UNIVERSITY of STRATHCLYDE
CENTRE FOR ENERGY POLICY

Policy Briefing

# The role of CCUS in industry clusters in delivering value to the political economy: a new multiplier metric for the quality of employment

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## Introduction

CCUS has been identified as one of a range of low carbon solutions that are likely to be required to deliver our ambitious net-zero carbon emission reduction targets by 2050 at UK level, and 2045 in Scotland (CCC, 2019). The UK Government's CCUS Action Plan (BEIS, 2018) focuses on the role that CCUS can play in decarbonising our high-value but emissions intensive industrial clusters. A crucial objective for policy is to ensure that industrial decarbonisation happens in such a way that not only are direct industry and supply chain jobs retained, but that these jobs may ultimately grow as industry responds to competitive decarbonisation solutions. The impact on jobs and people's incomes is important in the context of the 'Just Transition' that the Scottish Government has set up a Commission to consider. The aim of our UKCCSRC project[1] is to develop methods to investigate the value associated with supply jobs supported by key potential capture industries in the UK industrial clusters, and how this may be affected by the introduction of a CCUS system. Our initial applied focus is on Scotland, and the type of industries located at the Grangemouth cluster in the Central Eastern belt. These are predominantly the Scottish Chemicals industries.

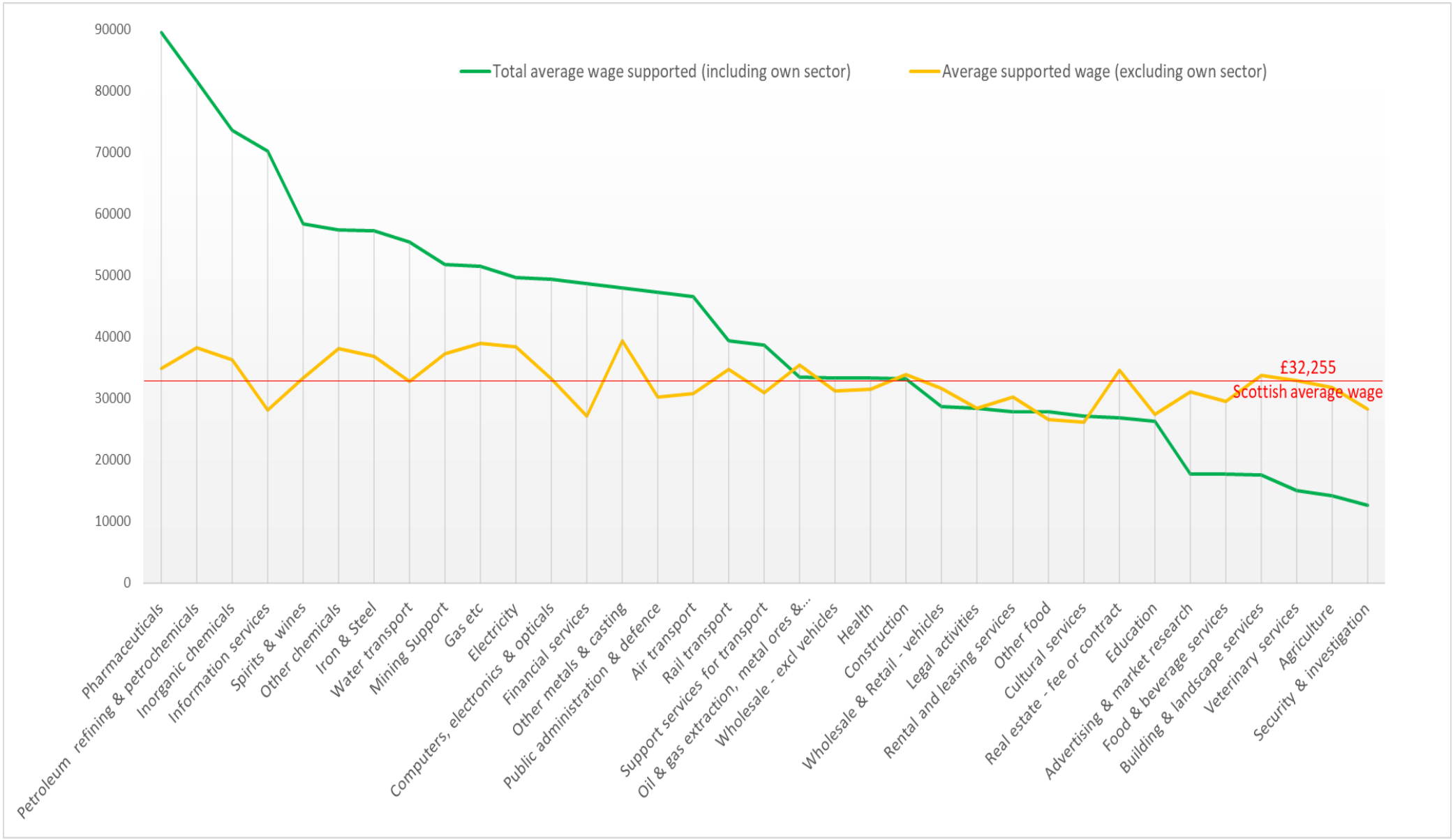
In previous work[2] that has informed the CCUS Cost Challenge Task Force and the BEIS CCUS Action Plan, and two subsequent projects[3,4] funded by Crown Estates Scotland and Scottish Enterprise, we have investigated how many direct and indirect (supply chain) jobs are supported by Scottish and UK industries that may be targeted for CCUS and/or other industrial decarbonisation solutions. This has included both the industries that could be play a key role in delivering $CO_2$ transport and storage services (the oil and gas industry and its supply chain), and capture industries. In UK regional context, potential capture industries located at key cluster locations are of particular interest under the BEIS CCUS Action Plan.[5]

In Scotland, particular interest lies in the Scottish Chemicals industry, much of which is located at the Grangemouth cluster. Basic employment multiplier analyses (using input-output data published by the Scottish Government) tells us that, while relatively capital intensive (making direct industry jobs hard to create), industries in the Chemicals sector support supply chain jobs across multiple Scottish sectors. Multiplier analysis using the Input-Output Tables published by Scottish Government for the year 2015, tells us that, overall, the Scottish Chemicals industry directly employs 5,691 full-time equivalent workers, with a further 7,796 employed in supply chains throughout Scotland.

## A new multiplier metric to assess the quality of employment supported, or the associated wage premium

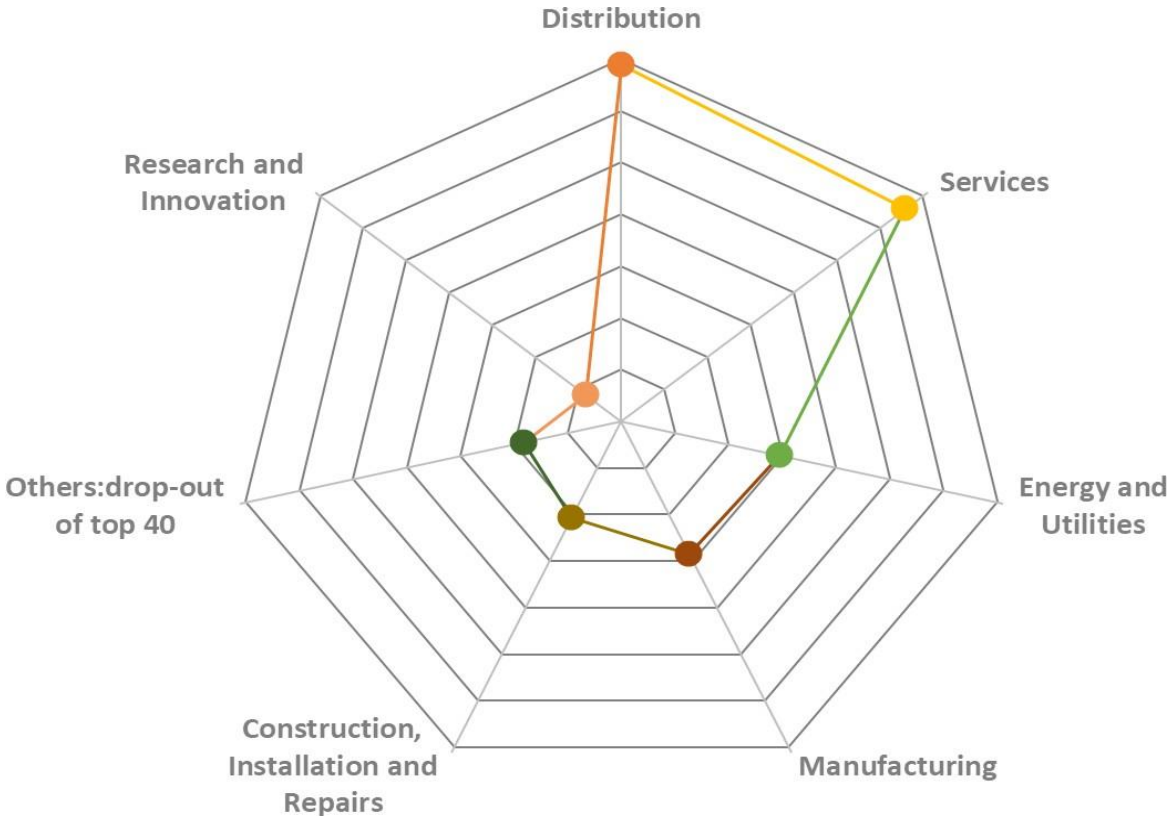
The question we address here is the extent to which this may be considered as high quality employment. We extend conventional input-output economic multiplier analysis to produce a new metric that reports the quality of employment in terms of the average wage supported across the wider economy by any given industry's activity. We find that the Scottish Chemicals industries support average wages per full-time equivalent (FTE) worker in their upstream supply chains that range (in 2015 prices) between £36k (Inorganic Chemicals) and £38.2k (Petroleum Refining and Petrochemicals). This is considerably greater than the average wage across all Scottish industries (£32.2k per FTE worker), and among the highest supported by any Scottish industry.

## Figure 1. The wage premium multipliers: total average wage supported across all Scottish sectors by activity in selected Scottish industries



If the direct own-sector wage is included in the calculation, Figure 1 shows that the average supported wage rises considerably in each case, with the three Chemicals industries being second only to the Scottish Pharmaceuticals industry in terms of the wage premium associated with total supported jobs.

Figure 2: Composition of upstream employment supplied by the Scottish 'Petroleum Refining and Petrochemicals' industry




| Industry grouping | Breakdown of composition of supply chain jobs | Rank | Average wage (£) | Rank |
|---|---|---|---|---|
| Distribution | 600 | 1 | £32,007 | 6 |
| Services | 574 | 2 | £32,528 | 5 |
| Energy and Utilities | 246 | 3 | £55,321 | 1 |
| Manufacturing | 236 | 4 | £50,009 | 2 |
| Construction, Installation and Repairs | 166 | 5 | £38,626 | 4 |
| Others: drop out of top 40 | 144 | 6 | £42,052 | 3 |
| Research and Innovation | 54 | 7 | £26,213 | 7 |

Our method allows us to consider the critical contributors to these high average supported wages. For example, in the case of the Scottish 'Petroleum Refining and Petrochemicals' industry we find that supply chain employment is dominated in absolute terms by jobs in lower wage Distribution and Services sectors. But the presence of higher wage energy/utilities and other manufacturing sectors pull up the average wage supported (£38.2k). This is illustrated in Figure 2 above. The spiral diagram breaks down the total indirect supply chain employment supported by demand for the output of the Scottish Petroleum Refining and Petrochemicals sectors, with the table section detailing the breakdown of jobs across industry grouping. It also reports the average wage supported in each of these groups (which, in turn, is determined by just what activities are required in this case).

The next stage of our research project will be to consider how this value may be impacted under different scenarios for introducing and, crucially, paying for CCUS.

## Conclusions

So what does our work with this new multiplier metric tell us? We have extended the basic input-output analysis methods to relate the employment and (wage) income multipliers that are familiar to, trusted by and often used by policymakers to consider how much activity is ultimately supported by different industries across the wider economy. By incorporating information the matrices that underlie conventional employment and income multipliers, we have derived a new metric. We refer to this as the average wage supported by an industry's activity. It tells us about the wage premium, for example, relative to the average wage across the wider economy. The average supported wage metric can be reported including or excluding the industry's own average wage. We look at this alongside the associated employment, which can be the total (direct plus indirect) full-time equivalent (FTE) number of workers, or just those in the supply chain (the indirect component). The link to employment numbers is important as it tells us just how important the supported average wage is in delivering value to the economy.

In this initial briefing we focus attention on the Scottish Petroleum Refining and Petrochemicals industry, much of which is located in the INEOS operation at Grangemouth. The employment multipliers that can be derived from the most recent Scottish Input-Output Tables (reported for 2015) tell us that this industry directly employs 2,571 FTE workers but supports a further 1,825 in its Scottish supply chain. Our new multiplier metric tells us that the average supported wage across the indirect supply chain component is £38,206, delivering a wage premium of £5,951 per worker above the Scottish average FTE wage of £32,255 (all figures relating to and in 2015 prices). This is one of the largest wage premiums delivered by any Scottish industry (only 'Other Metals and Casting' has a higher average supported wage, of £39,447).

Underlying determinants of this value the scale of employment supported in Scottish service and distribution industries (albeit with lower average wages), and the wage income associated with supply linkages to other Scottish manufacturing sectors, and our energy and utilities industries. Therefore, in considering how industrial decarbonisation actions may impact the value delivered by key industries such as Scottish Chemicals, it is important to consider circumstances (including decarbonisation activity) in the other Scottish sectors that it currently shares such strong domestic supply chain linkages with. This will be the focus of the second stage of our work: to consider scenarios for the deployment of costly solutions such as CCUS.

## About the project

This research project is funded by UK Carbon Capture and Storage Research Centre (UKCCSRC).We are grateful to the policy and industry actors that have engaged with the research at different stages. All research outputs of the project will be published and available on CEP and UKCCSRC websites (below).

## About the authors

Karen Turner is Director of the Centre for Energy Policy (CEP), University of Strathclyde and an expert on modelling and analysis on the economy-wide impacts of decarbonisation and low carbon solutions and energy policies. She is currently serving on the Scottish Just Transition Commission

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## Endnote

[1] Turner, K., Race, J., Katris. A., and Alabi, O., (2019). 'The Role of CCS in Industry Clusters in Delivering Value to the Political economy'. *University of Strathclyde*, [online] Available at https://doi.org/10.17868/68739

[2] Turner, K., Race, J., Alabi, O., and Low, R., (2018). 'Making the macroeconomic case for near term action on CCUS in the UK? The current state of economy-wide modelling evidence', *University of Strathclyde,* [online]. Available at: https://strathprints.strath.ac.uk/63554/

[3] Turner, K., Alabi, O., Low, R., & Race, J. (2019). 'Reframing the Value Case for CCUS: Evidence on the Economic Value Case for CCUS in Scotland and the UK' *University of Strathclyde,* [online]. Available at: https://strathprints.strath.ac.uk/67392/

[4] Turner, K., Race, J., and Sweeney,G. (2019). 'The economic opportunity for a large scale CO2 management industry in Scotland. Available at http://www.evaluationsonline.org.uk/evaluations/Search.do?ui=basic&action=showPromoted&id=689

[5] See BEIS CCUS Action Plan,p.29

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