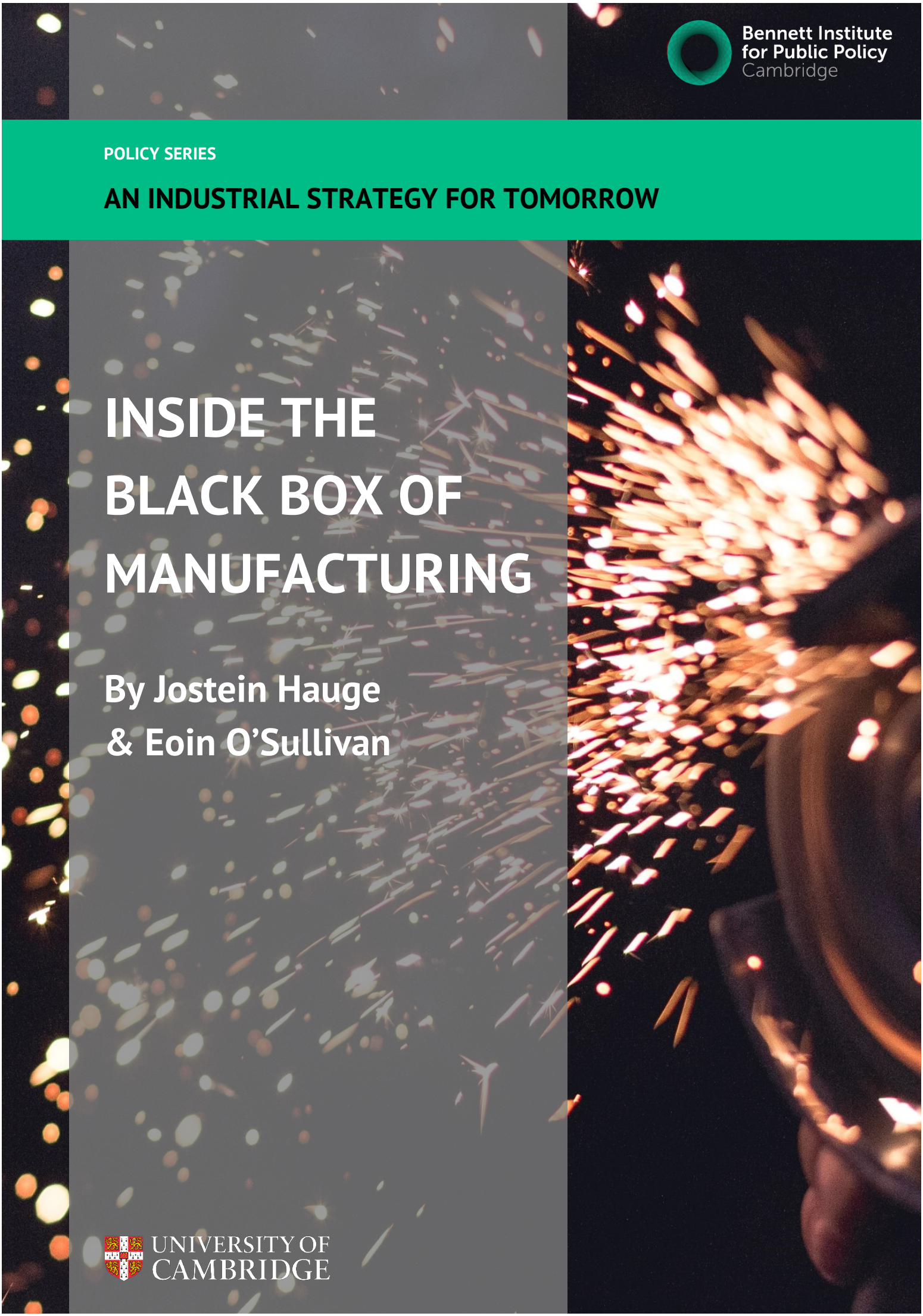


Bennett Institute for Public Policy Cambridge

POLICY SERIES

AN INDUSTRIAL STRATEGY FOR TOMORROW

INSIDE THE BLACK BOX OF MANUFACTURING

By Jostein Hauge & Eoin O'Sullivan

UNIVERSITY OF CAMBRIDGE

Authors:

Dr. Jostein Hauge is an economist and a Research Associate at the Centre for Science, Technology and Innovation Policy (Institute for Manufacturing) at the University of Cambridge. He is also a Fellow of the Royal Society of Arts. His research focuses on economic development, industrialisation, technological change, international trade, globalisation, and the role of the state in economic change.

Dr Eoin O'Sullivan's policy-focused research explores what makes national innovation systems effective at translating new science and engineering ideas into novel technologies and emerging industries. Research projects are designed to support the evidence needs of technology and innovation policymakers, in particular those officials in public research agencies who are responsible for programme design, portfolio management and strategy development. Research projects are distinguished by efforts to more carefully characterize the technologies, application systems and industrial structures involved in the journey from research to economic wealth.

Published:

February 2020

CONTENTS

A publication from the Bennett Institute for Public Policy

INTRODUCTION

For the newly elected government in the UK, like many of its counterparts elsewhere, industrial strategy has become the most important institutional vehicle through which it seeks to achieve some of its core goals. These include promoting economic growth, tackling falling productivity growth, designing research and innovation policies that will enhance the strengths of the UK economy, and ensuring that its leading sectors are globally competitive.

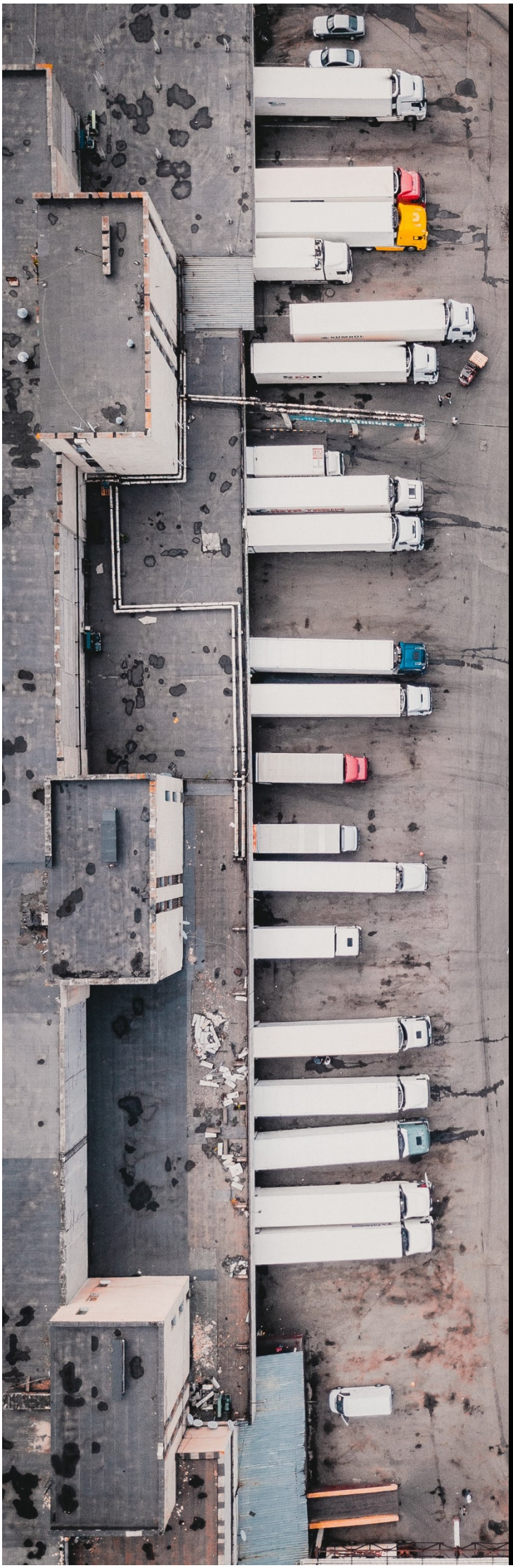
Its declared commitment to 'levelling up' the performance and opportunities of poorer regions with wealthier and more productive ones is also connected to its industrial strategy. This shift in UK government thinking mirrors developments elsewhere, as a range of international organisations and various western governments have recently proclaimed their commitment to 'place-based' economic development strategies.

Some experts in this area argue that there exists a template or model that the UK could import from other leading economies. At the Bennett Institute, however, we take a different tack. We have been working with some of the leading researchers at Cambridge, and engaging key decision-makers in government, to interrogate more deeply some of the dilemmas and challenges facing those tasked with designing and evaluating the industrial strategy, and the local strategies which government has encouraged some of its metro-mayoral authorities and Local Enterprise Partnerships in England to develop. Our belief is that these will only succeed if they understand and address today's social and economic needs from place to place, and align with the key dynamics shaping the economy emerging in the coming decades.

Each of the papers in this series offers an in-depth examination of some of the fundamental issues – concerning data, measurement, definition, research policy and strategic ambition – which will determine how well governments across the UK fare in this area. Some of these draw upon evidence from other countries, and some offer arguments and proposals that are germane internationally, as well as applying to the UK.

Our aim in publishing these is to enrich and stimulate thinking and debate about some of the core precepts and goals of the industrial strategy which we need for tomorrow, not just today.

Michael Kenny and Diane Coyle
Co-Directors of the Bennett Institute for Public Policy



KEY ADVICE

- The economic value of manufactured goods increasingly depends on activities that are officially categorised as belonging to other sectors of the economy.

- Therefore - for the purpose of industrial strategy, most advanced economies, including the UK, are not counting manufacturing the right way. For example, a range of manufacturing-related technical services are excluded from the manufacturing category in the national accounts, such as R&D, industrial design, analysis and testing.

- The authors propose a new analytical framework for policymakers that is more useful than the existing system of industry classification codes. This reflects a fuller understanding of how firms self-organise into their industry communities. Essentially, policymakers need to have a more holistic sense of the industrial system.

- The findings are equally relevant for local and regional industrial strategy, as well as national industrial strategy. Geographical clusters of technological capabilities defy the conventional demarcation between manufacturing and services, and some clusters of capabilities span the different categories of industry classification codes. Therefore, regional authorities should be strategising for geographically clustered value chains rather than conventional sectors.

Overview

Most of us are familiar with the concept of 'industries' — like the automotive industry, the financial industry, or the consulting industry. What we think of as industries, and how we classify entire industrial sectors in the national accounts, are very important questions. Answers to them tell us much about the types of economic activities that are important in different countries. For example, China can be perceived as a manufacturing powerhouse, and the UK as a services-based economy.

In our recent report written for the UK Department for Business, Energy and Industrial Strategy, we suggest that there are some flaws in the way official statistics on industrial classification are compiled.

The main problem lies in the system of national accounting which employs categories of economic activity that do not accurately reflect how firms place themselves within distinct 'industry communities'. For example, a range of manufacturing-related services are excluded from the manufacturing category which government uses.

These manufacturing-related services are most importantly technical services that require production-knowhow, like R&D, industrial design, analysis, and testing. Additionally, regulatory services, intellectual property services, investment services, and consultancy services are increasingly tailoring their needs to specific manufacturing industries. For the purpose of industrial strategy, we argue that many of these services should 'belong' to the manufacturing sector.

Understanding the manufacturing system

The functioning of a manufacturing system should be considered as a complex organism, like the human body. The body relies on cooperation between interdependent biological sub-systems — like the circulatory system, the digestive system, the immune system, the nervous system, the muscular system, the respiratory system, and so on. Just like the human body, the functioning of a manufacturing system relies on cooperation between interdependent sub-systems. The central value chain, which consists of R&D, design, production, distribution, and after-sale services, needs timely provision of technical services, like analysis, testing, and logistics.

It also needs timely provision of specialist professional services, like regulatory services, intellectual property services, investments services, and consultancy services. And it needs a reliable supply of materials, components, and other manufactured inputs, like machinery, equipment, and tools.

We use the following definitions of key terms, all set out in more detail in our report, to capture the systemic nature of manufacturing.

Manufacturing: a series of inter-related activities and operations involving the design, materials selection, planning, manufacturing production, quality assurance, management and marketing of the products of the manufacturing industries.

International institution for Production Engineering Research (CIRP), 1983

'...a business system encompassing all activities required to deliver products that meet customer needs... extends from R&D, design, engineering, to production, finance, sales, marketing, and after-sales service... extends beyond any single enterprise, across increasingly global supply chains and business networks'.

Canadian Manufacturers & Exporters (2005)

The first part of our report reviews a range of different definitions and ways of understanding manufacturing and production. We have reviewed these terms because it is so important to highlight that defining manufacturing in the 21st century is not a straightforward task. While, essentially, manufacturing is the transformation of raw materials into finished products, many people should, and do, understand it as something more complex than that.

Counting manufacturing in the economy

If you adopt a systems-view of manufacturing, like the one outlined, you quickly discover that the way most countries count the contribution of manufacturing in their economies is problematic.

The neglect of manufacturing-related services

First, and most important, is the neglect of manufacturing-related services. While it could and should be debated which services are truly 'embedded' in manufacturing, studies have made it abundantly clear that services are becoming an increasingly important part of manufacturing. According to Penny Bamber and colleagues at the Duke Global Value Chains Center, more than one-third of the value of manufacturers' exports (globally) come from services embedded in manufacturing. They find that distribution and business services make the largest contribution. The EU tops the list of 'servitisation' of manufacturing, where embedded services accounted for 40 percent of manufacturers exports in 2011.

Because of this development, some scholars suggest that policies and initiatives to promote manufacturing should take a value chain perspective — in other words, manufacturing statistics should include pre-production services, like R&D and industrial design, and post-production services, like repair and sales. In a recent study published by the Brookings Institutions, Kate Whitefoot and colleagues compared employment in US manufacturing between a value chain perspective and a non-value chain perspective. They found that in 2002, manufacturing narrowly defined employed about 15.2 million workers, but that the entire value chain employed nearly 37.2 million workers. By 2010, employment had dropped to 11.5 million in production and to 32.9 million across the value chain — meaning that there was deindustrialisation, but barely in the services segments of the value chain.

For this report we carried out a similar project, looking at the life science industry in the UK. The UK Office for Life Sciences has undertaken a very useful exercise, mapping the landscape of the UK life science industry (medical technology and biopharmaceutical sectors) in a way that includes the range of services linked to the manufacturing process. Part of the motivation for carrying out such an exercise is that the standard way of classifying industries in the national accounts does not fully reflect the way in which the industry is really organised, especially regarding the deep links between manufacturing and service activities.

We looked at all the data gathered by the Office for Life Sciences at the firm level, and found that a significant share of the industry's value is generated by services: especially information and communication services; professional, scientific and technical services; administrative and support services; and wholesale and retail trade services. In fact, the entire life science industry generates roughly three times more revenue than the core manufacturing activities in the industry.

This is not to suggest that the life-science industry is three times larger than the official statistics suggest, or that all these service activities should be counted as manufacturing. But the industry is certainly larger than the statistics on only manufacturing suggest. And there is a case for at least including professional, scientific, and technical services in the equation. Research has made it abundantly clear that such services are closely intertwined with the manufacturing process in many industries, both geographically and through shared capabilities (see for example research by Gary Pisano and Willy Shih).

The illusion of (some) de-industrialisation

If we started counting some of the manufacturing-related services as part of manufacturing output in the economy, we would appreciate that the UK has not de-industrialised as severely as the official statistics tell us.

Furthermore, in the UK's national accounts, companies are normally classified according to the activity in which the largest number of their employees is engaged. This means that a company that both makes and delivers a product will be classified as either manufacturing or services, not both, depending on the number of people working in each category.

In the past, manufacturing firms used to carry out many services in-house, such as design, programming, marketing, analytics, and even 'generic' services, like catering and security guards. But they were still classified as manufacturing firms because this was their core activity and this was the activity that most employees were engaged in. However, recent developments in information and communication technology and massive increases in firm size have enabled many of these services to grow into separate firms, supplying manufacturing firms in important ways. In the national accounts, this has resulted in an increase in services as a share of the economy. In reality, though, this development is simply a reclassification effect, not a change in the productive structure of the economy. Services that were formerly carried out as in-house operations in manufacturing firms have now moved out. A good deal of de-industrialisation has, therefore, been significantly overstated.

De-industrialisation in UK has certainly happened. But if we were to count manufacturing output more 'accurately' — based on our discussion so far — it would probably be closer to 15% of the UK economy, rather than 9%, which is what the national accounts report. Admittedly, this figure would include some activities that are indeed services, and should be counted as services for some purposes. But in the context of the UK's industrial strategy, these services cannot be overlooked because many of them are integral to its industrial systems.

What are the implications for national and local industrial strategy?

Essentially, we are proposing an analytical framework that is far more useful for policymakers than the existing system of industry classification codes, and which reflects a fuller understanding of how firms organise themselves into their production ecosystems.

Policy therefore needs to have a more holistic sense of the industrial system. And a viable industrial strategy should be designed not only with manufacturing firms in mind (those currently counted as manufacturing firms in the industry classification system), but should consider all the services which firms provide and which serve wider industrial systems. Those countries that wish to retain a strong manufacturing base need to invite these services firms to the table when they develop their national industrial strategies.

Our findings also have implications for local/regional industrial strategy, as well as national industrial strategy. Much of the debate about growth is concerned with understanding the benefits of geographical clustering of certain capabilities and technologies. As we have highlighted, the traditional way of thinking about 'sectors' is no longer sufficient to understand how firms organise themselves into their industry communities. This is also true at the regional level — as geographical clusters of technological capabilities defy the conventional demarcation between manufacturing and services, and some clusters of capabilities span the different categories of industry classification codes. Silicon Valley in the U.S. is the perfect example. Therefore, regional authorities should be strategising for geographically clustered value chains rather than conventional sectors.

In order to build a competitive local cluster, it is crucial to understand the quality and strength of linkages within it, and, externally, foster the quality and strength of linkages to national and global supply chains. To understand these linkages, policymakers need better evidence. In particular, they need better evidence about relevant technological capabilities, better evidence on national versus international linkages, and better benchmarking evidence on competing regions of industrial clusters (both nationally and internationally).

In conclusion, changing the way in which we count manufacturing activity should be an integral part of the development of an industrial strategy. Otherwise, such a strategy will fail to target all those firms that should be targeted. Second, if manufacturing does not appear to be important for a regional or national economy, the chances of an industrial strategy becoming a priority for government will diminish.

References

Hauge, J. and O'Sullivan, E. (2019). "Inside the black box of manufacturing: Conceptualising and counting manufacturing in the economy." Cambridge: University of Cambridge Engineering Department.

Bamber, P. Cattaneo, O., Fernandez-Stark, K., Gereffi, G., Van der Marel, E. and Sheperd, B. (2017). "Diversification through servification." World Bank: Washington D.C.

Whitefoot, K., Valdivia, W. and Adam, G. (2018). "Innovation and manufacturing labour: a value-chain perspective." Washington D.C.: Brookings Institution.

This essay is based on a report written by the authors for the UK Department for Business, Energy and Industrial Strategy. Funding for the research was provided by the Gatsby Charitable Foundation.

The Bennett Institute for Public Policy
Department of Politics and International Studies
Alison Richard Building
7 West Road
Cambridge, CB3 9DT
www.bennettinstitute.cam.ac.uk

@BennettInst

UNIVERSITY OF CAMBRIDGE

Bennett Institute for Public Policy Cambridge