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Towards the 2025 System of National Accounts: Well-being and sustainability

GDP and Welfare: Empirical Estimates of a spectrum of opportunity

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Summary

The National Accounts and GDP provide an internally coherent view of the economy, focussed on those goods and services produced by humanity and validated by at least one other human through market transactions. Whilst a meaningful measure, this fails to reflect value generated without human input or validation, excluding natural and human capital and the resultant flows from these. These exclusions make GDP a poor measure of welfare, despite the constant utility assumption underpinning the price deflators used to derive real estimates. In a world where policy-makers increasingly need to consider the trade-offs between the economic, environmental, and social realms, this paper applies proven methods from National Accounts to a wider set of pre-existing UK data, accepting that activity outside the market can be measured and accounted for in a similar fashion. The resultant indices, Gross Inclusive Income (GII) and Net Inclusive Income (NII) are conceptually comparable to GDP and Net National Disposable Income. This paper also presents and comments on experimental results, revealing remaining statistical challenges and policy trade-offs. The substantial shift out of market-based activity towards home production, (for example) may help reveal new causes for the UK productivity puzzle, as the resultant extra output is not visible via existing GVA estimates. Another key insight comes from combining carbon emissions and carbon prices in a volume framework, which reveals that the UK's net contribution to atmospheric degradation continues to grow despite falling emissions because the price of emissions has grown at a faster rate, resulting in continued increasing damage.

[1] Prepared by Richard Heys, Robert Bucknall, Stephen Christie, and Cliodhna Taylor.

I. Introduction

1. Many policymakers globally are unsatisfied with the present state of statistical information about the economy and society, in particular the effective treatment by many of Gross Domestic Product (GDP) as the dominant indicator of economic welfare[2] (see Stiglitz et al, 2009). As has been noted (e.g. Coyle (2015) and Dynan and Sheiner (2018)), whilst real GDP *is* a welfare measure due to the constant utility assumptions underlying the price deflators which convert nominal data to volume, it is a *weak* measure because of what it omits. Nevertheless, there appears to be an increasing gap between the information contained in GDP and the factors which contribute towards people's well-being. Recognising that value can be generated in different domains, (e.g. the environment) with different levels of human participation and finding a way to measure this in a form which is consistent with National Accounts should enable better policy-making by exposing the inherent trade-offs.

2. This paper aims to contribute to this debate by demonstrating a practical empirical application of what can already be produced to deliver objective, monetised measures of economic welfare in a country which has well-developed National Accounts, a Household Satellite Account produced in line with the System of National Accounts 2008 (UN(2008)), a set of Natural Capital Accounts produced in line with the System of Environmental Economic Accounts (SEEA) (UN(2021)), and a measure of Human Capital stocks produced in line with the relevant UN statistical guidance (UN(2016)). By applying proven National Accounts methods, whilst accepting that activity outside the market can be measured and accounted for in a similar fashion, this paper utilises pre-existing data to implement an extension of the national accounts framework. This paper captures a wider range of capitals alongside the flows of benefits received by consumers arising from these to widen the National Accounts asset and production boundaries to integrate natural capital (together with their corresponding ecosystem services) as well as begin to integrate human capital, alongside the outputs consumers receive from these in a simple additive framework, which is coherent with GDP and other national accounts metrics.

3. This paper discusses the measurement challenge (section II), proposed methods (section III), exclusions and areas for future work (section IV), empirical results (section V), and conclusions (section VI).

II. The measurement challenge

4. GDP as a single-measure index is often preferred for decision-making over other more complex presentations because it has a range of attractive analytical qualities – simplicity, international and historical comparability, objectivity of weights, regularity and frequency of publication, accuracy in terms of measuring the volume of output produced in the market, and the ability to be broken down into its component parts. These attributes make GDP dominant in many user's eyes, even if it is not conceptually aligned with the item of interest. Production of more suitable metrics alone is insufficient – there are plenty of alternatives to GDP already. To be successful, any new metric has to be better aligned conceptually *and* achieve equivalence in terms of the above attributes if it aspires to better serve users. Pragmatically this requires the use of pre-existing data, at least in terms of providing meaningful historical time series, but also to ensure budget constrained national statistics institutes (NSIs) can deliver these data at a low marginal cost. Nevertheless, it is important to ask *how* to improve conceptual alignment if we are looking to use pre-existing data.

5. GDP is a poor indicator of a society's standard of living, of overall economic welfare, because it is a partial measure which excludes important components to focus primarily on

[2] This paper refers to "welfare" in a narrow sense – as "economic" welfare measured as the flow of goods and services received by consumers. We reserve "well-being" for a more expansive and general definition. "Welfare" is therefore neutral toward the impact of the use of resources – whether they do in fact raise life satisfaction, decrease anxiety, etc. or not. This is to be contrasted with more direct measures of well-being, for example that directly ask about life satisfaction or anxiety.

the market. GDP does not directly account for activities conducted outside the market, such as unpaid work in the home or community, leisure, and the value that society may place on services provided 'free at the point of delivery'[3]. Therefore, it does not portray a complete picture of household consumption. It equally tells us little about the distribution of income or the impact of increases in variety and technology. GDP can be argued to also measure the outcomes of public services poorly and pays little attention to environmental quality or the impact of health and education services on human capital, the latter two of which are deliberately excluded. These are just a few examples of goods and services which affect people's welfare, whether or not they are bought and sold, and whose social value is not fully captured in their price even when they are transacted in the market.

6. This paper does not present a micro-data based solution to this challenge, and is not explicitly predicated on an underlying social welfare function. Rather, it presents an accounting-based approach[4] to tackling this question, which is predicated on utility being a function of consumption. Using pre-existing data sources, this paper takes the existing framework and making simple extensions to the stock and flow concepts to widen the range of consumption goods and services in scope. Throughout we shall rely on the standard national accounts methods which (on the non-financial side) can be simplified as a flows argument:

$$GDP = Y_1 = f(K_1,L_1) = r_1K_1 + w_1L_1 = C_1 + I_1 + G_1 + (X_1 - M_1) \quad (1)$$

a stocks argument:

$$K_1 = K_0 + I_0 - \delta_0 + revaluation_0 - destruction_0 \quad (2)$$

And from which we can also develop a net statement of flows:

$$Y^N_1 = Y_1 - \delta_1 \quad (3)$$

7. Where Y represents output (GDP), K represents capital assets, L represents labour, r is the rate of return on capital, w is average wages and salaries, C is consumption, I is investment, G is government expenditure, W is exports, M is imports, and δ is depreciation, with sub-scripts indicating time periods and super-script N indicates a net measure. The SNA definition of each of these variables is defined by a set of constraints or 'boundaries' defining what is in scope and not, alongside well-established methods to determine the value of each component. Within the current national accounts, key to the decision whether an item is in scope is whether there is clear human intervention in its creation / use through a meaningful economic transaction.

8. However, if one is willing to extend these 'boundaries' to capture relevant concepts there is little to prevent the application of essentially the same 'stocks and flows' national accounts methods to wider data to develop new measures of welfare on the same monetisable, exchange value basis (i.e. excluding consumer surplus and externalities[5]), in both current price (CP) and real chained-linked volume measure (CVM) terms, through widening the definitions of which assets and flows can be included within these variable definitions. To do this, we need to understand GDP's limitations.

9. Output (Y) is increasingly derived from capital (K) rather than labour inputs (L) (see Piketty 2014), and when one looks at capital, one sees authors and measurement authorities (e.g. Dasgupta (2021), World Bank (2022) and UNEP (2023)) considering an extended set of permissible factors in three broad classes; produced (both tangible and intangible

[3] Excluding those delivered by the public sector and 'paid for' via taxation; a meaningful economic transaction.

[4] Developed via two discussion papers in the Economic Statistics Centre of Excellence Discussion Paper series - Heys, Martin, and Mkandawire (2019), and Bucknall, Christie, Heys, and Taylor (2021)

[5] Noting that the flow of benefits received from natural assets, such as carbon sequestration, could be considered externalities because of the absence of a market. In this work we look to capture this in line with the general trend in the measurement and policy communities to recognise that the environmental impact of economic and other human activity is an essential component of understanding the economy.

(Corrado, Hulten and Sichel 2009)), natural, and human[6]. Of these three, only the first is included in the national accounts, and is broadly equivalent to K within the current national accounts model, noting that not all intangible assets are currently included ('capitalised') into the accounts. Only a subset of natural capital is capitalised ("cultivated assets"), whilst human capital exists in a 'halfway house' where the human capital *stock* itself is not captured in the accounts but the resultant *flows* are. Salary differentials received as a result of human capital acquisition are included, but only as a labour reward in the form of 'compensation of employees' (broadly equivalent to *w* in (1)), and the investment to create human capital, either in the form of education or health services, or in-firm training, is included as recurrent spending (C or G), but not as investment (I), and hence not flowing into (2).

10. This is the central challenge from which all others flow. It is surely incongruent to ask policy-makers in an increasingly capitalised world, in which both natural and human capital have growing importance and impact, to make decisions based on a measure which partially excludes both in different ways. Even if one believes we should give productive capital primacy and exclude natural (K^N) and human capital (K^H), it is odd to focus our attention on a measure which suffers from only having a partial coverage of productive capital through the exclusion of a number of intangible assets, which are generally recognised as being increasingly important in economies utilising advanced technologies (see, for example, Goodridge and Haskel 2022). It becomes ever clearer a new strategic vision is required.

11. To produce a better measure which is more reflective of the trade-offs policy-makers are making between the economy, society and the environment, a core assumption in this paper is that people derive economic utility or value both from what they consume from within the productive economy as defined in the SNA08, but also from the more broadly defined productive economy – including the flow of services they produce and consume in the unpaid household satellite account, and similarly from environmental assets. By considering each of these in terms of providing either a proxy or equivalent to a flow of income one can view the summation of these incomes as a total measure of monetised and non-monetised income and hence a feasible measure of economic welfare. Therefore, one needs to include into revised equations 1, 2 and 3, all three capitals, alongside the flows of benefits and costs consumers derive from / incur from these, even if they arise without human intervention. This paper therefore widens the 'production boundary' to include all output arising from the three capitals, irrespective of whether there is a paid transaction, or indeed whether there is human involvement in the production process at all. That is, the 'production boundary' is widened in line with the changes implemented to the 'asset boundary'. As far as possible, all other national accounts concepts and methods remain untouched.

12. As such we apply changes to the definitions of Y, K and other variables (denoted by Y*, K* etc), taking account of the need to maintain internal coherency, and prevent double-counting. Effectively we 'loosen' the 'asset boundary' to allow the inclusion of all three capitals, (such that $K_1^* = K_1 + K^H_1 + K^N_1$) irrespective of the degree of human intervention, and make equivalent changes to incorporate the resultant flows from all three capitals within the 'production boundary', that defines which output is in scope of Y in equation 1. In doing so, we also act to treat produced capital more consistently. Capital purchased by businesses to deliver goods and services in the market are included in the national accounts. Produced capital purchased by households to deliver services in the home (as such fridge-freezers, domestic cars and home computers) are instead treated as consumption items, and not capitalised in (1).[7] I* will now capture this as investment.

[6] Social capital is often described as a fourth, but there is a powerful argument by Dasgupta that social capital is a contextual factor which determines the value of other capitals: a machine might be valuable to its owner in a country with operating laws and justice functions, but the same machine has no value in a failed state where it could be immediately stolen. As such, it can be considered to be 'priced into' the framework proposed in this paper.

[7] The SNA defines the production boundary for GDP as "activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods or services. There must be an institutional unit that assumes responsibility for the process of production and owns any resulting goods or knowledge-capturing products or is entitled to be paid, or otherwise compensated, for the change-effecting or margin services provided."

13. Production of services undertaken by households for their own use (i.e. for which they will receive no pay, and which is not for exchange with another institutional unit – such as home cooking to be consumed by the family), utilising a combination of labour and household capital appliances, is, therefore, not included in Y in (1). Since these activities contribute to living standards, and the consumption of household capital items are a key part of understanding our environmental impact[8] any indicator of welfare would be incomplete without them, so we need to bring these assets within the definitional scope of K* and I*, but in doing so we need to also capture the output they produce within Y*[9], leading to the following re-defined equations:

$$GDP = Y_1^* = f(K_1^*, L_1^*) = r_1K_1^* + w_1L_1^* = C_1^* + I_1^* + G_1 + (X_1 - M_1) \qquad (1^*)^{10}$$

$$K_1^* = K_0 + K^H{}_1 + K^N{}_1 + I_0 - \delta_0^* + \text{revaluation}_0^* - \text{destruction}_0^* \qquad (2^*)$$

$$Y^N{}_1^* = Y_1^* - \delta_1^* \qquad (3^*)$$

14. The elements for inclusion are as below, noting that the authors rely wholly on the wider UK statistical system in terms of the data used. This is predicated on the joint assumptions that i) statistics have been accurately produced against a relevant international framework, ii) where measures have been monetised, these are in a consistent market equivalent price or exchange value form where they can be used, aggregated or compared in equivalent terms – that is £100 of market output is equivalent to £100 for services received from trees acting as stores of carbon is equivalent to £100 of home-produced transport services (e.g. *'dad's taxi'*), and iii) the frameworks under which these statistics are derived are mutually consistent without double-counting or exclusions. This means that all production-based welfare measures described in this paper exclude consumer surplus[11], as well as most externalities (i.e. only economic flows which are conducted under mutual consent are included) – save those generated from natural capital assets as a key aspect of this work is to 'internalise' the impact of humanity on the environment within our understanding of economic welfare. [12]

15. Nevertheless, there are still several areas where data are unavailable or experimental. As such, the estimates presented in this article should be treated as experimental and as proofs of concept. Contingent on user feedback, the aim is both to update this work to further improve these measures, as well as use this framework to highlight gaps and identify areas for future work.

[8] Particularly those with significant pollution externalities, such as domestic cars and household gas boilers.

[9] As we bring more assets / services into scope, both the flow of benefits from these assets and the depletion / depreciation are added to the measure together.

[10] We assume that government expenditure already include spend on environmental activity and that unpaid household goods and services are not internationally traded. There is no trade in environmental services.

[11] In the case of the household satellite account, where the producer is the consumer, the distinction between consumer surplus (which is excluded from National Accounting frameworks) and producer surplus (which, as this money is included in the transaction, is included in National Accounting frameworks) is conceptually a little more difficult to determine.

[12] Any 'single measure' approach to calculating an economic value of welfare needs to be weighted to bring contributing factors together into a meaningful common metric. Market prices are the most objective way to compare, and so aggregate, production of goods and services – and remain so when creating a singular measure of (production-based) welfare. This only works as a solution when focusing solely on economic welfare and does not offer a solution of how to compare economic welfare with environmental and societal measures of well-being. The production of an aggregate measure of overall well-being, including societal and environmental factors, would necessitate substantially more subjective intervention, and so, alongside many other authors and statistics producers we consider such aggregates undesirable, both because their subjective nature could be used to distort debate, but also because even if subjective weights could be agreed on within one society, they may not apply to another, making comparisons potentially invalid.

III. Proposed Methods[13]

16. To widen the definition of Y in equation 1 to Y* falls into two parts: firstly, expanding from current standards to capture those dimensions of the productive economy which are currently omitted, and secondly to bring into scope those flows relating to human and natural capital which are also out of scope.

17. There are three components omitted from the current definition and methods applied in the UK to measure Y: 'uncapitalised' or omitted intangible assets, quality adjustment of public service outputs, and the inclusion of output generated in the household for domestic use using productive capital currently treated as recurrent spending.

18. In relation to uncapitalised intangibles or Intellectual Property Products (IPPs), under the assumption that this would previously have been accounted for as intermediate consumption we need to add these in the form of additional output, and resultingly as additional investment and depreciation in equation 2. Data is drawn from ONS publications estimating the value of these uncapitalised stocks (e.g. ONS 2021b). As elsewhere, this assumes definitions for these additional IPPs are mutually exclusive from those already accounted for in the National Accounts, although in this instance work is currently being undertaken in ONS to examine the extent to which this is the case.

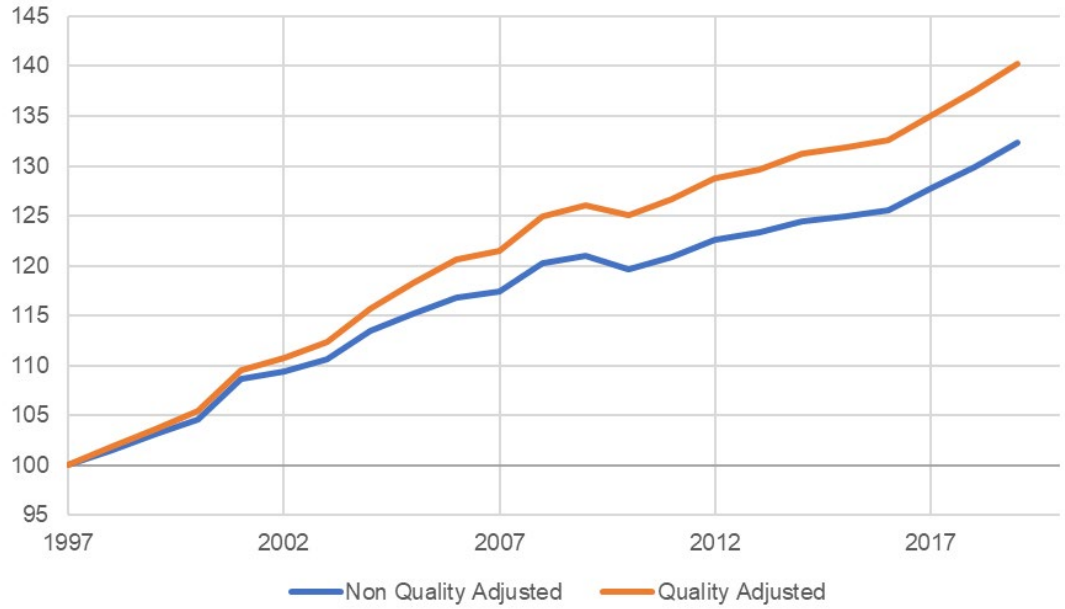
19. In relation to the value of public services, as summarised in Foxton, Grice, Heys and Lewis (2019), to understand the value added from public services which are delivered at zero price, one needs to follow the methods laid out in SNA08 to quality adjust these measures to take account of the quality of the outcomes achieved, in line with the methods proposed in Atkinson (2005). The UK does not currently conform to this standard as it aligns to the European System of Accounts 2010 (ESA10), which deviates from SNA08 in this important dimension[14].

[13] Wherever a method is presented in summary terms, full methods and datasources can be found either in Bucknall, Christie, Heys, and Taylor (2021) or the Quality and Methods documentation available on the ONS website (ONS 2022b).

[14] ESA10 regulates the production of GNI estimates for each EU country, which determine contributions to the EU budget. The EU wished to observe further method developments to confirm comparable methods across all countries to ensure consistent application and therefore a 'fair' budgetary allocation.

Figure 1
The effect of quality adjustment on Government, Health, and Education (O, P, and Q) Output

20. *Chained Volume Measure, 1997 = 100*



21. This paper uses the ONS's work to develop quality adjustments on the public services to produce public service productivity data to implement an adjustment to the non-market component of sectors O, P and Q[15]. To do this, we take the average quality adjustment on the 49.1% of public services where quality adjustments exist, (ONS 2023) and extrapolate this across the whole of the non-market portion (around 80%) of O, P, and Q, using a simplifying assumption that the whole of government is subject at any time to the same spending constraints and a consistent requirement for efficiencies and service improvements. To derive this measure, we uprate the CVM measures of non-market output of the industries associated with the provision of public services (O, P, and Q) in line with the average quality adjustment of service areas with calculated quality adjustments.

22. In relation to unpaid household activities, the sum of these is simply drawn from the household satellite account (ONS 2022d) in current price terms and CVM estimates are constructed using;

- Direct volume estimates in the case of childcare (where hours are used) and transport (where distance travelled, adjusted for time taken, is used)
- Services producer price indices are used for laundry (specifically, the "Washing and (Dry-)Cleaning Services of Textile and Fur Products" SPPI)
- Industry deflators for comparable industries are used for household housing services, nutrition, and adult care.
- The whole economy implied GVA deflator is used to deflate voluntary activity.

23. In addition to these, we also need to account for the flows resulting from the inclusion of human and natural capital. Of these, natural capital is the easiest as the value of both natural capital stocks, and the flows of capital services arising from these are included in the Natural Capital Accounts (ONS 2022d). The flow of benefits from carbon sequestration in the Natural Capital Account are used as provided in current price terms but deflated using the GDP deflator. This deflator is used for the time being as the benefits received from environmental assets are difficult to compare with other broad categories of products from the market sector

[15] Whilst there are other non-market sectors of the economy, such as imputed rentals on owner-occupied housing, we do not propose any adjustment of these.

– in theory, the best deflator to use would be one which represents a market-equivalent of the service the environmental asset provides. Future work would be required to identify these market equivalents and their relevant deflators, which in some cases may require additional data collection.

24. We have only added carbon sequestration from ONS's Natural Capital Accounts as a number of flow of services from environmental assets labelled 'provisioning services' (e.g., fossil fuel production) are already be included in GDP, and other environmental asset services have short time-series which only begin after 2005. As such, these estimates should be seen as a component of the contribution of environmental assets to value added – and not as a proxy for the entirety of environmental asset services.

25. We label Y* **Gross Inclusive Income (GII)**, which can be considered as conceptually equivalent to GDP with a widened production and asset boundary. In summary, GII is calculated as:

Gross Inclusive Income (GII)

GDP (minus non-market gross value added in industries O, P, and Q)
Plus: Quality adjusted non-market GVA in industries O, P, and Q
Plus: Household flow of benefits (to be expanded to include household production using digital services in future work)
Plus: The flow of benefits from carbon sequestration performed by a subset of environmental assets in the UK.
Plus: Investment in previously uncapitalised Intellectual Property Products (i.e. intangible capital)
= Gross Inclusive Income (GII)

Capturing depreciation and depletion

26. GII is still a gross measure, failing to capture the impact of depreciation or depletion of various types of assets. Alongside Y*, we also compute new equivalent values for K* via equation (2) taking into account uncapitalised productive capital, natural capital and human capital[16].

27. We also develop a new net measure of Y^{*N}, **Net Inclusive Income (NII)**, which can be considered as broadly equivalent to the existing Net National Disposable Income (NNDI) variable already produced within the ONS Blue Book (e.g ONS 2022c). NII takes GII and converts it to a net measure in line with the methodological steps used to convert GDP to NNDI by taking account of depreciation and depletion through the consumption of capitals, covering productive capital, including a wider set of IPPs ('intangible capitals'), household durables, and environmental assets (effectively δ*). It is also capable of capturing degradation of natural resources. Importantly we have not included any adjustment for human 'capital', as discussed below.

28. Income and transfers from abroad are also taken into account to arrive at NII, derived from net national income by adding all current transfers in cash or in-kind receivable by resident institutional units from non-resident units and subtracting all current transfers in cash or in kind payable by resident institutional units to non-resident units.

Net Inclusive Income (NII)

Gross Inclusive Income (GII)
Plus: Income from abroad
= Gross National Income
Less: Transfers from Abroad
= Gross National Disposable Income
Less: Depreciation of
i) Tangible and intangible productive assets
ii) Durables in the Household sector

[16] Derivations of stock estimates, including asset lives etc is contained in Heys, Bucknall, Christie and Taylor (2021).

ii) Uncapitalised intangibles
Less: Degradation of Atmosphere due to Carbon Emissions
= Net Inclusive Income (NII)

29. A key feature of this measure is the subtraction of deprecation for all assets involved in the production of GII. This means that, as well as subtracting depreciation of those assets already capitalised in GDP, we also subtract depreciation of capitals involved in household production.

30. The calculation of natural capital degradation is key to the valuation of environmental assets within production accounts, however, as ONS have not yet produced these estimates, this paper presents experimental estimates for an area of environmental assets the authors view as of primary importance – the atmosphere[17].

Deflation

31. We compute GII and NII in both current price (CP) and chain volume measure (CVM) terms. For CVMs we also need to determine how to deflate assets and flows outside the national accounts to ensure we adequately control for the relative change in real value over time of different flows of benefit or cost, noting that in some instance direct measures of volume are available which do not require deflating.

32. This is one of the most complex issues in this study: how best to ensure that prices have been adjusted into comparable terms which make conceptual sense. In a number of instances we have derived volume measures in terms of CVM values from available current price estimates. As such, we made every attempt to utilise deflators from other ONS data sources (such as producer price indexes), from National Accounts, or have used the GDP deflator where appropriate local deflators are unavailable. In some cases direct volume measures are available and have been used where high-quality deflators are not available. Both GII and NII CVMs have been constructed by chaining together the relevant components.

IV. Exclusions and areas for future work

33. For speed we have worked with available data. In some instances data is not available, or the work to align the conceptual frameworks has not been fully undertaken. Some data is therefore excluded, which we would wish to later incorporate, and we have provided experimental estimates where international methods agreement has not yet been achieved. These include the experimental, purpose-built estimates of carbon emission related atmosphere degradation, the treatment of public service quality adjustments, and the use of the ONS's experimental estimates of uncapitalised intangibles. Finally, in the interest of pragmatism we have identified further conceptual changes which would be required to make our system fully internally consistent but where we have not been able to make progress. These include the use of free digital services and platforms, degradation of other environmental assets, and the full inclusion of human capital.

Improving atmospherics degradation estimates

[17] This model only reflects degradation due to carbon emissions. As this excludes greenhouse gases such as methane, the model could be thought of as a lower bound estimate of atmospheric degradation – or, more accurately, atmospheric degradation purely accounted for by carbon emissions. The model also makes no assumption of the proportion of the atmosphere – if any – which would be included within the UK's national or domestic boundary, or which economic sector owns the atmosphere. Instead, degradation of the (global) atmosphere, as included in NII, can be interpreted as a combination of two phenomenon, both of which have the same effect on the numbers. The first is the UK 'consuming' its own atmospheric environmental asset through the emission of carbon. The second is the UK importing degradation (akin to importing capital services) of the atmosphere through the emission of carbon into the non-UK atmosphere. As both of these (consumption of 'capital' and importing of 'capital services') have the same effect on a 'net' measure of production, the question of which is taking place can be put to one side.

34. Currently being addressed on an international level through the SNA update is the framework for environmental degradation measurement, and its relation to National Accounts. This article uses a highly experimental model for estimating atmosphere degradation related to carbon-emission induced climate change, but this represents a highly simplified approach – while attempting to follow SEEA guidance where possible – compared to the integrated set of environmental asset accounts which would be required to fully understand the economic effects of climate change. As internationally agreed methods are put in place we would look to substitute these for those put forward as part of this work.

Improving quality adjustments for public services.

35. Quality adjustment of output, particularly that of public service output, remains challenging in the National Accounts. While quality adjustment of market output can be achieved indirectly through adjusting prices and deflators, this approach cannot be used for public service output due to their being provide free at the point of consumption. Hence, finding conceptually ideal indicators with which to quality adjust the output of this sector remains challenging and an area always needing further improvement and development. While this paper uses those adjustments available and expands them to cover all non-market production of public services, this is no substitute for the rigorous development of new and improved quality metrics on a service-by-service basis. This process was commissioned by the Chancellor of the Exchequer in 2023 in a review led by Sir Ian Diamond, the National Statistician, and the relevant UK Statistics Authority (UKSA) processes have been followed such that once developed, these metrics can be integrated into UK GDP. This would effectively align GII and GDP in this respect and this adjustment would therefore drop out of the GII compilation process at that time to prevent duplication.

Improving Intangibles estimates

36. The ONS already publishes long time series of investment data for these assets, some of which will be incorporated into the 2025 revision of the SNA. As such methods may need to be amended to align with agreed international best practice.

Free digital services and platforms

37. Top on the agenda is the impact of free digital services – and free digital *platforms* in particular – on the measurement of production of household services in the household satellite account.

38. The economic welfare of societies can be argued to have been increased partly through access to free digital platforms (and the content hosted on these platforms) such as those provided by Facebook, YouTube, Instagram, X/Twitter just to mention a few. Households use these platforms to engage in activities – such as sending tweets, developing TikTok dances, or composing pictures on Instagram – which may be thought of as own-account production within a household, or free-at-the-point-of-use trade in services between households. The reduction in the number of stamps sold whilst the number of messages has grown exponentially is a classic example of a movement across the current production boundary distorting our perception of growth in the economy, widely defined.

39. While the business model underlying these platforms is similar in some respects to long established industries, such as advertisement funded TV programming, the pace at which digital services have expanded mean the way in which we account for these services may impact not just our understanding of the long-run level of economic welfare, but its growth (or decline) in the short term. Where the value of household production of services using these free digital services as an input is affected by this, this should be accounted for in GII and NII.

Degradation of environmental assets other than atmospheric degradation

40. This work currently takes account of a limited number of ecosystem services, due to the short time series currently available for these assets, and the relatively low values attached to these, in part driven by the efforts made to align pricing of these assets at market price, or exchange values, which could exclude some or all of the externalities inherent in these services. The ONS is at the forefront of the work to develop such measures internationally and we aspire to add to this element of the model as new data series are produced.

Human Capital

41. Human capital represents the most significant remaining concept omitted from this analysis at this stage, for two reasons. The first is because it may be necessary to adjust existing aggregates within the National Accounts, whilst the second is the current method for calculating the stock is subtly different from that used for other capitals, and this data may require further developmental work to bring into a consistent form.

Compatibility with existing aggregates

42. If human capital is a capital, it must be created through investment. One therefore needs to identify the process by which this investment occurs. Clearly education output would be one source, but also business and household spending on adult education, apprentices, and non-firm specific training would need to be captured within our estimate of human capital investment. Under the current framework, firm-specific training[18], the benefits of which accrue to the corporate sector, would be captured in the existing estimates of uncapitalised intangibles already incorporated into GII and NII.

43. Resolving how the entirety of this educational investment is converted into capital is a substantive topic in its own right. For example, would primary school spending in year 1 be treated as capital investment in year 1, or as 'work in progress' until the child has completed their school career and joined the labour force? Equally, if human capital is a capital, what is the rate of return and where would this be observed? When one considers primary and secondary allocations of income, we require an agreed treatment of compensation of employees (CoE), mixed income and gross operating surpluses based on agreed sectoral ownership of the human capital asset, and indeed whether there is a need to disaggregate CoE into a return to labour and a return to human capital. Importantly, how would one account for depreciation (e.g., skills eroded through unemployment hysteresis), depletion (e.g., untimely death whilst still in the labour force), and retirement (e.g., people leaving the labour market as they reach the end of their career)? If one captures retirement, how then does one account for human capital deployed in the household for household production, either during retirement or before? What portion of unpaid childcare should be classified as investment in human capital? Does one adjust the human capital stock for the health of the workforce? How does one account for imports (immigration) and exports (emigration) of human capital?

44. Due to these and further similar issues, this paper excludes human capital. However, Dunn (2022) provides considerable progress in this space based on UN (2016), and we consider provides a framework for integrating human capital into this model. Additional research into flows identifiable in ONS's existing human capital model, as well as detailed conceptual considerations around this, is the subject of a forthcoming discussion paper through the Economic Statistics Centre of Excellence.

Computational issues

45. UN (2016) lays out a model for the calculation of human capital stocks in line with the ground-breaking work of Jorgenson and Fraumeni (1989). This delivers a clear picture of the expected return to human capital acquisition recognising that human capital qualifications can serve two purposes; the acquisition of new skills, and acting as a gateway permitting access to further qualifications which will further enhance skills, increasing earning power, and themselves potentially permitting access to further qualifications. Let us take a simple three time period model (shown by t), where in period 1 people can receive education at level A with probability p(A), and in period 2, undergo education at level B with probability p(B) if and only if they have achieved education level A. Wages relate to training undergone (shown by sub-scripts – 0 representing not having achieved educational level A or B) where $w_0 < w_A < w_B$, w_0 is always received whether working or in education, and δ is a time discount factor.

[18] Defined as training which does not result in a transferable wage supplement – that is if the worker moves employer the new employer would not add a wage supplement in response to holding these qualifications.

The UN (2016) model calculates the human capital ($K^{H)}$ stock of an average individual at time 0 as the discounted sum of future earnings.

$$K^{H}_{0} = w_{01} + \delta_1 [(1\text{-}p(A)).w_{02} + p(A).w_{A2}] + \delta_2 [(1\text{-}(p(A)).w_{03} + (p(A)\text{-}p(B)).w_{A3} + p(B)).w_{B3}]$$

46. The challenge with this approach in a National Accounts context is that the capital investment in future time periods (education B in period 2) is reflected in the stock in period 1. This is akin to arguing that if one took the example of a building to which significant extension work was undertaken in future time periods, then this future investment should be incorporated into the capital value of that building today. Core national accounts principles are to reflect the value of the building today, in line with its current market valuation, and recognise future investment in maintenance or new capital acquisition in future time periods. In this light, it is not hard to see why human capital estimates for the UK at £24tn exceed the complete value of productive capitals contained in the National Accounts (£11tn) to such an extent (see ONS (2022a) and figure 6 below). National accounts consistent human capital data, with a clear bridging table to the existing data, is clearly the next required step to show the value of current investment without further investment, whilst existing published data show the full potential value of such investments including commensurate future investment. Initial exploratory work suggests the difference in stock values terms is likely to be in the region of 15%.

47. Finally, there are two potential expansions to this model, relating to a) externalities and b) distribution.

Accounting Prices

48. As can be observed in the results section below, the benefits arising from environmental assets are dramatically low compared to other benefit streams. This is due to several factors, including;

49. This work has not split out from market, public sector, and non-profit GVA the portion which could be attributed to ecosystem services (i.e. provisioning services).

50. Due to the limited time spans available for time series, we have not yet incorporated the full suite of non-provisioning ecosystem services produced by ONS, to maintain comparability of our estimates across time

51. But as well as these practical factors, there is one important theoretical factor which may lead to these estimates being lower than expected – following SEEA, the estimates are based on exchange prices (i.e. market equivalent prices). Considering the externalities associated with natural capitals and their corresponding ecosystem services, this could omit a substantial portion of the economic importance of these capitals. The work recommended by Dasgupta (2021) to make more use of accounting prices, prices which do not reflect exchange values but instead try to internalise the cost of externalities, is clearly key to presenting a more realistic picture of these data.

Distributional Analyses

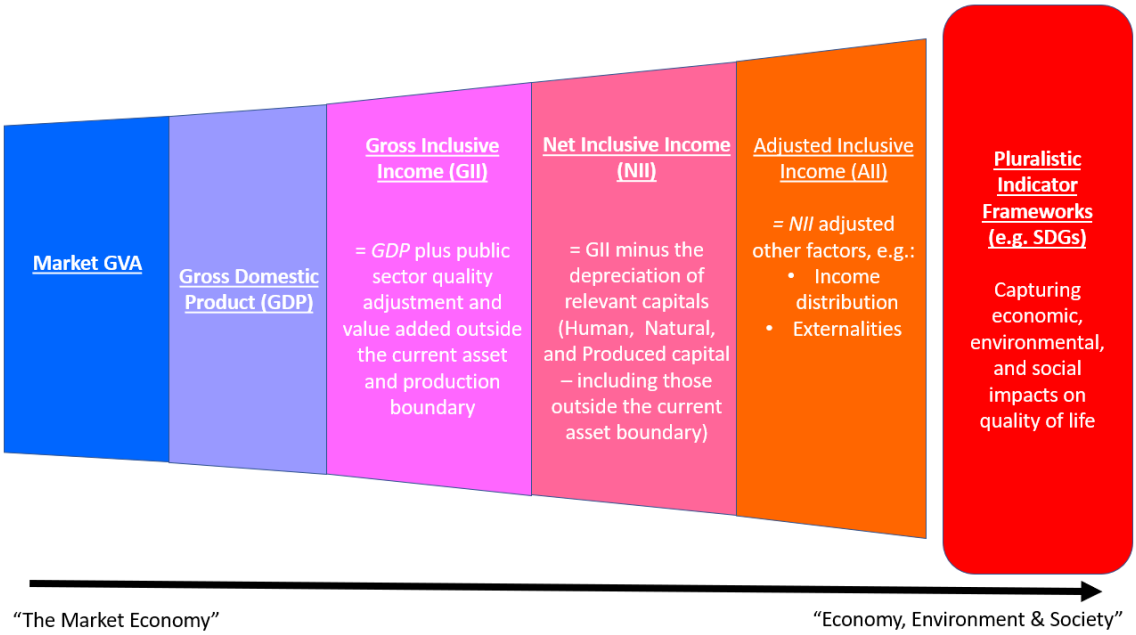
52. By thinking about this work in 'income' terms, the key question arises of 'whose' income and what do they consume from this income? Once this question is addressed, there is the further issue of sourcing relevant deflators for different groups. Drawing on Aitkin and Weale (2018a & 2018b), the question of 'whose income this is' can be expanded into several more particular questions, such as how to allocate non-household income to households, and which deflator is considered optimal, particularly for services delivered in the household or from the environment.

53. Net Inclusive Income (NII) denotes the most complete *plutocratic* (as Aitken and Weale would describe it) aggregate measure of welfare possible using currently available data, as it reflects the average of all households not the average household[19]. Extending this framework is possible to develop a metric we would label **Adjusted Inclusive Income (AII).**

[19] A simple example is if a billionaire in a country of 60 million people purchased a £60m superyacht (if this was considered a consumption item), then the average individual would consume £1 of superyacht.

This is a '*democratic'* measure which would attempt to adjust NII to take income distribution into account (Aitken and Weale 2018a), delivering the growth rates of different percentiles of the economy. The following figure is a diagrammatic representation of a potential end-state.

Figure 2
The range of inclusive income metrics



54. Within this framework, **Well-being** would be measured by pluralistic indicator frameworks incorporating a wider range of quality-of-life factors which are harder to conceptualise as flows on consumption / proxied by income. Such frameworks would include the full range of factors that influences what we value in living, reaching beyond its material side. Well-being includes intangible aspects that cannot be traded in a market. This paper again does not attempt to deliver this component of the spectrum, in the main because existing 'dashboards', such as the UN's Sustainable Development Goals (United Nations (2015)) are clearly superior in terms of their spread and depth. The authors propose that NII or preferably AII could naturally fit into such a 'dashboard' and provide a powerful context for the other measures.

V. Results

55. A proof of concept, a pilot model was compiled using the methods above to produce GII (Gross Inclusive Income) and NII (Net Inclusive Income) in previous working papers which was translated into a full statistical publication in 2022 and 2023 by the Office for National Statistics (ONS (2023). Whilst data can be sourced for some variables for long time periods, the period for which all the key data are available is 2005-2019. Full tables are available in Annex A.

56. Figure 3 presents the relative scale of the adjustments incorporated to derived GII and then NII in current prices[20] for 2019, with positive contributions shown as green and negative as red. The inclusion of household production is by far the biggest adjustment – adding £1.54tn in 2019. For context, this is around three times bigger than the size of the non-market elements of the economy currently contained within GDP and is nearly equivalent in scale of all market-based production. That is to say that the UK is in a position whereby the value of production within the household is only marginally less than the value of output produced in

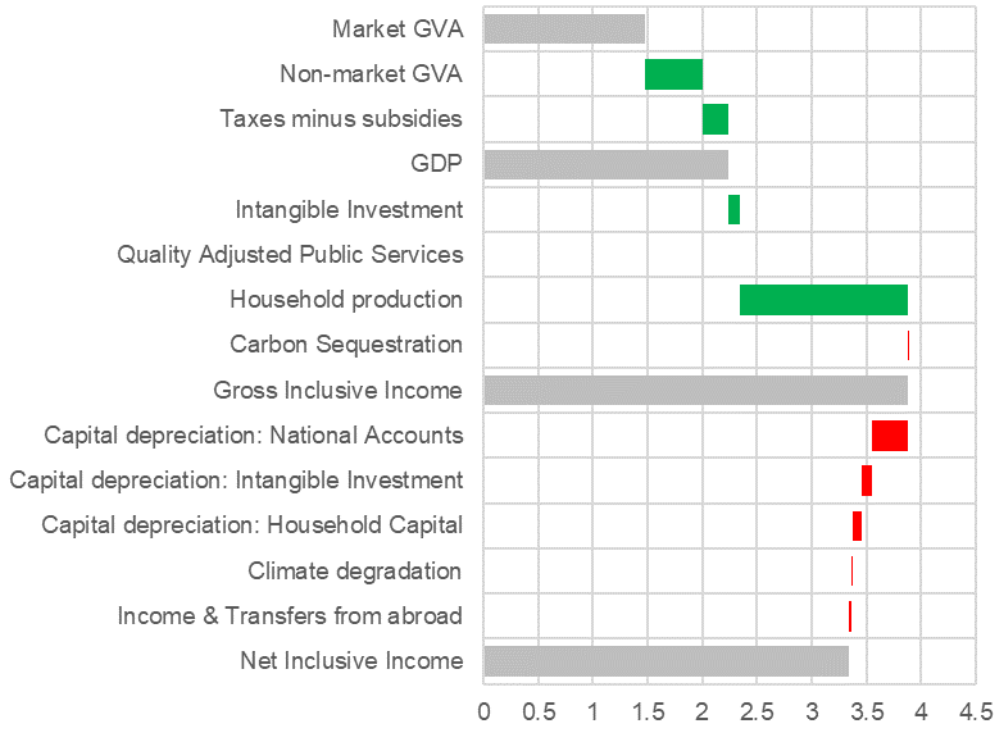
[20] The quality adjustment of public services has no effect on current price data, as the quality adjustment only applied to volume measures.

the market. Whilst we do not have historic data to compare to, this may represent a significant turning point in UK society and merits further investigation.

57. The size of other contributions added to GDP to derive GII (investment in additional IPPs, £103bn, and carbon sequestration, -£1.33bn) are substantially smaller, or even negative[21]. As we will observe elsewhere, the impact of environmental services, as measured under SEEA as broadly equivalent to market prices, may exclude significant externalities and merit consideration, as proposed in Dasgupta (2021), towards measuring value in accounting prices.

Figure 3
Progression through Spectrum from Market GVA to Net Inclusive Income

UK, £trillions, Current Prices, 2019



58. *Note: Different measures are shown in grey, and green and red bars represent components added to progress from measures on the left to measures on the right. Quality Adjustment of Public Services has no impact on current price data, but are included for completeness.*

59. Turning to the contributions subtracted from GII to move to NII, we see less of a dominance of any one component. That said, depreciation of capitals already included in National Accounts still accounts for just over half the contributions at this stage (-£333bn). In contrast with its effect on GII, the effect of accounting for household production on moving to net figures is much more subdued, amounting to just -£79.1bn. Finally, the effect of carbon-emission related degradation of the atmosphere is relatively small, at -£14.5bn. We re-emphasise that this measure is intended as a proof-of-concept.

60. As with standard GDP data, comparisons of growth over time are best undertaken using Chained Volume Measures (CVM) – which control for changes in prices – as shown in the following figure, which compares NII with GDP, market-sector GVA and NNDI. The general trajectory of NII over time is correlated with that of GDP but demonstrates weaker overall growth through the period (20.5% compared to 22.1%). Comparing to Blue Book NNDI also shows similar overall trends, excepting 2008-9: Blue Book NNDI falls by 6.1%

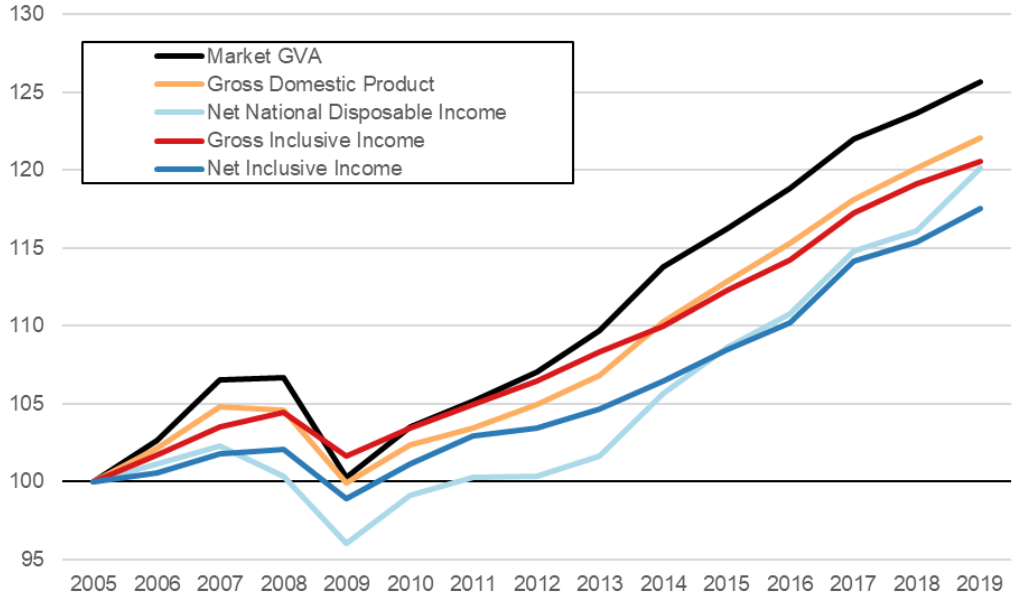
[21] In the case of carbon sequestration this is negative because natural resources in the UK which should absorb carbon, such as peatland, is so damaged it is currently emitting / releasing carbon rather than capturing it.

between 2007 and 2009 while NII only fell by 2.8%. However, NII does not always show stronger growth than GDP, with 2012 telling a quite different story: whilst market GVA grew at 3.4% and GDP grew at 1.5%, NNDI grew by 0.1% and NII grew by 0.5%. Compared to GDP, this is driven by negative contributions in that year from capital depreciation (from national accounts capitals), household production, and income and transfer from abroad.

Figure 4

A comparison of market GVA, standard GDP and Net National Disposable Income, as published by the ONS in Blue Book 2022, with Gross and Net Inclusive Income

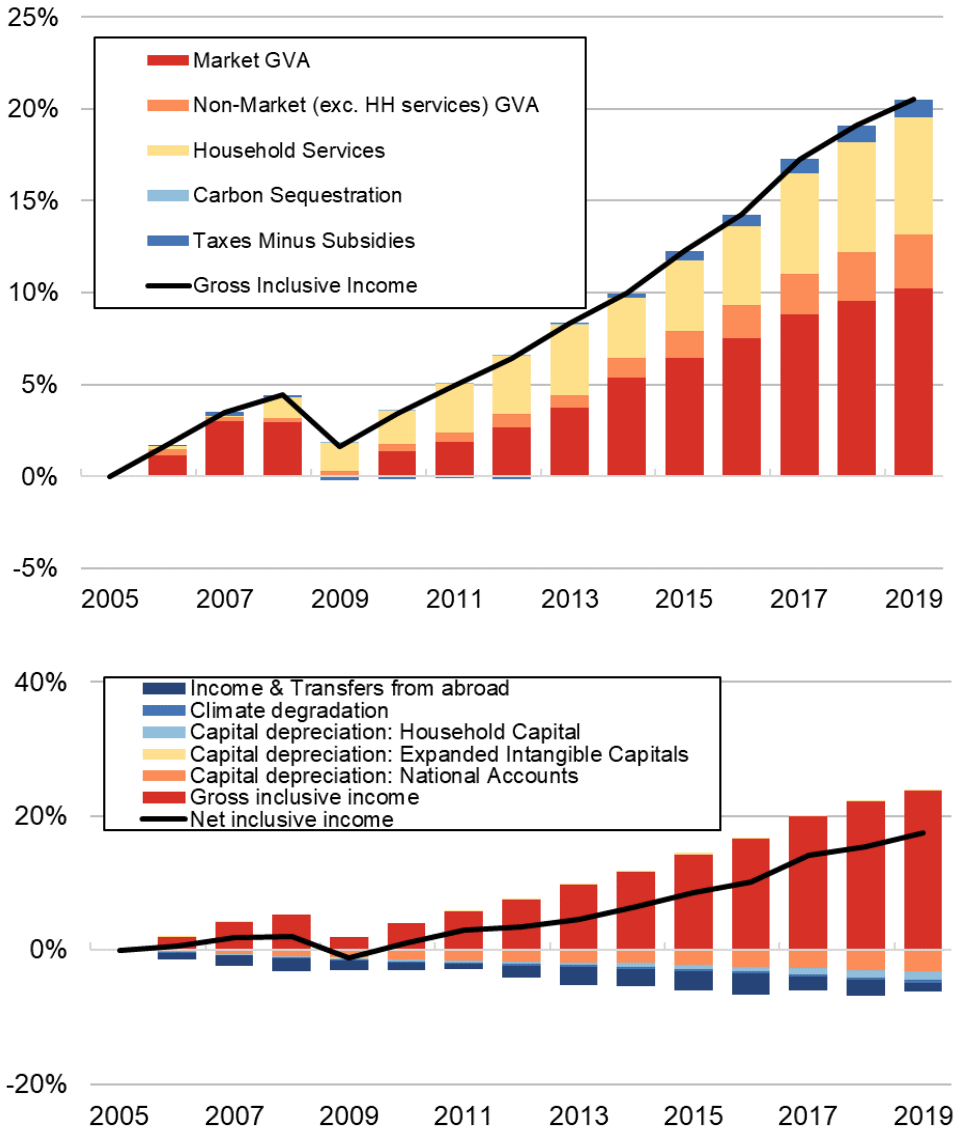
UK, 2005 = 100, Chained Volume Measures



61. Figure 5 explains these differences by decomposing cumulative growth in CVM GII and NII since 2005. Whilst market GVA is a relatively large component with substantial volatility – such as the 2008-09 recession and subsequent recovery, other components of NII mitigate these movements. When market sector GVA pushed GII growth downwards by 2.9 percentage points in 2009, household production partially offset this through a 0.4pp upwards contribution. Interestingly, household production generally demonstrates a stronger counter-cyclical dynamic (i.e. growth in household production is negatively correlated with growth in market GVA) than non-market GVA currently included in GDP.

Figure 5
Contributions to growth in CVM GII and NII since 2005

UK, % and percentage points



Notes: "IPPs" refers to a subset of assets called Intellectual Property Products, otherwise known as "intangible capital".

62. Certain stories dominate: while the market economy is the largest contributor to growth in GII (and so NII), household production makes a substantial contribution in second. While (CVM) market GVA grew by 25.6% between 2005 and 2019, household production grew by 17.9%. Additionally, an interesting narrative which comes out of this data is that, despite carbon emissions falling over the period, carbon-related climate degradation increased (albeit mildly) so climate degradation contributed negatively to NII. This can be attributed to the global temperatures increasing over time, such that the marginal growth in the damage per unit of carbon emitted outweighed the effect of carbon emissions falling, or put another way, the price of the damage incurred grew faster than UK output of emissions fell.

63. Finally, annual growth figures are summarised in Figure 6 for all measures. Differences between the growth rates mostly below 2 percentage points, with a few outliers; 2008-09 for example, reflecting the market-led economic downturn in those years. Nevertheless, an overall effect can clearly be seen: while broad trends are similar, NII and GII growth were less volatile than NNDI and GDP. This indicates that market-centred

indicators like GDP may overstate the importance of short-term factors on economic welfare, and broader measures like NII may better focus on longer term trends.

Figure 6
Comparison of annual growth for economic welfare measures

UK, % change on same time previous year, Chained Volume Measure (CVM)

64. These analyses demonstrate the power of these new aggregates in assessing expansions of the production and asset boundaries in order to better measure welfare – and evaluating how these expansions can change our understanding of events like the 2008-09 recession.

VI. Conclusions

65. This paper claims only a relatively narrow contribution to the international statistical community's broader work on Beyond GDP – it does not deal with distributional issues, or comprehensively tackle the inter-linkages between the Stiglitz's three pillars of the Economy, Environment, and Society. It brings together many pieces of work which have previously been treated in isolation and adds value by combining them within a framework consistent with those already in place for National Accounts, but it is not a substitute for the UN's Sustainable Development Goals, or other multi-dimensional analyses of wider wellbeing, where the components of these are harder to conceptualise in proxy income terms.

66. This paper nevertheless presents new indicators of welfare using national accounts methods applied to a wider range of assets, goods, and services, using data which is available today. Even using this limited evidence, several key insights are available which touch on a variety of key current debates.

67. Firstly, our perspective of the way the UK produces goods and services has to reflect the impact of unpaid household production of goods and services, specifically whether the large and growing share of GII which we observe is evidence of a fundamental change in the way we relate to production as a society.

68. Second, and inherent in the first, is the question of the relationship between paid and unpaid work, both following the 2007-9 Financial crisis and the Covid-19 pandemic. What factors caused labour to become dislocated from paid activity at these times, and here in particular the question of distribution is important: if this unpaid work is retired people on good pensions delivering unpaid childcare through enjoying days out with their

grandchildren this is dramatically different from a lone parent providing the same childcare because they cannot afford to work and pay childcare fees. The relationship between financial and non-financial wealth and the decision to opt out (either fully or in part) of the labour market and deliver unpaid output is one we consider worthy of further investigation.

69. In the immediate term, the relative growth of unpaid work and its distribution have experienced a major shock, through Covid-19. During the pandemic, roughly a quarter of the UK workforce were furloughed and had more time for training, self-development, or to undertake unpaid activity in the home, shifting a volume of consumer services from the market economy back to the household economy. For example, time use data taken between 28 March and 26 April 2020 indicates that time spent on paid work was below 2014-15 levels, but time spent on gardening and DIY increased during lockdown (ONS 2020b). GDP fell over this period, but GII and NII would allow us to analyse the effect of the wider basket of contributors to economic welfare through the shock, such as reduced pollution from fewer car journeys. While this would not fully capture the effect of the lockdown on wider well-being – for example, the effects of a possible increase in domestic violence (ONS 2020a) or reduced socialising due to social distancing – being able to judge the extent to which economic activity 'shifted' outside the traditional production boundary and the extent to which economic activity as a whole actually declined would be a useful advancement of our understanding of the pandemic.

70. Fourth, the dramatic extent of growth *outside* the production boundary necessarily compels us to think again about productivity and the puzzle of the UK's low growth since 2008. Whilst traditional analyses have focussed on investment and flatlining TFP growth, it needs to be questioned whether we should be considering this growth of output as a key factor. For example, could it be the case that business innovation and investment may be delivering growth outside the traditional measures of the market sector? An obvious example is investment in projects to reduce carbon emissions and other pollutants. A business could easily invest significant sums to do this, without delivering any increase in output, with the benefits being observed only through enhanced ecosystems delivering improved flows of services to households. Stopping polluting a public beach improves that beach's amenity value but is not visible in GDP as currently scoped[22]. Secondly, as mentioned above, free goods and services have dramatically changed the production technology for unpaid activities. Instead of writing one or two letters a week and posting these via the mail, today's digital correspondent sends dozens of written communications a day, via platforms such as email, LinkedIn, Facebook, WhatsApp and Twitter/X to name but a few. That exponential growth in unpaid output, from one or two communications to maybe hundreds is just one example of how free technologies may have created vast productivity growth, just not within GDP, which will only value these platforms in terms of the cost of production.

71. Fifth, this work presents a significant challenge to natural capital measurement. The SEEA uses, as mentioned, market prices or imputes the equivalent to exchange values. Whilst these will internalise some current externalities, the threat is this may continue to under-value these assets and hence place relative less importance onto them than justified. In part this is because of notable methodological challenges around how to value cliff-edges in marginal pricing models. This suggests further thought needs to be urgently given to the feasibility of using accounting prices rather than market prices, recognising the challenges both methodological and practical. Finally, the impact of human capital, when applied into the framework could be very significant, but is heavily dependent on continued methodological work. Where the current international methods appear to not fully align with national accounting norms means more work is required, and this may change our understanding of the relative value of human capital in the UK.

72. These are all key questions: the nature of the UK economy, the nature of apparent economic inactivity, the relative importance of the environment, the productivity puzzle and

[22] It may be visible in a market price if the beach has charged access and more can be charged to access a 'clean' beach. One of the challenges with accounting prices is not necessarily adding the externalities costs to the polluters price, but working out if there are second-order effects where the externality may, to some degree already be included in a different price. Public service provision of health services may be the key example of this.

the importance of human capital, and all are cast in a new and better informed way by presenting data together to allow policy-makers to observe in a simple way the trade-offs between the economic, social and environmental domains. Following sustained investment since the Bean Review (2016) the UK's Office for National Statistics, commenced publication of these data in 2022 and will be updating as well as improving upon them over time. Although these data will be improved further in future years, the ability to apply proven methods and techniques across a wider landscape opens the door for economists to build upon, rather than rebuilding, GDP without further delay. Rather than long debates about how and whether to change GDP, this model allows consumer choice, and provides users a means to place the data they have previously used into a wider context at low additional cost to the taxpayer now the foundational investments by ONS have already been delivered. Whilst there is always more to do to perfect methods and data, we have enough data to aide users now, without compromising the quality of market-based metrics essential for macro-economic policy making.

Annex A

GII and NII Datasets

Table F1
Current Price Spectrum Estimates and Contributions

	Market GVA	Non-market GVA	Taxes minus subsidies	**GDP**	Intangible Investment	Quality Adjusted Public Services	Household production	Carbon Sequestration	**Gross Inclusive Income**	Capital depreciation: National Accounts	Capital depreciation: Intangible Investment	Capital depreciation: Household Capital	Climate degradation	Income & Transfers from abroad	**Net Inclusive Income**
1997	**631,841**	230,601	91,510	**953,952**	48,709	-				- 123,199			- 4,937	- 6,814	
1998	**662,863**	237,753	98,710	**999,326**	52,684	-		- 1,314		- 127,653			- 5,273	1,835	
1999	**687,055**	250,032	107,063	**1,044,150**	56,607	-		- 1,385		- 135,278			- 5,722	- 11,626	
2000	**726,530**	261,376	113,237	**1,101,143**	61,658	-		- 1,373		- 143,789			- 6,523	- 7,148	
2001	**752,093**	278,212	115,018	**1,145,323**	64,016	-		- 1,318		- 153,461			- 7,522	- 762	
2002	**781,004**	291,229	119,282	**1,191,515**	66,379	-		- 1,238		- 161,878			- 7,828	4,380	
2003	**824,487**	309,746	125,442	**1,259,675**	69,035	-		- 1,237		- 170,746			- 8,760	3,595	
2004	**861,775**	328,421	133,224	**1,323,420**	72,008	-		- 1,165		- 177,483			- 9,348	- 164	
2005	**912,809**	347,991	138,843	**1,399,643**	75,307	-	684,877	- 1,149	**2,158,677**	- 187,530	- 68,932	- 62,451	- 10,028	1,710	**1,831,446**
2006	**962,522**	364,204	146,111	**1,472,837**	78,114	-	710,686	- 1,102	**2,260,535**	- 199,136	- 72,150	- 63,782	- 10,666	- 18,366	**1,896,435**
2007	**1,013,865**	377,448	154,479	**1,545,792**	82,952	-	761,523	- 1,059	**2,389,208**	- 210,672	- 75,485	- 65,378	- 11,401	- 27,858	**1,998,414**
2008	**1,051,497**	391,663	151,577	**1,594,737**	82,293	-	822,438	- 1,010	**2,498,458**	- 225,870	- 79,919	- 62,989	- 11,937	- 34,899	**2,082,845**
2009	**1,010,393**	402,865	138,624	**1,551,882**	80,997	-	890,020	- 1,009	**2,521,889**	- 235,710	- 83,507	- 61,595	- 11,479	- 28,492	**2,101,107**
2010	**1,040,692**	412,139	159,550	**1,612,381**	80,045	-	917,950	- 1,004	**2,609,372**	- 236,805	- 86,091	- 62,119	- 12,912	- 19,561	**2,191,884**
2011	**1,070,943**	415,001	178,267	**1,664,211**	77,416	-	982,992	- 956	**2,723,663**	- 243,877	- 86,456	- 62,570	- 12,733	- 14,136	**2,303,892**
2012	**1,107,224**	423,912	182,105	**1,713,241**	78,390	-	1,021,507	- 993	**2,812,145**	- 252,270	- 85,699	- 63,888	- 13,984	- 37,102	**2,359,202**
2013	**1,161,386**	429,369	191,541	**1,782,296**	81,434	-	1,092,304	- 1,050	**2,954,984**	- 259,619	- 84,858	- 65,408	- 14,408	- 57,689	**2,473,002**
2014	**1,217,581**	443,471	201,775	**1,862,827**	83,314	-	1,144,063	- 1,019	**3,089,185**	- 268,199	- 84,752	- 66,989	- 13,829	- 57,559	**2,597,856**
2015	**1,257,522**	455,907	207,569	**1,920,998**	88,461	-	1,213,031	- 1,112	**3,221,378**	- 277,744	- 83,643	- 69,457	- 13,379	- 65,988	**2,711,167**
2016	**1,308,415**	473,700	217,346	**1,999,461**	91,678	-	1,242,874	- 1,078	**3,332,935**	- 290,604	- 84,714	- 71,109	- 13,226	- 70,973	**2,802,308**
2017	**1,374,338**	485,948	224,722	**2,085,008**	97,248	-	1,335,697	- 1,048	**3,516,905**	- 306,716	- 86,618	- 72,332	- 13,537	- 45,324	**2,992,377**
2018	**1,420,672**	504,763	231,975	**2,157,410**	102,726	-	1,437,117	- 1,198	**3,696,056**	- 319,006	- 89,107	- 75,572	- 14,128	- 55,247	**3,142,997**

2019	**1,473,430**	526,727	238,191	**2,238,348**	102,563	-	1,543,104	- 1,329	**3,882,686**	- 332,595	- 92,242	- 79,090	- 14,480	- 27,535	**3,336,744**

Table F2

Chained Volume Spectrum Measures and Contributions (£2019)

	Market GVA	Non-market GVA	Taxes minus subsidies	**GDP**	Intangible Investment	Quality Adjusted Public Services -	Household production	Carbon Sequestration	**Gross Inclusive Income**	Capital depreciation: National Accounts -	Capital depreciation: Intangible Investment	Capital depreciation: Household Capital	Climate degradation -	Income & Transfers from abroad -	**Net Inclusive Income**
1997	**904,686**	405,845	167,436	**1,471,263**	69,001	24,369				186,838			3,199	10,509	
1998	**940,048**	409,977	172,999	**1,517,715**	73,531	23,485		1,997		192,680			3,470	2,787	
1999	**972,464**	419,655	175,939	**1,563,460**	78,390	23,290		2,073		200,032			3,823	17,408	
2000	**1,025,507**	422,025	182,246	**1,627,447**	86,245	22,273		2,028		208,460			4,416	10,564	
2001	**1,046,135**	431,933	187,101	**1,662,558**	87,229	23,163		1,913		217,344			5,183	1,106	
2002	**1,068,237**	431,813	194,352	**1,691,998**	88,793	21,458		1,759		226,169			5,511	6,220	
2003	**1,105,073**	441,551	200,390	**1,744,840**	90,283	20,131		1,713		234,662			6,325	4,980	
2004	**1,130,121**	449,997	208,221	**1,785,756**	91,822	18,723		1,572		241,741			6,927	221	
2005	**1,172,850**	452,892	209,128	**1,833,406**	94,470	15,774	1,310,296	1,506	**3,221,530**	248,549	91,666	51,539	7,652	2,240	**2,839,782**
2006	**1,203,792**	458,950	211,336	**1,873,015**	95,754	13,083	1,317,411	1,402	**3,276,506**	255,313	90,845	52,549	8,384	23,356	**2,856,262**
2007	**1,249,469**	455,995	216,540	**1,921,029**	101,091	11,954	1,311,936	1,315	**3,334,558**	263,012	91,057	53,556	9,178	34,620	**2,890,583**
2008	**1,250,942**	455,217	212,408	**1,918,064**	98,206	10,527	1,354,440	1,215	**3,363,949**	270,911	92,321	54,319	9,919	41,975	**2,899,135**
2009	**1,175,797**	453,099	202,640	**1,831,550**	91,589	8,447	1,369,625	1,191	**3,274,159**	276,469	92,548	54,994	9,723	33,627	**2,808,489**
2010	**1,214,106**	457,308	204,165	**1,876,058**	90,548	7,526	1,381,185	1,169	**3,332,711**	281,882	92,372	55,914	11,092	22,760	**2,871,584**
2011	**1,233,261**	457,440	205,038	**1,896,087**	86,901	5,897	1,413,981	1,089	**3,380,406**	286,888	91,311	56,866	11,179	16,106	**2,922,267**
2012	**1,255,362**	463,993	203,874	**1,923,551**	87,420	5,116	1,433,880	1,114	**3,428,930**	290,924	89,472	57,894	12,460	41,656	**2,937,984**
2013	**1,286,304**	463,042	209,197	**1,958,557**	88,221	4,271	1,457,715	1,154	**3,489,264**	293,678	87,519	59,566	13,112	63,394	**2,971,642**
2014	**1,334,928**	471,297	215,150	**2,021,225**	89,946	3,012	1,438,019	1,105	**3,542,339**	297,692	86,358	61,182	12,750	62,453	**3,022,115**
2015	**1,362,923**	482,706	224,003	**2,069,595**	94,913	2,161	1,457,662	1,198	**3,617,441**	303,653	85,707	63,399	12,416	71,092	**3,081,136**
2016	**1,393,865**	493,767	226,792	**2,114,406**	96,943	1,736	1,472,509	1,139	**3,680,643**	310,914	86,590	66,574	12,512	75,053	**3,128,323**
2017	**1,430,701**	504,336	231,113	**2,166,073**	100,862	1,320	1,514,081	1,088	**3,777,939**	318,976	88,084	70,280	13,036	47,086	**3,241,120**
2018	**1,449,855**	516,415	236,775	**2,203,005**	105,163	448	1,531,011	1,224	**3,837,333**	326,547	89,959	74,696	13,831	56,415	**3,275,581**
2019	**1,473,430**	526,727	238,191	**2,238,348**	102,563	-	1,543,104	1,329	**3,882,686**	332,595	92,242	79,090	14,480	27,535	**3,336,744**

Table F3

Contributions to Cumulative Growth in CVM Net Inclusive Income Since 2005 (percentage points)

	Market GVA	Non-market GVA	Taxes minus subsidies	Investment in additional IPPs	Quality Adjusted Public Services	Household production	Carbon Sequestration	Capital depreciation: National Accounts	Capital depreciation: Additional IPPs	Capital depreciation: Household Capital	Climate degradation	Income & Transfers from abroad	**Net Inclusive Income**
2005	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	1.31	0.25	0.08	0.06	0.09	0.2	0	-0.28	0.03	-0.07	-0.05	-1.07	0.58
2007	3.25	0.13	0.27	0.29	0.14	0.05	0.01	-0.6	0.02	-0.13	-0.11	-1.54	1.79
2008	3.31	0.1	0.12	0.17	0.19	1.3	0.01	-0.92	-0.03	-0.18	-0.15	-1.84	2.09
2009	0.22	0.01	-0.22	-0.11	0.27	1.76	0.01	-1.15	-0.04	-0.22	-0.14	-1.5	-1.1
2010	1.77	0.18	-0.17	-0.15	0.31	2.11	0.01	-1.36	-0.03	-0.27	-0.22	-1.06	1.12
2011	2.52	0.19	-0.14	-0.3	0.37	3.11	0.02	-1.56	0.01	-0.31	-0.22	-0.8	2.9
2012	3.38	0.45	-0.19	-0.27	0.4	3.73	0.02	-1.71	0.09	-0.37	-0.29	-1.8	3.46
2013	4.58	0.42	0.02	-0.25	0.44	4.48	0.01	-1.82	0.17	-0.45	-0.32	-2.65	4.64
2014	6.44	0.74	0.25	-0.18	0.48	3.85	0.02	-1.97	0.22	-0.52	-0.3	-2.62	6.42
2015	7.48	1.18	0.59	0.01	0.51	4.49	0.01	-2.19	0.25	-0.62	-0.29	-2.94	8.5
2016	8.62	1.6	0.7	0.09	0.53	4.99	0.02	-2.45	0.21	-0.76	-0.29	-3.09	10.16
2017	9.98	2	0.86	0.23	0.55	6.37	0.02	-2.75	0.16	-0.92	-0.31	-2.05	14.13
2018	10.69	2.44	1.07	0.39	0.57	6.94	0.01	-3.03	0.09	-1.09	-0.35	-2.39	15.35
2019	11.53	2.81	1.12	0.29	0.59	7.35	0.01	-3.24	0	-1.25	-0.37	-1.35	17.5

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