

Should measures of the nation's capital stock be expanded to include types of assets that are currently excluded, and if so what measurement changes are needed?

Introduction

Formally defined by the Office of National Statistics (2021) as 'the quantity of produced non-financial assets with a lifespan of more than a year which contribute to the production of goods and services, without being completely used up or transformed in the process' national capital stock is a salient component of the macroeconomic analysis of a country due to its importance in determining the efficiency with which inputs can be transformed into outputs, which ultimately underpins the principals of national income and gross domestic product. However, one major proponent of capital which is typically not included in capital stock accounting is the stock of human capital. With an overall difference in the structural set up of business due to technological advances and other factors such as the rising rates of education over the last two decades, human capital has become of increasing importance. This paper will propose the inclusion of human capital in the nation's capital stock by considering its obvious yet often overlooked significance, it will also take into account the issues involved in the current lifetime income-based approach method of quantifying human capital and address potential alternations that could be made such as considering aspects of the indicator- based approach in order to ensure the calculated value is the most precise and appropriate way before proceeding to incorporate this into the net capital stock of the nation.

Current condition of the national capital stock and opportunities for including human capital

According to recent data the net capital stock of the United Kingdom is valued at £4.6 trillion in chained-volume measures which is only an increase of 0.6% compared to the previous year (Johannsson, 2021). As seen in Figure 1 much of this value is composed of physical assets including dwellings, buildings, structures, machinery, equipment and weapons, intellectual property products and cultivated assets. These assets each saw a decrease in investment in 2020 in addition to an overall drop in the growth of gross fixed capital due a lack of investment during the Covid-19 pandemic (see Figure 4) with an especially significant decrease of 38% in dwellings.

Human capital which is defined by the OECD (2019) as the stock of knowledge, skills and other personal characteristics embodied in people that helps them to be productive is not currently accounted for in any capacity in the national capital stock of the country. Human capital has great significance and is a powerful tool which can boost economic growth. For instance, when knowledge is gained through education it gives rise to a greater skill set and overall understanding which is used to perform jobs more efficiently in the labour market, due to their improved and extensive skill set these individuals have the potential to obtain higher earnings which are reflected in greater consumer spending, thus increasing economic growth.

One major factor in support of including the human capital is the fact that the UK has a considerable stock of human capital valued by the ONS at an estimated £21.4 trillion, this is approximately 10 times the size of UK gross domestic product (ONS, 2019). Of those who

are economically active there are more individuals holding a masters degree than those with no academic qualifications. These holders also have a 10% premium compared to those with an undergraduate degree. Typically increases in educational attainments had the greatest effect on the real growth of human capital contributing towards 10.8% of the growth since 2004.

Figure 1: Growth in UK net capital stock, chained volume measures, 2011 to 2020. Source: The ONS, Johannsson (2021b).

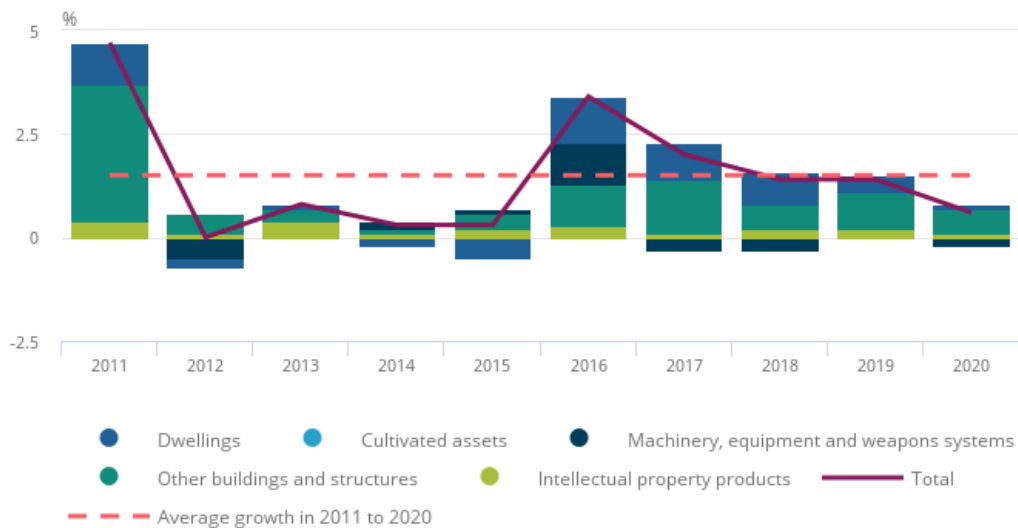
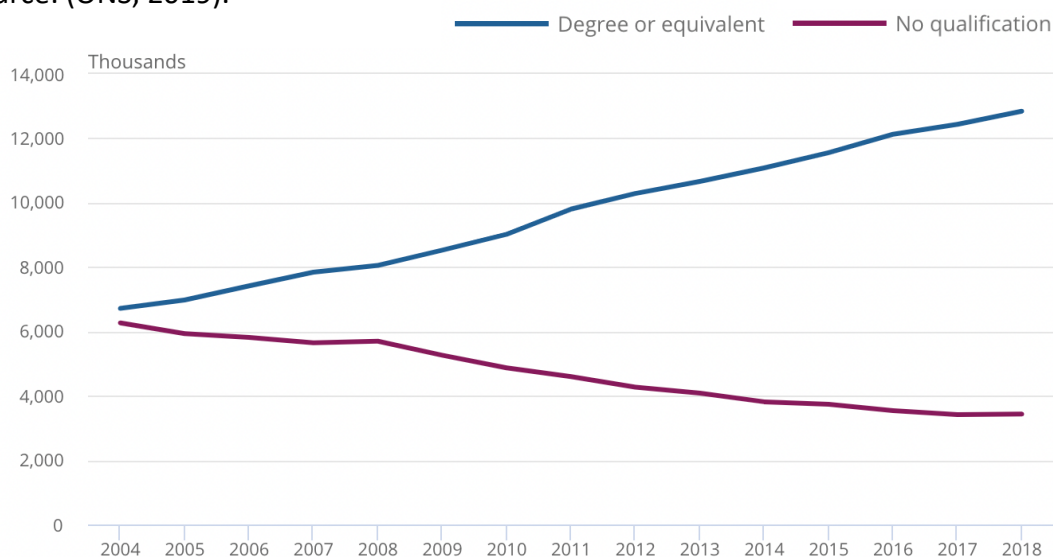
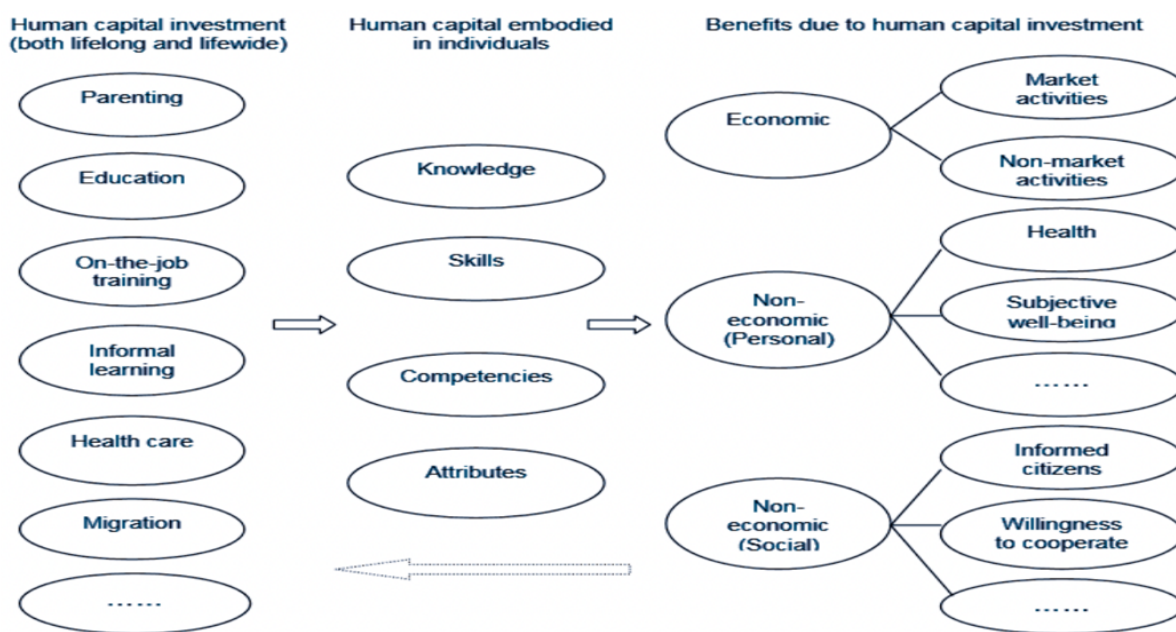


Figure 2: Economically active population, highest educational attainment, UK, 2004 to 2018. Source: (ONS, 2019).



Aside from the economic advantages of human capital it is thought that the non-economic advantages generated by human capital are just as beneficial including but not restricted to personal wellbeing, social cohesion and improved health as shown in Figure 3 (UNECE, 2016a). These factors play a large role in the broader societal structure within the country which in turn affects productivity and eventually the economic outcomes thus proving to be an extremely advantageous asset.

Figure 3: Human capital: a sketch of its formation, composition and benefits generated. Data Source: UNECE (2016a).



Over recent years due to technological advancements and an overall change in the structure of markets and employment, the competitive edge countries and firms once had because of their technology have now become of less importance as these methods have become increasingly ubiquitous and easy to obtain or emulate. Because of this human capital may arguably be the most important facet of a country with employees being a primary source of

revenue (Samartha et al., 2019a). Due to this it is clear that a country's human capital is a great asset to it and should be included as a part of the capital stock of the country (Parker et al., 1989).

In contrast to the recent decrease in investment and capital growth, the Human Capital Index for the United Kingdom has in fact increased from 0.777 to 0.783 as seen in Figure 5 (The World Bank, 2020). This delineates that despite a dramatic fall in almost all forms of capital in light of the pandemic, due to the nature of the value of human capital it retained stability.

Figure 4 : Total Annual growth rate of investment (GFCF) 2014 to 2020. Data Source: OECD (2020).

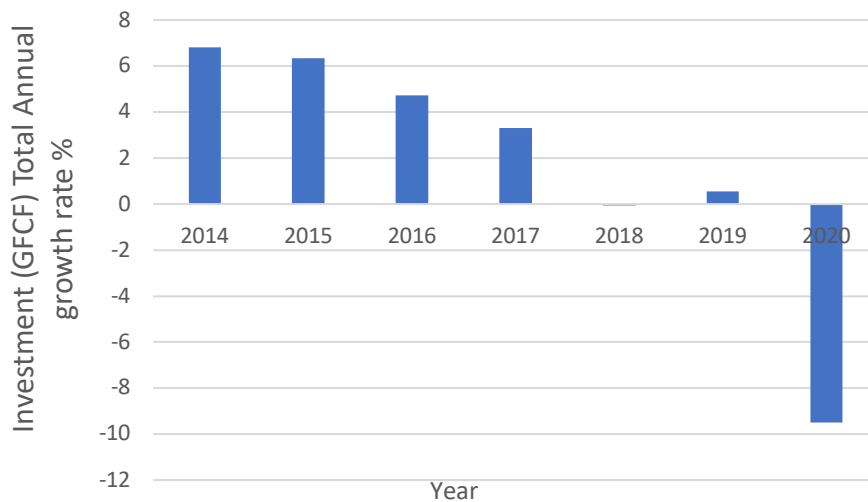
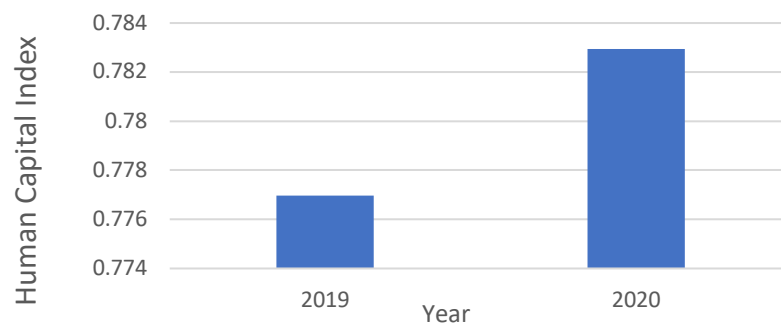


Figure 5: Human Capital Index for the United Kingdom. Data Source: The World Bank (2020).



Proposed calculations

Detractors of the inclusion of human capital on typical balance sheets in capital accounting often argue that the components of human capital such as knowledge and skill are difficult to assign numerical value to as the calculated value can become somewhat subjective or complex, nevertheless methods have been put in place to quantify this value. According to the United Nations Economic Commission there are currently three main approaches measuring human capital (UNECE, 2016b).

- I. The cost-based approach
- II. The lifetime income-based approach
- III. The indicators-based approach

The cost-based approach - calculates the value of the human capital stock as being the depreciated value of the stream of past investment.

The lifetime income-based approach - determines human capital by taking the sum of the discounted values of all future income streams that all individuals in the population expect to earn throughout their lifetime; it is a calculation of output rather than input.

The indicators-based approach - estimates human capital based on educational output indicators. Many different measures have been used in the associated literature for example, adult literacy and school enrolment rates.

The current method of assigning a numerical value to human capital in the United Kingdom is the lifetime income-based approach however there is ongoing research being performed to determine whether this is the best method of calculation. Before adding human capital to the national capital stock, the associated data must be deemed representative and accurate. An evaluation of the methods will be given below to determine if the lifetime income-based approach is the most appropriate.

Current Formula used:

The preliminary formula used to calculate the human capital is taken from the formula of calculating real market value of an asset which is given by:

$$V_t = \sum_{\tau=1}^T \frac{f_{t+\tau-1}}{(1 + \delta)^\tau} \quad (1)$$

V_t is real market value of an asset at the beginning of year t

f is the real rental income earned in each period

T is the service life of an asset in years

δ is the discount rate

The corresponding equation for a human capital asset involves using earnings as the rental income and working life as the service life. Thus, the real market value of an asset at the beginning of year t is the present value of lifetime income. This is calculated using factors such as age and stage of life in a 5-step process using the Jorgenson and Fraumeni (1989) method.

Evidence to support the use of the lifetime income-based approach

The lifetime income-based approach is currently the preferred method of computing the value of capital in the United Kingdom due to the fact it makes the most use of classic economic theory basing its use on the fact labour is paid according to its marginal productivity. The method uses income as a measure of returns to investment thus the value of human capital is a result of the forces of demand and supply of labour (UNECE, 2016c).

A prominent example of the success of this method of calculation at a microeconomic level is Infosys, an Indian based IT company. This company has adopted the Lev and Schwartz compensation model in their Human Resource Accounting method which uses a formula akin to the above and is delineated by the following:

$$V(y) = \frac{I(t)}{(1+r)^{t-r}} \quad (2)$$

$V(y)$ is the expected value of a 'y' year old person's human capital

t = years of service in the particular designation

$I(t)$ is the expected earnings of the person in period t

r = discount rate (specific to the cost of capital to the company)

Stakeholders can view the company's commitment to investing in employees across all levels of experience (Kaye, 2012). Following this the company has subsequently seen high

market valuations following their method when considering human capital as an asset rather than a liability using this calculation (Samartha et al., 2019b)

Another advantage of the lifetime income approach as compared to the other methods is that outputs can be measured independently of inputs; in contrast the cost-based approach is based on the assumption that inputs and outputs are of equal value. The system also has typical elements of accounting systems whilst in the cost-based approach the choice of price index to deflate past expenditures creates complexities (UNECE, 2016d).

Furthermore, in the lifetime income-based approach is that human capital can be broken into components such as investments from births, education and immigration as well as depreciations from ageing and emigration which can help with precision and give one further insights and potential for real time changes and adaptations.

Changes to the current approach

As mentioned previously the calculation of human capital is a notoriously complex process with refinements and augmentations being considered constantly. One interesting and highly significant example of this is the recent change in the method the United Kingdom uses to measure how real human capital changes over time. Instead of using chain-linked indexes such as the Laspeyres, Paasche and Fisher indexes the Törnqvist method is used to 'index the quantity of stock' as the ONS (2019) believes it entails certain advantages such as the fact 'it takes into account the changes within the number of people within each of the population categories by age, sex, and highest qualification attainment and the changes in the shares of them.' This in turn indicates how human capital changes over time.

Recently there has also been debate surrounding the prospect of switching to an indicator-based approach in calculating the value of human capital. The ONS (2020) conducted a survey in which they asked 126 individuals if they thought this method would be appropriate when determining this value. The outcome of this survey showed 87% of the individuals agreed with including an indicator-based approach to calculate the value and ‘provide a more holistic overview than the current income-based approach.’

Respondents also gave suggestions into what indicators can be included in this method, these included: Crime, Independent learning, Personality traits, Health and family life. Although the indicator approach method lacks a common metric it is useful as these factors can be accounted for. The indicator-based approach can be split into two groups, indicators that represent the flow of investment and indicators of the state of human capital in the population (stock indicators). The value of stocks can be calculated using flows through the perpetual inventory method (Berlemann and Wesselhöft, 2014).

The calculation for this can be defined as:

$$K_t = K_{t-1} + I_{(t-1)} - D_{t-1} \quad (3)$$

Where:

K_t is the net capital stock

t is the net capital stock at the beginning of period

K_{t-1} net capital stock at the beginning of the previous period

$I_{(t-1)}$ is gross investment in the previous period

D_{t-1} is the consumption of fixed capital

The suggested factors given by respondents in this trial can be taken into account when developing new models of human measurement and may support the move towards an indicator-based approach.

In addition, another beneficial factor of the indicator approach is that it relies less on assumptions than the other two monetary approaches. The cost-based approach relies heavily on an assumption regarding the rate of depreciation which is often difficult to calculate. The lifetime income-based approach also assumes labour is paid according to its marginal productivity. By reducing the number of assumptions, the calculation may be more precise and accurate (UNECE, 2016e).

It is important to note that respondents from central government, local government and industry were clear that this method should not be a substitute for the current system yet should act in tandem with the existing measures.

Conclusion

Overall, the exclusion of human capital from the net capital stock must be revised in the interest of inclusivity of all forms of essential capital. It is clear human capital is a considerable asset to the country especially in light of the technological and structural alterations of the ever growing and rapidly changing business and education sectors. The optimal way to do this to ensure an accurate and encompassing value is calculated which is

already the subject of an ongoing macroeconomic investigation in the country. Alongside the current income-based approach the indicator approach should be further investigated and incorporated due to its additional advantages, following this the asset of human capital should be added to the net nation capital of the United Kingdom due to the fact it is becoming increasingly important to recognise that the return on human capital is equally important as the return on investments as human capital has direct impacts on society, both in terms of monetary and non-monetary gain.

Reference list

Berlemann, M. and Wesselhöft, J.-E. (2014). *Estimating Aggregate Capital Stocks Using the Perpetual Inventory Method -A Survey of Previous Implementations and New Empirical Evidence for 103 Countries*. [online] Available at: http://www.review-of-economics.com/download/Berlemann_Wesselhoeft_2014.pdf

Johannsson, K. (2021). *The National Balance Sheet and Capital stocks, Preliminary estimates, UK*. [online] Office of National Statistics. Available at: <https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/bulletins/thenationalbalancesheetandcapitalstockspreliminaryestimatesuk/2021>

Kaye, L. (2012). *Time to start valuing human capital as an asset on the balance sheet*. [online] the Guardian. Available at: <https://www.theguardian.com/sustainable-business/valuing-human-capital-asset-balance-sheet>

Mayo, A. (2008). *Financial Statements and Human Capital*. [online] Available at: <http://www.mayolearning.com/assets/Uploads/Publications/ICAEW-May-08-Measuring-Human-Capital.pdf>

OCED (2019). *Productivity, human capital and educational policies - OECD*. [online] Oecd.org. Available at: <https://www.oecd.org/economy/human-capital>

OECD (2020). *GDP and Spending - Investment (GFCF) - OECD Data*. [online] The Organisation for Economic Co-operation and Development. Available at: <https://data.oecd.org/gdp/investment-gfcf.htm>.

ONS (2019). *Human capital estimates in the UK*. [online] Ons.gov.uk. Available at:
<https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/humancapital/estimates/2004to2018>

ONS (2020). *Consultation response: Indicator-based approach to measuring human capital*. [online] *The Office for National Statistics*. Available at:
<https://consultations.ons.gov.uk/well-being-inequalities-sustainability-and-environment/indicator-based-approach-to-measuring-human-capita/results/onshumancapitalconsultationresponse.pdf>.

ONS (2021). *The National Balance Sheet and Capital stocks, Preliminary estimates, UK*. [online] Office of National Statistics. Available at:
<https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/bulletins/capitalstocksconsumptionoffixedcapital/2021>

Parker, L., Ferris, K. and Otley, D. (1989). *Accounting for the Human Factor*. New York: Prentice Hall.

Samartha, V., Hawaldar, I.T., Jane, L. and Souza, D. (2019). Application of Lev and Schwartz Compensation Model on the Accounting Practices of MCF Limited. *International Journal of Scientific & Technology Research*, [online] 8(08). Available at: <https://www.ijstr.org/final-print/aug2019/Application-Of-Lev-And-Schwartz-Compensation-Model-On-The-Accounting-Practices-Of-Mcf-Limited.pdf>.

Singh, A. (2010). Human Resource Accounting at Infosys - A Case Study. In: *Emerging Markets Case Studies Collection*. [online] Excel Books. Available at:

https://www.researchgate.net/publication/305723324_Human_Resource_Accounting_at_Infosys-_A_Case_Study.

The World Bank (2020). *Human Capital Index (HCI) (scale 0-1) - United Kingdom | Data*.

[online] Worldbank.org. Available at:

https://data.worldbank.org/indicator/HD.HCI.OVRL?cid=GGH_e_hcpexternal_en_ext&end=2020&locations=GB&most_recent_year_desc=false&start=2010

UNECE (2016). *United Nations Economic Commission for Europe Guide on Measuring Human Capital Prepared by the Task Force on Measuring Human Capital United Nations*. [online]

Available at:

https://unece.org/fileadmin/DAM/stats/publications/2016/ECECESSTAT20166_E.pdf.