Box D:

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A Direct Forecasting Approach to GNI* and CA*

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As has been documented for several years, the advanced internationalisation of the Irish Economy since 2014 has caused a significant disconnect between conventional measures of macroeconomic and trade metrics, and the underlying position of the domestic Irish economy.[2] In an attempt to derive more appropriate measures of Irish economic output and income, the CSO established an Economic Statistics Review Group in 2015. With the publication of their final report in December 2016, two additional statistics were suggested as being suitable for monitoring the Irish economy:

- A supplementary GNI indicator (GNI*) that subtracts the retained earnings of re-domiciled firms and adjusts for the depreciation of categories of foreign-owned domestic capital assets (e.g. IP capital assets). The derivation of GNI* from GDP is shown below in Figure 1.

- A corresponding adjusted current account measure (CA*) that records the retained earnings of re-domiciled firms as functionally equivalent to foreign factor income outflows and a corresponding adjusted stock of foreign portfolio equity liabilities.

Additionally, the CSO developed a complementary indicator, Modified Domestic Demand (MDD) that eliminates net exports and large transactions of foreign corporations from GDP, neither of which have a strong statistical association with the underlying domestic economy. MDD is a less volatile measure of domestic activity and available at quarterly frequency. GNI* is a broader measure of national income, incorporating the underlying growth attributable to trade, but is only available at an annual frequency.

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[1] Irish Economic Analysis Division
[2] See Fitzgerald (2020) and Byrne, Conefrey and O'Grady (2021) for more on this topic.

Figure 1: Transition from GDP to GNI*, 2021 values (€bil)

Source: CBI calculations using CSO National Accounts data

Since the introduction of these supplementary indicators, a number of domestic and international organisations have incorporated them into their regular forecasting exercises, including the Department of Finance, the ESRI and the Central Bank of Ireland.[3] However, a number of difficulties in the GNI* estimation process has complicated the forecasting process for GNI* and CA*.

The initial approach to estimation of GNI* used what was described as a "top-down" methodology.[4] To remain consistent with CSO calculations, forecasts for two separate series would be derived: the headline GNI series and globalisation effects related to highly mobile economic activities of MNEs. The projections of globalisation effects would then be removed from the GNI series to create a forecast of GNI*.

As an alternative approach, the ESRI, Department of Finance and IFAC adopted a "bottom-up" methodology in 2020. The process uses MDD as a starting point, and estimates changes in the difference between GNI* and MDD (referred to as the "residual") as being a function of changes in net domestic exports, such that:

$$\Delta Residual_t = \Delta Domestic\_Exports_t - \Delta Domestic\_Imports_t$$

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[3] See Department of Finance (2021).
[4] This was the approach taken by the ESRI and the Department of Finance prior to 2020.

As with the top-down approach, there are a number of assumptions embedded in this framework:

- As domestic exports and imports are not an available statistical measure, they must be approximated. The standard approach is to take gross exports (imports) and eliminate all exports (imports) from any sector where MNE activity is believed to account for more than 50% of GVA.

- Net factor income is forecast to remain constant year-to-year, i.e. ΔNFI=0. This is based on the assumption that profit outflows is the largest component of NFIs, and MNEs are the primary driver of profit outflows.

- The statistical discrepancy in the modified current account (CA*) is constant year-to-year, over the forecast horizon.

- Net current transfers follow an identical growth rate to GNI*, over the forecast horizon.

- Changes in value added components of all MNE activities are captured indirectly in MDD projections, with no other direct contributions to growth from the MNE sector.

Forecasts for the residual in the GNI* calculation are obtained by adding the projected change in net domestic exports to residual outturns for the previous year. This is then added to MDD to reach GNI*. While this approach addresses some of the issues with the top-down forecasting approach, and remains consistent with the underlying concept of GNI*, there are still a number of complications attached to the methodology.[5]

These difficulties include short sample problems, issues with data granularity, and the need for additional forecasts of some exogenous variables.[6] [7] Furthermore, the in-sample forecast performance suggests that efficiency gains from this method may be limited, with more naïve approaches producing better forecast performance.

Forecasting GNI*: An Alternative Statistical Approach

There is a high degree of correlation between MDD and GNI*; unsurprising given that MDD accounts for between 88% and 102% of GNI* over the 1995-2021 period.8 Fitting a basic statistical

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[5] These include the restrictive assumptions failing to hold in practice, the difficulty in only excluding MNE trade activities in the merchandise and services trade data, and the considerable lag in obtaining disaggregated services import and export figures at the sectoral level.

[6] As data is only available for domestic imports and exports back to 2003 on an annual basis, regression methods using these series will be underpowered, with an additional decade of data required before sampling distribution of the estimators starts to be well-approximated by a normal distribution.

[7] Services imports and exports data is only available with a 9-18 month lag. Given this issue, it is likely that estimates will need to be used for both the current and previous year when generating forecasts of net exports.

[8] The correlation between both variables is 98.2% in levels, 94.8% in first differences, and 93.4% in growth rates.

relationship between MDD and GNI* growth rates produces an estimate of GNI* growth that is surprisingly efficient. Figure 2 presents the results from this method, against a bottom-up approach, to the actual realised growth rate of GNI* over the 2004-2021 period.

As can be seen from the chart, the estimate of GNI* that relies solely on the relationship with MDD preforms relatively well in tracking GNI* growth rate over the sample period. In comparison to the estimate derived from the bottom-up approach, the sum of squared errors (SSE) is reduced by 36 per cent, while the average absolute error declines from 3.5 per cent to 2.3 per cent.[9]

Figure 2: Forecast estimates of GNI* Growth, 2004-2021
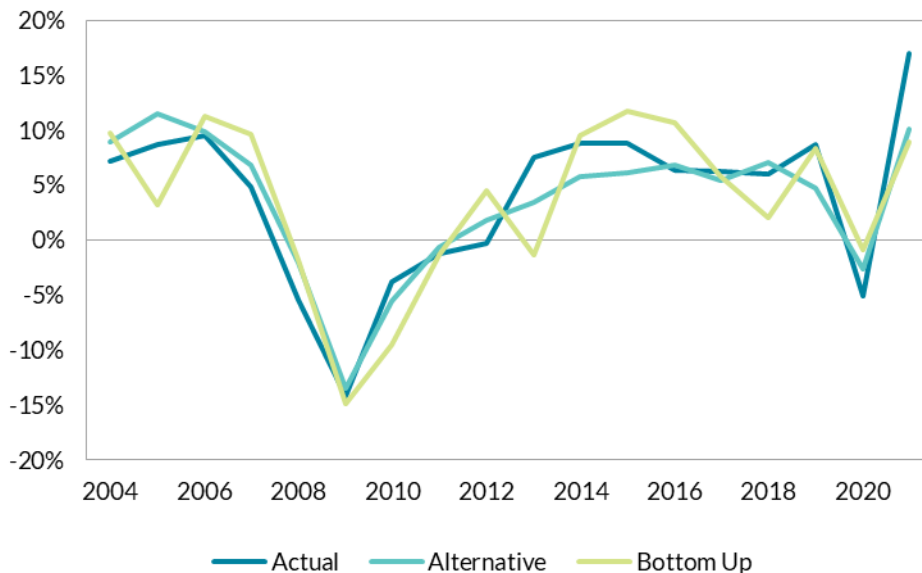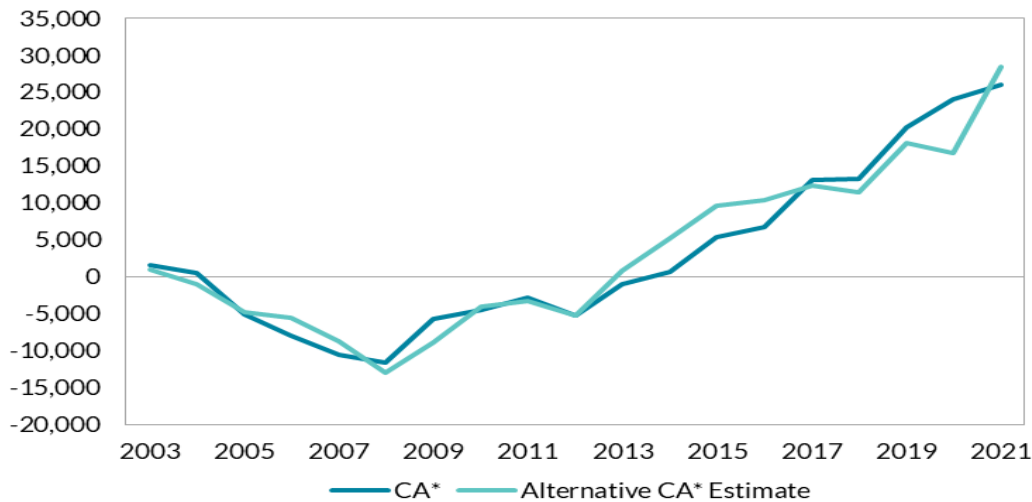

Source: Author's calculations using the CSO National Accounts database and the ECB Trade Consistency Exercise.

Similarly, when forecasting the modified current account (CA*), the difference between GNI* and MDD is a good predictor of CA*. Again, simple statistical correlations show a 97 per cent correlation in levels, and a 78 per cent correlation in first differences, between both series.

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[9] SSE is defined as the sum of the squared deviation between actual values and the predictions of the model.

Figure 3: Forecast estimates of CA*, 2004-2021

Source: Author's calculations using from CSO National Accounts data.

While the estimate of CA* (Figure 3) does not perfectly match the actual data, it does track movements and directional trends in the series with a strong degree of accuracy.

The approaches presented in this Box are by no means considered to be optimal methods for forecasting GNI* or CA*. Rather, they present an alternative technique to the current top-down and bottom-up approaches that are used, and give an improved level of forecast accuracy, despite the reduced degree of complexity and data requirements. A drawback of the statistical approach relative to the bottom–up method is that it does not identify the changes in the components of GNI* that are behind the forecast for the aggregate measure.

While there is still ongoing work across most Irish economic organisations to better understand dynamics in GNI* and CA*, simple statistical methods can provide a useful benchmark forecast for both variables. This approach can then be complemented with the bottom-up method or top-down method, in addition to expert judgement regarding the prevailing state of MNE activity or domestic exports and imports. Table 1 below shows the forecasts for nominal GNI* and the modified current account based on the statistical approach. Nominal GNI* is projected to grow by 13.6 per cent in 2022 before moderating to average growth of around 7 per cent in 2023 and 2024. A modified current account surplus of over 11 per cent of GNI* is projected out to 2024.

Table 1: Forecast estimates of for MDD growth, GNI* growth and the CA*-to-GNI* ratio, 2022-2024

	2020	2021	2022(F)	2023(F)	2024(F)
MDD growth (nominal)	-4.90%	9.90%	13.60%	7.20%	6.20%
GNI* growth (nominal)	-5.10%	16.90%	13.70%	7.50%	6.60%
CA* / GNI*	12.00%	11.10%	11.70%	11.50%	11.40%