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Innovation Policy at the Regional Level: the Case of Wales

Elisa Salvador and Rebecca Harding

Abstract: This paper examines policy structures to promote innovation in Wales. Following the devolution process, the National Assembly decides its regional policy priorities and has considerable power to develop and implement policies within a range of areas, of which one is economic development. The Welsh Assembly and the Welsh Development Agency - which play key roles in the economic development success of Wales - have a strong focus on building their region through enterprise and innovation.

This paper illustrates the extent to which the strategy followed by the National Assembly and the Welsh Development Agency has begun to bear fruits. It critically assesses some of the published material on Welsh Development, specifically growth targets set in 'A Winning Wales', and looks at progress towards achieving these targets. The paper highlights the importance and the consequences played by the devolution process and the establishment of the Welsh Assembly in the 'catch-up' process.

Keywords: SMEs; Wales; devolution; regionalism; governance; HEIs.

1 Introduction

Innovation policy has increasingly been informed by two important theoretical developments in the literature. The first, broadly termed endogenous growth theory (Schumpeter, 1954; Audretsch and Keilbach, 2004), argues that innovation and knowledge transfer from within the economic system is a key driver of economic growth. The number of knowledge workers and how much innovation is generated (measured through patenting and innovation based start up activity) is a determining factor in generating productivity growth.

The second, broadly termed the 'Triple Helix' approach (Etzkowitz, 1994; Viale and Ghiglione, 2000; Leydesdorff, 2005a, 2005b; Leydesdorff and Etzkowitz, 1997, 2000) sees knowledge transfer as a function of the complex set of formal and informal linkages between research institutions, finance and commercial businesses and the government. The interactions between the three strands to the 'helix' creates the unique and distinctive characteristics of an innovation system – the 'symbiotic tension' (Harding, 2002a) – at either a national or regional level.

Within the triple helix literature there is a distinct group of authors who regard national competitive innovation advantage as generated at the regional rather than at the national level (Cooke and Schall, 1997; Edquist, 2001; Cantwell and Iammarino, 2000; Sachsenian, 1997; Harding, 2000b;

Harding, 2002a). This is because the region is a focus for sectoral specialisation and, hence, related know-how accumulation. This in turn allows symbiotic learning relationships between institutions to develop (Harding, 2000a).

Learning and adaptation to changing market and technological conditions is more likely to be effective and sustainable at a regional level since tacit knowledge transfers more easily between actors in close spatial proximity with clear links to the cumulative skills and attributes of the regional labour market (Todtling and Kaufmann, 2001; Cooke and Schall, 1997; Porter and Ketels, 2003; Vickers and North, 1999). As expertise starts to build, specialist financiers, accountants and lawyers are established to support the base in knowledge production and, accordingly, any start-up businesses are provided with appropriate and readily accessible advice and consultancy. The evolution of this type of regional 'industrial system' is argued to go some way to explaining the development of Silicon Valley and Route 128 in the US (Sachsenian, 1997).

The attractiveness of this, 'cluster' approach (Porter, 1998, 2002) to policy makers is clear, especially in the area of innovation policy. Innovators are dependent on scientific, innovation, commercial and financial networks both for ideas and for markets. For example, universities or the research function of large corporations are known to act as pulls for entrepreneurial activity (Czarnitzki and Kraft, 2001) insofar as entrepreneurs will tend to locate close to research and commercial hubs. If this set of inter-relationships can be systematised, then regionally generated knowledge will add value through the cumulative learning process to create the specialisation that is so important to international competitive advantage, particularly in research-led sectors such as information and communications technology or biotechnology (Cooke, 2001, 2002; De la Mothe and Paquet, 1998). The assumption tends to be that the institutional base (venture capital and business angel networks, universities and inward investment, for example) will generate entrepreneurial activity and that knowledge will transfer between knowledge generators and knowledge users automatically.

This paper examines the case of Welsh innovation policy through the lens of the Triple Helix theory. It is argued that the unique powers given to the Welsh Assembly and the Welsh Development agency under devolution have given governmental structures a unique opportunity to mesh the three strands of the Triple Helix in a novel and effective way. This has led to innovation successes from which other policy makers at a national and regional level can learn. The paper is structured as follows: after an overview on the governance structure in Wales following the devolution process and on the Welsh economy in the latest years in section two and three, it follows an analysis on Wales innovation policy and the related priorities chosen by the Welsh Assembly in section four. The conclusions try to critically assess this new policy approach and the results now achieved, highlighting the interactions with the Triple Helix model.

2 Political Background to the Welsh case

Since 1st July 1999 the National Assembly for Wales and the Welsh Assembly Government decide their regional policy priorities within the 'limits' of the devolution process. The Government of Wales Act gave the National Assembly for Wales power to pass subordinate legislation, which is the body of law that provides the details of how the primary legislation passed in Westminster, will be applied in Wales (Keating, 1998; Pyper and Robins, 2000; Richards and Smith, 2002).

An Assembly, not a Parliament as in Scotland, has been justified in Wales on grounds of limited consensus for change and closer integration with England.

Devolution raises new issues of how public policy may be controlled and coordinated across the United Kingdom. The devolution settlements for Wales and Scotland created new elected bodies which enjoy considerable autonomy from central government. Before devolution, Welsh policy was closely aligned with central policy as collective responsibility in the Westminster Cabinet bound the Welsh Secretary to centrally-determined policies. Now the Welsh Assembly Government may pursue its own policies within the broad framework of Westminster primary legislation and its block spending allocation (Laffin *et al.*, 2004).

In July 2004 the Central Government in London published the 'Science and Innovation Investment Framework 2004-2014' (HM Treasury, 2004), which is the beginning of a 'new' policy in this field.

The ten year strategy aims at renewing the United Kingdom approach in innovation and related fields. Linked to this is the publication of Richard Lambert review of Business-University collaboration (DTI, 2003b), that showed the need of increasing the supply of science and engineering skills and hoped for a more collaborative approach between the university sector and the business one.

The innovation review was necessary not only because innovation is a 'moving phenomenon' and it needed changes in policy, but also because of the latest years UK policy towards the regions in terms of delivery.

The new approach that it can be seen in the UK has similar developments also in Wales, which is trying to encourage regional economic growth. Networking, improving workforce skills, all have a part to play in creating business to business links. Wales has recognised this and is trying to make innovation a best priority and to bridge the gap between university needs and business sector ones. There is an emerging literature which reinforces the belief of regional scientists that regions are increasingly important bases of economic coordination and are advantaged by true synergies and linkages among economic actors (Cooke, 1998). This is what one can see in Wales.

3 The Welsh Governance structure

The most important actors in the political field in Wales are the National Assembly and the agencies, and in particular the Welsh Development Agency (WDA), the Welsh European Funding Office (WEFO), Education and Learning Wales (ELWa) and Wales Trade International (WTI). A great importance is also attributable to Finance Wales.

The agencies have been pursuing active policies for regional development against a background of economic decline (Hendry *et al.*, 2002).

The Assembly is a single body corporate, including both the parliamentary and executive functions within one legal entity and with one set of staff. The National Assembly for Wales has sixty elected members and is chaired by the Presiding Officer, elected by the whole Assembly (Figure 1). The National Assembly has delegated many of its powers to the Welsh Minister, and he in turn has delegated them to other Cabinet Ministers. But Ministers remain responsible to the National Assembly as a whole and are answerable to it. As a Cabinet member, the Secretary of State ensures that the interests and needs of Wales are fully considered in policy formation within the UK Government.

The Assembly decides on its priorities and allocates the funds made available to it from the Treasury in London according to its own spending priorities. Within its powers, the Assembly develops and implements policies which reflect the particular needs of the people of Wales. The Assembly is funded by the UK Government through general taxation and it also receives resources through a grant each year from the Secretary of State for Wales. The budget is set for three years and is adjusted every second year when the UK Government sets its forward expenditure plans through Whitehall Spending Reviews (NAW, 2005a). Most of these adjustments are made according to the Barnett formula, that is used to adjust the budget, not to calculate the total available to the Assembly in each year (see Bristow, 2001).

The WDA plays a key role in the economic development success of Wales. The two principal strategies adopted by the WDA for economic renewal are inward investment and business support services (Hendry *et al.*, 2002). Since its establishment by the UK Government in 1976, the WDA has been working to stimulate and support the economic prosperity of Wales. It's one of the most successful development agency in Europe (WDA, 2004a). The board is composed of a chairman, thirteen non-executive members and the chief executive. Stimulating the growth of business in Wales, attracting world-class companies to invest in the region and working with local communities to encourage prosperity have been the cornerstones of these improvements after years of economic decline. The WDA's head office is located in Cardiff. It has offices in all of the key regions in Wales and in many countries throughout the world. The WDA is accountable to the Welsh Assembly Government. The WDA helps businesses in obtaining grant support; ongoing help and advice once a business is established and operating within Wales. Close collaboration with customers is a particular feature of the WDA (Hendry *et al.*, 2002).

Comparing the WDA with the Regional Development Agencies (RDAs) in England – that were established in 1999 and 2000 on the model of the WDA (Benneworth, 2001) –, one may say that the

WDA is much a stronger body because its role is clear in terms of economic development. The tools are the same, but the context and the resources are very different. For example, the London Development Agency's budget is about £ 3 hundred million, while the WDA's budget is about £ 209 million and the size of the Welsh economy is not developed as the London one.

WEFO was established on 1st of April 2000 as an executive agency of the Welsh Assembly Government. It's role is to manage all aspects of European Structural Funds in Wales and to ensure that Wales derives the maximum possible benefit from European funding programmes.

WEFO ceased to be an Executive Agency of the Assembly in July 2003. It is now fully integrated and forms part of the Economic Development and Transport Department.

ELWa was established in April 2001; it's an Assembly sponsored public body, responsible for the planning and promoting of further education, work based learning, adult and continuing education and school sixth forms, with the exception of higher education. The Higher Education Funding Council for Wales (HEFCW), introduced in 1992, complements ELWa competencies. The Council is responsible for the administration of higher education in Wales.

WTI is part of the Assembly; it has the aim to promote international trade, working in collaboration with the WDA and Trade Partners UK. The inward investment international activities remain with the WDA.

Established by the WDA and the Welsh Assembly Government, Finance Wales encourages SMEs in Wales to realise their potential for growth. Jointly funded by the EU and the private sector, it has been created as a subsidiary of the WDA with its own separate board to provide loan and equity finance to SMEs in the Objective 1 area. It acts as a lender of last resort by offering financial solutions on a commercial basis, complementing existing sources of finance. Over the financial year 2003-2004 Finance Wales invested and provided borrowing facilities to over 130 companies (NAW, 2004b). 'To date, it has invested in 300 companies. In 2002, 175 businesses received a total investment of £ 8m from Finance Wales, creating 1,700 jobs.', (WDA, 2004a).

One of the most important characteristic of the Welsh structure is the interaction and deep collaboration among the policy actors, like a partnership system. In general, the Welsh system is working well, because there is a good relationship between the National Assembly and the agencies. There is collaboration, there is a certain amount of overlapping, but it's acceptable, it's not excessive. The important thing is that all the most important actors do work together to try to improve the economic environment and keep each others informed.

It should also be mentioned that the WDA, Wales Tourist Board (WTB) and ELWa are merging with the Assembly on 1 April 2006. They will cease to be quangos by 1 April 2006 and they will be incorporated directly into the relevant departments of the Assembly administration (WAG, 2005). It constitutes a major step forward in the simplification of government and the process of devolution in Wales (WAG, 2005).

Figure 1 The National Assembly for Wales Structure

4 An overview on the Welsh economy

There continues to be substantial diversity between the regions of the UK. Scotland, Wales, Northern Ireland and the regions of England are all different in character, industrial structure and economic performance. Scotland, for example, has the largest area, but has a small population relative to its size; London has the smallest area, but the second largest population (after the South East) – over 7 million. In 1999 Wales had 5 per cent of the population (about 3 million people), 4.5 per cent of the total of economically active persons, 3.9 per cent of the UK's GDP (the actual GDP in Wales is about £ 30 billion), (Contemporary Wales, 2003; Welsh Economic Review, 2002).

Furthermore, within Wales there are large economic disparities. While the South East centred on Cardiff and Newport is the most prosperous part, there are pockets of deprivation in North and Mid Wales and the South Wales Valleys which qualify for Structural Funds programming (WDA, 2004a).

The Welsh economy is under deep changes. During the last 20 years, Wales has undergone a major industrial transformation. From dependency on traditional industries such as steel and coal, the region has attracted many overseas manufacturing companies (the majority of them has yet a market in England) in sectors ranging from car components to electronics (Cooke, 1998). The manufacturing sector remains of central support to the Welsh economy (NEDS, 2004). In general, Wales is highly dependent on conditions elsewhere in the world, particularly Europe and is highly integrated with the rest of the UK economy. The industrial structure presents a prevalence of SMEs (FSB, 2000 and 2002), (see Table 1); above average dependence on declining or low value-adding industries; record in attracting foreign investors; record on exporting manufactured goods.

Table 1 Firms in Wales

	<i>Number</i>		
	<i>Firms</i>	<i>Employment (000s)</i>	<i>Turnover (£ million)</i>
Total (turnover excludes Sector financial intermediation)	154,495	748	51,354
Agriculture, forestry and fishing	17,520	35	1,395
Mining, quarrying, energy, water	9,470	190	20,040
Construction	32,405	68	4,099
Wholesale, Retail & Repairs, Hotels & Restaurants	32,510	176	14,632
Transport, Storage & Communication	9,045	29	1,782
Financial Intermediation (excluding turnover), Real Estate, Renting & Business Activities	25,140	88	3,788
Health, Education, Other Services	28,405	163	5,618

Source: Small Business Service (SBS).

Some of the most important reasons in the ‘catch-up’ process in Wales may be identified as follows:

- *the quality of workforce*: low level of industrial disputes, commitment to building success, flexibility to adapt to changing investor needs and innovation characterise the skilled workforce in Wales, even if there are several studies of high level of economic inactivity and deficiencies in the level of skills (NAW, 2005b; WAG, 2004);
- *low cost base*: set-up and ongoing operational costs in Wales are very competitive;
- *infrastructure*: Wales’ infrastructure is well developed. A research by Huggins (2000-2001) on ‘Why was the investment located in Wales instead of elsewhere?’, concluded that ‘the most important deciding factor in choosing Wales as an investment location was the availability of government grants and subsidies that facilitated the initial location process. Within the second band of key location factors were the relative costs that a company would directly incur in locating in Wales, as compared with elsewhere. (...)’, (Huggins, 2001, pp. 839 – 840).

Wales has one of the most impressive track records in Europe for attracting international businesses; more than 2,000 inward investment projects were secured into Wales between 1983 and 2000. Many of the world’s largest multinationals such as Sony, Panasonic and GE, are investing in Wales. Their success has helped create one of Europe’s fastest growing regions and one of the most impressive foreign direct investment (FDI) track records world-wide.

Despite this success in attracting inward investors, more statistics suggest that Wales is not as entrepreneurial as it could or should be. The region is at least 30 per cent behind the average for the UK for the rate at which it creates new businesses (GEM, 2001a and b). According to WDA (2004a), ‘Wales has historically fallen behind other regions of the UK in terms of the average number of new business start-ups.’

However, once businesses become established in Wales, they have a better chance of survival. Over 60 per cent of Welsh businesses survive at least 3 years which places Wales above the averages for both England and Scotland, though behind Northern Ireland (NAW, 2002).

Anyway, Wales’s trying to continue to work in partnership to develop innovative solutions to transform the economy of the region (NEDS, 2004).

Entrepreneurial activity in Wales has grown by 74% since 2002, which represents the highest expansion after London and the South East (Cowling *et al.*, 2003).

Besides, Wales has experienced strong and sustained growth in funding since 1999.

This trend is continuing. Wales settlements, delivered through the Barnett formula, have been added to by the UK Treasury in a unique arrangement that recognises the significant amount of European Structural Funds given to Wales. As a consequence, during the 2004-2005 budget period, Wales is receiving £ 555 million over and above the Barnett based allocation (NAW, 2005a). While the budget for 2002-2003 of the National Assembly was around £ 11 bn, it has increased in the latest years (HM Treasury, 2002). And this trend is expected to continue over the next three years: Wales

budget will increase from £ 12.6 bn in 2005-2006 to £ 14.3 bn in 2007-2008. This will boost Wales spending power by 21%, giving Wales an extra £ 2.5 bn each year to spend by 2007-2008 compared to 2004-2005 (NAW, 2003a and 2003b). This means that by 2007-2008 the Assembly budget will have almost doubled from £ 7.5 bn – available in 1999 when the Assembly was first established – to £ 14.3 bn (NAW, 2004a and 2005a).

Figure 2 provides some data on the Assembly budget 2005-2006 and Table 2 and Figure 3 illustrate how is distributed the amount available for economic development and transport (£ 1.492bn), that is one area in which the Assembly has considerable power to develop and implement policies. Innovation and competitiveness has one of the highest amount for the year 2005-2006, £119,110, and it shows a considerable increase for the year 2006-2007.

Figure 2 The Assembly Budget 2005-2006

Source: National Assembly for Wales (NAW), (2005a).

Table 2 Economic Development and Transport, Spending Programmes

Programme	Budget 2004-2005	Budget 2005-2006	Plans 2006-2007	Plans 2007-2008
	000 £	000 £	000 £	000 £
Innovation and competitiveness	108,260	119,110	126,860	121,860
Entrepreneurship	80,198	80,198	80,198	80,198
Telecommunications and infrastructure	35,568	35,823	37,568	35,568
Property and related infrastructure	62,362	62,362	62,362	62,362
Regeneration packages	77,725	89,125	86,225	84,725
Domestic international business promotion	55,281	55,281	55,281	55,281
Financial support for employment creation/promotion	89,212	89,212	89,212	89,212
Maintain the trunk road network	465,552	466,244	466,244	466,244
Improve the trunk road network	54,831	65,458	74,478	79,341
Improve rail services	16,879	31,980	24,565	23,715
Improve local roads	52,246	55,883	55,883	55,883
Improve integration and delivery of local transport services	109,777	119,958	123,173	126,923
Improve road safety	12,363	12,914	12,914	12,914
Improve the quality of the local environment	3,925	4,075	4,075	4,075
Support walking and cycling	9,241	12,501	12,501	12,501
Structural funds and match funding supporting other programmes	92,210	168,279	180,279	192,979
Tourism promotion	24,034	24,034	24,034	24,034
TOTAL	1,349,664	1,492,437	1,515,852	1,527,815

Source: National Assembly for Wales (NAW), (2005a).

Figure 3 Spending Programmes 2005-2006

Source: National Assembly for Wales (NAW), (2005a).

5 Innovation policy in Wales

The Welsh Assembly and the Welsh Development Agency (WDA), just as the United Kingdom in general, have a strong focus on building their region through innovation. This is beginning to bear fruit in terms of increased levels of entrepreneurship in most regions of the UK in 2003 (Cowling *et al.*, 2003).

Set against a background where Wales has consistently lagged behind other regions of the UK, the target of closing the prosperity gap looks ambitious. It won't be an easy task, because Wales is behind most of the other regions in the UK and in the European Union in terms of prosperity (GEM, 2001a and b). A central plank of this policy is 'entrepreneurship' (GEM, 2001a and b). And, as it has been shown in the preceding section, Wales has consistently improved its performance in this direction. The challenge remains to transform Wales into a higher value added, innovative and entrepreneurial regional economy, capable of delivering increased prosperity to people in all parts of Wales.

In April 2004 was published an updated version of the economic strategy 'A Winning Wales', aiming at delivering a prosperous Welsh economy that is based on successful, innovative businesses supported by a highly skilled, well-motivated workforce.

The priorities set out in the new version of 'A Winning Wales' remain the same, to continue to improve skills and infrastructure, to encourage and support R&D and innovation and to provide an environment which is business friendly. These priorities reflect the needs of the business community in Wales (NEDS, 2004).

Wales was also the first region in the UK and one of only eight regions in Europe invited by the European Commission to develop a strategy aimed at improving innovation and technology in a regional context. The result was the publication of a Regional Technology Plan (RTP) in 1996: its objective has been to develop a consensus through extensive consultation on a strategy to improve the innovation and technology performance of the Welsh economy. The plan is managed by the WDA and operates as the framework for public sector resource allocation in innovation and technology transfer in Wales.

Underpinning the drive for technological improvement and inspired innovation is Wales for Innovation, the Welsh Assembly Government's action plan for innovation, launched in 2003, building on the WDA Regional Technology Plans of 1996 and 1998 (WDA, 2004a, 2004c and 2004e).

According to WAG (2003a), the RTP laid much of the groundwork to start to address the innovation deficit in Wales. Following a major consultation exercise different organisations throughout Wales developed programmes to address the various priorities of the RTP. Examples are Innovation&Technology Counsellor (ITC) Service, the Finance Wales Spin-out Wales Programme (It aims to stimulate and support the creation of new businesses emanating from HEIs. The programme offers start-up packages to academics and entrepreneurs wishing to transfer their skills and knowledge to a commercially viable business), Centres of Excellence for Technology&Industrial Collaboration (CETICs, the programme is designed to help fund the recruitment of commercial and technical staff dedicated to working with industry, and in particular SMEs), Know How Wales, a Technology Exploitation Grant, Technium developments. According to ANGLE (2003) 'Technium was conceived to provide an infrastructure and support mechanism to assist in the creation and development of knowledge-based businesses in the South West Wales region. The original aims of the project were three fold:

- to assist the creation of new spin-out businesses;
- to help develop existing indigenous businesses;
- to provide a seamless mechanism to attract R&D inward investment opportunities'.

The new political responsibilities have given freedom to the region, that administers autonomously the budget transferred from London, and decides its own priorities. The entrance of Wales in Objective 1 regions in 2000, beneficiaries of European Structural Funds, is a good way to implement initiatives to improve Wales' economy.

The WDA is responsible for the implementation and administration of the main incentive schemes to businesses. According to Cooke (1998, p. 245) 'The establishment of the Welsh Development Agency in 1976 meant that, for the first time, Wales had a body capable of promoting strategic economic development'.

In the latest years, the Assembly has given more and more power to the WDA in order to concentrate the main responsibilities in one organisation. The WDA has published an Action Plan for Innovation, which sets out the devolved administration's strategy for innovation through to 2005-2006. The focus of Wales is on five main action areas (WAG, 2003a; WDA, 2004d):

- communicating what can be achieved through more innovation;
- developing more high growth potential businesses, especially in the high technology sectors;
- better equipping people to innovate;
- simpler, more accessible, business innovation support through advice and mentoring activities, grants and external sources, specialist facilities for incubator centres;
- maximising the economic development impact of Welsh universities and colleges.

According to WAG (2003a), Wales is giving more and more importance to promote business opportunities in the region, to create a clear environment for firms in terms of innovation grant and support services, to establish better links between businesses and universities. These may be defined the most important innovation policy priorities in Wales. Specifically, the region decided to set up a £ 4 million campaign promoting the benefits of innovation to companies, higher and further education institutions.

According to Cowling *et al.* (2003), the high profile campaign to develop a greater awareness of entrepreneurship is starting to bear fruit.

According to Cowling *et al.* (2003) 'Of interest is the fact that the number of individuals who believe that there are good start-up opportunities in the next six months has risen again from 22 per cent to 37 per cent of the population'.

The current take-up of ICT by Welsh businesses is not high enough. To be competitive, businesses must grasp the opportunities presented by the e-business revolution. Wales urgently needs a comprehensive information infrastructure across Wales to provide access to high speed band-width at competitive rates. Physical infrastructure and access to utilities is patchy and tends to be deficient in the more isolated and less prosperous parts of Wales.

Besides, Wales has established SmartCYMRU - a single innovation grant scheme - as part of a more streamlined approach to innovation support and is investing £ 5 million in boosting highly proactive specialist support services, targeting effort more effectively on the delivery of practical high quality advice and support that is valued by business.

Wales is investing up to £ 150 million by 2005-2006 in expanding across Wales the Technium Centre concept pioneered in Swansea, creating quality high-tech incubators which will act as innovation focal points within their regions. According to WDA (2004a, p. 15) 'Business incubation is now a well recognised business development tool in Wales and (with certain provisos) can be seen to make significant contribution to the survival and growth of technology businesses, with long-term economic benefits'.

Related to innovation priority is responsibility for improving scientific skills and education.

Aiming at strengthening the activities of both ELWa (Education and Learning Wales) and the WDA on winning the commercial benefits of the ideas and talent in Welsh universities and colleges, Wales decided to invest £60 million through to 2005-2006. In response to relative weaknesses in some science areas, the programme will include the Higher Education Economic Development Fund, up to £ 9.3 million over three years from the Higher Education Funding Council for Wales (HEFCW), to drive forward the development and implementation of commercially-oriented strategic business plans geared to focusing universities' efforts, working closely with the business world, on exploiting their in-house technology and knowledge to the full.

Wales has an enormous untapped resource in its Higher Education Institutions (HEIs), (Morgan, 2002), (Figure 4).

There is a real need to further encourage links between businesses and HEIs, with success rates benchmarked against best-in-class in the UK and beyond (PriceWaterhouseCoopers, 2003 and 2004). As the UK in general, Wales must ensure better integration of its academic institutions into its economy.

Figure 4 Higher Education Institutions (HEIs) in Wales

Table 3 illustrates the budget for education and lifelong learning till 2008.

Table 3 Education and Lifelong Learning, Wales (000 £)

	<i>2005-2006</i>	<i>2006-2007</i>	<i>2007-2008</i>
ELWa	544,053	564,175	575,806
HEFCW	382,827	395,495	404,724

Source: National Assembly for Wales (NAW), (2005a).

ELWa has a budget of over £ 540 million for the year 2005-2006, that is more than the double of the WDA budget in the same year (£ 209,241). This is an evidence of the importance attributed to improve the educational sector in Wales, following the new policy priorities towards a better relationship in the business-university sector.

Table 4 and Figure 5 provides some data on R&D expenditure in Wales since 1995. It can be observed a general increase in total expenditure on R&D, and in particular a sensible growth in 1999, when the National Assembly for Wales was established. Similarly, in the latest years, HEIs and businesses increased their expenditure in R&D.

Table 4 Research and Development Expenditure, Wales

<i>Expend. type</i>	<i>Total expenditure on research and development</i>	<i>Higher education bodies research and development</i>	<i>Business enterprise research and development</i>	<i>Government and Research Councils research and development</i>	<i>Private, non-profit bodies research and development</i>
Year					
1995	228	102	96	30	..
1996	245	105	108	32	..
1997	257	111	113	33	..
1998	289	113	125	51	..
1999	387	129	203	55	..
2000	348	139	144	65	..
2001	340	155	136	49	..
2002	402	180	182	41	..
2003	~	~	264	~	..

Source: Stats Wales.

Figure 5 Research and Development Expenditure, Wales

Source: Stats Wales.

Figure 6 R&D expenditure by region

Source: Stats Wales.

Compared to the UK regions, instead, Wales has one of the lowest levels of R&D expenditure of any UK region or country (Figure 6). Wales aims to increase business R&D expenditure to more than 1% of Welsh GDP by 2010. One of the most important reasons for Wales poor performance in R&D, is given by the fact that Wales has attracted the so-called ‘branch factories’ of companies or multi-nationals which have their head offices and R&D functions elsewhere. This holds back the

relative GDP in Wales, because jobs with the highest wage are not in Wales and the R&D departments that often provide the ideas people who spin-off to start their own companies are similarly outside the region (WAG, 2003b). That's why Wales has lower unemployment than England, but a much lower GDP per head at the same time and a lower rate of company formation. And that's also why Wales has yet a relative good higher and further education system that benefits more other UK regions than the local economy. It is a matter of fact that the most attractive jobs for the brightest graduates are not located in Wales.

This has been defined a 'top-sliced' characteristic of the Welsh economy (WAG, 2003b), and it's recently showing improvements. In the latest years, many of the new companies are moving into Wales, bringing R&D departments with them. This trend is in progress and it hasn't yet improved on relative GDP figures or in company formation, but Wales is working towards this direction.

5.1 Main Instruments of innovation policies and Industry-Higher Education Institutions (HEIs) relationship

A more coherent framework for innovation support is now in place in Wales.

Wales is trying to encourage innovation by ensuring that all businesses realise the potential of innovation in developing new products, processes and management practice, and maximising the use of ICTs (NEDS, 2004).

Through Regional Selective Assistance (DTI, 2000 and 2003a) and the Assembly Investment Grant business programmes, Wales supports the expansion and/or new investments of existing businesses, as well as new companies formation in the region. These grants are tied to private sector investment and the creation of new jobs or protecting existing ones.

In recognition of Wales need to encourage creativity, the WDA revised its innovation grants into a single £ 25 million scheme, called SmartCYMRU, which has substituted RIN, SMART and SPUR schemes. This new streamlined grant promotes innovation and research in business and it's administered by the Welsh Development Agency (WDA) itself. The programme was realized in collaboration with businesses with the aim of encouraging R&D activities to realize new products and/or processes. It is a vital element of the Welsh Assembly Government's Wales for Innovation action plan (NAW, 2004b). Besides, it's the only scheme of its kind in the UK that provides funding to help launch as well as market new products (WDA, 2004a).

Opportunity Wales gives assistance in the ICT sector, while Business Eye is the new business gateway launched in September 2003, that may take inquirers straight to appropriate and efficient assistance and expertise on innovation issues and support (according to WDA 2004d, the total expenditure on this key activity for 2004-2005 is about £ 5,536).

The WDA has been tasked with delivering key elements of the Innovation Action Plan and also has taken on responsibility for managing the Knowledge Exploitation Fund (KEF), which is a fund that was set up to encourage entrepreneurship and innovation through assisting Higher and Further Education to develop the skills of staff and students, create a culture of innovation within their institutions, and apply their knowledge in the business world. The WDA is responsible for this fund since 14 January 2004 and as a consequence, became entitled to receive £ 4,248,586 in additional funding to cover all outstanding commitments under the funding contracts (NAW, 2004b).

These activities together with the roll out of the Technium programme and the implementation of the Future Technologies Programme, form the basis of the WDA's Technology and Innovation activities for the year 2004-2005 (WDA, 2004d). The WDA is releasing £ 3 million from the Knowledge Exploitation Fund for collaborative research projects between academia and industry. The fund will pay for up to half of project costs, to a maximum of £ 500,000 in key sectors including automotive, aerospace, construction, advanced engineering and materials, pharmaceutical and biochemistry, and technology including electronics and optoelectronics (WDA, 2004b). Together with the Teaching Company Scheme (TCS), available in all the UK, KEF is the main scheme in the university-industry relationship.

Besides, Know-how Wales, introduced in 1999, is a scheme guided by the WDA to help create partnerships between university and businesses.

In 1998 was created HELP Wales, to foster businesses utilise the resources and expertise within the HEIs in Wales. Welsh HEIs can apply their knowledge of new technology and business expertise to help companies improve their efficiency, develop new products and explore new market potential. Help Wales provides SMEs grants for consultancy projects to be undertaken by academics within Welsh HEIs. The aim is to give SMEs access to knowledge and expertise that will help them to develop innovative products, explore new markets, improve efficiency, raise productivity and boost competitiveness (CBI, 2001).

Table 5 provides financial data on total expenditure on Innovation and Technology Programmes 2004-2005 in Wales, that is about £ 39,025.

Table 5 Innovation & Technology Programmes 2004-2005

<i>Examples of key activities</i>	<i>2004-2005 £, 000 Spend</i>
CETICS	£ 2,250
Wales Innovation Relay Centre	£ 650
SmartCYMRU (programmes)	£ 8,000
Technology Exploitation Programmes	£ 2,201
ITCs	£ 1,060
Knowledge Exploitation Fund (KEF)	£ 9,500
Technology Comm. Centre	£ 1,000
Wales Innovators Network	£ 440
Low Carbon Partnership	£ 873
@ Wales	£ 583
Other Technium Support	£ 1,247
Environmental Goods and Services	£ 1,198
Others	£ 10,023
Total amount	£ 39,025
Main results	
Jobs created	1,708
Jobs safeguarded	3,022
Industry Academia Collaborations	536
New products and processes introduced	1,625

Source: Welsh Development Agency (WDA).

The highest amount of funds is given to SmartCYMRU and to KEF programmes, which may be defined the most important innovation scheme.

Among the key WDA support activities, it's included a number of collaborations between academic institutions and the business community in R&D. This activity resulted in 536 industry-academia collaborations in 2004-2005 (Table 5). Agency promotion of innovation and technology resulted in 2,440 new products and processes being developed by firms in Wales, compared to 1,625 introduced (Table 5).

A further step is given by the development of a Knowledge Bank which will further enhance capacity to assist innovative activity (NEDS, 2004). Wales is planning the launch of the Knowledge Bank this year with the aim to strengthen the research base and to assist with the exploitation and commercialisation of that research through encouraging closer links between higher education and business (NAW, 2005a).

Trying to become a 'better country', Wales has committed itself to further develop knowledge economy through stronger links between higher education and business. The Welsh higher education sector has a key role to play in promoting knowledge exploitation and the development of a skilled workforce. The latest UK-wide higher education business interaction survey shows that Wales is punching above its UK economic weight in a number of key knowledge transfer activities. For

example, in 2001-2002 Wales accounted for over 10% of all spinout activity from UK HEIs; 19% of all graduate business start-ups; 11.6% of all Higher Education Institution contracts signed with SMEs; and 6.9% of all UK Research Council grants involving business co-funding (HM Treasury, 2004). In addition, the quality of research undertaken by the higher education sector in Wales has improved over the past decade.

To encourage innovation Wales is trying to establish stronger links between businesses and the education institutions on a wide range of matters including recruitment, training, management development, international networking and technology transfer. Wales wants also to strengthen the technology base of its education institutions (NEDS, 2004).

Another gap in the innovation infrastructure in Wales is the lack of effective science parks. There are currently at least 80 science parks in the UK, but while Scotland has by far the greatest number (Figure 7), with the East of England, South East and North West following behind, Wales is at the bottom of the table with very few major science parks (Bristol Science Park, 2004). Wales has only three major science parks. They are the Bangor Innovation&Technology Centre (INTEC), Cardiff Business Technology Centre and Technium in Swansea.

Figure 7 UK science parks – number by region

Source: Bristol Science Park (2004).

6 Conclusions

In the knowledge-based economy innovation policies are pivotal. The United Kingdom chose a policy of renewal in this field, according to new strategies of the Labour government.

Nowadays, there is an increasing pressure on universities to cooperate with business all around the UK (Harding, 2004). The Treasury and the Department of Trade and Industry (DTI) have led move to prioritise the knowledge-based economy and have recognised the broader role for universities in generating and transferring knowledge to industry (Harding, 2004).

Networks, alliances, sectoral specialization, flexibility and dynamism are taken into account in the debate on the centrality of technology for competitiveness. These priorities, together with the

power of the regions, may be defined as the sources of innovation in the UK (Harding, 2001 and 2002b).

Success will, however, depend on implementation. It's too early to say if these reforms will be positive and how much they'll improve the business environment.

Anyway, gaps still persist. Regarding availability of finance, venture capital remains under-utilized as a means of small business finance. An effective venture capital market may create economic growth and employment by stimulating development in SMEs, and so stimulate innovation (Harding, 2002a). According to Harding (2000b), it would be tempting to see venture capital as a panacea for creating growth, innovation and employment. And a venture capital market is quite absent in Wales. Apart from Finance Wales, the supply of venture capital is generally low across Wales, particularly outside Cardiff (WDA, 2004a; Cowling *et al.*, 2003). Through the work of Finance Wales and SmartCYMRU, much has been done to plug the finance gap in Wales, but start-up and early-stage technology-based companies still find it difficult to raise seed and growth finance (WDA, 2004a).

In the field of business-university relationship, also science parks make a significant and distinctive contribution to the UK's economic infrastructure. According to the ANGLE Technology research (2003), the accommodation they provide is valued by tenants and the overall commercial performance of the companies based on them is better than similar firms located off-parks. There are, however, a number of specific areas where there is potential for the science park movement to enhance its contribution to the development of the knowledge-based economy in the UK. And Wales has much to do in this direction, because the region has the smallest number of science parks of all the UK.

The institutional framework for the governance of economic development has become multi-level and fragmented across the European, national, sub-national, regional and local levels. Regional learning and innovation have been promoted by forms of regional economic policy that emphasise the role of regions as agents of their own development (Humphrey *et al.*, 2004).

Concerning Wales in particular, the need to increase the knowledge, R&D and innovation capacity in all parts of the Welsh economy is well recognised. To investigate how effectively Welsh businesses are innovating today, and to understand the role of public sector support in improving the current situation, PricewaterhouseCoopers worked in collaboration with CBI Wales to undertake a detailed survey of Welsh businesses during March and April 2004. This survey, 'Building the Dragon Economy. Innovation in Wales: the story so far' (2004) revealed that Wales continues to fall below the global trend line for innovation. It's those businesses with a structured approach to bringing innovation from concept to commercialisation that generate the best results. Anyway, these businesses with both a real understanding of smart innovation and an ability to implement it, are in a minority for the majority, because a lack of structure and process appears to be the norm. At the moment, although many businesses are innovating in Wales, they don't do it very well. According to this survey, there is a disconnect between creativity in businesses and the subsequent managed commercialisation of new products and services. Those businesses that adopt a formal structure to innovation generate the best results.

According to PricewaterhouseCoopers (2004), there is a number of areas where the Welsh Assembly Government could maximise the rate and efficiency of innovation in Wales. Firstly, much more needs to be done to understand the barriers to innovation by Welsh businesses and refocus assistance programmes to fill the gaps in the services sought; secondly, additional investment is needed in training and mentoring. Besides, there is potential for greater collaboration between academia and business and there is a need to expand the focus on innovation beyond product development, especially process and relationship.

Wales has a skills gap which is holding back innovation. Too many company employees are suffering from a basic lack of innovation-based skills and experience. Too many are trying to learn on the job (PricewaterhouseCoopers, 2004).

The devolution process and the subsequent competencies delegated since 1999 to the Welsh Assembly, in particular in the field of economic development, has enabled to establish a structure in which any body has quite a clear role. The direct and deep relationships among the most important bodies in Wales, is one of the most important reasons of the nowadays success of the Region and it's at the base of the present implementation process of the Structural Funds programmes. Wales has a very active regional policy to promote economic development and innovation partly through the support of this kind of networks (Cooke, 1998). The challenge for Wales is to improve the nowadays

Welsh success in the economic field and the importance of the country in attracting foreign direct investments.

In the latest years, there is an increased emphasis towards entrepreneurship in Wales (Cowling *et al.*, 2003). Wales has recognised the fact that support to business goes wider than simply offering grants: it has to be accessible and effective. That's why it has simplified the range of business support schemes on offer to make it easier and quicker for firms to get the right business advice at the right time.

Wales is trying to attract more companies in the region, so that they may innovate more and carry out their R&D work in Wales, and is trying to enhance existing networking and education activities. To this aim Wales is working to improve the innovation framework and to create better and much closer links between university research and business opportunities, along the evolutionary interpretation of the TripleHelix model.

Wales may be defined a good example of what Audretsch (2004) calls 'the strategic management of regions'. A new policy of importance of regions and strategic management of places, as a result of globalization, is emerging in the latest years (Audretsch, 2004). Typical features of this approach are programs promoting entrepreneurship in a regional context, strong links between program-financed firms, the creation of social capacity and enhanced innovation performance. Innovation is not considered to occur solely within the boundaries of the enterprise, but there is a recognition of the role of knowledge externalities that has led to the emergence of geographic space as a crucial platform for innovative activity. Strategic management of places is based on knowledge and social capacity. In a globalising world, information can be easily codified and has a singular meaning and interpretation. By contrast, knowledge is vague, difficult to codify and often only serendipitously recognised (Audretsch, 2004). Knowledge is not only university research, but also skill and education. It's not simply the concentration of skilled labor, suppliers and information that distinguish the region, but also the propensity of people to innovate and have business ideas. Knowledge and ideas are the key of the new policy. Universities play an important role in establishing knowledge transfer programmes. The emphasis is on regional peculiarities and on this new strategic management of regions focused on entrepreneurship policies. Wales may be defined as a clear example of this new approach, because the Welsh Assembly and the WDA efforts are all focused on trying to achieve the best results from the peculiar economic and cultural characteristics of the region.

This is a good vision, but the real challenge for Wales will be to implement in an effective way the new policy priorities based on a communication campaign, on improving the high-tech sector, on developing a learning culture, on maximising university-business links and on simplifying business innovation support. Wales has a good quality workforce and low cost base, which attract many overseas businesses, but this is not enough. The region has also to maintain this success through developing Welsh peculiarities and best capacities.

Since 1999, Wales has the power to implement its own policy in several fields, of which one is economic development. The new government structure with its enthusiastic establishment, the Structural Funds programming, the foreign investments and the willing of the local economy and the Welsh workforce, are all evidence of this policy change and the new direction that Wales is following. In this context, the TripleHelix model and the Audretsch (2004) theory are good interpretations of this active involvement in structuring a new Welsh system of interactions among academia, businesses and government.

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