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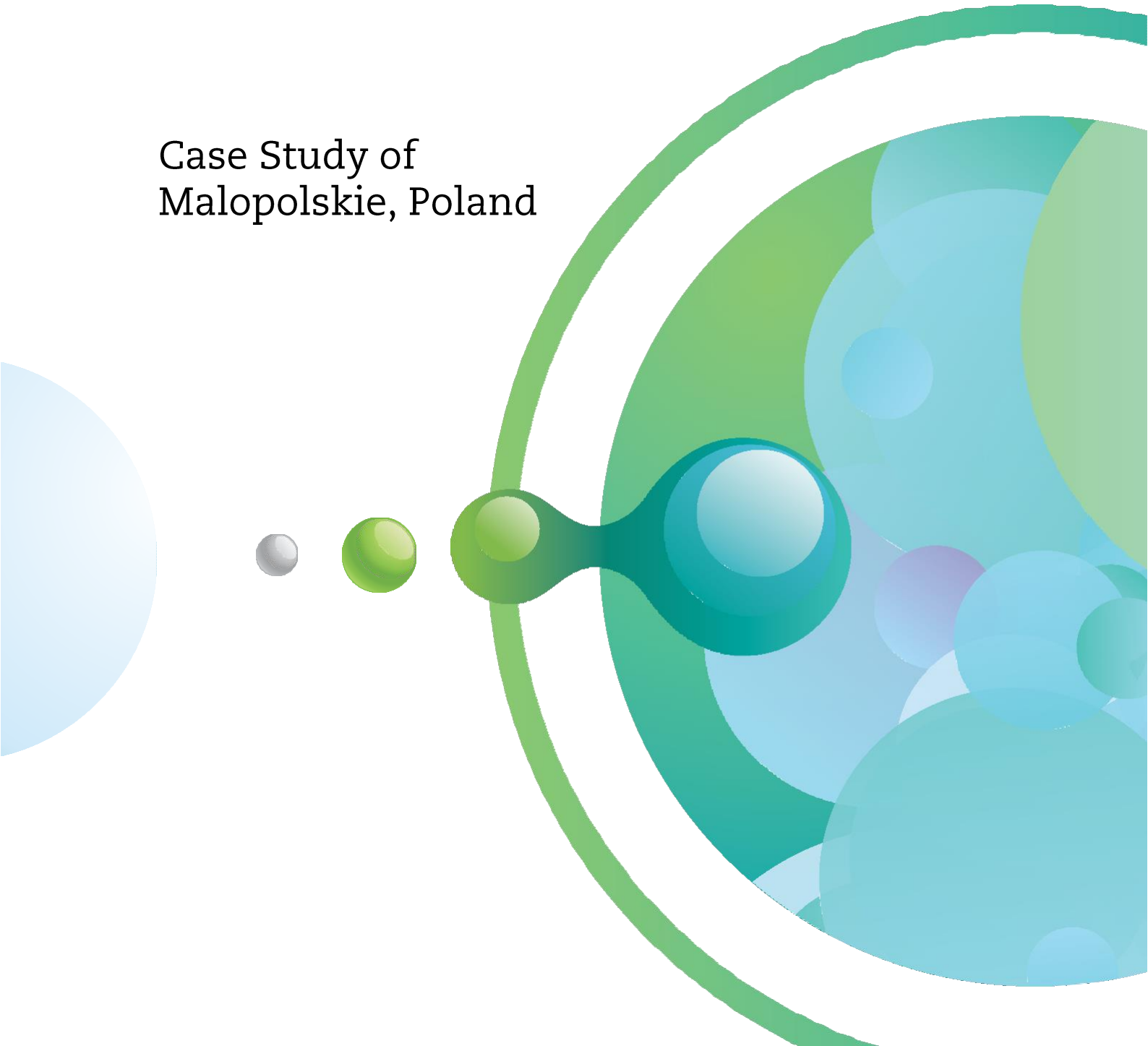
Case Study of
Malopolskie, Poland



OECD Local Economic and Employment Development (LEED)
Working Papers

Local Entrepreneurship Ecosystems and Emerging Industries

Case Study of Malopolskie, Poland

Final Report
May 2019

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This paper was authorised for publication by Lamia Kamal-Chaoui, Director, Centre for Entrepreneurship, SMEs, Regions and Cities, OECD.

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Foreword

This report examines the local entrepreneurship ecosystem of the Malopolskie region in Poland and its capacity to promote productivity upgrading and industrial renewal. It forms part of the OECD's work stream on local entrepreneurship ecosystems and emerging industries.

The OECD local entrepreneurship ecosystems work examines the main dimensions of local entrepreneurship ecosystems that affect innovative start-ups, scale-ups and innovation in existing enterprises in case study regions. It relates the policy development of local entrepreneurship ecosystems to the principle of regional smart specialisation, and investigates how smart specialisation strategies are helping to strengthen entrepreneurship and innovation in regions.

The Malopolskie region is a particularly interesting case study of policies for local entrepreneurship ecosystems and emerging industries because of its strong policy will to succeed in this area. The European Committee of the Regions recognised this by awarding Malopolskie the status of a European Entrepreneurial Region (EER) 2016 based on its strategy for developing SMEs and entrepreneurship. Malopolskie's award was particularly related to the region's articulation and demonstration of "embracing the importance of engaging stakeholders in the process of developing an entrepreneurial spirit in the region".

In accepting the European Entrepreneurial Regions Award 2016, the Marshal of the Malopolskie regional government, said:

"Malopolskie is a region of creative citizens and innovative entrepreneurs – it is them who inspire us to act and to undertake new challenges. In the following years we shall focus mainly on the development of new technologies in business because it is the area where we see a great chance for the Malopolskie region. We are aware that it requires building a strong partnership between local government, entrepreneurs and scientific institutions. This is our ambition for the forthcoming years"[1].

This report presents an analysis of Malopolskie's industrial development and local entrepreneurship ecosystem. Based on the analysis, bottlenecks and enablers are identified and initiatives are proposed to further strengthen entrepreneurship activity and industrial renewal.

[1] See http://cor.europa.eu/en/news/Pages/European-Entrepreneurial-Regions-2016.aspx

Acknowledgements

This report was prepared by the Centre for Entrepreneurship, SMEs, Regions and Cities (CFE) of the Organisation for Economic Co-operation and Development (OECD) led by Lamia Kamal-Chaoui, Director. It was requested by the Polish Ministry of Investment and Development and the Regional Government of Malopolskie. It forms part of the work of the Local Economic and Employment Development (LEED) Committee of the OECD on local entrepreneurship ecosystems.

The project was led by Jonathan Potter, Head of the Entrepreneurship Policy and Analysis Unit, and Sandra Hannig, Policy Analyst, CFE, OECD. The report was drafted by a team involving Sandra Hannig (OECD), Helen Lawton Smith (Birkbeck, University of London), Chay Brooks (University of Sheffield), Łukasz Mamica (Krakow University of Economics), Tim Vorley (University of Sheffield), Bill O'Gorman (Waterford Institute of Technology) and Jonathan Potter (OECD).

The project was co-ordinated in Poland by Przemysław Herman, Ministry of Investment and Development, and Agnieszka Bachórz, Tomasz Kwiatkowski, Dorota Leśniak and Michał Ososiński of the Treasury and Economy Department of the Marshal Office of the Malopolskie Region.

Many individuals and organisations in the region provided important information. A wide range of stakeholders participated in meetings with the OECD review panel during an OECD study mission to the region. The organisations participating included the Economic Development Department of the regional government, the Regional Labour Office, the Technology Transfer Centre at Krakow University of Technology, the Sustainable Infrastructure Cluster, the KPT Scale Up Akcelerator, the Krakow Technology Park, No Label, Delphi Automotive, Autenti, Malopolskie Regional Development Agency, Foundation Klaster Life Science Krakow, Krakow Chamber of Commerce and Industry, Malopolskie Centre of Entrepreneurship, City Development Department City of Krakow, Polspecial, Institute of Advanced Manufacturing Technology, Creative Industries and Leisure Cluster, Sambud-2, Centre for Technology Transfer Jagiellonian University, Selvita, and Aspire.

Subsequent to the study mission, several very useful additional interviews were held, including with Michał Adamczyk, Foundation Start-up city; Wacław Andruszko, Director, Krakow Chamber of Commerce; Joanna Domańska, Vice Director, Department of Economic Development, Marshal's Office; Bartosz Józefowski, Scale-up Accelerator, Krakow Technology Park; Rafał Solecki, Director, Malopolskie Centre of Entrepreneurship; Sebastian Kolisz, Regional Director, Business Link and AIP (Academic Business Incubator); Kazimierz Murzyn, Managing Director, Life Science Cluster in Krakow; Agnieska Czubax, Head of Department, EU Cooperation and Training, Krakow Chamber of Commerce and Industry; Tomasz Sokol, Deputy Director, Malopolskie Centre for Entrepreneurship; Irena Łobocka, President, Sustainable Infrastructure Cluster; Karolina Studniarek, New Connect; Małgorzata Mazur, PSIK; Manuel Vega, Markets and Listing; and Sonia Wojciechowska, Games Industry specialist, Krakow Technology Park.

The draft report was discussed at a stakeholder workshop on 4 October 2018 in Krakow. The participants in this workshop provided important inputs to the finalisation of the report.

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Acronyms and abbreviations

ABSL	Association of Business Service Leaders
AGH	Gorniczo-Hutnicza Akademia (as in AGH University of Science and Technology)
ASPIRE	Association of IT & Business Process Services Companies
BPeSA	Business Process Enabling South Africa
BPO	Business Processing Outsourcing
CeBiM	Business in the Małopolskie region Centre
CEE	Central and Eastern Europe
CEO	Chief Executive Officer
CIS	Community Innovation Survey
CoR	Committee of the Regions
CSR	Corporate Social Responsibility
DEC	Digital Entertainment Cluster
DSMR	Development Strategy for the Malopolskie region
EC	European Commission
EER	European Entrepreneurial Region
EIS	Enterprise Investment Scheme
EPO	European Patent Office
ERDF	European Regional Development Fund
EU	European Union
EUR	Euro
FDI	Foreign Direct Investment
FKLSK	Klaster LifeScience Krakow Foundation
GDP	Gross Domestic Product
GLP	Good Laboratory Practice
GMP	Good Manufacturing Practice
GUS	Local Bank Central Statistics Office
H2020	Horizon 2020 (programme of the EU)

HEI	Higher Education Institution
HGF	High-growth Firm
HQ	Headquarters
HR	Human Resources
ICT	Information and Communications Technology
IE OP	Innovative Economy Operational Programme (of the EU)
INTERREG	EU programme – helps develop better policy through Inter-regional cooperation
IP	Intellectual property
IRR	Internal Rate of Return
IT	Information Technology
ITO	Information Technology Outsourcing
JU	Jagiellonian University
K	Thousand
KIS	Knowledge Intensive Systems
KKF	Krakow Film Cluster
KPT	Krakow Technology Park
KTC	Knowledge Transfer Centre
KTP	Knowledge Transfer Partnership
LBA	Lewithan Business Angel
MARR	The Malopolskie Region Regional DevelopmentAgency
MHT	Medium high-tech
MNE	Multinational Enterprise
MPTI Park	The Malopolskie Region Information and Communications Technology
NCBiR	National Centre for Research and Development (operator of the BRIdge Alpha program).
NEET	Not in Education, Employment, or Training
NGO	Non-governmental organisation
OBN	OBN (United Kingdom network, previously the Oxford Biosciences Network)
OECD	The Organisation for Economic Co-operation and Development
OR	Overarching Recommendation – the main recommendations of the document.
PARP	Polish Agency for Enterprise Development
PE/VC	Private Equity/Venture Capital

PFR	Polish Development Fund
PL	Poland
PLN	Polish Zloty
PSIK	Polish Private Equity and Venture Capital Association
R&D	Research and Development
RCI	Regional Competitive Index (of European Commission)
RII	Regional Innovation Index
RIS	Regional Innovation Scorecard
RIS3	Research and Innovation Strategy for Smart Specialization
RISMR	Regional Innovation Strategy for the Malopolskie Region
ROP	Regional Operational Programme (of the European Union)
SEAPJ	South East (Ireland) Action Plan for Jobs
SEIS	Seed Enterprise Investment Scheme
SERSF	South East (Ireland) Regional Skills Forum
SMEs	Small and Medium Enterprises
SSC	Shared Services Centres
SWOT	Strengths, Weaknesses, Opportunities, Threats
TEK	Technical Centre in Krakow
TTO	Technology Transfer Office (of a university)
USD	US Dollar
VAT	Value Added Tax
VC	Venture Capital
WSA	Warsaw Stock Exchange

Executive Summary

The Malopolskie regional economy

Malopolskie had 3.38 million inhabitants in 2016, with a significant concentration in Krakow, the metropolitan centre of the region and the second largest city in Poland in terms of Gross Domestic Product (GDP). The region's population has been growing and it experiences stable positive net international migration. It ranks second in Poland on internal expenditure on Research and Development (R&D) and the number of R&D employees. Krakow is a significant destination for tourism and is viewed as a good place in which to be based. It is the focus of most innovation-led and R&D-led activity in the region.

The region is developing successfully in promoting entrepreneurship. In 2016, over 31 000 new firms were registered in the region (9.59 firms per 1 000 inhabitants), which was above the Poland average. This entrepreneurship is supported by a number of entrepreneurship ecosystem strengths, especially by access to high levels of "talent" based on educational qualifications, good access to finance, new knowledge generation (from public and private organisations), business services and networks between entrepreneurs.

Furthermore, in 2016, the region received the award for *Entrepreneurial Region of the Year* given by the European Union (EU) Committee of the Regions – the first Polish region to receive this title – based on its commitment to actions to promote entrepreneurship and SMEs. A further key driving force in its approach is its adoption of the EU's smart specialisation agenda identifying priority economic activities for investment in entrepreneurship and innovation.

However, there are currently challenges and bottlenecks to stimulating the entrepreneurial activities needed. They relate to:

- Supporting early stage entrepreneurship;
- Further developing an entrepreneurial culture;
- Increasing the number of scale-up firms;
- Building on the potential of larger firms to stimulate local entrepreneurship and innovation; and
- Ensuring that the knowledge base and skill sets in the region continue to meet the needs being generated.

This report will thus:

- Discuss the opportunities and barriers to stimulating entrepreneurship and emerging industries in Malopolskie. These are discussed in terms of enterprise start-ups, scale-ups, and the contribution of large organisations to local entrepreneurship and innovation.
- Suggest policy measures and tools to further promote entrepreneurship and local emerging industries.

Key findings

Local entrepreneurship ecosystem conditions for start-ups

There is evidence of a strong start-up community in Malopolskie and of a generally improved quality of new firms. This contributes positively to emerging industries and productivity growth. For example, the number of start-ups in the digital economy, many of which focus on global markets, has been increasing annually since 2015.

The regional government is heavily involved in supporting the development and creation of enterprises, including by organising events such as the annual Entrepreneurship Week. Both the national and regional governments are working to simplify start-up processes and reduce the time it takes to get into business (from weeks to days). Knowledge Transfer Centres (KTCs) have been set up in the region in the fields of ICT, energy and life sciences. There is an increasing number of accelerators and venture capital funds in the region.

The most significant bottlenecks to a flourishing regional ecosystem that promotes start-ups in emerging industries include a lack of cohesive networking among stakeholders in the region, a lack of trust amongst entrepreneurs, and insufficient long-term assistance for innovative start-ups including advice and mentoring. There is also an insufficient focus on linking regional skills development and knowledge generation to the smart specialisation priorities.

Local entrepreneurship ecosystem conditions for scale-ups

Scale-ups enterprises can be seen as firms with at least 10 employees that achieve growth of at least 10% per year in employment or turnover terms for 3 years. They can make an important contribution to regional productivity growth and diversification into emerging industries. Malopolskie has generated several scale-ups in the last five years, particularly in life sciences and ICT such as Codewise and Selvita. However, there is scope to further improve the conditions for scale-ups with adapted policies.

In examining the scale-up issue, it is useful to consider different kinds of policy support needed for three different kinds of scale-up or potential scale-up (i) established firms that have achieved fast growth and reached a critical mass; (ii) innovative firms that have grown and show growth potential and may need support with internationalisation, skills, intellectual property (IP), networking and so on; and (iii) firms that have an ambition to grow but are facing series barriers such as in raising finance or developing management teams.

A bottleneck to scale-ups in Malopolskie is lack of ambition for growth and a reluctance by SME owners and managers to make the efforts and take the risks needed to sell more innovative products. There is also a strong reluctance of SMEs to collaborate, partially due to a lack of trust among businesses. A further bottleneck is a lack of planning for future skills requirements and a lack of alignment between university skills generation and business needs.

There is a need to expand the policy support system for scale ups and to market the available initiatives effectively to enterprises.

Involvement of large enterprises in the local entrepreneurship ecosystem

Historically, large enterprises in Malopolskie have centred on metallurgy, steel and energy. Large enterprises in these sectors continue to maintain and support important regional

supply chains. In addition, Polish companies working in sustainable agricultural practices, and innovations in the transportation and logistics sectors are well placed to lead innovation in their supply chains. At the same time, large enterprises are frequently involved in innovation and R&D collaborations with the universities and regional and municipal agencies.

However, a bottleneck concerns the tendency for many of the multinational enterprises (MNEs) in the region to have limited linkages with local SME suppliers. Instead, product and service inputs are often either provided internally or through non-regional supply chains. Furthermore, the work in many of the MNEs in the region is process-based. This is evident in a specialisation of inward investment in Business Process Outsourcing (BPO)/Shared Service Centres (SSC) and in the sectors of metals manufacturing, electrical engineering, and machine building. In these activities, there is lesser emphasis on R&D and innovation than in more sophisticated activities turned more towards the final consumer.

A further bottleneck is a limited involvement of local large enterprises in spaces of co-production and collaboration with start-up entrepreneurs and entrepreneurs in SMEs. Public intermediary agencies could be better brokers of information and support with the aim of fostering promoting stronger entrepreneurial networks.

Key recommendations

The priorities for entrepreneurship development and local emerging industries in Malopolskie lie in the areas of stimulating more ambitious entrepreneurs, increasing private sector collaboration in innovation, developing a lifelong learning culture and providing for the future skills needs of the region's smart specialisations, and increasing knowledge about access to financing opportunities.

The following are among the key policy recommendations in this report to address these issues:

- Implement entrepreneurship education courses at all education levels, introduce an acceleration and mentoring programme that match start-up firms with large companies and strengthen support for enterprise leadership development, and create an investment fund in university spin-out enterprises.
- Provide brokering opportunities for start-up and scale-up firms and SMEs to work with large enterprises, universities and research institutions on joint innovation projects focused on the smart specialisations, including by utilising the networks of the existing cluster organisations and using public funding to trigger innovation collaborations.
- Bring together all key stakeholders to map skill needs and provision and plan how to better provide for the future skills requirements of the region's smart specialisations.
- Improve information flow to entrepreneurs about finance availability and introduce new models of financial support focused in particular on strengthening crowdfunding and angel investment.

1. Overall assessment and recommendations

This chapter summarises the findings and recommendations of the report. It identifies enablers and bottlenecks in the regional entrepreneurship ecosystem for developing innovative start-ups and scale-ups and engaging larger firms in local entrepreneurship and innovation. It highlights key policy suggestions to further strengthen the regional entrepreneurship ecosystem and the capacity of the region to support its emerging industries.

The Malopolskie entrepreneurship ecosystem

The regional economy is healthy overall

Malopolskie had 3.38 million inhabitants in 2016, with a significant concentration in Krakow, the metropolitan centre of the region. In terms of Gross Domestic Product (GDP), Krakow is the second largest city in Poland, behind Warsaw. Krakow is a significant destination for tourism and is viewed as a good place in which to be based. It is the focus of most innovation-led and R&D-led activity in the region.

Malopolskie's population has increased by approximately 4% since 2002 and it has stable positive net international migration; of 3 376 in 2016. Approximately 70% of people of working age are economically active, while unemployment was 4.6% in 2016 compared with a national average of 5.6%. On the other hand, the level of youth (below 24 years) unemployment was 15.8% in 2016, although this has declined significantly since 2010.

Malopolskie is becoming an entrepreneurial economy

Malopolskie region is also developing as an entrepreneurial economy. In 2016, over 31 000 new firms were registered in the region (9.59 firms per 1 000 inhabitants), which was above the Poland average. This entrepreneurship is supported especially by high levels of "talent" based on educational qualifications, and good access to finance, new knowledge generation (from public and private organisations), business services and networks between entrepreneurs relative to the overall Polish national context (EC, 2016a, 2016b).

The regional economy is becoming more diversified

Malopolskie is an economy where "services flourish, industry carries on and agriculture lingers" [2]. Industry accounts for 26.5% of the region's jobs. The industry base consists of traditional sectors such as metallurgy, mining, metals, steel, machinery, heavy chemicals, tobacco, wearable goods and food processing industries. For example, Malopolskie is home to Europe's fourth largest manufacturer of cables (Tele-Fonika), third largest producer of synthetic rubber (Dwory) and the world's second largest producer of roof windows (Fakro).

The economy has become more diversified over the last two decades as the number of innovative firms in new sectors increases and foreign direct investment (FDI) has been attracted. In 2014, there were almost 5 000 FDI firms in Malopolskie providing over 45 000 jobs. The Malopolskie Regional Development Observatory estimates that there were approximately 99 new FDI projects with a value of at least EUR 1 million in 2016.

The region has developed a smart specialisation strategy

Since 2014, developing and adhering to a national or regional smart specialisation strategy has been a prerequisite to accessing EU innovation funding from the European Regional Development Fund (ERDF). The priority areas selected for smart specialisation in each region are intended to improve the targeting of support for research and innovation by identifying the areas of greatest strategic potential, building on the region's strengths and comparative advantages.

Regions are required to focus their investments on at least two of the following key priority areas: (i) innovation and research, (ii) the digital agenda, (iii) support for small and

[2] http://www.krakow-info.com/malopol.htm

medium-sized enterprises (SMEs), and (iv) the low-carbon economy. Malopolskie is classified as an EU "transition region", and must therefore expend a minimum of 60% of its ERDF funding on at least two of these priority areas. The Malopolskie regional government is achieving this goal, in part, though its focused investment on innovative start-ups aligned to these priority areas.

The smart specialisation strategy is set out in the Regional Innovation Strategy for the Malopolskie Region 2014-20 (RISMR). This is one of the strategic programmes of the Development Strategy of Malopolskie Region (DSMR) 2011-2020[3], which is the high level strategy document for the region. The RISMR identifies three priorities:

- Creating demand for innovations.
- Development of infrastructure for the knowledge based economy.
- The development of the information society.

Seven smart specialisation areas are included in the strategy. There are three "traditional" specialisations where the development strategies are based largely on the upgrading of long-established industries in the region through processes of climbing global production networks, renewal of existing technologies and niche development. These specialisations are:

- chemicals;
- manufacturing of metals and metal products as well as products made of mineral non-metallic materials; and
- electrical engineering and machine building.

Although "traditional", these specialisations are innovative in a number of ways, in particular through introduction of process and organisational innovation and the development of niches, particularly in the chemical industry.

There are four new specialisations in the region that are growing largely through processes of diversification into related activities or importation of emerging industries that are new to the region :

- life sciences;
- sustainable energy;
- information and communication technologies (ICT); and
- creative and leisure-related industries.

The Regional Innovation Strategy was prepared according to the EC's Guide on Research and Innovation Strategy for Smart Specialisation (RIS3) methodology. The process of identifying the region's smart specialisations was led by the regional government's Department of Economic Development. The process was carried out with the involvement of representatives from various groups of the regional innovation system. The development of the smart specialisation strategy went through three main stages – Stage 1: technological foresight involving analysis of data and generation of ideas from local stakeholders on future technological developments with strong potential in the region and the issues that

[3] Strategic Programme: Regional Innovation Strategy of the Małopolska Region for 2014-2020, Annex No. 1 to Resolution No. 586/14 of the Board of the Małopolska Region, dated 3 June 2014.

policy needs to address; Stage 2: Evaluation of the technological development ideas and selection of the potential smart specialisations, stressing exploitation of the R&D potential in the region's HEIs, and Stage 3: Public consultation on the potential smart specialisations through public meetings with local stakeholders.

Upon completion of this process, an initial strategy document was adopted by the Board of the Malopolskie Region in June 2014. The EDP process was then continued with further stakeholder consultations in the form of the establishment of Working Groups involving companies, HEIs and other actors in the regional innovation system. This process led to a refined and reshaped document with detailed descriptions of the smart specialisations. Calls for proposals were then issued for R&D projects in the smart specialisations, and a final version of the smart specialisation strategy was adopted in June 2016 following an open debate and environmental check.

Malopolskie is a 'Moderate Innovator'

Malopolskie is classified as a 'Moderate Innovator' in the European Regional Innovation Scoreboard 2017[4]. This means that its innovation performance is between 50% and 90% of the European average. However, the Malopolskie region's innovation performance has improved over the last few years.

The region performs well compared to the EU average on several innovation performance indicators, notably in the areas of tertiary education, R&D expenditure by the public sector, and design applications. Its performance is relatively weak in other areas, however, notably European Patent Office (EPO) patent applications, public-private co-publications, R&D expenditures by the business sector, most cited scientific publications and lifelong learning (Table 1.1). There has been a slight improvement in the overall innovation performance of the region, with the composite regional innovation index rising from 54.0% of the EU average in 2011 to 57.2% in 2017.

[4] http://ec.europa.eu/DocsRoom/documents/24181

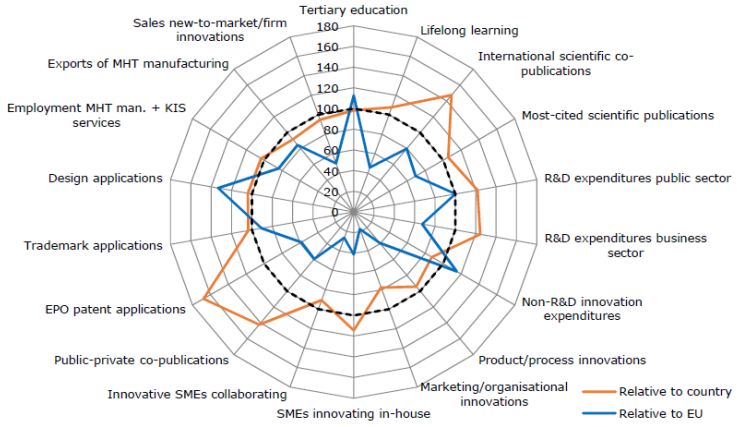
Table 1.1.Relative innovation performance of the Malopolskie region, 2017

	Data	Normalised Score	Relative to Poland	Relative to EU
Tertiary education	42.7	0.620	98	113
Lifelong learning	3.8	0.215	108	46
International scientific co-publications	667	0.333	147	80
Most-cited scientific publications	5.2	0.378	106	69
R&D expenditures public sector	0.74	0.546	122	100
R&D expenditures business sector	0.64	0.307	124	67
Non R&D innovation expenditures	±	0.346	±	±
Product/process innovations	±	0.174	±	±
Marketing/organisational innovations	±	0.068	±	±
SMEs innovating in house	±	0.188	±	±
Innovation SMEs collaborating	±	0.095	±	±
Public-private co-publications	39.1	0.176	142	59
EPO patent applications	1.55	0.228	168	58
Trademark applications	4.84	0.356	104	90
Design applications	1.99	0.694	104	133
Employment in medium-high tech (MHT) manufacturing/knowledge intensive services (KIS)	12.5	0.448	103	84
Exports of MHT manufacturing	45.5	0.534	92	84
Sales new-to-market/firm innovations	±	0.234	±	±
Average score	--	0.330	--	--
Country EIS-RIS correction factors	--	0.786	--	--
Regional Innovation Index (RII) 2017	--	0.260	--	--
RII 2017 (same year)	--	--	106.4	57.2
FII 2017 (relative to EU 2011)	--	--	--	58.7
Regional Innovation Index (RII) 2011	--	0.239	--	--
RII 2011 (same year)	--	--	102.3	54.0
RII – change between 2011 and 2017	--	4.600	--	--

Note: ± Scores are not shown as these would involve recalculating confidential regional Community Innovation Survey (CIS) data.
Source: EU Regional Innovation Scoreboard 2017.

Figure 1.1 shows Malopolskie's performance in 2013 on each of the 18 indicators that constitute the Regional Innovation Index (RII), compared to Poland and the EU. This highlights relative strengths (e.g. design applications) and weaknesses (e.g. marketing/organisational innovations).

Figure 1.1. Malopolskie's Regional Innovation Index performance compared to Poland and the EU, 2013



Source: Based on EC (2016a, b).

Significant innovation infrastructure has been developed in the region to support innovation. A notable flagship is the Krakow Technology Park, a joint venture of the State Treasury, the City of Krakow, the Malopolskie Regional Development Agency (MARR), Jagiellonian University, the Technical University of Krakow, Gorniczo-Hutnicza Akademia (AGH) University of Science and Technology and ArcelorMittal Steel (EC, 2017). The Technology Park supports innovative companies and their links with research institutions including with finance, commercialisation, consultancy and co-location opportunities. Another notable facility is the Malopolskie ICT Park (MPTI), which provides office spaces, laboratories, business advisory services and other amenities to support enterprises in their work.

The regional entrepreneurship ecosystem

Malopolskie provides good conditions for entrepreneurs and SMEs in physical and connectivity infrastructure. However, there are bottlenecks in the following areas:

- Low levels of innovation activities and commercialisation of research results;
- Under-developed entrepreneurship culture and entrepreneurship skills among graduates;
- Limited openness of firms to co-operate with others; and
- Lack of trust in the government and its services (perception of corruption in government services).

Innovative start-ups in Malopolskie

Start-up levels are strong

There is a strong start-up community in Malopolskie. For example, the number of start-ups in the digital economy has been increasing annually since 2015 and many are focusing on global markets. In Krakow alone, there are 60 000 high-tech businesses, 28 000 of which are ICT-related. There are 250 highly innovative companies in the Krakow Technology Park, mostly in the ICT sector (e.g. video games, internet of things, animation, satellites, cyber security) and 50 companies in the Park's Innovation Centre incubator.

There is significant policy support for start-ups

There are many public support initiatives available for start-ups in the region. Nationally, the Polish Agency for Enterprise Development (PARP) is very active in the implementation of projects in the region. Its support includes the Innovation Loan Fund, which assists companies at the start-up stage with debt finance for further development on condition that the entrepreneur can also find and secure a private investor to engage in the new company. Similarly, the Ministry of Development operates the Start in Poland programme, aims to reduce the administrative burden of the start-up process, support entrepreneurship education and mentoring, ease access to finance for start-ups and scale-ups and offer support to foreign people to start in Poland. The regional and national governments have also developed three Knowledge Transfer Centres in the region (in ICT, energy, and life sciences) to support innovation-intensive start-ups, together with an accelerator programme and regional venture capital funds.

Universities and foreign direct investors play a role in start-ups

The region's 31 universities/institutes of technology have helped to build up skills and knowledge that support start-ups in the region. Some of them operate start-up programmes for students. Furthermore, 13 university incubators are supporting the commercialisation of research (although it is still problematic). On the other hand, there has been a tendency for many of the universities to work mainly with larger businesses. Foreign direct investment (FDI) is currently an essential element of the innovative start-up process in the Malopolskie region. For example, 70% of start-ups are by people who have worked with foreign-owned multinational enterprises (MNEs).

The region's clusters play an important role in diversifying into emerging sectors, but could do more

There are 10 key cluster organisations operating in Krakow, including the Life Science Kraków Cluster and Digital Economy Cluster, which both have important ongoing activities to favour collaboration among enterprises, higher education institutions, regional government and other organisations regionally, national and internationally. These cluster organisations used to receive funding support from EU sources in the past EU programming period, but have had only limited funding for activities from EU Structural and Investment Funds in the 2014-2020 programming period.

There are start-up opportunities in new sectors

Many of the start-ups are in sectors that can contribute to emerging industries in the region. In particular, there are concentrations of start-ups in the video games, IT, cyber security, and outsourcing sectors, mainly reflecting the founders' backgrounds, education and industry experience with foreign-owned MNEs. In particular, there is a great opportunity for further development in cyber security, based on the IT skills developed in the Krakow universities.

Bottlenecks to start-ups in the regional entrepreneurship ecosystem

Bottlenecks to innovative start-ups in the region include:

- A domination of low knowledge content operations in the FDI stock in the business services sector, although knowledge content is growing in the region's FDI with time. The few spin-outs that have occurred from FDI operations are subcontractors, as opposed to innovative start-ups based on new technologies, procedures or processes.
- A lack of financing opportunities for start-ups, despite the availability of some public support initiatives such as "technology loans" from banks.
- A limited focus of technology infrastructures in the region on generating innovative start-ups, despite initiatives such as technology centres at the universities focused on the commercialisation of research. The accelerator in Krakow has had a successful start, but it appears that it is more of benefit to meeting the innovation needs of the industry partner organisations than generating innovative start-ups. There is no clear link between the Innovation Centre based in Krakow Technology Park and the accelerator; currently the Innovation Centre is not seen as a pipeline for the accelerator.
- There is a lack of entrepreneurial attitudes in university graduates and a limited generation of business ideas from current graduates. Furthermore, for many students, team building and sharing of business ideas for start-up does not come naturally.
- Few mechanisms exist in the region to facilitate collaboration and co-operation among entrepreneurs. Equally, there are very few links between start-ups and existing enterprises, including large and foreign-owned companies.
- Lack of skills, especially management skills, is also a constraint on successful innovative start-ups in the region. Lack of knowledge about future skills requirements and a lack of business orientation of many universities are hindering factors.
- There is also a lack of awareness among potential entrepreneurs about the public enterprise supports available to them. The Malopolskie Centre of Entrepreneurship has been established to help address this issue by acting as the operational arm of the regional government in its support to entrepreneurship.
- Some of the region's smart specialisations seem to reflect past or existing industrial strengths of the region rather than opportunities to diversify into higher value-added activities. The concern is that resources could therefore be more constrained for industry sectors where there are greater opportunities for innovative start-ups.

- A factor affecting the creation, development, growth and propagation of innovative start-ups in Malopolskie is the significant level of "brain drain" out of the region.

Recommendations for promoting innovative start-ups

Specific recommendations for strengthening the support for innovative start-ups in Malopolskie are set out below. Most will be mainly the responsibility of regional governments, but some are mainly the responsibility of national government. The main level of responsibility is indicated against each recommendation.

Box 1.1. Recommendations for promoting innovative start-ups

1. Implement entrepreneurship education courses at all education levels with content aimed at addressing the lack of innovation, entrepreneurship and ambition. Bring in more industry leaders and private-sector representatives to help teach entrepreneurship in universities. (Regional and national)
2. Improve collaboration and networking in the provision of regional start-up support. Support agile intermediary organisations with an "arm's length" relation with the regional government to bring together support services with those needing them and ensure that the entrepreneurship support services anticipate and respond to future needs. Sustain and maintain existing local networks and clusters and link them into the start-up support system. (Regional)
3. Engage industry, HEIs, and regional government in a collaborative process of identifying future skills needs for industry. (Regional)
4. Implement a system of tax credits for innovative start-ups and SMEs to hire graduates into their businesses and ensure low levels of bureaucracy in the application process (National).
5. Improve information flow to new and potential entrepreneurs to create greater levels of awareness on the availability and conditions of financial and other supports available for innovative start-ups. More clarity needs to be provided and easy-to-follow instructions on how to apply for support. While further financing opportunities would help, there also needs to be greater "pushing" of information on existing initiatives to potential beneficiaries. (Regional)
6. Ensure greater awareness of the region's smart specialisations. This awareness needs to be delivered to all stakeholders and needs to be continuously repeated. (Regional)

Scale-ups in Malopolskie

Definition of scale-ups

Scale-ups can be defined as firms with at least 10 employees that achieve high growth (e.g. at least 10% growth in turnover or employment over three consecutive years). "Gazelles" are a subset of young high-growth firms (born five years or less before the end of the observation period). These firms tend to play a disproportionate role in regional economic development.

There are three categories of such firms. Firstly, there are established firms that have achieved fast growth and have reached a critical mass, e.g. have been launched on a stock exchange. There are currently very few of these in Malopolskie. Secondly, there are innovative firms which are just below the scale of the first category but still beyond average in their potential for innovation and growth. Thirdly, there are firms which have an ambition to grow but are facing serious barriers, for example in raising finance or developing management teams. The second and third categories are the ones where policy intervention is most needed.

Overall Malopolskie appears to lack a large base of scale-ups

Data on high-growth firms from all three categories in the Malopolskie region is fragmented and only available by assembling information from a variety of different sources, including consultancy reports, cluster organisations and public bodies.

However, the evidence that is available suggests that Malopolskie and Poland as a whole under-perform in the number of high-growth firms compared to other locations and countries. For example, international data show that in 2013, Poland ranked 8th out of 28 OECD countries in industry sectors and 25th out of 28 in service sectors in the shares of high-growth enterprises in the enterprise population (OECD, 2017).

At the same time, there are several top-layer scale-up firms in the region

At the same time, there are some notable examples of top-layer scale-up firms in Malopolskie, particularly in the life sciences, digital and IT sectors. The number of Polish companies in Deloitte Technology's "Fast 50 Central Europe 2016"[5] breakdown of the fastest-growing tech companies in the Central and Eastern Europe (CEE) was 22 in 2013, 12 in 2015, and 17 in 2016. Of these, about one quarter are based in Krakow. One of the top category "Rising Star" positions in the ranking is based in Krakow (Codewise).

NewConnect[6] is an alternative stock market for young, growing companies, especially, but not exclusively, in the high-tech sector. In 2011, there were 199 companies listed on NewConnect, with only 3 in the Malopolskie region. In 2017, there were 408 companies listed, with 33 in Malopolskie[7].

[5] https://www2.deloitte.com/content/dam/Deloitte/global/Documents/About-Deloitte/central-europe/ce-tech-fast-50-2016.pdf

[6] https://newconnect.pl/en-home.

[7] https://newconnect.pl/companies

There appear to be untapped scale-up opportunities in the digital sector

Krakow has a significant cluster of digital companies with scale up potential by working with companies in Industry 4.0 and Services 4.0 sectors, where personalised product-service packages make a wide range of innovative business models possible. This would, however, require greater interaction between scale-ups and large firms (domestic and foreign).

Scale-ups are not always aware of their skill needs

Malopolskie has a high concentration of high-skilled workers. However, the appropriateness of many peoples' skills does not always match that required by potential scale-ups. One of the barriers it that SMEs are often unable to identify the skills they need to acquire. Support is therefore needed for scale-ups and potential scale-ups to identify skill needs. Universities in the region are starting to become more active in this respect. The Krakow University of Economics now has about a dozen active business partnerships. The Comarch Competence Academy ran a series of workshops on business intelligence in building market advantage. In business services, accelerators provide mentoring skills and business advice including advice on skills development.

The regional science base potentially provides strong support for scale-ups

The availability of new knowledge from the science base for scale-up firms is being facilitated by innovation policies in the region, including the availability of innovation vouchers and the InnoBridge regional strategy. However, there remain difficulties in commercialising university technologies in terms of availability of financing and support for universities working with SMEs and large firms (EC, 2017).

Support is available for raising finance

There are a number of supports for private equity and venture capital investment in the region and nationally that favour access to finance for scale-up firms. NewConnect allows smaller companies to float shares. Giza Polish Ventures invests in Polish start-ups and technology companies in various stages of development, from seed to growth and expansion. Augere Ventures[8] invests in growing companies in Malopolskie.

Business angel networks also operate in Poland. The largest is Lewiatan Business Angel (LBA) network based in Warsaw. However, taxation rules can be problematic. Whereas large angel investors can invest in closed investment structures this is not possible for international investors who come to Poland as parallel investors.

Crowdfunding is legal and accessible for most in Poland. However, scale-ups need more funding than seed capital and hence need the support of investor networks and this is underdeveloped in Poland.

BRIdge Alfa is an investment vehicle supported by the National Centre for Research and Development and private investors that aims to commercialise R&D from Polish public research institutions. This can be an important finance source for scale-ups in Malopolskie, particularly for companies with projects aligned to regional smart specialisations.

[8] http://www.augereventure.pl/en/#augere-venture.

Bottlenecks to scale-ups in the regional entrepreneurship ecosystem

Bottlenecks to scale-ups in the region include:

- Many SMEs in Malopolskie – and in Poland more generally – lack ambition to develop more innovative products and to sell outside of the Polish market.
- Potential scale-ups, irrespective of size, often have difficulty in raising external funding.
- Potential scale-ups are not taking full advantage of networking and collaboration with other firms in key clusters or large firms in the region, particularly outside Krakow. Relationships between firms are often characterised by a lack of trust. The existing cluster organisations are a potential focus of support for networking but they have limited funding.
- There is a lack of interaction between universities and potential scale-up firms on access to new technology, and insufficient funding for the commercialisation of university technology (including financing for proof of concept). There is also insufficient awareness of, and respect for, intellectual property.
- There is a limited talent pool of scientists with business skills and mobility for recruitment. Many entrepreneurs and their employees do not speak English, which is a barrier to scaling up outside Poland. More generally, limited knowledge and forecasting of skills needs for growing innovative firms inhibits the development of a coherent skills strategy.
- There is a shortage of experienced coaches and mentors who can guide the development of scale-up companies, especially in the biomedical sector.
- Overall, there is a lack of co-ordination between key policy actors to develop a strategy to focus on goals for helping a target group of innovative firms with potential to grow.

Recommendations for promoting scale-ups

Specific recommendations for strengthening the support for scale-ups in Malopolskie are set out below. The level of government expected to have the main responsibility for the policy action is indicated against each recommendation.

Box 1.2. Recommendations for scale-ups

Entrepreneurship and smart specialisation policy

1. There should be better integration of policy measures for the creation of start-ups and support for scale-ups. Documents for Malopolskie's European Entrepreneurial Region 2016 application should be used as a basis for a regional innovation strategy that encompasses entrepreneurship and provides a single point of contact for companies wishing to scale up. (Regional)

Networks

2. Better use should be made of the existing cluster organisations for supporting networking between scale-ups and potential scale-ups and other firms and organisations. This will require ensuring that cluster organisations are properly staffed and financed and that they seek to create connections among firms, including with sources of potential scale-ups in academia. (Regional)
3. A research and acceleration programme that matches start-up firms with large companies should be introduced. (Regional)

Leadership

4. There is a need for high-level meetings to agree objectives and targets for entrepreneurship development and identify key actors to champion those actions. A single kickoff meeting bringing the key players together would impart impetus. (Regional)

Finance

5. Policy makers should create and implement suitable public financial instruments to support the early development of scale-ups in emerging industries, including biomedical companies. Such instruments should be used to prime and leverage co-investment from private sources. (Regional and national)
6. A review of the financial instruments available to scale-ups should also be undertaken. Clearly some forms of funding are not currently working well enough, for example business angel finance and crowdfunding. Specific tasks include a review of the legislative framework in Poland, and other measures such as tax relief to encourage investors. (National and regional)

Talent and skills

7. A multi-stakeholder skills needs assessment body including SMEs, large regional employers and universities should be established and tasked with undertaking and updating current and future skills needs assessments for scale-ups, including the detailed needs of the smart specialisations. Responses to the skills needs assessment should include tools for continuing professional development. (Regional)
8. Teach and reinforce English in incubators and accelerators. (Regional)

New knowledge

9. Universities should be encouraged to increase their innovation networking and innovation management support for businesses. The Israeli Technion Centre is a model – see Box 4.8. (Regional)
10. Universities should be encouraged to seek external funding for an investment fund in university spin-out enterprises, which would sit alongside the Technology Transfer Office (TTO). (Regional and national)
11. Support for student and academic scale-ups could be through subsidised short-term or longer-term internships or fellowships in firms. The UK's Knowledge Transfer Partnerships scheme is a model – see Box 4.9. (Regional and national)
12. Measures should be taken to: (i) make the community aware of the key role of intellectual property (IP) in value creation; (ii) set proper rules to streamline the roles of universities, institutes and TTOs in their dealings with licensees and investors that involve IP and align their objectives with the goal of creating value by company creation and growth; (iii) persuade academic institutions to identify and protect IP early enough and their TTOs to manage this effectively; and (iv) ensure that university activities are well-aligned with those of incubators/clusters. (Regional and national)

Business services

13. An online register of mentors for scale-ups should be made available. They should provide individualised support targeting specific scale-up company needs, based on an accurate analysis of business potential, and clarifying the challenges at hand. Measures should also enable the collaboration of locals with professionals from abroad. (Regional)
14. Increase support for strategic leadership capabilities (examples include board mentoring and initiatives for the development of future vision – e.g. market and technology foresight); networking activities designed to enhance learning from peers and industry leaders; strategic planning and monitoring capabilities (examples include the transfer of non-executive directors to scale-ups); and instrumental and task-execution capabilities (examples include the transfer of experienced managers to the new venture and hands-on management consulting activities). The Scottish Enterprise Companies of Scale programme is a model for leadership training and mentoring support – see Box 4.11 (Regional and national)
15. Involve universities more in management support and training. Focus the Innovation Vouchers especially on scale-ups. (Regional and national)
16. Improve training for those delivering mentoring and training. (Regional and national)

Entrepreneurship culture

17. Role models of existing regional scale-ups (e.g. OneLabel, Selvita and Estimote) should be publicised to raise the aspiration level of potential scale-ups, using the media to promote success stories. (Regional)

Large enterprises in the local entrepreneurship ecosystem

Large enterprises play a key role in the Malopolskie economy

Malopolskie and Krakow are significant economic centres in Poland with a strong representation of domestic and foreign-owned large businesses. This includes high levels of inward investment, especially in the Business Processing Outsourcing (BPO) / Shared Services Centres (SSC) sectors. There is an opportunity to increase the benefits of their presence in the region for the stimulation of entrepreneurship and innovation, although there is a current tendency for them to compete on a cost rather than innovation basis.

The region has a strong industrial history that persists today, and the current smart specialisation strategy includes a number of mature and traditional industries where large firms have very important roles. However, if these industries are to maintain their importance, there needs to be greater emphasis on their future smart potential. There is limited evidence of innovation-led growth in sectors such as the "manufacture of basic metals and non-metal products" and "electrical and mechanical engineering" which continue to compete on cost. While currently low tech, there is innovation potential in these sectors, although there is little evidence of entrepreneurial transformation being pursued by larger established firms.

There is an emerging critical mass of small firms developing in the region in the ICT and life sciences sectors and there is an opportunity for large businesses to engage more strongly with them in promoting their own innovation and mutual development benefits.

Large firms can be anchor institutions in the local entrepreneurship ecosystem

Anchor institutions are those which play a prominent role within a regional economy and act as important stakeholders in economic activities. Large firms often play this role in regional economies. As catalysts, large firms they can develop and retain human capital and provide a strong policy voice in the development of supportive business and innovation policies. As facilitators, they can also work prominently in co-developing programmes for innovation and skills development with universities.

Indigenous large enterprises, in particular, can serve this role well as they have strong tangible connections to a region and are unlikely to relocate. However, FDI can also play this role where it is focused on innovation and can be interested in developing strong local linkages.

Malopolskie's smart specialisation strategy is an important tool for engaging large enterprises in regional development projects, including research collaborations with potential to strengthen smart specialisation activities. This needs to be complemented by additional policy measures, including refocusing inward investment activities on attracting higher quality inward investment, developing local supply chains and developing local skills ecosystems.

Bottlenecks for Malopolskie in leveraging the value of large enterprises

Bottlenecks to fully engaging large enterprises in Malopolskie's local entrepreneurship ecosystem include:

- Much of the FDI attracted to Malopolskie has been process-based with a comparatively low degree of complexity and autonomy, although this is beginning to change for the better with more and more complex processes and technology advancement occurring in the global business services sector.

- In some cases, the nature of the work in large firms is associated with a mismatch between a supply of regional graduates with increasingly high skill levels and a predominant demand from large firms focused on low skilled occupations. This drags on the ability of large enterprises to support innovation and entrepreneurship in the region through supplying skilled and innovative employees to the ecosystem.
- At the same time, the focus on process-based FDI activity constrains the involvement of large enterprises in innovation collaborations, although there are also some important R&D-intensive collaborations from large firms in the region.
- There is a need to both attract more strategically important R&D-intensive inward investment, as well as work with large businesses already in the region to upgrade the range of functions they undertake locally.
- There is also a need to better embed large businesses in the local entrepreneurship ecosystem. Large firms have the capacity to both contribute as entrepreneurial organisations and as drivers of entrepreneurship, innovation and industrial diversification.

Recommendations for involving large enterprises in the local entrepreneurship ecosystem

- Specific recommendations for better embedding large enterprises in the local entrepreneurship ecosystem are set out below. The level of government expected to have the main responsibility for the policy action is indicated against each recommendation.

Box 1.3. Recommendations for engaging large enterprises in the local entrepreneurship ecosystem

Attracting and retaining FDI

1. Change the focus of inward investment attraction policy from an emphasis on quantity to quality. Institute a deliberate policy shift towards targeting higher skill, higher value-added types of inward investment that will stay and invest in the region. Focus attraction policies on positioning and promoting Malopolskie region as an open innovation region, where businesses will want to locate to benefit from being part of an ecosystem that extols the virtues of competition and collaboration. (Regional)
2. Increase the emphasis on follow-on support, or aftercare, for inward investment, with a view to retaining and embedding inward investment and encouraging an upgrading of the function of inward investment from process-driven to more complex tasks. This effort should include increasing the knowledge of policy makers of the functions of the different subsidiaries worldwide and the strategic objectives of the large firms operating in the region. (Regional)

Upgrading work in FDI

3. Emphasise policies that encourage the upgrading of work in inward investors by creating a favourable environment for high productivity and innovative activities. This could include stronger local business/innovation networks, supporting clusters of innovative firms, developing innovation infrastructure and connections between businesses and universities and building the strengths and capabilities of workers, including through dedicated initiatives to attract talent from outside the region. (Regional)

Promoting large firm networking and embedding

4. Promote the regional engagement of large firms in innovation by providing space, funding and encouragement for engagement in collaborative innovation projects focused on reinforcing smart specialisations, including by making full use of the possibilities provided by the ROP 2014-2020 to involve large firms in R&D projects. (Regional)
5. More actively engage large firms in skills development initiatives in the region, including common education programmes with universities. (Regional)
6. Seek to tap into large firm resources to promote local entrepreneurship, including corporate spin-outs and spin-ins. (Regional)

Common issues to be addressed

Many of the bottlenecks and opportunities for entrepreneurship and emerging industries in Malopolskie are common to the areas of promoting start-ups, scale-ups and embedding large enterprises in the local entrepreneurship ecosystem. The main common issues are:

- **Innovation:** The region is becoming more innovative largely as a result of government action rather than through a natural tendency of firms and individuals

to innovate. FDI has not always helped, as the organisations rarely bring their more innovative functions to the region and have few linkages with local SMEs.

- **Collaboration:** An innovative environment requires people to work together and pool ideas and R&D efforts. This can only happen in an open environment with mutual trust among the parties involved. Even when trust is present, there are skills involved in collaborating which are not currently always present in entrepreneurs and SME managers in the region. Building habits and positive experiences of networking can help promote the trust and skills needed for collaboration, whether it be through clusters, with universities for R&D, or with business support organisations.
- **Skills mismatch:** Workers and managers in all types of organisations in the region are lacking in the right adaptable skills for the changing employment that (disruptive) innovation brings. There is little lifelong leaning culture. Furthermore, the future skills needs of smart specialisations do not yet seem to have been mapped and there is little history of industry and academia coming together to address the problem and to "intercept" future requirements.
- **Ambition:** There are pressures that favour keeping organisations small and operating solely regionally or nationally. Poland is a large economy and the Malopolskie region does well within it so why risk anything further? As a result, there is a dearth of scale-up enterprises, which are important to productivity upgrading and industrial diversification in the region. The entrepreneurship culture is in need of a further push. Linking the availability of funds to the ambition of the entrepreneur may help.
- **Finance:** Access to finance for entrepreneurship and innovation is much better than it has been. However, it still suffers from a lack of knowledge of financing opportunities, complexity of systems to access public financing support, and the need to introduce new mechanisms that are successful elsewhere. Finance for "commercialisation" seems especially problematic.

The Malopolskie region has done well since Poland joined the EU. It has attracted FDI and has a strategy for success in generating entrepreneurship and SME development. It has managed to diversify its industry base and has ridden out the downturn resulting from the financial crisis of 2008, showing earlier signs of recovery faster than most of the rest of the country.

Most successful local entrepreneurship ecosystems are "nice places" with good infrastructure and amenities (transport, leisure activities etc.), where people and enterprises want to locate, and where they can achieve high productivity through accessing locally-specific innovation assets and networks. The Malopolskie region, especially Krakow, has an excellent start here but must continue to invest in the local factors that promote entrepreneurship and innovation.

Overarching recommendations

The suggested overarching recommendations to address the issues common to the local entrepreneurship ecosystem as a whole are set out below. Each needs to be addressed by both regional and national levels of government through their respective responsibilities and programmes.

Box 1.4. Overarching recommendations

1. A more co-ordinated place-based policy approach to entrepreneurship, innovation and skills development should be introduced in the region, with well-defined and informed objectives and priorities based on strengthening the local entrepreneurship ecosystem and the key forward-looking smart specialisations. (Regional and national)
2. This design of this place-based policy approach needs to be backed up with the systematic and connected collection and use of more data (intelligence) on firms and their intentions, common bottlenecks in the entrepreneurship ecosystem and evaluation evidence on entrepreneurship and innovation policy impacts. (Regional and national)
3. There should be stronger support for collaboration among enterprises and between enterprises and universities and research institutions and for creating a culture of open innovation. This should be encouraged by providing brokering opportunities and sharing information on innovation projects, particularly those with public funding involvement. (Regional and national)
4. Access to public entrepreneurship and innovation programmes should be improved, by simplifying many of the administrative procedures for participants, improving information flow to potential participants and introducing new models of financial support. (Regional and national)
5. It is important that the regional government and the region's firms and individuals become more ambitious. This will attract higher quality investment and aid the retention of highly skilled workers, moving away from an "imitating rather than innovating" economy. Educators have a key role to play in inculcating entrepreneurship culture and skills in students, innovators should think beyond the Polish market and government should provide marketing and other trusted support. (Regional and national)
6. There is an urgent need to bring together all key stakeholders to plan how to address what seems to be a growing skills requirements/skills base mismatch. It is important to anticipate and address future needs rather than tie training and education activities to obvious immediate needs. (Regional and national)

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2. The Malopolskie entrepreneurship ecosystem

This chapter examines the entrepreneurship and innovation activity rates in Malopolskie region, the evolving industrial structure of the region, and the local entrepreneurship ecosystem. It also explores the region's policy approach to entrepreneurship and innovation support through its smart specialisation strategy. Overall the region is doing well but has significant challenges ahead as the industrial landscape changes. A SWOT analysis is provided.

Socio-economic overview of the Malopolskie region

Population and human capital

Malopolskie had 3.38 million inhabitants in 2016, about 8.8% of the total Polish population. The region's population increased by approximately 4% compared to 2002; the third highest growth rate in Poland (after Pomorskie and Mazowieckie). It has a relatively high population density, with 223 inhabitants per square kilometre in 2016, the second highest of the 16 Polish regions (after Slaskie) and almost twice the country average. In 2016, the share of people of working age in Malopolskie was estimated at 62% (over 2.09 million), roughly equal to the national average, with a small increase on 2002 (61.1%).

Since 2005, Malopolskie has had stable net international and national migration, estimated in the range of 3 100 to 3 700 per year. In 2016 it was 3 376, putting the region in third place in Poland (after Mazowieckie and Pomorskie). It is one of only 5 of 16 regions in Poland with positive net international and national migration.

Labour utilisation and labour productivity

Malopolskie had 1.48 million economically active persons in 2016, almost the same as in 1995. About 70% of people of working age were economically active, slightly below the national average of almost 73%.

The unemployment rate (the number of unemployed persons divided by the total number of economically active persons) in the region in 2016 was 4.6% compared with a national figure of 5.6%. This was the fourth lowest regional rate in Poland (after Wielkopolskie, Slaskie and Pomorskie). The level of unemployment in the Malopolskie region has fallen by almost 6 percentage points since 2003.

The share of the long-term unemployed (over one year) out of the total unemployed in the Malopolskie region in 2016 was 39.9%, very similar to the national level (40.7%). Compared with 2003, this decreased by over 11 percentage points. It decreased rapidly to a minimum of 26.7% in 2009 but then increased through the global downturn until 2014 and has subsequently decreased only a little.

The level of young (below 24 years) unemployed persons in Malopolskie in 2016 was 15.8%, which was higher than the average for Poland (13.4%). However, this has decined significantly since 2010 when the indicator was at 27.6%. At the same time, the share of the population aged 15-24 not in education, employment or training (NEET) was 9.8% in Malopolskie in 2016, below the national average of 10.5%.

Business demography and entrepreneurship

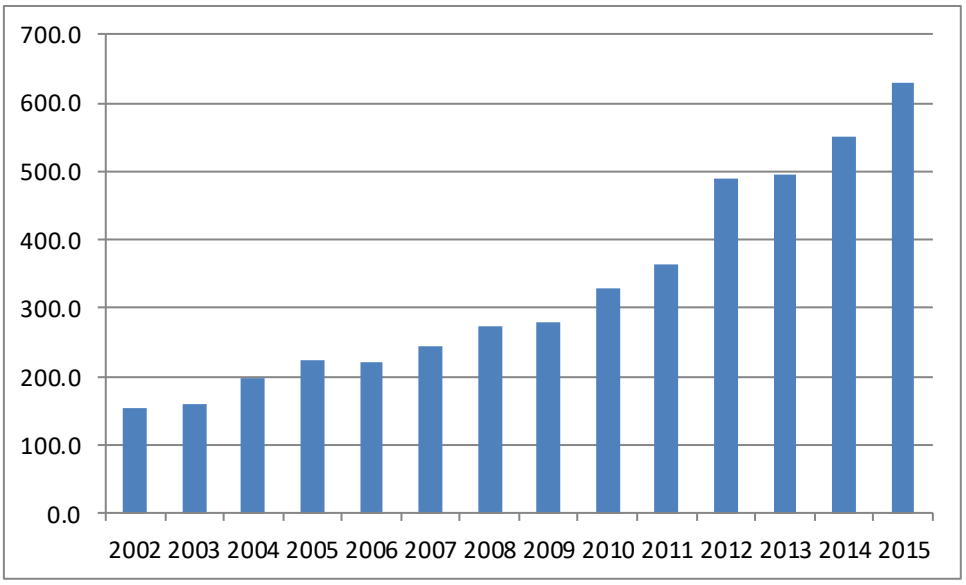
In 2016, over 31 000 new firms were registered in Malopolskie (9.59 firms per 1 000 inhabitants). This was 0.5 percentage points higher than the Poland average. This indicator has been relatively stable over recent years both at the national and regional levels. Malopolskie had the sixth highest regional share of new firms per 1 000 inhabitants in Poland, significantly behind the leading regions of Mazowieckie (12.65) and Pomorskie (11.1).

Innovation

In 2015, internal expenditure on R&D per employee in Malopolskie was estimated at Polish Zloty New (PLN) 628. In the national ranking this put Malopolskie in second place after

Mazowieckie, where it was PLN 1 300. From 2002 to 2015 there was a more than fourfold increase in Malopolskie (Figure 2.1).

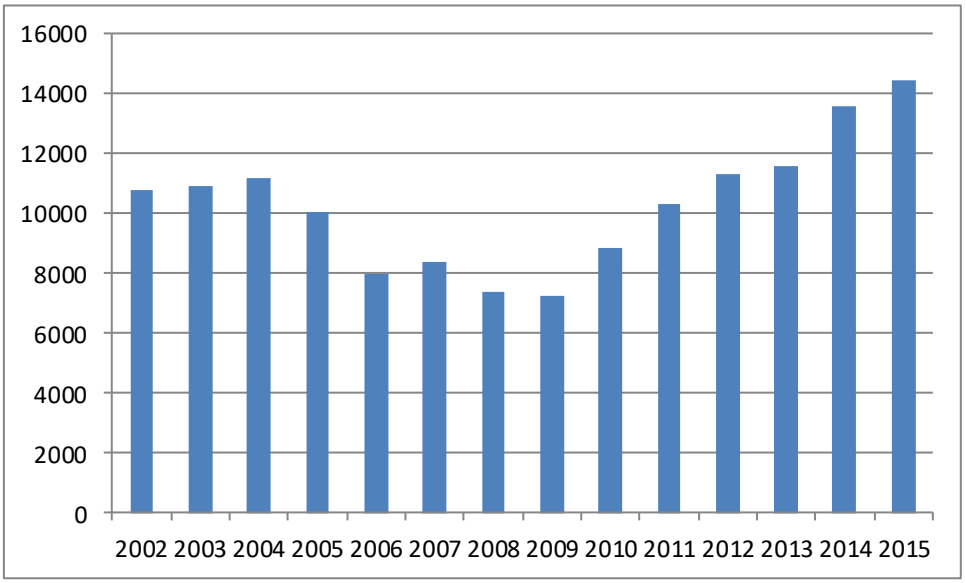
Figure 2.1. Internal expenditure on R&D in Malopolskie per employee (PLN), 2002-15



Source: Based on Local Data Bank Central Statistical Office (GUS).

There were 14 475 persons employed in R&D activities in Malopolskie in 2015, the second highest among Polish regions after Mazowieckie (33 949). R&D numbers have been growing since 2009, when the figure hit its lowest of the last 14 years. Between 2009 and 2015 this figure almost doubled Figure 2.2. Some 10.6 people were employed in R&D per 1 000 economically active persons in 2015, in second place out of the Polish regions after Mazowieckie (11.6). .

Figure 2.2. Employment in R&D in Malopolskie, 2002-15



Source: Based on Local Data Bank Central Statistical Office (GUS).

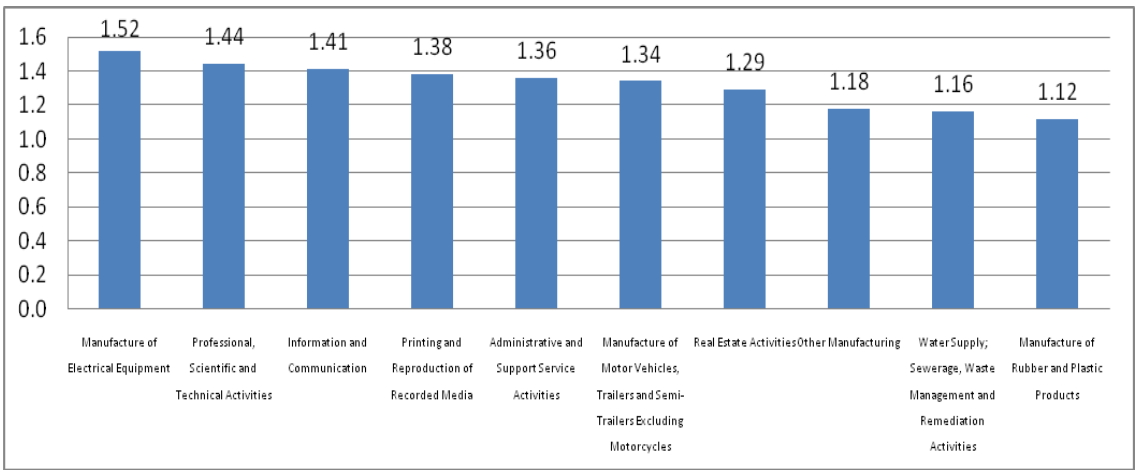
Industry structure in Malopolskie

Industry trends in Malopolskie

There are 246 000 industrial jobs in Malopolskie, accounting for 26.5% of total employment in the region. The industry base consists of traditional sectors such as metallurgy, mining, metals, steel, machinery, heavy chemicals, tobacco, wearable goods and food processing industries. For example, Malopolskie is home to Europe's fourth largest manufacturer of cables (Tele-Fonika), third largest producer of synthetic rubber (Dwory) and the world's second biggest producer of roof windows (Fakro). In parallel, the hi-tech industry sector has been increasing in prominence over the last two decades.

As shown in Figure 2.3, the sectors in Malopolskie with the greatest recent employment growth are: manufacture of electrical equipment; professional, scientific and technical activities; and ICT.

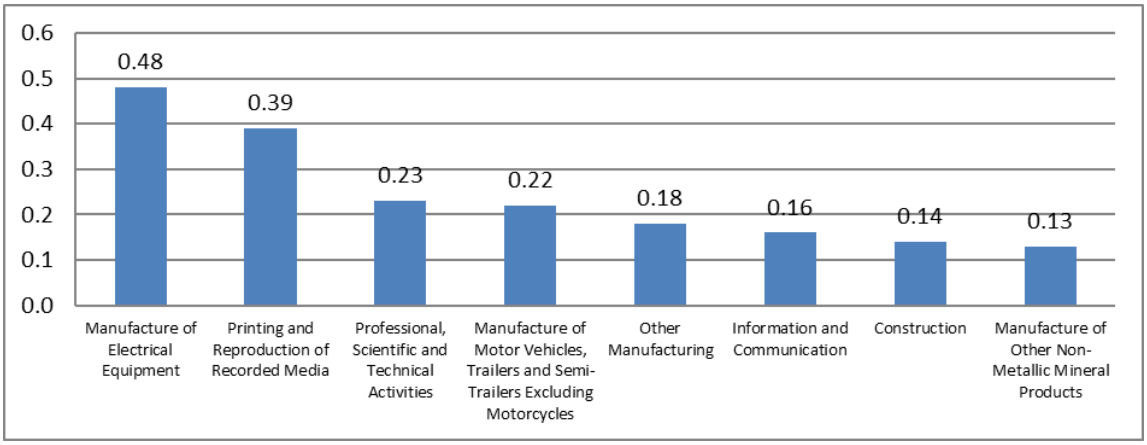
Figure 2.3. Change of employment in selected sectors in Malopolskie, 2008-14 (2008=1)



Source: Based on Local Data Bank Central Statistical Office (GUS).

Compared with national trends, the largest relative employment growth was in manufacture of electrical equipment (48% higher than at national level); printing and reproduction of recorded media (39% higher than nationally); and professional, scientific and technical activities (23% higher than nationally) (Figure 2.4).

Figure 2.4. Change of employment in the Malopolskie relative to change at national level, 2008-14 (per cent differential divided by 100)



Source: Based on Local Data Bank Central Statistical Office (GUS).

Foreign direct investment and business service centres

Malopolskie is considered to be the "fourth most popular destination"[9] for Foreign Direct Investment (FDI) in Poland. In 2014, there were almost 5 000 FDI operations in Malopolskie, which represented almost 6% of all FDI operations in Poland[10]. These firms

[9] http://www.krakow-info.com/malopol.htm

[10] https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/malopolskie

provide over 45 000 jobs in the region.[11] The Malopolskie Regional Development Observatory estimates that there were approximately 99 new FDI projects with a value of at least EUR 1 million in 2016.[12]

Many of the FDI activities are business service centres. According to the Polish Association of Business Service leaders, there were 195 business service centres in Krakow in 2018, in BPO, SSC, IT and R&D business services with 64 000 jobs (Gorécki, 2018). Krakow is a leading centre in Poland in this sector, and has the highest share of its employyment in this sector of key Polish cities. This activity is dominated by FDI (only approximately 16 establishments are Polish-owned). According to Tholons Services Globalisation Index (Tholons, 2018), Krakow held sixth position in the world.

Cluster organisations in the Malopolskie

There were 10 cluster organisations operating in Malopolskie in 2015, with 354 members. This represents 7.46% of all cluster organisations in Poland (Buczyńska et al., 2016). These cluster organisations used to receive funding support from EU sources in the past EU programming period, but have had only limited funding for activities from EU Structural and Investment Funds in the 2014-2020 programming period.

The ten clusters are described below.

- MedCluster was created in 2007 as the first medical cluster in Poland. The cluster consists of entities dealing with health care: primary care clinics; hospitals; service spas, and entities from the Information Technology (IT) and training-consulting sector; health resorts; higher education institutions; and self-governing units. Members of the Malopolskie region cluster also operate in Slaskie, Podkarpackie, Swietokrzyskie and Lubelskie.
- Klaster Edutainment was founded in 2010 as a joint initiative of entities representing four sectors: SMEs, business institutions, public administrations, and colleges. The main products offered by this cluster are business games. The cluster constantly develops and introduces state-of-the-art effective simulation methods which are attractive for recipients and support the transmission of knowledge. There are 21 members of this cluster.
- The Malopolskie Graphic Cluster was founded in 2012 in Krakow as a result of ten years of co-operation between companies connected with the printing and advertising industry. Five companies founded this cluster. The number of cluster members is rising and includes printing houses, advertising agencies and higher education and trade schools. There are 31 members of this cluster.
- The LifeScience Krakow cluster is a platform for co-operation between companies and scientific teams from the fields of biotechnology, pharmacy, medicine, cosmetology, and environmental protection. The cluster was created in 2006 and brings together 70 entities, which are offered access to a co-operation network of scientific and business actors in the life sciences sector. It is also involved in many international projects, such as the Vanguard Project.
- The Tarnow Industrial Cluster is focused on the city and the sub-region of Tarnow. It has been promoting entrepreneurship since 1999 and has 37 shareholders. Its

[11] http://www.krakow-info.com/malopol.htm

[12] https://www.obserwatorium.malopolska.pl/eng/blog/foreign-investors-malopolska-voivodship-2015-2016/

main task is to create a climate and conditions conducive to the development of entrepreneurship locally, operating particularly in industrial parks and the Economic Activity Zone.

- The Cluster of Multimedia and Information Systems (MultiCluster) was created in 2006 in Nowy Sacz by National-Louis University in collaboration with SMEs from the creative industries sector. As a key part of the Multimedia City project, the cluster combines various supports for innovation, such as a Technology Park, R&D centre, business incubator, co-operation cluster, and venture capital. Presently, over 60 SMEs in new technologies and new media activities from all over Poland are members of the cluster.
- The Malopolskie - Podkarpackie Clean Energy Cluster was established in 2006 at AGH University of Science and Technology in Krakow. It has 44 institutions: universities, research units, state and private enterprises, and regional government offices. The core objective of the Clean Energy Cluster is to create a platform for the exchange of knowledge and information between science, industry and local government.
- The Inter-regional Cluster of Innovative Technologies (MINATECH) aims to support co-operation among universities, research units, local authorities, enterprises, agencies, associations, and foundations in the area of micro-nanotechnology and biomedical engineering. It aims to concentrate the potential to accelerate the development of modern technologies and their application in the economy.
- The European Centre of Games (ECG) is a joint initiative of companies involved in the video game industry, the AGH University of Science and Technology, the Jagiellonian University and the Krakow Technology Park. The agreement on the establishment of the ECG was signed in 2008 by 19 companies and institutions. The mission of the cluster is to support the development of the video game industry as a regional business opportunity for the Malopolskie region.
- The INRET Culture and Leisure Time Cluster Foundation is an organisation created to co-ordinate the work of the INRET Culture and Leisure Industry Cluster. The cluster has 13 members.
- The South Poland Cleantech Cluster was created in 2015 with 30 shareholders. The cluster's mission is to support sustainable and green growth in the region by participating in the creation and implementation of inclusive green growth policies that will improve the social situation of inhabitants.

These established cluster organisations offer a potential route to favour collaboration among enterprises, higher education institutions, regional government and other organisations in support of entrepreneurship and innovation, although their activity levels are currently limited.

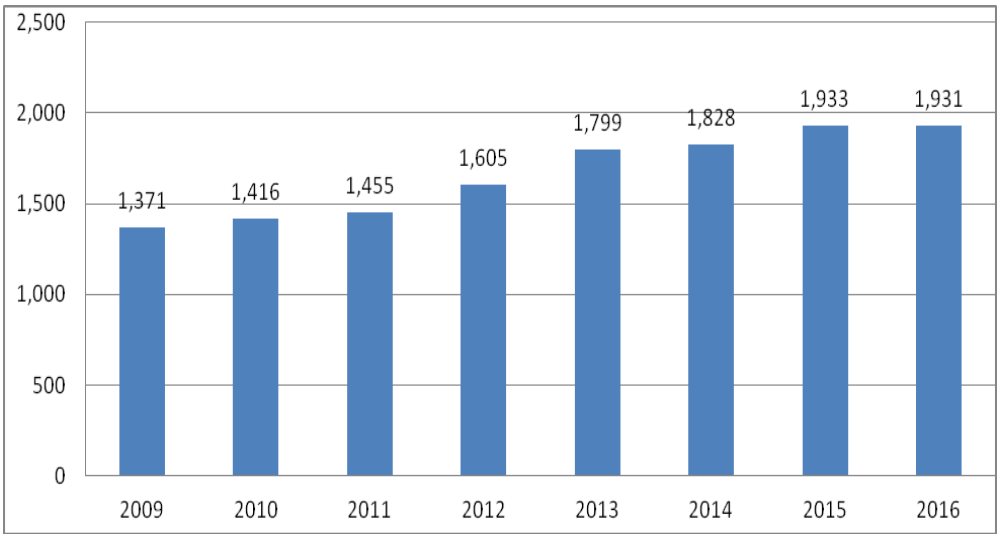
The regional entrepreneurship ecosystem – access to resources

Access to finance

There were 1 931 financial service entities in Malopolskie in 2016, excluding insurance and pension funds. This placed the region in a rather poor fifth position in Poland (after

Mazowieckie, Slaskie, Dolnoslaskie and Wielkopolskie. However, financial services grew by 40% in the region between 2009 and 2016 (see Figure 2.5).

Figure 2.5. Number of entities in financial service activities in Malopolskie, excluding insurance and pension funds, 2009-16



Source: Based on Local Data Bank Central Statistical Office (GUS).

In addition to private sector resources, there is EUR 870 million for entrepreneurship support available from national and regional funds under the Malopolskie Regional Operational Programme 2014-20. EUR 160 million will be invested in research and innovation in enterprises and EUR 180 million in entrepreneurship.

There is a good level of interest from enterprises in accessing grants for innovation activities, which addresses previous concerns on limited usage of EU money due to too strict research expectations. However, for the future it is important to increase the share of resources for innovation that are provided in the form of loans rather than grants, in order to increase the numbers of firms that can benefit, especially when considering a possible decrease of EU resources available in the next EU programming period.

There are also several loan and loan guarantee funds in the region that support firms with start-up and SME development investments including: the MIKRO Initiative, the Entrepreneurship Development Fund, the Rabka Region Development Fund, the Local Government Centre for Entrepreneurship and Development, the Local Self-Government Loan Fund, and the Malopolskie Credit Guarantee Fund.

In addition, the Malopolskie Regional Development Agency offers information and advisory services for business owners, subsidies for business development and financial products such as loans and guarantees.

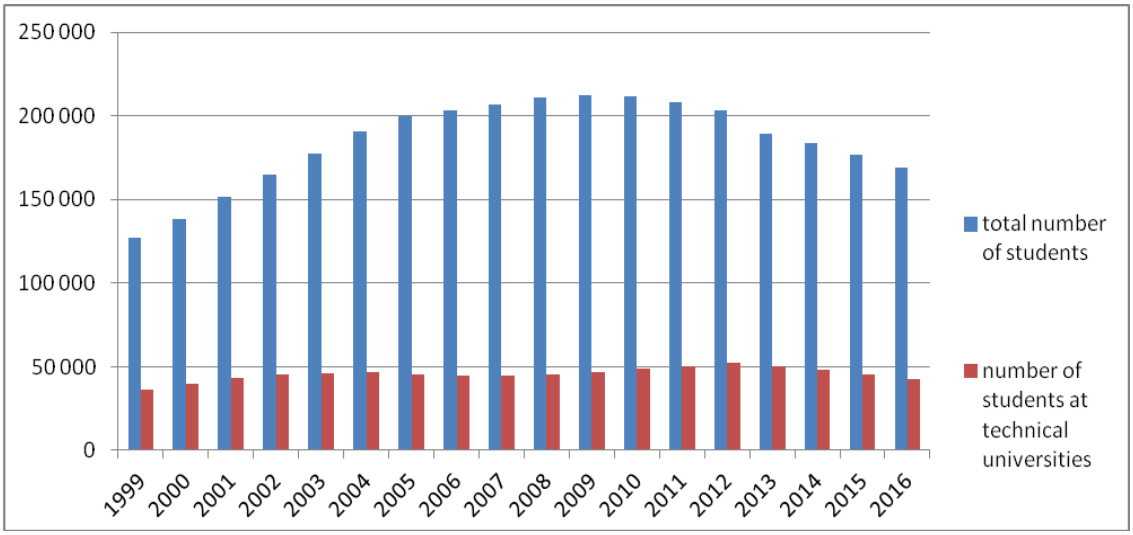
Talent

Malopolskie is characterised by very strong human capital potential. There are 31 universities/institutes of technology in the region, 23 of which are located in Krakow. They include the Jagiellonian University established in 1364 and the University of Mining and Metallurgy. These Universities were ranked in second and third place respectively in their categories in the national ranking of “Perspektywy”, a nationwide periodical. These

universities had over 169 000 students in 2016, the second highest regional student numbers in Poland (after Mazowieckie).

Malopolskie had 114 university graduates per 10 000 population in 2016, the highest regional rate in Poland, which had an average value of 95 graduates per 10 000. There has been steady growth since 2003, when it was 85. However, there has been a stable decline in the number of students since 2009 when it peaked (Figure 2.6).

Figure 2.6. Total number of students and number of students at technical universities in Malopolskie, 1999-2016



Source: Based on Local Data Bank Central Statistical Office (GUS).

New knowledge generation

Malopolskie is classified as a Moderate Innovator in the EU Regional Innovation Scoreboard (RIS) 2017[13], indicating an overall index score of between 50% and 90% of the European Union average. Malopolskie's innovation performance has nonetheless increased over the last few years. Table 2.1 shows the region's normalised scores by RIS indicator and results relative to the Poland and EU averages.

As shown in the Table, Malopolskie performs well on many innovation performance indicators when compared to the EU average. Most notably this is the case in tertiary education, R&D expenditure by the public sector, trademark applications, and design applications. Malopolskie does creditably against the EU average for international scientific co-publications, employment in medium high-tech (MHT) manufacturing/knowledge-intensive services (KIS), and exports of MHT manufacturing. In other areas, notably lifelong learning, business sector R&D expenditure and public-private co-publication, it does relatively less well, although Malopolskie has performed well in all reported indicator measurements against the Poland average.

Table 2.1 also shows Malopolskie's overall Regional Innovation Index (RII) in 2017 compared to Poland and the EU and the performance change over time. Malopolskie has

[13] See http://ec.europa.eu/DocsRoom/documents/24181

improved its innovation index from 54% of the EU average in 2011 to 57.2% in 2017; and from 102.3% of the Poland average in 2011 to 106.4% in 2017.

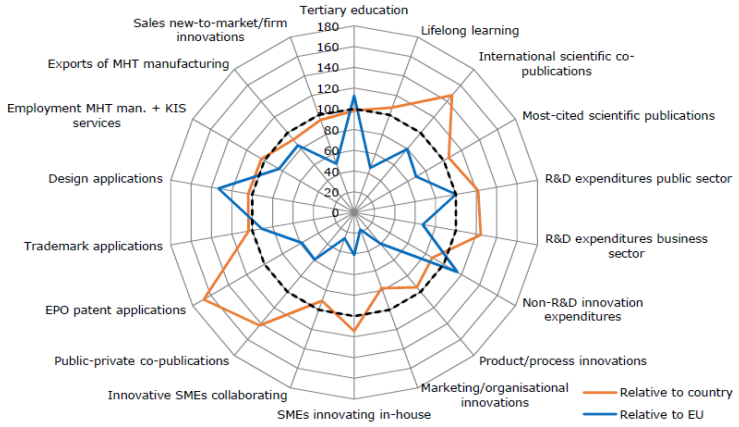
Table 2.1. Malopolskie scores on RIS 2017 performance indicators

	Data	Normalised Score	Relative to Poland average	Relative to EU average
Tertiary education	42.7	0.62	98	113
Lifelong learning	3.8	0.215	108	46
International scientific co-publications	667	0.333	147	80
Most-cited scientific publications	5.2	0.378	106	69
R&D expenditures public sector	0.74	0.546	122	100
R&D expenditures business sector	0.64	0.307	124	67
Non-R&D innovation expenditures	±	0.346	±	±
Product/process innovations	±	0.174	±	±
Marketing/org. innovations	±	0.068	±	±
SMEs innovating in-house	±	0.188	±	±
Innovative SMEs collaborating	±	0.095	±	±
Public-private co-publications	39.1	0.176	142	59
European Patent Office (EPO) patent applications	1.55	0.228	168	58
Trademark applications	4.84	0.356	104	90
Design applications	1.99	0.694	104	133
Employment MHT manuf./KIS services	12.5	0.448	103	84
Exports of MHT manufacturing	45.5	0.534	92	84
Sales new-to-market/firm innovations	±	0.234	±	±
Average score	--	0.33	--	--
Country correction factor (EIS-RIS)	--	0.786	--	--
Regional Innovation Index 2017	--	0.26	--	--
RII 2017 (same year)	--	--	106.4	57.2
RII 2017 (cf. to EU 2011)	--	--	--	58.7
Regional Innovation Index 2011	--	0.239	--	--
RII 2011 (same year)	--	--	102.3	54
RII - change between 2011 and 2017	--	4.600	--	--

Note: ± Scores are not shown as these would involve recalculating confidential regional Community Innovation Survey (CIS) data.
Source: RIS 2017.

Figure 2.7 shows Malopolskie's performance in 2013 on each of the 18 indicators that constitute the Regional Innovation Index (RII), compared to Poland (red line) and the EU (blue line). This highlights relative strengths (e.g. design applications) and weaknesses (e.g. marketing/organisational innovations).

Figure 2.7. Malopolskie's RII performance compared to Poland and the EU, 2013

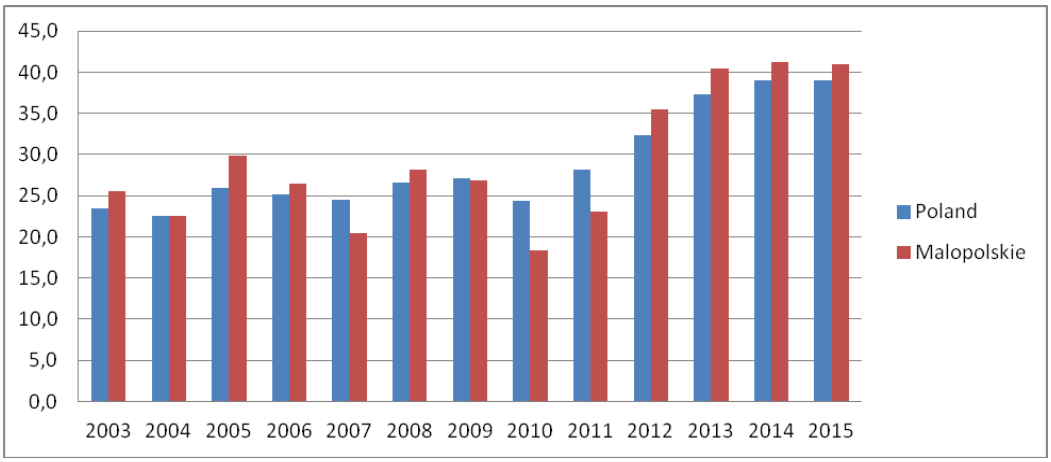


Source: Author's own elaboration based on (EC 2016a, b).

There are about 300 active research units in the region. The 31 universities in the region are actively involved in creating new knowledge. There are also operational R&D centres of international companies in the region such as Motorola, ABB, Delphi, and Comarch.

In the business sector, 41% of total R&D expenditure in Malopolskie was financed by the enterprise sector in 2015. This was the fifth highest regional share in Poland, following Podkarpackie (63.8%), Kujawsko-Pomorskie (53.9%), Pomorskie (51.7%) and Slaskie (44.8%). This share has grown over time (Figure 2.8), indicating an increasing understanding of the role of R&D in the development of firms.

Figure 2.8. Share of R&D expenditures (%) financed from the enterprise sector, Poland and the Malopolskie region, 2003-15



Source: Based on Local Data Bank Central Statistical Office (GUS).

Significant innovation infrastructure has been developed in the region to support large firms and firms with high entrepreneurial potential in their innovation activities, including through the advantages of co-location. The development of the Krakow Technology Park is a notable flagship for supporting entrepreneurial activity within larger enterprises. It is a joint venture of the State Treasury, the City of Krakow municipality, the Malopolskie

Regional Development Agency (MARR), Jagiellonian University and the Technical University of Krakow, alongside Gorniczo-Hutnicza Akademia (AGH) University of Science and Technology and ArcelorMittal Steel (EC, 2017). The Technology Park aims to support research institutions that are seeking the development of new technological solutions alongside innovative companies. Similarly, the Malopolskie ICT Park (MPTI) provides office spaces, laboratories, business advisory services and other amenities to support enterprises in their work.

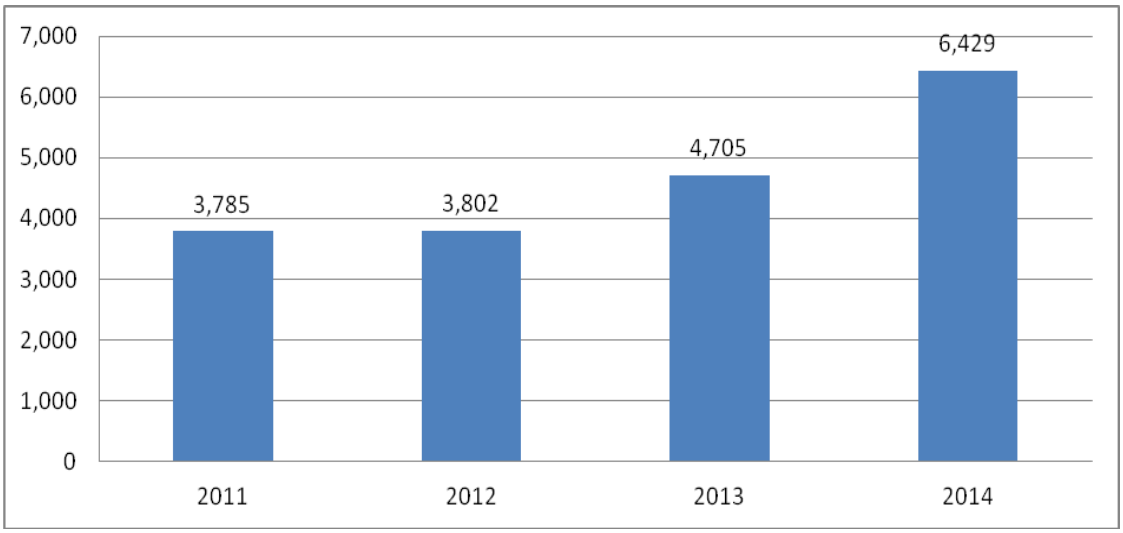
Polish regions also have technology transfer centres whose aims include exploiting and commercialising knowledge. In Malopolskie, there are about ten such centres. These include Knowledge Transfer Centres (KTCs) in three Malopolskie universities (the Jagiellonian University, the Krakow University of Technology and the AGH University of Science and Technology). The KTCs are significant groups of researchers and business contacts from three thematic areas: life sciences, sustainable energy, and information and communication technologies. There are also knowledge transfer platforms such as the "Malopolskie Innovation Festival" and "Malopolskie - here technology becomes a business".

To encourage uptake of financial support for innovation among enterprises, Malopolskie Centre of Entrepreneurship, which is responsible for the distribution of EU funds for innovation, has implemented an innovative method for the evaluation of applications. Projects are first evaluated in terms of their innovativeness, next there is a meeting with applicants regarding their application, and only then are the formal aspects of applications put together.

Business services intermediaries

There were some 1 269 office administrative, office support and other business support entities in Malopolskie in 2014 (the sixth largest number among Polish regions) employing 6 429 (the fourth largest regional number). These entities have significantly increased their level of employment, by about 70%, since 2011 (Figure 2.9).

Figure 2.9. Number of people employed in office administrative, office support and other business support activities in Malopolskie, 2011-14



Source: Eurostat

There are numerous business support organisations in the region: business incubators (including in every major university in the region), the regional development agency[14], chambers of commerce, technology transfer centres, technological incubators, and technology parks (e.g. the Krakow Technological Park, Life Science Park, industrial parks). There is also a Business Centre in Malopolskie (CeBiM), which aims to improve investor and exporter services and promote the region.

Demand for new goods and services

According to the European Commission (EC) 2016 Regional Competitiveness data (EC, 2016a), disposable income per capita in Malopolskie was 66% of the EU average in 2013. On this indicator it ranked only in eighth position of the Polish regions. The relatively weak position is connected to high spatial disparities within Malopolskie, with Krakow generating about 40% of total regional GDP. This low income per head may reduce the demand for new goods and services locally, although significant demand could come through the supply chain of larger local companies.

Physical infrastructure

Malopolskie scores 51.6 on an index of accessibility to motorways, compared with an EU average of 100, as measured by population in areas surrounded by motorways and travel time on motorways. This puts Malopolskie in fifth position among Polish regions. Malopolskie is third among Polish regions on a measure of accessibility via railway, as measured by population living in areas surrounding railways weighted by travel time along railways. The region's index score is 60.8 compared with an average of 100 in all EU regions. Malopolskie ranks third among Polish regions for accessibility via airports, as measured by daily numbers of passenger flights. In 2016, Krakow airport had 4.98 million passengers, the second highest volume in Poland behind Warsaw (12.84 million).

There has been significant development of infrastructure in Malopolskie in recent years. The EU has funded projects such as the purchase of 25 new trains with a total value of PLN 259.3 million and over 90 regional road projects with a total of 645 kilometres of new and modernised roads.

The regional entrepreneurship ecosystem – quality of institutions

Formal institutions

According to data from the European Commission Regional Competitiveness Index 2016 (EC 2016a) the perception of corruption in government services is relatively high in Malopolskie, which ranks 15th of 16 Polish regions. This could constrain entrepreneurship activities. It is only ranked seventh of Polish regions for perception of the impartiality of government services. However, Malopolskie has the best regional score in Poland for the quality and accountability of government services.

Entrepreneurship culture

As indicated earlier, Malopolskie had a rate of new firm registration of 9.59 firms per 1 000 inhabitants in 2016, the sixth highest regional share in Poland. There was a significant

[14] Regional Development Agency http://www.marr.com.pl/kontakt.html.

growth in new firm registrations in Malopolskie after 2007 (Figure 2.11), indicating a strengthening entrepreneurship culture.

Figure 2.10. New firm registrations per 10 000 inhabitants in Malopolskie, 2013-2016

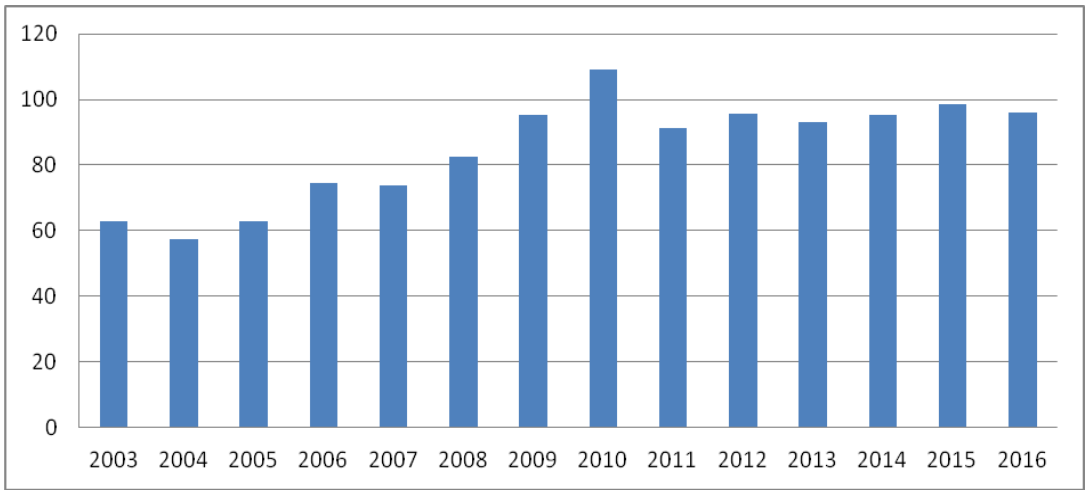


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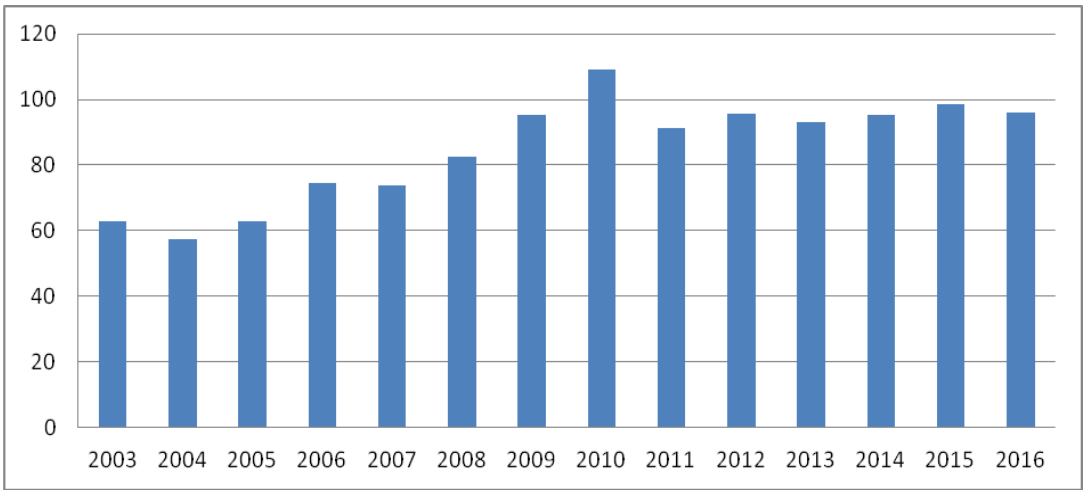
Figure 2.11. New firm registrations per 10 000 inhabitants in Malopolskie, 2013-2016



Source: Based on Local Data Bank Central Statistical Office (GUS).

Networks

Only 5.7% of industrial enterprises in Malopolskie co-operated in innovation activities in 2016, only slightly above the national average of 5.5%. This places Malopolskie region seventh in the ranking of Polish regions. In services, only 2.4% of enterprises declared co-operation in innovation activities in Malopolskie in 2016, slightly below the national average of 2.6%. This places Malopolskie fourth among Polish regions.

Analysis of the share of research projects realised by consortia of firms in Malopolskie financed by EU resources in the 2007-13 programming period shows relative weakness in this kind of co-operation. Businesses in Malopolskie generally adopt a model of implementation of innovative ventures by their own staff and are reluctant to co-operate with other entities (especially research institutions or universities).

Regional government undertakes a number of activities to catalyse co-operation among entrepreneurs. For example, the Malopolskie Innovation Festival organises visits to innovation laboratories of partners and the Malopolskie at the Innovation Fairs initiative supports SMEs to participate in trade fairs. In addition, co-operation has become a prerequisite for receiving R&D subsidies in some of the actions of the Regional Operational Programme 2014-20, such as Innovation Vouchers. Thus, it is necessary for firms to identify a partner with whom co-operation can be realised.

The regional smart specialisation strategy

Development of the smart specialisation strategy

In 2013, the European Union introduced an initiative to encourage regions and Member States to organise their research and innovation policies through the development of smart specialisation strategies. This concept was part of the EU's new framework programme for research and innovation, Horizon 2020[15], and was reinforced by the introduction of an ex ante conditionality in the European Regional Development Fund (ERDF), making ERDF funding for innovation projects dependent on EU Member States and/or their regions articulating and putting actions in place to realise their smart specialisations. The concept was to be articulated by an "entrepreneurial discovery process" (EDP) in each region or EU Member State, guiding the region's innovation investments in a way that reinforces regional comparative advantages and strengths. The strategies were to be developed following a standardised European Union (EU) Research and Innovation Strategies for Smart Specialisations (RIS3) methodology.

The concept of smart specialisation has been adopted by many regional authorities, including those of Malopolskie, as the basis for realigning their industry landscapes to achieve ongoing sustainable regional development. This is a good basis for planning policy for innovative start-ups, scale-ups and SME innovation in the region.

In Malopolskie, the smart specialisation strategy is documented in the Regional Innovation Strategy for the Malopolskie Region 2014-20 (RISMR 2014-20). This is one of ten strategic programmes drafted by the regional government under the high level Development Strategy of the Malopolskie Region 2011-2020:

- Transport and communications.
- Environmental protection
- Rural areas
- Healthcare

[15] Official Journal of the European Union COUNCIL DECISION of 3 December 2013 establishing the specific programme implementing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) and repealing Decisions 2006/971/EC, 2006/972/EC, 2006/973/EC, 2006/974/EC and 2006/975/EC (Text with EEA relevance) (2013/743/EU)

- Social inclusion
- Territorial marketing
- Heritage and free time
- Regional innovation strategy
- Intellectual capital and labour market
- Strategy of southern Poland.

Preparation and implementation of the RISMR 2014-20 is led by the regional government following the standard RIS3 methodology, with the close involvement of the Malopolskie region Innovation Council, which is the advisory body for the board of the regional government administration supporting the process of entrepreneurial discovery.

The EDP used for the development of the smart specialisation strategy involved three main stages:

- Stage 1 consisted of a technological foresight exercise led by Krakow Technology Park. It involved analysis of data and generation of ideas from local stakeholders on future technological developments with strong potential in the region and on the issues that policy needs to address to achieve this technological development. It included an analysis of the region's historical base, its traditional industrial strengths, its current industrial strengths, its research and innovation capabilities, its current human capital and skillsets, and its aspirations for the future. In addition, 25 meetings were held with a broad and extensive range of relevant stakeholders. This brought together some 1 000 people leading to generation of ideas on how to support specific innovations and technological developments in the region.
- Stage 2 involved evaluation of the technological development ideas and in order to identify a small number of potential smart specialisations for the region. In evaluating the smart specialisations, particular stress was placed on the capacity of the region to exploit R&D potential in the region's HEIs. This led to the proposal of four potential smart specialisations.
- Stage 3 involved a public consultation on the potential smart specialisations through public meetings with local stakeholders. This led to the proposal of a further three potential smart specialisations.

Through this process seven smart specialisation priorities were proposed in an initial smart specialisation strategy document in 2014.

The regional government continued the EDP process to refine the smart specialisations in collaboration with the stakeholders. In 2015 it established Working Groups for each smart specialisation, including companies, HEIs and other participants in the regional innovation system. Together with the Malopolskie Innovation Council, these Working Groups created detailed descriptions of each smart specialisation. Following the establishment of the detailed specialisations, the Working Groups have continued to meet regularly to support the evolution of the S3 strategy. Box 2.1 provides more information about the Working Groups.

Box 2.1. Stakeholder Involvement in the EDP through Smart Specialisation Working Groups – Malopolskie, Poland

Malopolskie illustrates a good policy practice in developing an EDP in how it has created Working Groups to involve regional stakeholders from business, research and government in a systemic way in the development of the region's S3 strategy. Key features of the Working Group process are highlighted below.

Specifications for the Working Groups

Following preparation of the initial S3 strategy document, the regional government defined the composition and working approach of Working Groups to be created to help further develop the strategy. It created eight Working Groups – seven to represent the regional smart specialisations and one "Interdisciplinary Group" to provide a broader and more cross-cutting view of policy needs. The aim was to involve up to 20 representatives of entrepreneurs, research institutions, regional and local government, and other stakeholders in each Working Group, with at least 50% of the participants from business. The Working Groups were to meet quarterly or twice-yearly in meetings organised by the regional government to advise on the S3 strategy as well as respond online to ad hoc requests.

The establishment of the Working Groups

In Spring 2015, the regional government held a public and open call for participation in the Working Groups, reaching out to all the actors in the regional innovation system. More than 260 individuals applied to join the Working Group, 50% of them representing companies. Some 140 stakeholders were finally selected, with 70-80% of the members coming from business and entrepreneurs. Each Working Group nominated its own Working Group co-ordinator.

The role of the Working Groups

The Working Groups provide bottom-up information on opportunities in the smart specialisation areas in response to various regional government consultations. This information helps to prioritise the region's research and innovation policies. The principal activity of the Working Groups was to participate in the detailed definition of the S3 fields at the early stage of developing and approving the S3 strategy. However, the regional government has continued to facilitate meetings of the Working Groups since the agreement of the specialisations and to make further consultation requests on key issues affecting the smart specialisations, including obtaining stakeholder views on the implications of regional analyses, information on the outcomes of international projects and insights on the best opportunities for future innovation policy in the region. The regional government also keeps the Working Groups up to date with information on calls for project proposals in the ROP and the result of these calls.

Impacts

By defining the detailed smart specialisations with the regional government, the Working Groups helped to define the scope of the research and innovation activities supported by the ROP 2014-2020 and its associated policy instruments. All the project proposals for the ROP calls for proposals under the smart specialisation headings have to correspond to the

definitions created by the Working Groups, the Malopolskie Innovation Council and the regional government, including two calls for Innovation Voucher projects.

The Working Groups also identified 339 Regional Agendas of Scientific Research for to help guide potential policy support. The Working Group members have also been involved as consultants in the Malopolskie Innovator Competition.

As well as being an important vehicle for regional government to engage stakeholders in the development of policy, the Working Groups also have an important role in facilitating information exchange and potential project development among entrepreneurs and research institutions in the region.

Challenges

A key challenge for this type of initiative is to maintain the engagement of stakeholders over time, especially in the case of the business and entrepreneur representatives and after the initial process of establishing the detailed definitions of the smart specialisations. In this respect it has been important that the regional government makes use of the inputs from the stakeholders.

Source: Malopolskie Regional Government.

Calls for proposals were then issued for R&D projects to be supported under the ROP Priority Axis 1 "Knowledge Economy" and Priority Axis 3 "Entrepreneurial Economy", with the smart specialisation descriptions providing guidance to stakeholders, the regional government and Malopolskie Centre of Entrepreneurship in determining compliance of proposals with the smart specialisations.

A final version of the strategy was adopted in June 2016 ("Malopolskie Smart Specialisations – Refinement of Areas Indicated in the Regional Innovation Strategy of Malopolskie 2014-2020") following an open debate and environmental check.

The region is committed to following through on these smart specialisation priorities until at least 2020, when a refreshed smart specialisation strategy is expected to be prepared.

Content of the smart specialisation strategy

A distinct aim of the RISMR 2014-20 is to make Malopolskie attractive to investment by enhancing its knowledge-based economy, professional activity and entrepreneurship, with a particular focus on knowledge-intensive services and high-technology manufacturing sectors. The strategy delineates innovation and entrepreneurship policy through the following actions: (a) strengthening research, technological development and innovation; (b) enhancing access to, and use and quality of ICT; (c) enhancing the competitiveness of SMEs, the agricultural sector and the fishery and aquaculture sectors; (d) supporting the shift towards a low-carbon economy in all sectors; and (e) investing in education, training and vocational training for skills and lifelong learning.

The RISMR 2014-2020 identifies three priorities:

- Creating demand for innovations.
- Development of infrastructure for the knowledge based economy.

- The development of the information society.

It also identifies seven smart specialisation areas:

- Life sciences
- Sustainable energy
- Information and communication technologies
- Chemical industry
- Manufacturing of metals and metal products as well as products made of mineral non-metallic materials
- Electrical engineering and machine-building industry
- Creative and leisure-related industries.

The smart specialisation strategy includes three specialisations that can be seen as "traditional" in their basis, where the development strategies largely involve the upgrading of long-established industries in the region through climbing global production networks, value chain renewal and niche development:

- chemicals;
- manufacturing of metals and metal products as well as products made of mineral non-metallic materials; and
- electrical engineering and machine building.

Although they can be seen as "traditional" in many ways, these specialisations are innovative in a number of ways, in particular through introduction of process and organisational innovation and development of niches, particularly the chemical industry.

There are also four "new" specialisations in the region, growing largely through processes of diversification into related activities or importation of emerging industries that are new to the region:

- life sciences;
- sustainable energy;
- information and communication technologies (ICT); and
- creative and leisure-related industries.

Implementation of the smart specialisation strategy

One of the key tools for operationalising the strategy is the Regional Operation Programme (ROP) for Malopolskie 2014-2020. The ROP document makes a clear commitment to continue the region's 2007-2013 Investment Strategy to expand the scientific research infrastructure so as to allow the commencement or development of research activity in areas associated with regional smart specialisations. It emphasises that intervention should also ensure a successful transfer of research results into business activity, thus contributing to an increase in the innovativeness of enterprises. Thus the ROP stresses the need to selectively support the development of facilities such as science parks and R&D centres that focus on pro-innovation services, thereby contributing to the development of

innovative start-ups under conditions of free movement of knowledge that facilitates open innovation.

ROP investments in the Malopolskie region, especially as regards R&D, supporting SMEs, industry-led projects and sub-regional development strategies (for example enterprise development in rural areas), should be aligned to at least one of these smart specialisation priority areas in the project's aims, objectives and outcomes

A key actor involved in the implementation of the smart specialisation strategy is the Malopolskie Centre of Entrepreneurship. This is an organisational unit of the Malopolskie regional government established with the aim of carrying out tasks for the regional government Management Board, acting as a managing institution for the Malopolskie Regional Operational Programme. It ensures that the smart specialisation priorities are taken into account in the selection of research and innovation projects for investments through the Regional Operational Programme.

Conclusion

Malopolskie faces the challenge of transforming a significant part of its regional economy from an imitative to an innovative economic development process, as witnessed for example by the current classification of the region as only a "Moderate Innovator" in the European Commission's Regional Innovation Scoreboard.

One of the priorities is to increase the degree of innovative entrepreneurship activity in the form of innovative start-ups and scale-ups. This can be supported by increasing the entrepreneurship knowledge and competences in students, improving access to finance, and supporting effective partnerships for innovation between businesses and academic centres.

At the same time, FDI activity is dominated by business process outsourcing centres, as opposed to innovative centres based on R&D, although there are some second level centres in international companies such as Motorola and TEVA, requiring an effort to upgrade the innovation content of FDI as well as its links with local firms.

The key issues for regional innovation and the regional entrepreneurship ecosystem are summarised in the following SWOT analysis.

Figure 2.12. . SWOT of the Malopolskie entreprendurship ecosystem

Strengths	Weaknesses
Good access to capital for innovation and start-ups Well-educated labour force and positive net migration Krakow is a good place to be and the second largest centre of education of students at technical universities High internal expenditure on R&D per employee High employment in R&D activities Krakow is the most important business service centre in Central and Eastern Europe and is ranked ninth in the world	Limited openness of firms to co-operate on innovative projects Low level of innovative activities in firms resulting from a culture of imitating rather than innovating Low level of commercialisation of research results Lack of skills of graduates in co-operation and entrepreneurship Perception of corruption in government services
Opportunities	**Threats**
Increased co-operation with neighboring regions like Slaskie and Podkarpackie More effective use of available EU funds	Decreasing external demand for Business Process Outsourcing Lack of qualified labour force for future skill needs Decrease in EU funding

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3. Stimulating innovative start-ups in Malopolskie

Innovative start-ups make an essential contribution to a region's productivity growth and industrial renewal. This chapter explores the innovative start-up landscape in Malopolskie, identifying bottlenecks and challenges to the formation and sustainability of such start-ups. The chapter also provides suggested solutions to these hindrances including policy recommendations and inspiring programme examples from other countries.

Profile of start-ups in Malopolskie

There is evidence of a strong innovative start-up community in Malopolskie. This includes several flagship start-ups such as Estimote, an Internet based organisation; Brainly, an education portal; and Base, which creates customer relationship management solutions. Currently, there are 50 companies in the incubator of the Innovation Centre in Krakow Technology Park.

Key opportunities for innovative start-ups in Malopolskie are in the video games, Information Technology (IT), cyber security, and outsourcing domains, mainly because of founders' backgrounds, education and industry experience (with foreign-owned MNEs). In particular, there is an important opportunity in cyber security based on people with IT-based Masters degrees and PhDs coming out of the Krakow universities.

The importance of innovative start-ups is recognised by the regional government, which was awarded the title of European Entrepreneurial Region by the European Union (EU) Committee of the Regions in 2016 for its forward looking policy strategy to promote SMEs and entrepreneurship.

Enablers of innovative start-ups in Malopolskie

Support for entrepreneurship culture

One of the ways in which the regional government promotes entrepreneurship is in activities that stimulate an entrepreneurship culture. The region organises almost 600 technological events for enterprises per year with a strong focus on encouraging and supporting start-ups. It also participates actively in the annual Global Entrepreneurship Week, an international agenda that regions can use to support their own entrepreneurship promotion agendas. Over 40 partners from the region prepare nearly 300 activities (workshops, seminars, meetings with entrepreneurs and others) as part of Global Entrepreneurship Week, which aim at encouraging people in Malopolskie to start their own businesses. In 2016, 10 300 persons were involved in some way.

Public access to finance support

Another enabler of innovative start-ups in Malopolskie is the availability of a range of funding support from different public sources in the region, especially if their ideas, products and services are aligned to at least one of the region's seven smart specialisations. Innovative start-ups also benefit from national financial support programmes run by the Polish Agency for Enterprise Development (PARP) in conjunction with the European Structural and Investment Funds and state budget. One example is the Innovation Loan Fund, which is a debt-based financial instrument that can provide funds to finance the development of a new company if the entrepreneur is also able to find and secure a private investor such as a venture capital fund or a business angel.

Public advice and mentoring support

There are also important advice and mentoring programmes available for start-ups in Malopolskie. In particular, the region started an accelerator programme in 2017 that offers intensive business development advice, mentoring, financial support and office space for three to six months to knowledge-intensive start-ups lasting to speed up their development. The accelerator in Krakow (one of ten in Poland) is a publicly-owned company supported by the regional government, universities and nine large companies and aimed at preparing

products or services for commercialisation, based on intense work with programme participants. The first cohort comprised 11 companies and the second cohort will comprise 12 companies. Specifically, companies participating in the programme receive Technology Roadmaps developed by the accelerator team and PLN 50 000 equity free funding. The companies participating can from anywhere in Poland. Therefore, the accelerator is a conduit for "brain gain" into the region (7 of the 11 participants in the first cohort were from outside the region).

Human capital in universities and FDI

Another key ingredient in Malopolskie's innovative start-up environment is its human capital base. The region's 31 universities generate a large pool of young talent and skilled professionals. Many of those graduating can speak a number of languages fluently and have skills consistent with building high value-added enterprises. Moreover, some of the universities have start-up programmes. There is a total of 13 incubator centres within the university domain.

The environment for innovative start-ups in the region is also strengthened by the presence of important foreign direct investment (FDI) operations locally, which continue to flow into the region. FDI is key driver of the innovative start-up process in Malopolskie; for example 70% of start-ups are by people who have worked with large companies (including foreign-owned MNEs).

Support for commercialisation of research

As regards the commercialisation of research ideas from universities and research centres through start-ups, there is significant support from EU-funded projects such as Horizon 2020 and the Regional Operational Programme. This includes support for innovation centres that have played an important role in commercialising new products and processes though start-ups. While the application conditions for commercialisation funding have been viewed as complex and cumbersome, new documents and procedures are being prepared to make the application process more user friendly.

Strategic cluster support

Further support for innovative start-in Malopolskie involves the significant presence in Malopolskie of the national Sustainable Infrastructure Cluster, implemented by enterprises, research institutions and government organisations to support the development, implementation and commercialisation of innovative technologies in the field of construction and in-house automation. This cluster, through EU funding such as INTERREG Baltic, has set up laboratory spaces in Malopolskie that can be rented by innovative start-ups to build prototypes. The cluster also provides a "matchmaking" service to its members to link innovative start-ups to relevant research centres, universities, and enterprise support agencies.

Bottlenecks to innovative start-ups in Malopolskie

Lack of entrepreneurship culture

Although the number of start-ups in the region is high, there is a small share of start-ups with ambition to grow or innovate. A contributory factor is a perception of difficulties in growing a start-up, which it is perceived would require developing difficult operations management and human resources management capabilities. Therefore, most entrepreneurs

are happy to remain at micro scale using standard business models. At the same time, university graduates who could start promising enterprises, such as IT students, tend to lack entrepreneurial attitudes (OECD, 2017).

Lack of enterprise collaboration and networking

There are few links between start-ups and large companies, partly reflecting the foreign ownership of much of the region's large firm base and concentration of many key activities and decision-making powers in foreign head offices. Equally, there are few interactions between start-ups and universities, partly reflecting a lack of an open attitude to collaboration with industry in some local universities. One of the underlying issues behind the lack of collaboration in general that has been identified by local stakeholders is a lack of trust across businesses. Such concerns are not conducive to encouraging entrepreneurial activity in a region. Furthermore, only some of the region's clusters have connections with universities, which limits the scope for innovation collaborations.

Lack of skills for future-oriented smart specialisations

Innovative start-ups require skilled labour relevant to the key sectors where they will develop. The region's schools, colleges and HEIs are still not sufficiently focused on preparing students for the type of work they will do in the region's smart specialisation areas. There is also a lack of communication between the key stakeholders in each of the seven smart specialisations and the regional Labour Office on the future skills needs of the smart specialisations that would help ensure appropriate training opportunities and career guidance. There is also a high level of "brain drain" out of the region whereby many skilled and trained workers are being enticed out of the region to receive higher pay elsewhere, reflecting a lack of high-paid job opportunities locally.

Lack of awareness of enterprise supports

There is a lack of awareness among potential entrepreneurs on the enterprise supports available to them from the regional government and other public actors. Navigating the system of available start-up support programmes is complicated because there is no single regional institution that implements all the relevant programmes. There is also a division of tasks whereby some start-up programmes are controlled at a regional level, for example driven by the Regional Operational Programme, and others at a national level, for example through National Operational Programme resources for start-ups administered by PARP.

Difficulties in access to start-up finance

Despite a number of access to finance programmes for innovative start-ups there are still some difficulties. For example, entrepreneurs can apply for "technology loans" from banks using a "technology promise" part of which has to be used to repay capital back to the bank. However, the enterprises must have support from a bank and the allocations available are often smaller than what an entrepreneur typically needs. Furthermore, even though there are many sources of funding available to entrepreneurs, the process of acquiring the funds is not simple or quick because the entrepreneur/enterprise must demonstrate that they can use the funds/services and be able to pay back the loan and/or grant.

Insufficient focus of the smart specialisation strategy on new industries and insufficient awareness of the smart specialisations

A number of the region's seven smart specialisation themes are related to traditional sectors that are dominated by existing businesses in the region, as opposed to sectors where new start-ups might drive the diversification of industry into more high value-added activities. This leads to the possibility that resources (financial, education, infrastructure and human capital) could be diverted into industry sectors where there is little opportunity for the creation and growth of innovative start-ups.

Also, there is not widespread awareness or understanding of the smart specialisations across the region, which may limit the stimulus to the generation of future innovative start-ups in emerging specialisations. In particular, the generation of new knowledge in HEIs and public research centres is insufficiently linked to the region's smart specialisations.

Recommendations and international inspiring policy practices

This chapter has identified a number of bottlenecks to innovative start-ups that could help drive emerging industries in Malopolskie, particularly in the future-oriented smart specialisations.

One of the issues is a lack of entrepreneurship culture in terms of a lack of sufficient creativity and entrepreneurship skills being generated by schools, colleges and HEIs. Here it is recommended to implement creative thinking and entrepreneurial skills courses at all education levels.

A second issue is lack of cohesive networking between the stakeholders in the region exacerbated by a lack of trust amongst entrepreneurs. To respond, it is recommended to appoint a networking department within regional government. One purpose of this department will be to set up a series of regional workshops engaging stakeholders in a process of collaboration, co-operation and sharing of knowledge and experience. It is important that these networks engage people from many disciplines, sectors, and social strata. It is equally important that the networks are sustained and maintained.

Another issue is insufficient focus of education and training on future skills requirements of the region's smart specialisation priorities and a brain drain of skilled people from the region. One of the responses can be to engage industry, HEIs, and regional government in a collaborative process of identifying future skills needs for industry. An example of such an approach is given in Box 3.1. It is also important to create an environment whereby more skilled and educated people either set up their own innovative start-ups or seek employment in innovative start-ups and SMEs. For this purpose consideration could be given to providing employment grants to innovative start-ups to hire graduates into their businesses.

Box 3.1. Identifying Future Skills Needs – South East Regional Skills Forum, Ireland

Much of the pressure that industry exerts on governments and HEIs for the provision of skills is based on immediate, short-term demands. At the same time, the response from HEIs is usually reactive and therefore courses are provided to supply graduates with skills for current or past needs rather than future needs. There are few examples where industry, HEIs and government have worked together to focus on identifying, and preparing for, medium to long term industry needs. One current example is based in South East Ireland.

The South East Regional Skills Forum (SERSF) was set up by the Department of Education and Skills in 2015 to provide a cohesive structure for employers and the Further and Higher Education Institutions to work together in building the skills needs of their regions; to help employers better understand and access the full range of services available across the education and training system in each region; and to enhance links between education and training providers in planning and delivering programmes specific to industry needs.

It was supported by the South East Action Plan for Jobs (SEAPJ) 2015-2017 run by the Department of Jobs, Enterprise and Innovation. The main object of the SEAPJ was to "close the gap that exists between the South East and the rest of the country in terms of employment and wealth"

The alignment and interaction between the SEAPJ and SERSF has already yielded a number of education programmes designed and delivered by the HEIs in the region to provide graduate skills to meet future industry needs.

However, all stakeholders engaged in the process are fully aware that the continued, sustained economic growth of the region will be based on "focusing on providing quality jobs as opposed to merely quantity of jobs" and that sustained development of the regions rests on the generation of higher quality and quantity of STEM (science, technology, engineering and maths) related jobs.

A further issue is lack of awareness of the available public supports to innovative start-ups. More clarity needs to be provided to potential entrepreneurs and start-up entrepreneurs and easy to follow instructions to apply for grants need to be generated. There is also a perceived lack of sufficient finances to help support the creation and growth of innovative start-ups among entrepreneurs. Although there are a number of relevant finance support programmes for innovative start-ups there still appear to be difficulties related to amounts available and awareness of the range of support available. At a minimum there needs to be greater "marketing" of sources of funding for innovative start-ups.

A final issue that has been raised is an insufficient focus of the region's smart specialisations on future-oriented activities rather than established industries while HEIs and research centres are not fully aware of the region's smart specialisations and incentivised to generate new knowledge in these domains. Policy should therefore seek to create greater awareness of the region's smart specialisations as a focus for increasing competitiveness and economic development of the region. This awareness needs to be delivered by regional government to all local stakeholders and needs to be continuously repeated. An example of such an approach is the implementation of an Academy of Smart Specialisations as shown in Box 3.2. Creating and implementing such a platform and incentive scheme could lead to the generation of a higher quantity and quality of innovative start-ups.

Box 3.2. Academy for Smart Specialisation, Sweden

The Academy for Smart Specialisation is based in Värmland, Sweden. It is a collaborative engagement between Karlstad University and regional government of Värmland. As far back as 2014, regional government of Värmland was convinced that innovation was essential to the region's task of contributing to creating new, good jobs and a sustainable and inclusive growth in Värmland. Society, along with industry, academia, municipal councils and the county council, as well as the regional government, recognised that they needed to become more innovative in order for Värmland to be well-positioned in a highly competitive world. Relying on this strategy, the regional government, together with the business and academic communities and the public sector, prioritised investments in innovation in order to bolster Värmland's competitiveness.

The ethos of the stakeholder engagement in Värmland is that there is open acceptance of the need for latitude for experimentation, and to a certain extent, also failure.

The Academy for Smart Specialisation is based on a clear strategy and set of expectations with regards to collaboration between the region's university and other relevant regional stakeholders. The Academy was founded based on RIS3 principles and particularly in order to progress the implementation of the region's six smart specialisations identified as part of Värmland's research and innovation strategy. The six smart specialisations are: (i) value-creating services, (ii) forest-based bioeconomy (iii) digitalisation of welfare services (iv) advanced manufacturing and complex systems (v) digitalised experience of nature, culture and place and (vi) systems solutions with solar energy.

The Academy is a continuation of the formal partnership arrangements between the regional government of Värmland and Karlstad University. It has a steering group involving both the University Rector and the Director of the regional government of Värmland as well as political representation in the form of two Regional Commissioners.

The Academy is a virtual entity and not a hard research centre/institute or building/space within the university. It does, however, have joint co-ordinators from the university and the regional council, and staff (such as finance and communication officers) that work to support its day-to-day operations.

The cluster organisations in the region are not formally part of these management structures, but they are fundamentally involved in shaping the activities of the Academy. An advisory group is also in the process of being formed, which will include representatives from industry (including the cluster organisations), national government agencies, and European entities.

Overall, the Academy for Smart Specialisation aims to deepen the ongoing process of strategic alignment between Karlstad University and the regional government by concentrating on the priority areas identified within the region's RIS3. The underlying thinking behind this approach is to enable the university and the region to more effectively "package" the collaboration that takes place in the region. The "brand" of the Academy for Smart Specialisation will also enable the region's stakeholders to more clearly communicate their depth of specialism as well as their human and social capital outside of the region.

For further detail see: http://www.regionvarmland.se/wp-content/uploads/2016/02/VRIS3.pdf.

Box 3.3. Recommendations for promoting innovative start-ups

1. Implement entrepreneurship education courses at all education levels with content aimed at addressing the lack of innovation, entrepreneurship and ambition. Bring in more industry leaders and private-sector representatives to help teach entrepreneurship in universities. (Regional and national)
2. Improve collaboration and networking in the provision of regional start-up support. Support agile intermediary organisations with an "arm's length" relation with the regional government to bring together support services with those needing them and ensure that the entrepreneurship support services anticipate and respond to future needs. Sustain and maintain existing local networks and clusters and link them into the start-up support system. (Regional)
3. Engage industry, HEIs, and regional government in a collaborative process of identifying future skills needs for industry. (Regional)
4. Implement a system of tax credits for innovative start-ups and SMEs to hire graduates into their businesses and ensure low levels of bureaucracy in the application process (National).
5. Improve information flow to new and potential entrepreneurs to create greater levels of awareness on the availability and conditions of financial and other supports available for innovative start-ups. More clarity needs to be provided and easy-to-follow instructions on how to apply for support. While further financing opportunities would help, there also needs to be greater "pushing" of information on existing initiatives to potential beneficiaries. (Regional)
6. Ensure greater awareness of the region's smart specialisations. This awareness needs to be delivered to all stakeholders and needs to be continuously repeated. (Regional)

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4. Promoting scale-ups in Malopolskie

There are major problems in many regions, including Malopolskie, with growing start-ups into scale-ups. This chapter analyses the issues, identifies enablers and bottlenecks associated with scale-ups in Malopolskie's entrepreneurship ecosystem, and suggests policy solutions to ensure a firmer foundation for growth and diversification in the regional economy.

Profile of scale-ups in Malopolskie

Definition of scale-ups

The definition of scale-ups here is those firms that have at least 10 employees and have potential for high growth (see OECD, 2007). "Gazelles" are a subset of scale-ups, being young scale-up firms (for example born up to five years ago). The economic benefits of scale-up firms are not only in employment, but also in innovation and diversification of economies through the creation of new markets.

Within the definition of scale-ups there are three categories of firm:

1. Established firms that have achieved fast growth and have reached a critical mass, e.g. they have been launched on a stock exchange. There are currently very few of these in Malopolskie.
2. Innovative firms that are just below the first category but still beyond average in their potential for innovation and growth.
3. Firms which have an ambition to grow but are facing serious barriers, for example in raising finance or developing management teams.

The second and third categories are those where policy intervention is most needed. This chapter outlines what a support system could look like that focuses explicitly on scale-up firms, providing guidance on a) how to identify these companies and b) how to best support them.

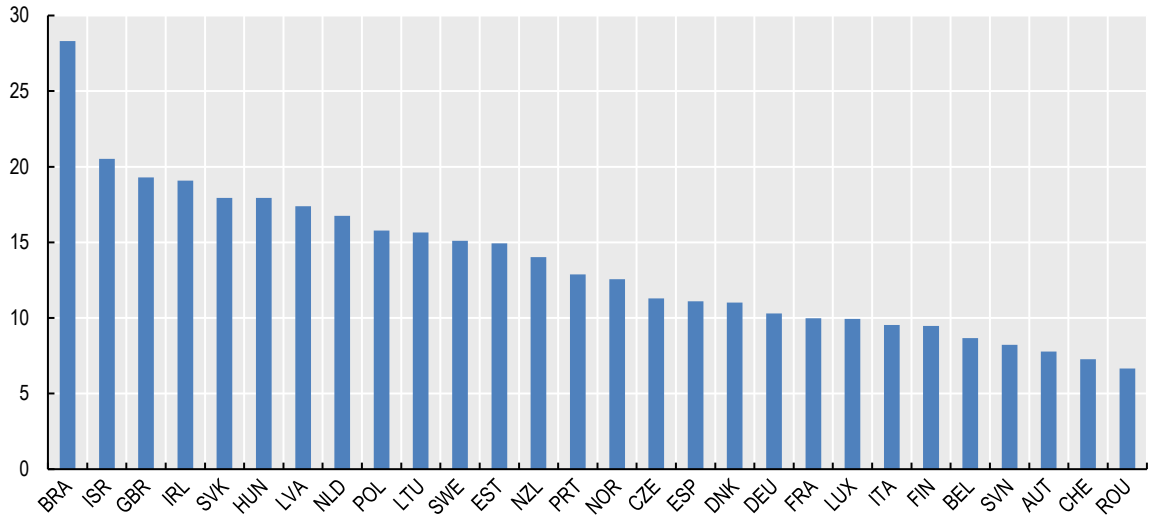
Higher growth rates tend to be found in smaller and younger companies (Criscuolo, Gal and Menon, 2014). However, NESTA (2009) concluded that scale-ups are found across a broad range of sectors, including non-high-tech sectors; that half of scale-ups are more than ten years old due to their innovation capacity; and that scale-ups are attracted to areas of high skill density and high local rates of tertiary education (see also Anyadike-Danes and Hart, 2016). They are more likely to be foreign-owned firms than domestic, possibly because of being part of a large business group, in line with findings in Poland in the manufacturing sector in the 2000s (Cieslik, 2007).

Scale-ups in Malopolskie

Figure 4.1 shows that Poland as a whole is slightly above the median of 28 OECD and non-OECD countries in share of employment in high growth enterprises in 2014. However, it is more difficult to obtain summary data on scale-up firms in Malopolskie.

Figure 4.1. Share of employment in high growth enterprises (more than 10% employment growth)

Percentage of employment in enterprises with 10 or more employees, 2014 or latest available year



Source: OECD 2017

Data on scale-ups of all three categories in Malopolskie is fragmented and only available through combining information from a variety of sources including consultancy reports, cluster organisations and public bodies. The available evidence focuses on the top and second layer of scale-ups (those that have achieved very fast growth or fast growth, rather than potential scale-ups that are ambitious but constrained in growth). Evidence is used from Deloitte Technology, the NewConnect website and the Financial Times FT 1000 list of Europe's fastest-growing companies[16]. It shows that there are some notable examples of top-layer scale-up firms in Malopolskie, particularly in the life science, digital and IT sectors.

According to the Deloitte Technology Fast 50 Central Europe[17] breakdown of the fastest growing tech companies in the Central and Eastern Europe (CEE) area, over 2013-2018 the number of Polish companies included in the Fast 50 fluctuated from 22 in 2013, to 12 in 2015, then back up to 18 in 2018.

Three Krakow-based companies in this ranking are Miquido (the fastest-growing mobile development company in Central Europe), Benhaur (a marketing automation company) and Bold Brand Commerce (which implements e-commerce solutions). Codewise (an advertising technology business) was the 2015 recipient of the "Rising Star" award, designed for companies that are too young to make the main ranking. It was founded in 2011 and had 103 employees in 2015. In 2017 The Financial Times FT 1000 list of Europe's fastest-growing companies[18] ranked Codewise in second place. Only one other Polish company was in the top 100, a games company in Warsaw.

[16] https://ig.ft.com/ft-1000/

[17] https://www2.deloitte.com/content/dam/Deloitte/ce/Documents/about-deloitte/ce-technology-fast-50-2018-report.pdf

[18] https://ig.ft.com/ft-1000/

Box 4.1. Codewise – A Young Scale-Up, Krakow

Founded in 2011, Codewise has already opened a London office and is planning to set up in the US. On its own website the company calls itself "Poland's fastest-growing and sexiest start-up", going on to highlight how its "amalgamation of geeks, scientists, creative wizards and digital marketers" enjoy "disrupting and redefining industries with serious technology." Founder Robert Gryn has stated publicly that to perform well people must look forward to coming to work. He lists his business priorities as "people, products, profits – in that order". He firmly believes that young Polish businesses should set out with greater ambition. "There's so much talent in Poland. However, people are generally risk-averse and often don't think on a global scale. I would love to see this change." He certainly had that ambition himself, turning Codewise from a business that took on outsourced projects into a "venture-building" company – a business that builds companies and brands using its own internal resources.

The company continues to be entirely self-funded. The founder has a very basic rule when it comes to running and managing the business - that people come first. This has resulted in a naturally open and autonomous organisation where the culture is relaxed yet everyone feels a good degree of responsibility and ownership over the challenging tasks at hand. "This has allowed our team of just shy of 100 people to bring in USD 50 million+ revenue in 2016."

Source and for further detail: https://codewise.com/.

NewConnect[19] is an alternative Polish stock market for young, growing companies, especially, but not exclusively, in the high-tech sector. As of 1 February 2011, there were 199 companies listed on NewConnect (with only 3 in the Malopolskie region) with a market capitalisation of PLN 5.93 billion. In 2017, there were 408 companies listed (7 foreign) with a value of PLN 9.409 billion[20]. Of these, 33 were listed as being in the Malopolskie region. In 2018 the market has contracted somewhat but the number of firms in Malopolskie has remained the same[21]. Of these 33, 19 were based in Krakow. Those with Krakow addresses were in a variety of sectors including video games (2 firms), food (1), software/IT (2), financial services (3) and real estate (1).

Further examples of scale-ups in Malopolskie are given in Box 4.2 and Box 4.3.

[19] https://newconnect.pl/en-home

[20] https://newconnect.pl/companies

[21] https://newconnect.pl/companies

Box 4.2. Selvita – An Established Scale-Up in the Krakow Life Science Cluster

Selvita was established in 2007 and currently employs over 360 scientists, 30% of whom hold PhDs. Selvita's laboratories are located in Krakow and have Good Laboratory Practice (GLP) and Good Manufacturing Practice (GMP) certification. Drug discovery clients of Selvita include more than 50 large and medium-sized pharmaceutical and biotechnology companies from the USA and Europe. Selvita has been listed on the Main Market of Warsaw Stock Exchange (WSE:SLV) since December 2014.

Selvita has two primary focus areas: to serve the drug discovery market as a customer-centric provider of high quality, integrated drug discovery services; and as a drug discovery company engaged in the research and development of breakthrough therapies in oncology. The company's offices are located in the USA in Cambridge, MA and in the San Francisco Bay Area, CA; as well as in Cambridge, UK, and Krakow, Poland.

Source and for further detail: https://selvita.com/about/.

Box 4.3. Miquido – A Young Scale-Up in the Digital Technology Sector, Krakow

Miquido was founded in 2011 and is based in Krakow. It is a mobile-first technology consultancy company focusing on mobile design and software development for cutting-edge businesses.

"We are proud to increase sales, customer engagement, and productivity of unicorn start-ups, growing companies, and global enterprises. "Post-PC era" is a fact, so by building mobile apps, wearable and smart home solutions we want to prepare our clients' businesses to get most benefits from the connected world dominated by mobile technologies. Nine out of ten of our projects come from referrals so with 90+ delivered solutions for international clients, we have grown from 3 to over 70 people in just five years! That made us an award-winning, leading Polish mobile-first solutions provider".

Source (as accessed at the time of research) and for further detail: https://www.miquido.com/.

Overall, the evidence indicates that there are conditions for successful scale-ups in Malopolskie, and that it is an important region for scale-up activity within Poland, but that the number of scale-ups in Malopolskie is still relatively low compared with regions in other countries, partly reflecting relatively low scale-up rates in Poland as a whole.

One of the concentrations of existing scale-up activity in Malopolskie is in the digital sector. Indeed there may be additional scope for this type of scale-up in the region, focusing on servicing Industry 4.0 and Services 4.0 trends, whereby personalised product-service packages make a wide range of innovative business models possible. Krakow has a cluster of digital companies that could expand and work with companies developing Industry 4.0 and Services 4.0 products, increasing quality and productivity in the value chain in the region. This would, however, require greater interaction between scale-ups and large firms (domestic and foreign). There is little current evidence of that happening.

Key enablers and bottlenecks for scale-ups

Current entrepreneurship and smart specialisation policy

Enablers

A strategic framework for smart specialisation policy

The smart specialisation strategy has identified seven key sectors that will enable regional growth through innovation. The European Entrepreneurship Region (EER) 2016 document provides a starting framework for identifying how to support scale-ups in these fields and which organisations will provide support.

Bottlenecks

Lack of an integrated entrepreneurship strategy

There are many examples of policy support initiatives for scale-ups in the region, such as the Digital Dragons awards to encourage the games sector[22] and Global Entrepreneurship Week. However, it is not clearly set down how scale-ups will be encouraged in each of the smart specialisations and how the different initiatives will be integrated and promoted as a package.

Networks

Enablers

Presence of cluster organisations

Networks support scale-ups by providing opportunities for firms to access new knowledge, customers, suppliers, and contacts with professional service providers. Specialised networks are formally organised in the ten established clusters organisations operating in the region. In addition, the Chamber of Commerce organises networks via "branch sessions" where SMEs meet from time to time for training on innovation and internationalisation.

Bottlenecks

Lack of trust

Many local stakeholders argue that relationships between firms are often characterised by a lack of trust, with the consequence that formal agreements and understandings need to be in place before firms will co-operate. The issue of trust is also identified by the Polish Private Equity and Venture Capital Association (PSIK)[23], which argues that there is general endemic mistrust and people are afraid of discussing ideas. This is unlike, say, in Silicon Valley where people gain by sounding out ideas. It has an impact on business relations. Top-layer firms such as Selvita find that there are not many companies in the region which they trust and with which they want to collaborate.

[22] https://www.malopolska.pl/aktualnosci/biznes-i-gospodarka/digital-dragons-2017-vi-edycja-wystartowala

[23] https://psik.org.pl/en/.

Leadership

Enablers

Leading organisations and entrepreneurs

There are several key players and actors that take the role of lead initiatives that support scale-ups. These include the regional government, the Head of the Cluster Initiative, Aspire, Krakow Technology Park and individual firms, and return migrant entrepreneurs. For many return migrants the motivation goes beyond simple economic reasons – many of them actively want to contribute to the economic, social and political development of Poland and its regions (Klagge and Klein-Hitpaß, 2007).

Bottlenecks

Lack of co-ordination on scale-up among leaders

There is a lack of co-ordination between key actors to develop a strategy to focus on goals for helping a target group of innovative firms with potential to grow.

Finance

Enablers

Availability of venture capital funds and private equity

Inovo has estimated that the value of venture capital investments in Poland above EUR 250 000 during the year April 2015 to March 2016 was about EUR 50 million[24]. Out of the total , 72% was led by Polish venture capital funds (36% by state-backed Polish funds, 26% by Polish private venture capital funds and 10% by Polish angel investors) and 28% by foreign investors. The most active Polish investors by number of investments included Inovo VC, MCI Internet Ventures and Experior. However, 3TS and EBRD were the most important in terms of value.

There are a number of funds that are active in supporting scale-ups in Malopolskie. Innovation Nest is a micro venture capital fund established by Piotr Milam, the founder of Ivision, a Krakow-based start-up and one of the strongest digital companies in Poland[25], together with Marek Kapturkiewicz:

"In total, we invested in 25 companies, 4 of them are stars and 9 of them are promising companies that with reasonable probability will become stars soon. The fair value of the existing portfolio shows net internal rate of return (IRR) of 16.4% and in the next years we hope that some of the stars will become supernovas[26]. Kraków, though small, has several start-ups founded in the last five years that are in Round A or Round B growth stage. These companies are: Brainly, Base CRM (technically a US company but most of its employees and founders are based in Kraków), Estimote, Kontakt.io, Silvair, Elmodis, Salesmanago, Gamedesire, and Codewise. Five years ago, we started the fund and all these companies

[24] https://150sec.com/how-big-is-vc-market-in-poland/.

[25] http://www.innovationnest.co/people/piotr-wilam/, https://ivision.pl/.

[26] https://medium.com/startup-grind/a-micro-vc-a-true-story-88d5d4998f99.

were at an early stage. We were lucky to grow as an investor in such an amazing community".[27]

Another significant scale-up investor in Malopolskie is Giza Polish Ventures. This is a PLN 84 million fund that invests in Polish start-ups and technology companies in various stages of development, from seed to growth and expansion stages[28].

Augere Ventures is another local fund investing in scale-ups[29]:

"Supporting growth stages of development requires smart money, as well as flexibility in the amount of supplied capital, in introducing new tools for management, mastering competences, or in launching new products or services on the market. As we consider all the above crucial in the process of following trends and needs of the markets, we invest in projects which have both global and regional potential and whose value is built through the processes of mergers and takeovers. We support new technologies and innovative projects with the use of competences of our experts, managers and scientists from all research and development institutions we co-operate with in our specialised accelerators".[30]

Box 4.4. Scale-Up Financing for Nano Games, Krakow

Nano Games, a Krakow developer of computer games, obtained an investment of PLN 2.2 million from Accelerator Technology Gliwice and Augere Business Angels Network to enable rapid development of the company using previously produced technology. The purpose of the investment is to become the technological leader in the market simulators area and to expand co-operation with international publishers in the production of new simulation games based on licensed globally recognised brands. The funding allows for the expansion of the production team, the further development of simulation technologies, parallel implementation of several games, and a research project, which will contribute to the dynamic development of the company and a significant increase in revenues in the following years.

Source and for further detail: http://www.augereventure.pl/en/#augere-seed

The Polish government announced in 2016 that it is building a new investment platform as part of the Polish Development Fund and Start in Poland programme called PFR Ventures with over EUR 630 million (PLN 2.8 billion) to be put into equity investments in innovative companies at an early stage of development. Investments may be made directly together with a co-investor; or indirectly through venture capital funds as the leading investor. Using EU funds, PFR Ventures is also creating private investment trusts. Seed funds and venture capital funds may receive investment from PFR Ventures of approximately EUR 5 million to EUR 200 million, financing half of the investment value, with the other half coming

[27] Quote sourced from company website: https://medium.com/startup-grind/a-micro-vc-a-true-story-88d5d4998f99.

[28] http://gpventures.pl/.

[29] http://www.augereventure.pl/en/#augere-venture.

[30] Quote sourced from company website: http://www.augereventure.pl/en/#how-we-work.

from private investors, both institutional and individual. This will be used to finance projects at various stages of development and different sizes – from around EUR 50 000 to EUR 15 million for a single project. PFR is looking for new teams as there are very few experienced venture capital firms in Poland or Europe that have the financial and operating experience with entrepreneurship rather than corporate experience.

Project "BRIdge Alfa Polish Institute for Research and Development Investments" is a fund created by the Polish Research and Development Institute in response to a financial gap in commercialising Polish R&D. It is co-financed by the EU from the European Regional Development Fund under the Operational Programme for Intelligent Development. BRIdge Alfa is relevant for scale-ups because it addresses the issue of funding early stage businesses through to exit. It supports Polish scientists and entrepreneurs whose solutions are innovative, but whose stage of technology development is too early to find financial support from venture capital or industry. Commercialisation of ideas at an early stage requires an assessment to confirm the commercial potential of the technology. The fund size is PLN 30 million of which PLN 24 million is subsidised. The preferred exit is the sale of 100% of shares to a professional investor within three to four years from the moment of investment. The size of investment ranges from PLN 100 000 to PLN 1 million. In return for financing the project, a minority stake in the start-up is expected: 10% for a PLN 100 000 investment, 25% for PLN 1 million.

Opportunities for scale-ups to gain finance through stock market listing

The NewConnect alternative stock market, run by the Warsaw Stock Exchange, was set up in 2007 and allows smaller companies to float shares. The exchange is conducted outside the regulated market as a multilateral trading facility. Compared to the main market of the Warsaw Stock Exchange, NewConnect offers lower costs for floated companies, simplified entrance criteria and limited reporting requirements. The exchange maintains two indices measuring the performance of the listed companies: the broadly composed NCIndex (which comprises all companies listed on the NewConnect) and NSX Life Science (which comprises companies from the pharmaceutical and biotechnology sectors)[31]. This offers an alternative source of financing for larger deals.

Availability of business angel funding

A number of business angel networks exist in Poland that are also active in Malopolskie. Probably the largest and most active is the Lewithan Business Angel (LBA) network based in Warsaw[32]. It was established in 2005 with the use of EU funds. LBA's main goals are: to promote the investment of business angels in Poland, to match business angels with companies seeking growth funding, and to exchange experience and encourage best practice. In 2017, the Polish Development Fund (PFR)[33] – a group of financial and advisory institutions supporting companies, local governments and individuals – announced a programme to support business angels by creating co-investment funds. Investments in companies are contributed equally by PFR Biznest FIZ working in collaboration with financial intermediaries, and by business angels. Innovative companies at seed and growth

[31] https://en.wikipedia.org/wiki/NewConnect

[32] http://www.lba.pl/.

[33] https://www.pfr.pl/en/

stage will have access to repayable funding close to PLN 500 million. Individual investments will be up to PLN 4 million per company[34].

Supportive crowdfunding regulation

Crowdfunding is legal and accessible for most people in Poland but is underdeveloped. There are 25 or more crowdfunding platforms available of all types (donation, lending, equity, reward). They raise raising several million PLN monthly. In 2016 the law on public offerings changed and charity and private online fundraising is now a lot simpler and thus getting more popular. Equity crowdfunding is possible, but with quite low limits or uncomfortable restrictions for online investments, and its use depends on the type of company. Further legal changes came into force in April 2018. Trends include better quality project description and an increase in marketing budgets for crowdfunding campaigns[35]. On the other hand, the pool of crowdfunding investment in Poland is still very small and the crowdfunding route does not offer important advice and networking that can be made available through angel and venture capital investment routes[36].

Public funding for scale-up finance

EU Structural and Investment Funds are being used productively to support the growth of venture capital and stimulate commercial loans to scale-ups. In addition, EU funds though the national "Innovative Economy" operation programme and the Malopolskie Regional Operational Programme constitute a basic source of financing for innovation and entrepreneurship projects in the region[37].

Bottlenecks

Obstacles in access to external funds

Obtaining external funds is a major difficulty for potential scale-ups of all sizes and at all stages of growth. This has been indicated as a major impediment by about half of entrepreneurs in a recent survey in Malopolskie, with newly opened businesses relatively more often affected (60%)[38].

Unfavourable taxation of business angels

Whereas as large Poland-based angel investors can invest in closed investment structures (such as Fizan), this is perceived as a barrier for international investors who come to Poland as parallel investors because of unfavourable tax treatment. Furthermore, smaller domestic business angels have a problem of double taxation of tax relief for investors in innovative companies. The UK's Enterprise Investment Scheme (EIS) and Seed Enterprise Investment Scheme (SEIS) tax relief schemes for investors in small companies are models for encouraging angel investment.

Lack of mid-sized investment amounts

[34] https://www.pfr.pl/en/news/pfr-ventures-launches-pfr-biznest-fiz/

[35] http://cgs.org.pl/en/polish-crowdfunding-landscape/.

[36] https://psik.org.pl/en/.

[37] http://www.pi.gov.pl/eng/chapter_86530.asp.

[38] http://www.rpo.malopolska.pl/download/program-regionalny/o-programie/zapoznaj-sie-z-prawem-i-dokumentami/regional-operational-programme-for-the-malopolska-region-2014-2020/2016/08/RPOWM_EN.pdf.

There is a large amount of financing available for start-ups, with the majority coming from public sources, but there is a finance gap for growth potential innovative businesses between the small amounts available for seed capital and the larger amounts available through venture capital for firms which tends to aim at firms with international activity.

Lack of knowledge on finance sources

Scale-up firms need advice on how to access international sources of funding. One response to this has been work by PFR to provide information, but this is not currently sufficient.

Box 4.5. Scale-Up Financing for Selvita, Krakow

Selvita has undergone a painful process of obtaining finance from business angels and VC. Investors would not back a strictly R&D business enterprise so part of the company was made into a service company. R&D businesses have a high failure rate, so they needed to have a less risky part of the business. For every R&D project the company got a grant which enabled the company to scale up.

Source: OECD interviews with local stakeholders.

Talent and skills

Enablers

Large numbers of skilled graduates

Malopolskie has a high concentration of high-skilled workers generated by its 31 universities and a growing number of scale-ups which in themselves are generating newly skilled employees. There is evidence that skills development for industry is increasingly being addressed by the universities[39]. For example, Krakow University of Economics has about a dozen active business partnerships. The Comarch Competence Academy ran a series of workshops on business intelligence in building market advantage. On the other hand, in general Polish HEIs are not yet very active in co-operation with businesses in skills development.

Bottlenecks

Lack of people with appropriate skills for scale-up

People frequently have technical skills to start a business in a certain technological area but lack business and management skills, such as in general sales or marketing. University education is very theoretical and business education is lacking. Universities need to focus more on providing business skills to graduates and to existing SME managers. The emphasis on Work Integrated Learning at University West, Sweden, is a model.

[39] http://businessinmalopolska.com/public/upload/fck/orange_raport_7(3).pdf.

Box 4.6. Work Integrated Learning, University West, Trollhättanm Sweden

University West, Trollhättan Sweden, is a "regional university". The majority of its students are recruited from within the region. It markets itself as Sweden's leading university for Work Integrated Learning or WIL. This exemplifies the important relationship between the academy and the outside world. WIL is also an area of research and a focus of doctoral degree programmes.

The university is also a specialist hub for production engineering and works closely with local firms. Not only do firms want engineering skills, but they also want pedagogy. The university's role is to broaden the perspectives of innovators in the companies – original ways of thinking and explaining things. Three research areas are given priority at University West: work integrated learning, child and youth studies and production technology.

Engineering and social sciences are the major areas of research at University West. As well as the three priority areas there is also research in the fields of the humanities and nursing and health sciences. Research is mainly focused on producing results that could be of community benefit and much of it is conducted in collaboration with the surrounding community.

Relevance to the Malopolskie region lies in University West's specialist approach to the needs of companies in the region. It provides skills and innovation in collaboration with local businesses.

For further detail see https://www.hv.se/en/.

Difficulties for scale-ups in identifying their skill needs

The results of an OECD study[40] demonstrate that the majority of SMEs are unable to identify employees' requirements for essential skills to be acquired, and in most cases they declare no such needs. Additionally, SMEs rarely see training as a means to obtain benefits for the firm. They are similarly unappreciative of the value that training presents to employees. This attitude of SMEs, alongside the high cost of training indicated as a problem by companies, results in the low involvement of enterprises in improving staff competences. This creates a major barrier to staff development as well as a challenge for regional policy in this field[41].

[40] OECD Leveraging Training Skills Development in SMEs https://www.oecd.org/cfe/leed/47081344.pdf.

41 http://www.rpo.malopolska.pl/download/program-regionalny/o-programie/zapoznaj-sie-z-prawem-i-dokumentami/regional-operational-programme-for-the-malopolska-region-2014-2020/2016/08/RPOWM_EN.pdf.

Box 4.7. Skills Development in No Label, Krakow

No Label is a scale-up that specialises in movie making and videos. It is the largest such firm in Malopolskie and the number two in Poland. It employs 30+ people in Krakow and co-operates with specialist subcontractors, e.g. architects and programmers. To find suitable employees the company is working with a small art school to supply people with 3D graphics skills and colourists. The same kinds of people are used in other industries, e.g. games. There is a lack of this kind of skills development in the general education system.

Source: OECD interviews with local stakeholders.

Insufficiently widespread language skills

Although graduate knowledge of English is high, many entrepreneurs and their employees do not speak English. If entrepreneurs cannot speak good English, then they cannot communicate in business circles, no matter how many trade fairs they attend. Every accelerator should improve language skills so that firms can communicate internationally via emails and meetings. There are many firms in Malopolskie's emerging industry sectors that do not have English language as an option on their websites, so firms are not reaching out to potential non-Polish customers and investors.

Lack of future skills needs analysis for the smart specialisations

The region's smart specialisation strategy has a missing link in terms of identifying how the seven specialisations will develop in their demand for labour. Although there is strong discussion of technology, there is little discussion in the strategy of what skills and qualifications are needed.

New Knowledge

Enablers

Strong regional research base and commercialisation support

There is a strong research base in the region's 31 universities and large firms. At the same time, there is significant support for commercialisation through the "Research and Innovation in Enterprises" measure of the Regional Operational Programme for the Malopolskie Region 2014-20, which supports R&D projects and R&D infrastructure in enterprises and offers Innovation Vouchers for collaboration between enterprises and universities and research centres. The European Commission Peer Review of Poland's Higher Education and Science System (EC, 2017) highlighted as a success a substantial critical mass for R&D commercialisation, strong visibility of the support to the target group, and sufficient budget resources with a long-term perspective. It also highlighted a very good integration of the peer-reviewed measure into the regional support system with strong networking among the stakeholders (e.g. Working Groups for Smart Specialisation).

Furthermore, the recognition of opportunities for technology transfer is well-developed at major universities in the region. For example, Krakow University of Technology's Technology Transfer Centre has an internal infrastructure set up to assess the potential of projects by academics and provide intellectual property support. It uses a technology push model – searching databases for appropriate firms with which to partner. This could be

supplemented by more effective dialogues with firms – e.g. networking events (including events to which corporate entities are invited), targeted at introducing academics to local companies.

Another possibility for scale-ups to work with universities is the BRIdge Alfa proof of concept programme. Target areas are high-tech projects in the ICT, life sciences, cleantech and energy sectors. Funding can be provided of up to EUR 28 000 per technology for services by external providers, such as lab tests, over six months to gain innovativeness and raise market maturity. University technology transfer offices and special purpose companies can use the resources to invest in R&D teams and then approach business angels for finance. However, more can be done in this area by setting specific university investment vehicles for commercialisation. For example, Oxford University has set up Oxford Sciences Innovation Fund, which sits alongside its TTO, Oxford University Innovation. Investors come from a wide range of organisations including the Oman Investment Fund.

The Technion Centre in Israel offers a model for support to scale-up firms by promoting innovation networking and better innovation management within the firm.

Box 4.8. Israeli Knowledge Centre for Innovation (Technion)

Technion has identified the two main challenges for scale-ups as: i) learning to co-operate with competitors to become internationally competitive and ii) learning to manage the innovation process. To address these two challenges, the Israeli government has set up two specific programmes: "Magnet" and "Moving up". The first is a programme that promotes both co-operation among competitors and closer relationships between industry and university. The key principle of the scheme is that participant companies use the same intellectual property to develop different prototype products in collaboration with university departments. The second is a small-scale initiative that helps fast-growing firms manage the process of innovation through a series of monthly meetings. The meetings can take the form of front lectures, case studies, business advice from mentors or action learning. The subject may involve setting a business innovation strategy, change in management and leadership, building teamwork, strategic human resources management, innovation in a global world, etc. Dr Arbel of Technion reported the three main bottom-up tools to strengthen leadership and management skills in scale-ups as : i) training and education programmes for innovation management; ii) mentoring by leading entrepreneurs and CEOs; iii) inter-firm co-operation, especially in the field of R&D and technological innovation.

Relevance to the Malopolskie region is that it is a university-based initiative (Technion University, Faculty of Industrial Engineering and Management) designed to support scale-up firms.

For further detail see http://innovation.technion.ac.il/default.asp?lang=eng.

Bottlenecks:

Lack of involvement of students in commercialisation

One of the tensions involved in the commercialisation of academic research is that research teams also need to publish and undertake constant research for their own career advancement as well as for societal benefit. In this context the student body and early career

researchers potentially have a key role to play in transferring technology to scale-ups. However, only 6 of the 31 universities in Krakow are involved in the student academic/start-up programme. The UK's Knowledge Transfer Partnerships programme offers a potential model for supporting student involvement in innovation in scale-up firms.

Box 4.9. The UK's Knowledge Transfer Partnerships scheme

The Knowledge Transfer Partnership (KTP) scheme has been helping businesses for the past 40 years to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK knowledge base. A KTP serves to meet a core strategic need and to identify innovative solutions to help the business grow. A KTP often delivers significant increased profitability for business partners as a direct result of the partnership through improved quality and operations, increased sales and access to new markets. Social enterprises also see improved results.

The academic or research organisation partner will help to recruit a suitable graduate, known as an Associate. It will then act as the employer of the graduate, who then works at the company for the duration.

The relevance to the Malopolskie region lies in its proven effectiveness in transferring technology from universities into firms. This is one of the weaknesses in the Malopolskie region. It also provides benefits to the academic partners as well as to the graduate.

For further detail see http://ktp.innovateuk.org/.

Reliance on EU funding for commercialisation

The majority of the support for research commercialisation in Malopolskie is dependent on EU structural and investment funds. As identified by EC (2017) it will important in the future to find new ways of financing regional innovation policy and introduce more non-financial policy instruments to encourage commercialisation in anticipation of future reductions in EU funding to the region[42]. Indeed, even though there is significant support for links between universities and scale-up firms through Innovation Vouchers, BRIdge Alpha and the KTC programme for example, the scale of support could be usefully increased.

[42] https://www.interregeurope.eu/innobridge/news/news-article/632/innobridge-peer-review-malopolska-region-poland/.

Box 4.10. Estimote

An example of a scale-up from two Krakow universities is Estimote, Inc. a technology start-up building a sensor-based analytics and engagement platform. Estimote, Inc. was founded in 2012 by Jakub Krzych and Łukasz Kostka, internet entrepreneurs with a strong technology and product background. The former is a Jagiellonian University alumnus with an MSc degree in applied computer science and a BSc in computational physics, and the latter graduated from AGH University of Science and Technology and has an MSc degrees in computer science in control and management and, right after graduation, started his PhD research on Smart Cities.

Source and for further detail: https://estimote.com/about/.

Business services

Enablers

Availability of business advice for scale-ups on accelerators

The presence of accelerators offering mentoring and business advice provides a focus for identifying what kinds of firms are scaling up and can scale up.

Availability of management training

The Krakow Chamber of Commerce organises training events on exports, VAT, innovation and how to co-operate with science institutions. It uses experts to deliver training which is open to all businesses and not just members of the Chamber. The Chamber is involved in the European Innovation Network and awards programmes.

Bottlenecks

Lack of mentoring and management team development outside of accelerators

There is limited support for developing management teams (through training and recruitment) outside of the accelerators. At the same time, many of the region's growing firms have not been through the accelerator programmes. The Krakow Technology Park accelerator programme provides mentoring, but only 11 firms were in the first cohort and few of these were from within the region. The new accelerator programme that started in late 2017 needs monitoring. Targets should include a greater emphasis on advice for exporting and on women entrepreneurs. However, existing technology promotion measures are unlikely to be sufficient since many scale-ups are found in non-high-tech sectors (Wennberg 2013, Autio 2013). A model is how Scottish Enterprise supports the development of leadership competences.

Box 4.11. Companies of Scale Programme, Scottish Enterprise, United Kingdom

Scottish Enterprise, the regional development agency for Scotland, operates the Companies of Scale programme with the aim of stimulating and supporting the growth of scale-up enterprises in Scotland. The programme places particular on the development of leadership skills in high-growth firms in recognition of the crucial role of entrepreneurial ambition and leadership competences in the achievement of high growth. The programme supports the development of leadership competences through a combination of activities including training, executive education programmes, business advice and coaching, peer learning, etc.

Scottish Enterprise works with 2 000 firms in Scotland through an account management system. Some of the most promising firms in the system are selected into "Companies of Scale", a highly selective and intensive programme. Only firms with a turnover above GBP 10 million (EUR 11.2 million) and with the ambition to become GBP 100 million+ (EUR 112 million+) businesses are eligible to enter into the programme. A common objective of the programme is then to help participant firms to go international or to strengthen their presence in international markets.

The way that the firms are selected into the programme is highly qualitative and revolves around the concept of "trigger points". Trigger points are those moments in the lifecycle of a business which are more likely than others to generate turnover and employment growth. They encompass ownership changes (e.g. management buyouts), new product development or entry into a new market. Potential participants are therefore approached by Scottish Enterprise when there is evidence that they will shortly navigate key growth triggers raising specific challenges that may require assistance.

The key services that high growth firms are offered are:

- structured leadership development for the entire management team and not simply for the main business owner;
- strategy management, especially with respect to business internationalisation; and
- peer learning based on the sharing of experiences by entrepreneurs from different sectors.

An example of how policy can influence firm growth by supporting leadership is the case of business internationalisation. The Companies of Scale programme has often helped fast-growing entrepreneurs enter into new markets that they had not thought about in ways that they had not thought about (e.g. joint ventures, partnerships and even mergers rather than more traditional exporting). Influencing leadership and management skills also has an impact on how companies react to the transformational points or trigger points they experience.

For further detail see https://www.scottish-enterprise.com/services/support-for-entrepreneurs/high-growth-venture-support/overview.

Entrepreneurship culture

Bottlenecks

Lack of ambition

One explanation given to us for why there are so few companies in the third category of scale-ups (constrained firms with ambition to grow) concerns a lack of ambition. This is mentioned by the founder of Codewise (see Box 4.1). Further anecdotal evidence is provided by a blog by the Startup Yard, a seed accelerator. This commented that:

"It's a cliché among start-ups and investors in the CEE region that Polish start-ups lack urgency. There are many cases in which that just isn't true, but I have to say, having visited Poland many times in search of start-up founders with global ambitions, the stereotype is rooted in some truth. Polish companies can be too inwards looking. Polish companies have access to the whole Polish market, which is four times the size of the Czech market, and growing quickly. But Polish start-ups can and do focus on the Polish market, and do reasonably well"[43].

As shown by the OECD/European Commission HEInnovate review of Poland, HEIs in Poland in general are starting to play an important role in promoting entrepreneurship education and culture among university graduates, leading to the stimulation of more entrepreneurial mindsets among young people, however there is more to be done in supporting students with business ideas more intensively with mentoring and coaching opportunities and support with accessing finance, and entrepreneurship education could be spread more widely across HEI subject areas, as well as to lower levels of education (OECD/European Union, 2017).

The role of clusters in supporting scale-ups

Malopolskie hosts ten clusters, which do not completely map on to the RIS3 smart specialisation themes. They could be important in stimulating networking and collaboration between firms in the cluster. However, one of the problems they face is funding: since the 2017-13 EU programming period they have been excluded from regional funding for their basic operations and only provided with soft support – for example from public private partnerships which support sectoral collaboration. Examples are now given of the challenges facing cluster organisations and scale-up firms in two main clusters in the Krakow Technology Park. These are illustrative of general issues relating to scale-ups, particularly those in the early stages of growth.

Life Sciences Cluster

The Life Sciences Cluster Krakow (FKLSK) relates to one of the seven smart specialisation themes in Malopolskie. Its governing foundation directly addresses goals included in the Regional Innovation Strategy and is a key national cluster. The cluster can rely on a strong science base and human capital for life sciences in the region. Many university departments and private companies carry out R&D, mainly in the areas of biotechnology, pharmacy, medicine, and IT. In addition, many universities conduct teaching in life sciences, e.g. Jagiellonian University, Krakow University of Technology, the AGH University of Science and Technology and the Agricultural University.

[43] Source of quote: http://startupyard.com/is-the-polish-government-drowning-its-innovators-in-money/.

The FKLSK is based in the Krakow Technology Park. Its mission is: "To create and sustain "The LifeScience Network" to enable effective global connectivity and the optimisation of existing potential of individuals and organisations; support innovation and encourage effective commercialisation of research results in the Life Sciences; and develop resources and competences in the life sciences sector in order to effectively explore existing and future opportunities related to the development of a knowledge-based economy"[44]. The initiative is formed as a common project, managed and administered by the Jagiellonian Centre of Innovation Ltd.,one of its founding members. Data provided by FKLSK shows that more than 70 entities operate in FKLSK – encompassing SMEs (47%), other public institutions (31%) and large enterprises (18%).

Networking is part of the FKLSK strategy. The Life Science Open Space is designed to create opportunities for firms to improve their access to partners, hire an expert, collaborators or resolve an issue, for example. The model for this activity is the UK organisation OBN[45], formerly known as Oxfordshire Bioscience network. FKLSK considers this as the best example in Europe of how to provide services to members, have direct contact with its CEO and foster and support SMEs participating in the annual BioTrinity Conference[46]. FKLSK is outward looking, for example, by being represented at the 6th Central European Congress of Life Science – Eurobiotech 2017 in Krakow, September 2017.

FKLSK understands that the growth of the region (as regards the life sciences sector) will depend on start-ups which are able to scale up. The best example and success story is Selvita, established in 2007 (see Box 4.2). Therefore, the strategy of the cluster initiative is to actively stimulate start-ups. However, FKLSK's direct capacity is limited to promotion and education. "All we can do is to collaborate with those agencies and organisations which directly provide services to start-ups and SMEs and integrate or co-ordinate these services along the value chain".

There will be several new venture capital (VC) organisations established and supported with public funds (under the BRIdge Alfa programme). They will focus on the life sciences sector, and FKLSK will engage with all of them, streaming information about investment opportunities and supporting inventors looking for funds. The long-term plan is to develop its own capacity aimed at increasing the value of the projects (inventions) along the development stages. FKLSK believes that scale-ups are likely to emerge in the sector – following from the seed funding, but also believes that further nurturing of the start-ups is necessary in order to increase the survival and scale-up rate. There is, however, a lack of strategic integration of such support at regional level and there needs to be additional effort to co-ordinate activities in the life sciences field.

FKLSK is involved in several initiatives designed to support scale-ups. Two are now highlighted. First, in 2015 French company Markets & Listing, a field operator, and FKLSK signed a collaborative agreement to accelerate the international development of Polish companies with scale up potential in the life sciences and healthcare sectors. The company has been a close observer as well as a participant in the FKLSK since 2009 as part of under the European Bioct project (2009-11). The agreement formalised assisting FKLSK with teaching/training and advising on projects and companies. In 2012, the

[44] Source of quote: https://lifescience.pl/en/about-klaster-lifescience

[45] http://obn.org.uk/.

[46] https://www.biotrinity.com/.

company ran a two-week intensive training course on biotech companies in France exclusively dedicated to 10-12 people from the FKLSK and the Jagiellonian University. In 2014, a few advanced students were hosted by Markets & Listing in Paris to train them in the areas of biotech company development.

Between 2011 and 2017, Markets & Listing participated as experts for the evaluation of projects/companies for FKLSK and Jagiellonian University and as speakers. They identified a number of bottlenecks faced by FKLSK. These are based on the company's experience with incubators, clusters and companies in other European regions. They are intellectual property (IP) creation; access to stock markets; the need for public investment to leverage private investment; respecting strategic priorities; aligning and staffing incubators and clusters with academic institutions and the need to train and coach local advisors[47]. These issues are discussed below:

Intellectual property (IP)

The key importance of having solid IP does not seem to be in the minds and agenda of Polish students, researchers and entrepreneurs – the central place of IP in the core value of the future company is not properly recognised. It has been suggested that university Technology Transfer Offices (TTOs) currently interfere too much in dealings between entrepreneurs and their potential investors, introducing an additional layer of complexity into negotiations on IP assets and therefore on company creation.

Accessing the stock market

In spite of the success of Selvita, the stock market is not the target of most projects/companies in the region. Investors (angels, VCs and others) invest only if there is a chance to get a proper return and access to liquidity in the future. Facilitating and incentivising access to the stock market will boost private equity investment which will in turn boost company/economic development.

In the case of Poland, the obvious stock market is the Warsaw Stock Exchange (WSA). However, Polish policy makers need to make efforts in two directions: (i) top down, to create conditions for the local stock market to understand, welcome and properly value the incoming innovative technology companies and (ii) bottom up, (by regulations, incentives, education, creating the ecosystem) to pave the way for innovative Polish companies to access the listing opportunities elsewhere, for example at the Alternative Investment Market of the London Stock Exchange.

Public investment to leverage private investment

Finding suitable private investment for biotech-medtech start-ups is still difficult in Poland. Several factors are involved. Although some public sources of finance exist, they are quite limited in size and are not enough to mobilise the required amount of money needed to support the development of the biotech-medtech industry.

Strategic priorities at the regional and national levels

Forces have to be channelled in the desired directions. In the biotech sector, neither value nor economic development are created to the same extent by each of the innumerable

[47] Vega 21 September 2017.

business models or offers (type of products, products, services) found in the biotech-medtech industry. If the target is to promote the economic development of the region/country through positive moves and policies in the life sciences sector, the emphasis must be on the places that create the most value. Well-defined and well-informed strategic priorities should be set and effective and applicable instruments should be defined and implemented to orient, align, favour and promote private initiatives (brains, time and money) in order to go in the desired direction.

Incubators and clusters

In spite of appearances, there seems to be a function misconnection (gap, misalignment) between incubators/clusters and the upstream sources of projects (universities, research institutes). It is as if the incubators/clusters have their own objectives rather than (i) boosting the flow of projects/companies sourced from academic institutions; or (ii) helping, advising and guiding start-ups (to obtain financing or to define their business models, plans etc.).

FKLSK is a model cluster in the country. It has been successful in creating links with academic institutions as well as in attracting well-established Polish companies to the cluster. Incubators/clusters are quite well marketed. They are visible and located in modern, large and well-connected premises. However, these premises tend not to contain novel, innovative projects and companies. Furthermore, the language and concepts used by staff of incubators/clusters do not seem to match those used by company creators/entrepreneurs.

Training and coaching of local advisors

The history of the movement to promote and facilitate the training and education of those directly involved in day-to-day work with entrepreneurs (such as clusters and incubators) is quite recent in Poland. With a few exceptions, there has not yet been enough time to close the circle of the generation of entrepreneurs and companies that will feedback and enrich the next cycle. Although it is growing, the overall experience is very limited with regard to many aspects relevant to biotech-medtech company creation and development.

Digital Entertainment Cluster (DEC)

The Digital Entertainment Cluster (DEC) was initiated in March 2013. Its main mission is to support the games market. Like FKLSK, DEC has become a nationwide initiative and is one of the most important projects related to the digital entertainment sector in Poland. By September 2017, some 22 companies were listed on the website. Of these, 13 are based in Krakow or have a Krakow connection while others are based outside Malopolskie, for example in Warsaw and Katowice. Some of the cluster members are local scale-ups. These include EVERYDAY iPlay which was founded in 2012 and has 20 employees, GRY-Online S.A which was founded in 2000, and the oldest, Onet.pl Group which was founded in 1996. GRY-Online and Onet.pl are both media outlets but one of them is dedicated strictly to games and the other also devotes a special part of their website to games. However, both are also part of large international media publishers – Axel Ringier Springer and Webedia respectively.

Incuvo, Serious Impact, Duckie Deck, Vrizzmo, Anshar Studios, 11 Bit Studios, Ars Thanea, Onet.pl Group and World-Loom are the newest members. An example of a young, local scale-up in the cluster is GameDesire.

Box 4.12. GameDesire

This is a company experienced in the development of computer games. The company was founded in August 2014 and now employs around 80 people. Members of the team, however, have significant experience in casual game development. The company is focused on making casual games: Hidden Object Puzzle Adventures, Time Management games, VR adventures and mobile apps.

The firm emphasises the commitment and passion of staff for the work being undertaken. It plans to continue development of this kind of casual entertainment, but is also exploring new areas – lately there is a growing interest in Virtual Reality technology.

Source and for further detail: https://www.gamedesire.com/.

The companies frequently change strategies. For example, EVERYDAY iPlay is no longer involved in video games but makes board games. This is a characteristic of small game developers; the landscape changes rapidly. An example is Dardanele Studio, which has grown through a strategy of being customer focused by providing unique products and attaching considerable importance to project management. This means that working closely with customers results in a shorter design process and reduces the possibility of mistakes. The company's skill set reflects its need to deliver innovative projects. This company illustrates how companies have to adapt their working practices to meet the needs of the market in order to achieve growth and retain creative staff by providing a stimulating environment. This was not an isolated case and is an exemplar of a business model that works in the face of stiff competition.

Box 4.13. Dardanele Studio

"We specialise in 2D animation and create advanced multimedia products, cartoons, business animations, educational games and applications, i.e. any project in which graphics and animations play a key role. We have more than ten years of market experience. Our philosophy of doing business is rooted in building long-term relations with customers. We make co-operation with Dardanele Studio effective, pleasant and profitable for both sides."

Dardanele is a creative team that comprises: illustrators, animators, visual communication and UI designers, scriptwriters, programmers, and sound technicians.

Source and for further detail: www.dardanele.com

The basic tasks of DEC include organising co-operation between Polish businesses, enhancing the potential of the Polish sector at foreign fairs, and supporting businesses to obtain financing for participation in these fairs. Following the principle that "size does matter", DEC significantly leverages the promotion of Polish businesses at international events. Additionally, DEC supports the process of acquiring foreign business partners for Polish companies from the sector. It is a development initiative of Polish companies in movies, art, video games and other digital entertainment areas.

The cluster has been developing international relations co-operating with various accelerators, incubators, training programmes and funds to define best practices in supporting a regional digital games industry. Cluster members have attended many international conferences and DEC has been present at many local events dedicated to the game industry, technology and start-up community.

In 2016, the DEC cluster conducted a SWOT analysis of 24 companies (mainly scalue-ups in the constrained but ambitious category).

The main strengths were:

- Strong market position – recognisability of Polish developers, easy access to the international market, know-how, games portfolio.
- Human resources – qualified and experienced company employees, strong co-operation between companies, exchange of knowledge among entities (companies, universities, institutions, etc.).
- Experience in building and delivering innovative products.
- Variety of services, products – many engines, technologies, and game genres.
- Wide range of high-quality products.

The main weaknesses were:

- Lack of awareness of own needs.
- Lack of investment funding.
- Insufficient funds to participate in fairs necessary for visibility.
- Lack of recognition of the cluster brand internationally.
- High churn of companies in a cluster.
- Poor information flow and communication.

DEC co-operates with the Malopolskie regional government on a daily basis on various projects including those related to the game industry, so it continuously provides feedback regarding support to the game industry. The cluster is currently starting a project, Baltic Game Industry, with the regional government as an associated partner, where there will be an attempt to identify good practices for supporting the game industry in the region.

A very important potential related cluster area is cyber security. Krakow has great scientific potential thanks to HEIs and systemic systems of cyber security developed by Krakow organisations in a cyber security hub. However, it needs more commitment from central government, which commissioned a report on this through the Ministry of Digital Affairs[48]. Large companies such as Cisco are interested, and SMEs want to hold a potential co-operation meeting with all technical universities and big companies. Skills and assets include very good IT courses and institutes. The key drivers are people with a Masters degree and above, some of whom are professors who have in the past developed cyber security systems for the state. This would build on a strength in the region but a push is required to realise the potential.

[48] https://cyberwiser.eu/Poland-pl.

Recommendations

There are firms in each category of scale-up in different sectors in Malopolskie, but the overall volume of firms in each category is low. The key categories of scale-up require specific support tailored to their specific needs:

Established scale-up firms need support for:

- Advanced management and leadership skills, which could be provided by the region's universities in collaboration with the private sector.
- Advanced financing, especially in high-risk sectors such as life sciences.
- Publicity from regional government to reinforce their international profile.

Firms newly exhibiting fast growth need support for:

- Support for internationalisation of business activity, e.g. exporting, branding and travelling to attend international conferences and trade fairs.
- Management skills, including leadership skills. This requires better training for those delivering mentoring and training.
- Follow-on finance, using public funds to leverage private investments larger than seed funding especially in risky sectors.
- Development of skills to access university intellectual property, which requires universities to be more professional in protecting intellectual property and working with small firms on gaining access, for example through the proof of concept programme.
- Support for networking.
- Help in accessing NewConnect and the Warsaw Stock Exchange (WSA).

Potential scale-up firms with ambition need:

- Accurate analysis of business potential, clarifying the challenges at hand; subsequent business advice on developing their business models; and understanding the skillsets needed to them to develop, especially management skills.
- Understanding of the process for generating innovative ideas and selecting an appropriate methodology to develop them.
- Assessment of strength of their existing skillset and where there are gaps.
- Appropriate early-stage funding.
- Access to internal skills development and recruitment of skilled employees.
- Support and guidance in networking.
- Better information, mentoring and support from incubators for firms within and outside the incubator.
- International activity and branding.
- Support for communication and knowledge flows including English language teaching. Websites need to have the option of being translated into English in order to reach worldwide markets and investors.

In addition, bottlenecks in the region related to finance, skills, internationalisation of activity and networking need to be addressed for all types of scale-ups. Recommendations to better exploit the enablers and address the bottlenecks are given below.

Box 4.14. Recommendations for scale-ups

Entrepreneurship and smart specialisation policy

1. There should be better integration of policy measures for the creation of start-ups and support for scale-ups. Documents for Malopolskie's European Entrepreneurial Region 2016 application should be used as a basis for a regional innovation strategy that encompasses entrepreneurship and provides a single point of contact for companies wishing to scale up. (Regional)

Networks

2. Better use should be made of the existing cluster organisations for supporting networking between scale-ups and potential scale-ups and other firms and organisations. This will require ensuring that cluster organisations are properly staffed and financed and that they seek to create connections among firms, including with sources of potential scale-ups in academia. (Regional)
3. A research and acceleration programme that matches start-up firms with large companies should be introduced. (Regional)

Leadership

4. There is a need for high-level meetings to agree objectives and targets for entrepreneurship development and identify key actors to champion those actions. A single kickoff meeting bringing the key players together would impart impetus. (Regional)

Finance

5. Policy makers should create and implement suitable public financial instruments to support the early development of scale-ups in emerging industries, including biomedical companies. Such instruments should be used to prime and leverage co-investment from private sources. (Regional and national)
6. A review of the financial instruments available to scale-ups should also be undertaken. Clearly some forms of funding are not currently working well enough, for example business angel finance and crowdfunding. Specific tasks include a review of the legislative framework in Poland, and other measures such as tax relief to encourage investors. (National and regional)

Talent and skills

7. A multi-stakeholder skills needs assessment body including SMEs, large regional employers and universities should be established and tasked with undertaking and updating current and future skills needs assessments for scale-ups, including the detailed needs of the smart specialisations. Responses to the skills needs assessment should include tools for continuing professional development. (Regional)
8. Teach and reinforce English in incubators and accelerators. (Regional)

New knowledge

9. Universities should be encouraged to increase their innovation networking and innovation management support for businesses. The Israeli Technion Centre is a model – see Box 4.8. (Regional)
10. Universities should be encouraged to seek external funding for an investment fund in university spin-out enterprises, which would sit alongside the Technology Transfer Office (TTO). (Regional and national)
11. Support for student and academic scale-ups could be through subsidised short-term or longer-term internships or fellowships in firms. The UK's Knowledge Transfer Partnerships scheme is a model – see Box 4.9. (Regional and national)
12. Measures should be taken to: (i) make the community aware of the key role of intellectual property (IP) in value creation; (ii) set proper rules to streamline the roles of universities, institutes and TTOs in their dealings with licensees and investors that involve IP and align their objectives with the goal of creating value by company creation and growth; (iii) persuade academic institutions to identify and protect IP early enough and their TTOs to manage this effectively; and (iv) ensure that university activities are well-aligned with those of incubators/clusters. (Regional and national)

Business services

13. An online register of mentors for scale-ups should be made available. They should provide individualised support targeting specific scale-up company needs, based on an accurate analysis of business potential, and clarifying the challenges at hand. Measures should also enable the collaboration of locals with professionals from abroad. (Regional)
14. Increase support for strategic leadership capabilities (examples include board mentoring and initiatives for the development of future vision – e.g. market and technology foresight); networking activities designed to enhance learning from peers and industry leaders; strategic planning and monitoring capabilities (examples include the transfer of non-executive directors to scale-ups); and instrumental and task-execution capabilities (examples include the transfer of experienced managers to the new venture and hands-on management consulting activities). The Scottish Enterprise Companies of Scale programme is a model for leadership training and mentoring support – see Box 4.11 (Regional and national)
15. Involve universities more in management support and training. Focus the Innovation Vouchers especially on scale-ups. (Regional and national)
16. Improve training for those delivering mentoring and training. (Regional and national)

Entrepreneurship culture

17. Role models of existing regional scale-ups (e.g. OneLabel, Selvita and Estimote) should be publicised to raise the aspiration level of potential scale-ups, using the media to promote success stories. (Regional)

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5. Large enterprises in the local entrepreneurship ecosystem

Malopolskie has attracted significant foreign direct investment and hosts several domestic large firms, but the basis of the activity has largely been cost driven rather than innovation based. This chapter looks at actions needed for the upgrading of this large enterprise activity and its greater embedding in the regional entrepreneurship ecosystem.

Profile of large enterprises in Malopolskie

Large businesses, both multinational and domestic, are important drivers of economic growth and industrial diversification in Malopolskie, which both pursue entrepreneurial and innovative activities themselves and help shape the conditions of the entrepreneurship ecosystem through their engagement with start-ups, scale-ups and SMEs and other organisations in entrepreneurship and innovation.

Large enterprises have come to recognise the importance of diverse "corporate entrepreneurship" activities for their own growth, as a catalyst for identifying and creating opportunities that might otherwise not be associated with larger firms (Zahra and Garvis, 2000). This shift is characterised by harnessing the entrepreneurial capabilities of employees as well as developing more open innovation models.

Large enterprises also have the capacity to shape significantly those regions in which they locate as "anchor institutions" in the local entrepreneurship ecosystem, generating externalities by their presence. A central challenge facing entrepreneurship ecosystems is to ensure that there is a productive and symbiotic relationship between components, whereby the sum is greater than that of its parts. The focus of this chapter specifically considers how large firms can both benefit from and contribute to the entrepreneurship ecosystem, thereby driving economic growth, industrial diversification and smart specialisation.

Historically, the large enterprises in the region sat within the Soviet command economies and were centred on large metallurgy and steel plants including precision cutting and tool equipment production. These industries still remain a meaningful component of the regional economy, with companies such as ArcelorMittal producing cutting-edge technologies such as the hot strip mill alongside large-scale investments in steel production. For example, ArcelorMittal has adopted a central role in the local entrepreneurship ecosystem through its integration in entrepreneurship and innovation-led projects, working closely with universities and smaller companies to maintain its competitive advantage and tap into the existing skilled human capital within the region. However, the role within the entrepreneurship ecosystem of many of the large steel and metallurgy plants is as large employers of skilled steel specialists who can maintain and operate machinery and apply technical skills rather than as anchors of entrepreneurship activity.

Another key driver of economic activity in the region is foreign direct investment (FDI). Malopolskie is particularly strong in the Business Process Outsourcing (BPO)/Shared Service Centres (SSC) sector and has attracted FDI operations which have sought to capitalise on the large number of universities in the region, which provide linguistically proficient and technically skilled workers. This trend of supporting BPO/SSC operations as a form of inward investment began in the 1990s, as cheaper labour and the proximity to Western Europe allowed larger enterprises to become attractive propositions to foreign companies looking to outsource "back office functions". However, the extent to which such functions are providing value-adding activities and supporting growth-oriented industries is debateable. CapGemini is the largest employer in the Polish BPO/SSC sector and this story of large technology companies locating "back office" functions in the region is continued by other companies including IBM, which employs 1 600 employees, Shell Business Service Centre, which employs more than 1 500 people, and Phillip Morris International Service Center Europe, whose 1 000 employees provide services in finance, human resources and IT in 25 European countries (Business in the Malopolskie Region, 2016). Increasing the innovative nature of the large enterprise operations in these sectors is

an important challenge that can occur in particular through upskilling of these jobs and attracting further inward investment in higher value-added parts of the value chain.

The energy sector is also a major element of the regional economy. BP Polska, PHU Energokrak sp. zo.o., and Orlen Oil sp. zo.o. are some of the largest industrial corporations in the region. Sustainable energy forms an important sector for the regional smart specialisation strategy.

As environmental pressures increase, finding innovative solutions to pressing global concerns is an important rationale for entrepreneurship activities that Malopolskie can also be involved in in areas such as clean technologies, sustainable agricultural practices, and innovations in transportation and logistics. Polish companies working in these sectors are best placed to provide relevant and timely contributions to global value chains and be at the forefront of technological development.

The creative industries sector is also blossoming in the region. The successes of smaller enterprises in this field have signalled a value-adding activity that has connected Malopolskie companies to global markets. This has included work on television and movie graphic presentations and the successful development of projects within the computer and video games industry. The industrial profile for these companies is largely comprised of small and medium-sized enterprises (SMEs), but they demonstrate the high-tech and digital capabilities of workers in the region. This skills base represents a significant opportunity for larger businesses looking to upgrade their operations, with such skills a key factor for businesses in deciding on the location of investment in all but the most basic industries.

These industries provide a base for the further development of entrepreneurship and innovation in Malopolskie driven by and involving large enterprises. The development of the Krakow Technology Park is a notable flagship of entrepreneurial activity within larger enterprises. It is a joint-venture of the State Treasury, City of Krakow municipality, MARR, Jagiellonian University and the Technical University of Kraków, alongside AGH University of Science and Technology and ArcelorMittal Steel (EC, 2017). The Technology Park aims to provide and support research institutions and innovative companies that are seeking the development of new technological solutions for large firm partners. This business environment includes consultancy services, financial advice and pathways for commercialisation.

As a result of the greater industrial collaboration between large enterprises, regional and municipal agencies and universities, R&D activity in Krakow has begun to bear fruit in terms of innovation activity. Large companies in the region recorded the highest innovation sales (11.1% in 2012) and the region features many prominent large companies involved in innovative activities (Krupa, 2013). These include companies such as ABB and Motorola, which have given the region, and Krakow in particular, a high level of R&D activity.

Challenges and opportunities in integrating large enterprises in the entrepreneurship ecosystem

Human capital and skills

Anchor institutions are those which play a prominent role within a regional economy and act as important stakeholders in economic activities. These institutions tend to remain embedded in a region and are usually large in size. Whilst many anchor institutions tend to be not-for-profit, private businesses can still assume the role of facilitating economic

growth through their extended networks, the critical mass of resources and capital, and the core capabilities that they harness. Bringing these assets together can provide significant benefits to a regional economy, in particular by supporting the development of human capital in growing industries and supporting innovation within the ecosystem (Culkin, 2016).

However, it is also the case that the broader human capital of the region cannot be developed on one site or through one large company alone. This is where the concept of anchor institutions as levers for unlocking the potential of human capital can provide a useful lens for regional economic development. Larger institutions can enable the further retention and development of human capital in the dual roles of catalysts and facilitators.

As catalysts, the larger enterprises can have a strong policy voice in the development of skills for key sectors. They can also act as regional flagships to attract further inward investment by organisations looking to tap into the talent available in the region.

In their role as facilitators, large enterprises can also work prominently in co-developing skills development programmes with universities or offering close collaboration through placements and internships to encourage graduate employment in higher-value jobs. The large number of universities in Malopolskie relative to other regions in Poland and Central and Eastern Europe provides the region with an important pathway for talented and skilled workers to enter value-adding and growing industries. This in turn can help to redirect skilled graduates from the back-office functions of business support services into employment with greater opportunities for career development and innovative productivity.

A larger graduate base within a population is positively associated with more science and higher-skilled jobs (Venhorst, 2017). However, there is a perception by some in the large business community that the universities are outdated and that they used old-fashioned methods not suitable for enabling entrepreneurial behaviour or producing graduates ready for current demands. Whilst higher education curricula must not slavishly follow business needs, it is important that open channels of communication are established between higher education institutions (HEIs) and larger enterprises so that both are aware of the opportunities and support that can flow between these parties.

Human capital flows depend on a combination of labour market characteristics and regional knowledge endowments (Faggian and McCann, 2008). Whilst the provision of universities and a strong educational system can increase the quality of human capital within a region, if there are no supportive private enterprises with sustained regional presence and reputation, there is little chance of this labour being directed into areas of high productivity. Firms tend to locate in regions where human capital is highly concentrated as a means to leverage competitive advantages. The institutional arrangements that enable large enterprises to capture and nurture the human capital in Malopolskie should be a primary policy consideration. In particular, the mechanisms by which large enterprises connect and sustain relationships with entrepreneurs through spaces of co-production and collaboration need to be considered as important policy points.

There is no apparent trend for entrepreneurs working in highly successful small businesses, particularly in the digital technology sector, to move to larger companies. Entrepreneurship in this sense is seen by regional stakeholders as an activity performed in silos away from the innovative activity of large enterprises. This is unhealthy for creating an open and local entrepreneurship ecosystem that can support knowledge exchange. Encouraging a reciprocal relationship between SMEs and entrepreneurs and the innovative activities of

larger enterprises is one step in creating a culture of trust and opportunity that can service the needs of both stakeholders.

Human capital is an important aspect of the regional economy's capacities and capabilities to succeed in achieving its economic growth plans. At the centre of each of the smart specialisations is the need to harness the skills of talented graduates and skilled workers who can drive the industries that form a central function in Malopolskie's economy. Overcoming barriers to trust and engagement between different sectors and institutions should be at the centre of future plans to develop the pathways necessary to direct human capital into the most productive and value-adding activities of the regional economy.

Nature of work

Despite the highly qualified workforce in Malopolskie, there is little evidence that these skills are being fully utilised in the workplace. The extent to which workers and employees are able to use their education and skills in the workplace matters, because higher incomes are associated with more highly skilled work. Moreover, higher-skilled work also tends to be associated with higher levels of productivity. This is a challenge in Poland, and in Malopolskie in particular, which has so far seen high levels of growth that are built on the offshoring of services and the location of manufacture by multinationals based on the cost of labour as opposed to capabilities.

In those sectors where there is an emphasis on "routinized" work, whether manufacturing or service-based, little autonomy or discretion is required of employees. This work is likely to be based in Malopolskie, to a greater or lesser extent, on the basis of cost, which is less likely to be a competitive advantage of the region in the future. In Malopolskie there are examples of smart specialisation sectors that exhibit characteristics of more routinized work; the challenge is how these types of jobs can be upgraded to reflect the capabilities of employees as opposed to the current deskilling of employees.

This is not to say that the BPO/SSC sector itself cannot be further enhanced to support and leverage the human capital in the region. Indeed the sector is already beginning to upgrade to more complex processes. Routinised work is increasingly transferred to other countries such as India and replaced by the design of processes and other more complex work. These trends should be encouraged. There are over 70 000 people now employed in this area. The sector should be seen as a developmental opportunity in which to upskill current workers into new areas of ICT development and attract more advanced functions from international companies. This will, in turn, complement the already strong presence of Krakow in the broader Polish economy as a cultural and international centre by attracting more skilled workers to Malopolskie from other Polish regions and from abroad. Harnessing companies which are strategically invested in the region is an important function of the regional economy stakeholders. A model is offered by BPeSA, which provides an example of how a government-sponsored intermediary can develop a skills strategy to develop the BPO sector in collaboration with FDI.

Box 5.1. Upskilling jobs and upgrading work – BPeSA, South Africa

Business Process Enabling South Africa (BPeSA) serves as an important intermediary in South Africa in promoting and developing the BPO sector. There are 32 500 jobs in the BPO sector in South Africa with the majority of these jobs in the Western Cape region. During 2016, the total number of jobs was increased by 85%, with 71% of these jobs as a result of international investment.[1] The main objective for BPeSA is job creation through the advocacy of the BPO sector. Its stated rationale for this is "raising awareness of the industry's potential internationally, thereby assisting in attracting new investments. It achieves this by helping to create an enabling environment for investments to thrive and grow – developing the skills base, supporting SMEs, and providing linkages to national and regional government, ensuring the implementation of pro-growth policies."[2]

The BPeSA achieves this through a focus on investment, networking/industry development and skills development. BPeSA provides a particularly insightful example of how the development of human capital infrastructure through intermediaries can support rapid economic growth through upskilling employees in the BPO sector. In 2012, a skills review conducted by BPeSA noted that there was a lack of sector specific skills in BPO and, in particular, a lack of middle management skills to operate effectively in BPO organisations. In response, BPeSA created a skills strategy and works closely with national and provincial governments, businesses and other service providers in order to "develop skills programmes and targeted skills interventions that will result in a sustainable world-class BPO talent pipeline".[2] This strategy included conducting research and providing insights on human capital including its dissemination to practitioners and policy makers. They also launched a youth training programme (TEAMC4) to focus on developing a youth talent pipeline.

The BPeSA skills strategy focuses on numerous dimensions of upskilling initiatives, support services for those seeking work, a skills portal, and a "federated skills supply chain". In Cape Town, this has included working with Amazon which is a large employer (around 1400 employees) in the BPO sector, to facilitate closer collaboration with the University of Cape Town and Western Cape government in order to train employees to be able to deal with technical issues with customer products (alongside language fluency).[3] This has become an increasing concern due to the need for workers to be able to respond to more complex issues as mundane and routine tasks are increasingly handled through automation. BPeSA has been instrumental in supporting skills development for BPO workers, through courses focused on financial and accounting management, risk management, technology and innovation management, and other sector-specific skills necessary to service the needs of the international (and domestic) enterprises.[4]

BPeSA has been key in selling the region as a site for BPO investment and overcoming the common challenges associated with offshore investments. Alongside the lower price point for offshore investments, there is a need to scale activities as business grow, and the large employee base in the sector assisted in attracting companies which were convinced of the capacity of the country to handle increasing customer demands. Similarly, having cultural familiarity with the customers was useful in establishing contracts with UK, European and US companies. The lesson here is that intermediary organisations such as BPeSA are vital to ensuring a coherent narrative, and support infrastructure to add value to existing sector strengths and simultaneously upskill the human capital to increase further inward investment.

For further detail see:
BPeSA (2016) South Africa Business process services Key Indicator Report 2016 Available online: http://www.bpesa.org.za/wp-content/uploads/2017/06/Key-Indicator-Report-2016-low-res-1.pdf (Accessed 28/11/2017).
BPeSA (2017) Business Process Enabling South Africa http://www.bpesa.org.za/ (Accessed 28/11/2017).
BPeSA (2012) http://www.bpesa.org.za/wp-content/uploads/2017/06/Ovum-Amazon-Case-Study-20121127-Final.pdf (Accessed 28/11/2017).
BPeSA (2010) Developing Talent http://www.bpesa.org.za/wp-content/uploads/2017/06/DevelopingTalent.pdf (Accessed 28/11/2017).

One example of a company that invested strategically is the automotive manufacturer Delphi, which first established a presence in Poland as a component manufacturer in 1994. With sites in Jelesnia, Blonie and Gdansk, the investment of Delphi in Poland saw the country become part of automotive global production networks, albeit at a relatively low level through the manufacture of low-value products produced by "under-employed" labour. However, as well as establishing the Delphi SSC in Krakow in 2000, the company also then established the Technical Centre in Krakow (TEK) which employs over 1 950 staff today, of which 1 300 are engineers. This marked a substantive shift in the strategy behind Delphi with respect to its presence in Poland, from being solely a low-cost component manufacturer to see Krakow become Delphi's largest R&D facility in Europe.

Beyond the higher value-added and strategic function of the TEK, Delphi in itself is an important driver of growth, its impact multiplied through supply chains within and beyond the region. In keeping with the principles of smart specialisation, this is contributing to the competitiveness of SMEs as well as promoting industrial diversification through the supply chains. With the workforce in the Malopolskie region capable of more complex and knowledge-intensive work comes the possibility of upgrading of jobs. Thus a higher level of R&D activity is created in the region as a result of more, higher-level skilled jobs.

Another sector that has demonstrated the potential for increased knowledge-intensive activity is that of bio-life sciences. While still a nascent sector, Krakow is home to Selvita, which has established itself as one of the largest drug discovery companies in Europe. The business model combines both integrated drug discovery services and in-house drug discovery, and in 2016 it was the highest-ranked Polish firm in terms of the ratio of R&D investment to revenue, at over 37%. Selvita currently employs over 400 people of which 30% are qualified to PhD level. There is considerable potential here, as the life sciences ecosystem is still comparatively embryonic.

The role of these larger businesses in fostering entrepreneurial activities has several implications for the smart specialisation strategy in the region. Firstly, with the location of more "knowledge-intensive" businesses in the region, there is a greater chance of the occurrence of knowledge spillovers and the capture of more innovative work. This can assist in promoting related and unrelated variety in the region, but can also consolidate vibrant innovation activity within high-growth sectors and those areas in which collaboration and platforms can emerge (Asheim et al., 2011). Secondly, generating investments in human capital, the R&D base, and the stock of technology in the region are commonly understood as preconditions for beneficial effects to be accrued by a regional economy in the EU (Cortinovis and Van Oort, 2015). Thirdly, larger enterprises in sectors such as life sciences can drive innovation within the entrepreneurship ecosystem through internal firm-led R&D activities which provide a substantial driver for regional innovation. Malopolskie therefore needs to invest both financial and non-financial support to those large enterprises that are extending the technology base of the region and those that can

deliver the positive externalities expected to be derived from the objectives of the smart specialisation strategy.

Whilst upgrading the nature of work in FDI may in part be a point of re-marketing and re-branding regional strengths and through the provision of investment incentives, the key is increasingly about non-financial factors such as knowledge spillovers, infrastructure, skilled labour and business networks that augment the business. This is also likely to see larger businesses become more embedded within the region as a part of the industrial culture as well as through more formal regional, national and international networks (Hess, 2004).

Networking and open innovation

The Malopolskie regional government and its development agencies have successfully marketed and promoted the region to inward FDI, with particular success in attracting BPOs/SSCs as well as manufacturing. Poland as a whole has over 1 000 BPO/SSCs which employ over 200 000 people, a fifth of whom are in Krakow and the surrounding area. However, attraction for FDI has tended to be efficiency savings associated with a relatively low cost environment. Over the past two decades, the emphasis has been on the volume of FDI attracted, as opposed to the quality of inward investment in terms of higher-skilled and more R&D-intensive work, although the jobs are often comparatively good compared to domestic employment in traditional sectors.

An inherent risk associated with efficiency-driven inward investment of this nature is that it is relatively insecure due to the fact that it is often cost sensitive. Understandably, if the strategic decision to locate in the Malopolskie region was based simply on cost, there may be few if any links to the local entrepreneurship ecosystem. For many of the multinational enterprises (MNEs) investing in BPO/SSC and manufacturing operations there is no need to develop extensive local linkages – needed products and services can either be provided internally or contributed vertically through non-regional supply chains. An exception to this is where MNEs that have invested in the region provide services to other MNEs present in the region, although there are few links to the wider business base.

A risk of the profile of inward investment in Malopolskie, beyond the not insignificant number of jobs created, is that there are often few wider benefits to the region. That is to say that the potential spillover benefits of the inward investment are not being leveraged or realised. Needless to say they do not just happen. The BPOs and SSCs in Malopolskie exhibit low levels of embeddedness, characteristic of "branch plants" more than regional assets. This is of course substantively a strategic question for individual businesses, nevertheless regional governments and development agencies can support and promote embedding of inward investment. Of the large companies, both domestic and foreign owned, the extent of regional engagement currently is typically limited to corporate social responsibility (CSR) activities and accessing graduate labour.

In terms of those larger businesses engaged in R&D and innovation activities in the region, there are a number with relationships with universities, although these are typically project-based as opposed to longer-term strategic relationships. There is little evidence of larger businesses engaging or collaborating with SMEs, whether through regional production networks, value chains or innovation networks. While there is a growing critical mass of firms in the ICT and life sciences sectors, the connection with larger firms represents a missing link despite the presence of numerous business networks. If Malopolskie is to achieve R&D-led growth, there is also a need for larger companies to connect with small companies to drive innovation through the creation and dissemination of knowledge, as

well as acting as anchors in the region. A model is how the large firm Philips built an R&D campus in its host region in the Netherlands encouraging spin-out enterprises and open innovation collaborations (Box 5.2).

Box 5.2. High Tech Campus Eindhoven, Netherlands

The Dutch electronics and technology company, Royal Philips Company (Philips), had total revenues of about EUR 24 billion in 2016. Today the business is organised into three main divisions: Philips Consumer Lifestyle, Philips Healthcare, and Philips Lighting. The company boasts 59 R&D facilities across 26 countries and has operations in over 100 countries.

Until the mid-1990s Philips, typical of many R&D-intensive multinationals, undertook much of its R&D in house, the locations of which were spread across the city of Eindhoven. In the late 1990s the decision was made to co-locate all Philips R&D activities in Eindhoven on a single site, and in 2003 Philips made the unprecedented move to open the High Tech Campus to other businesses.

The campus came to represent an important part of the innovation strategy for Philips, and changed the attitudes and culture of the business towards innovation. This was apparent in the increased number of spin-offs created by Philips that would not have otherwise been possible, due to the new knowledge created with collaborators and partners from other small businesses and university researchers. In 2006, MiPlaza, an open laboratory concept on campus, became a separate division of Philips Research and increased the company's innovativeness and corporate portfolio.

For further detail see https://www.hightechcampus.com/.

By virtue of the disconnect between larger and smaller businesses, there is little evidence of shared learning or the socialisation of knowledge in the region. Despite a number of large firms with established R&D profiles in the region, there is still a lack of inter-firm networks and vertical networks with start-ups and SMEs, which stymies collective learning and innovation. This effect is not only detrimental to the prospect of regional growth, but also to those firms, both large and small, that are not realising their innovative potential. The importance of the network, therefore, is not just in the connections between larger companies and their smaller counterparts, but what this means for the ecosystem in terms of reduced labour mobility, less collaboration, and fewer corporate spin-outs for example. Developing the interaction between large and small companies within the ecosystem is critical to strengthening the industrial R&D capacities of businesses in Malopolskie, and will further stimulate innovation-led growth and diversification through the smart specialisations.

A trend that is increasingly associated with both RIS3 and the corporate innovation process is that of "open innovation", where knowledge is absorbed and shared to develop new businesses and business opportunities. Clearly, the disconnect between firms is likely to detract from the potential for open innovation in the region, but this is exacerbated by the lower R&D intensity of larger firms in the region, which is itself a product of the inward investment attracted. The regional government has a critical and multifaceted role to play here in creating a virtuous cycle to attract and embed larger businesses, and in leveraging their strengths to enhance the ecosystem and stimulate innovation-led growth and industrial diversification. This role needs to sit alongside, and be sensitive to, the strategies of the

firms investing in the region, and will ultimately be achieved by creating a collaborative and business-friendly environment.

Corporate entrepreneurship

The concept of corporate entrepreneurship has gained increased traction among senior leadership teams seeking to describe the entrepreneurial behaviour of larger businesses, an important source of competitive advantage. The distinction between corporate entrepreneurship and entrepreneurship is an important one. Whereas entrepreneurship is focused on the creation of new ventures, corporate entrepreneurship is concerned with how opportunities are exploited and value created within existing organisations. The definition of corporate entrepreneurship is wide ranging, but is generally associated with developing new products, processes and services or markets within the corporate context. In this way, corporate entrepreneurship can be understood as the innovative activities of the business, with the "intrapreneurs" being those who pursue the new ideas and opportunities.

While there is evidence that corporate entrepreneurship can sustain the performance of larger firms, it can take different forms, determined by the organisational context which can both enable and constrain behaviour. As noted above, in those businesses where the nature of the work is more process-based in nature there is little scope for employees to pursue entrepreneurial (or intrapreneurial) opportunities in the corporate context. In the context of Malopolskie this is evident in the BPO and SSC sectors as well as the metals manufacturing and electrical engineering and machine-building sectors, where there is less scope for the development of new products, processes and services given the often process-based nature of activities within the businesses.

One of the businesses most effective in pursuing corporate entrepreneurship in Malopolskie has been Comarch, which is one of the region's flagship businesses. Comarch is one of only a few Polish firms that have successfully established themselves globally, and its entrepreneurial orientation has been instrumental to this. Clearly, the strong and active leadership of the business under the founder, Janusz Filipiak, has been critical to developing the scope and international presence of Comarch. In many respects Comarch is an entrepreneurial organisation par exemplar. The strategy of the firm has been to develop a diverse portfolio of products and global customer base, competing against more established software providers on price and flexibility. While the entrepreneurial orientation of Comarch can be chiefly attributed to its leadership and strategy, it has created a flat organisational structure with seven operational divisions and an organisational culture which also allows employees to be intrapreneurial.

Comarch has been particularly effective in the development of new intrapreneurial ideas and opportunities supported through the divisional structure by the senior leadership team. As a business, Comarch commits at least 12% of its revenue to R&D activities and the pursuit of innovative projects which totalled PLN 169.1 million in 2016. What is interesting, and contrasts with the experience of the majority of other examples of corporate entrepreneurship, is the extent to which Comarch is deliberately disconnected from entrepreneurship ecosystem in Malopolskie. Being part of the wider entrepreneurship ecosystem is not a precondition for corporate entrepreneurship, however, it is widely argued that corporate entrepreneurship is often enhanced by the ecosystems in which the firms operate if they are engaged. An example is the Stevenage bioscience campus for SMEs in life sciences co-located with GSK, again promoting corporate entrepreneurship and open innovation (Box 5.3).

Box 5.3. Stevenage Bioscience Catalyst, United Kingdom

GlaxoSmithKline plc (GSK) is a British pharmaceutical company with a market capitalisation of about USD 107 billion that has reinvented its business model from one of fully integrated pharma R&D to an embedded model where sharing and collaborating have become central to how the business works.

The Stevenage Bioscience Catalyst campus is a very good example of this. The initiative was established in 2012 as the result of a partnership between GSK, the Department for Business, Energy and Industrial Strategy (then the Department of Business, Innovation and Skills), the Wellcome Trust, the former East of England Development Agency and the Technology Strategy Board (now Innovate UK). As well as being located on the GSK site, the pharmaceutical giant invested about USD 15 million to build and launch the campus.

Intended as a hub for small and medium-sized bio-life science companies, the Stevenage Bioscience Catalyst facility provides access to both world-leading scientific facilities and an environment hosting researchers and businesses pioneering biomedical discoveries and healthcare solutions. Despite the presence, and prominence, of GSK at the Stevenage Bioscience Catalyst, all tenants have the freedom to engage and collaborate with any commercial partners.

The Stevenage Bioscience Catalyst embodies the shift in GSK from a closed model of R&D to a more open alternative, the key aim of which was to cultivate a more open culture of innovation that will place the UK bioscience sector at the forefront worldwide. This growing bio-life science cluster now represents a formidable example of how a large company such as GSK is able to position itself at the centre of an ecosystem and benefit from more porous boundaries.

For further detail see https://www.stevenagecatalyst.com/.

Although Comarch is an archetypal example of an entrepreneurial organisation, it is the exception rather than the rule in Malopolskie and in Poland more generally. The ability and interest of firms to support corporate entrepreneurship will inevitably vary from firm to firm. That said, there are typically lower levels of corporate entrepreneurship in business units where there is a lesser emphasis on R&D and innovation activities. Clearly, this is a challenge in Malopolskie, and other Polish regions, where historically domestic businesses and international subsidiaries have tended to be more process and production-based. While the regional administration has limited capacity to influence the strategy of businesses, it can target the profile of inward investment and promote the upgrading of multinational business functions in Malopolskie. Attracting jobs with higher levels of complexity and strategic importance to the region, as described above, is likely in the medium to longer-term to increase the prevalence of corporate entrepreneurship.

It is unsurprising that the extent of corporate entrepreneurship is limited given the profile of larger businesses based in Malopolskie and their respective functions. Consequently, to-date there have been relatively very few examples of corporate venturing, corporate start-ups or corporate spin-offs in the region. There should be an aspiration to see more larger businesses based in Malopolskie engaging in higher levels of R&D as this will have the potential to yield innovation and with it higher levels of corporate entrepreneurship.

Clearly, corporate entrepreneurship can provide an important source of competitive advantage to individual firms, such as Comarch. However, if such businesses are embedded

in the entrepreneurship ecosystem then corporate entrepreneurship could have the potential to drive industrial transformation or the creation of new industries as the result of internal innovation. Smart specialisation is intended to stimulate innovation in companies, and corporate entrepreneurship is an aspect of this, but beyond the culture of individual businesses it is contingent on the institutional environment. In this way, large companies can also be seen to contribute to regional development through their corporate entrepreneurship activities with shared benefits.

Intermediaries

Intermediary organisations are those which act as ambassadors and champions for a region. Moreover, intermediaries are organisations that are active in an innovation system, and aim to alleviate bottlenecks that impede flows of knowledge within an innovation system (Nauwelaers, 2009). Traditionally, academic literature has portrayed these organisations as those connecting research organisations and businesses (Warnke et al., 2016). However, the increasing complexity of regional innovation systems has meant that the definition of intermediaries is now much broader and more flexible. These organisations can be privately run or develop organically out of relationships that emerge across businesses. They can be ephemeral or permanent, physical or virtual. They can also form an important instrument of a regional agency or government to serve as a point to connect investors and current businesses to others in a region or internationally. In essence, they act as agencies or brokers of information and support with the direct aims of fostering ongoing dialogue between regional stakeholders and of promoting a stronger entrepreneurship ecosystem.

For smaller businesses and entrepreneurs, accessing touchpoints with larger enterprises can help them to share, leverage and borrow resources or provide them with a shop window for future acquisitions and buy-outs. Intermediaries serve an important function in overcoming some of the bottlenecks noted in regard to corporate entrepreneurship and the role of large anchor institutions. From a human capital perspective, developing touchpoints through the facilitating role of intermediaries provides potential employment opportunities through close networking and associations that are built up through collaboration and support. For the larger businesses too, working closely with smaller firms can provide an insight into the regional ecosystem alongside a horizon-scanning opportunity in the first instance. This cannot be the only function of the relationship but can lay the foundations for a productive and rewarding entrepreneurial climate in which start-ups may migrate into areas where there is an opportunity for their work to be noticed by prominent corporate leaders in the region.

There is a distinct lack of space within Krakow where these kinds of interactions are facilitated compared to some other Polish cities such as those in the Tri-City area of Pomorskie. These spaces and organisations could be in the form of business clubs, cluster associations or regular forums for clear touchpoints to emerge between the larger organisations and the SME owner-managers and entrepreneurs more broadly. An important issue for intermediary organisations is to create conditions in which a specialised cluster or district of innovation may emerge within the smart specialisations identified as strategically important to the region. In the sectors that have a clear capacity and presence in the form of vibrant, large enterprises, start-ups and SMEs, fostering a closer regional association can provide a springboard to becoming a "sticky place" for inward investment. In realising and building on the existing competitive advantages, clusters can diversify into value-added activities that otherwise may go uncaptured without a coherent, place-based vision for strong industries and sectors.

There is a clear regional advantage borne out of the high regard that intermediary organisations can signal through the presence of science parks and other such associations (Felsenstein, 1994). The Krakow Technology Park plays an important role in this space in encouraging dialogue between stakeholders and visible touchpoints to potential investors from both within and outside the region. These touchpoints may be instantiated through the development of co-working spaces and hubs, online portals or platforms or physical events which serve to enable a regular space of collaboration and networking. Intermediary organisations can fulfil this powerful function as a go-between and sustaining influence in the development of such spaces and connections, and are importantly geared towards regional interests over and beyond solely business motives.

The geographic nature of these intermediaries can be micro, macro or meso-level stakeholders (Smedlund, 2006.) At a micro level these can be individuals or small-scale organisations which support everyday interactions, whilst macro and meso-level intermediaries may be geared to more regional and national-level functions through the support of policy or as lobby groups. The role of these organisations is more than simply knowledge transfer or support to an innovation system; they can generate different scales of interactions and plug the gaps that exist in the entrepreneurial ecosystem through the development of strong networks and informal institutions. Crucially, these intermediaries can attract further anchor tenants into a region, thus reducing the dependency on existing large enterprises and diversifying the broader input of organisations to the regional economic growth strategies. A model of such an intermediary organisation is provided by Acció in Catalonia, Spain, which links regional government, education and scientific institutions and business around mutually supportive agendas, such as in the development of relevant new technologies (Box 5.3).

Box 5.4. Acció (Spain)

Acció is the Catalonian Trade and Investment Agency and has been credited with changing the regional economy from an industrial base to one focused on knowledge-intensive activities. Acció has headquarters in Barcelona and is connected to global markets through a network of 39 offices in overseas locations. It has overseen around 5 500 investment projects in its 30-year existence, attracted EUR 8.8 billion in inward investment (with 7 026 foreign companies located in the region) and created 44 560 jobs.[1] It has done so through the provision of integrated services, the development of a clear regional strategic focus, and through the creation of new clusters and R&D centres of excellence.

Catalonia currently has around 31 clusters including around 2 200 firms and 250 000 workers. This includes clusters in food, advanced manufacturing, mobility, water and energy, health, and digital. One of the key facets of the regional cluster policy has been to connect the entrepreneurship ecosystem between large businesses and specialist SMEs. Specialist advisory services pooling expertise from multidisciplinary backgrounds allow Acció to place international investors into the local ecosystem and provide them with discernible infrastructural support in part sustained through linkages into collaborative networks. Acció pools the knowledge from previous successes to feed into models of best practice to inform new investors and create clear strategies. For example, through a certification programme (TECHNIO), Acció has credited developers and facilitators to devise, sell and showcase technologies to clients and customers. Acció's active profile in the region has helped to nurture and connect these companies into a sustainable and vibrant ecosystem.

This strong knowledge base and regional vision spearheaded by intermediaries such as Acció has led to prominent global companies locating major innovative activities in Catalonia. For instance, Hewlett Packard has created an R&D centre in Catalonia which is the main site for the development of both 3D and large format printing. It is now the largest site for the company outside of North America. The multinational pharmaceutical company, AstraZeneca has located its R&D facility in Barcelona citing "the presence of qualified pharmaceutical professionals, a long-standing tradition of respiratory medicine and its network of researchers, hospitals and universities".[2]

Acció is a world-leading investment agency that serves an important intermediary function between regional government, educational and scientific institutions, and business. IT occupies an important scalar role in connecting local business ecosystems to national and international markets and has a clear mission and vision driving its ambition to make Catalonia an international hub of innovation. Internationalisation, trade and the support of indigenous companies is complemented by its work in attracting inward investment from global firms. This is due in part to its active role in promoting the region internationally to investors through trade missions, which are closely aligned in terms of business interests and opportunities for co-operation.[3] Importantly, it serves as a significant facilitator in overcoming bottlenecks faced by larger companies looking to locate in the region.

For further detail see:
http://catalonia.com/en/about-us.jsp. For the 2016 updated report please refer to:
http://catalonia.com/en/binaris/Annual_Report_2_2016_tcm213-240174.pdf.
http://catalonia.com/en/invest-in-catalonia/we-work-for-you/succes-stories.jsp. See this link for further examples of large enterprises working in the region: http://catalonia.com/en/about-us.jsp.

In Malopolskie, the strongest intermediary organisations reside in the BPO/SSC sectors. In contrast to other sectors in the region, the business services sector has firmly established membership associations and support networks for those businesses in the outsourcing-related industries. In this sense, there is a more co-ordinated approach to pushing highly skilled graduates into business services industries rather than into more productive forms of work. For example, outsourcing companies have run workshops and had clear graduate recruitment strategies, which was surprisingly not as evident in some of the higher growth potential sectors at the centre of the smart specialisation strategy. The non-governmental organisation (NGO), the Association of IT & Business Process Services Companies (ASPIRE), is based in Krakow due to the significant presence of large enterprises in the sector and acts as a champion of BPO services in the city. As the ASPIRE mission and vision statement reads:

"ASPIRE takes a city-centric approach to the development of the industry; our mission is to put technology and business services at the heart of Kraków's transformation and climb up the value chain. We aim to do this by nurturing the local ecosystem, harnessing the passion, energy and expertise of our members at all levels of their organisations, encouraging deep collaboration, information sharing and shared learning between members, as well as between members and the wider community of stakeholders."

This is a template intermediary organisation that provides strong support to the sector. It also provides lessons for other sectors in the region. Allied to this, within ASPIRE and similar organisations, the intermediary role can champion higher-value activities and the development of more innovative and entrepreneurial employees in the BPO sector. ASPIRE is working towards these ends and should be encouraged to do so by regional stakeholders in an attempt to capture and enhance the existing regional strengths in this area. By being a strong regional voice to externally-facing investors and competitors, intermediary organisations can promote the innovations and opportunities in their sectors to encourage investment of more value-adding activities. The effect of offering a coherent and consistent regional narrative can capture the existing knowledge and skills base and afford a clear marketing message that Malopolskie is future oriented and becoming a market leader in some of its existing core competencies.

Crucially, intermediaries can fulfil important functions in the implementation of smart specialisation strategies. As Nauwelaers (2009) notes, intermediaries can be instrumental in the facilitation of a dialogue between actors in a regional innovation system, they can embolden complementarity between different intermediaries for accessible and timely support, and they can service the broader innovation process beyond just the process and product innovations driven by science and technology.

Recommendations

There is an important opportunity to increase the role of large businesses as active participants in the Malopolskie entrepreneurship ecosystem and smart specialisations. The region faces a number of challenges in this respect.

First, while Malopolskie has so far been effective at attracting inward investment, there is a need both to attract more strategically important R&D-intensive inward investment and to work with those large businesses in the region in order to upgrade the functions. The mismatch between the demand for and supply of workers with specific capabilities has led to under-employment, with higher-skilled workers in lower-skilled occupations. This represents a potential asset in attracting more complex, higher-value work.

Second, there is a need to embed these larger businesses in the regional entrepreneurship ecosystem. As discussed above, large firms are more than just anchors, and have the capacity to both contribute as entrepreneurial organisations and drive entrepreneurship, innovation and industrial diversification.

Two address both of these challenges a key focus for the regional government and its agencies should be to create a pro-entrepreneurship, pro-innovation environment in which large businesses are not only contributing to regional growth, but are driving it. The smart specialisation strategy is an important aspect to achieve this. However, it needs to be viewed alongside other policy measures and programmes including, but not limited to, attracting inward investment, embedding larger businesses, fostering collaboration, developing supply chains, and promoting internationalisation.

In this respect, the Malopolskie region is well-positioned as a region, and the emphasis needs to be on ensuring the coherence of policies and programmes as opposed to radically changing the basis of policy at the regional scale.

The following specific recommendations are offered:

Box 5.5. Recommendations for larger enterprises

Attracting and retaining FDI

1. Change the focus of inward investment attraction policy from an emphasis on quantity to quality. Institute a deliberate policy shift towards targeting higher skill, higher value-added types of inward investment that will stay and invest in the region. Focus attraction policies on positioning and promoting Malopolskie region as an open innovation region, where businesses will want to locate to benefit from being part of an ecosystem that extols the virtues of competition and collaboration. (Regional)
2. Increase the emphasis on follow-on support, or aftercare, for inward investment, with a view to retaining and embedding inward investment and encouraging an upgrading of the function of inward investment from process-driven to more complex tasks. This effort should include increasing the knowledge of policy makers of the functions of the different subsidiaries worldwide and the strategic objectives of the large firms operating in the region. (Regional)

Upgrading work in FDI

3. Emphasise policies that encourage the upgrading of work in inward investors by creating a favourable environment for high productivity and innovative activities. This could include stronger local business/innovation networks, supporting clusters of innovative firms, developing innovation infrastructure and connections between businesses and universities and building the strengths and capabilities of workers, including through dedicated initiatives to attract talent from outside the region. (Regional)

Promoting large firm networking and embedding

4. Promote the regional engagement of large firms in innovation by providing space, funding and encouragement for engagement in collaborative innovation projects focused on reinforcing smart specialisations, including by making full use of the possibilities provided by the ROP 2014-2020 to involve large firms in R&D projects. (Regional)
5. More actively engage large firms in skills development initiatives in the region, including common education programmes with universities. (Regional)
6. Seek to tap into large firm resources to promote local entrepreneurship, including corporate spin-outs and spin-ins. (Regional)

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