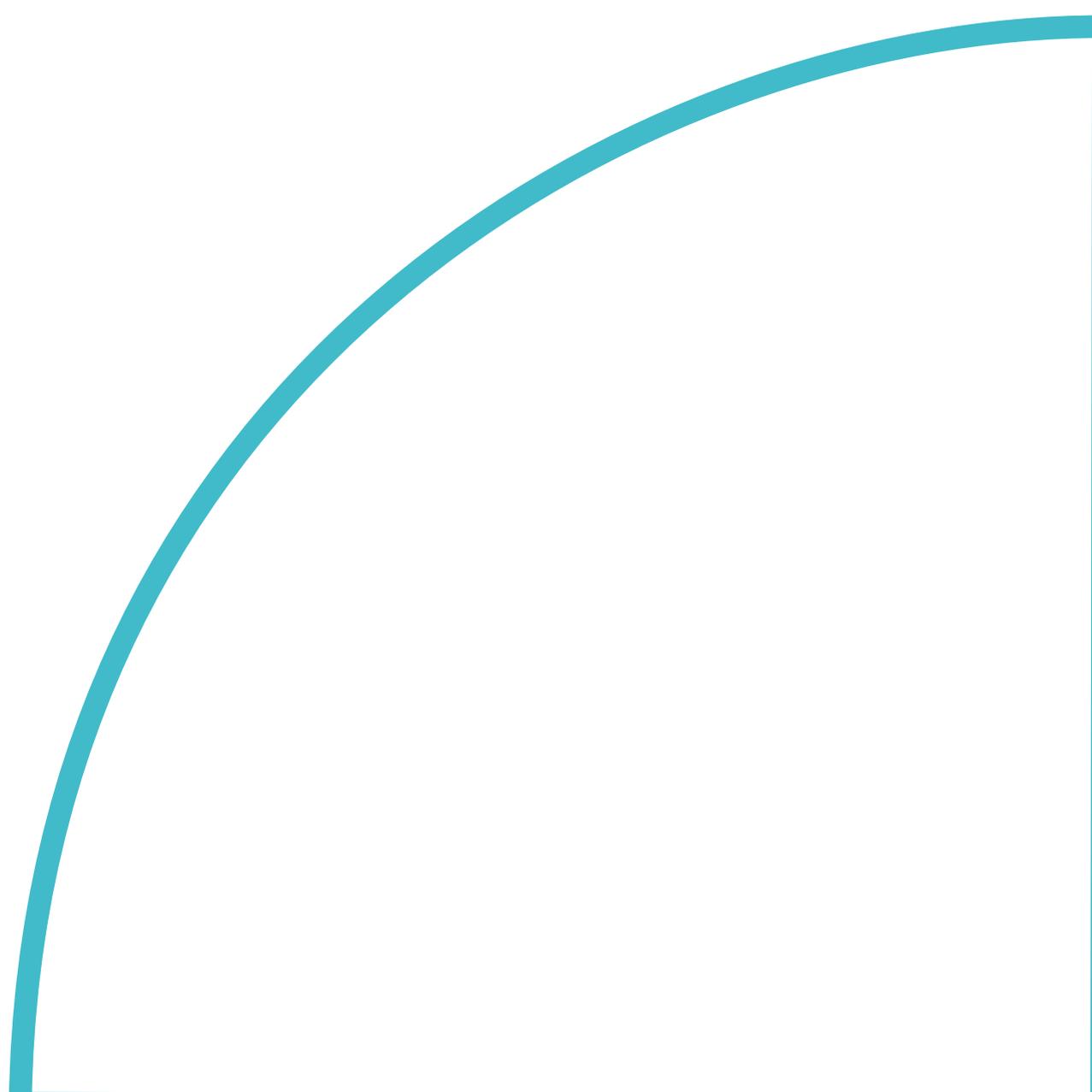


Investing in Valorisation: The Economic Opportunity

A report to Universiteiten van Nederland
26th January 2022



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1. Executive Summary

The purpose of this report is to provide evidence to inform policy decisions about the role of valorisation from the Dutch universities, university medical centres, and research institutes in driving economic and social recovery in the Netherlands.

Recovery from the economic impact of Covid-19, meeting climate change targets and the aspiration to deliver a wellbeing economy means that strategic and economic environments are changing very significantly. Doing things as we've always done is not an option - the case for innovation has never been stronger.

It is common knowledge that innovation is a key driver of economic growth. The long-term sustainable economic growth of the Netherlands demands a renewed commitment to promoting the impact of the innovation created by our research organisations. This is where valorisation plays an important role, because it drives the benefits of teaching and academic research into society.

The contribution of Universities, UMCs and research institutes to the economy and society start with producing educated graduates adding to the country's stock of skilled human capital, essential to economic growth in today's advanced workplaces. Their teaching role is not distinct from their role in supporting innovation impacts, it is an essential component and teaching benefits spill over into local, regional and national economies. This happens when valorisation teams: actively engage with employers; promote entrepreneurial activity within curricula; promote interdisciplinary and project-based learning; support teaching innovation; develop digital skills; encourage and support student/graduate start-up companies; and more. All of this requires an integrated approach to valorisation and a sustainable valorisation service that plays a role right across each individual institution's ecosystem, including its external commercial and public stakeholders

Academic research provides a pipeline of knowledge. Where this is disseminated into society to create value, research fuels innovation. Research findings are translated into the economy through several routes, and these create benefits through increased productivity, employment, and wellbeing impacts. Without research there can be no innovation impact, but the extent to which public investment in research creates benefits in society relies wholly on a successful valorisation strategy within each institution. The approach taken to valorisation matters.

Valorisation activities are resource intensive, and the operational capacity of the Technology Transfer Office is of critical importance. To create impact from research and teaching, TTO staff must build and manage sustainable relationships across the ecosystem, internally and externally, deliver a wide range of activities, and control several complex processes. It is therefore not surprising that recent research from the United States shows the size of the TTO has a highly significant positive effect on innovation impact.



The economic opportunity is significant. For universities in the Netherlands, valorisation impacts represent 16% of total impacts, while the equivalent figures for comparators range from 18% to 22%, representing a gap of 2-6 percentage points. **Closing this gap could result in an additional economic impact from valorisation of €0.9 - €2.5 billion from universities alone.** This would increase the ratio of income-impact from 5.6 currently to between 5.7 and 5.9. The economic opportunity is greater if we include impacts of valorisation from the wider population of Dutch research organisations, which have not been quantified within the scope of this analysis.

There is a strong rationale for public investment. Several market failures are linked to public funding decisions in innovation projects and programmes. High risks, sunk costs, market uncertainty, lack of full appropriability of results, and unavailability of funding all drive underinvestment research by business, and underinvestment by individual universities in valorisation. Public sector funding is justified to maximise the spillovers that innovation generates. This is an accepted norm among economic development specialists in governments across the world's advanced economies.

In conclusion, the Netherlands' universities, university medical centres, and research institutes create enormous economic and social value through their research and teaching activities, critical to drive the innovation needed to adjust to the challenges we face as a society. This presents a huge opportunity, providing the outcomes of the research being funded can be valorised to create value to society.

To be successful, valorisation activity must be supported and sustained. There needs to be capacity within a university ecosystem to undertake the broad range of activities required.

We have made the case for government investment in the TTO functions of our research institutions. This should include capacity funding so that specialist TTO teams can be sustained over the longer term. Strategic or project funding can be overlaid on this to support particular sectors or areas of policy interest.

With a considered policy investment in valorisation, the Netherlands can catch up with its competitors and realise significant additional economic and social benefits from its planned investments in research and education.



2. Introduction

Recovery from the economic impact of Covid-19, meeting climate change targets and the aspiration to deliver a wellbeing economy means that strategic and economic environments are changing very significantly. The economy is experiencing radical uncertainty and systems change and will continue to do so into the future. Doing things as we've always done is not an option - the case for innovation has never been stronger.

Dutch universities and university medical centres (UMCs) welcomed the recent coalition agreement which promises substantial investments in education, research and impact. In December Universiteiten van Nederland (UNL) promoted this good news, commenting that it will support the sector to contribute solutions to the major challenges facing society and enable us to invest more in fundamental scientific research and translational research.

It is important that these government investments in teaching and research create benefits for everyone in the Netherlands, that we maximise valorisation opportunities, so the results of research and teaching create value for society and the economy.

The purpose of this report is to provide evidence to inform policy decisions about the role of valorisation from the Dutch universities, university medical centres, applied knowledge institutions and research institutes in driving economic and social recovery in the Netherlands. We present a narrative to explain how valorisation creates benefits, along with economic evidence to demonstrate the scale of benefits that could be created. Finally, we present a rationale for public funding support of valorisation. We conclude by making the case for public support to allow the Dutch universities and university medical centres to fulfil their potential as drivers of economic transformation.



3.

R&D, Innovation, and Impact

The role of valorisation in realising economic and social impact from academic research and teaching

The fight against COVID-19 has demonstrated the crucial role of innovation in social and economic resilience. Innovation has always been accepted as a core requirement for advanced economies to flourish, along with skills and investment. Societies already faced complex and urgent challenges, with a global pandemic adding more urgency: from security, the climate emergency to an ageing population. Innovation is crucial to anticipate and respond to these challenges, to support economic growth and jobs, and support social prosperity and wellbeing.

3.1 Productivity Impacts from Public R&D

It is common knowledge that innovation is a key driver of economic growth, supported by a huge body of research evidence published over decades. This has unequivocally calculated a large and positive social rate of return from innovation investment for different countries and analysis periods, of around 20% to 30%¹. Firms and economies achieve large and significant returns from these public investments, which also create new and better jobs. Investment in innovation contributes to providing solutions to key issues for society, including health, climate change and more inclusive and resilient societies. The Netherlands is not immune to these benefits. In a study on productivity in the Netherlands between 1975 and 2014, Soete (2017)² reported extra investment in public R&D has a clear positive effect on total factor productivity growth.

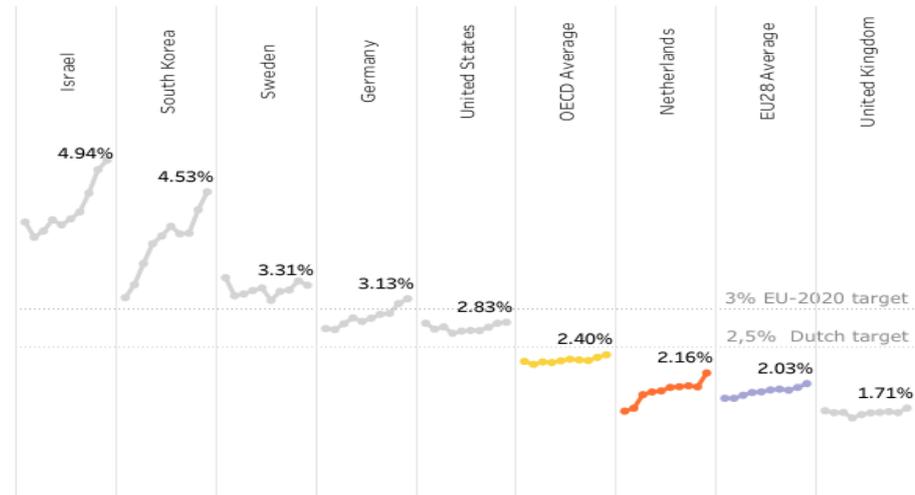
However, despite the potential benefits, the Netherlands has historically underinvested in R&D compared to other leading economies. In 2014, the European Union set a goal of R&D investments exceeding 3% of GDP by 2020. The most recent figures show that R&D investment in the Netherlands represents 2.16% of GDP (Figure 3-1, below).

¹ Source: BIS (2014), [Rates of Return to Investment in Science and Innovation](#)

² Soete, Luc & Verspagen, Bart & Ziesemer, Thomas, 2017. "The productivity effect of public R&D in the Netherlands," MERIT Working Papers 2017-021, United Nations University - Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT).
<https://ideas.repec.org/p/unm/unumer/2017021.html>



Figure 3-1: Trends in R&D Funding as a percentage of GDP



Source: UNL, https://www.universiteitenvannederland.nl/en_GB/nederland-dreigt-toppositie-als-kennisland-te-verliezen-door-achterblijvende-investeringen.html

Increasing the country's R&D intensity should remain a priority, and the coalition agreement's planned investments in research demonstrates there is a renewed commitment to this in the Netherlands. However, there are other key challenges to be addressed to ensure the Netherlands' investment in research creates productive benefits.

The long-term sustainable economic growth of the Netherlands demands a renewed commitment to promoting the impact of the research delivered by our universities and university medical centres. This is where valorisation plays an important role, because it drives the benefits of teaching and academic research into society. This is highlighted in the latest Global Competitiveness Report from the World Economic Forum, which describes how public R&D funding is among the types of investments that can generate the highest number of good-quality jobs. It has been estimated that in OECD economies five new jobs are created with every 1 million dollars invested in public R&D, **and twice as many when the investment is channelled through higher education institutions**³. This is higher than the job creation triggered by investment in any type of infrastructure in advanced economies (electricity, roads, health and education, water and sanitation).

With this as important context, the sections that follow explore how valorisation from Dutch universities, university medical centres, applied knowledge institutions and research institutes can create opportunities to maximise the benefits of their teaching and research activities.

³ Global Competitiveness Report Special Edition 2020: How Countries are Performing on the Road to Recovery, <https://www.weforum.org/reports/the-global-competitiveness-report-2020>



3.2 Innovation Impacts from Learning and Teaching

Universities' contributions to the economy and society start with producing educated graduates adding to the country's stock of skilled human capital, essential to economic growth in today's advanced workplaces. Indeed, there is overwhelming consensus that the most important contribution of universities to the economy is through the education of their students to prepare them for diverse roles in their futures, as workers, researchers, entrepreneurs, leaders and collaborators.

The teaching role of universities and university medical centres is not distinct from their role in supporting innovation impacts, it is an essential component⁴. The role that university teaching activities play in the innovation landscape includes:

- preparing graduates and their employers for disruptive innovation;
- extending graduates' research related competencies;
- promoting digital skills;
- fostering entrepreneurial mind-sets;
- re-skilling and upskilling in response to innovation needs;
- supporting continuing professional development for employers, helping their adaptability.

Because of these roles, universities' teaching benefits spill over into their local, regional and national economies. This happens when the valorisation teams of the universities: actively engage with employers; promote entrepreneurial activity within curricula; promote interdisciplinary and project-based learning; support teaching innovation; develop digital skills; encourage and support student/graduate start-up companies; and more. All of this requires an integrated approach to valorisation and a sustainable valorisation service that plays a role right across each individual university's ecosystem, including its external commercial and public stakeholders.

3.3 Innovation Impacts from Research

Research provides a pipeline of knowledge. Where this is disseminated into society to create value, academic research fuels innovation. Research findings are translated into the economy through several routes, including publications in professional journals, patent applications, collaboration with private firms, and creating spin out businesses to commercialise research. Together these create benefits through increased productivity, employment, and wellbeing impacts created by health, environmental and social innovations.

A recent economic study from the U.S. has drawn from a wealth of data across the country to understand the issues that influence successful valorisation activity⁵.

⁴ European University Association (EUA), (2019), The Role of Universities in Regional Innovation Ecosystems

⁵ Vinit Nijhawan, Cullum Clark, Christian Blackwell. 2020. "The Innovation Impact of U.S. Universities." Bush Institute, <https://www.bushcenter.org/publications/resources-reports/reports/universities-innovation-impact.html>



There are important findings of this research, which have direct relevance to our consideration of the role of valorisation in the Netherlands.

Firstly, the data shows that university leaders and policy makers should not fear that prioritising technology innovation, commercialisation and entrepreneurship will detract from traditional missions in teaching and fundamental research. On the contrary, the data shows that success in generating innovation impact reinforces the teaching and research activities of universities, at least in STEM fields. There is a virtuous circle here.

There is no play off between investing in fundamental research and investing in valorisation. Without research there can be no innovation impact, and this includes research that is low on the Technology Readiness Level⁶ scale, or without an obvious or immediate commercial purpose.

In fact, there is strong evidence to show that the relationship between public research spending and innovation impact from valorisation is always positive⁷. This means an increase in public research spending by government would raise an institution's innovation outputs. However, the effect of sourcing a relatively large share of a university's research funding from industry appears to be negative. This may be because industry funding tends to push researchers towards applied projects that lead to fewer widely cited papers, patents, licenses and spinout companies than projects focussed on transformational basic research. And, of course, because universities often negotiate sponsored research arrangements that fully transfer intellectual property to the industry sponsor, with little or no license income available to the university from commercialised technologies. Therefore, the coalition's investment plans to support academic research will undoubtedly help our long-term productivity growth.

The extent to which public investment in research creates benefits in society relies wholly on a successful valorisation strategy within each institution. The approach taken to valorisation matters.

3.4 The Importance of Valorisation Strategies

University and institute innovation systems rely on a vital third leg, in addition to research and teaching – knowledge exchange, or valorisation. This depends upon strong engagement with internal and external stakeholders, a two-way process that drives the benefits of research and teaching into society and at the same time highlights societal challenges and brings them in to the system to be addressed by researchers and educators.

⁶ Technology readiness levels (TRLs) are a widely used method for estimating the maturity of technologies. The use of TRLs enables consistent, uniform discussions of technical maturity across different types of technology.

⁷ European University Association (EUA), (2019), The Role of Universities in Regional Innovation Ecosystems



Typically, universities and research institutes in advanced economies focus on six types of activities to valorise the benefits of teaching and research⁸:

1. transferring technology and creating value and IP from university research;
2. facilitating business innovation through user-friendly access to university research;
3. conducting contracted research or collaborating with businesses in joint research projects;
4. building long-term strategic partnerships with businesses;
5. supporting business creation (student start-ups and research spin-offs);
6. offering continuing education/professional development courses for external stakeholders.

Technology transfer services have expanded in institutions across Europe and North America, capturing the opportunities these activities create to deliver economic and social impact. Technology Transfer Offices (TTOs) are established to deliver these areas of activity.

In the main, IP related technology transfer activity is a rather small part of the overall contribution of the university or research institute to innovation outcomes. In fact, facilitating access of businesses to research with high innovation potential is a more important contribution to regional and national innovation⁹. A good interface between university researchers and companies is a central strategic concern within universities and research institutes that achieve high levels of innovation impact. Ease of access to researchers by SMEs is particularly important in regional economies, and a recognised challenge, requiring investment of time and resources of knowledge institutions. This is recognised across the Dutch innovation system, see, for example TNO's 2022-25 strategy, which highlights its ambition to increase the contribution to innovation and growth of SMEs¹⁰.

Across Europe, there has been an emergence of vibrant business start-up communities around universities and research institutes in knowledge intensive regions. The importance of regional innovation ecosystems around a hub university or research institute cannot be overstated. Student start-ups and research spin-outs have benefited from their university's start-up support. In their early development phase, start-ups and spin-outs often use university support and spaces, in proximity to other similar firms and researchers. These spaces and the networks they host have developed into a distinct subculture in many locations across Europe and have often caught the eye of policy makers and metropolitan developers, sometimes becoming figureheads for urban revitalisation and economic revival.

These activities are resource intensive, and the operational capacity of the Technology Transfer Office is of critical importance. To create impact from

⁸ Ibid.

⁹ Ibid.

¹⁰ Connecting, Changing, Accelerating, TNO Strategy 2022-25, <https://www.tno.nl/en/about-tno/mission-and-strategy/tno-strategy-2022-2025/>



university research and teaching, TTO staff must build and manage sustainable relationships across the university ecosystem, internally and externally, deliver a wide range of activities, and control several complex processes. It is therefore not surprising that recent research from the United States shows the size of the TTO has a highly significant positive effect on innovation impact¹¹. The evidence shows that where there is inadequate staffing and other resources in the TTO, the most innovative work by academic researchers never makes it into knowledge exchange systems.

Supporting the notion of the virtuous cycle between research, teaching and valorisation, the evidence also shows that the TTO staff body not only influences an institution's success in generating patents, technology licenses, and spinout companies, but also its research and teaching impact. One reason for this is that effective technology transfer operations attract unusually innovative researchers, who publish widely cited papers and in turn attract talented students and raise the intellectual level of the whole institution.

¹¹ Vinit Nijhawan, Cullum Clark, Christian Blackwell. 2020. "The Innovation Impact of U.S. Universities." Bush Institute, <https://www.bushcenter.org/publications/resources-reports/reports/universities-innovation-impact.html>



4.

The Economic Opportunity

Benefits that could be generated from funding valorisation activities can be estimated by comparing the contribution of valorisation to the economic impact of universities in the Netherlands and elsewhere.

4.1 University Economic Impact Studies

The methodology for undertaking economic impact studies has been developed over the last 20 years, initially in the UK and the United States, and over the last decade, in several European countries. Economic impact studies have helped institutions and policy makers to understand how the activities of universities lead to benefits for economic performance and wider societal benefits. This has provided a basis for public policy and institution-level strategies that have sought to increase economic and societal benefits.

BiGGAR Economics is one of a number of economic research organisations that have developed the methodology and has undertaken studies for individual universities and for sector organisations across Europe. This has included two studies for the League of European Research Universities (LERU), which have been influential with policy makers in the European Commission.

Economic impact studies undertaken in the UK have encouraged government to consider the universities sector as more than a provider of education and research for the wider economy, to recognise the sector as a driver of regional and national economies.

Over the last 20 years BiGGAR Economics has worked with over 200 universities and research institutes across Europe assessing the economic impact of their activities. This included economic impact assessments of five universities in the Netherlands (Leiden, Utrecht, Groningen, VU Amsterdam and the University of Amsterdam), as well as the network of eight University Medical Centres (UMCs).

This provides an evidence base that can be used to compare the nature of the economic impacts generated, including those impacts most associated with valorisation.



Economic impact studies aim to describe and where possible quantify the effect of various activities on the economy. Quantified impacts are generally presented in terms of gross value added (GVA)¹² generated and the number of jobs supported.

The sources of economic impact that studies typically consider include:

- core impacts arising from universities' operations, including direct employment of staff, activity supported in suppliers of goods and services to universities, activity supported by the spending of staff wages in the local economy and benefits to the construction and related sectors arising from investment in estates and other physical capital;
- the activities of students, such as spending in the local economy, providing a part-time work force in several sectors and volunteering activity;
- valorisation activities;
- science parks and incubators operated by universities or economic development agencies to lower the barriers to business-university interaction and allow for co-location of businesses with universities;
- tourism activity (including conferences and events); and
- increased productivity in the economy arising from the additional productivity of graduates, arising from their education and university experience.

Universities, UMCs and Research Institutes are important contributors to national and local innovation systems and so many of these impacts are inter-related and mutually supporting. It could therefore be argued that all of these impacts could be enhanced by investment in valorisation resources. However, this analysis has focused on those sources of impact most closely associated with valorisation activity, those that capitalise on the research, technology and skills within the work of the university and transfer the benefits more widely in the economy through the creation of new businesses and driving innovation.

The impacts which are typically considered include:

- **technology licensing:** licensing agreements with industry give companies the legal right to use technology or intellectual property developed at a university, facilitating increases in sales, reductions in costs or otherwise the improvement of productivity;
- **spin-outs and start-ups:** companies that are typically set up by university staff or students to take existing university technology and develop it into a business;
- **collaborative research:** facilitating knowledge exchange by translating university research and expertise through the services it provides to businesses, including consultancy work, contract research for industry and providing access to facilities; and
- **continuing professional development (CPD)/training:** courses which help individuals and businesses to develop their skills and enable them to deliver higher value to their organisations; and

¹² GVA is a measure of economic output.



-
- **staff expertise:** university staff often contribute their expertise outside of the university environment, including providing policy advice and engaging with the wider public to increase understanding.

Note that these are impacts on the wider economy, rather than financial returns to the universities. For example, the technology licensing impacts refer to the economic activity generated by the license holders (such as additional sales and employment) as a result of commercialising the licensed intellectual property, rather than the license fees paid to the university.

4.2 Comparative Analysis

In order to assess the relative contribution that valorisation makes in the Netherlands, the economic impacts arising from valorisation have been compared across different university systems.

BiGGAR Economics' experience across the UK and Europe provides a useful basis to assess how universities in the Netherlands perform in its valorisation efforts relative to other university systems.

The analysis of the Dutch system focused on universities in the Netherlands for which economic impact studies had been undertaken, and a comparator group that includes:

- 5 Flemish universities;
- 14 Finnish universities;
- 22 UK universities;
- 23 universities in LERU;
- 61 universities across several European countries.

In addition to the Dutch case study universities, BiGGAR Economics has also undertaken an economic impact study of the UMCs. They also contribute a range of economic impacts, including valorisation impacts. However, the UMCs also provide healthcare and so their economic impact can not be directly compared to that of universities that do not include hospitals, and a comparator group that has a similar relationship between academic institutions and hospitals and a quantified economic impact has not been identified. The UMCs have therefore not been included in the comparator analysis.

The comparator studies have all been undertaken in the period 2014 to 2021 and so are relatively recent and have comparable methodologies.

The evidence base from the economic impact studies that have been undertaken have shown that the total impact on the economy in GVA terms is significant when compared with funding and income received. The total GVA impact will typically be a multiple of income received.



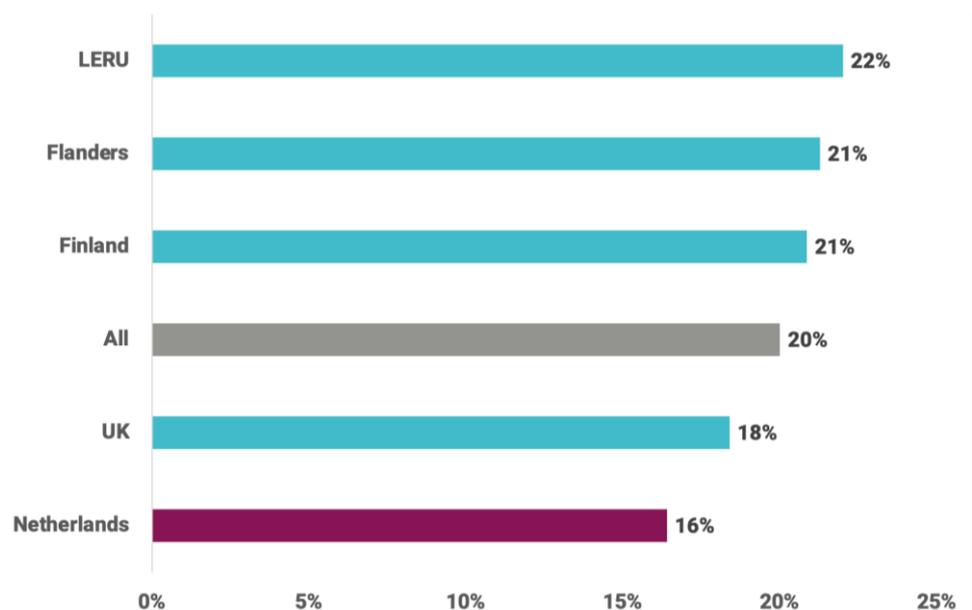
In the case of the Dutch universities, the combined income of the case study universities in the year that the studies were undertaken was €3.6 billion (representing 57% of the total income to the sector) and the combined GVA impact was €20.3 billion. This gives an income to GVA impact ratio of 5.6.

Whilst this represents an impressive rate of return for the Netherlands economy, an analysis of the contribution made by valorisation impacts, compared with universities in other countries, suggested that this could be further enhanced.

The impact a university generates is made up of the several different types of impact (as discussed in Section 4.1). Valorisation is an important contributor to the total, which can be assessed as a percentage of the total impact and compared across different university systems.

As can be seen in Figure 4.1, for universities in the Netherlands valorisation impacts represent 16% of the total economic impact. This is lower than in other university systems (ranging from 18% in the UK to 21% in Finland and Flanders, and 22% in LERU), a difference ranging from 2-6%. This suggests that there is scope to increase impacts from valorisation in the Netherlands.

Figure 4.1 Valorisation Impact as a % of Total GVA



Source: BiGGAR Economics

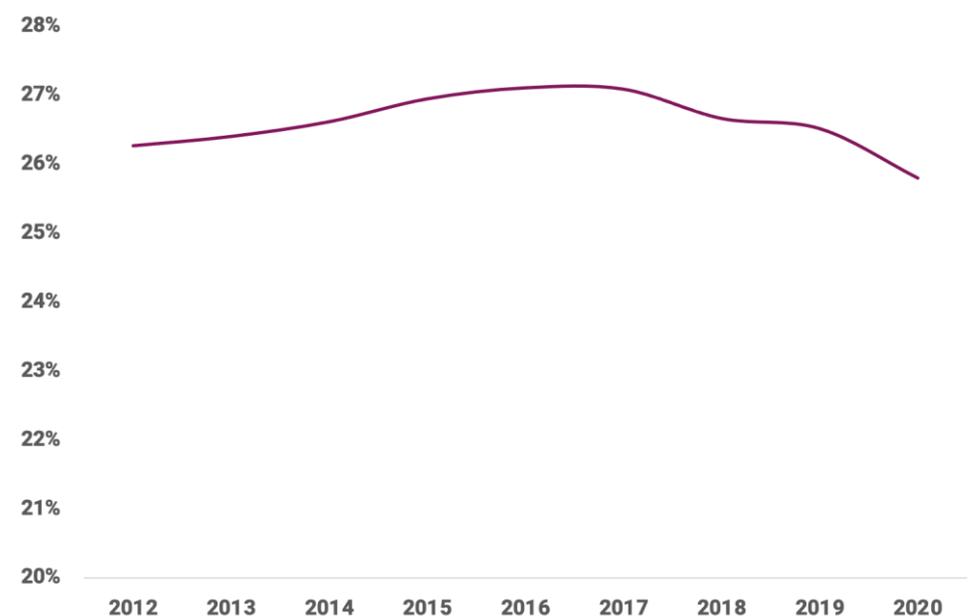
4.3 Income from contract research activities

Universities in the Netherlands report income received from contract activities, which includes income from businesses, government organisations and other types of institution. Generally, this income is for types of activity that would be considered knowledge exchange, such as collaborative research, consultancy and other types of expertise sharing.



As can be seen in Figure 4.2 the share of income from contract activities (calculated as 3-year average beginning in 2010) has declined as a percentage of universities' total income from around 27% in 2015-17, to under 26% in 2018-20. Given the substantial revenues of the Dutch universities (€7.9 billion in 2020), this difference corresponds to the equivalent of **€100 million less** in revenue compared to the level in 2015-17. This suggests that knowledge exchange activity, and the benefits arising, haven't kept pace with the general trajectory of Dutch universities.

Figure 4.2 Income from Contract Activities as % of the Total (3 year average)



Source: Rathenau Institute

4.4 Opportunity for Impact from Valorisation

The comparative analysis was based on economic impact studies conducted over a number of years. The most recent figures for the Dutch universities show that in 2020 they had total income of €7.9 billion¹³.

Applying the income-impact ratio of 5.6 from the case study universities suggests that the economic impact associated with the universities' activities in 2020 would be more than €44 billion, of which €7.2 billion would be associated with valorisation impacts.

If the Dutch universities were to increase the valorisation impacts as a share of total GVA by 2-6% points to close the gap with other university systems this would result in an increased economic impact of between €0.9 and €2.5 billion each year. This would increase the income-impact multiplier from 5.6 to between 5.7 and 5.9.

¹³ Rathenau Institut (2021), Income of universities in the Netherlands by source of funds



Table 4.1: Change in Valorisation Impact

	Change in impact, as % of total GVA	Change in Valorisation impact (€bn)	Change in income-impact ratio
Low	2%	0.9	5.7
High	6%	2.5	5.9

Source: BiGGAR Economics Analysis

4.5 Scope of Analysis

The evidence presented above provides the basis for estimating the economic opportunity of investing in valorisation of the Dutch universities only. The quantitative analysis has been limited in scope to the universities because we hold a strong dataset to show the economic impact of different elements of operations of Dutch universities, and data is not available to us from the other research organisations. This means the actual economic opportunity for the Netherlands is larger than shown above - the overall impact of increasing valorisation activity across all of the Netherlands' publicly funded research organisations will be considerably greater. The whole population of research organisations includes the universities, university medical centres, applied knowledge institutions and research institutes.

The UMCs also have an important contribution to make through valorisation. Direct comparisons could not be included in the quantitative analysis because the UMCs are funded and structured differently from research intensive universities with significant medical faculties elsewhere in Europe - in particular their role in delivering healthcare to patients as well as their role in education and research. However, as with the universities, it is clear that the economic returns from the education and research activities of the UMCs could be increased by investing in valorisation resources.

The other Netherlands organisations that are included in our argument include TNO, Wagenengen Research, Deltares, NLR and Marin. We know that the economic benefits from this wider body of research organisations will carry a similar value to those of the universities, because of economic impact assessments of similar organisations elsewhere. Two examples are an economic impact study of ETH Domain in Switzerland¹⁴, and VIB in Flanders¹⁵.

The ETH Domain is composed of six member institutes, which together represent some of the most highly regarded research-intensive institutes in the world, attaining top positions in international rankings. ETH Domain includes several research institutes which differ from research universities in their scale, the nature of their work and their linkages into the national economy. Despite this the valorisation

¹⁴ <https://ethz.ch/en/the-eth-zurich/organisation/eth-domain.html>

¹⁵ <https://vib.be/>



activities and impacts are similar to those of universities, achieved through licensing technology, supporting the formation of new businesses, and providing access to large scale research infrastructure.

VIB is a renowned genomics institute. Discoveries by VIB researchers have been used to develop new products with several applications, including diagnostic tests, therapeutic agents and improved crops. VIB works through partnership to commercialise these applications and make them available to a global market place. VIB's partners range from bio-pharma to agribiotech and food-processing companies and from SMEs to multinationals. As with universities, valorisation is supported by government investment and is realised through the creation of start-up companies, industrial research collaboration, and licensing. VIB is embedded as part of the Flemish innovation system, along with the universities. BiGGAR Economics' analysis found that VIB's success is attributed to several, inter-related factors:

1. A holistic, dual focus on global excellence in science and commercialisation of research, with these outcomes being held in equal esteem;
2. A broad research base in several fields of medical and agri-biotech areas;
3. Recruiting scientists with commercial experience to the valorisation team;
4. A long strategic and investment cycle, with 5-year reviews of strategy and focus;
5. A continuing and long term commitment from government from the outset, enabling a long term strategic approach to cluster development;
6. Strength in leadership between the partners (VIB, universities and government), and consistency of leadership at the institute;
7. An international focus through staff and research and also through peer review;
8. A strategic role in creating physical space for companies in the science hub and bio-incubators;
9. Attracting and supporting finance and venture capital;
10. Attracting foreign direct investment as well as investment in its start-ups;
11. Achieving critical mass and momentum in research work;
12. Well-developed collaboration with universities.

As case studies, VIB and ETH demonstrate the importance of a strategic approach to valorisation across all of a country's public research organisations.



5. Rationale for Public Funding

How valorisation impacts can be supported by government investment

The analysis described above shows that higher innovation impact from universities would bring faster economic growth in the Netherlands. To achieve this, there is a case to invest more in publicly funded academic research, for which there is already a commitment, and in an expansion of valorisation activities of TTOs and other innovation promoting activities to enhance the impact of research and teaching.

There is a strong rationale for public investment. Several market failures are linked to public funding decisions in innovation projects and programmes. High risks, sunk costs, market uncertainty, lack of full appropriability of results, and unavailability of funding all drive underinvestment research by business, and underinvestment by individual universities in valorisation. Public sector funding is justified to maximise the spillovers that innovation generates. This is an accepted norm among economic development specialists in governments across the world's advanced economies.

Looking across industrialised economies, valorisation is now a well-established element of all universities' strategies. Given that it also delivers diverse and significant public goods, there is a clear rationale for funding of valorisation. It delivers a higher volume of activity with a wider range of partners. The growth in systems of public support is a recognition of the need to shift from an initial, misplaced belief that valorisation offers universities a surplus-generating income stream which will drive a market-based expansion of activity. Moreover, there has been a realisation that effective valorisation rests strongly both on the quality of TTO staff who operate alongside the academic community and the creation and enhancement of the relationships that those staff have with companies and other external organisations.

As a result, there has been a recognition that sustained and broadly predictable support for the employment of those staff is a crucial element of any successful system. In fact, the lack of a stable base and financial commitment for valorisation centres was raised an issue of concern in the 2018 evaluation of the Netherlands' Valorization Program¹⁶. A system of sustained financial support might be enhanced by the overlaying of project funding, but short / medium cycle project funding alone is not the optimal approach to creating and enhancing relationships and impacts.

The level of organisation of valorisation – single university, regional or national - needs to reflect what will best support these relationships. There is something to be learned from the Valorization Program that was introduced by the Ministry of Economic Affairs and Climate and the Ministry of Education, Culture and Science in

¹⁶ Dialogic (2018), Eindevaluatie Valorisatieprogramma, <https://www.dialogic.nl/projecten/eindevaluatie-valorisatieprogramma/>



2010, and which ran to 2018. The goal was to improve and embed the use of knowledge in regional ecosystems. After the Program ended, there was a mixed level of continued support for valorisation from universities and their business and other partners. Much of this could be explained by the continuing market failures that are recognised across the innovation landscape.

A common approach across advanced economies is to support valorisation teams at the level of an individual university with additional collaborative action taken where this offers benefit, in meeting geographic or industry sectoral needs or in delivering support and enhancement activity, such as staff development. This also allows for a tailoring of approach to enhance existing project initiatives and offers capacity to leverage further project investment, for example from EU or other sources.

The rationale for public investment in universities, UMCs and research institutes capacity for valorisation is therefore that:

- all valorisation benefits from a community of specialist staff in universities and research organisations who can develop and enhance relationships with external organisations, be they private industry; the public sector; or the third (charity) sector;
- those relationships are enhanced both by having high quality staff that organisations can employ for the long term, (as opposed to short-term project teams alone), and in providing those staff with financial and other capacity to create and foster relationships with companies and other organisations, most particularly those furthest from expanding and accelerating their innovation actions and investments;
- only a small minority of valorisation provides for surplus-generating income and so there is a clear market failure rationale for investment in valorisation staff and the projects that they initiate. This is most marked in the relationship with the SME sector where significant economic benefit can be realised and where the need for innovation support in the face of accelerating change in operating contexts is most marked; and
- there are strong policy reasons for supporting a full range of valorisation activity, with excellent economic, cultural, and societal benefits, including from those activities that are furthest from being economically viable without public funding, for example, working with SMEs / microbusinesses, culture and public engagement with science.

Systems of public investment in valorisation capacity can be driven by the policy outcomes that government seeks. Capacity funding can be linked to output metrics, however it is important that shifts in funding are controlled so that the employment of specialist TTO teams, and therefore the relationships and impacts they create, is not destabilised.



Such a funding system might usefully:

- offer financial resources to individual institutions on a formulaic basis. The formula should draw on metrics of success so that the system is attuned to the need to drive and reward performance whilst offering sufficient stability to sustain teams and their relationships;
- offer complementary strategic or project funding that supports action across groups of universities and with specific industrial sectors where this is operationally preferable;
- accept that some public goods, such as culture and public engagement, cannot be metricised and so support should be hypothecated within a total award to a university or allocated against a proxy metric, for example the number of academic staff (in certain disciplines); and
- recognise that funding driven solely by volume metrics will lead to the unintended outcome that the smallest institutions are unable to secure a share of total funding to sustain even the smallest team of professional valorisation staff. A minimum funding allocation to each university can address this.



6.

Conclusion

The strategic and economic case for government investment in valorisation

The Netherlands' universities, university medical centres, research institutes and TNO create enormous economic and social value through their research and teaching activities, critical to drive the innovation needed to adjust to the challenges we face as a society. Universiteiten van Nederland welcomes the coalition government's commitment to increase research spending, which will help the Netherlands on its way towards the EU goal of 3% of GDP. This presents a huge opportunity, providing the outcomes of the research being funded can be valorised to create value to society.

There is a wealth of evidence from across the world's advanced economies to demonstrate the importance of valorisation in the innovation landscape. It is logical that without valorisation, the benefits of research and teaching cannot reach into society. Within successful and impactful university ecosystems, valorisation is an esteemed activity that sits hand in hand with teaching and research. Data and analysis from Europe and the United States demonstrates that these are mutually reinforcing activities, with strong valorisation strategies adding value to both teaching and research successes. Investment in one of these areas does not detract from the importance of success of another.

To be successful, valorisation activity must be supported and sustained. Intellectual property related technology transfer is only a small part of the contribution of valorisation to innovation outcomes, and a narrow focus on this area misses the wider opportunity for impact that the country needs to capture economic growth from research and teaching activity. There needs to be capacity within a university or research institute ecosystem to undertake the broad range of activities required. The activity is complex and involves relationship building over the longer term with researchers, educators, businesses, governments, and communities.

The economic opportunity is significant. For universities in the Netherlands, valorisation impacts represent 16% of total impacts, while the equivalent figures for comparators range from 18% to 22%, representing a gap of 2-6 percentage points. Closing this gap could result in an additional economic impact from valorisation of €0.9 - €2.5 billion from universities alone. This would increase the ratio of income-impact from 5.6 currently to between 5.7 and 5.9. The economic opportunity is greater if we include impacts of valorisation from the wider population of Dutch research organisations, which have not been quantified within the scope of this analysis.

The rationale for government investment in valorisation is strong. In addition to the economic opportunity for the nation, there are several market failures that lead to underinvestment in research and commercialisation by businesses and



underinvestment in valorisation by individual academic and research institutions. Public sector funding is justified to maximise the spillovers that innovation generates. This is an accepted norm among economic development specialists in governments across the world's advanced economies.

We have made the case for government investment in the TTO functions of universities, university medical centres, TNO and the research institutes. This should include capacity funding so that specialist TTO teams can be sustained over the longer term. Strategic or project funding can be overlaid on this to support particular sectors or areas of policy interest. With a considered policy investment in valorisation, the Netherlands can catch up with its competitors and realise significant additional economic and social benefits from its existing investments in research and education.

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