gross national income (GNI)
	minus
F:	retained earnings of re-domiciled PLCs
	minus
G:	depreciation of IP assets located in Ireland ⁹
	minus
H:	depreciation of aircraft owned by aircraft leasing companies
	equals
I:	modified gross national income (GNI*)

Source: Department of Finance

The rationale for excluding the depreciation of Irish-based, but foreign owned, IP and aircraft is that these costs are borne by foreign shareholders and not by Irish residents. These highly mobile assets disproportionately impact the headline results and have very limited connection to underlying activity in Ireland.¹⁰ In relation to the retained earnings of re-domiciled PLCs, these profits do not accrue to Irish residents and will, at some stage, be paid out to the foreign owners of the firm by way of dividends.

Figure 2b illustrates the components of GNI* and the increasing divergence between GNI and GNI* over time driven, in particular, by the depreciation of IP assets since the middle of the last decade.

It is important to stress that, from a legal perspective, the CSO is required to produce existing macroeconomic statistics (GDP, GNP, GNI, etc.) in accordance with internationally-agreed methodologies. Similarly, Ireland's international obligations are still assessed on these bases (e.g. the EU budget contribution is still based on GNI, compliance with the Stability and Growth Pact is assessed on the basis of GDP). To note, there are also other aggregate variables which are more useful for analysing economic developments in Ireland, such as net national income (NNI). However, from a forecasting perspective, NNI would require forecasting depreciation – including depreciation linked to volatile investment components such as IP and aircraft - and unlike GNI*, the net income of re-domiciled PLCs remains in NNI.

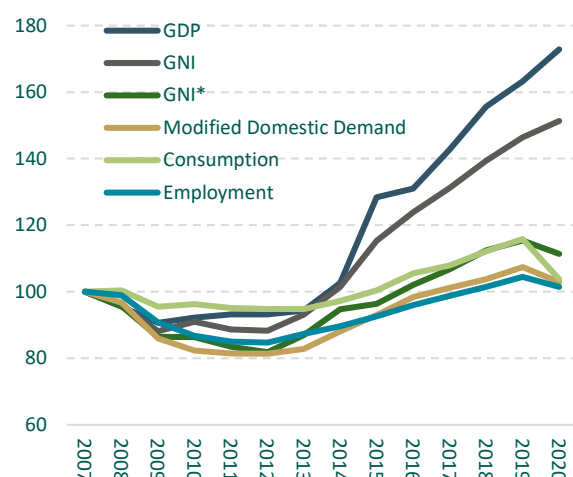
⁹ Also includes R&D service imports – i.e. the capitalised outputs from R&D activities out-sourced to another jurisdiction. More precisely, all of the depreciation associated with R&D service imports and trade in IP is removed including the portion that relates to Irish-owned firms, although this accounts for a very small share of the total.

¹⁰ The depreciation on foreign-owned machinery and equipment investment located in Ireland is also a cost borne by foreign shareholders but is not excluded from GNI* as these assets are more closely linked to the domestic economy than foreign-owned IP and aircraft.

For these reasons, the Department of Finance will continue to produce forecasts of GDP/GNI.¹¹ However, given the significant shortcomings with these statistics, modified metrics such as GNI* are the go-to measures for understanding underlying economic developments.

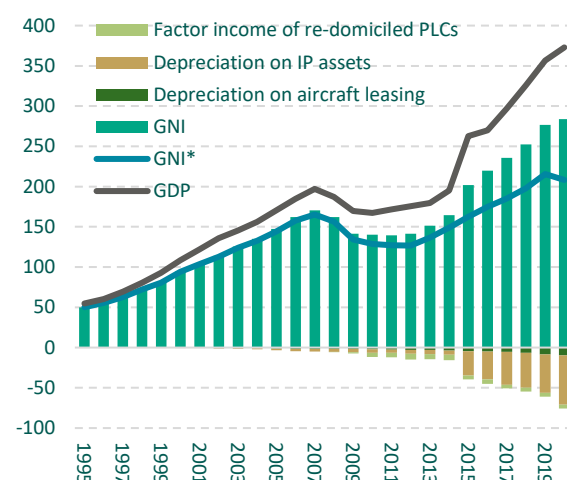
Figure 2: Understanding GNI*

A: Divergence of GDP and GNI, index = 2007



Source: CSO, Department of Finance

B: Components of GNI*, in current prices, €bn



Source: CSO, Department of Finance

Section 3: Underlying forecast logic

Prior to 2021, the Department of Finance forecast GNI* using a top-down approach, which involved forecasting GNI, and then projecting the variables which are excluded from GNI* (see [figure 1](#)).¹² In addition to the standard difficulties in forecasting GNI, this approach is particularly challenging as the adjustments to GNI* tend to be quite volatile and are not strongly linked to other variables in the domestic economy.¹³

In recent years, the Department of Finance has assumed that the depreciation on foreign-owned assets – intellectual property and aircraft related to the leasing sector – grows at a constant share of new investment in these categories. The retained earnings of re-domiciled PLCs were generally assumed to grow broadly in line with global demand.

In order to produce real GNI* projections, the approach also requires forecasting deflators for the GNI* adjustments. Given the difficulties in reliably forecasting these variables, the Department did not previously publish forecasts of real GNI*, although the GNI deflator could be used to produce an implied forecast. For this reason, the GNI* forecasts were principally used as a denominator for ‘ratio analysis’, in particular for fiscal purposes, rather than as an indicator of the performance of the economy.

An alternative to the top-down method is outlined in this paper. This alternative is a bottom-up approach, which builds up from the expenditure components of GNI*, and was first proposed by the Fiscal Council.

¹¹ GDP forecasts and in particular forecasts of components of GDP such as gross operating surplus are also still important for tax forecasting purposes.

¹² This methodology is outlined in greater detail by the Fiscal Council in the Fiscal Assessment Report of June 2019, available here: <https://www.fiscalcouncil.ie/wp-content/uploads/2019/06/FAR-June-2019-Box-E-Deriving-Forecasts-for-Modified-Gross-National-Income-and-the-Modified-Current-Account.pdf>

¹³ For instance, projecting the depreciation on foreign-owned assets is very challenging as it requires forecasting extremely volatile investment flows driven by a small number of multinational firms as well as accounting for the retirement of assets over time. This will become even more difficult over the medium-term as significant volumes of intellectual property assets on-shored in recent years become fully depreciated.

This bottom-up methodology has been used by the Department of Finance to produce forecasts of GNI* in its 2021 spring and autumn forecasts.

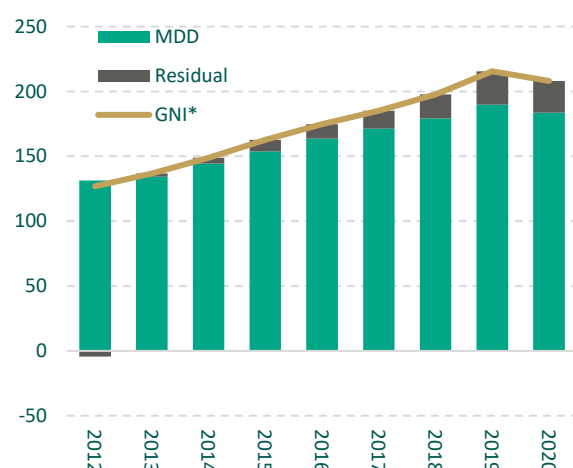
The approach mirrors the walk to the conventional measure of GNI, which adds up domestic demand, the current account – essentially consisting of net exports and net factor income (net profit repatriations) - and net subsidies and transfers. One of the main advantages of this approach is that it does not require forecasts for the volatile and obscure GNI* adjustments.

The starting point of this approach is modified domestic demand (MDD) i.e. domestic demand excluding investment in IP and aircraft for leasing. MDD is forecast separately by the Department of Finance and is strongly correlated with growth in GNI* (**figure 4a**).

The key to this method is forecasting the level difference between MDD and GNI*, referred to from hereon as the residual (**figure 3a**). The residual is composed of the modified current account (CA*),¹⁴ plus the statistical discrepancy minus net current transfers.¹⁵¹⁶ As **figure 3b** demonstrates, the modified current account is the main component of the residual and main driver over the medium-term. However, the statistical discrepancy is often an important determinant of annual changes due to the inherent volatility of this metric while the components of net current transfers tend to be relatively stable.

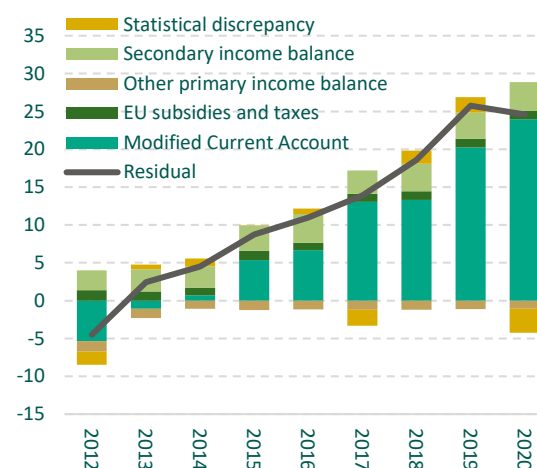
Figure 3: Residual between MDD and GNI*

A: Residual MDD to GNI*, in current prices, €bn



Source: CSO, Department of Finance

B: Components of the residual, in current prices, €bn



Source: CSO, Department of Finance

Figure 4b shows the contribution to real GNI* growth from MDD and the residual over the 1996-2020 period. In general, the contribution to growth from the residual has been quite significant since the beginning of the recovery in 2013, reflecting a substantial turnaround in the modified current account balance.¹⁷

¹⁴ The modified current account refers to the current account excluding the retained earnings of re-domiciled PLCs and depreciation on IP and aircraft leasing assets as described above for GNI*, and adding back net aircraft related to leasing, net R&D IP imports, and R&D service imports. The modified current account therefore better reflects the economy's underlying external balance. This is discussed in more detail in the Department of Finance paper *The Balance of Payments in Ireland: Two Decades in EMU*, (2019).

¹⁵ Net current transfers consists of the secondary income balance and the other primary income balance, less net subsidies (EU subsidies – EU taxes). However, the secondary income balance and the other primary income balance have no impact on (modified) GNI as they are included in the (modified) current account but then removed through net current transfers. In contrast, net subsidies and taxes, are included within (modified) GNI.

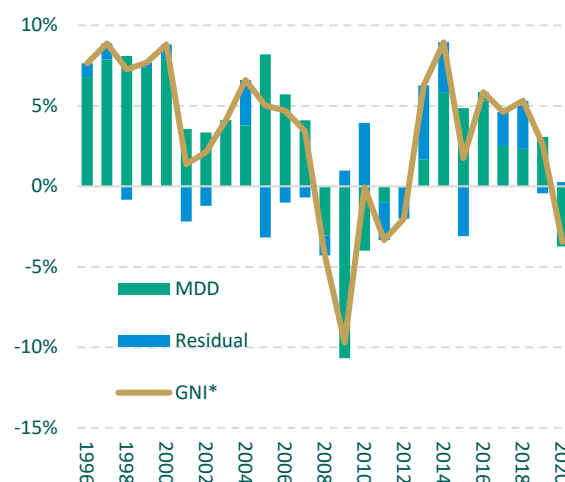
¹⁶ See **figure A1** in Annex 1.

¹⁷ Despite recording significant increases in nominal terms, the contribution to real growth from the residual was negative in 2015 and 2019. This could potentially be due to the implied statistical discrepancy i.e. the difference between real GNI and the sum of the components, which can be very large due to the chain linking process.

Figure 4: MDD and GNI***A: Correlation of real growth in MDD and GNI*, 1996-2020**

Note: This correlation is even stronger when looking at nominal growth ($R^2=0.93$).

Source: CSO, Department of Finance

B: Contribution to growth in real GNI*

Source: CSO, Department of Finance

In any given year, GNI* is the sum of MDD, the residual of the previous year, and the change in the residual from the previous year to the forecast year. As MDD is forecast separately, and the residual of the previous year is a known outturn, this methodology then only requires forecasting the level change in the residual from the previous year to the forecast year.

$$GNI^*_t = MDD_t + Residual_{t-1} + \Delta Residual_t$$

The Fiscal Council methodology involves approximating historical series for exports and imports that are consistent with the residual, which is mainly driven by developments in the modified current account balance. Specifically, this involves estimating adjusted or 'domestic' series for exports and imports that remove the impact from multinational-dominated categories of trade. The level change in net domestic exports from one year to the next i.e. net exports excluding multinational trade, is therefore assumed to account for the change in the modified current account balance.¹⁸ This ensures that the GNI* and CA* forecasts are fully consistent.¹⁹

$$\Delta Residual_t = \Delta Domestic_Exports_t - \Delta Domestic_Imports_t$$

This approach relies on the simplifying assumption that the 'underlying' (or domestic) value-added from these MNC categories of trade - the difference between multinational exports, on the one hand, and imports and profit outflows, on the other - is already essentially captured in MDD.²⁰ For instance, the MNC sector directly increases MDD through investment and indirectly boosts public and private consumption via paying wages, taxes, etc.

The validity of these assumptions and the issues they raise are discussed in greater detail in section 5.

¹⁸ This also assumes that the change in net factor income is dominated by profit outflows and that these outflows are primarily driven by developments in the multinational sector.

¹⁹ The other components of the residual are assumed to be either static (in the case of the statistical discrepancy) or increasing broadly in line with GNI* (in the case of net current transfers) over the forecast period.

²⁰ More precisely, this approach assumes that annual *changes* from net multinational trade in the forecasts are captured in MDD and have no direct impact on the change in the modified current account as the contribution from net MNC trade is, of course, incorporated in residual /modified current account outturns.

Section 4: Forecasting GNI*

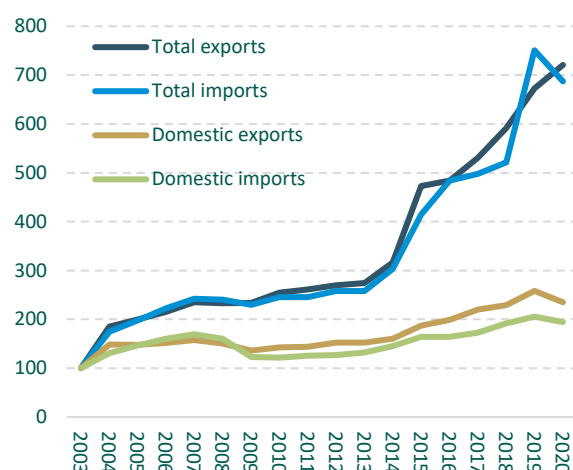
4.1 Projecting net domestic exports

In order to forecast net domestic exports, historical series for domestic imports and exports must first be constructed. This involves determining which sectors of trade are MNC-dominated and removing those sectors from the total value of trade, leaving essentially domestic exports. On the goods side, trade linked to 'contract manufacturing', pharmaceuticals and electrical machinery are removed, while for services trade, the categorisation was based on the CSO foreign ownership classification.²¹ The services sectors considered to be dominated by multinationals are insurance, computer services, royalties and licenses, business services and repairs and processing.^{22,23} Figure 5a illustrates the substantial divergence in growth of total and domestic trade over the last two decades.

This bottom-up methodology can be used to forecast GNI* in either real or nominal terms. In order to forecast real GNI*, the series for domestic imports and exports need to be deflated. This is done by first deflating MNC exports and imports using the conventional deflators i.e. the overall export and import deflators from the quarterly national accounts, and then subtracting these categories of trade from total real exports and imports, respectively.

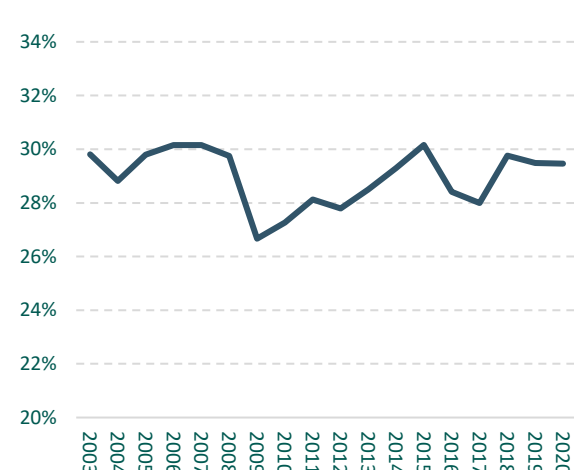
Figure 5: Domestic trade series

A: Total and domestic trade, index = 2003



Source: Eurostat, CSO, Department of Finance

B: Domestic imports share of modified final demand



Source: Eurostat, CSO, Department of Finance

Once calculated, the domestic trade series can then be forecast using the standard trade relationships, with domestic exports driven by changes in competitiveness and foreign demand, and with domestic imports dependent on modified final demand (MDD plus domestic exports). Specifically, domestic exports is forecast using a simple regression model with the real effective exchange rate (REER) and foreign import demand (FID) as independent variables.²⁴ Domestic imports are forecast to evolve broadly in line with modified final demand while also taking into account the long-term average import share of final demand (figure 5b).

²¹ CSO publications on Services Trade by Enterprise Characteristics in 2016, 2017 and 2018.

²² The services trade and specific SITC3 goods' categories which were removed are detailed in full in Annex 1 of this paper.

²³ Given the substantial headline trade surplus, in general the more MNC sectors which are removed, the smaller net domestic exports becomes. This creates a trade-off between removing MNC-dominated sectors and obtaining a level of net domestic exports which is approximately in line with the residual.

²⁴ The regression coefficients on the REER and FID are -0.49 and 1.04 respectively, with both variables significant at the 5 per cent level.

As discussed previously, the forecast for the residual in the GNI* calculation is obtained by adding the projected change in net domestic exports to the residual outturn for the previous year. This is then added to MDD to reach GNI*.

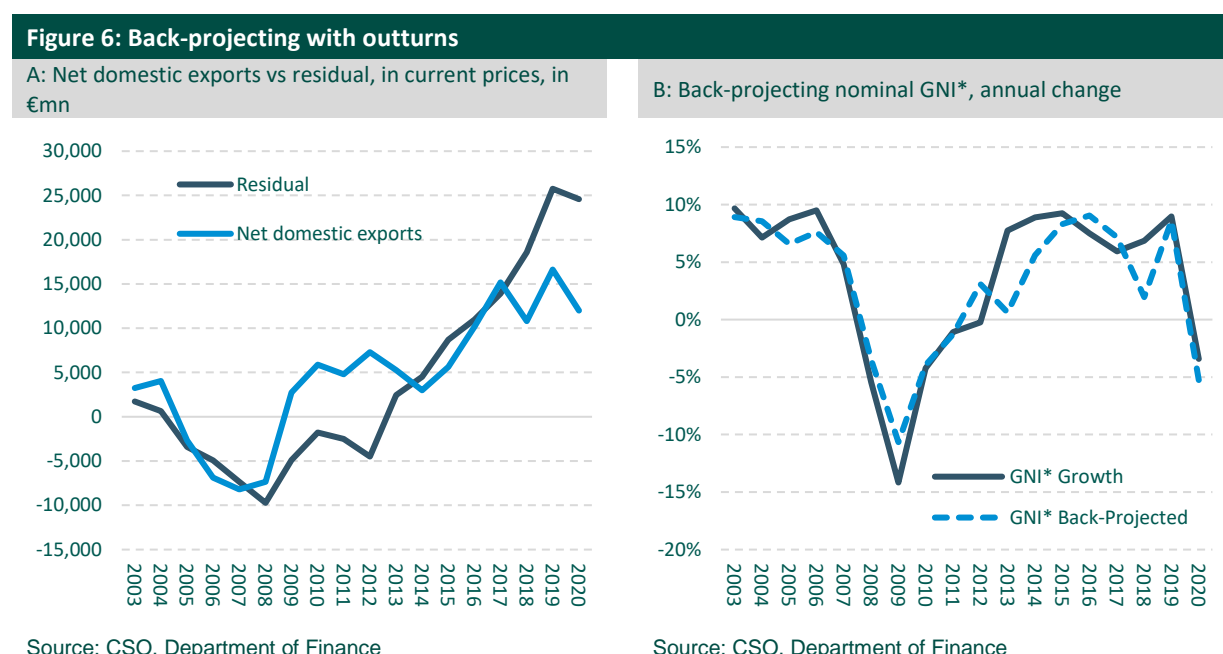
4.2 Back-projecting GNI*

GNI* can be back-projected to demonstrate the application and assess the output of the methodology. As for forecasting, the accuracy of the back-projection depends on two factors. First, net domestic exports should be a reasonable approximation of the residual. Second, projections of net domestic exports should be reasonably accurate in order to produce an appropriate projection of GNI*.

Figure 6a shows the computed series for net domestic exports plotted against the residual while **figure 6b** shows the estimates of GNI* incorporating outturn data for MDD and net domestic exports.

$$GNI^*_{(t)} = MDD_{(t)outturn} + Net\ Domestic\ Exports_{(t)outturn}$$

Despite some outliers, particularly during the crisis period, there is generally a reasonably good fit between the back-projected series and the outturns.²⁵



The next step is to show that forecasting net domestic exports instead of using outturns still produces reasonable estimates of GNI*. As discussed above, domestic exports are forecast using a simple regression model with competitiveness (the REER) and world demand (FID) as the independent variables, while domestic imports are held at their average share of modified final demand. **Figure 7a** below shows GNI* projected on a one-step ahead basis. This means the outturns for MDD in a given year are used, and each year net domestic exports are projected and the change is added to the residual outturn of the previous year.

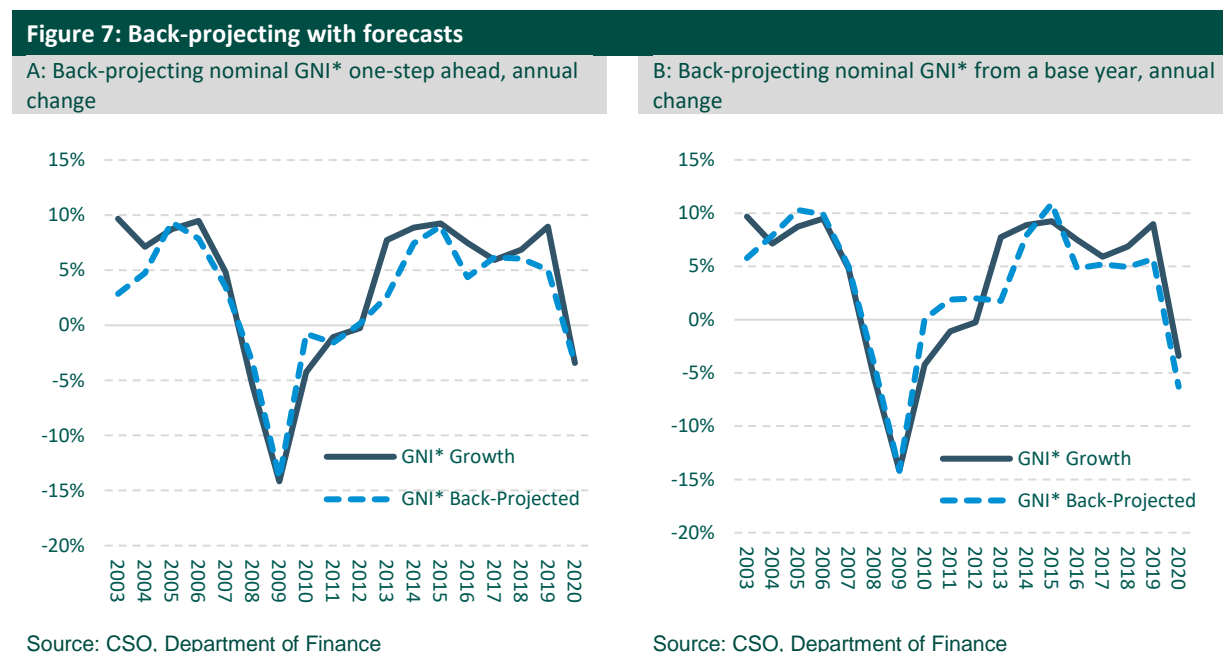
$$GNI^*_{(t)} = MDD_{(t)outturn} + Residual_{(t-1)outturn} + \Delta Net\ Domestic\ Exports_{(t)forecast}$$

²⁵ The divergence in 2019 and 2020 reflects the significant increase in the modified current account with a double-digit surplus recorded last year. This is an extremely elevated position from both a historical and comparative perspective. It is also well in excess of estimates suggested by structural factors and as such is difficult to interpret.

Figure 7b shows an additional check performed to test the accuracy of GNI* projections over a longer time period, as forecasts are generally performed by the Department over a five-year horizon. It shows GNI* projected forward using outturns for MDD in each year with net domestic exports projected forward from a base year i.e. with no further updates to the residual. In other words, in the first year of the back-projection, the outturn for the residual in the base year is used, in line with the one-step ahead formula for back-projection.²⁶ From that point on, the back-projected or 'forecast' residual is used.

$$GNI^*_{(t)} = MDD_{(t)outturn} + Residual_{(t-1)forecast} + \Delta Net Domestic Exports_{(t)forecast}$$

In general, despite some outliers in particular during the crisis period, both approaches produce broadly reasonable results.²⁷



The Department's Budget 2022 GNI* forecasts are presented in Annex 2 to further illustrate the application of the methodology.

4.3 GNI* deflator

The GNI* deflator is also estimated using a bottom-up approach, that is by forecasting the residual and MDD deflators separately and weighting accordingly.²⁸ However, over much of the last two decades, the GNI* deflator has been almost indistinguishable from the GNI deflator, as **figure 8** demonstrates. While this is to be expected in the period up to 2010 given the minor differences between GNI and GNI*, the close alignment over the last decade, with the exception of 2019, is quite difficult to explain given the significant increase in GNI* adjustments over this period.

Similarly, the divergence of the GNI* deflator from the MDD deflator, which is the main driver of GNI*, appears stronger than what might be accounted for by the residual/modified current account given the

²⁶ For the one-step ahead forecast the back-projected value for GNI* in each year is compared to the outturn value for GNI* in the previous year to obtain a growth rate. For the longer-term forecast, the back-projected value for GNI* in each year is compared to the back-projected value for GNI* in the previous year to obtain a growth rate.

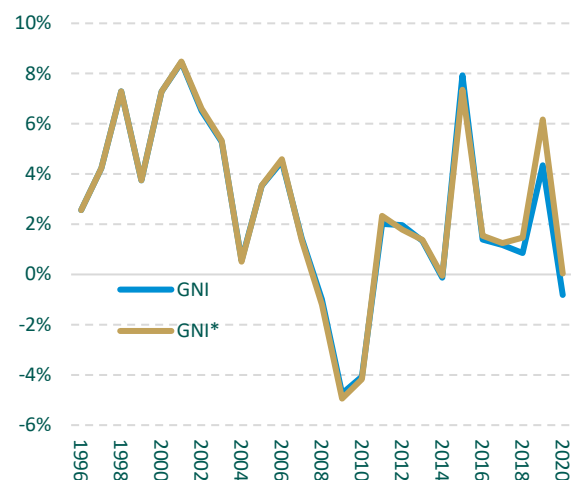
²⁷ Back-projections are also shown on a real basis in Annex 1.

²⁸ As discussed in section 4.1, the forecasting methodology can be used to produce nominal or real GNI* projections. The implied deflator from the two approaches can also be compared to a direct projection of the deflator – using the MDD deflator and forecasting the residual deflator on the basis of exchange rate and oil price assumptions etc. – as a useful robustness check.

residual's relatively minor weight. As noted earlier in the paper, the correlation between GNI* and MDD is markedly stronger on a nominal than a real basis, reflecting the divergence in the deflators.

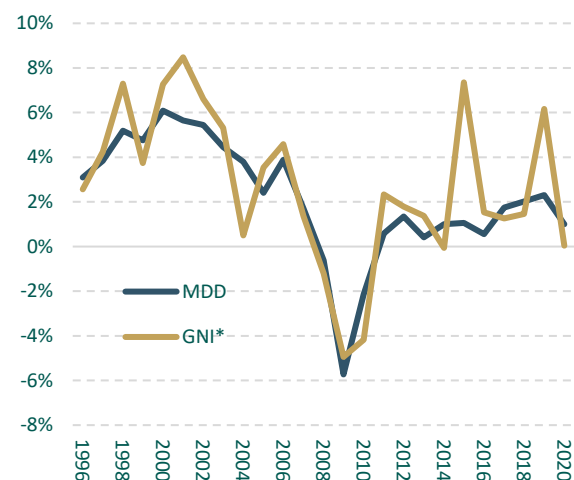
Figure 8: GNI* deflator

A: GNI* and GNI deflators, annual change



Source: CSO, Department of Finance

B: GNI* and MDD deflators, annual change



Source: CSO, Department of Finance

Section 5: Limitations of the methodology

The CSO produce GNI* as an adjusted measure of national income using a top-down methodology where certain globalisation-related distortions are removed via adjustments to income outflows. This is an important limitation of GNI* as a measure of activity, as it means the contribution of specific components of expenditure (exports, imports) to underlying growth cannot be identified. It also creates difficulties from a forecasting perspective, as it requires projections for a number of globalisation-related adjustments, which are both highly volatile and not strongly linked to other variables in the domestic economy.

The bottom-up approach described in this paper attempts to correct for these factors by forecasting GNI* using adjusted expenditure-side components. While this approach is a significant improvement on the top-down approach, there are still a number of potential issues with this methodology.

The first of which relates to the calculation of net domestic exports. Specifically, the binary categorisation of trade as either MNC-dominated or domestic in nature is very imprecise. Sectors are categorised according to their broad composition and as a result, some trade which is domestic is excluded from net domestic exports while some MNC trade is included.

An additional issue in relation to the computation of net domestic exports is the calculation of the deflators. Real and nominal data is only available at the headline level for goods and services trade. This means that the deflators will not be fully appropriate for the deflation of domestic exports and imports. For instance, changes in the euro-dollar exchange rate, which is one of the most important determinants of the headline goods export deflator, are likely to have a far more significant impact on pharmaceutical exports than more traditional goods exports.

There are also a number of conceptual limitations with this approach. One of the key simplifying assumptions underpinning this methodology is that changes in the underlying value-added (e.g. wages and taxes paid) from the multinational sector are essentially captured in the MDD projections. As a result, this approach potentially underestimates the contribution to underlying growth from the

multinational sector as it only includes the indirect impact of changes in wages and taxes etc. via changes in private and public consumption as well as public investment.²⁹

There are also issues with how changes in factor flows are incorporated in the methodology. Specifically, this approach does not take into account the impact of changes in total profit inflows i.e. from both the foreign-owned and Irish-owned sectors, or profit outflows from the traditional sector on GNI*. In other words, this approach is based on the simplifying assumption that changes in net factor flows consist solely of multinational profit outflows. This is a potential shortcoming of the methodology as NFI flows that are not associated with multinational exports are still relevant in an Irish context. For instance, a large proportion of the Irish retail market, the food and beverage sector and other 'traditional' sectors are foreign-owned while native Irish-owned firms have a significant presence abroad.³⁰

Some of these issues could be mitigated with more granular data, for instance a greater disaggregation of services trade would help more accurately select categories of trade by firm ownership. However, others require a more judgement-based approach, for instance, by incorporating recent trends in factor flows.

Section 6: Conclusion

The internationalisation of the global economy has significantly reduced the information content of conventional measures of Irish aggregate activity. Given the shortcomings with these statistics, modified metrics, which better capture the underlying dynamics of the Irish economy, are now the go-to measures for analysing underlying developments and changes in national income.

The purpose of this paper has been to set out the Department's bottom-up approach to forecasting GNI*, one of the most relevant modified metrics and the most comprehensive measure of underlying activity. This methodology was originally conceived by the Fiscal Council and has been further developed by the Department in its spring and autumn 2021 forecasts.

The CSO produces estimates of GNI* on a top-down basis, which involves first estimating GNI and then removing several globalisation-related distortions. In contrast, the Department's bottom-up approach builds up directly from expenditure components of GNI*. As a result, it does not require projections for a number of globalisation-related adjustments, which are both highly volatile and not strongly linked to other variables in the domestic economy. It also provides a more solid conceptual underpinning for analysis of underlying import and export shares as well as, relatedly, the contribution from net trade to growth.

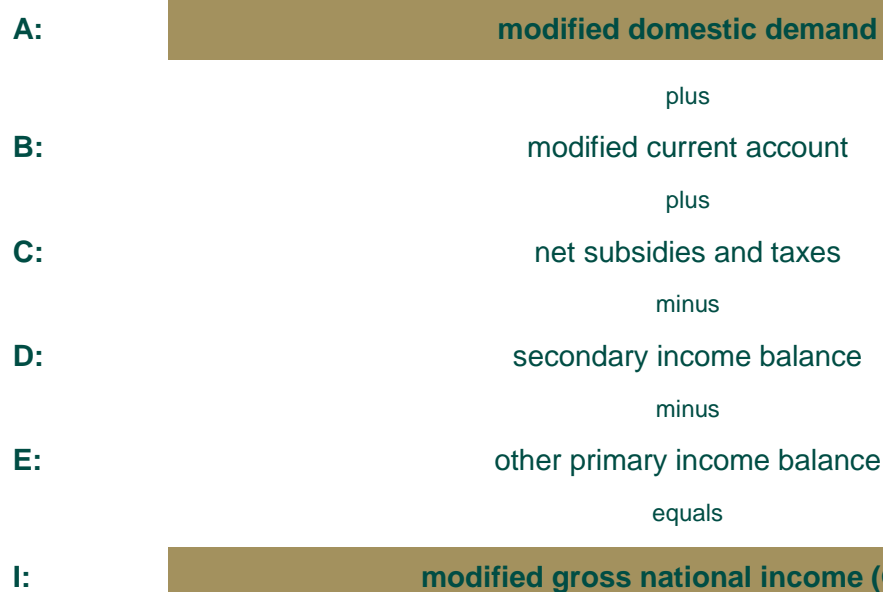
While this approach is a significant improvement on the top-down approach, there are still a number of potential issues with this methodology. For instance, this approach does not take into account the impact of total profit inflows or profit outflows from the traditional sector on GNI*. The binary categorisation of trade is also very imprecise. In addition, by excluding MNC-dominated trade it underestimates the direct contribution to underlying growth from the multinational sector. While some of these factors could be helped with more detailed data, others require a more judgement-based approach.

²⁹ Neither the change in MDD nor the change in net domestic exports captures changes in non-IP/non-aircraft depreciation of the MNC sector, i.e. the MNC contribution to depreciation of core M&E and other building and construction. This depreciation contributes positively to GNI* and changes in its value are not taken into account by the methodology.

³⁰ Foreign profit inflows to Irish-owned NFCs excluding re-domiciled PLC's amounted to 3.6 billion in 2020.

Annex 1: Additional graphs and tables

Figure A1: Bottom-up walk from MDD to GNI*

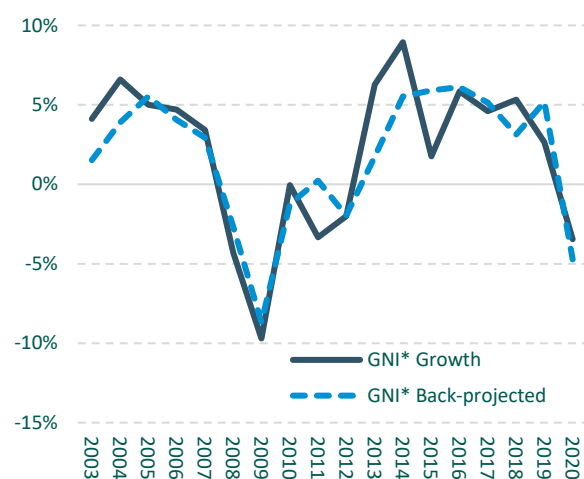


Note: Together net subsidies and taxes, the secondary income balance, and the other primary income balance make up net current transfers.

Source: Department of Finance

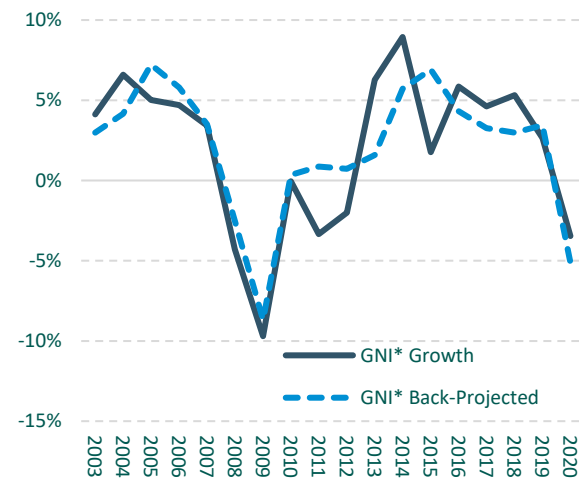
Figure A2: Back-projecting real GNI* growth

A: Back-projecting real GNI* one-step ahead, annual change



Source: CSO, Department of Finance

B: Back-projecting real GNI* from a base year, annual change



Source: CSO, Department of Finance

Table A1: Multinational trade sectors excluded from net domestic exports

Code	Sector
Goods	
515	Organo-inorganic compounds, heterocyclic compounds, nucleic acids and their salts, and sulphonamides
541	Medicinal and pharmaceutical products, other than medicaments of group 542
542	Medicaments (including veterinary medicaments)
551	Essential oils, perfume and flavour materials
752	Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, n.e.s.
792	Aircraft and associated equipment; spacecraft (including satellites) and spacecraft launch vehicles; parts thereof
Services	
	Insurance
	Computer Services
	Royalties/Licenses
	Business Services
	Repairs and Processing

Source: Department of Finance

Note: For SITC 752, only exports not imports are excluded as these imports boost underlying investment (core M&E) and therefore are included in MDD. On the other hand, imports of SITC (792) are removed as they are also excluded from MDD.

Annex 2: Budget 2022 GNI* forecasts

Figure A3a below presents the Departments autumn projections for real GNI* and real GDP. As can be seen, GNI* is expected to grow far less than GDP this year. This is due to the rapid growth of exports from the multinational sector driven by *inter alia* a massive rebound in 'contract manufacturing'.

As shown in **figure 5a** above, MNC exports and imports in Ireland have grown at a far more rapid pace over the last two decades than their counterpart domestic series. This differing pace of exports growth is expected to continue, although to a lesser extent, over the forecast horizon, contributing to the divergence in GDP and GNI* growth rates. That is why GDP/GNI growth forecasts cannot be used as a proxy for GNI* growth.

Table A2: Budget 2022 GNI* and deflator forecasts, annual percentage change

	2021	2022	2023	2024	2025
Real GNI*	4.7	5.2	3.5	3.3	3.2
Nominal GNI*	7.1	7.9	5.7	5.3	5.2
GNI* Deflator	2.3	2.6	2.1	2.0	2.0

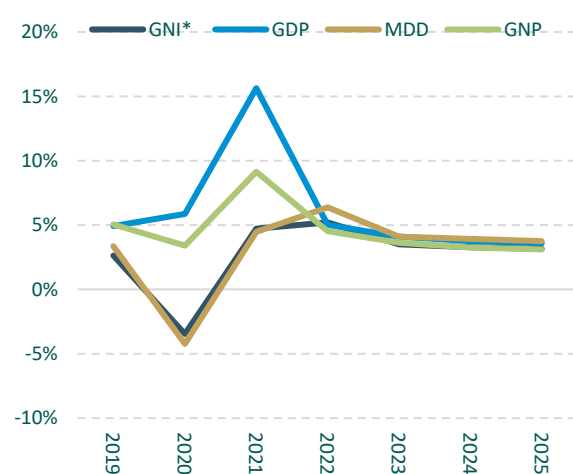
Source: Department of Finance

Real GNI* is forecast to grow by 4¾ per cent in 2021 due to the anticipated strong recovery in MDD and robust growth in exports reflecting the rebound in external demand.

Next year, GNI* is projected to grow just above 5 per cent driven entirely by the ongoing recovery in MDD as net domestic trade is expected to make a negative contribution (**figure A3b**). The latter is due to the significant negative impact on domestic exports from the introduction of full customs checks by the UK and solid growth in domestic imports reflecting the continued strength of MDD.³¹

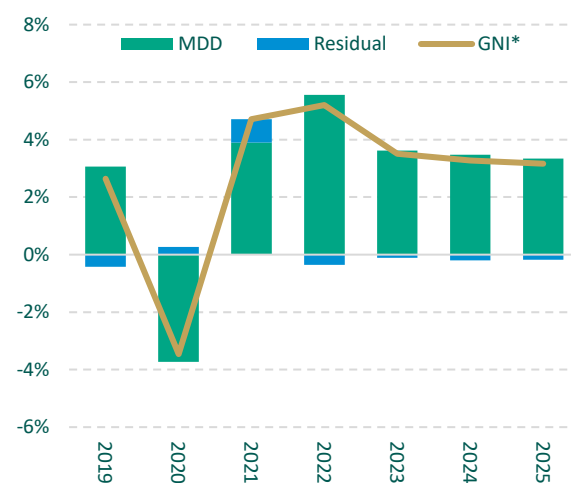
Figure A3: Budget 2022 Forecasts

A: Budget 2022 GDP, GNP, GNI* and MDD forecasts



Source: CSO, Department of Finance

B: Budget 2022 forecast contribution to real GNI* growth



Source: CSO, Department of Finance

³¹ The full introduction of customs checks by the UK authorities next year is expected to have a far more significant impact on domestic exports than conventional exports as indigenous sectors are more dependent on the UK as an export market.

Over the medium-term, GNI* is projected to increase by around 3¼ per cent per annum with MDD expected to continue to be the sole driver of growth.

The GNI* deflator is primarily driven by the MDD deflator throughout the forecast period, in particular over the medium-term, as the adjusted terms-of-trade is assumed to be unchanged. This results in nominal GNI* growth projections of just over 7 per cent this year and just under 8 per cent next year. Over the medium term, nominal growth is forecast to moderate gradually to just above 5 per cent.

The modified current account is expected to decline significantly over the forecast horizon but still remain well above estimates suggested by structural factors, in other words the current account 'norm'.



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