

## 1. Understanding the contributions of universities to regional development

### 1. Introduction <sub heading>

Universities, since the Middle Ages, have been set up with the purpose of meeting the demands of their societies. These demands varied according to the socio-economic and political context of the time. This means that universities have had an extraordinary capacity for adaptation and reinvention throughout history. The world has changed and so have they.

But what are universities for? This simple question, which is as old as universities themselves, remains extremely topical and pertinent today. In fact, the rapid transformation experienced by contemporary societies implies the search for a better understanding of the role and purpose of universities. Due to the profound changes in the world economy, universities have been called upon to go beyond their traditional missions, and therefore play a strategic role in the development process of their regions.

In order to act as strategic institutions and generate greater social and economic impacts on regional economies, universities must play multifaceted roles in the regions in which they operate. This chapter outlines the main ways in which universities can contribute to resilience and adaptation in regional economies.

### 2. Evolution of the 'Idea' of the university

The question "what are universities for?" has become an almost metaphysical one over the past century. Cardinal Newman's 'idea' of the university was of a community of thinkers, learning for learning's sake rather than any instrumental purpose, covering a broad range of liberal arts rather than narrow, scientific specialisms. While this philosophy might have resonated with faculty and students housed in the dreaming spires of the ancient universities established in the mediaeval era, it was directly challenged by the founding of the so-called English

Civic Universities<sup>1</sup> and US Land-Grant Colleges<sup>2</sup> throughout the 19<sup>th</sup> Century.

The primary function of these universities was to provide the research and skills for the new industries that were emerging as a result of the agricultural and industrial revolutions, as well as the teachers and medical professionals needed to ensure an educated and healthy workforce<sup>3</sup> and, as such, heralded a move away from a Newmanist model of higher education.

While there has historically never been a singular accepted European model of higher education, the Humboldtian principle which emphasises the 'union of teaching and research' in academic work was dominant in German speaking Europe, and highly influential in parts of Eastern Europe, from the late 1800s to the 1950s<sup>4</sup>. This principle contends that the function of the university was to advance knowledge by original and critical investigation, not just to transmit the legacy of the past or to teach skills<sup>5</sup>.

This philosophy of higher education arguably led to the emphasis on collaborative and applied research for the benefit of industry, the military and wider society in

places that adopted the Humboldtian model. This was in contrast to the Newman model which advocated a distinction between discovery and teaching, or the Napoleonic model that dominated in Southern Europe, where higher education was regulated and controlled by the state.

Since the middle of the 20<sup>th</sup> century, the centralisation of higher education policy and increased public funding for research saw European universities move away from a focus on meeting the skills needs of their local economies<sup>6</sup>, while in the US decentralised higher education and the dependence of public and private universities on local sources of funding meant that collaborative research relationships with industry became increasingly common<sup>7</sup>. The focus of universities' links with the 'outside world' over the past 50 years has tended to be centred around the exploitation of research with the approach being an assisted linear model based on technology 'push'<sup>8</sup>.

This approach resulted in a considerable emphasis on the so-called 'Triple Helix'<sup>9</sup> (see Glossary), which emphasises how the links between university, industry and government can drive innovation. In this framework, the stress has been on the role of research, particularly in scientific and technological fields. The emergence of the high-tech industries centred around Silicon Valley on the West Coast of the US was seen as the embodiment of the success of this approach and one that policy makers around the world have sought to replicate (often with little success). This has led to a concentration of effort and resources on supporting collaborations between businesses and universities which generated 'hard' outputs such as patent applications and business spin offs, often to the neglect of developing the potential for 'softer' impacts such as human capital and social<sup>10</sup>.

Although the landscape of higher education in Europe remains heterogeneous, the 20 years following the Bologna Process<sup>11</sup> have seen significant changes in cooperation between universities and business<sup>12</sup> and there is a growing acceptance across European Union member states of the "new relevance" of universities to social and economic development<sup>13</sup>. This is underpinned by the Europe 2020 Growth Strategy and especially the emergence of the policy of smart specialisation<sup>14</sup> which gave increasing prominence to the role of universities not only in terms of the supply side (i.e. of research and skills) but also in supporting the demand side through capacity building and supporting the governance of regional

innovation<sup>15</sup>.

By the end of the first decade of the 21st Century, this emphasis in public policy on the role of universities in explicitly contributing to social and economic development had continued to grow due to a number of concurrent factors. Some of these were driven by external global forces and trends, some were specific to local, regional and national policy contexts and some were driven by changes in how universities are internally managed and led. This trend, if anything, accelerated in the 2010s and shows no evidence of slowing down as we enter the third decade of the century.

This remains a policy conundrum at the European level and even beyond, led by organisations such as the OECD with their reviews of university-regional collaboration around the world, and is arguably most keenly felt in the UK, and in England in particular. This has manifested itself in recent years with UK Government initiatives such as Science and Innovation Audits (aimed at mapping regional, largely university-led, research and innovation strengths) and the 2019 Civic University Commission. At the same time the launch of a range of new funding schemes (e.g. the Industrial Strategy Challenge and Strength in Places funds) imply a leading role for (research intensive) universities in addressing persistent and pervasive regional inequalities; most recently manifesting itself in policy terms as the 'levelling up' agenda.

Today, universities (or higher education institutions, HEIs) are essential stakeholders in the context of the countries and regions where they are located, promoting, in an articulated way, the improvement in levels of development and quality of life. However, this commitment of universities to the places in which they are situated is relatively recent. While many universities as institutions date back to the Middle Ages, their participation in actions and policies for local and regional development only began to occur in the last decades of the 20th century. For centuries, universities were seen as rather elitist institutions, closed in on themselves, with many performing their teaching and research functions without any meaningful connection to their own geographies.

The OECD has synthesized this behaviour very well:

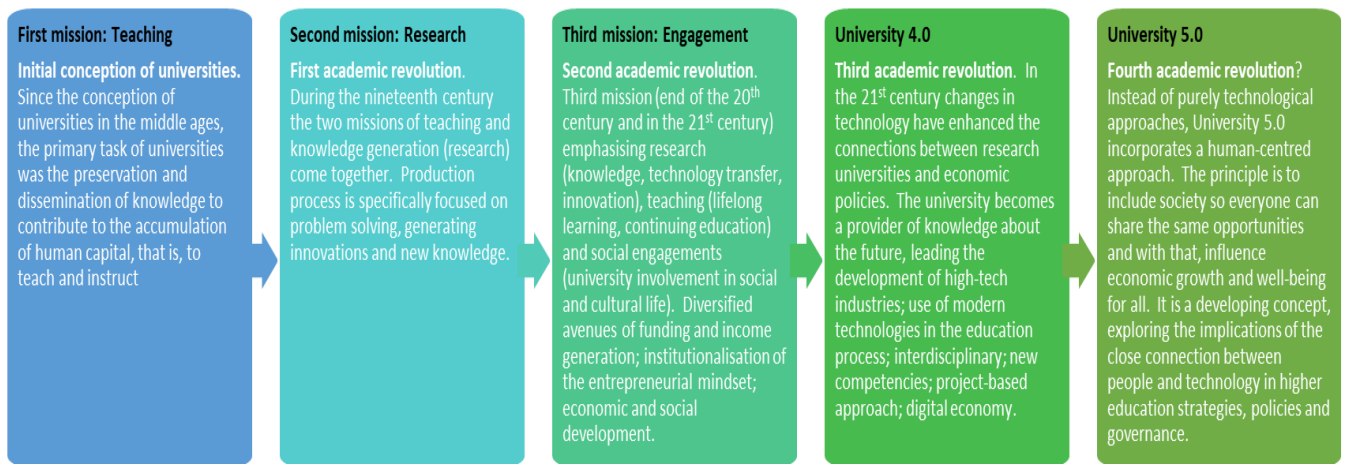
“In the past, neither public policy nor the higher education institutions themselves have tended to focus strategically on the contribution that they can make to the development of the regions where they are located. Particularly for older, traditional HEIs, the emphasis has often been on serving national goals or on the pursuit of knowledge with little regard for the surrounding environment”<sup>16</sup>.

However, universities have been changing to meet the growing demands of society. This ability over time to change is, to a large extent, responsible for making universities recognised worldwide as repositories of knowledge, potential sources of innovation, and drivers for nations’ economic growth.

HEI missions, together with their local and regional impacts, depend on several factors, internal and external. Regardless of the impact level, it is noticeable that in the last few decades, the relationship between HEIs and their regions has been brought together more prominently with the objective of maximizing the impacts of their potential role within regions<sup>17</sup>.

HEIs differ from each other and regions differ as well. The focus, or the missions, of each university will also be different and, over time, become increasingly multifaceted, possibly incorporating new roles (see Figure 2.1). This classification of university missions does not mean that all universities today only focus on University 4.0 or 5.0; rather, universities develop missions incrementally over time and are often at different stages of development.

Figure 2.1: Development of university missions' focus over time



Source: Adapted from Mora, Serra & Vieira (2018), Shah, Shahjehan & Afsar (2019); Kretz & Sá (2013); Madaliyeva et al. (2020).

As the economy and society evolve, new industrial and technological changes occur, through, for instance, the development of Internet of Things platforms, mobile devices, big data, Augmented Reality, cloud computing, and cybersecurity. Universities can play a pivotal role in this new economy through their role in advancing technology associated with, and even give rise to spin-outs to high-tech industries. However, these technological developments, and how they impact upon places, are not uniform or linear in their effect.

Existing socio-economic inequalities and regional asymmetries can interfere and shape how HEIs, researchers and students interact with University 4.0. The reasons for that can be varied: a lack of hardware, a lack of training, a lack of quality software, a lack of infrastructure, and a lack of technical support. These have all been identified as barriers to the effective use of this technology in many places around the world. This is especially the case in peripheral and less developed countries<sup>18</sup>.

In developing regions, or in the most peripheral regions in economically advanced nations, the first mission, for example, will be essential for the qualification of the local and regional workforce, and may be the largest and most relevant mission expected by the region. This does not mean that universities do not strive for the second, third, or fourth missions, but rather they may be secondary to current regional needs.

The more dynamic the regional productive structure, the greater the interaction with the HEIs it tends to be, and the more likely it will be that additional missions will be developed over time.

Many characteristics of HEIs influence the way they may develop the five missions. The way the HEI will transfer its cutting-edge research knowledge to the locality, or the possibility to be entrepreneurial, depends on an increase in the number of business incubation centres at the university or in partnership with other agencies.

This is highly dependent on a university's R&D budget, but also on the number and diversity of its students in higher education, the demands of the specialized labour force in the region, and the existence of partnerships between universities and public-private institutions and industries<sup>22</sup>. It also depends on alignment (or differences) between stakeholders and the goals of public and private universities,

and what internal factors are affecting a university's business model, such as its structure, recruitment, strategic orientation, leadership, and cultural values.

### 3. Universities as regional actors <sub heading>

Over the last 20 years, universities have become significant regional actors, taking on an important role in helping to develop the regions where they are located. Within a knowledge-based economy, universities are no longer considered just creators and producers of knowledge, trainers of a skilled workforce that will become future citizens, or cultural disseminators. They are recognised to be useful assets and strategic players in the successful economic growth and development of their home regions.

What led largely insular and secular universities to transform and change, becoming active and relevant players in promoting regional development? The reasons for this transition relate to the fact that universities, as with other regional organisations, are interested in promoting articulation between economic or social agents or citizens, to achieve *a mutual interest in cooperation and collective trust*.

In recent decades, in most developed countries, public sector finances have suffered cuts in their funding. This has been the consequence of more restrictive levels of budgets, as well as the fact that the amount of public services has increased and diversified considerably. Those financial constraints have translated into difficulties for the public budgeting of universities in many countries, at a time when the higher education sector has been growing.

This changed reality started to take place in the last decades of the 20th century – at the time with the expansion of higher education across the globe (see Box 2.2) - and was accentuated at the beginning of the 21st century with the financial crisis and subsequent Great Recession of 2007-8. Following the 2020 COVID-19 pandemic, we are once again witnessing upheaval across higher education, as the disruption affects student migration (see Box 2.3), international recruitment, exam entry processes with knock-on implications for university finances. Indirect impacts on higher education is also the consequence of:



- i) the demands of wider nation states' public policy, especially in the social domains of health, social care and employment support, that continue to demand significant proportion of state budgets; and
- ii) gradual reduction in international student recruitment and mobility as registrations decrease year upon year.

The ongoing contraction in public funding to support HEI activities has led universities to seek other business models and external partners, both of which may contribute to enhancing and diversifying sources of financing. But these alternative business models have also led to universities paying more attention to greater liaison with local and regional stakeholders, what is often referred to as the university's 'third mission'.

The third mission's effectiveness implies that the partners involved have mutuality: HEIs need to increase and diversify their sources of financing, while other regional partners need to have easier access to knowledge, innovation, and technology. In this positive sum game, which generates numerous territorial externalities, HEIs can participate through, for example, knowledge creation, improving human capital, supporting new business, providing policy and advice, paying taxes, or contributing to the cultural environment. In return, HEIs can receive - from regional and local stakeholders - student enrolment (retained or new numbers), finance for specialised research or consultancy, or requests for training and continual professional development.

To reinforce and support this mutuality, it is necessary to create an environment of trust between HEIs and other regional partners. Building institutional trust across sectors and agencies can be a time-consuming process. It does not happen simply through the signing of Memoranda of Understanding, but needs to be brokered and nurtured. For example, in low-density regions, where the number and diversity of stakeholders are small, the knowledge and confidence required for establishing institutional contacts is often easier to achieve, and based on existing webs of relations or personal interactions between the leaders of organisations.

**Box 2.2: Where are higher education students in the world?**

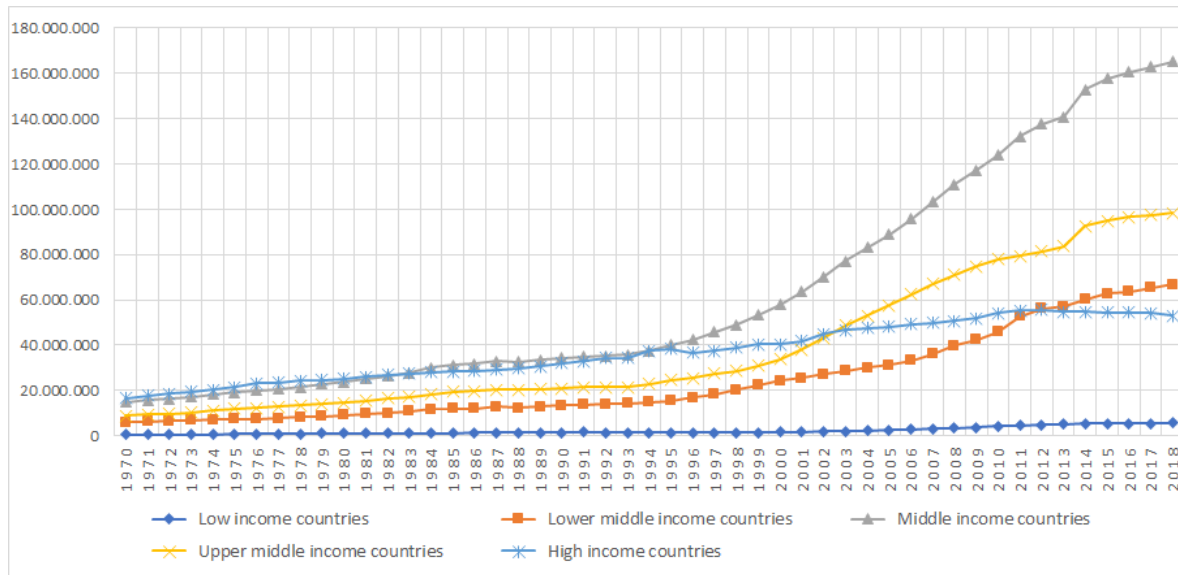
The graph shows the increase in the number of enrolments in global higher

education. It shows two major characteristics: the differences in the growth in the number of students in higher education in distinct groups of countries; and the structural change resulting from this, concerning the proportion of qualified human capital across various regions of the world.

Higher income countries comprised the majority until the mid 1980s when it was surpassed in number by middle income countries. Then, at the beginning of the 21st century, it was surpassed again by upper middle income and lower middle income countries.

The graph shows that access to higher education is spreading to all regions, regardless of the income group. Growth has been much lower in low income countries, and high income countries have shown a slight decrease since 2011.

Enrolment in tertiary education by World Bank Income Groups 1970-2018



Source: UNESCO (2020).

These changes reflect changes in demographic evolution of the last few decades, with the more developed countries (with higher income levels) ageing. This is unlike those countries with intermediate levels of income and development, where the importance of young people has increased.

### Box 2.3 The flow of internationally mobile students

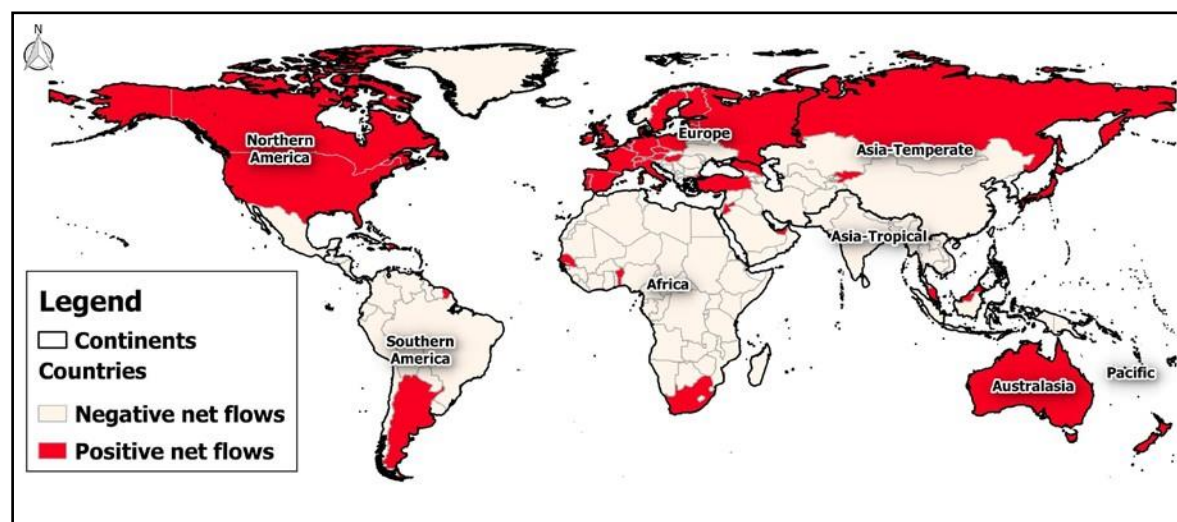
Worldwide, countries have enhanced young people's school qualification attainment levels and therefore more, by default, have reached the thresholds to enter higher education. As a result, most countries met the increased demand, by their universities adopting robust responses. These developments have allowed a greater democratization in access to higher education and, in parallel with the growth of globalization and greater ease of travel between countries, higher education systems to become available to a wider cohort of international students.

Although COVID-19 may have affected international student mobility, universities have responded rapidly with a move to online learning and teaching platforms, thereby opening up the possibility of remote teaching formats alongside any face-to-face contact.

In a context in which several developed countries have higher education systems with a higher capacity than the needs of the home student market, some universities have faced the challenge of enhanced global competition for students. The ability to attract and retain students to universities (whether home or overseas in origin) has been seen as one of the best ways to strengthen the university's link to regional economic development.

The internationalisation process of higher education is increasingly more significant in relation to the challenges of globalisation and regionalization in which the sector takes place. Although the internationalisation agenda is not just about student mobility, it has been one of the most visible and impacting forms on many universities globally. Although higher education's internationalisation aims to eliminate barriers and frontiers of knowledge between nations, the process is not spatially balanced or homogeneous.

Figure 2.2: The net flow of internationally mobile students (inbound-outbound) in 2017.



Source: Adaptation from UNESCO (2020).

The northern hemisphere has two concentrations of countries: it is in these regions that universities in the developed countries have received the most international students with: the United States of America (898,332); United Kingdom (400,482); the Russian Federation (193,999); and France (169,001). The countries that send the most students to study abroad (and create a negative net flow in the process) are: Vietnam (-90,500); India (-285,330); and China (-770,982).

Australia is an exception in this analysis, as it is in the southern hemisphere, and was the third country with the highest positive balance in 2017 (367,707).

Many universities in the northern hemisphere can continue to function because of the large number of international students that the countries receive. On the other hand, the exchange of knowledge generated by the countries that export students tend to see improvements in the knowledge and skills of their students. This has allowed national governments to fund overseas degrees and, in most cases such as China, contribute to the national economy on their return.

### 3. How universities contribute to (regional) economic development <sub heading>

From the mid-twentieth century, there has been an international trend for raising levels of participation in higher education<sup>24</sup>. This now means that universities, or other types of higher education institution (HEI), are a common feature of regions across the world. In the context of contemporary knowledge-based economies, these institutions are increasingly viewed as potential assets for place-based regional policies<sup>25</sup>. This is especially the case for universities located in regions where one of the key development challenges is increasing their share of innovative and high-skill industries.

Policymakers often act on the conviction that the research and teaching capabilities possessed within universities can be used to engender this growth in what-are-termed 'peripheral' or 'old industrial regions'. In the academic literature, there is, however, an increasing recognition that the processes through which universities may contribute to local development are complex, and dependent on favourable conditions that will not be present in many regional contexts. The rest of this chapter

begins to explore these processes and associated challenges by outlining the main ways in which HEIs can support the economy of their home region.

This section introduces three main areas of university activity and impact that underpin their contribution to resilience and adaptation in regional economies. The rest of the chapter then discusses each of these in more detail.

***Anchoring local employment and expenditure:*** Its global expansion over recent decades now means that higher education is, in its own right, a sizable industry in many countries. For regions with a significant HEI presence, this brings a number of identifiable impacts for their local economies<sup>32</sup>. Universities are often now major employers of people across varied academic and non-academic occupations. Furthermore, they also purchase a range of goods and services from suppliers who will include local businesses. At the larger end of the scale this can, for instance, include major investments in the construction of new buildings. Universities may also attract large numbers of domestic and international students to live in a city.

Students generate further economic impacts through their distinctive consumption patterns, demand for short-term rented housing, and entry into local labour markets as part-time workers<sup>33</sup>. The economic multiplier effect means that the full extent of these sort of impacts will include further 'induced' activity stimulated by first-order employment and expenditure. For instance, according to one analysis covering the whole of the UK in 2014-15, the estimated number of additional jobs supported through the spending of universities, their employees, and international students (540,000), was notably higher than the number of people directly employed in the sector (404,000)<sup>34</sup>.

***Supplying graduates for regional labour markets:*** As institutions of tertiary education, the primary function that universities, colleges or technical institutes have in supporting the economy is the teaching of students who enter the labour market following their graduation. Higher education equips students with advanced knowledge in different specialised fields and enables them to develop a range of transferrable skills (e.g. technical, analytical, creative, communication, entrepreneurial, etc.) that are of value across a range of jobs in contemporary economies. These personal capabilities, in an aggregate form that economists call 'human capital', are recognised as a driver of growth at the regional as well as national level<sup>26</sup>. This has benefitted the economies of prospering cities that tend to have an above average concentration of workers with tertiary level education<sup>27</sup>. They are also often net importers of graduates from other, less economically successful,

places.

***Enabling innovation through research and knowledge transfer:*** In many countries, universities are central actors within public research systems. The basic and applied research they perform across different scientific fields is a stimulus to the development of new technologies and other innovations taken up in industry and the public sector<sup>28</sup>. This transfer of knowledge occurs through varied means of engagement or collaboration with companies, and/or commercialisation of research by universities themselves or academic spin-out firms<sup>29</sup>. Publicly funded research also helps expand capabilities for future innovation in the economic system. This occurs through the development of new scientific techniques and instruments, the training of highly skilled researchers, and formation of networks between academics and industry<sup>30</sup>. The clearest manifestation of these 'knowledge spillovers', as a regional development impact, is the emergence of clusters around universities in new high-tech or science-based industries<sup>31</sup>.

#### 4. Anchoring local employment and expenditure <sub heading>

The foundational role of universities in generating and sustaining wider activity within their local economies means they are sometimes referred to as *anchor institutions*<sup>35</sup>. As well as their size, this designation is based on the low likelihood that universities will relocate to another region (although some may open domestic or international branch campuses). Universities have also, traditionally, had a level of financial security from a combination of, for example, public funding, student fees, estate holdings and endowments. This means, especially in comparison to organisations in the private sector, they are less vulnerable to suffering institutional failures that lead to closure, forced mergers, or severe downsizing. This anchor institution characteristic may, however, be under threat for some universities due to a combination of moves towards market-based systems of higher education funding<sup>36</sup>, and by the unfolding effects of the COVID-19 pandemic on the sector<sup>37</sup>.

Nevertheless, the employment and expenditure impacts of large, locally-embedded, and financially secure universities can represent a source of stability in a regional economy. As the size of higher education sectors have expanded, they have become increasingly important within cities that have concurrently undergone decline of other industries.

For example, according to figures given in a recent report, between 1978 and 2019 the number of people working in the steel industry in the northern English city of Sheffield fell from 45,000 to 3,000. Over the same period, however, the number of students in Sheffield rose from 4,000 to 60,000<sup>38</sup>. The two universities in the city are now – with public sector organisations such as the City Council and National Health Service – amongst the largest local employers with a combined number of 11,980 direct employees (10,420 full-time equivalent) in 2018-19<sup>i</sup>.

These mainly passive impacts can also be enhanced through procurement strategies that ensure a larger proportion of university expenditure remains in the local economy. For instance, this is an approach pioneered in the USA through the Evergreen initiative in Cleveland, Ohio (see Box 2.4).

#### **Box 2.4: Harnessing the procurement power of local anchor institutions – the Evergreen initiative**

In 2008 a group of local institutions came together to facilitate an economic breakthrough in Cleveland, Ohio. They aimed to create a more sustainable, green economy in a post-industrial city that had experienced population decline and capital flight over several decades. The Evergreen Initiative set out to harness the spending power of city anchor institutions such as universities and hospitals, which are specifically tied to a local economy and can't 'get up and leave'. Cleveland adopted a model of community wealth building as an alternative to the dominant 'trickle down' model, which often relies on inward investments, where public subsidy is used to entice multinational corporations to set up in a city; often resulting in low-wage jobs, with business profit also leaving the local area.

To achieve the Evergreen's initiative economic development aims, a group of cooperative businesses were formed that were designed to deliver specific services that would meet the growing demand from anchor institutions and create living-wage jobs in six low income neighbourhoods through employment, investment and business development. These included a laundry, a renewable energy company, and a fruit and vegetable producer.

The Evergreen initiative has re-engaged local people in the economy to support local employment, investment, and increase the circulation of capital in Cleveland; addressing the multiple socio-economic challenges from the area's large scale

<sup>i</sup> Figures from <https://www.hesa.ac.uk/data-and-analysis/staff/working-in-he> [Accessed 16/08/20]



industrial change. It has created successful local businesses that re-invest in the local community, creating new job opportunities, particularly those who are furthest from the job market.

The project has social good at its heart, and through local, worker owned job creation; sustainable, green and democratic workplaces ultimately aims to ensure that the benefits of economic growth in Cleveland are equitable. Importantly, it has successfully harnessed the spending power of its big local anchor institutions to stabilise and revitalise disinvested communities through procurement programmes and co-operatives.

Source: Localise West Midlands.

<http://localisewestmidlands.org.uk/2019/community-economic-development-in-action-the-cleveland-model>

Universities will often publicise employment and expenditure impacts as measurable evidence of the economic benefits they bring in return for public funding received. An over-reliance on these multiplier effects will, however, be limited as an approach to the role of universities in regional policy. Beyond higher education itself, this contribution to the local economy will not be focused on the growth of knowledge-intensive industries that less-developed regions need to transform their economy towards higher-productivity activities.

Much of the extra employment induced by the spending of universities, their staff, and students will be in socially-valuable, but relatively low paid and insecure service jobs that are characteristic of post-industrial cities. The concentration of large numbers of students in certain neighbourhoods can also have negative social, cultural, or housing displacement effects on local communities that counteract any economic benefits this group brings to a city<sup>39</sup>. Moreover, the employment and expenditure impacts of universities are largely separate from their qualitatively more important functions for regional development that arise from research and education activities.

Recent academic and policy thinking has sought to understand strong regional economies as those that are *resilient* to 'shocks' in the wider national or global economy. As higher education has proved to be less vulnerable to previous economic downturns or structural transformations than many other industries (including parts of the public sector), cities or towns with large anchor universities will

benefit from an extra buffer of steady employment and expenditure. This, in turn, may help them to withstand or even recover from these shocks better than those typically smaller cities or towns that do not have a significant HEI presence.

However, the academic studies have come to emphasise that the most resilient regional economies are those that are best able to *adapt* to global competition and technological change on an ongoing basis<sup>40</sup>. It is in helping to expand this adaptive capacity for change over time that university education and research can make their more significant inputs to the long-term success of regional economies.

#### 5. Supplying graduates for regional labour markets <sub heading>

The primary value of higher education for regional development is in increasing knowledge and skills in the local labour force. The accumulation of human capital is a dynamic that encourages continual transformation in a regional economy by raising levels of *labour productivity* (of highly-educated individuals and their co-workers), *innovation* (through enabling the quicker generation and adoption of new technologies), and *entrepreneurship* (via individuals with the ideas, skills and access to resources to start new growth companies)<sup>41</sup>. These human capital effects therefore expand the adaptive capacity of the regional economy<sup>42</sup>. This is supported by empirical evidence that metropolitan regions in the U.S.A., with larger numbers of university graduates in science, technology, engineering, and mathematics (STEM) subjects, had stronger productivity growth during the period (2007-09) of the Great Recession<sup>43</sup>.

The importance of a local supply of graduates is such that the foundation of a university in a peripheral city can itself be a regional policy intervention with positive effects on human capital and productivity<sup>44</sup>. In some deindustrialised cities, such as Pittsburgh in the U.S. Rust Belt, the presence of large universities may also be associated with growing numbers of young educated workers that are helping to slow or reverse patterns of urban decline and population loss<sup>45</sup>.

The major challenge for these different types of less-developed regions, however, is increasing their retention of graduates from local universities. A key process shaping the economic geography of any country is the internal migration of highly-skilled

people<sup>46</sup>. This mobility is very high amongst those who have recently graduated from university, especially if they had previously moved from their home region to study<sup>47</sup>.

Studies from multiple countries have shown that, on balance, the resulting migration flows clearly favour core cities and regions where there are better career opportunities for graduates<sup>48</sup>. These patterns of so-called 'brain drain' can therefore undermine the benefits that the educational function of universities bring to the economies of less-developed regions. This is particularly so when these institutions have a large intake of highly-mobile students from outside their home region.

By working in partnership with local policymakers and businesses, universities can take steps to boost levels of graduate retention. This can be achieved through actions, for instance, to connect students to regional SMEs, encourage graduate entrepreneurship, or involve universities in strategies to grow the local technology sector<sup>49</sup>. Another approach may advocate universities more closely matching their educational provision to the needs of local employers<sup>50</sup>.

The danger of this, however, is that it can reinforce an existing 'low skills equilibrium' in less-developed regions rather than helping to generate the new, more knowledge-intensive jobs that are needed to upgrade the local labour market<sup>51</sup>. This is why wider regional policy measures to support the expansion of knowledge-intensive industries are required to work in conjunction with efforts to increase graduate retention. Indeed, there is evidence that the spillover effects that academic research and development activities have within a regional economy can help to attract human capital, by raising demand for high-skilled labour in technical or scientific fields<sup>52</sup>.

## 6. Enabling innovation through research and knowledge transfer <sub heading>

The distinctive societal function of universities in carrying out more exploratory forms of basic research (often alongside other public research organisations) is crucial to the development of long-term adaptive capacity in national and regional economies<sup>53</sup>. In exceptional cases, the innovation generated through these activities can lead to a region developing new economic paths based on radically different technologies<sup>54</sup>.

For instance, the U.S. city of Pittsburgh has been widely recognised for its transition from a dependence on a declining steel industry to a post-industrial economy, in which high-technology sectors such as advanced manufacturing and life and health sciences have been drivers of recovery<sup>55</sup>. This process has been brokered by enterprising local political and business leaders, but it has drawn heavily on the strong research universities, hospitals, and other institutional assets that exist in the city<sup>56</sup>.

The contribution of universities to regional adaptation can, however, also be focused on enabling the transformation of traditional industries through processes of technological upgrading or diversification. These different forms of path development may entail different mechanisms of engagement. The indigenous creation of new industries implies a focus on the formation of enterprises through university spin-outs, technological upgrading or diversification.

On the other hand, technological upgrading or diversification is more likely to require academics to interact with existing firms through knowledge transfer channels such as research collaborations, consultancy, or staff/student secondments<sup>57</sup>. The second of these approaches is the focus of the Advanced Manufacturing Research Centre (AMRC) discussed in Box 2.5.

**Box 2.5: University of Sheffield Advanced Manufacturing Research Centre (AMRC)**

The AMRC was established by the University of Sheffield and Boeing in 2001 as a centre of excellence in academic-industry collaboration. It is located on an Advanced Manufacturing Park outside of Sheffield and now employs over 500 researchers and engineers. Since 2011, it has been part of a UK network of national technology and innovation 'Catapult' centres in High Value Manufacturing. The AMRC interacts with manufacturing companies of different sizes to give them access to advanced expertise and research and development capabilities in such areas as high performance machining, composite materials, and digitalisation. For SMEs, this is done through channels including short demonstrator projects with individual companies, collaborative research projects involving a consortium of partners, and programmes focused on helping members become part of specialist supply chains. The centre works with manufacturers throughout the UK (and now has branches in Preston and North Wales) but does bring specific extra benefits for its home region.

For instance, it runs an engineering apprenticeship training course that is focused predominately on young people and employers in the Sheffield City Region. The AMRC has also attracted companies to locate on the Advanced Manufacturing Park, including the recent opening of manufacturing facilities by two of its long-term partners, Boeing and McLaren.

Sources: AMRC website; Breach, 2019<sup>58</sup>

The need for universities to fulfil these roles in regional innovation policies is especially pronounced in less-developed regions where research and development (R&D) capabilities in the private sector and other parts of the public sector may be lacking. Even where areas of academic research excellence do exist in universities outside of core regions, however, there is no guarantee that this will translate into innovation within their local economy<sup>59</sup>. This is due to a set of common barriers that are identified in Box 2.6, drawing on a review by Bonaccorsi:

**Box 2.6: Barriers to regional development impacts (from academic research)**

- Critical mass: the scale of excellent research in universities is not large enough, or too fragmented between different fields, to generate significant knowledge spillovers;
- Motivation: a lack of incentives for universities and/or academics to work with industry and other stakeholders in their region;
- Misalignment: little connection between the scientific focus of research activities in universities and industrial specialisations in the region.
- Absorptive capacity: the narrow scope for local firms (especially small and medium enterprises) to engage with and make use of the advanced knowledge generated by research in universities due to the comparatively underdeveloped nature of their existing technology and human capital;
- Intermediaries: gaps in the translational capability needed to effectively coordinate university-industry collaborations and facilitate knowledge transfer.

Source: Bonaccorsi, 2017<sup>60</sup>

These barriers highlight the need to develop regional innovation systems in which the *supply-side*, *demand-side*, and *translational* dimensions of knowledge transfer between universities and businesses are all present<sup>61</sup>. Addressing factors limiting the demand to interact with universities on the part of local firms, such as *misalignment* and *absorptive capacity*, are key challenges in many less-developed regions. In these cases, research universities are more likely to look outside of their home region to work with firms that do have the requisite absorptive capacity to make their collaboration mutually beneficial<sup>62</sup>.

By contrast, the concentration of high technology industries in certain geographical centres (e.g. cities such as Boston, San Francisco and Seattle in the U.S.) leads to a virtuous circle of increasing demand for connections into local universities from a growing population of innovative firms<sup>63</sup>. However, the main productive industries in less-developed regions are often those that innovate incrementally through applied problem solving and learning-by-doing with suppliers and customers, rather than through a R&D driven process that depends on collaboration with universities<sup>64</sup>.

In such contexts, the role of universities within 'smart' regional innovation policies should be oriented towards means of engagement that will help these existing industries transform themselves by upgrading their technology or diversifying into new markets<sup>65</sup>.

## 7. Conclusions <sub heading>

This chapter has outlined the ways in which universities can help regional economies become more resilient and adaptive to change through their employment and expenditure, education programmes, and research activities. At the same time, however, it has also highlighted a number of challenges commonly encountered with these processes in less-developed regions.

For these barriers to be overcome, it is necessary for universities to be *actively* engaged in the development of these regions. This is instead of expecting meaningful results to come about as a side effect of their core teaching and research functions, or from the socio-economic impacts generated by their presence as anchor institutions. For instance, this could be achieved through universities taking steps to

target procurement towards local suppliers, increase graduate retention in their home city, or undertake collaborative research and development that is oriented towards the industrial base of the region.

The next chapter will explore the different forms that this shift in institutional orientation can take in more depth and in the context of regional policy internationally.

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