Time to build a new practice of foresight for national economies? Ireland, and uncertain futures in forecasts and scenarios

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Abstract

Purpose – *The literature on economic forecasting, is showing an increase in criticism, of the inaccuracy of forecasts, with major implications for economic, and fiscal policymaking. Forecasts are subject to the systemic uncertainty of human systems, considerable event-driven uncertainty, and show biases towards optimistic growth paths. The purpose of this study is to consider approaches to improve economic foresight.*

Design/methodology/approach – *This study describes the practice of economic foresight as evolving in two separate, non-overlapping branches, short-term economic forecasting, and long-term scenario analysis of development, the latter found in studies of climate change and sustainability. The unique case of Ireland is considered, a country that has experienced both steep growth and deep troughs, with uncertainty that has confounded forecasting. The challenges facing forecasts are discussed, with brief review of the drivers of growth, and of long-term economic scenarios in the global literature.*

Findings – *Economic forecasting seeks to manage uncertainty by improving the accuracy of quantitative point forecasts, and related models. Yet, systematic forecast failures remain, and the economy defies prediction, even in the near-term. In contrast, long-term scenario analysis eschews forecasts in favour of a set of plausible or possible alternative scenarios. Using alternative scenarios is a response to the irreducible uncertainty of complex systems, with sophisticated approaches employed to integrate qualitative and quantitative insights.*

Research limitations/implications – *To support economic and fiscal policymaking, it is necessary support advancement in approaches to economic foresight, to improve handling of uncertainty and related risk.*

Practical implications – *While European Union Regulation (EC) 1466/97 mandates pursuit of improved accuracy, in short-term economic forecasts, there is now a case for implementing advanced foresight approaches, for improved analysis, and more robust decision-making.*

Social implications – *Building economic resilience and adaptability, as part of a sustainable future, requires both long-term strategic planning, and short-term policy. A 21st century policymaking process can be better supported by analysis of alternative scenarios.*

Originality/value – *To the best of the authors' knowledge, the article is original in considering the application of scenario foresight approaches, in economic forecasting. The study has value in improving the baseline forecast methods, that are fundamental to contemporary economics, and in bringing the field of economics into the heart of foresight.*

Keywords *Foresight, Forecasting, Scenarios, Economy, Uncertainty, Public policy*

Paper type *Conceptual paper*

1. Introduction

1.1 Two distinct branches of economic foresight, forecasts and scenarios

Economic foresight, in public policy, could be described as a practice of considering the future evolution of an economy to support better analysis or improved decision-making. Much of the heritage of economic foresight activities resides in two almost entirely separate

branches of practice, short-term economic forecasts and long-term economic scenarios. Economic forecasts are the conventional approach used to consider the future growth of national economies and related fiscal balances and are used in support of government budget management. Economic forecasting seeks accurate prediction and typically develops a single forecast, sometimes with policy variants or shocks, with a particularly strong role for observed historical patterns. This branch has focused its empirical efforts on improving the accuracy of prediction (Windsor, 2021). Forecasting typically considers theories of growth and observed historical trends to set the model input assumptions for a quantitative macroeconomic model. Economic forecasting has often concentrated on timescales of one to three years (Frankel, 2011) and considers ten years as "long-term" (Morikawa, 2020). Hendry (2018) mounts a considerable challenge to macroeconomic forecasting across theory, data and models. Hendry (2018) argues that all macroeconomic theories are incomplete and incorrect, all macroeconomic time series are inaccurate, and that all macro-econometric models are mis-specified in numerous ways. Hendry proceeds to conclude that macroeconomic forecasts often go awry, with consequences for policy.

A distinctly separate branch of economic foresight has arisen in the past three decades, primarily in answer to the need for long-term analysis of global sustainability and development challenges, including analytical and policy inquiry of climate change (IPCC, 1992; Nakicenovic *et al.*, 2000; Van Vuuren *et al.*, 2014; O'Neill *et al.*, 2014; O'Neill *et al.*, 2015) and of ecosystems and biodiversity (Alcamo *et al.*, 2005; UNEP, 2007; Pereira *et al.*, 2010). The heritage of global change scenarios is similar to the practice of "scenario planning", applied in corporate and strategic planning (Schwartz, 1995; Schoemaker, 1995). The core difference within these fields is the general acceptance of the centrality of uncertainty in how complex human systems unfold into the future. This led to the conclusion that accurate prediction and forecasting are not methodologically appropriate, with historic patterns providing limited insight. The objective of scenario analysis is, therefore, not prediction but to better handle uncertainty, across a divergent set of alternative scenarios, that map a range of plausible or possible futures. The practice of long-term economic foresight, as part of this "scenario analysis", often addresses timescales from 30 to 50 years, and even up to 100 years or more for global environmental change.

These two distinct fields of practice, in short-term economic forecasts and long-term economic scenarios, have evolved almost entirely separately and rarely cross-over. Sustainability challenges, such as climate and ecological breakdown (IPCC, 2018; IPBES, 2019), have increased the need for improved long-term economic, social and sustainability foresight. In parallel, the global recession of 2008, and the recent global pandemic, have put increased attention on the uncertainty prevalent in more immediate short-term economic forecasts. Attention is being increased on how this near-term term economic foresight responds methodologically to the irreducible uncertainty implicit in all human systems across all timescales and at all levels.

1.2 Uncertainty in the general field of economic forecasting

In general, deep uncertainty is a challenge to analysis of how complex economic, social and environmental systems may evolve in the future (Nakicenovic *et al.*, 2000). For econometric models, this includes overconfidence in forecasts due to uncertainty in the causal variables in an econometric model and assumptions about relationships that do not hold over the time horizon (Armstrong, 2001). The further into the future an analysis proceeds, the more uncertainty inevitably grows. More than thirty years ago, Funtowicz and Ravetz (1990) made a useful contribution by distinguishing three main sources of uncertainty: data uncertainties, modelling uncertainties and completeness uncertainties. Respectively, these refer to the appropriateness of data inputs, incomplete understanding of modelled phenomena and lack of knowledge due to factors that are unknown or unknowable. Yet even in the short-term, forecasts and projections can perform poorly. For macro-economic forecasting in general and small globalised economies such as Ireland in particular, accurate predictions are difficult to achieve even on short timescales

(Bergin *et al.*, 2009). This includes uncertainty related to factors external to these economies, in international markets, but also due to internal complexities.

In short-term forecasting, including in-year and next-year forecasts, errors have repeatedly been found. The focus on uncertainty in the short-term has consequently increased, particularly in the past decade, since the financial crash and resulting recession (Windsor, 2021; Potter, 2019; Morikawaa, 2020; Cronin and McQuinn, 2020; Beyer, 2017; Frankel and Schreger, 2013; Braude, 2012; Frankel, 2011).

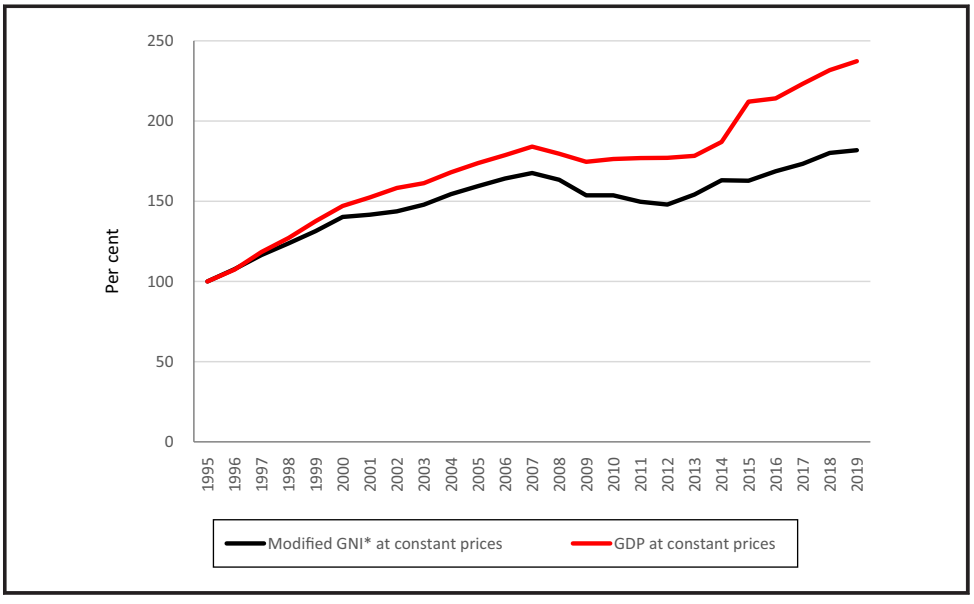
An additional challenge emerged with the arrival of the global COVID-19 pandemic and related economic uncertainty in 2020 [International Monetary Fund (IMF), 2020]; this added further attention to event-driven uncertainty, in addition to ever-present systemic uncertainty in economies. The literature on forecasting widely accepts the problem of forecast error, chiefly in the form of an optimistic growth bias. In a sample of 33 countries, Frankel (2011) found a mean upward bias in gross domestic product (GDP) of 1.8% over three years. Morikawa (2020) found an upward bias in 10-year economic growth forecasts of Japan, with academic researchers errors less than in private institutes but more than in other fields. Merola and Pérez (2013) found a correlation between optimistic forecasts of European governments, with both economic upturns and electoral cycles and noted that independent agencies also internalise these biases. Consistent with this, Cronin and McQuinn (2020) noted the problem of recency, in that there has been a shift to a pessimism bias in the economic downturn in European Union (EU) Member States. Windsor (2021) concluded that, since the financial crisis that began in 2008, there has been increased criticism of over-reliance on the forecasts of macroeconomic models and more focus on better understanding particular sectors of banking and households. In the EU, Regulation (EC) 1466/97 requires that short-term economic projections are based on "the most likely macro-fiscal scenario, or on a more prudent scenario", and allows for sensitivity analysis of the main variables. Yet despite changes to practices, including independent oversight, forecasts continue to experience persistent errors.

1.3 Introducing economic uncertainty, the Irish case

The case of Ireland is interesting from a number of empiric and policy perspectives. As per Figure 1, it experienced unprecedented economic growth through the 1990s and into the 2000s. This period involved a rapid economic expansion, with evolution from a largely agrarian, to an increasingly services-based economy. In this period of growth, popularly coined "the Celtic Tiger", the nations' economic ranking was reversed from one of the poorest to one of the richest Member States of the EU (DGECFIN, 2006). This pattern came to an abrupt halt with the financial crisis and global recession in 2008. Many economic commentaries believed Ireland's economy would come to a "soft landing" (Bergin *et al.*, 2003; Rae and van den Noord, 2006). Ireland's 2005 "Medium Term Review" proposed that the fundamental factors driving the Irish economy remained favourable while also noting a number of threats present, including in the building and construction sector, and that a correction was increasingly likely (Fitzgerald *et al.*, 2005). Immediately prior to the recession, the subsequent review in 2008 ceased mention of these threats, forecasting optimistically that the economy was "resilient", and that the fundamentals of the economy were sound (Fitzgerald *et al.*, 2008). The recession that followed in the Autumn of 2008 was comparatively deep in Ireland and persisted for a number of years. It led to high social costs, a growing public deficit, and the arrival of EU/International Monetary Fund (IMF) intervention in 2010.

The importance of monetary and fiscal policy errors are recognised, yet the severity of the collapse in the housing market, the financial crisis and consequently the deep recession were strongly linked to weak governance and regulation of finance (Honohan, 2010; Regling and Watson, 2010). It can also be related to policy for economic and physical development. For at least two decades up to 2008, the development strategy was to champion pursuit of output growth and largely ignored risk and sustainable development (O'Mahony *et al.*,

Figure 1 Ireland's Real GDP and Real GNI* from 1995 to 2019 from CSO (2020) in 2018 prices



2013). Notwithstanding the risks of policy failures, forecasts in Ireland have concentrated on improving short-term accuracy, in line with the focus of EU regulation. In Ireland, national capacity for long-term economic foresight and for scenario analysis and strategic planning has not been a priority.

It can be seen in Figure 1, in the more recent years post-crisis, that strong GDP growth resumed in Ireland. This may be attributed to the activity recovery that can occur post-recession, but it is also partially related to measurement. It is accepted that the GDP data in Ireland is distorted by globalisation, chiefly the movement, by multinational enterprises, of profits arising from intellectual property. The difference between these two values led to international controversy. Ireland's GDP data was termed "leprechaun economics" by Paul Krugman after a 26.3% growth was reported for 2015. Much of this growth arose from an extreme example of a base erosion and profit shifting action to the European headquarters of the US multinational Apple Inc. This distortion led Ireland's Central Statistics Office (CSO) to create its "modified Gross National Income" (GNI*) indicator, to strip this distortion out. While growth measured by GDP increased by +235% from 1995 to 2019, modified GNI* increased by +182%, a 53-point reduction (CSO, 2020).

Pre-COVID, for the last quarter of a century, Ireland's economy grew and fell rapidly and then returned to strong growth once more, with the notable caveats on data. The uncertainty in future economic development is considerable, even in the short-term. In scenarios parlance, "wildcard" events such as the financial crisis and the global pandemic pose major challenges for all economic forecasts. This is in addition to the uncertainty that is ever-present in the driving forces of economic growth in general.

In response, this conceptual article seeks to discuss economic uncertainty and consider the potential of using scenario analysis, to further enhance economic foresight, even in the short-term. Continuing with the useful case of Ireland, Section 2 briefly rehearses current understanding of factors affecting long-term economic development, followed by comparison of forecasts and scenarios of Ireland's economy. Section 3 discusses approaches with potential to assist in improving economic foresight, in analysis and in support of policy and decision-making. Section 4 provides concluding remarks.

2. Considering long-term future economic development

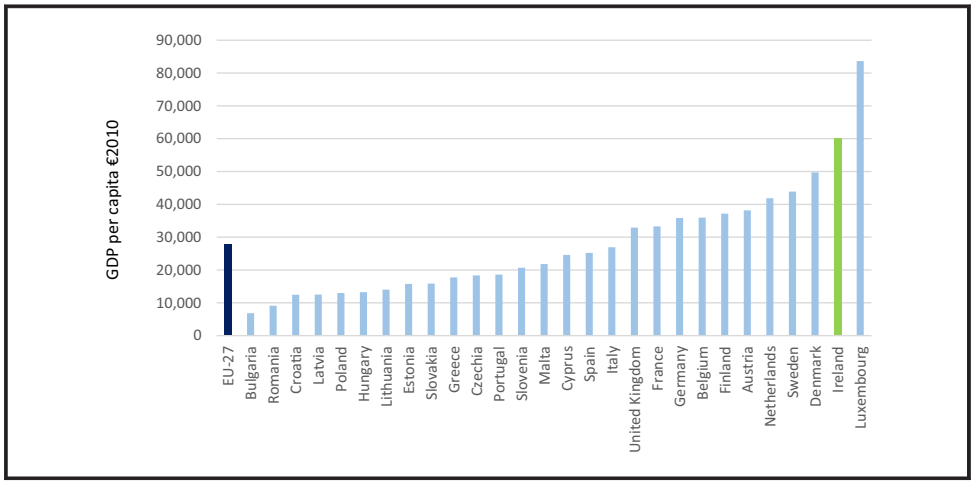
2.1 Factors affecting long-term economic development, and the Irish case

Economic growth can be achieved by increasing factor inputs to production, such as capital or labour, or by increasing productivity (Nakicenovic *et al.*, 2000). Solow (1957) suggested that the key factors in explaining long-run growth are knowledge and technology. It is commonly anticipated that advanced economies converge in the long-run. Rostow (1990) coined the term that the "poor get richer and the rich slow down", reflecting the convergence theorem of neoclassic theory and diminishing returns on capital. Lange *et al.* (2018) pointed to heterodox theories and cast doubt on the received wisdom of exponential growth, in keeping with newer theories on *secular stagnation*. The authors showed that in 18 mature economies, growth per capita from 1960 to 2013 was linear, with only two countries exhibiting exponential per-capita growth at the perceived "normal" level of >1.3%.

In Ireland, the conditions that led to strong growth economy until global recession in 2008 are variously attributed. As discussed in Cech and Macdonald (2004) and Fitzgerald *et al.* (2008), credit has primarily been given to state-driven economic development; social partnership arrangements; increased labour force participation of women; decades of investment in domestic higher education; targeting of foreign direct investment; a low corporation tax rate; an English-speaking workforce; and crucial EU membership, which provided transfer payments and export access to the EU Single Market. Ireland's rapid economic growth, and the resulting development catch-up on its neighbours, ended abruptly in 2008. The coincidence of a sudden correction in over-valued national house prices, rising unemployment and the consequent banking and public finance crisis with the global recession shocked Ireland's economy into rapid contraction (Bergin *et al.*, 2009). Notwithstanding the impact in Ireland of anomalies in the reported GDP data, economic growth recovered in the years following the recession, as per Figure 1. The impact of Brexit, the coronavirus pandemic and potential global recession are considerable near-term uncertainties. The long-term involves even greater challenges for economic foresight.

A key factor in recent decades was that Ireland was playing development catch-up on its neighbours, as per Rostow (1990), a phase which it has now substantially passed. Figure 2 shows that Ireland's GDP per capita (GDPPC), at €60,170 (in 2010 € values), is the second highest in the EU, behind Luxembourg (EUROSTAT, 2021). This is more than double the EU-27 average (€27,970) and almost double that of its nearest neighbour, the UK (€32,910).

Figure 2 2019 Real GDP per capita in the EU-27, plus the UK, from data by EUROSTAT (2021)



Consequently, a continuation of the high historical rates of growth observed in Ireland does not appear plausible.

2.2 Forecasts and scenarios of Irish economic growth

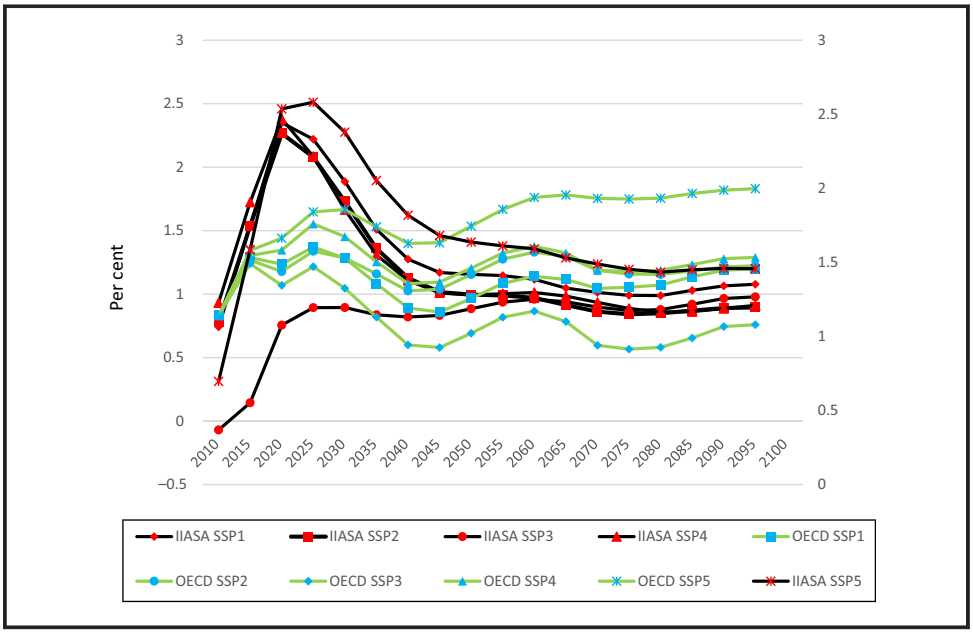
National economic forecasts in Ireland have predominantly focussed on the period up to 2025 (Bergin *et al.*, 2016) for the purposes of supporting short-term economic and budgetary policy. More recently, the impact of the pandemic on growth up to 2030 has been considered (de Bruin *et al.*, 2020) [1]. In-year forecasts have recently shown volatility due to the uncertainty of the impacts of the pandemic and containment measures. In the fourth quarter of 2019, the GDP forecast for 2020, was for a growth of +3.3% (McQuinn *et al.*, 2019). In the second quarter of 2020, this was amended downwards to a –12% reduction (McQuinn *et al.*, 2020a). In the fourth quarter of 2020, this was amended upwards again, to +3.4% growth (McQuinn *et al.*, 2020b). In addition to the uncertainty arising from the SARS-COV-2 related global pandemic, of 'COVID-19', the impact of Brexit on the Irish economy has also been a challenge noted in national forecasts. For this event-driven uncertainty, the estimated deviation from baseline over 10 years, under three forecasts of trade arrangements between the UK and the EU, ranged from –2.2% to –3.5%, as a permanent reduction in GDP from the baseline forecast (Bergin *et al.*, 2016).

For the long-term economy, this is less studied nationally. The short-term economic forecast produced by Bergin *et al.* (2016) considered growth to 2025 and assumed that long-run wage growth would converge towards inflation at 1.5%. In developing an energy and carbon emissions baseline forecast to 2050, Chiodi (2014) assumed growth in GDP averaged at of 1.7% per annum, or 1.0% in GDPPC. Glynn *et al.* (2019) made an assumption of average growth in GDP to 2050 of 1.8%. In moving from assumptions to modelled long-term outcomes, the European Commission produced a projection for Ireland to 2070, estimating potential growth averaged at 1.6% in GDPPC (DGECFIN, 2017). "Potential" growth is considered the highest growth that can be sustained over the long term using the Cobb–Douglas function [2].

In long-term economic foresight, the focus has been on updating the Special Report on Emission Scenarios (SRES) (Nakicenovic *et al.*, 2000) by developing the shared socio-economic pathways (SSP's). The SSP's (Van Vuuren *et al.*, 2014; O'Neill *et al.*, 2014) are the most comprehensive explorations of future economies available and were developed to assist in understanding long-term greenhouse gas emission paths, their mitigation and also for climate change impacts and adaptation. For the high income countries, across the five scenarios from labelled in sequence from SSP1 to SSP5, these frame plausible average annual growth of GDPPC from 2010 to 2100, in a range of 0.6% to 1.6% (Leimbach *et al.*, 2017). The SSP scenarios have been interpreted for national-level change in GDPPC [3] by the Organisation for Economic Co-operation and Development (OECD) in Dellink *et al.* (2017) and by the International Institute for Applied Systems Analysis (IIASA) in Cuaresma (2017). The paths of Ireland's GDPPC in the scenarios of Dellink *et al.* (2017) and Cuaresma (2017) are illustrated in Figure 3. The scenario sets of each study are grouped by a common colour in Figure 3, as it is the pattern and scenario range that are of chief interest. Also, while the OECD scenarios adopt a common point of departure in 2010, the IIASA scenarios take a different interpretation, varying the starting point. For Ireland, the scenarios of Dellink *et al.* span a range of average growth in GDPPC, across the five scenarios, from 0.8% to 1.6% per annum to 2100. The IIASA scenarios (Cuaresma, 2017) span a range of 0.8%–1.7% annual average growth in GDPPC. The overall patterns of these two studies of Ireland's long-term economy are distinctly different.

The OECD scenario interpretations, based on an augmented Solow growth model, show a gradual process of convergence to a balanced growth path (Dellink *et al.*, 2017). These scenarios explore tempered growth in the initial two decades and a wider span in subsequent decades to 2100. The IIASA scenarios are based on a standard macroeconomic production function, with labour input differentiated by age and education attainment level (Cuaresma, 2017). The IIASA scenarios have evidently placed greater

Figure 3 Average annual change in GDPPC for Ireland in the SSP scenario interpretations from the OECD (Dellink *et al.*, 2017) and IIASA (Cuaresma, 2017)



emphasis on recency in the plausibility of near-term growth, showing higher growth in the initial two decades followed by a narrower range later.

3. Discussion of potential approaches to improve economic foresight

The considerable challenge of improving economic foresight has had different responses by discipline and by methodological focus. Economists, statisticians and forecast modellers are typically focussed on improving the accuracy of prediction from quantitative economic forecasting models. Hendry (2018) highlights the systematic forecast failure pervasive and pernicious across equilibrium-correction mechanism (EqCM) models [4] due to unanticipated "location shifts" in underlying data distributions, with the financial crisis offered as a key example. The wider, cross-disciplinary field of forecasting encompasses a multitude of approaches to producing and evaluating forecasts, identified in the review of Petropoulos *et al.* (2022). The voluminous interdisciplinary authorship involved in the review paper of Petropoulos *et al.* (2022) considered dozens of approaches relevant to economic forecasting, beyond standard statistical and econometric models, including Bayesian probabilistic forecasting, such as Monte Carlo simulation; data-driven, including big data models; neural networks and agent-based modelling; and also noted the role of scenarios [5] and judgemental forecasting. In response to the failure of neoclassical equilibrium-based models [6] to anticipate the credit crisis and resulting economic recession, Bezemer (2010) advocated for a move from equilibrium-based models to accounting flow-of-funds models. Notwithstanding the value of improving modelling approaches, the critique of Hendry (2018) is pertinent, as it reflects the growing acknowledgement of the challenges to forecasting approaches, even in addressing the short term (Windsor, 2021; Potter, 2019; Morikawaa, 2020; Cronin and McQuinn, 2020; Beyer, 2017; O'Mahony, 2014; Frankel and Schreger, 2013; Braude, 2012; Frankel, 2011). Hendry offers that the primary justification for macroeconomic evidence is conformity to conventional theory, and contends that this is different from most science, which accords equal weight to both theory and data on actual outcomes, the latter termed "verisimilitude" (Hendry, 2018) [7].

In contrast to the forecast communities addressed by Petropoulos *et al.* (2022), the general foresight and scenario analysis and scenario planning communities have long been more focussed methodologically on addressing uncertainty and strategically on improving decision-making (de Jouvenel, 1986; O'Mahony, 2014). Specifically with respect to economics, adopting scenario analysis is consistent with the long-established movement for "complexity economics" that views economies as complex systems subject to irreducible uncertainty (Gomes and Gubareva, 2021; Kirman, 2018; Farmer, 2012; Anderson *et al.*, 1988;). This is also consistent with Hendry's conclusions on the effect of "location shifts" (Hendry, 2018) and with the emergent conclusion in the economic forecasting literature cited above – that national economies, even in the short-term, defy prediction. The most prominent scenario analysis application that can be found throughout science, that is inclusive of economics, could reasonably be described as that occurring in sustainability science across climate change and biodiversity research. Critical to understanding these societal priorities are future paths of economies and societies that lead to environmental pressures. The various activities of the Intergovernmental Panel on Climate Change (IPCC) have been at the forefront of improving long-term foresight activities in economics.

Before the process for the SSP scenarios, the IPCC SRES was a watershed in the long-term analysis of economic development, technology, demographics and sustainability (Nakicenovic *et al.*, 2000). The SRES specifically acknowledged that many biophysical and social systems are complex in evolution and poorly understood. In response, the SRES had the explicit objective of providing neither predictions nor forecasts but of exploring *equally plausible images* of future development. This was achieved through an *integrated* scenario process, where the scenarios are linking tools that integrate qualitative narratives, or storylines, with quantitative interpretation by modelling. The main differences between model-based and narrative scenarios in these fields has been the technical and economic detail in the former and social, political and cultural developments in the latter (Nielsen and Karlsson, 2007). Morita *et al.* (2001) characterised qualitative scenarios as holistic integrated sketches of the future that have a greater power to posit system shifts and to include critical factors that defy quantification such as values, cultural changes and institutional features. In contrast, quantitative models seek mathematical representation of key features of human and environmental systems to represent the evolution of systems under alternative assumptions and permit systematic and replicable analysis. As not all driving forces may be quantified in models, state of the art in scenario analysis includes qualitative approaches to systematically identify and analyse scenario driving forces and their potential interactions. Inter and transdisciplinary scenario studies frame driving forces under characterisations that may include: society and culture, governance, economy, demography, technology and environment [8].

In reviewing progress in global scenarios, Fisher *et al.* (2007) described how the limits of both deterministic modelling and descriptive analyses were shown in the first decades of emission scenarios and led to the advancement in the literature of a synthesis of qualitative and quantitative approaches as a way forward. As a non-probabilistic assessment, the SRES did not present any of the scenarios as more or less likely. In the IPCC expert meeting on emissions scenarios in 2005, the issue of uncertainty in scenario analysis surfaced once more (IPCC, 2005). The two main approaches to uncertainty were outlined as using narratives and using probabilistic approaches such as Monte Carlo simulation. It was noted that these approaches can be complimentary but that probabilistic analysis is not ideal on its own. This is because a reliance only on quantitative modelling overlooks drivers and dynamics that can only be fully considered in qualitative terms, and not least the ethical dimensions.

Given the high level of uncertainty involved in long-term global scenarios, these need to span a wide range of future trajectories. Specifically in the SSP process, these do not cover the full spectrum of "plausible" economic paths but seek to illustrate a substantial variance in GDP levels by the end of the century as *alternative exploratory scenarios*. Recognising the prominence of complexity and uncertainty in future development is fundamental to

methodologies for long-term scenarios. Integrating qualitative and quantitative approaches and considering a wide span of plausible future developments are key tools to respond. An important conclusion from the IPCC's review of the IS92 scenarios (Alcamo *et al.*, 1995) that came before the SRES was the need to use all of the scenarios in the set and not to focus on a single central reference scenario. This asserted that "best guess," "business-as-usual," or "likely" scenarios are not appropriate to address uncertainty.

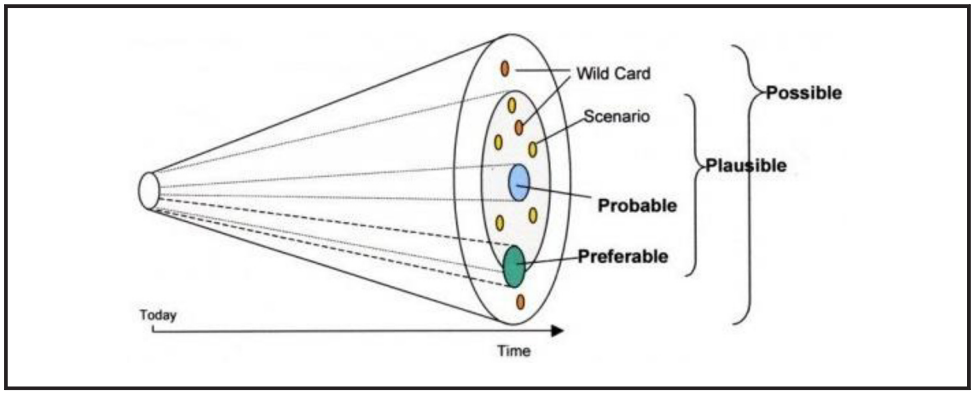
Some of the key analytical questions which seek foresight of long-term future developments include macroeconomic and population forecasts, energy and emissions projections and low-carbon and sustainability transitions. Yet this breadth of disciplines can apply terms such as "scenarios" interchangeably, whereas in the discipline of *futures studies* and in some elements of IPCC climate research, they have typically been more defined: where *projections* rely on historical trends, and *forecasts* on likely trends, *exploratory scenarios* are used to explore alternative outcomes in a plausible range [9] (Hummel, 2007). Another important scenario approach, sometimes used in low-carbon and sustainability transitions, is *backcasting* (Robinson, 2003). This is used to identify preferable or desirable futures and to work back the paths for achieving them. The main alternative approaches to foresight and scenario types are illustrated by the "futures cone" in Figure 4, by Voros (2001), adapted from Hancock and Bezold (1994).

While scenario analysis has chiefly been the preserve of global and long-term analysis, irreducible uncertainty and the related inability to accurately forecast in the short-term provide a credible basis for the extension of the application of scenario analysis to national economies, even in the short-to-medium term. A reliance on forecasts and projections can potentially misguide the understanding of potential change and leave policy and decision-making vulnerable to it. While recognising the value in improving quantitative modelling, a much greater focus on the assumptions inputted to modelling, à la scenario analysis, can credibly be supported. A concerted effort to improve economic foresight, in the form of national scenario analysis, in parallel to enhanced modelling, offers potential benefits for both empirical understanding of economic phenomena and economic policymaking that is strategically robust to future uncertainty.

4. Concluding remarks

The two main analytical branches of economic foresight, in shorter-term national economic forecasts and in long-term global scenario analysis, have evolved on different, largely non-overlapping paths. Short-term forecasting, from in-year forecasts, up to five years, are used for national economic and budgetary control. In the EU, forecasts are mandated by regulation, which permits sensitivity testing. The expanding literature on forecast accuracy

Figure 4 The "futures cone" by Voros (2001), adapted from Hancock and Bezold (1994)



has repeatedly shown a systematic optimism bias towards higher economic growth correlated with recent economic expansion and with electoral cycles. A new study has shown a pessimism after a recent downturn (Cronin and McQuinn, 2020), which together suggests that an excessive focus on the recency of current dynamics is a consistent problem for forecasts.

The case of Ireland is considered by briefly reviewing the factors leading to growth, the performance of forecasts and the long-term scenarios for the economy available from the international literature. The Irish case shows the considerable challenges that have confounded even in-year forecasts, including the 2008 financial crisis and the 2020 pandemic. It suggests mandatory economic forecasts, including that of the EU 1997 Regulation, may be counter-productive to sound national economic policy. Forecasts attempt to put preciseness on developments that have proven volatile and uncertain and can mis-guide policy decisions with major consequences. For Ireland in particular, but national economies in general, building capacity for economic foresight and strategic planning, including through scenario analysis, has the potential for notable public policy benefits.

The practice of scenario analysis, as the conventional approach in global study of sustainability in energy, emissions and biodiversity, has developed advanced approaches to long-term economic foresight. The combination of qualitative and quantitative methods in integrated scenario analysis is particularly useful. Rather than seeking to predict or forecast outcomes, scenario analysis seeks to embrace uncertainty by exploring a plausible or possible range and by encouraging more robust decision-making under uncertainty. For the long-term, it is crucial that neither strategic policy nor empirical analysis is based on single "most likely" forecasts or on baselines and variants. For the short to medium-term, it is pertinent to reflect on whether chasing improved accuracy is a chimera. There will continue to be an academic interest in forecasting, which can be useful to analyse the implications of specific developments in known and knowable research questions. However, the prudence of trusting economic foresight to single forecast or projection approach may be questioned, both for analysis and for decision-making.

The general field of forecasting (Petropoulos *et al.*, 2022) and the specific field of economic forecasting (Hendry, 2018) typically conclude that uncertainty is pervasive, leading to persistent inaccuracy of forecasts. Related arguments have recently surfaced in the literature on economic forecasting. Both Windsor (2021) and Potter (2019) have proposed a need to move away from over-reliance on forecasts by macroeconomic models. While recognising the usefulness of modelling of future outcomes, and the value in improving model choice and practice, in contrast to relying on improving forecast accuracy, there is merit in considering the application of scenario analysis to embrace uncertainty and to improve decision-making, even in the short-term (O'Mahony, 2014). In addition to analysing known uncertainties, this approach can also be used to consider "wildcard" events of low probability and high impact. The objective of economic foresight, through a scenario analysis, would not be to prescribe a forecast, of a single likely outcome but to develop a range of plausible scenarios within which analysis can be improved and decisions tested. Rather than seeking to reduce uncertainty, this is consistent with embracing it and encouraging decision-making that is resilient to change. These strategic foresight processes are also relevant to issues such as the 2008 economic crisis and the global pandemic, which were not high on conventional economic radars, but could be found as "weak signals" in foresight-related literature.

A pivotal development in economics in recent years has been the wide recognition of the critical importance of sustainable development [Stiglitz *et al.*, 2009; Fleurbaey *et al.*, 2014; International Panel on Social Progress (IPSP), 2018]. This goes beyond the specifics of "sustainable" economic, financial and budgetary management to critical social and environmental sustainability, on which economies fundamentally depend. Within this literature, there is discussion of "green growth" and "degrowth" paths (Grubb *et al.*, 2022) and the need to address both in analytical scenario literature (Keyßer and Lenzen, 2021). Frontier literature

suggests the potential to move to win-win outcomes (Rogelj, 2018). Strategically, this offers the opportunity to consider "prosperity without growth" (Jackson, 2009) and to reconceptualise development towards achievement of sustainability and wellbeing as the ultimate goals (O'Mahony, 2022). Consequently, a strategic process of economic foresight also offers a possible opportunity to align economic policymaking with sustainable development and to vision and critique plans for economic development intended to achieve it.

Foresight is now emerging as a distinct response to uncertainty in the landscape of public policy, including the OECD anticipatory governance (Tõnurist and Hanson, 2020) and the EU's first strategic foresight report (European Commission: Secretariat General, 2020). This can be related to the emergence of complex analysis between GDP and sustainability (Panula-Ontto *et al.*, 2018) as it pertains to risk in public economics and in investment portfolios in the long-run (Lauraéus and Kaivo-oja, 2017). Strategic foresight has been specifically recommended as an approach to improve public policymaking in Ireland (OECD, 2021). Exploratory and backcasting scenarios may be more beneficial for making public policy for economic foresight, to move from accuracy to adaptability, from seeking certainty to making decisions robust to uncertainty and from passively accepting the future to actively creating it.

Notes

1 The results suggested a GDP decline by 13% and 0.26% in 2020 and 2030, with respect to a business-as-usual (BaU) pattern.

2 The production function framework, based on standard specification of Cobb-Douglas Production function, with constant returns to scale, where potential GDP can be expressed formally as total output represented by a combination of factor inputs multiplied with total factor productivity (TFP), to embed the technological level. See Havik *et al.* (2014).

3 The scenarios database housed by IIASA provides the data including GDPPC from the interpretation of the SSP scenarios in Dellink *et al.* (2017) and Cuaresma (2017).

4 Where the EqCM class includes most regressions; vector autoregressions (VARs); Dynamic stochastic general equilibrium (DSGEs); and autoregressive conditional heteroskedasticity (ARCH) and generalised (GARCH) models.

5 The 'scenarios' considered in Petropoulos *et al.* (2022) are forecast-defined, rather than scenario-defined. They are optimistic and pessimistic forecasts, rather than key modes of scenario analysis inquiry, in the form of exploratory or backcasting approaches.

6 General equilibrium theory seeks to describe how the allocation of resources in a market economy, through interaction of supply and demand, will lead to equilibrium prices.

7 Farmer (2012) offers the interpretation that traditional economic theory is top-down, modelling decision making from first principles, and then testing against data later, and in contrast, econometrics, is bottom up, data-driven, but fundamentally ad hoc.

8 Kotler (1997) advanced the "six sector approach" as a typology of driving forces. The SRES (Nakicenovic *et al.*, 2000) used the "Kaya identity" to consider demographic change, social and economic development, the rate and direction of technological change and policy areas.

9 For an advanced discussion of plausibility in the case of energy scenarios see Schmidt-Scheele (2020).

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