Adapting smart specialisation to a micro-economy – the case of Malta

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Abstract

Purpose – The purpose of this paper is to set out the process by which a smart specialisation strategy was developed for a small, peripheral economy in the European Union, the Republic of Malta. It assesses the applicability of the approach in the context of a micro-economy with an industrial structure based on a small number of foreign direct investments and a predominance of micro-enterprises.

Design/methodology/approach – The paper follows an action research approach by presenting as a case study the process by which the strategy for Malta was assessed and developed through successive rounds of engagement with business and other actors with the application of scenarios and other prioritisation approaches to facilitate its development. An initial consultation with 20 public sector and representative organisations was followed by a general business workshop and 21 sectoral focus groups.

Findings – Lack of critical mass can be mitigated by maximising the generic use of available skills and competences. Given the higher vulnerability to external shock in micro-economies, strategies need to have a high degree of flexibility and adaptability. Greater internationalisation provides the main response to peripherality.

Practical implications – The approach can be applied more generally for micro-economies and in some aspects to other countries or regions lacking critical mass in research and innovation assets or facing peripherality.

Originality/value – The smart specialisation approach had not been applied in these circumstances and hence the findings allowed the concept to be extended and adapted to deal with the issues raised.

Keywords Innovation, Malta, Micro-economies, Small firms, Smart specialisation

Paper type Research paper

Introduction

Smart specialisation is a strategic approach predicated upon the need for regions to concentrate resources on key areas of economic potential. In the past, regional innovation strategies were frequently hampered by deficiencies including lack of an international and trans-regional perspective, failure to be in tune with the industrial

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and economic fabric of the region, investment in R&D that was not sufficiently business driven, lack of a sound analysis of the region's assets, and being driven by a "picking winners" syndrome and copying the best performing regions without consideration of local context (Foray *et al.*, 2012). This paper sets out the process by which a smart specialisation strategy was developed for a small, peripheral economy in the European Union (EU), the Republic of Malta in the context of guidance provided by the European Commission for the development of National/Regional Research and Innovation (R&I) Strategies for Smart Specialisation (RIS3 strategies).

RIS3 strategies are defined by Foray *et al.* (2012) as integrated, place-based economic transformation agendas that focus policy support and investments on key national/regional priorities, challenges and needs for knowledge-based development; build on each country/region's strengths, competitive advantages and potential for excellence; support technological as well as practice-based innovation and aim to stimulate private sector investment; get stakeholders fully involved and encourage innovation and experimentation; are evidence-based and include sound monitoring and evaluation systems.

The context for the initiative described is the EU's Europe 2020 Strategy, the Innovation Union Flagship initiative, adopted in 2010 as a comprehensive innovation strategy for Europe to deliver smart, sustainable and inclusive growth[1]. Regional policy forms a core part of this strategy, and encourages the design of R&I strategies for smart specialisation[2]. These strategies are intended to lead to a more efficient investment of structural and investment funds (the main instrument for supporting regional development and supporting cohesion policy, the EU term for reducing disparities between the various regions and the backwardness of the least-favoured regions and more balanced and sustainable territorial development). The key goals for innovation in this context are avoiding duplication and fragmentation of R&I support, joining up policies and programmes and indicating an appropriate mix of support measures to meet SME needs along the innovation value chain. Compliance with the terms of this policy is essential since, as part of EU Cohesion Policy in 2014-2020, the European Commission has made smart specialisation a pre-condition (so-called "ex ante conditionality") for supporting investments for two key policy objectives:

- strengthening research, technological development and innovation (the R&I target); and
- enhancing access to and use of quality of information and communication technology (ICT) (the ICT target).

In this paper we explore the application of the concept and process of smart specialisation to a small country on the periphery of Europe. This is done by presenting a case study of the development of an innovation strategy for Malta. After examining the foundations of the smart specialisation concept, the challenges facing micro-economies are discussed, particularly with reference to R&I policy. We explore strategies for dealing with two key issues resulting from small scale, namely lack of critical mass and increased vulnerability to external shocks. Industrial structure is also scale dependent. In this context we describe how engagement of business with policy development was undertaken and a process of entrepreneurial discovery initiated in a situation where the economy consists of a few foreign direct investments (FDIs), accounting for a considerable share of GDP, and a large number of micro-enterprises. The great majority of the latter do not have a tradition of innovation and the FDIs

conduct innovative activity in other locations. We shall argue that, when operating at small scale, with the additional constrain of being an island economy, policies driven by smart specialisation need to be adapted to introduce additional dimensions of flexibility and adaptability.

Context for smart specialisation

The concept of smart specialisation was first used in the context of a report addressing the transatlantic gap in R&D investment (Foray and Van Ark, 2007) and was later on extended to highlight the need to concentrate efforts on areas of strategic potential in Europe in order to avoid duplication and fragmentation of investment in R&I (Foray *et al.*, 2009). Foray *et al.* (2009) noted that rather than investing in areas that are too similar, "smart" regional strategies were required in the sense of enabling specialisation in areas that allowed clear synergies with current and potential productive capabilities of the region. The rationale was twofold: first, the need to realise the potential for scale, scope and spillovers in knowledge production and use and, second, the need to focus on certain domains to develop distinctive areas of specialisation as opposed to adopting "mimetic" regional programmes.

While initially the concept had a strong sectoral focus, the "Barca Report" (Barca, 2009) shifted the focus from a sectoral concept to a place-based one more suited to regional policy (McCann and Ortega-Argilés, 2013), recommending a need to focus on fewer priorities and for better coordination of place-based policies.

These ideas also emerged in the context of previous policy experiences, most notably the various RIS and RITTS (Regional Innovation and Technology Transfer Strategies) initiatives in place since the mid-1990s, aimed at enhancing the use of structural funds through institutional change and the promotion of partnership, networking and learning in regions (Landabaso and Reid, 1999; Oughton *et al.*, 2002). Despite significant advances in institutional upgrading and policy learning, these exercises were also associated with a tendency for regions to adopt me-too strategies, a linear rather than interactive approach to innovation and to neglect interregional linkages and interdependencies as well as the importance of leadership (see, e.g. Charles *et al.*, 2012).

The concept of smart specialisation has been the focus of considerable debate and contestation. It has been, in the words of Foray *et al.* (2011, p. 1), "a policy running ahead of theory", very quickly attaining substantial influence among policy audiences. This is despite many of the arguments underpinning the concept lacking a sound base of empirical work and the policy instruments and tools supporting its implementation still being in their infancy (Foray *et al.*, 2011). In the words of Aranguren and Wilson (2013, p. 128), "the concept itself is still very much being explored and refined at the same time as policy-makers are adopting it and putting it into use". They consider that despite the confusion and uncertainty that can arise as a result, this rapid uptake of the concept enables the development of "theory in practice" as opposed to linear translation of ideas into policy practice without "proof of concept" Aranguren and Wilson, 2013). The exercise reported in this paper may be seen as an effort towards interactive adaptation of the concept.

Nonetheless, the speed and the way the smart specialisation agenda has been adopted poses, according to Morgan (2013), three fundamental challenges for its implementation. The first and the most obvious one is the challenge to understand the meaning of the concept and its implications for the theory and practice of regional innovation policy. A second, operational, challenge relates to its translation into a

coherent policy agenda. The final challenge is how to ensure political mobilisation and commitment at multiple levels of governance and engagement of multiple stakeholders (including from business and civil society) to deliver the strategy, in other words how to make the multi-level polity accountable for the delivery of the place-based regional development policy and how to sustain commitment and iteration over time.

Related to these challenges is the link of the RIS3 agenda with previous policy approaches and already established policy initiatives. For instance RIS3 is being introduced in regions with a long tradition of cluster policies (Aranguren and Wilson, 2013). The context of policy inertia and policy path dependencies in which smart specialisation strategies (like all policies) are being designed should not be overlooked (Morgan, 2013; Flanagan *et al.*, 2011). This relates to the idea of regions following different "innovation journeys" (Benneworth, 2007) and the need to acknowledge the difficulties and challenges different regions, particularly weaker ones, may encounter in the process of implementing RIS3. This was the conclusion Charles *et al.* (2012) derived from their analysis of IQ-Net regions, which exhibited very different capacities, leadership and ambition to deliver on the RIS3 agenda.

The ideas informing RIS3 are according to Charles *et al.* (2012) not too dissimilar from previous approaches to regional innovation systems and strategies. Like previous approaches, smart specialisation is predicated upon the idea that regional innovation strategies need to be systemic, demand-led, institutionally embedded and place based. However, in the conceptual building blocks of RIS3, a stronger emphasis is placed on issues such as diversity, relatedness, connectivity and the entrepreneurial discovery processes.

One of key building blocks of RIS3 is the idea that smart specialisation emerges out of an entrepreneurial process of discovery. This is related to the idea of self-discovery process of Hausmann and Rodrik (2003) and places the onus of specialisation on the search and discovery activities of entrepreneurs widely understood. Entrepreneurs are an on-going source of novelty and hence of the variety upon which selection processes act so that economic evolution can continue (Metcalfe, 1998). Entrepreneurial knowledge naturally involves more than knowledge of science and technology, and includes knowledge of market growth potential and innovation needs (Foray *et al.*, 2011).

Such knowledge is fragmented and distributed, specific, local and tacit (Metcalfe and Ramlogan, 2005). Entrepreneurs tend to start new ventures at places where they previously lived and worked (Stam, 2010) and they tend to draw upon familiar markets and technologies and diversify into related products (Hidalgo *et al.*, 2007). New industries tend therefore to branch out of related local industries through a process of recombination of existing capabilities which are exploited and reconfigured into new activities. Such regional branching through related diversification can take several forms, e.g. transition to a new activity; modernisation or upgrading within an existing industry, diversification through exploiting synergies between an existing activity and a new one; or the radical discovery of a new niche (Foray *et al.*, 2012).

A second key idea is therefore the relevance of not just regional specialisation but related diversification across related technologies (Neffke *et al.*, 2011). Research on "related variety" (Frenken *et al.*, 2007) suggests that such diversified regions are more likely to adapt to changing conditions and less susceptible to lock-in effects. They are more adaptable because they are able to act as "shock absorbers" (Pike *et al.*, 2010).

Another key dimension is the acknowledgement of the importance of connectedness and interdependencies across regions. There are several dimensions to the idea of

connectedness. First, in relation to the importance of both local linkages among "triple helix" actors (Etzkowitz and Leydesdorff, 2000; Lundberg, 2013) but also of accessing global pipelines (Bathelt *et al.*, 2004) to favour-related variety and avoid lock-in effects. Second, the developments in a region will be affected by what happens in other regions in that developments in one region may influence outflows of people from another region, or limit opportunities for development in another (Charles *et al.*, 2012; Dilaver *et al.*, 2014). A third consideration relates to the acknowledgement that the knowledge ecology relevant for innovation is "not necessarily deployed and contained within strict regional boundaries and their development and evolution is likely to defy administrative frontiers" (Foray, 2013, p. 67). In other words, we should not assume that all the dimensions relevant for innovation could (or should) be present in the same region. Interregional collaboration can in this context enable more integrated system of innovation reaching a broader range of actors (Uyarra *et al.*, 2014). Interregional collaboration may thus help regions overcome isolation and fragmentation and achieve greater economies of scale, scope and positive knowledge spillovers.

Small economies

Briguglio (1995) catalogued the dimensions of economic vulnerability faced by small island developing states to include limited natural resource endowments and high import content with little prospect of substitution, small domestic markets and exports dependent upon a narrow range of products, a limited ability to exploit economies of scale, low levels of domestic competition and inability to achieve any economies of scale in government services. However, Streeten (1993) observes that despite such drawbacks there are many success cases among small countries resulting from factors such as a high degree of urbanisation and greater flexibility and social cohesion. They are often more open to flows of people and capital. Approaching the issue of specialisation in this context it is relatively easy to characterise the risks that may be associated with over-specialisation. These would result principally from an inability to respond to external shocks or less dramatically but on the same lines, a restricted ability to adapt to the rise and fall of sectors and firms. Hence, if a sector is dominated by a single firm, the fate of a whole sector may be bound up with that firm's business performance and if it is a multinational, by external location and investment decisions. For Malta this is a clear reality – the largest manufacturing player is the French-Italian owned STMicroelectronics which is the country's largest employer and exporter.

Similar arguments in relation to over-specialisation can apply to sectors made up of micro-firms, which may in the first instance benefit from agglomeration effects but could also succumb to lock-in and risk losing variety and its attendant benefits, in effect system failures in the innovation system (Narula, 2002). On the other hand a lack of specialisation, while on the surface being more flexible can mean that all sectors are sub-critical in terms of capability and a lack of local competition reduces the incentive to innovate.

Earlier work on the position of countries in the EU with a population of <2.5 million had explored scale dependence specifically in the context of R&I (Cassingena Harper, 2011). Several issues were identified. Problems in maintaining broad coverage of science and technology typically mean that resources are spread thinly and that capacity in a field is dependent upon one or two key individuals. As a result, the ability to assemble interdisciplinary teams nationally may be inhibited where key gaps exist. This creates a particular vulnerability to brain drain. On the capital side, small

countries are rarely able to afford large scale or even medium scale scientific infrastructures and hence are particularly dependent on sharing and/or access arrangements. Metrics themselves are an issue: scoreboards and other indicators may exclude small countries or produce inappropriate results which are subject to wide fluctuations due to small sample sizes.

International collaboration in science is likely to account for a much higher proportion of activity than in a large country. While this has advantages it may inhibit the emergence of a national strategy or effective implementation of national R&I goals where these are set. On the other hand the SME sectors are relatively less likely to be internationalised and particularly in the peripheral context of the Maltese islands, may struggle to achieve the kind of interaction with markets that can stimulate innovation and allow businesses to grow beyond the level sustainable in the small country itself.

More generally, as noted above, small economies can be highly coordinated and fast moving. However, there may be also a proneness to lagging effects caused by lock-in to existing relationships between institutions. Small markets make it harder to develop lead markets for the introduction of innovations. On the other hand specialised needs of smaller states could be a market in themselves (e.g. smaller-scale energy generation, water desalination systems or government IT systems) and hence some pooling of market opportunities could be beneficial (Georghiou *et al.*, 2010).

R&I in Malta

To locate our case study, Malta, against the spectrum of the small-country issues discussed above, we first note the basic descriptors of the R&I system. Malta is the smallest country in the European Union with a GDP of €6.4 billion and a population of 413,000 in an area of 316 km^2. While the second island Gozo has a dedicated ministry, because of the size of the Republic of Malta there are no administrative regions and hence the Innovation Strategy is constituted at national level. R&D intensity (GERD/GDP) was 0.73 per cent in 2011 (above the original EU 2020 National Reform Programme target) with the private sector accounting for 66.7 per cent of R&D spend and the public sector the remainder. Malta is classed as a "moderate innovator" in the EU Innovation Scoreboard but the indicator can be unstable at the small scale of most activities measured here. Hence, there were 588 FTE researchers in the country in 2010, of whom 336 were in the business sector and 224 in the private sector. Patent numbers may be fewer than ten in a given year and scientific publication numbers fewer than 100. This also has relevance for measures such as the Scoreboard where very small movements can result in large percentage changes.

One typical feature of small countries, exhibited strongly by Malta, is a very high propensity to internationalisation. For Malta this partnership is heavily focused on the UK which accounts, for example, for 60 per cent of scientific co-publications. Much more limited collaboration exists with Italy, Germany and Spain. As mentioned above, patenting activity is at a low level and appears still lower when the address of the inventors is analysed, suggesting that the research underpinning the application originates abroad. The few patents relate to "consumption goods", "electrical devices" or "analyses-measurement control".

The principal instrument for competitive R&I funding is the National R&I Programme, which has been running since 2004. Since 2008 the programme has required proposals to have both academic and industrial partners and projects are expected to meet the multiple goals of increasing R&D capacity, fostering collaboration

and achieving commercialisation through putting innovative products and services onto the market. In 2012 it funded seven proposals with a budget allocation of €1.4 m. Public sector research is heavily concentrated in the University of Malta, accounting for about 0.23 per cent of GDP. Higher education is mainly provided by the University and the Malta College of Arts, Science and Technology (MCAST) a tertiary vocational institution. Malta Enterprise, the national development and inward investment agency also has a remit to promote innovation and offers a number of incentive and support schemes some of which go beyond technology, product and process to encompass organisational and service innovation. It comes under the remit of the Ministry for the Economy, Investment and Small Business. The Malta Information Technology Agency (MITA) is the central driver of the government's ICT policy, programmes and initiatives. It delivers and implements programmes set out in the National ICT Strategy – The Smart Island Strategy 2008-2010.

The business sector is dominated by micro-enterprises (0-9 employees) which accounted for 97 per cent of the total in 2011. The great majority of these are low tech – for example in the manufacturing sector in 2011 only 8.32 per cent were in the high or medium-to-high tech categories. R&D is carried out mainly by large firms located in Malta as a result of FDIs. Sectors covered include high-value-added manufacturing in ICT, manufacture of machinery, the manufacture of chemicals and medical instruments and the generic pharmaceuticals industry. These firms largely account for the country's high-tech exports. The service sector is becoming more knowledge intensive, with the proportion of firms in that category rising from 31 per cent in 2006 to 35 per cent in 2011.

Gross value added in the Maltese economy increased by 45 per cent in the period 2000-2010, rising from €3.6 billion to €5.5 billion. This growth concealed substantial changes in the contribution of different sectors. The growth of the service sectors has been marked while the largest sectors, industry and wholesale and retail trade, transport, accommodation and food service activities showed the largest declines. Similar shifts are discernible in shares of employment where the professional, scientific and technical activities; administrative and support service activities category, grew from 4.9 per cent to 11.8 per cent while industry declined from 23.4 to 13.8 per cent. These shifts make it clear that an innovation strategy also needs to encompass the service sector.

A study commissioned by MCST in 2008 on the in-house R&I readiness of SMEs in Malta found that innovation efforts are primarily in product innovation (as opposed to process or organisational innovation) and that most innovation is at the level of the firm rather than the level of the market. Only a minority (7 per cent) offer products and services that are unique to the market. Top management is not seen as putting innovation as a high priority. In 2008 MCST conducted a workshop on their needs for innovation policy with Maltese firms drawn from cross-section of FDIs, traditional SMEs and start-ups (Cassingena Harper and Georghiou, 2011). Barriers to innovation encompassed lack of resources, knowledge and capabilities for innovation but also emphasised a sense of isolation from the kind of market and user feedback that stimulates innovative activities.

The first strategy for R&I dates from 2005 when, following a strategic review of the MCST, the formulation of the National R&I Strategic Plan was announced in the 2006 National Budget. This was based on a vision of putting R&I at the heart of the Maltese economy to support value-added growth and wealth, the first time that such recognition had been achieved. The plan itself was based upon extensive

consultation with stakeholders. Implementation began in 2007. The centrepiece was the identification of four key priority thematic areas: ICT, value-added manufacturing and services, energy and environment, and health and biotechnology. Sub-strategies were called for in each of these areas. To date overarching national strategies have been produced for manufacturing and health. In practical terms the National R&I Programme was re-oriented to foster collaboration between industry and academia in these four areas. This reflected the strategic plan's focus on applied research and commercialisation. The operational programmes for ESF and ERDF also used the priority areas as a point of reference. Examples include upgrading of laboratories at the University of Malta and capacity building at MCAST.

The plan also sought to address the low percentage of science and technology graduates and human resources in science and technology in the labour force. The priority areas guided the award of scholarships, including the ESF-funded Strategic Educational Pathways Scheme[3]. ESF funding is also used to support science popularisation.

At the start of the process for production of the smart specialisation strategy required by the European Commission, the departure point was a draft strategy for R&I which had retained the four themes of the previous strategy as "thematic pillars" but had added six further pillars which are presented as fundamental components of a healthy R&I ecosystem. The first four addressed the evidence base for policy, measures to build human capital, research infrastructures and international cooperation (including schemes to attract third country entrepreneurs and researchers to Malta). Pillar 5, called "Ideas to Innovation" represented a departure from the previous strategy, whereby innovation was given considerably more prominence, being defined to include both research-based and non-research-based innovation and proposing a series of support mechanisms, including finance, advice, procurement and cluster policies. Pillar 6 addressed funding, giving indications of how proposed measures will be financed including the National R&I Programme and the use of structural funds. This document had been in wide circulation and contained many of the elements of a RIS3 strategy but lacked any in depth business engagement and put forward priorities that were at a more generic level than that which would be expected for a smart specialisation strategy.

Smart specialisation process

As noted, a substantial amount of analysis had already taken place in the context of the national strategies. For the specific production of the smart specialisation strategy the core challenge was to design a process of entrepreneurial discovery that would generate input and engagement from the stakeholders. Given the industrial structure and the lack of tradition in engaging business in policy making and the low level of experience in innovative activity, it initially appeared to be a significant challenge to gain the level of engagement that would be needed to initiate a process of entrepreneurial discovery. It was decided to undertake a staged approach with the aim of building hypotheses and engagement in parallel.

The process of business engagement undertaken is summarised in Figure 1.

The first step was a desk-based analysis of various macro and micro-economic indicators and other information grouped by NACE Rev. 2 Sections. Information was gathered on gross value added, employment, participation in FP7, participation in CIP, participation in COST, submitted and funded proposals under the National R&I Programme, take-up of grants for R&D and innovation funded through ERDF, student

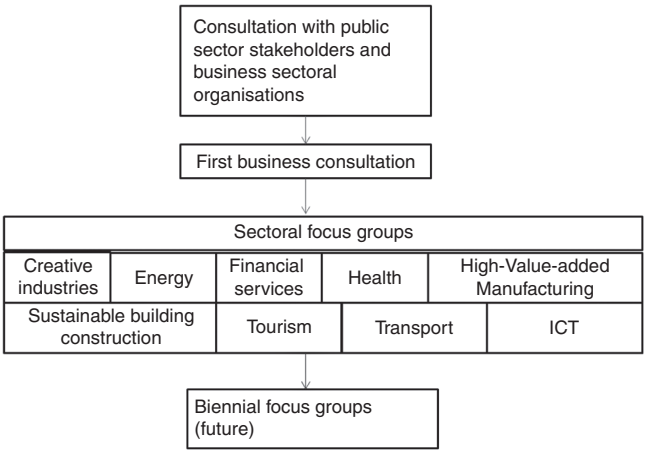

Figure 1.
Process for business engagement with smart specialisation strategy

population and trends at the University of Malta and MCAST. This information was used to inform the discussions held during the next step of the process.

The next step was a round of meetings with key stakeholders in the public sector, and with representative organisations. The aim was twofold – to explain the key elements of the smart specialisation concept and to discuss the organisations' views on the economy and priorities therein in the light of ongoing strategies. While some 20 organisations were consulted at this stage, the most important inputs could be characterised as representing the strands of the triple helix (Etzkowitz and Leydesdorff, 2000), government, higher education and business.

From the government perspective a two-level approach was engaged at this stage, with inputs at the policy level from the Ministry of Finance and at the implementation level from Malta Enterprise – the investment and development agency. Malta's fiscal system and its investment in education are seen by the ministry as providing the underpinnings of competitive strengths. It was noted that the country has moved from low to higher value-added sectors and also shifted from manufacturing to specialised service. Challenges included the need to strengthen the infrastructure (legal, intellectual property and ICT) and the need to attract and retain highly skilled people. Other strengths and opportunities were identified in the service sector, some of which relate to Malta's geographical position, including maritime services and aviation maintenance. Nonetheless, the general view was that competitiveness in these sectors was more about the quality of the offering than location. A strong message coming through from the ministry was that a small economy could only remain competitive if it retained flexibility to take advantage of opportunities as they arose. Hence, the smart specialisation strategy would need to be adaptable to a changing environment, the situation in all of the sectors identified above.

The public higher education sector was represented by the University of Malta and MCAST, an institution primarily engaged in vocational training. The University of Malta, while stressing that its role is to respond to national priorities, had a clear vision of where it sees its strengths coinciding with opportunities. Four areas were identified. Each could be described as a broad interdisciplinary platform. Molecular medicine and life sciences are the main area where the university considers it has critical mass – the concept being that expertise in separate areas including diabetes,

thalassaemia, some cancers and related social sciences such as healthcare management and bioethics can be brought together. The second area identified by the University was climate change adaptation and sustainable living. This brings together a wide range of capabilities including legal, economic, scientific and sociological and bringing the perspective of small island states and a regional perspective on climate change. The third area is technologies and systems for economic services and economic systems. This involves the application of ICT and engineering systems and technologies to the service sector, including public administration, financial services, healthcare, tourism, environmental services and value-added and smart manufacturing. It also covers systems engineering, security and prototyping. Finally, the fourth area is art and design for the creative industries – ranging from performing and visual arts, through digital media to edutainment. Digital gaming falls within this cluster of activity. While these "priorities" could be seen as covering a very broad range of disciplines, they reflect the fact that a single university in the country, of necessity is unable to build any strength in depth without strong reliance on synergies across subject areas.

The second institution, MCAST, which is primarily engaged in vocational training, identified ICT, because of its cross-cutting enabling character, value-added manufacturing – in particular precision engineering servicing of super yachts, applied health sciences and their link to social aspects (e.g. obesity and dementia), energy efficiency in buildings (construction materials, energy audits, water harvesting, retrofitting, etc.) and niche agricultural products. As a general point, the lack of land meant that most contributors who mentioned it felt that agricultural development opportunities were limited to niche artisanal products linked to heritage and tourism. The greatest agricultural challenge is water shortage and associated issues such as nitrates pollution. There is also a substantial human resource deficiency in the sector.

At this stage consultation with business was restricted to trade associations of which the most comprehensive is the Malta Chamber of Commerce, Enterprise and Industry. This is a body which was formed from the merger of the two main business representative organisations and covers the full range of economic activity. The organisation had recently issued a document on meeting the R&D&I needs of industry, focusing, among others, on innovation management issues. Lack of patent awareness and the need for improved links with the university were identified as key steps. A pilot agreement in the area of engineering is being negotiated to progress this agenda. In terms of sectors the MCCEI pointed to first to a survey of top executives of 230 foreign-owned companies based in Malta (Ernst and Young, 2012). Among the 90 respondents, when asked which industries would be driving the Maltese economy in the next three years, 92 per cent mentioned financial services as the key industry. This was followed by tourism (78 per cent) and iGaming (57 per cent), whereas only 16 per cent of respondents felt that manufacturing would drive the Maltese economy in the coming years. Nonetheless MCCEI also identified value-added manufacturing in pharmaceuticals and plastics as important sectors. A project with the MITA had identified sectors with potential for clustering. These were pharmaceuticals, waste management, health and bio, plastics and aviation (including maintenance, private jets and pilot training). In the domain of tourism, niche developments were favoured.

In the discussions, scenarios were explored within each of the regional branching pathways envisaged for smart specialisation – see Table I – whereby servicing of "superyachts" represents a transition from an existing sector to a new one, the

Process	Example
Transition	Drydocks sector historically focused on naval requirements evolved to servicing of yachting sector, opportunity with "superyachts". Maritime cluster based on popular flag, producers for parts used in the yachting sector and existence of human resource capacity retrained from dockyard
Modernisation	Manufacturing sector is increasingly focused on high value-added activities and needing to adopt latest technologies and methods to remain competitive
Diversification	Extension of the tourism offering to lengthen the season and to create a focus on cultural heritage and to combine the language education sector with ICT training, backed by digital innovation
Radical foundation of new domain	1. Digital gaming based on combination of skills across a range of sectors and attraction of academic expertise from abroad 2. Exploitation of genetic and e-health data as a foundation for development as a venue for clinical trials and a biotech sector, supported by development of molecular medicine capability

Table I.
Scenarios for processes of structural change

manufacturing sector is seeking to modernise, the tourism sector has a strategy to diversify through synergies with the cultural and education sectors and there are two cases of seeking to found a radically new domain. The first is under way. In 2011 a multi-organisation group coordinated by Malta Enterprise had developed a strategy to take advantage of growing global opportunities in digital gaming building upon an incipient local industry. Recommendations included the need to build a supportive ecosystem for the sector with fiscal and inward investment incentives combined with support for local start-ups. Market analyses indicated areas within the sector that required smaller teams. The university established an institute for postgraduate education and research in game studies, game design and game technology supported by some international recruitment. The second area, exploitation of the relatively homogenous genetic data and potential for high-quality e-health data (given the single main hospital in the country), is understood as an opportunity but does not as yet have a clear implementation pathway.

On the basis of the first round inputs, a set of synthesised baseline priorities were produced as an input for consultation with business. These are shown in Figure 2. Essentially all main active sectors of the economy had been identified but, within these, niches had begun to be evident. It was also clear that the sectors were interconnected through cross-cutting technologies which were enablers for innovation such as ICT and manufacturing and through their use of services including finance, energy and transport. Tourism occupied a strong position given its economic weight. One area of opportunity, aquaculture, was agreed to hold promise but was currently isolated in the absence of obvious connections with other areas. Sustainability, climate change adaptation and the green economy were seen as drivers rather than as sectors in themselves.

With this preparatory phase complete, the challenge was to design a process of business engagement that would open up the possibility for entrepreneurial discovery as envisaged within the smart specialisation concept. Recalling that the industrial structure was largely composed of micro-enterprises, a few much larger FDIs and institutions in the financial services sector, it is not surprising that there had been little tradition of systematic involvement in innovation policy making. To build interest, a stepped approach was used.

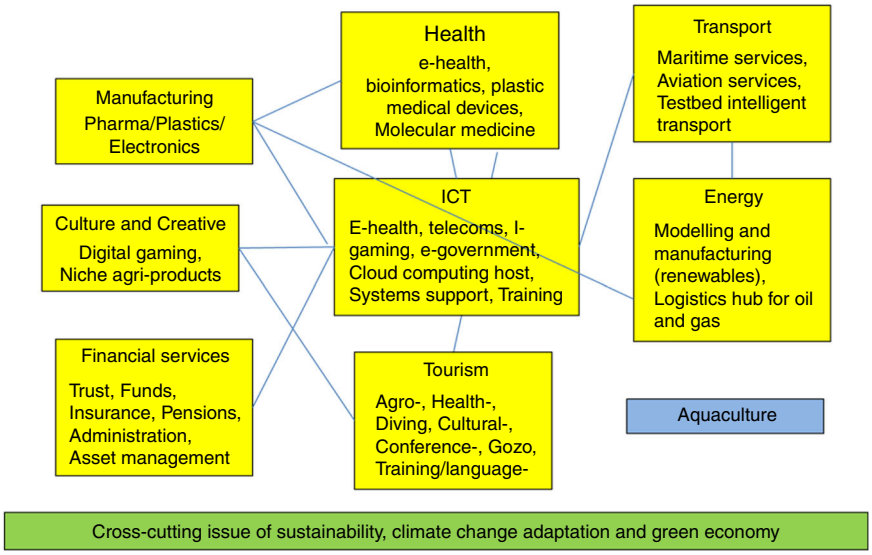

Figure 2.
Draft priorities emerging from first round consultation

An initial cross-sectoral workshop was used to validate and develop the priorities that had emerged from the public sector/stakeholder round and at the same time to identify specific policy measures that could help the sector. This first business consultation exercise provided a general endorsement of the topics identified by the consultation with the public sector and representative organisations. Some areas of clearer focus emerged but there was also a strong emphasis on crossovers and intersections between the sectors. While that would be true to some extent in any region, the lack of critical mass in a small economy means that there is an additional premium on exploitation of such synergies. The other conclusion that could be taken was that the business sector had a clear view that there is a need for a raft of pro-business and pro-innovation measures if Malta is to take advantage of the opportunities.

While there was a good broad-based attendance at the workshop, such events carry the risk of reflecting the views only of those selected. To ensure that the consultation was more widely grounded, it was agreed that a series of sector-specific focus groups would constitute the next stage of consultation and entrepreneurial engagement. A public call was made for expression of interest in business focus groups centred on the themes originally validated by the cross-sectoral workshop. However, the call also included an invitation to respondents to identify other themes in addition to these. More than 100 replies were received, most of them interested in more than one theme. The call for additional themes resulted in the identification of one additional theme, and a dedicated focus group on this theme was also held. Totally, 21 workshops were convened, organised on a sectoral basis. For most sectors, between two and three focus groups were held for each. Each focus group lasted two hours and was made up of around ten people. Following a short presentation by MCST, an open discussion based on a set of guiding questions was held with the aim of identifying niches within the thematic area or at the intersection with other areas. The groups then sought to identify measures which could be put in place to help the realisation of these identified niches. In practice, much of the discussion focused on more generic measures. Each of

these identified key challenges and drivers for its sector and, on the basis of these, potential opportunities for innovative business. Some cross-cutting messages included the difficulty, when an economy is operating on a very small scale, of establishing real clusters that could be said to constitute a niche. Existing niches were frequently occupied by a single company and, if not highly competitive, conditions could inhibit cooperation. In consequence, the need for networking is very often cross-sectoral, or in areas of pre- or non-competitive activity.

There are some inbuilt limits to such consultation – firms in some sectors, those confined to micro-enterprises, have not had the time or resources to develop considered views beyond the short-term challenges faced by their businesses. In other, larger, sectors such as tourism a consensus about what is needed already existed and could be drawn upon.

The outcomes of this work were submitted to a peer review organised by the RIS3 platform within the European Commission's Joint Research Centre. During this peer review, Malta sought to discuss issues concerning the link between the national R&I strategy and the smart specialisation process, addressing data challenges, ensuring ownership at the implementation level especially by the private sector, embedding flexibility and ensuring effective monitoring. The issues discussed reflect to a large extent the already mentioned characteristics of limited experience of business engagement and limits in the availability of relevant data at a very small scale.

Outcomes

The consultations had yielded interesting insights as to how the smart specialisation framework could be applied in a peripheral micro-economy. At one level the perspective could be clearly translated to the Maltese context. The flexible smart specialisation priorities represent a clear step forward from the broad technological areas which had defined the previous strategy. A new development was the recognition that service sectors such as tourism and maintenance in the maritime and aviation sectors can be a focus for innovation priorities.

Most of the priorities are specific in the sense that there are relatively few firms in each and they are small and hence can only focus upon particular niches. Few sectors outside services have even the basic elements to be described at present as a cluster.

The explicit smart specialisation strategy was published in September 2013 as a chapter of a new, revised national R&I strategy document, again put out for consultation

Identified specialisation areas in the public consultation draft are summarised in Table II along with their rationales.

Several amendments were made to the draft smart specialisation areas following the public consultation. Part of the public consultation process involved interaction with the European Commission in advance of its decision to agree conditionality. At the consultative stage, climate change adaptation had appeared as a theme with the rationale that Malta needed to invest in understanding climate change impacts within the local context in order to be able to adequately adapt to the changing environment by informing policy as well as business responses. However, this theme was identified by the commission as not having a clear, direct business niche in Malta and hence went against the spirit and logic of smart specialisation. This guidance in itself helps to define the reality of the interpretation of smart specialisation. It was proposed that the sustainability theme could effectively be turned into a horizontal activity by being subsumed into resource efficient buildings and potentially expanded into water management, renewable energies and transport technologies. Interestingly

Table II. Thematic areas in Malta's draft smart specialisation strategy consultation document

Specialisation area	Rationale
Tourism marketing	Tourism is a key pillar of economic activity in Malta. The sector is well established and mature and there is a good degree of collaboration among operators. The sector is not R&D intensive but must innovate in order to remain attractive and competitive. Consultations yielded several avenues for innovation activity, however, innovation in tourism marketing was repeatedly highlighted as an key niche for innovation. In addition to linkages with other specialisation areas such as ICT, this specialisation area should involve extensive collaboration with the creative industries
Maritime services	This is a mature economic sector in which Malta has a historic legacy and world-level profile. The sector has diversified over time to provide a wide range of services to the maritime sector, but the variety of services remain fragmented. There is therefore scope for improved clustering of maritime services in order to provide more integrated, new and improved services. Malta's drive towards becoming a maritime hub should include a drive to foster innovation in maritime engineering, ICT, design and services
Aviation and aerospace	This is a relatively new economic sector which has grown rapidly and attracted several foreign investors, and has diversified to include a number of niches such as maintenance, repair and overhaul and aircraft registration among others. Malta has also built a strong portfolio in avionics research, a relatively high-critical mass of human resources as well as numerous established international R&D links in the area. There is scope for further investment to raise the level of achievement to the next level by venturing into the high value-added engineering market in order to move up the value chain in specific niches within the aerospace sector
Health	Various data sources (such as public R&D expenditure, participation in the European Cooperation in Science and Technology – COST, and publications) indicate that "health and medical research" is a significant component of Malta's R&D investment. However, there appears to be significant fragmentation within it. As a result, actions within this area will include the fulfilment of the function of the national governance framework for health R&I as recommended in the National Health R&I Strategy for Malta
Resource efficient buildings	The construction sector in Malta accounts for 4 per cent of GVA and 5.4 per cent in terms of employment (2012 data), however, these figures have been decreasing over the past years. There is scope for exploring innovative solutions in the sector which address water scarcity and energy (dependence on fossil fuels, take up of renewable energy sources, etc.), both of which remain two of Malta's major economic challenges. Innovation in resource efficient buildings would transform the sector by increasing value added, while at the same time addressing a societal challenge which is in itself a business opportunity. This specialisation area will focus on solutions for improved resource efficiency in new and existing buildings through, inter alia, demonstration projects and optimisation. The importance of innovation in this area stems from the fact that solutions developed abroad may not be easily transposed locally due to climatic differences and differences in building materials, among others. This specialisation area should involve extensive collaboration among architectural design, engineering, materials science and energy technology among others

(*continued*)

Table II.

Specialisation area	Rationale
High-value-added manufacturing with a focus in processes and design	While its share of GVA as a percentage of total GVA has decreased over time, the GVA in real terms of the manufacturing sector has increased over the past years. This sector remains the predominant sector for research and innovation investment. Statistics for 2010 indicate that manufacturing activity encompassed 65.4 per cent of all innovation expenditure and 62.2 per cent of intramural R&D expenditure. This indicates clearly that, in spite of shifts towards the services sector, the manufacturing sector is still strong and should therefore be sustained in the future through a greater focus on innovation niches in this sector. To this end, two focus areas for innovation are process innovation (through optimisation of resource use, energy efficiency, automation, etc.) and innovation in product design (product development, prototyping, etc.)
Climate change adaptation	Climate change and adaptation to it are major global concerns. However, climate change impacts can be highly diverse and depend on, inter alia, geographical, hydrological and economic specificities. It is therefore important for Malta to invest in understanding climate change impacts within the local context in order to be able to adequately adapt to the changing environment by informing policy as well as business responses. Evidence-based adaptation to climate change is therefore necessary for long-term economic growth, competitive advantage, efficiency gains and cost savings. Investment in research into climate change adaptation is therefore identified as an area of focus which should span across and beyond identified specialisation areas. Given the existing (albeit somewhat fragmented) high degree of expertise in various facets of climate change adaptation, the time is ripe for Malta to consolidate its expertise, augment and valorise it through the development of a centre of excellence on climate change adaptation
Aquaculture	Malta's aquaculture industry has developed to its present status over a period of around 20 years. R&D is carried out mainly at the government-owned Malta Aquaculture Research Centre. There is a significant level of collaboration between the public and private level in aquaculture R&D, and Malta has participated in a number of EU-funded R&D projects in the area. Malta is considered to be at the forefront of research in amberjack, which is considered to have excellent potential for aquaculture. The foundations for the commercial production of this and other species are being laid with plans for a local hatchery. Research is also on-going with regard to closing the production cycle for blue fin tuna. Maltese aquaculture can therefore capitalise on such alternative species know-how, differentiating itself from the mass production of other species found elsewhere

Sources: Malta Council for Science and Technology: Draft National Research and Innovation Strategy 2020, Public Consultation Document, September 2013

all of these had been present in the earlier discussions but had not emerged as front-line priorities, principally because there were no clear industrial champions, despite the clear existence of demand-side drivers in the form of public agencies with needs and purchasing power. This was reflected in the final strategy document through a shift of the climate change adaptation theme to a priority research area under the second strategic goal of achieving a stronger knowledge base. A similar situation arose for the health thematic area, wherein the public consultation draft recommended the implementation of the National Health R&I Strategy (adopted in early 2013). The commission recommended that the health thematic area should go beyond simply focusing on the implementation of a government strategy. It was suggested that this priority should be refined to ensure that investments continue to build on current infrastructures and are specifically aimed to attract private sector interests. This rationale led to a change in the final strategy, with clearer focuses on business opportunities in the health sector.

A second feature was the treatment in the strategy of ICTs. The consultation process had emphasised the role of ICT as a horizontal enabler for all sectors and disciplines, and in the draft version of the smart specialisation it had been presented in this context with an emphasis on continued investment in specialised skills coupled with extended integration of ICT-based innovation in all economic sectors. In this case the local consultation provided the additional argument that besides an enabler for innovation in other sectors, innovation within the ICT sector itself is necessary to sustain its enabling role. This was reflected in the final strategy document.

The final list of thematic areas in the national strategy's smart specialisation pillar is therefore: tourism product development, maritime services, aviation and aerospace, health with a focus on healthy and active ageing and e-health, resource-efficient buildings, high-value-added manufacturing with a focus on processes and design, and aquaculture. The role of ICT is identified as both an enabler of innovation and a source of innovation in itself, especially in health, digital gaming, financial services and tourism product development.

Beyond the themes, the strategy also needed to encompass action lines. Given the diversity of the sectors and themes involved, a considerable degree of tailoring is needed to attune policy instruments to the specific needs of each. This would involve a combination of national and European funds, and active pursuit of cross-fertilisation of ideas, expertise and projects among different thematic areas with the ultimate goal being the identification and commercialisation of new solutions, products, processes and services and the take-up of innovation opportunities at the interface between two or more nodes. This approach helps to mitigate lack of critical mass by combining the resources of sectors and at the same time serves to broaden the vision of potential innovators by taking them out of the potentially locked-in vision of a well-established sector. International linkages are also envisaged as a means of filling gaps in capabilities.

Reflections

To reflect on the experience of applying the concept of smart specialisation in the context of a micro-economy requires a series of issues to be highlighted concerning both the content and the process.

In terms of content, a core consideration is the way in which the concept of critical mass is interpreted. There is little chance in most areas to achieve critical mass in the

way that would constitute specialisation for a large region. As we have seen, it is normally the case that numbers of researchers in any given field are very low and firms face little local competition in areas beyond basic provision. Under these circumstances different strategies need to be employed to achieve critical mass. One is to maximise the generic re-use of available skills and competencies. Hence, as we have seen, the same ICT providers may engage in several of the opportunities and the university plans to assemble all of its climate change adaptation researchers, who would normally be distributed across several departments, to achieve interdisciplinary gains and provide an environment where research training can grow the cohort. A similar approach was adopted for molecular medicine, where the university has invested significantly in this area with the aim of building interdisciplinary teams which can raise the level of critical mass and attract further students in the area, thus increasing the cohort further. Related variety is generally understood to mean that a degree of specialisation exists but allows synergy and adaptation by having a diversified set of specialisms. In this case, the same principle applies but can only be achieved by taking a more thinly spread set of capabilities and encouraging them to be configurable in more than one context. If this can be achieved then the small country issue of vulnerability to shocks can be mitigated by enhancing the capacity to adapt to change. Adaptability in innovation policy is a sound strategy in evolutionary terms (Metcalfe and Georghiou, 1998) but only if the system has the capability to move from experimentation to learning and then to making adaptive changes.

The other principal route to critical mass is to seek missing components from abroad, corresponding to the notion of regional interdependencies. This also addresses the issue of peripherality discussed above. For Maltese firms and researchers, international collaboration is essential in terms of access both to technological and business process knowledge and to knowledge of export markets. The emergent strategy is taking account of the competitive position of the country but with the exception of the tourist sector, where there is an international scale cluster, this is largely a matter of the positioning of individual firms. Lack of capacity to internationalise is recognised as a major barrier for Malta's SMEs and is reflected in their priorities for public support. However, in an island state the concept of a neighbouring region becomes less relevant. The peripherality of Malta means that duplication and fragmentation *vis-à-vis* neighbouring regions, a potential risk for smart specialisation, is not in this case a significant issue. There is only very limited scope for synergetic collaboration in innovation with, for example, Sicily. Communications make cooperation with Northern Europe equally feasible in logistical terms and often better matched in content. Hence, the tendency to seek cooperation in the UK (for historical, cultural and linguistic reasons) is well established. There are sectors where small scale could define cooperative opportunities and others where regional climate and conditions may mean that an innovation adapted to Maltese conditions would carry over its advantages to markets in other countries in and around the Mediterranean. The internationalisation of SMEs, as key producers of technology, suppliers and exporters, can have significant impacts on national capacity building and competitiveness. To achieve this, there is a need for strategic bilateral agreements and promotion of inward mobility of foreign researchers and entrepreneurs. Other dimensions include international industry-academic cooperation and support for R&D transfer/relocation from multinational corporations to Malta subsidiaries.

In terms of process, the preparation of the strategy described here placed engagement with business as a necessary preliminary to entrepreneurial discovery. However, the challenge was to situate such a process in an environment where few firms have a culture of innovation and where the ecosystem to support innovative activity is also missing several key elements such as access to risk finance. The workshops demonstrated that many firms (or key individuals within them) were aware of the potential for innovation for their business and more widely for their sector. They were also fairly clear about the type of measures needed to create a pro-innovation environment. The RIS3 process can fairly claim that bringing forward these views and focusing them on the proposed areas of specialisation has been an advance. The challenge now is how to nurture that engagement over a sufficient period that recognition of opportunity turns into realised innovative activity. For Malta this will involve a cultural change not only in the business sector but in the wider approach to the governance of innovation and business development. Public agencies used to producing top down strategies will need instead to engage with those brought together in this process and provide them a role as strategic partners in guiding the direction of structural and investment funds. The interim test of success will be to see investment focused on supporting innovation opportunities in the identified sectors and the ultimate test will be the visible operation of adaptive and flexible innovation ecosystems generating new market opportunities and economic growth.

Notes

1. http://ec.europa.eu/research/innovation-union/index_en.cfm
2. Communication Regional Policy contributing to smart growth in Europe 2020, October 2010
3. www.nche.gov.mt/page.aspx?pageid=103

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