Size Matters: Completing the Jigsaw for Rural and Regional Productivity. Exploring the Concept of Heatmapping for Evidencing the Non-Teaching Interactions and Impact of Smaller and Specialist Universities and Colleges in the United Kingdom

Matthew J. Guest
GuildHE

James C. Ransom
University College London

In this paper, we explore an emerging experimental measure for capturing the interaction and impact of smaller and specialist universities and colleges in the United Kingdom. We conducted a series of qualitatively-based case studies in order to "map" institutional interactions locally, nationally and internationally. This paper discusses their development, summarises the approach taken and why it may be more beneficial than an economic impact report. The paper concludes by posing some further questions and recommendations.

Keywords: economic impact, heatmap, impact, interaction, knowledge exchange, research, place, policy, university

INTRODUCTION

The concept of the economic impact report is not new. It can be a useful tool for illustrating an organisation's, a group of organisations', or a sector's perceived economic contribution through direct and indirect spending, most often through an input-output model (Ambargis at al, 2014; Siegfried, 2008). Where education is concerned, it can go further and include wider contributions to society, for example, through estimating savings to the taxpayer. Unsurprisingly, it has been a tool that universities and colleges use frequently to prove their worth to their local and national communities. UK universities and higher education providers are no exception to using economic impact reports to demonstrate that they contribute positively and significantly to the economic, social and cultural development of their regions, and to the national economy.

Economic impact studies do result in impressive numbers, especially at sector level: "The higher education sector is vital to the UK economy... In 2014–15 it supported almost one million jobs, and contributed £21.5 billion to UK gross domestic product" (Universities UK, 2017). The University of Oxford estimated its contribution in the same period to be £5.8 billion GVA and 50,600 jobs (BiGGAR Economics, 2017).

This in itself raises one of the challenges with the traditional economic impact study: the "big number". Such estimates of economic impact are problematic for smaller universities, specialist universities and other smaller higher education providers because on face-value economic comparisons they do not generate the same economic benefits. As a result, they tend to be underrepresented and overlooked by national policy makers, despite having crucial roles for the professions they support and their regional socioeconomic environment (Guest, 2019; Bols & Guest, 2018).

The big number approach is one of the long-acknowledged challenges with this economic impact approach, not least the risk of overclaiming impacts (Siegfried et al, 2008; Elliot et al, 1988). There is, therefore, a risk that relying solely on flashy economic impact studies by themselves will undermine the positive benefits that institutions make to their local and national communities.

This is a particularly pertinent risk within the UK at a time when the higher education sector is both under increased political scrutiny with a strong government narrative on the importance of tackling "low quality higher education" (Williamson, 2020) and yet at the same time is seen as part of the solution for driving economic growth and recovery from the Covid-19 pandemic and in addressing regional inequalities (HM Government, 2020).

There are, therefore, several drivers to evidence socioeconomic impact in different ways. It is within this context that we explore the emerging, experimental concept of heatmapping higher education institutional impact. We are particularly interested in the contributions that smaller institutions can make outside of their core teaching function because this area of evidence capture is underexplored. We suggest that universities have pockets of local, national or international collaboration that can be "mapped". The result is a visual heat signature: unique for each pattern of universities and place (Ransom, 2018).

In this paper, we firstly review the current UK policy context and the role smaller universities play within it. We describe some of the challenges with traditional economic impact studies. We then outline the experimental concept of heatmaps that has been employed, before discussing some potential drawbacks. The paper concludes with some recommendations on how the concept of heatmaps can be further developed.

RESEARCH AND KNOWLEDGE EXCHANGE POLICY

In order to set the scene for our heatmaps approach to capturing impact, it is important to consider the recent research and knowledge exchange policy context for higher education within the UK. There have been established drivers for universities to consider their research impact since "impact" was introduced in the 2014 Research Excellence Framework Exercise (REF). This has been expanded upon in the 2020/21 exercise. The REF, though, focuses on the impact *from* research that has been undertaken at an institution. It does not capture the many nuanced relationships that institutions have with their external partners and industries outside of this research-specific lens. The 2020/21 REF guidelines make it clear that non-research based impact and interaction will not be captured:

> "The REF aims to assess the impact of excellent research undertaken within each submitted unit. This will be evidenced by specific examples of impacts that have been underpinned by research undertaken within the unit over a period of time." (REF, 2019, p.68).

This does demonstrate that there is significant interest in how research organisations are contributing to society, but it would be short-sighted to assess university impact based on just the impact from research. There has always been interest in the non-research and non-teaching outputs of universities - the area now commonly referred to as knowledge exchange. Indeed, the UK has one of the longest continual public datasets on higher education engagement - the Higher Education Business & Community Interaction Survey (HE-BCI) - which has been collected since 1999 (Research England, 2020). The HE-BCI data drives related innovation and knowledge exchange funding. The Survey focuses on collecting hard metric data, such as income from commissioned research and licensing. It also captures data on community interaction, although this is usually in the form of the number of community events held. Challenges to the collection have been

acknowledged, such as counting the hours of academic staff time in the delivery of a public lecture as opposed to time involved in both developing and delivering the lecture (HESA, 2020) and the Higher Education Statistics Agency (HESA) is currently reviewing HE-BCI (HESA, 2019).

It was, however, the aftermath of the EU Referendum in 2016 that gave rise to increased policy attention towards the contribution of knowledge exchange to the UK economy and society. This was most apparent in the UK Government's Industrial Strategy in 2017. The Strategy outlined five foundations (Ideas; People; Infrastructure; Business Environment; Places) through which policy and activities were to be developed to address four "Grand Challenges": artificial intelligence and the data revolution, clean growth, the future of mobility, and meeting the needs of an ageing society. There was a renewed focus on research and development as a way to address the UK's economic and social challenges, with the Strategy explicitly stating: "The public and private sector must work with universities, researchers and civil society to put the UK at the forefront of these revolutions, breaking down conventional barriers within and between business sectors and academic disciplines" (HM Government, 2017, p.32).

Most notably, the Strategy committed to the introduction of the Knowledge Exchange Framework (KEF) to measure: the return on investment of increased funding through annual allocations, such as the Higher Education Innovation Fund (HEIF); challenge funding, such as the Industrial Strategy Challenge Funds; and funding for individual researchers and their teams, such as the Future Leaders Fellowships. HEIF and KEF have continued to receive government attention (UKRI, 2020).

The Rise of Place

An added element to the equation is the new centrality of "place". The 2017 Industrial Strategy devoted a whole chapter to place, including the need for local areas to develop their own Local Industrial Strategies. Other specific initiatives were also announced, including the Strength in Places Fund (HM Government, 2017). This competitive funding scheme takes a place-based approach to research and innovation funding to support significant regional growth, and marks the first time that research and development funding in the UK has had such a strong focus on place alongside academic excellence.

The Industrial Strategy was not the only government strategy that demonstrated the new emphasis on place. The Civil Society Strategy also stressed the importance of communities and, as with the Industrial Strategy, devoted a chapter to place (HM Government, 2018). Since the victory of the Conservative Party in the 2019 election, this focus on place has become even more apparent through the "levelling up" agenda. The UK Treasury's terms of reference for the Comprehensive Spending Review for government spending over the next three years explicitly states this as a core theme: "levelling up economic opportunity across all nations and regions of the country by investing in infrastructure, innovation and people" (HM Treasury, 2020).

In response to the government's increased focus on place and levelling up, other policy actors have taken a strong interest in the agenda, covering everything from the broad means of levelling up (O'Brien & Miscampbell, 2020) to sector-specific approaches, such as culture and creativity (Arts Council England, 2020; BOP Consulting et al, 2019).

Higher education has received attention too (Bridge Group, 2019), and research and development actors have also been active. The Nesta report, *The Missing £4 Billion*, argues strongly for the need to fund research and development activity outside London and the South East of England. The authors make a convincing claim that the UK's unbalanced R&D landscape is reflected in its unbalanced economic performance and suggest several remedies to achieve economic and levelling up goals (Forth and Jones, 2020). Actors are also collaborating across sectors in their attempts to drive the levelling up agenda. For example, the Yorkshire and Humber Academic Health Science Network, the NHS Confederation and Yorkshire Universities co-authored a report on how health can act as the new "wealth" for Yorkshire and the Humber as part of the UK's recovery from Covid-19 (Stubbs et al, 2020).

The Roles of Smaller and Specialist Higher Education Institutions

It is within this context that it is important to consider the role of smaller and specialist universities (SSUs). For the purposes of this paper, we define SSUs as GuildHE, the representative body for SSUs,

does: "universities, university colleges, further education colleges and specialist institutions from both the traditional and private sectors….member institutions include some major providers in professional subject areas including art, design and media, music and the performing arts; agriculture and food; education; business and law, the built environment; health and sports." (GuildHE, 2020).

SSUs are frequently found in poorer regions of the UK and often play fundamental roles in their places (Guest, 2019). They engage with communities in coastal and rural areas, serving their specialist professions through providing teaching, research, innovation and knowledge exchange activities (Brockhurst et al, 2014; Kleiman, 2015). Smaller, regional institutions are more likely to prioritise relationships with their localities than larger research intensives (Goddard et al, 2014). Furthermore, in light of Covid-19 and the recovery, regional creative specialists are agile industry experts that carry out high impact, practical research and knowledge exchange to grow the UK's world-leading creative industries. As such, they are well-positioned, in more ways than one, to play major roles in the post-pandemic world. They have the ideas and underlying ability to lead a rapid recovery for their industries, to enable employment and to focus on the future (Guest, 2020).

However, SSUs are often overlooked in policy making and funding, notably through their exclusion from HEIF (Guest, 2018). As HEIF allocations are based upon income-driven metrics (collected through the HE-BCI dataset), smaller institutions do not perform as strongly as larger institutions who are able to command high levels of commercial research and IP income. Combined with the renewed focus on place, it has therefore become increasingly important for SSUs to prove their worth.

THE CHALLENGE OF TRADITIONAL UNIVERSITY ECONOMIC IMPACT STUDIES

One way in which universities have traditionally aimed, and increasingly aim, to prove their worth is through the economic impact study. These have been carried out at sector level and provide a snapshot of likely economic contributions to their economy (Universities UK, 2017). They have also been used to evidence the economic impact of particular subjects and disciplines. In this way, they can be useful to illustrate the contribution of disciplines that have historically been overlooked or dismissed as "low value", such as sports and exercise science (Emsi, 2019). Some studies examine the impact of particular types of institutions on their local economies (Crookston & Hooks, 2012; Kantor & Whalley, 2014; Pastor et al, 2013), with useful findings. For example, Crookston and Hooks' (2012) study of the contribution of rural American community colleges from 1976 to 2004 shows that when investment was made in such colleges they contributed to high quality vocational higher education, provided local employment and encouraged regional socioeconomic growth. Yet they have received less attention in recent decades, which has some similarities with rural SSUs and further education colleges in the UK.

However, there are challenges with the traditional economic impact approach. These include increasing movement towards, and an expectation of, a uniform approach (usually mirroring that of larger research-intensive universities which, by extension, can lead to the omission of the individual strengths of SSUs), and big number fatigue (Ransom, 2020). The latter is also identified by Siegfried et al (2008, p25), who dismiss impact studies at their worst as "public-relations documents masquerading as serious economic analysis". Their criticism centres around the misrepresentation of big number contributions, exacerbated by institutions counting increased local jobs and spending as two separate measures – their impact is likely to be combined as employing local people will result in greater local spending. While Siegfried et al's work is some of the leading research that has undertaken to critically analyse the economic impact of universities, it is perhaps Pastor et al (2013) who best outline the problem with the central feature of most economic impact studies: the input-output methodology. They neatly outline the problem as follows:

> "One of the typical questions that arise are that I/O [input-output] tables assume that the technical coefficients are constant where implicitly it is assumed that they contribute to the change of the productive structure of the regions where they are located. Furthermore, the demand of intermediate inputs by universities of a given sector is not necessarily similar to the expenditure made in average by the other sectors. However, these shortcomings

apply not only to the analysis made in this paper, but in every I/O application of economic impact of universities." (Pastor et al, 2013, p552).

This drawback does not stop Pastor et al (2013) from using the methodology to conduct their study. Both Ambargis at al (2014) and Travis et al (2018) identify similar problems with the I/O model.

Another challenge for the traditional impact study is that it is institution-wide and includes student, staff, and spend impacts but does not often contextualise the impact of research and knowledge exchange activities in a local or regional context. Research in this area is also relatively sparse; Kantor and Whalley (2014) are notable exceptions. Their work concludes that "knowledge spillovers from universities tend to be concentrated on particular local industries" rather than being broad-based (Kantor & Whalley, 2014, p187). However, this conclusion is itself based upon an analysis of how well universities' endowments perform and the impact that that has on their expenditure and, in turn, local jobs markets.

We contend further that traditional impact studies do not do justice to the wide range of university activities (especially those found within SSUs). They "measure spending, output and employment, but do not capture the full impact of engaging with communities in a marginalised neighbourhood, or working with small businesses to strengthen their supply chains" (Ransom, 2020).

THE HEATMAPS APPROACH

SSUs have a big role in their areas (Brockhurst et al, 2014; Kleiman, 2015; Ransom & Guest, 2020) and add to the diversity of the higher education sector in the UK. Tight (2011) suggested that the mix of different kinds of institutions within a particular geography may be more important than the number of institutions. He was primarily interested in the teaching side; however the same argument can be applied to research and knowledge exchange where different institutions serve different communities and have different areas of expertise. Indeed, "research [and knowledge exchange] at newer universities tends to be more applied and arguably more locally relevant, and is not rewarded in the same way" (Goddard et al, 2014). The challenge is how to demonstrate this impact.

As we have discussed, the single 'big impact' number fails to capture what is increasingly important. The shift towards universities being 'for' a place, rather than simply 'in' or 'from' a place, means data needs to be far more nuanced (Ransom, 2020). In this section we describe the experimental, emerging approach of heatmapping institutional interactions, which offers a different way to think about and capture the impact of knowledge exchange.

In 2019, the policy need for SSUs to better capture their impact presented an opportunity to pilot a heatmapping project. The project aimed to tell the story of the local, national and international practical research and knowledge exchange that smaller institutions undertake. It did so by employing the idea of 'heatmaps' as a visual way of showing the unique contribution each institution has on "place". A selection of 11 GuildHE member institutions was chosen in order to demonstrate how their research and knowledge exchange work had local benefit, but also had an impact on the national and international stage. The institutions were chosen to reflect the diversity of higher education providers (by size, focus and type of institution), of geographic areas, and thematic work (drawn from the four Industrial Strategy Grand Challenges).

Data was collected through primarily qualitative methods by one of the authors (Ransom). This involved desk research of primary source materials (institution websites, reports and press releases); telephone interviews with members of the senior leadership team and project leads. Interviews followed a set of semi-structured questions and explored themes identified from the initial desk research. This allowed a qualitative picture of institutional interactions to be developed. In order to contextualise insights, Ransom visited three of the institutions involved - one standalone study (one institution) and one geographical study (two institutions). This approach reflects Gill & Johnson (2010, p225): "a case study can be an intensive study of an individual, a group, an organisation or a specific process. Basically the unit of analysis varies according to the interests and aims of the researcher: hence what constitutes a 'case' inevitably varies."

Heatmaps were generated, with a 'bird's eye view' map shaded to capture the spatial impact of the SSU. Each case study had a different 'heatmap signature' capturing pertinent aspects of SSU impact, generated through the process of interaction with SSU staff and engagement with primary source materials. For example, a map at the local level may show work with a nearby community that rings the campus, another may capture work with small and medium enterprises (SMEs) scattered across the region.

The dimensions of a heatmap are not fixed. A basic map may capture international partnerships, initiatives between universities and local government, between universities and businesses, or between universities and communities or community organisations. Darker shading may represent scale of activity, depth of engagement or a longer history of working together. It could represent informal collaboration, or any activity where the university reinforces the goals of local government or supports communities – or particular societal groups. This lack of rigidity allows new forms of impact and novel activity to be captured.

In total, five case studies were conducted involving 11 SSUs. They involved two single-institution studies; two regional studies; and one sectoral (agricultural) study. The findings are discussed in the next section.

PRELIMINARY FINDINGS

The heatmapping project was an experimental attempt to capture SSU engagements, interactions and contributions in a different way to traditional economic impact studies. One advantage in working with SSUs was that staff members at institutions often had both oversight and detailed knowledge of the specific projects discussed and an understanding of the strategic positioning of the institution.

Each study resulted in a qualitative case study and at least one heatmap visualising the topics covered. In this section we present extracts from two of the studies: one regional study and the sectoral study.

Regional Study Extract: Dorset (Figure 1)

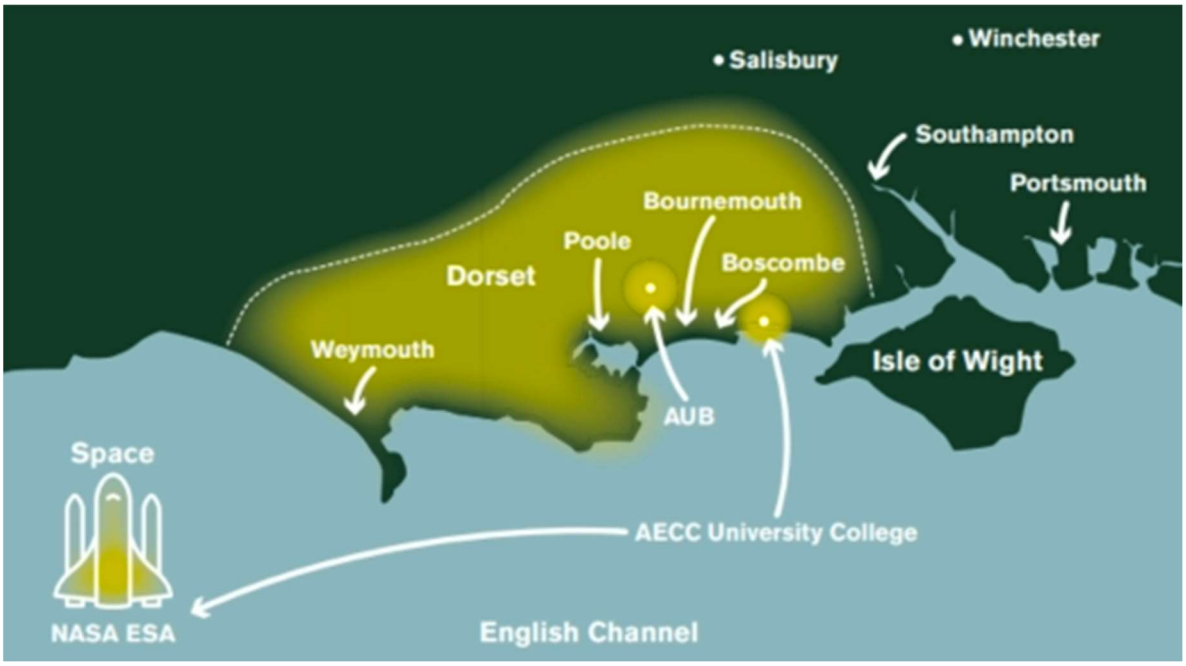
Dorset is home to a specialist arts university (Arts University Bournemouth), a specialist health sciences university college (AECC), and a specialist agricultural college (Kingston Maurward College), together with Bournemouth University. Although they focus on quite different specialisms, they are finding areas of overlap in tackling the challenges that Dorset faces, from encouraging multidisciplinary approaches for student problem solving to helping the elderly age well and remain physically, socially and culturally active. The region's higher education providers are responding as 'super specialists' (Hunt, 2019).

A 'super specialist' institution can have a wide impact. AECC University College have been global leaders in musculoskeletal healthcare since being established in 1965 as the first chiropractic college in Europe. AECC is home to highly-specialist equipment including an upright MRI scanner, thirty-two treatment rooms, an exercise centre and x-ray suite. Impact is global: technology developed at AECC has been used by NASA and the European Space Agency.

The work of Arts University Bournemouth (AUB) has helped meet the demand for, and drive the development of, the creative industries in Dorset: the region is one of the fastest growing creative and digital hubs in Europe. AUB has received £1.2 million from the European Regional Development Fund to help local businesses work with staff and students to solve design problems, and to access world-class equipment and facilities for prototyping and testing. A further £1.4 million from the Dorset Growth Deal will fund an Innovation Studio to support start-ups in the region – boosting the chances of survival for new companies and helping them to grow, and thereby increase opportunities for employment and graduate retention.

In addition to business, the impact of AUB extends into communities. A research group at the university, AUB Human, has explored how design can help navigate the challenges and opportunities of an ageing society. Students have helped tackle local health challenges: in a brief set by local leaders and the NHS, teams provided ideas and proposals to help the town of Poole become a dementia-friendly community and environment (Poole has 20,000 people living with dementia). To address the broad but interconnected economic and social challenges facing local areas, a 'super specialist' approach can be highly effective.

FIGURE 1
HEATMAP REPRESENTING SSU INTERACTIONS IN DORSET

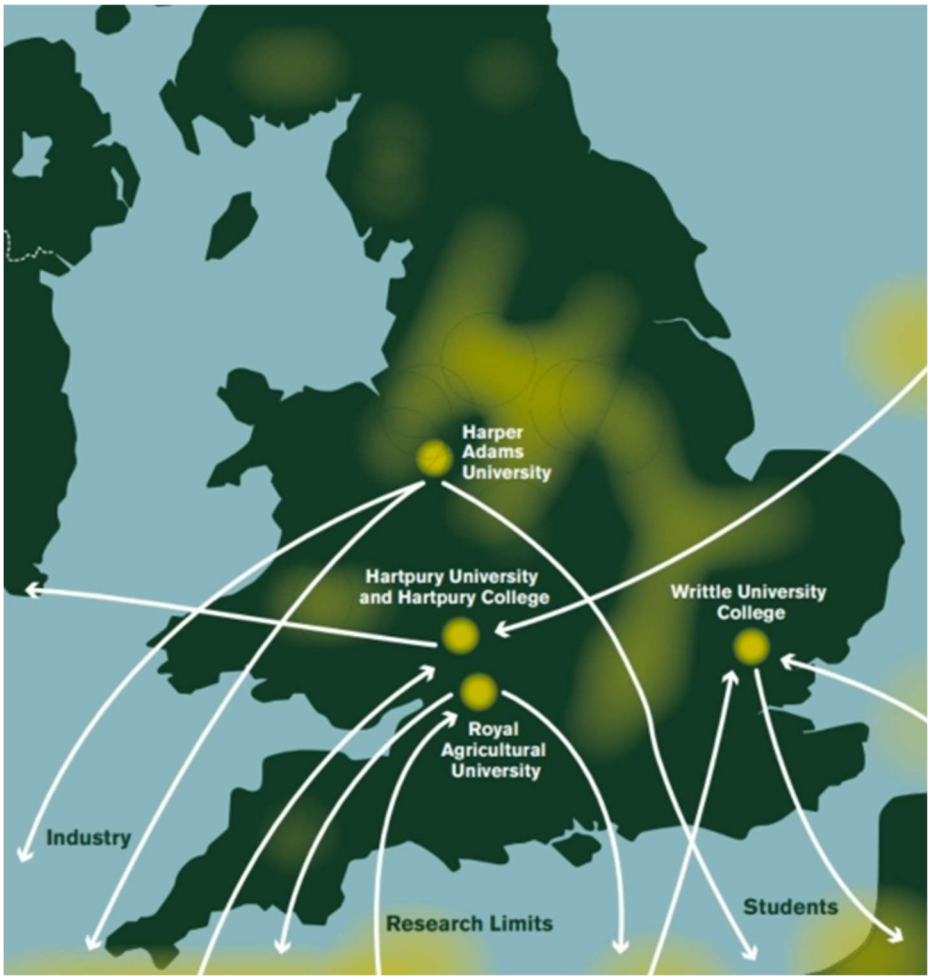


Sectoral Study Extract: Agriculture (Figure 2)

The UK is home to four specialist agricultural universities and university colleges: Harper Adams University, Hartpury University and Hartpury College; the Royal Agricultural University; and Writtle University College. Although these centres of expertise and training are scattered across the UK, and often in rural areas, they work with each other (and larger universities) and are keenly aware of each other's strengths and areas of focus. The result is a set of complementary institutions that have one eye on the challenges faced by the sector today, and another on the opportunities and changes of tomorrow. Above all, the importance of agriculture and food production to the UK means a sharp focus on translating innovation into practical, tangible, useful benefits for farmers and industry.

This specialist expertise is transforming the future of food production, bringing together disciplines such as robotics and artificial intelligence and contributing to the broader push towards clean growth. Several agriculture-focused higher education providers have their own farms and research centres, with industry based on-site for testing and development. However, their impact spreads wider than campuses: in their region, providers work with farmers who benefit from expertise and new knowledge, and institutions are active within Local Enterprise Partnerships (LEPs).[1] Nationally, providers work with the Department for Environment, Food & Rural Affairs and other organisations and government departments to shape policies and programmes. Agricultural institutions work with the Department for International Trade to boost the profile of UK agricultural innovation overseas, and educational and R&D programmes have been forged with a range of international partners from the US to Kenya.

FIGURE 2
HEATMAP REPRESENTING SSU ACTIVITY IN AGRICULTURAL SECTOR



DISCUSSION

The two examples that we have presented demonstrate the strong qualitative nature of the studies, which we believe is a strength of this approach. Case studies generate some rich and, to an extent, generalizable data (Gummesson (2000), and, as Johnson & Harris (2003, p109) note: "even though qualitative research is not usually prescriptive, this does not mean it is not generalizable." Ambargis at al (2014, p18) further support this approach in capturing university impact: "case studies that clearly profile successful university activities can often provide a better sense of the worth or implied worth of university functions or programs than can be inferred from economic impact studies."

The blend of qualitative case study and heatmap that visualises interactions is a noticeably different approach from traditional university impact studies. The shading on the maps captures the top level interactions for the different institutions involved and weaves a collective story in a departure from the traditional economic impact study. It is unusual for studies to attempt to capture the impact and interactions of more than one institution in this visual way without relying on economic impact numbers, and even rarer for the focus to be on SSUs. The project has shown the potential for heatmapping by seeking to understand, capture and visualise the complex nature of institutional interactions that can easily be overlooked (Ransom, 2018).

There are drawbacks to this approach. Similar to the economic impact study, it is important not to overclaim benefits. Maps can be stubbornly one-dimensional: they often show a fixed point in time, whereas patterns will change from day to night and times of the year. Unless they can show effectiveness or durability or inclusivity there is a risk of giving the illusion of successful engagement; some projects could create bold heat maps despite having largely negative effects (Ransom, 2018).

Reflections on How to Develop the Heatmap Concept

The selective use of data in putting together the case studies and heatmaps presents a challenge. Earlier models of economic impact involved the use of the questionnaire (Elliot et al, 1988), and indeed some recent studies still do (Akindola & Ojo, 2020). The benefit in this approach is that some element of triangulation can be achieved by asking more than one audience (for example, staff, students and local businesses).

There is an opportunity to employ a similar methodology to the heatmap concept in future. One simple method would be to interview community and business partners about the projects identified in order to triangulate the case study. The methodology employed by Travis et al (2018) is particularly worth considering in this context. Their approach included mapping interviews, time allocation reports, and a selection of impact statements into an initial logic model showing the inputs, activities, outputs, and impacts along with further triangulation with different agricultural stakeholders in order to build a more complete picture of interactions and benefits.

Another approach would involve utilizing public statutory data sets, such as the HE-BCI data. The data captured involves financial information but also basic local regional growth and community and public engagement data (HES, 2020). The data does not do justice to the relationships it captures. Applying the heatmapping concept would strengthen our understanding of the impact of these interactions. Using our example from AUB above, HE-BCI is likely to capture some of the community interactions mentioned that can not be accurately covered even across several interviews.

One final approach that lends itself to heatmapping is that of social value. Social value is "the quantification of the relative importance that people place on the changes they experience in their lives. Some, but not all of this value is captured in market prices. It is important to consider and measure this social value from the perspective of those affected by an organisation's work" (Social Value UK, 2020). Its most recognized form is its application to generating a Social Return on Investment (SROI), an approach that in itself is susceptible to similar methodological dilemmas that traditional economic impact studies have due to the subjectivity of measures used. Kelly and McNicoll (2011) describe the challenge well and conclude that SROI is not for universities on the whole because SROI focuses on particular projects rather than institution-wide measures. However, the concept of social value is much broader than SROI, mainly because it does not apply a financial figure to the interactions it captures. Indeed, Travis et al's (2018) case studies are not too dissimilar from a social value study and would give a strong start for developing a methodology along these lines. Therefore, utilising this approach together with heatmapping could better capture the (non-financial) value of projects.

RECOMMENDATIONS AND CONCLUSIONS

This paper has discussed how the qualitative heatmaps concept has been applied to a selection of smaller SSUs as an alternative to the traditional university economic impact study. We note that, while this is an experimental and emerging concept, it has potential to change the way that we think about institutional impact. The concept of heatmaps has a wider application than the small sample of SSUs in the UK that we studied. However, given their challenges in competing in the large metrics game, we believe this approach would be particularly beneficial for such institutions as well as universities and educational institutions more generally.

Further work should be undertaken to test the heatmap concept in order to assess where other data can be incorporated into the approach. In our discussion, we identify a couple of expansions to the methodology such as including existing public data sets to illustrate the interactions between universities and their

partners. A social value approach could also be taken. Ensuring that such work is not sponsored by any one institution would help achieve some objectivity.

In conclusion, the concept of heatmapping institutional activity should be further explored and developed. Such an approach could help institutions demonstrate their worth to their immediate neighbours, their regions and their nations, and help us to move away from simplistic approaches to capturing economic impact in "one large number".

ENDNOTES

1. Local Enterprise Partnerships are business-led partnerships between local authorities and local private sector businesses in England. They play a central role in determining local economic priorities and undertaking activities to drive economic growth and job creation, improve infrastructure and raise workforce skills within the local area. There are currently 38 partnerships. (LEPNetwork).
2. ORCID ID: https://orcid.org/0000-0002-1423-6239 - Matthew Guest
3. ORCID ID: https://orcid.org/0000-0002-3377-5414 - James Ransom

REFERENCES

Akindola, R.B., & Ojo, S.J. (2020). Tertiary institutions and development in rural communities: role of federal university Oye-Ekiti, Ekiti State, Nigeria. *Asian Journal of Agriculture and Rural Development*, *10*(1), 346-363.

Ambargis, Z., Mead, C.I., Rzeznik, S.J., Swenson, D., & Weisenberger, J. (2014). *Economic Impact Guidelines*. Retrieved from https://www.aau.edu/sites/default/files/AAU%20Files/Key%20Issues/Research%20Administration%20%26%20Regulation/AAU-APLU-Economic-Impact-Guidelines.pdf

Arts Council England. (2020). *Let's Create. Strategy 2020-2030*. Retrieved from https://www.artscouncil.org.uk/sites/default/files/download-file/Strategy%202020_2030%20Arts%20Council%20England.pdf

BiGGAR Economics. (2017, April). *Economic Impact of the University of Oxford*. Retrieved from https://www.ox.ac.uk/sites/files/oxford/Economic%20Impact%20of%20the%20University%20of%20Oxford.pdf

Bols, A., & Guest, M.J. (2018, July 30). *The missing piece of the puzzle – The role of specialist universities in the industrial strategy*. Retrieved from https://guildhe.ac.uk/missing-piece-specialist-universities-industrial-strategy/

BOP Consulting, Oxford Economics, Virgin Money. (2019). *Cultural Cities Enquiry Report*. Retrieved from https://www.corecities.com/sites/default/files/field/attachment/Cultural%20Cities%20Enquiry%20%5Bweb%5D.pdf

Bridge Group. (2019). *The influence of place: Geographical isolation and progression to higher education*. Retrieved from https://static1.squarespace.com/static/5c18e090b40b9d6b43b093d8/t/5cde8a84dc68af0001002240/1558088327131/TheInfluenceofPlace.pdf

Brockhurst, R., Millier, A., & Westwood, A. (2014). *Innovation systems and the role of small and specialist HEIs*. Retrieved from https://issuu.com/guildhecrest/docs/crest_innovation_systems__single_pa

Crookston, A., & Hooks, G. (2012). Community Colleges, Budget Cuts, and Jobs: The Impact of Community Colleges on Employment Growth in Rural U.S. Counties, 1976-2004. *Sociology of Education*, *85*(4), 350- 372

Elliot, D.S., Levin, S.L., & Meisel, J.B. (1988). Measuring the Economic Impact of Institutions of Higher Education. *Research in Higher Education*, *28*(1), 17-33.

Emsi. (2019). *Sport & Exercise Science Education: Impact on the UK Economy*. Retrieved from https://guildhe.ac.uk/wp-content/uploads/2019/05/SES-FullReport-Final_compressed.pdf

Forth, T., & Jones, R.A.L. (2020). *The Missing £4 Billion: Making R&D work for the whole UK*. Retrieved from https://media.nesta.org.uk/documents/The_Missing_4_Billion_Making_RD_work_for_the_whole_UK_v4.pdf

Gill, J., & Johnson, P. (2010). *Research Methods for Managers* (Fourth Edition). London, UK: SAGE Publications Ltd.

Goddard, J., Coombes, M., Kempton, L., & Vallance, P. (2014). Universities as anchor institutions in a turbulent funding environment: vulnerable institutions and vulnerable places in England. *Cambridge Journal of Regions, Economics and Society*, *7*, 307-325

Guest, M.J. (2018, January 5). *Higher education innovation funding – Underpinning a truly national industrial strategy*. Retrieved from https://guildhe.ac.uk/heif-underpinning-industrial-strategy/

Guest, M.J. (2019, December 5). *Lobsters and libraries: Why engagement with place matters*. Retrieved from https://guildhe.ac.uk/lobsters-and-libraries-why-engagement-with-place-matters/

Guest, M.J. (2020). A reflection on aiding recovery: The role of smaller, specialist, regional universities. *Knowledge Sharing and Exchange in a Pandemic*. Retrieved from https://www.theculturecapitalexchange.co.uk/wp-content/uploads/2020/06/FINAL-Document-V2_-Knowledge-Sharing-and-Exchange-in-a-Pandemic-1.pdf

Guest, M.J., & Ransom, J.C. (2020, June). *Size matters: Completing the jigsaw for rural and regional productivity*. Paper presented at the 2020 University-Industry Interaction Conference, Amsterdam [via Zoom].

GuildHE. (2020, July). *About GuildHE*. Retrieved from https://guildhe.ac.uk/about/

Gummesson, E. (2000). *Qualitative Methods in Management Research Second Edition*. London, UK: SAGE Publications Ltd.

HESA. (2019). *HE-BCI major review*. Retrieved from https://www.hesa.ac.uk/innovation/records/reviews/he-bci-major-review

HESA. (2020). *Definitions: HE - Business and Community Interaction*. Retrieved from https://www.hesa.ac.uk/support/definitions/hebci

HM Government. (2017). *Industrial Strategy: building a Britain fit for the future*. Retrieved from https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future

HM Government. (2018). *Civil Society Strategy: building a future that works for everyone*. Retrieved from https://www.gov.uk/government/publications/civil-society-strategy-building-a-future-that-works-for-everyone

HM Government. (2020). *UK Research and Development Roadmap*. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/896799/UK_Research_and_Development_Roadmap.pdf

HM Treasury. (2020, July). *Comprehensive Spending Review 2020 representations: guidance*. Retrieved from https://www.gov.uk/government/publications/comprehensive-spending-review-2020-representations-guidance/comprehensive-spending-review-2020-representations-guidance

Hunt, E. (2019, August 22). *The unique potential of Dorset's creative industry in innovative cross-sector collaboration*. Retrieved from https://www.dorsetlep.co.uk/news-article/the-unique-potential-of-dorset-s-creative-industry-in-innovative-cross-sector-collaboration

Johnson, P., & Harris, D., (2003) Qualitative and Quantitative Issues in Research Design. In D. Partington (Ed.) *Essential Skills for Management Research*. (pp. 99-116) London, UK: SAGE Publications Ltd.

Kantor, S., & Whalley, A. (2014). Knowledge Spillover from Research Universities: Evidence for Endowment Value Shocks. *The Review of Economics and Statistics*, *96*(1), 171-188.

Kelly, U., & McNicoll, I. (2011). *Through a glass darkly: Measuring the social value of universities*. Retrieved from

https://www.publicengagement.ac.uk/sites/default/files/80096%20NCCPE%20Social%20Value%20Report.pdf
Kleiman, P. (2015). *Excellence in Diversity. A report celebrating the diversity of UK higher education*. Retrieved from https://www.guildhe.ac.uk/wp-content/uploads/2015/07/Excellence-in-diversity-Full-report-2-July-20151.pdf
LEP Network. (2020). *Location Map*. Retrieved from https://www.lepnetwork.net/about-leps/location-map/
O'Brien, N., & Miscampbell, G. (2020). *Levelling up. Rebalancing growth-enhancing spending*. Retrieved from https://www.ukonward.com/wp-content/uploads/2020/03/Design-template-Levelling-up-1-1.pdf
Oxford Economics. (2017). *The Economic Impact of Universities in 2014-15. Report for Universities UK*. Retrieved from https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2017/the-economic-impact-of-universities.pdf
Pastor, J.M., Pérez, F., & Fernández de Guevara, J. (2013). Measuring the local economic impact of universities: an approach that considers uncertainty. *Higher Education*, *65*(5), 539-564.
Ransom, J.C. (2018, August 10). *Heatmaps: Hotspots, coldspots and the bits in-between*. Retrieved from https://jcransom.com/2018/08/10/heatmaps-hotspots-coldspots/
Ransom, J.C. (2020, June 10). *Why most university impact studies are flawed*. Retrieved from https://jcransom.com/2020/06/10/university-impact-studies-are-flawed/
Ransom, J.C., & Guest, M.J. (2020). *Building the Jigsaw: Heatmaps and Case Studies illustrating local, national and international impacts of smaller and specialist universities and colleges*. Manuscript in preparation.
REF. (2019, January). *REF 2019/01 January 2019: Guidance on submissions*. Retrieved from https://www.ref.ac.uk/media/1092/ref-2019_01-guidance-on-submissions.pdf
Research England. (2020). *HE-BCI survey*. Retrieved from https://re.ukri.org/knowledge-exchange/the-he-bci-survey/
Siegfried, J.J., Sanderson, A.R., & McHenry, P. (2008, March/April). The Economic Impact of Colleges and Universities. *Change*, *40*(2), 24-29
Social Value UK. (2020, July). *What is Social Value?* Retrieved from http://www.socialvalueuk.org/what-is-social-value/
Stubbs, R., Husbands, C., & Dickson, N. (2020). *Levelling Up Yorkshire and Humber: Health as the new wealth post-COVID*. Retrieved from https://www.nhsconfed.org/resources/2020/07/levelling-up-yorkshire-and-humber-health-as-the-new-wealth-post-covid
Tight, M. (2011). How many universities are there in the United Kingdom? How many should there be? *Higher Education*, *62*(5), 649-663
Travis, E., Alwang, A., & Elliott-Engel, J. (2018, February 2-6). *Developing a Holistic Assessment for Land Grant University Economic Impact Studies: A Case Study*. Southern Agricultural Economics Association, 2018 Annual Meeting. Jacksonville, Florida, United States. Retrieved from https://ageconsearch.umn.edu/record/266789/
UKRI. (2020, July 27). *Circular Letter: Recurrent and capital funding for 2020-21*. Retrieved from https://re.ukri.org/documents/2020/ukri-delegation-and-allocation-letter-2020-21/
Universities UK. (2017, October 16). *The economic impact of universities in 2014–15*. Retrieved from https://www.universitiesuk.ac.uk/economic-impact
Williamson, G. (2020, July 9). *Education Secretary FE speech with Social Market Foundation*. Retrieved from https://www.gov.uk/government/speeches/education-secretary-fe-speech-with-social-market-foundation