CHAPTER 5

WALES: FROM COAL AND STEEL TO HIGH PERFORMANCE ENGINEERING CLUSTERS

1. BACKGROUND

(i) Firms and Institutional Change in Wales

Until the mid-1980s, the main economic role of Wales within the UK system was as a supplier of agricultural and heavy industrial inputs, especially coal and steel. Having been a cradle of the Industrial Revolution, beginning with iron production in the 1780s, Wales experienced a lengthy period of restructuring from the early post-war years until the effective ending of major coal production following the defeat of the miners in the 1984-5 national strike.

During the post-war years, government policy had encouraged engineering and other manufacturing firms to relocate to the industrial belts of South and North Wales. Thus, companies such as Ford, Hoover, Ferodo, GEC, Ferranti, Hotpoint, Borg-Warner and 3M became established, many demonstrating the importance of American investment in a UK economy dependent for a time on Marshall Aid and seeking to recover traditional markets throughout the world. At this time (1945-1975), there was no obvious pattern to the incoming foreign investments other than that they were classical branch-plants, mainly in consumption goods industries, seeking and finding large numbers of semi-skilled shopfloor workers, both male and female. Few of these arrivals ever sourced much of their supplies locally with the exception of peripheral items such as packaging and transportation.

The establishment of the Welsh Development Agency (WDA) in 1976 meant that, for the first time, Wales had a body capable of promoting strategic economic development. Though WDA never produced an economic plan for Wales, not even producing a corporate plan until 1992, nevertheless there developed a tacit sector strategy to intensify the level of investment, both domestic and overseas, in automotive and electronic engineering. This strategy took off spectacularly in the 1980s, mainly because this was the period of most intense job-loss in coal, steel and the first-round of manufacturing industries. For a period of approximately ten years from 1983 to 1993 Wales, with 5 per cent of the UK's population and GDP, consistently attracted between 15 per cent and 20 per cent of inward investment in the UK.

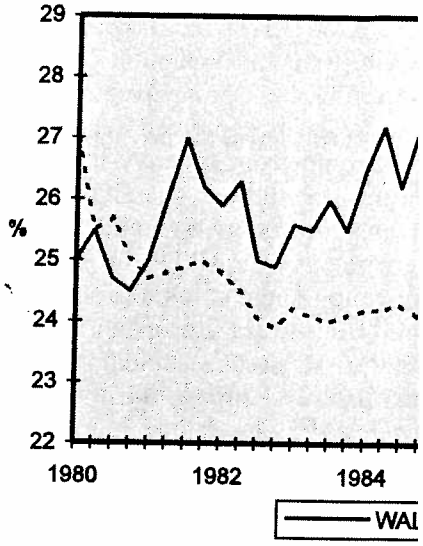
Much of this was Japanese, American and European (especially German) investment in engineering. Sony arrived in 1974, followed by Hitachi, Panasonic (Matsushita), Aiwa, Brother, Sharp and Orion, all in some way involved in consumer or office electronics. In automotive industries, Ford opened its new high-range (Sierra, Mondeo, Jaguar) engine plant at Bridgend in South Wales in 1978 and this was followed by acquisitions or new, greenfield investments by Calsonic, Valeo, Lucas SEI, Robert Bosch, Trico, ITT-Alfred Teves, Ina Bearings, Sekisui, Yuasa, Gillet, Grundy and Hoesch-Camford. Finally, in 1992 production of 200,000 engines a year by Toyota began as supply to their assembly plant in Derby and for export back to Japan. With the Ford engine plant producing 500,000 Zeta engines as well as Jaguar's new AJ26 V8 engine, Wales had become one of the key centres of high-quality, high-skill automotive engine and components production in Europe.

These and indigenously-developed supplier companies have built a customer base which includes all the UK and major European manufacturers in the automotive industry sector, including Rover, Ford, Jaguar, Nissan, Toyota, GM, Peugeot & Honda in the UK and Volvo, Saab, Fiat, Opel and Renault overseas. A similar result is obtained for the electronics industry, except that a much larger share consists of final assembly companies, especially in the case of the Japanese (e.g. Sony, Aiwa, Hitachi, Panasonic, Sharp and Brother). Hence, components and services are sourced from outside Wales and the UK as well as from local suppliers. Thus, the supply-chain flow is the reverse of that for the automotive industry. In the latter case, the Welsh industry is a supply-chain to final assembly firms that are located outside Wales. Of interest for electronics is the structure and distinctive growth pattern of the Welsh sector within the UK.

Perhaps the most striking development resulting from the emergence of a new engineering industry in Wales is that it is now both more of a manufacturing economy than it was and, proportionately, more of a manufacturing economy than the UK has become, as Figures 5.1 and 5.2 (and Table 5.1 and 5.2) make clear.

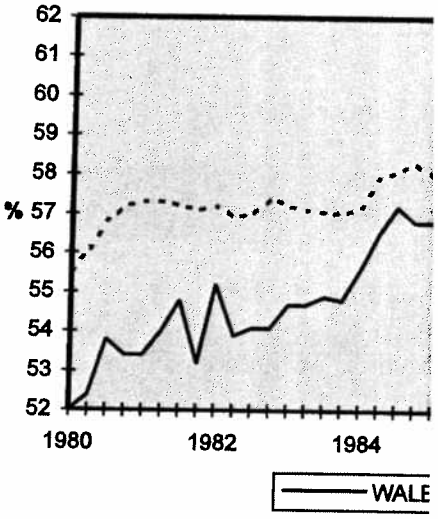
FIG

Share of Mar
Wal



FIG

Share of Se
Wales



and European (especially German)
ved in 1974, followed by Hitachi,
:r, Sharp and Orion, all in some way
nics. In automotive industries, Ford
Mondeo, Jaguar) engine plant at
l this was followed by acquisitions
alsonic, Valeo, Lucas SEI, Robert
Bearings, Sekisui, Yuasa, Gillet,
y, in 1992 production of 200,000
ɔly to their assembly plant in Derby
the Ford engine plant producing
·'s new AJ26 V8 engine, Wales had
igh-quality, high-skill automotive
Europe.

supplier companies have built a
l the UK and major European
stry sector, including Rover, Ford,
t & Honda in the UK and Volvo,
A similar result is obtained for the
uch larger share consists of final
ɛ case of the Japanese (e.g. Sony,
Brother). Hence, components and
:s and the UK as well as from local
ɔw is the reverse of that for the
case, the Welsh industry is a
hat are located outside Wales. Of
and distinctive growth pattern of

t resulting from the emergence of
is that it is now both more of a
and, proportionately, more of a
as become, as Figures 5.1 and 5.2

FIGURE 5.1

Share of Manufacturing in GDP
Wales and UK

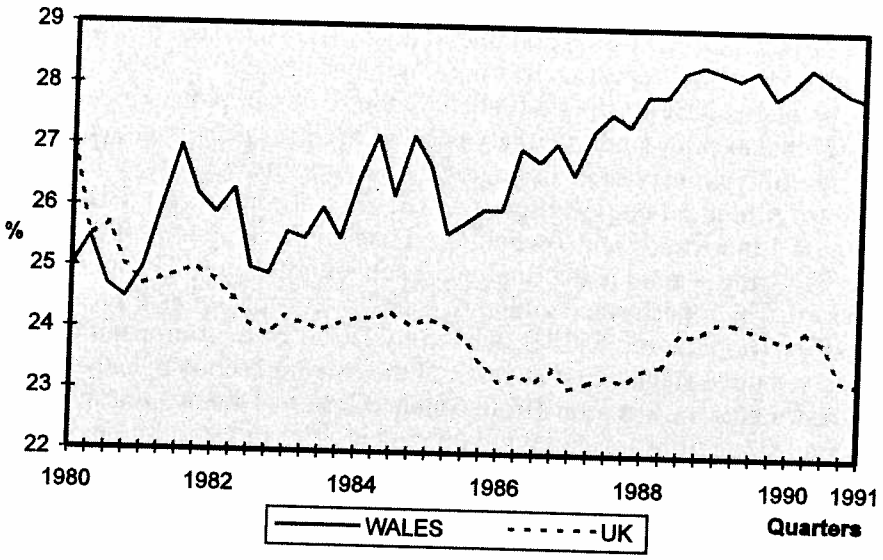
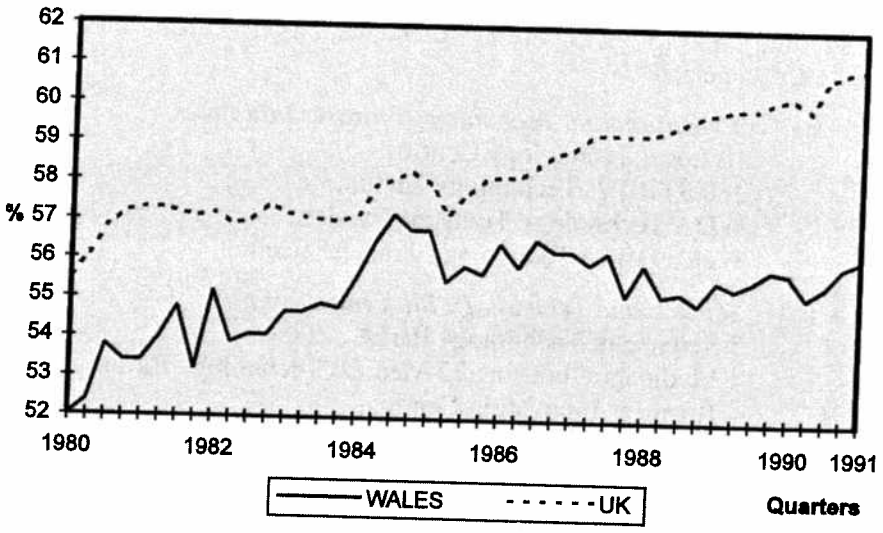


FIGURE 5.2

Share of Services in GDP
Wales and UK



(ii) Innovation and Technology Policies

The question that now arises concerns the development of innovation and technology policies and infrastructures in support of the manufacturing growth achieved thus far. It would be true to say that there is a bewildering array of such enterprise support interventions, only a flavour of which can be given in a brief report such as this. Amongst the most valuable of such interventions have been two funded by the EU, both pioneering studies conducted as pilot-studies largely because Wales is perceived to have so successfully transformed its regional economy from a heavy-industry base to a modern engineering one. The first of these is the EU-DG13 Regional Innovation and Technology Transfer Strategy for South Wales (RITTS), the second is the Regional Technology Plan (RTP) for Wales, both of which performed audits of innovation capacity as a prelude to strategy formulation. RITTS, funded by DG13 of the European Union, involves three stages; first an audit of the existing technological support infrastructure in a region (from Science Parks to innovation awards), second an audit of technology requirements as expressed by innovative firms, and third a business plan to synchronise the two. In the case of Wales, RITTS resulted in an electronic business innovation network 'Network Wales', being established whereby firms could communicate problems, solutions, needs and requirements on the Internet as part of a dedicated, marketed service. Regional Technology Plans are more strategic planning documents, funded from DG16 but managed by DG13, with a longer term perspective on filling obvious gaps in regional technology and innovation infrastructure. It might recommend building a new Technical University or research institute, for example.

In summary, the following are key elements, largely introduced during the 1985-95 period:

(i) *Innovation and Technology Transfer Initiatives:*
10 Local Technology Centres;
250 STRIDE Technology Audits;
WDA Technology Transfer Division;
Welsh Office Technology Transfer Section.

(ii) *Science and Technology Park Initiatives:*
7 Science or Technology Parks;
1 Medicentre housing 32 Medical Technology Firms;
4 Business Innovation Centres.

(iii) *Networking Initiatives:*
Medical Technology Forum;
9 Supplier Associations;
8 Supply-chain Groups.

(iv) *Innovation Finance In*
5 UK Innovation Prog
EU Innovation Framev
3 Venture Link Investc
4 Public Venture Fund

(v) *Research Initiatives:*
22 WDA University Cc

(vi) *Information Initiatives:*
8 Business Connect Ne
1 Network Wales Multi
1 EDI Awareness Centr
1 Wales Engineering Cc
1 EU Relay Centre for V

(vii) *Vocational Training Ini*
IT Wales Training Forur
Automotive Wales Trair
Aiwa Skills Developmer
2 Mechatronics Centres.

(iii) The Region and its Key Econ

The economic structure of Wales is a
are at least five very important f
highlighting. These are listed subseq

olicies

s the development of innovation and
es in support of the manufacturing
true to say that there is a bewildering
entions, only a flavour of which can
Amongst the most valuable of such
by the EU, both pioneering studies
cause Wales is perceived to have so
l economy from a heavy-industry
The first of these is the EU-DG13
Transfer Strategy for South Wales
Technology Plan (RTP) for Wales,
nnovation capacity as a prelude to
by DG13 of the European Union,
f the existing technological support
ence Parks to innovation awards),
ements as expressed by innovative
ynchronise the two. In the case of
onic business innovation network
whereby firms could communicate
ements on the Internet as part of a
nal Technology Plans are more
from DG16 but managed by DG13,
filling obvious gaps in regional
ture. It might recommend building
h institute, for example.

lements, largely introduced during

y Transfer Initiatives:
res;
Audits;
r Division;
Transfer Section.

ırk Initiatives:
arks;
Iedical Technology Firms;
tres.

ı;

(iv) *Innovation Finance Initiatives:*
5 UK Innovation Programmes;
EU Innovation Framework Funding;
3 Venture Link Investors Funds;
4 Public Venture Funds.

(v) *Research Initiatives:*
22 WDA University Centres of Expertise.

(vi) *Information Initiatives:*
8 Business Connect Networks;
1 Network Wales Multimedia Network;
1 EDI Awareness Centre;
1 Wales Engineering Centre;
1 EU Relay Centre for Wales;

(vii) *Vocational Training Initiatives:*
IT Wales Training Forum;
Automotive Wales Training Forum;
Aiwa Skills Development Partnership;
2 Mechatronics Centres.

(iii) The Region and its Key Economic Indicators

The economic structure of Wales is as shown in Table 5.1 and 5.2. There are at least five very important features in the data which deserve highlighting. These are listed subsequently.

TABLE 5.1

Wales
Basic Economic Statistics (with comparable UK figures)

1983-93	Wales		UK	
1991 Population=2.9m	1983	1993	1983	1993
(% UK)	5.0[1]	5.2[2]	100[1]	100[2]
GDP per Capita (UK=100)	85	87	100	100
GDP per Employee (UK=100)	107	111	100	100
Unit Labour Costs (UK=100)	99	91	100	100
Gross Earnings (UK=100)	95	90	100	100
% Employment by Sector				
Primary	8.2[3]	4.6[2]	4.6[3]	3.4[2]
Manufacturing	24.0[3]	23.0[2]	25.6[3]	22.0[2]
Construction	5.3[3]	4.8[2]	4.9[3]	4.7[2]
Services	64.5[3]	67.8[2]	64.9[3]	71.9[2]
U nemployment Rate (%)	15.7[3]	9.3[4]	13.1[3]	9.3[4]
Employees in Employment (1990=100)				
(N=1.26 million)	88.0	98.0[5]	98.0	95.0[5]
FDI	**1993**	**1994**	**1993(%)**	**1994(%)**
(£m) and % of UK	201	120	12	7
Employment ('000s)	40.2	68.0		
Companies	16.5	278.0		
% Occupational Change (Engineering)	**1983-1990**		**1983-1990**	
Managers & Technical	+58		+20	
Administration	+2		-13	
Supervisors & Craft	0		-18	
Operators	+10		-8	
% Occupational Change (Electronics)				
Managers & Technical	+120		+22	
Administration	+55		-10	
Supervisors & Craft	+65		-15	
Operators	+70		-5	

[1]1981 figure. [2]1991 figure. [3]1984 figure. [4]1995 figure. [5]1994 figure.

Source: CASS-*Welsh Economy Database*; Welsh Office-Welsh Economic Trends (various issues).

TA

Manufacturing Firm

	Manufacturing Firm		
	1983		
	Emp.	Units	
<50 Employees	8.6	46.1	
50-999 Employees	57.7	51.2	
>1000 Employees	33.7	2.6	
	(Units N=2405)		

Source: CASS-*Welsh Economy Da*
Trends (various issues).

The five key points arising from th

(i) Wales has overtaken the employment in the labou with average unemplo employees in employm

(ii) Occupational change markedly with the UK p growth in all but one ca all but two;

(iii) Due to a high dependen inhabitant but higher combined with lower u earnings;

(iv) Foreign direct investme both in employment and investment from overse

(v) Manufacturing firm-siz in Wales between 198 increase in the number c firms (as in the UK), a l the UK and a comparab large (1000 employee) f

E 5.1

les
th comparable UK figures)

Wales		UK	
1983	1993	1983	1993
5.0[1]	5.2[2]	100[1]	100[2]
85	87	100	100
107	111	100	100
99	91	100	100
95	90	100	100
8.2[3]	4.6[2]	4.6[3]	3.4[2]
24.0[3]	23.0[2]	25.6[3]	22.0[2]
5.3[3]	4.8[2]	4.9[3]	4.7[2]
64.5[3]	67.8[2]	64.9[3]	71.9[2]
15.7[3]	9.3[4]	13.1[3]	9.3[4]
88.0	98.0[5]	98.0	95.0[5]
1993	**1994**	**1993(%)**	**1994(%)**
201	120	12	7
40.2	68.0		
16.5	278.0		

1983-1990	1983-1990
+58	+20
+2	-13
0	-18
+10	-8
+120	+22
+55	-10
+65	-15
+70	-5

ure. [4]1995 figure. [5]1994 figure.

ıse; Welsh Office-Welsh Economic

TABLE 5.2

Manufacturing Firm Size (Percentage of Total)

Manufacturing Firm Size (Percentage of Total)								
	1983		1993		1983		1993	
	Emp.	Units	Emp.	Units	Emp.	Units	Emp.	Units
<50 Employees	8.6	46.1	18.6	85.6	9.4	47.3	19.3	89.0
50-999 Employees	57.7	51.2	62.7	14.0	59.6	50.3	59.9	10.6
>1000 Employees	33.7	2.6	18.6	0.4	30.8	2.2	15.8	0.2
	(Units N=2405)		(Units N=5552)					

Source: CASS-*Welsh Economy Database*; Welsh Office-Welsh Economic Trends (various issues).

The five key points arising from this statistical audit are:

(i) Wales has overtaken the UK as to the degree of manufacturing employment in the labour market as a whole. This is associated with average unemployment and a faster growth rate of employees in employment in the 1983-1993 period;

(ii) Occupational change in engineering industries contrasts markedly with the UK position. From a low base, Wales shows growth in all but one category while the UK shows decline in all but two;

(iii) Due to a high dependency ratio, Wales displays low GDP per inhabitant but higher GDP per employee than the UK, combined with lower unit labour costs, but at lower average earnings;

(iv) Foreign direct investment almost doubled from 1984 to 1993 both in employment and number of companies. Peak levels of investment from overseas occurred in the early 1990s;

(v) Manufacturing firm-size structure has changed dramatically in Wales between 1983 and 1993. There has been a large increase in the number of units and people employed in small firms (as in the UK), a larger growth of mid-size firms than in the UK and a comparable decline in units and employment in large (1000 employee) firms to that of the UK as a whole.

(iv) Horizontal Networking

A particularly interesting development has been the pursuit of a Network Programme linking SMEs in two different areas of Wales. The initiator was a Welsh enterprise agency *Menter a Busnes,* which had begun to encourage networking between SMEs in the Welsh 'Gaeltacht' area. Subsequently, they were alerted to the Danish scheme and invested in it. Eight brokers were appointed to build networks amongst some 300 firms. The final target is 16 networks comprising 120 companies with a job-creation objective of 130. The programme began in 1993 and by 1994 about eight embryonic networks existed. Independently of this initiative, Gwent Training and Enterprise Council invested in the DTI approach to networking through the latter's subsidiary *Business Net UK.* This began in 1994 with a single broker who visited 207 firms of which 42, in three sectors (chemicals, plastics and electronics) wish to develop formal networks. A second broker has been appointed in September 1995 to boost the programme's effectiveness (Huws, 1994).

2. INDUSTRIAL CLUSTERS

The transformation of Welsh industry towards a higher-skill, high GDP and low unit labour costs, engineering-led manufacturing economy has been inter-connected with the development of two key industrial complexes. These display most of the key characteristics of the ideal innovative regional cluster. As will be described, but can be observed from Figures 5.3 and 5.4, in both the automotive and electronics clusters, the following key features are present:

- Public and private sector R&D in each industry;
- Supply-chains from assemblers to systems and parts;
- Public and private sector Training Centres and Partnerships;
- Demanding Intermediate and Final Customers;
- A Core Industry Sector;
- A Public and Private Sector Support Infrastructure;
- Related Industries within the Region;
- Support Industries within the Region;
- Promotion of the Regional Specialisations.

(i) The Welsh Automotive Eng

(a) *Research and Develop*
The University of Wale
companies such as Luca
R&D is conducted for c
recent years, three
companies have opene

(b) *Vocational Training:*
Specialist automotive
transfer arrangements e
in the key companies the
at developing craft and

(c) *The Supply Chain:*
Both Systems and C
service-providing firm
relationships with both
within and beyond Wale

(d) *The Core Sector:*
The automotive industry
and Toyota engine pla
Jaguar engines at its Bric
electronics and cooling s
who, in turn supply their

(e) *Support Infrastructure a*
Within Wales, there a
associations, enterprise
development programme
industries ranging from
specialist legal and logist

(ii) The Welsh Electronics Engin

(a) *Research and Developme*
The University of Wales
conduct contract researc
semi-conductors and mag
conducts private sector
Telecom-related areas.

s been the pursuit of a Network
it areas of Wales. The initiator
t *Busnes,* which had begun to
1 the Welsh 'Gaeltacht' area.
nish scheme and invested in it.
/orks amongst some 300 firms.
ising 120 companies with a
ime began in 1993 and by 1994
ndependently of this initiative,
ivested in the DTI approach to
Business Net UK. This began
107 firms of which 42, in three
iics) wish to develop formal
)ointed in September 1995 to
vs, 1994).

'ards a higher-skill, high GDP
l manufacturing economy has
ment of two key industrial
:y characteristics of the ideal
:scribed, but can be observed
iotive and electronics clusters,

:ach industry;

systems and parts;

Centres and Partnerships;

Customers;

:t Infrastructure;

n;

)n;

sations.

(i) The Welsh Automotive Engineering Industry Cluster

(a) *Research and Development:*
The University of Wales has research programmes jointly with companies such as Lucas and Rover in which industry relevant R&D is conducted for clients inside and beyond the region. In recent years, three major foreign-owned automotive companies have opened their own in-house R&D facilities;

(b) *Vocational Training:*
Specialist automotive engineering courses and technology-transfer arrangements exist in Further Education Colleges and in the key companies themselves. These are primarily targeted at developing craft and technician-level skills;

(c) *The Supply Chain:*
Both Systems and Components suppliers as well as service-providing firms exist in integrated supply-chain relationships with both Intermediate and Final customers within and beyond Wales;

(d) *The Core Sector:*
The automotive industry is diverse, but at its heart are the Ford and Toyota engine plants, with Ford now also producing Jaguar engines at its Bridgend site. Machine-tool, automotive electronics and cooling system companies supply these firms who, in turn supply their final assemblers;

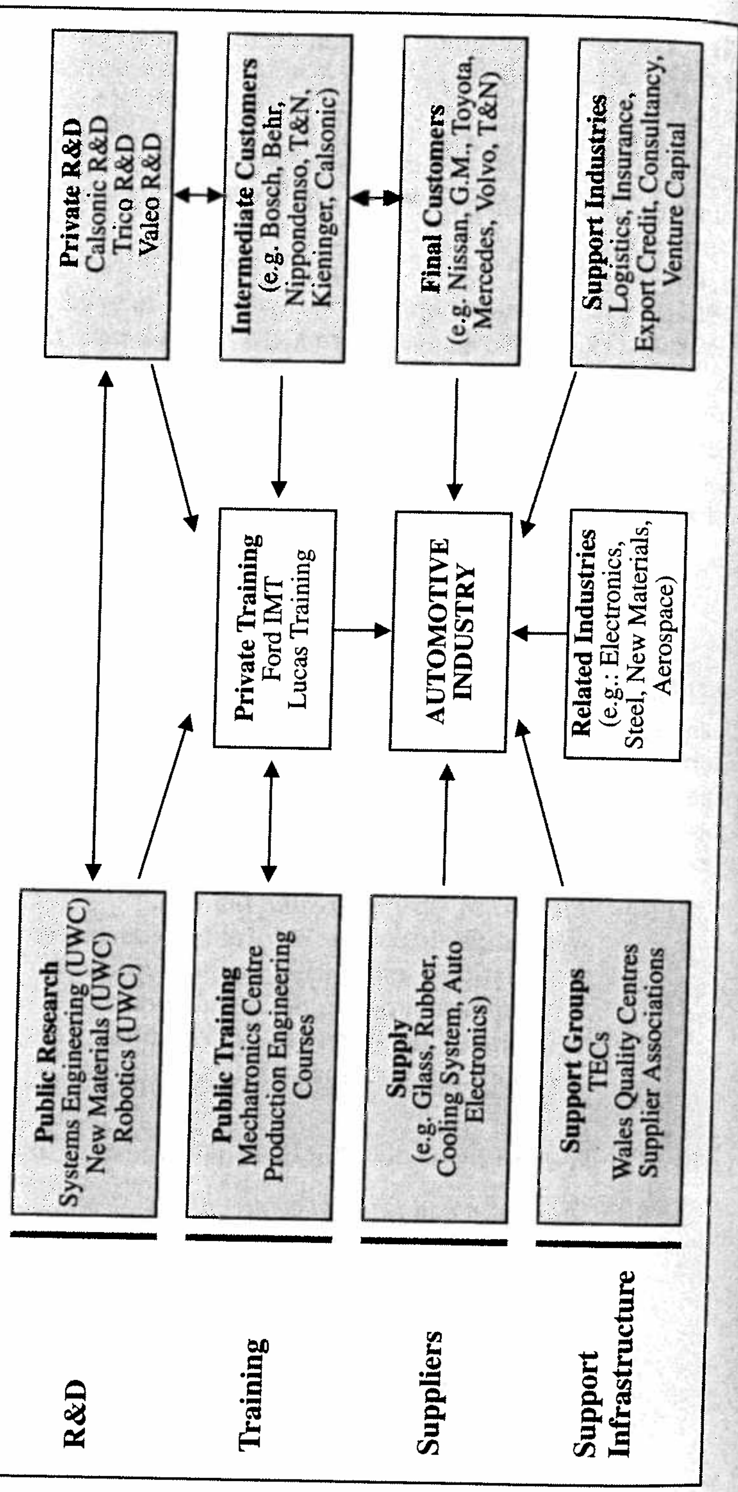
(e) *Support Infrastructure and Industries:*
Within Wales, there are numerous automotive supplier associations, enterprise support initiatives and supplier development programmes. In addition, related and supporting industries ranging from steel, electronics and aerospace to specialist legal and logistics firms are found within the region.

(ii) The Welsh Electronics Engineering Industry Cluster

(a) *Research and Development:*
The University of Wales and other higher education institutes conduct contract research for electronics companies in IT, semi-conductors and magnetics. A substantial group of firms conducts private sector R&D in the region, especially in Telecom-related areas.

FIGURE 5.3

The Welsh Automotive Cluster



(b) *Vocational Training:*
Within Wales there a
training facilities in el
there are four training co
based.

(c) *The Supply Chain:*
The Welsh electronics
contrast to the auton
Japanese consumer elec
their requirements loc
twenty-member Aiwa S
Diaplastics and Meiki a

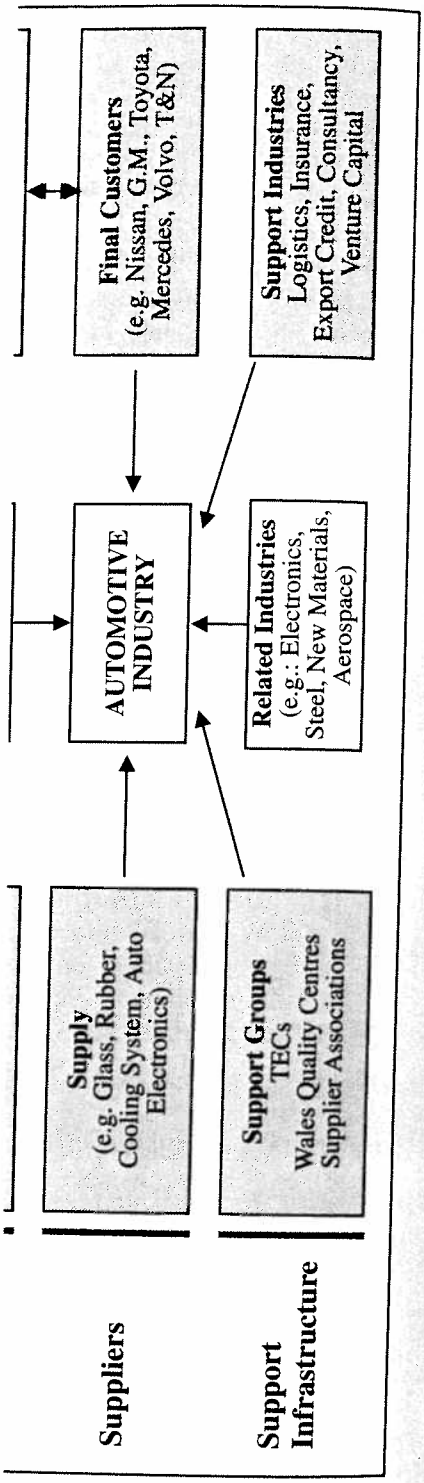
(d) *The Core Sector:*
There are two key elem
consumer electronics
ations). Vertical, in-hous
Telecom network (an ac
some external purchase.
Wales is typical of the c

(e) *Support Infrastructure a*
There are at least three
and numerous enterpri
industries, using the same
plastics, automotive etc.,
packaging to patenting a

3. THE ENTERPRISE SUPPO

(i) Governance Structure

There is a distinctive governance
economy in Wales. Despite the UK's
the Welsh office (a territorial Minis
and WDA have been industrially sup
During the crisis of the early 1980s, t
seeking to manage the crisis with cra
and worker retraining, for example. In
quite considerably, leaving industry
supplier-groups and consortia, to *self*
the past. The governance structure is
actions mediated through public-priva
kinds. There are strong tendencies tov



(b) *Vocational Training:*
Within Wales there are at least three specialist vocational training facilities in electronics, while in the private sector there are four training consortia, two of which are apprenticeship-based.

(c) *The Supply Chain:*
The Welsh electronics cluster is geared to final assembly, in contrast to the automotive industry cluster. Numerous Japanese consumer electronics firms source at least some of their requirements locally, a good illustration being the twenty-member Aiwa Suppliers Group. Companies such as Diaplastics and Meiki are part of the Sony supply-chain.

(d) *The Core Sector:*
There are two key elements to the Welsh electronics cluster: consumer electronics and IT (especially telecommunications). Vertical, in-house supply-chains exist in the Northern Telecom network (an acquisition firm STC, a UK firm) with some external purchase. External purchase within and beyond Wales is typical of the consumer electronics sector.

(e) *Support Infrastructure and Industries:*
There are at least three electronics industry supplier groups and numerous enterprise support programmes. Related industries, using the same suppliers in some instances, exist in plastics, automotive etc., and support industries ranging from packaging to patenting are found in the regional cluster.

3. THE ENTERPRISE SUPPORT POLICY SYSTEM

(i) Governance Structure

There is a distinctive governance structure supporting the regional economy in Wales. Despite the UK's neo-liberal regime since 1979, both the Welsh office (a territorial Ministry with UK Cabinet membership) and WDA have been industrially supportive of Welsh business interests. During the crisis of the early 1980s, the state agencies were to the fore in seeking to manage the crisis with crash programmes of factory building and worker retraining, for example. In the 1990s, the state has reined-back quite considerably, leaving industry itself, through clubs, partnerships, supplier-groups and consortia, to *self-regulate* considerably more than in the past. The governance structure is still stimulated by responsive state actions mediated through public-private representation on fora of various kinds. There are strong tendencies towards the development of a network

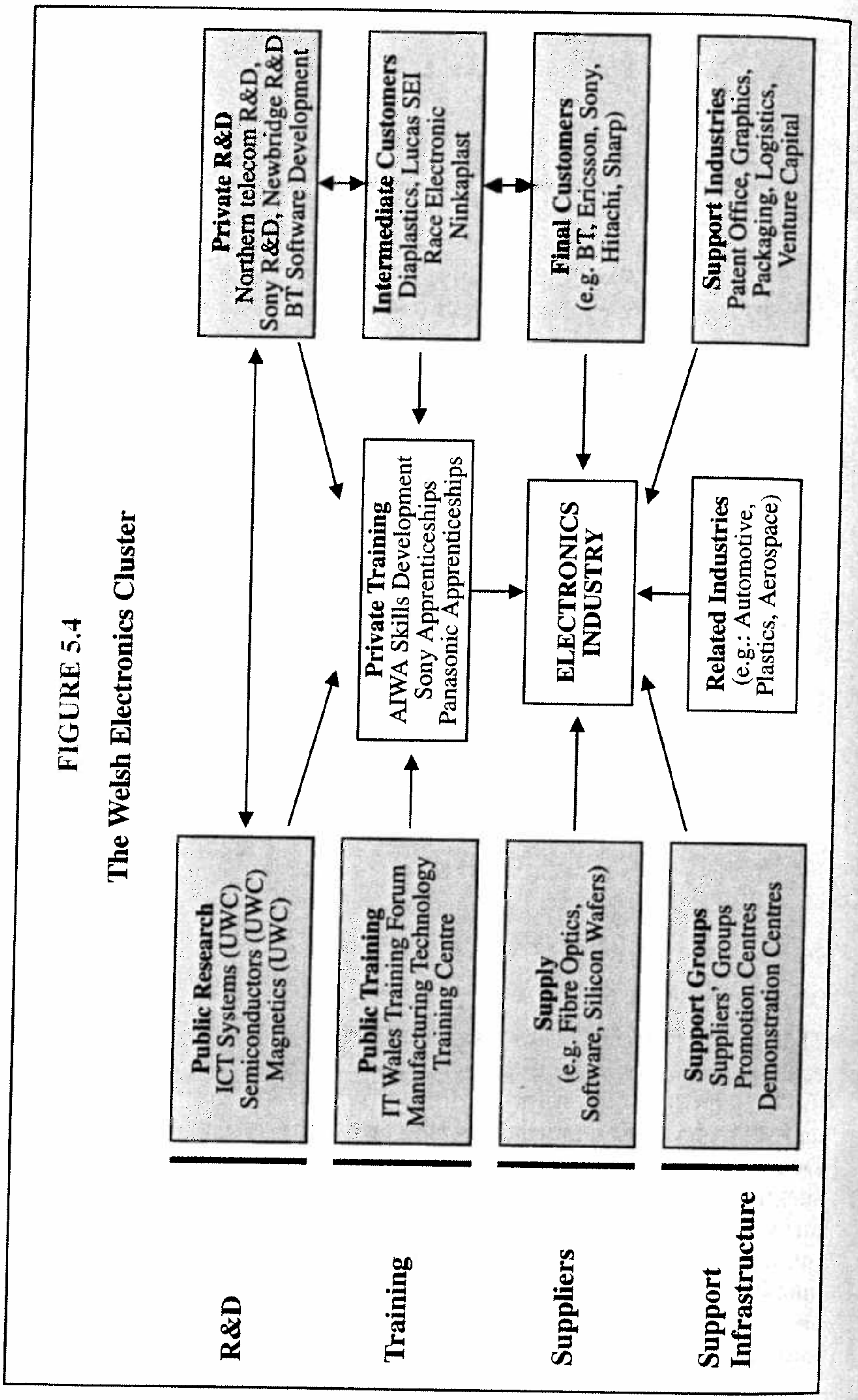


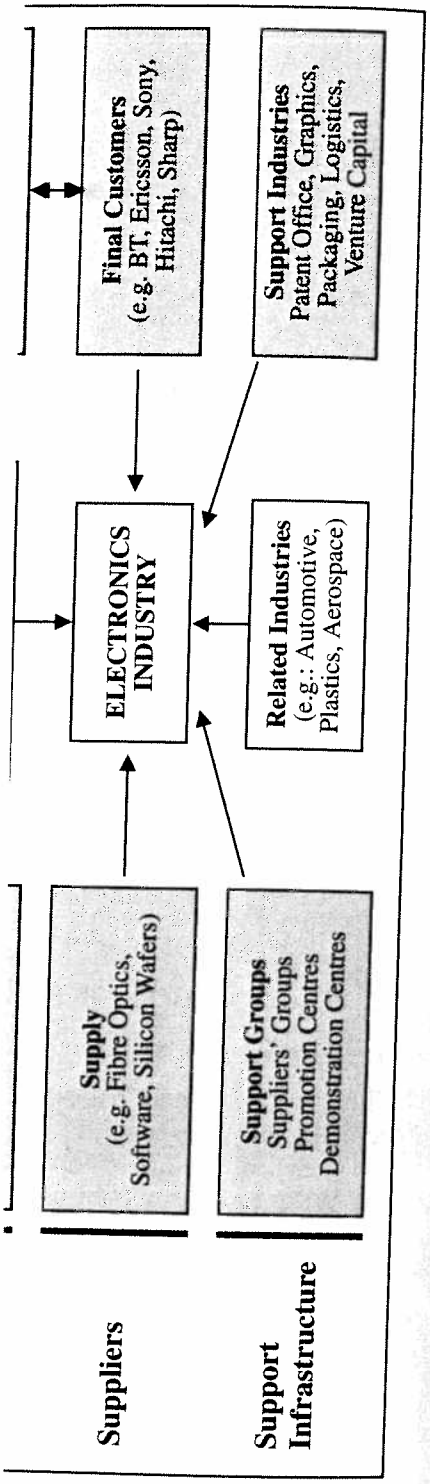
FIGURE 5.4
The Welsh Electronics Cluster

form of governance structure a
hierarchy-based regime.

From being historically an active a
State took the lead in most econo
1947 to the 1980s the main industr
has shifted much more towards
engineering industry clusters, b
intermediary problem-solving
established. The policy-stance in W
the discursive, with substantial po
rather than passive or strongly in
suggests that an appropriate policy
firms can learn to help themselv
practices that derive from economi
massive withdrawal of state fundi
basic kind (e.g. attracting FDI). Ra
about appropriate development pol
a qualitative kind is needed so that
and reliability, for example.

(ii) Innovation System

Despite the developments described
quantitatively, as a world-class in
GERD statistics. In 1992, research c
showed that R&D expenditure in W
GDP. This is well behind Baden
Rhône-Alpes 2.4 per cent at that
Spain's 0.85 per cent and within rea
is not unreasonable to estimate that th
on R&D) has risen based on research
a 29 per cent increase in industrial
1992-95. The 1995 GERD for Wal
1.4 per cent (Cooke & Morgan, 199
The number of industrial scientists
1992 at some 3,300, a figure which,
of Cooke *et al* (1995) rose by 9 per c
a total of 3,600. New firm forma
standards at 1 per thousand populatio
but the share of EU R&D grants for S
average. Wales stands poised at th
capability based on its emergent in
cluster morphology in two manufac



form of governance structure as distinct from a strictly market or hierarchy-based regime.

From being historically an active and interventionist regime in which the State took the lead in most economic initiatives, not least because from 1947 to the 1980s the main industries were state-owned, the policy-stance has shifted much more towards market-facing self-regulation by the engineering industry clusters, but with state representation in the intermediary problem-solving and learning fora that have been established. The policy-stance in Wales could thus be said to lean towards the discursive, with substantial policy forum and network arrangements rather than passive or strongly interventionist features. This strongly suggests that an appropriate policy stance is to create conditions in which firms can learn to help themselves and each other through enacting practices that derive from economies of association. This need not mean massive withdrawal of state funding for enterprise support of the more basic kind (e.g. attracting FDI). Rather, it implies a new stage in thinking about appropriate development policy once FDI has arrived. Support of a qualitative kind is needed so that indigenous firms can upgrade quality and reliability, for example.

(ii) Innovation System

Despite the developments described thus far, Wales does not yet qualify, quantitatively, as a world-class innovative region as measured by its GERD statistics. In 1992, research commissioned by the UK government showed that R&D expenditure in Wales stood at some 1.1 per cent of GDP. This is well behind Baden-Württemberg's 3.6 per cent and Rhône-Alpes 2.4 per cent at that time. However, it was greater than Spain's 0.85 per cent and within reach of Italy's 1.3 per cent. By 1995, it is not unreasonable to estimate that the level of GERD (Gross Expenditure on R&D) has risen based on research conducted for the EU which showed a 29 per cent increase in industrial R&D expenditure in South Wales 1992-95. The 1995 GERD for Wales may, conservatively be placed at 1.4 per cent (Cooke & Morgan, 1992; Cooke, Davies & Huggins, 1995). The number of industrial scientists and researchers in Wales stood, in 1992 at some 3,300, a figure which, following the EU research findings of Cooke *et al* (1995) rose by 9 per cent between 1992 and 1995, to reach a total of 3,600. New firm formation is comparatively low by UK standards at 1 per thousand population (compared to 1.5-3.0 in Germany), but the share of EU R&D grants for SMEs and universities is higher than average. Wales stands poised at the threshold of a significant growth capability based on its emergent innovation infrastructure and strong cluster morphology in two manufacturing industries, which continue to

display growth-potential within the UK context, due to dynamic Japanese and American as well as German ownership, low wages, high productivity and high GDP output.

In terms of crisis-awareness regarding questions of innovation, it should be said that the response has proved variable. There is certainly a better response to the issues concerning industrial innovation, including many conferences with, occasionally, transatlantic hook-ups bringing Michael Preston from MIT, Michael Porter from Harvard Business School and Tom Peters to Welsh business conferences. Moreover, in 1993, the Institute of Welsh Affairs orchestrated a discourse process amongst the key business, academic and governance representatives to produce its *Wales 2010* report (IWA, 1993) which has set the agenda for, as an example, the 1995 Year of Innovation in Wales. As has been shown, numerous partnerships, fora and consortia or groups exist in Wales to enhance innovation capacity.

The innovation system in Wales can be best understood by observing the ways in which the Automotive and Electronics Engineering *cluster* operate, as displayed in Figures 5.3 and 5.4. However, in respect of the four key features of an innovation system, the following details can be added:

(i) *Technological Monitoring*
Learning about innovations occurs in the following ways according to the findings of Cooke *et al* (1995) in their survey of 200 innovative Welsh firms. Over 40 per cent of companies acquire technical knowledge from customer or supplier firms. Some 32 per cent of firms use firm associations and higher education institutions for technical know-how development. Only 11 per cent of firms use government agencies or consultants for this purpose. Hence, while there is an organised system of technology monitoring, e.g. the EU-Wales Relay Centre, the WDA Technology Marketing section and the Welsh Office Technology Transfer function, firms clearly prefer to pursue their own technological monitoring path.

(ii) *Basic Research*
Basic research is conducted in the seven universities in Wales and, to some extent, though in a rather limited way, in some firms, e.g. British Steel and BP have 200 research staff each at their basic R&D centres. There are scarcely any freestanding public research institutes and relatively few basic research consultancies. Interaction between university research and industry is fruitful, with universities conducting

some £6 million of in
million is basic resear

(iii) *Applied Research*
Applied research is c
laboratories of firms.
development in Wales,
even in coal and st
laboratories in Wales.
By 1992, some £135 n
conducted in Wales, a
research (including un
million, some 80 per
previously Cooke *et al*
south Wales (accoun
economy) showed a 2
between 1992 and 19
attached to innovation.
applied) R&D statistic

(iv) *Technology Transfer a*
The principal sources
innovation system in
themselves. We have a
acquire technology trans
or universities. In the
Welsh Office and WD
technology marketing f
some 11 per cent of firr
adjunct, with a particul
enterprises. Private co
centres, tend to be favo
as the main auxiliary tec

(iii) Education

In Wales, as in the UK more gene
experiencing reform primarily in
performance of students and to sha
needs of industry. Thus, technolog
place in the curriculum as comp
process. At post-school, Further Ed
'incorporated' (i.e removed from l
to meet market requirements. This n

some £6 million of industrial research per year, of which £2 million is basic research.

(iii) *Applied Research*
Applied research is conducted in universities and the R&D laboratories of firms. Because of the history of branch-plant development in Wales, there has been relatively little tradition, even in coal and steel research, of industrial research laboratories in Wales. This changed dramatically in the 1980s. By 1992, some £135 million of industrial research was being conducted in Wales, added to which was £53 million public research (including universities). Of the overall total of £186 million, some 80 per cent was applied research. As shown previously Cooke *et al's* (1995) partial update of these figures south Wales (accounting for 75 per cent of the Welsh economy) showed a 29 per cent increase in industrial R&D between 1992 and 1995, an indication of the importance attached to innovation. This suggests a 1995 industrial (mostly applied) R&D statistic for Wales of at least £175 million.

(iv) *Technology Transfer and Marketing*
The principal sources of technology-transfer in the regional innovation system in Wales are, as in others, the firms themselves. We have already seen that 72 per cent of firms acquire technology transfer from other firms, firm associations or universities. In the 1980s, the public sector, mainly the Welsh Office and WDA, developed technology transfer and technology marketing functions but these are utilised by only some 11 per cent of firms. Nevertheless, they act as a useful adjunct, with a particular value for small and medium-sized enterprises. Private consultancies, rather than technology centres, tend to be favoured by the neo-liberal policy regime as the main auxiliary technology transfer provider.

(iii) Education

In Wales, as in the UK more generally, the education system has been experiencing reform primarily in order to improve the quality and performance of students and to shape the curriculum more towards the needs of industry. Thus, technology and science now have a privileged place in the curriculum as compulsory elements of the educational process. At post-school, Further Education level, FE colleges have been 'incorporated' (i.e removed from local government control) and forced to meet market requirements. This means training courses cater far more

ıe case in the past. FE colleges
numbers of course completions
ls (to retain 'A'-Level students)
ng larger manufacturing firms
en in some cases dedicated, to
the Further Education colleges
iculties remain, especially in
oyment and some firms, with
Council grants, are reviving
e craft and technical areas, to

has been transformed by the
kened trade union strike and
on of employment legislation.
el has largely been replaced by
e, individualised contracts. In
ratist tradition which had even
stors when they arrived. They
history and expertise of trade
wenty years, accepted union
ole) no-strike agreements and
s TUC (Trade Union Congress)
-delegations on foreign visits.

most important constraints on
in the research conducted by
ıct that the 1992-95 period had
R&D expenditure by firms
ly acute amongst small and
xtraordinarily difficult to raise
ans in the £50,000-£150,000
y less difficulty raising larger
s. Although there are venture
he WDA Technology Growth
it would prefer to invest in
gy business firms. This may
an excellent record in winning
un by the Welsh Office (e.g.

(vi) Regulative Constraints

Wales, like the rest of the UK, has been operating since 1979 under a *'neo-Schumpeterian workfare state'* compared to its previous Keynesian welfare state (Jessop, 1993). This means an enterprise culture has been pursued by government policies, concern for unemployment has been muted and government policy has been based on the belief that markets dissolve such problems while state action creates them in the first place. Wales, for territorial and cultural reasons, has had a slightly more interventionist economic regime until recently, but agencies such as the WDA and Welsh Office have experienced budget cuts as more right-wing regulatory policies have been pursued in the 1990s. Little has been done to tighten regulations on environmental pollution.

4. CONCLUSIONS

The Welsh case is of interest to that of Ireland in that it demonstrates clearly that FDI can integrate with an indigenous sector even when that indigenous sector is not particularly accomplished. The way this was done in Wales was partly a result of chance, partly through adaptation of an innovative SME support policy. In the 1980s the Welsh Office floated an initiative called 'Source Wales'. This advertised a small number of the best indigenous firms to the outside world in the expectation that customers would source supply from them. Most of these firms happened to be in engineering of one sort or another. Amongst customers targeted were recently arrived FDI firms and their inquiries encouraged Welsh Office to think in terms of encouraging the indigenous sector to focus on FDI in Wales rather more. The Welsh Development Agency then turned 'Source Wales' into its Supplier Development Programme when the Welsh Office handed over responsibility for managing it. The key feature of WDA involvement in such business services is that it tends not to allocate grants. Rather, it allocates trained personnel to assisting customers to assess supplier-firms from Wales and assisting suppliers, with consultant-aid, but mostly through 'supplier clubs', to help each other improve.

One reason why this approach may have worked in Wales is that the FDI, though world-class, was not primarily in high-tech sectors. Hence it has been feasible for some, by no means all, would-be supplier firms in Wales to upgrade to the quality and reliability necessary to meet exacting customer requirements. A further reason why FDI firms have sought to become embedded in the regional economy is that an important portion of them have located in Wales from countries where that is a normal expectation. Germany and, particularly, Japan and more recently other

Asian 'tiger' FDI has been locating in Wales and through word-of-mouth as well as WDA promotional efforts, recognised that there is potential for supply-chain development there.

A further point worth making in respect of the emergence of the two engineering 'clusters' in Wales is that they were not planned. Over the post-war years a mixture of overseas firms in a wide range of sectors was attracted to Wales because of its status as a development area consequent on the decline of older industries such as coal-mining. In the 1980s, there was a rather strong wave of inward investment that happened to be more closely focused upon the two engineering sectors in question. It was at that point that these newer firms from Germany and Japan began to express an interest in local supply. Hence, the WDA began to take a serious interest in 'supply-chain' rather than 'cluster' development. Thereafter, the support infrastructure has developed around these industries because these are now Wales' main manufacturing sectors. An illustration of how that happens in R&D would be that as the UK government has reduced funding for research to universities, so they have been forced to seek more industrial research funding, some of which can be found on the doorstep.

Finally, it is worth drawing attention to the initiatives adopted to introduce networking, under the tutelage of the Danish Technological Institute, to Wales. Although there was already some tentative movement in this direction promotion of the DTI approach in Wales, partly through the WDA, partly through university academics (IWA, 1993) solved certain practical problems by advocating a 'brokerage' approach to tutoring the networks. Networks, in their second year of operation in north and west Wales and reaching the end of the first in Gwent are already pursuing new product-related actions, in the clothing, printing and slate industries. Amongst them are networks operating amongst Welsh-speaking entrepreneurs not, hitherto, considered to be the most entrepreneurial segment of the business class.

CHA

STEIERMARK, AU CLUSTERING AND TH CO

1. INTRODUCTION: EC STEIERMARK

Steiermark (also Styria) is one of t with a population of around 1.2 mil GDP (Table 6.1). In terms of its e can be distinguished. First, the ol *Land*, developed on the basis of ir (*Obersteirische Industriegebiete*). industrial regions in Austria durin high level of Federal and *Land* s qualifications and products, has re The area possesses one university, one technology transfer centre, app secondary schools specialised in th

Second, the peripheral, predominan which are characterised by poor in of qualifications. This area also b challenges following the liberalisat

Finally, the urban centre of Steierm of around 250,000. Although Graz and research infrastructure (three applied research centres), problems land use conflicts and a marked in vehicles) are evident. Economicall urban focus for the surrounding hin

The economic structure of Steierma Structural Fund Objective areas. O Objective 2 regions are located in relative scale of the industrial probl remainder of the Land comprises an per cent of the Austrian total. The ec is dominated by traditional low-wa and wood processing, as well as agri the Steiermark which is not include area map is Graz and its hinterland.

'ales and through word-of-mouth
ognised that there is potential for

ct of the emergence of the two
hey were not planned. Over the
ns in a wide range of sectors was
s a development area consequent
; coal-mining. In the 1980s, there
stment that happened to be more
ng sectors in question. It was at
ı Germany and Japan began to
nce, the WDA began to take a
ıer than 'cluster' development.
e has developed around these
main manufacturing sectors. An
:&D would be that as the UK
earch to universities, so they have
arch funding, some of which can

ıe initiatives adopted to introduce
anish Technological Institute, to
ɔme tentative movement in this
ıch in Wales, partly through the
nics (IWA, 1993) solved certain
ɔkerage' approach to tutoring the
ar of operation in north and west
ı Gwent are already pursuing new
g, printing and slate industries.
ing amongst Welsh-speaking
to be the most entrepreneurial

CHAPTER 6

STEIERMARK, AUSTRIA: NETWORKS, CLUSTERING AND THE TECHNOLOGY POLICY CONCEPT

1. INTRODUCTION: ECONOMIC STRUCTURE OF STEIERMARK

Steiermark (also Styria) is one of the largest *Länder* in Austria (Map 6.1) with a population of around 1.2 million and a 15 per cent share of national GDP (Table 6.1). In terms of its economic structure, three distinct areas can be distinguished. First, the old industrial region in the north of the *Land*, developed on the basis of iron and steel and heavy manufacturing (*Obersteirische Industriegebiete*). This was one of the most depressed industrial regions in Austria during the 1980s, although the more recent high level of Federal and *Land* support, focused on the upgrading of qualifications and products, has resulted in a degree of economic upturn. The area possesses one university, many technology and industrial parks, one technology transfer centre, applied research institutes and numerous secondary schools specialised in the education of engineers.

Second, the peripheral, predominantly rural southern regions of the *Land*, which are characterised by poor infrastructure provision and a low level of qualifications. This area also borders Slovenia and thus faces new challenges following the liberalisation of Central and Eastern Europe.

Finally, the urban centre of Steiermark is Graz, a city with a population of around 250,000. Although Graz has a good provision of technological and research infrastructure (three universities, two technology parks, applied research centres), problems such as land scarcity in the city centre, land use conflicts and a marked increase in traffic (particularly private vehicles) are evident. Economically, Graz is strong and acts as the key urban focus for the surrounding hinterland.

The economic structure of Steiermark is reflected in its allocation of EU Structural Fund Objective areas. Over half (56 per cent) of the Austrian Objective 2 regions are located in Northern Steiermark, indicating the relative scale of the industrial problems in the area. The majority of the remainder of the Land comprises an Objective 5b region, representing 21 per cent of the Austrian total. The economic structure of these rural areas is dominated by traditional low-wage industries such as clothing, shoes and wood processing, as well as agricultural production. The only part of the Steiermark which is not included in the EU Structural Funds assisted area map is Graz and its hinterland.

MAP 6.1

Location of Steiermark

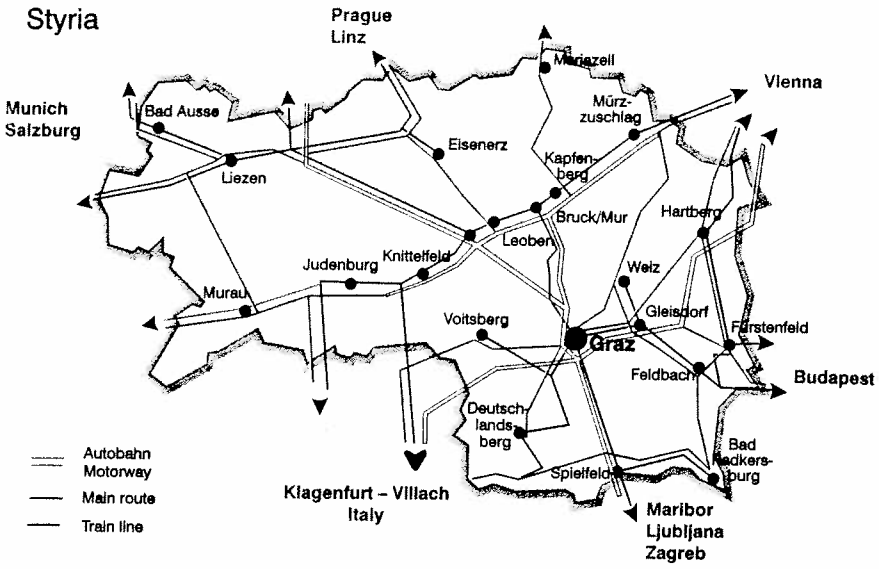


TABLE 6.1

Steiermark
Economic Clusters

	Steiermark	EU (EUR 12)
Population (1991)	1.2 million	344.8 million
Labour Force Participation Rate (1991)	44.4%	55.1%
Labour Force (1991)	0.53 million	142.0 million
Employment in Agriculture	8.6%	6.4%
Industry	36.0%	33.3%
Services	55.4%	60.3%
GDP Per Capita (1991: in per cent of EU average)	110%	100%
Unemployment rate (1993)	8.4%	10.4%

Source: Eurostat.

The Styrian Chamber of Comm
membership) show a total of 40,(
30,000 are sole traders, 12,000
approximately 1,350 manufacturi
than 20 employees. The regional p
concentration in which Upper S
specialised in iron and metal produ
calculated for transport facilities,
Graz while the border region i
low-wage products like clothi
following chart (Figure 6.1) com
those of Austria. A ratio of >1 in
this sector. It illustrates the domi
iron processing, paper and pulp in

2. STYRIAN INDUSTRIAL P

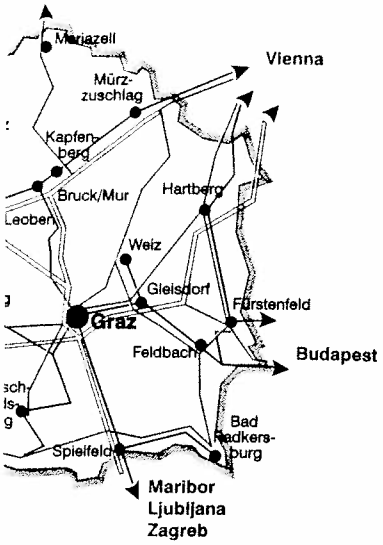
As a small and rather centralise
experience in decentralised industr
exist in Austria. The second-bigge
nearly 2 million inhabitants is Graz
In recent years, however, the Austri
something more like a decentralis
the difficult tasks for policy-maker
exact knowledge of the special nee
about specific measures which do
programmes but are complementar

The role of the *Länder* in the past
national grants, especially those su
subsidy projects. This produced a ra
federal government and the *Länder*
a very indiscriminate distributi
microwave ovens for restaurants) w
of reducing the number of proje
reduced amount of money to the s
Länder to fill the gap.

As far as industrial policy is conce
made:

- Research and most of
telecommunications) is mai
- Firm related support (investr
Länder policy;

ermark



sters

Steiermark	EU (EUR 12)
1.2 million	344.8 million
44.4%	55.1%
.53 million	142.0 million
8.6%	6.4%
36.0%	33.3%
55.4%	60.3%
110%	100%
8.4%	10.4%

The Styrian Chamber of Commerce statistics (firms have mandatory membership) show a total of 40,000 Styrian companies amongst which 30,000 are sole traders, 12,000 of them situated in Graz. There are approximately 1,350 manufacturing companies in Steiermark with more than 20 employees. The regional production structure displays a sectoral concentration in which Upper Styria (the old industrial area) is still specialised in iron and metal products. High location co-efficients can be calculated for transport facilities, shoes, paper and printing in the city of Graz while the border region in the South concentrates on typical low-wage products like clothing, wood-working and shoes. The following chart (Figure 6.1) compares Styrian industrial sectors with those of Austria. A ratio of >1 indicates above-average employment in this sector. It illustrates the dominance of metal and steel construction, iron processing, paper and pulp industry and leather industry.

2. STYRIAN INDUSTRIAL POLICY

As a small and rather centralised state, Austria does not have much experience in decentralised industrial policy. Medium size cities do not exist in Austria. The second-biggest city ranking after Vienna, with its nearly 2 million inhabitants is Graz with some 250 thousand inhabitants. In recent years, however, the Austrian *Länder* have pressed their case and something more like a decentralised culture has emerged. In principle, the difficult tasks for policy-makers in the *Länder* include developing an exact knowledge of the special needs of their region and innovative ideas about specific measures which do not duplicate national or international programmes but are complementary to them.

The role of the *Länder* in the past was hardly more than competing for national grants, especially those supporting declining industries and firm subsidy projects. This produced a rather strained relationship between the federal government and the *Länder*. In practice some national funds with a very indiscriminate distribution of grants (e.g. they supported microwave ovens for restaurants) were forced to cut their money. Instead of reducing the number of projects and clients, they distributed the reduced amount of money to the same number of firms and asked the *Länder* to fill the gap.

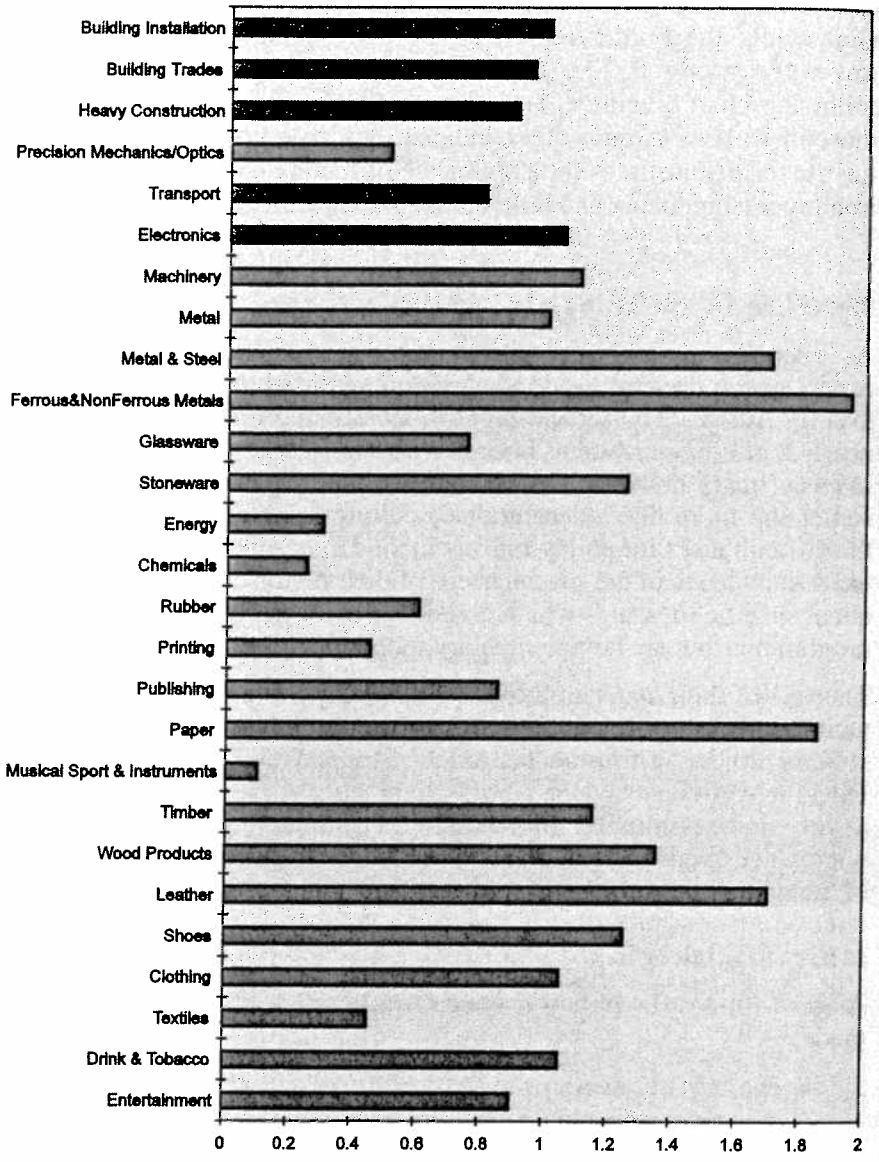
As far as industrial policy is concerned, a rough classification may be made:

- Research and most of technology policy (including telecommunications) is mainly federal policy;
- Firm related support (investment subsidies, training etc.) is mostly *Länder* policy;

- Special programmes for lagging regions, labour market policy as well as larger infrastructure and transport projects are common policy.

FIGURE 6.1

Sectoral Industrial Structure: Steiermark compared with Austria



Source: Steiermark *Land* Government.

Regional development in Steiern
main institutions. First, the *Land* g
the economic and social develop
the context of a federal state, tl
perceived as 'regional policy', altl
the definition of regional policy
designated areas of particular
development plans carried out
provide an important contribution
In the case of Steiermark, these pr
programme for the entire area, s
districts of Steiermark, programm
Eisenerz and Vordernberg (popu
loss) and Feldbach (particula
cross-border planning.

In addition, the *Land* government i
Federal-*Land* Agreement (*Bund*
government and Steiermark. Sim
majority of the nine Bundesländer
of joint measures designed to s
improve the employment situatio
Land. Included in the Agreement
individual research institutes or ce
or incentives which are co-funded
has necessitated the re-drafting of
a Structural Fund component. Thi
the inclusion of a wider range of n
regional management support.

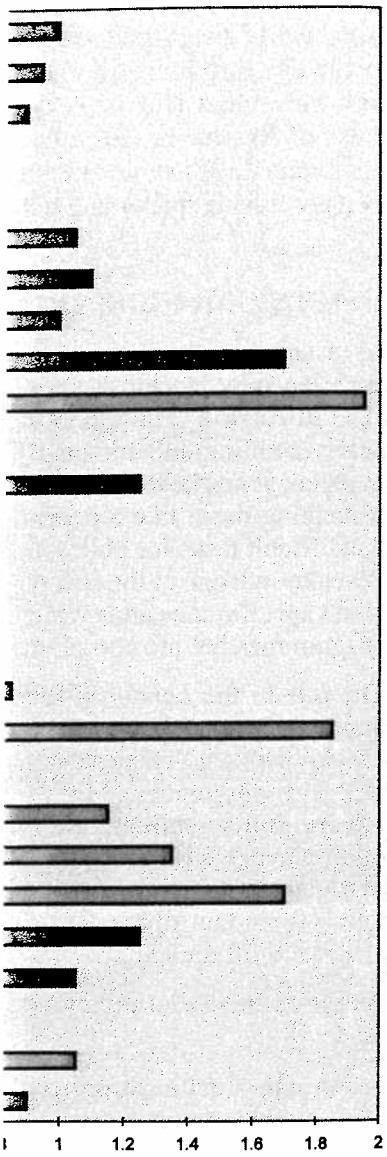
Within the *Land* governmen
Development (*Fachabteilung fü*
principally responsible for eco
Steiermark. The FAWF offers assi
tourism in the region, with the foc
economic support. Although the m
available throughout the Land, th
economy which typify Steiermark
support measures.

The support comprises, principall
interest and investment subsidi
indigenous economic growth,
innovation-oriented projects. A t
Development of SMEs which offe

egions, labour market policy as
transport projects are common

.1

nark compared with Austria



Regional development in Steiermark is carried out principally by two main institutions. First, the *Land* government clearly has competence for the economic and social development of the Steiermark region. Within the context of a federal state, the activities of the *Länder* are often perceived as 'regional policy', although clearly this does not comply with the definition of regional policy as that carried out solely in nationally designated areas of particular economic difficulty. The regional development plans carried out by the *Land* governments, however, provide an important contribution to the regional development of Austria. In the case of Steiermark, these programmes include a *Land* development programme for the entire area, sub-regional programmes based on the districts of Steiermark, programmes for areas with common problems e.g. Eisenerz and Vordernberg (population out-migration and employment loss) and Feldbach (particularly city-hinterland problems), and cross-border planning.

In addition, the *Land* government is responsible for initiating the so-called Federal-*Land* Agreement (*Bund-Land Vertrag*) between the federal government and Steiermark. Similar agreements are in place with the majority of the nine Bundesländer. The Agreement comprises a package of joint measures designed to strengthen the regional economy and improve the employment situation and infrastructural provision of the *Land*. Included in the Agreement are individual projects e.g. support of individual research institutes or centres of higher education, and measures or incentives which are co-funded. The accession of Austria into the EU has necessitated the re-drafting of many of these Agreements to include a Structural Fund component. This has led, in the case of Steiermark, to the inclusion of a wider range of measures such as feasibility studies and regional management support.

Within the *Land* government, the Department for Economic Development (*Fachabteilung für Wirtschaftsförderung* – FAWF) is principally responsible for economic development and support in Steiermark. The FAWF offers assistance measures for trade, industry and tourism in the region, with the focus being more generally on traditional economic support. Although the majority of the support programmes are available throughout the Land, the three distinct types of sub-regional economy which typify Steiermark, result in a natural regionalisation of support measures.

The support comprises, principally, financial instruments such as loans, interest and investment subsidies and grants, aimed at promoting indigenous economic growth, as well as more technology and innovation-oriented projects. A typical example is the Action for the Development of SMEs which offers non-repayable grants of up to 70 per

cent of project costs (to a maximum of AS 3 million), loans of up to AS 1 million (AS 16 = £1) and support for consultancy services of up to 50 per cent of the costs (up to a maximum of AS 150,000). Other programmes include tourism support, support for the attraction of firms and further personnel qualifications, the restructuring of the raw materials industry, environmental support for SMEs and support for research projects.

The second institution of regional economic development in Steiermark is the Steiermark Economic Development Agency (*Steirische Wirtschaftsförderungs-Gesellschaft – SFG*). The SFG was founded in 1991 as an independent, semi-public regional development agency, owned and financed by the *Land* government. Its activities are undertaken within the framework of the legal regulations of the *Land* which guide, to some extent, the scope and nature of financial assistance which can be provided by the SFG. The overall goals of the institution are to improve the conditions for economic development in Steiermark, to increase the opportunities for growth of disadvantaged areas within the *Land*, and to strengthen indigenous regional potential. It can be seen as a service agency to support innovative activities. In principle, the policy follows a strategy of upgrading instead of attracting new industry. Most of the modernisation measures aim to better the technological and organisational basis and to improve qualifications and product quality in line with existing industries. The most interesting aspect is the tool-box approach in programme design. Out of a comprehensive range of services, they bundle services designed to meet specific needs. For example, one package for regions, one for firms in the growth process, one for young firms' founders.

The SFG provides both direct financial incentives and soft infrastructure measures, including seed capital, subsidies for project costs, new start-up premiums, and consultancy. The direct financial support granted to enterprises is focused principally on innovation projects with the potential to eliminate regional disparities, strengthen the *Land* economy or increase regional technological potential. The emphasis of the SFG is firmly placed on innovative enterprises or firms undergoing growth – other forms of support, such as the provision of risk capital, are also available for this target group. The SFG can also promote, or participate in, key infrastructure projects being carried out by the districts or other institutions of Steiermark. This gives the agency an important co-ordination function between the various institutions in the *Land* active in the field of economic development. The SFG has a relatively free hand in the design and implementation of advisory services and infrastructure measures.

The specific tasks carried out by the areas:

- Regional/area development: marketing of specific locati
- New firm set-up: attractic advisory services; infrastruc
- Firms in the growth phase: ac services; financial promotio
- Technology transfer: orga initiation of co-operation: transfer; conference/exhibiti
- Attraction of investment: a information and support for i
- Technology parks, innov establishment and manag provision; attraction of firms.
- Training; raising quality s information and advisory ser

A range of types of assistance is ger seven spheres. In the case of suppor example, consultancy support of up maximum of AS 150,000, project co 20 per cent of cost and AS 6 million, a types of venture of up to 75 per cent are all available. A separate infras provides a range of incentives includin up to 50 per cent of costs (up to a max of up to AS 1 million, a new start-up project cost support up to a maximum

The role of the SFG in the economic a wider trend within Austria towards tasks to semi-independent institutior *Länder* have retained some direct fina *Land* government, but have moved mai support and some financial support me and technology oriented) to an institut Kärnten and Burgenland, all the tas devolved to a single institution wh

AS 3 million), loans of up to AS
consultancy services of up to 50
f AS 150,000). Other programmes
ıe attraction of firms and further
ng of the raw materials industry,
ıpport for research projects.

omic development in Steiermark
/elopment Agency (*Steirische*
SFG). The SFG was founded in
regional development agency,
ment. Its activities are undertaken
lations of the *Land* which guide,
financial assistance which can be
of the institution are to improve
ent in Steiermark, to increase the
ed areas within the *Land*, and to
ial. It can be seen as a service
In principle, the policy follows a
ting new industry. Most of the
etter the technological and
lifications and product quality in
interesting aspect is the tool-box
comprehensive range of services,
pecific needs. For example, one
e growth process, one for young

ncentives and soft infrastructure
es for project costs, new start-up
t financial support granted to
vation projects with the potential
en the *Land* economy or increase
mphasis of the SFG is firmly
ms undergoing growth – other
f risk capital, are also available
promote, or participate in, key
out by the districts or other
es the agency an important
us institutions in the *Land* active
e SFG has a relatively free hand
sory services and infrastructure

The specific tasks carried out by the SFG can be divided into seven main areas:

- Regional/area development: provision of infrastructure measures; marketing of specific locations;
- New firm set-up: attraction of new firms; information and advisory services; infrastructure assistance; financial promotion;
- Firms in the growth phase: acquisitions; information and advisory services; financial promotion;
- Technology transfer: organisation of exhibitions and fairs; initiation of co-operation; internationalisation; innovation transfer; conference/exhibition management;
- Attraction of investment: attraction of investors; provision of information and support for investors, infrastructure provision;
- Technology parks, innovation and entrepreneur centres: establishment and management of centres; infrastructure provision; attraction of firms, information and advisory services;
- Training; raising quality standards; personnel development; information and advisory services; internationalisation.

A range of types of assistance is generally available within each of the seven spheres. In the case of support for firms in the growth phase, for example, consultancy support of up to 50 per cent of project costs to a maximum of AS 150,000, project cost subsidies of up to a maximum of 20 per cent of cost and AS 6 million, and financial participation in certain types of venture of up to 75 per cent of project costs and AS 10 million are all available. A separate infrastructure support programme also provides a range of incentives including subsidies for consultancy support up to 50 per cent of costs (up to a maximum of AS 100,000), seed capital of up to AS 1 million, a new start-up premium of up to AS 250,000 and project cost support up to a maximum of AS 2.0 million.

The role of the SFG in the economic promotion of Steiermark is part of a wider trend within Austria towards devolving regional development tasks to semi-independent institutions. The majority of the Austrian *Länder* have retained some direct financial assistance measures with the *Land* government, but have moved many of the functions of infrastructure support and some financial support measure (often those more innovation and technology oriented) to an institution such as the SFG. In two cases, Kärnten and Burgenland, all the tasks of regional policy have been devolved to a single institution which provides financial support,

infrastructure facilities and soft measures. This decentralisation of economic support has generally been seen as successful, increasing the professional image of the agencies and the profile of the support on offer. Recently the management of both FAWF and SFG was unified under a single directorate.

3. THE TECHNOLOGY POLICY CONCEPT

The other major agencies in Styrian innovation policy and technology transfer have recently joined the two institutions mentioned above in the so-called *ERFA-Gruppe Aktiver Technologietransfer* (Technology Transfer Group, initiated by Graz City Council, Department for Economic Promotion and Tourism). This is a loose forum of 14 Styrian public or semi-public technology transfer agencies. The different services were collected and defined in the compendium *Steiermark Technology Transfer: Opportunities and Achievements (Technologiestransfer in der Steiermark – Angebots- und Leistungsübersicht).* At present, a common marketing identity is being discussed. This network facilitates a matching of initiatives of all the different agencies and enables the group to meet a broader scope of requests by SMEs (similar to the British Business Links or One-Stop-Shop initiatives).

The fourteen members in the Technology Transfer Group include the *Land* and Graz City Council economic development departments along with similar departments of the regional development agency, the chamber of commerce, the labour market service, training and technology transfer centres, including university facilities. These agencies interact through meetings and regular communication such that actions and policies are complementary. Information gathered in a survey by the university technology transfer agency will be routinely disseminated amongst group members to ensure policy complementarity and to pick up promotion or problem-solving opportunities and actions.

On behalf of the Styrian Land Government, the *Institut für Technologie- und Regionalpolitik InTeReg* (Institute for Technology and Regional Policy) of Joanneum Research (a semi-governmental agency for applied research) has prepared a Technology Policy Concept for Steiermark. Its main objective is to create strong, competitive, regional structures through research-based and diffusion-aided innovation.

The Concept consists of two parts: the conceptual part includes a survey of Styrian industries and defines technological strengths and weaknesses.

The second offers a catalogue of
Styrian Technology Policy. The e

- The identification of indus
compete on an internationa
of Styrian businesses;
- The innovation and co-ope
- The regional technologica
technology transfer agenci
- The role of business start-u

The whole amounts to a systematic
the strategic technological and innc

The survey reports on collaboratic
cent of the enterprises have informa
play a minor role. High-tech com
range of products and a high rate o
more emphasis on collaboration tl
inter-firm collaboration by high-te
may be explained by the fact tl
collaborate cannot find suitable
international contacts. On the other
companies do not seem to be so int

Inter-regional collaboration (e.g
companies) is rather low. In terms of
Hungary is the main partner. Gene
investment in Eastern Europe to me

sures. This decentralisation of
een as successful, increasing the
he profile of the support on offer.
VF and SFG was unified under a

CONCEPT

ınovation policy and technology
stitutions mentioned above in the
chnologietransfer (Technology
City Council, Department for
ıis is a loose forum of 14 Styrian
r agencies. The different services
ɔendium *Steiermark Technology*
nts (Technologiestransfer in der
bersicht). At present, a common
ıis network facilitates a matching
s and enables the group to meet a
ilar to the British Business Links

ɔgy Transfer Group include the
development departments along
onal development agency, the
t service, training and technology
ıcilities. These agencies interact
nication such that actions and
ɔn gathered in a survey by the
will be routinely disseminated
cy complementarity and to pick
tunities and actions.

ent, the *Institut für Technologie-*
for Technology and Regional
;overnmental agency for applied
licy Concept for Steiermark. Its
ompetitive, regional structures
led innovation.

ɔnceptual part includes a survey
ɔgical strengths and weaknesses.

The second offers a catalogue of measures for the implementation of Styrian Technology Policy. The empirical part deals with:

- The identification of industrial sectors in Steiermark which can compete on an international level and, the technological strengths of Styrian businesses;
- The innovation and co-operation strategies of Styrian businesses;
- The regional technological infrastructure including the role of technology transfer agencies and technology parks;
- The role of business start-ups.

The whole amounts to a systematically-integrated partnership to develop the strategic technological and innovatory capacity of firms in the region.

The survey reports on collaboration amongst Styrian companies. 41 per cent of the enterprises have informal contacts; licensing and joint ventures play a minor role. High-tech companies (i.e. companies with a young range of products and a high rate of skilled personnel or academics) put more emphasis on collaboration than low-tech ones. Noticeably, local inter-firm collaboration by high-tech firms is of minor importance. This may be explained by the fact that high-tech companies willing to collaborate cannot find suitable regional partners and so rely on international contacts. On the other hand, Styrian medium- and low-tech companies do not seem to be so interested in collaboration.

Inter-regional collaboration (e.g. between Styrian and Carinthian companies) is rather low. In terms of collaboration with Eastern countries, Hungary is the main partner. Generally Styrian companies prefer direct investment in Eastern Europe to mere joint ventures

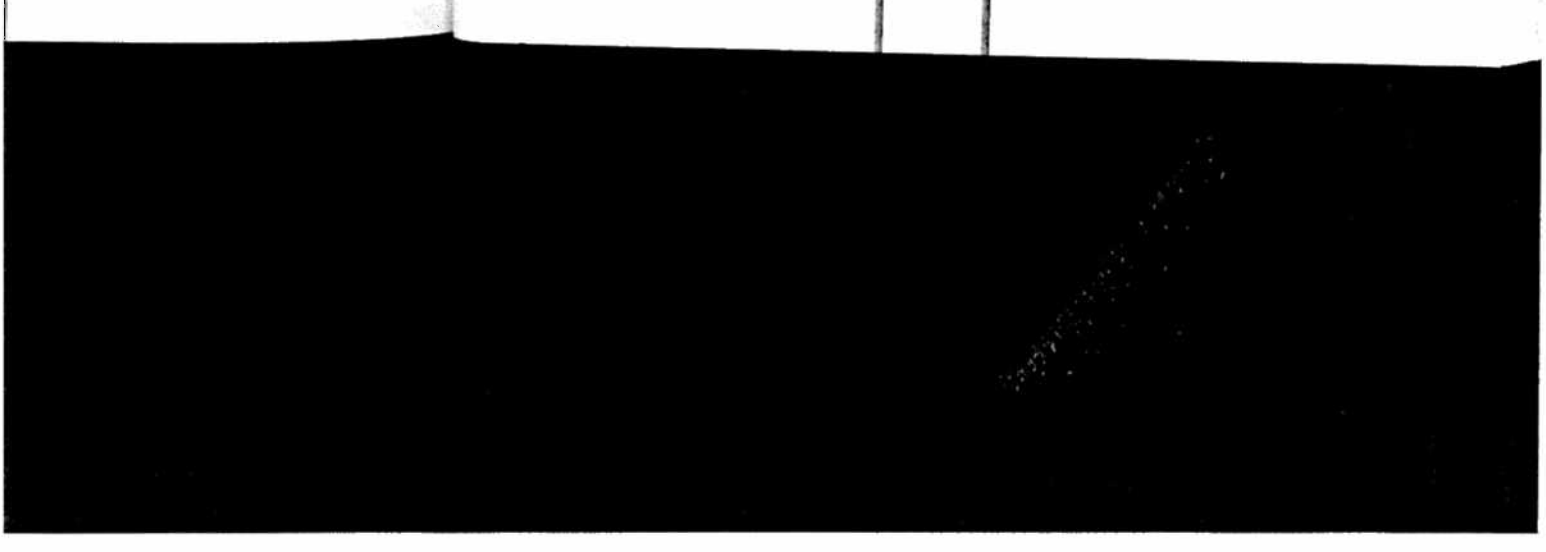
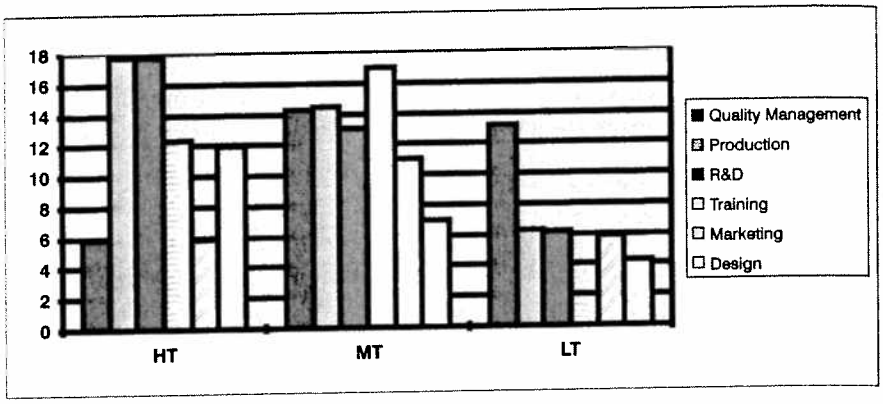


FIGURE 6.2

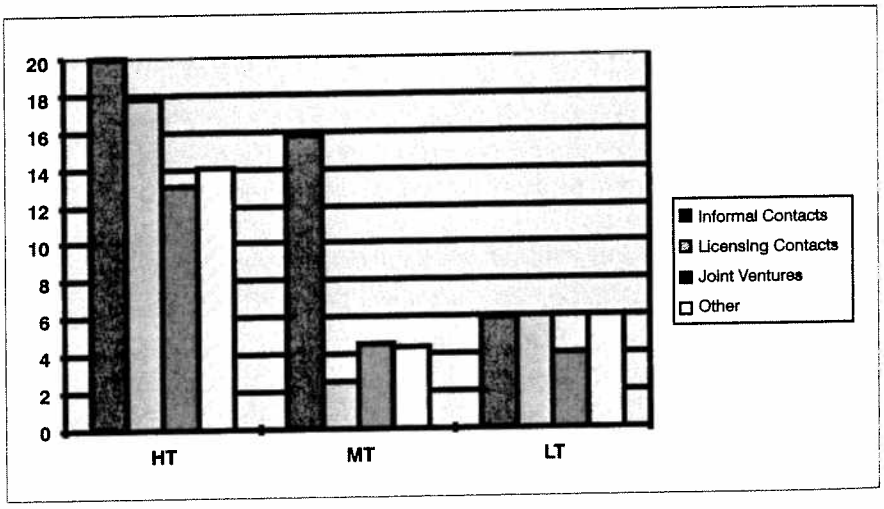
Percentage of Styrian High-, Middle- and Low-Tech Enterprises for which Different Types of Collaboration are of Major Importance



Source: Survey by Technical University of Graz.

FIGURE 6.3

Percentage of Styrian High-, Middle- and Low-Tech Enterprises for which Different Fields of Collaboration are of Major Importance



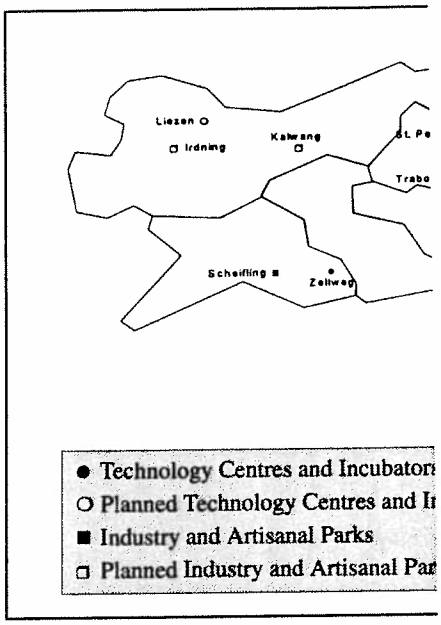
Source: Survey by Graz University of Technology.

4. TECHNOLOGY INFRAST

At present, there are 5 *Tec* (technology parks and parks for bu *Gewerbeparks* (industrial and artis businesses, 26 alone in STP *Steir* following map (6.2) shows the reg

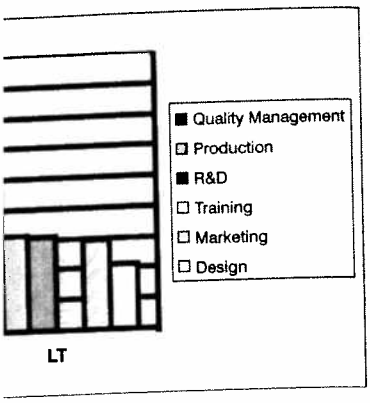
M

Location of Technolo



The extent of co-operation was anc especially in terms of co-operatio technology parks have become ce important instruments of a new Networking with different institutio substantial. Whether technology p regional inter-firm collaboratio networking among the technology p basis ('coffee-break knowledge-t advantage of these institutions. For from graduating PhDs at Graz Uni low-rent unit on a Technology Pa *complementarity* with firms alrea

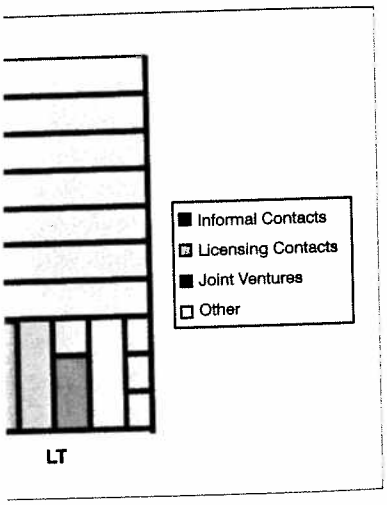
ınd Low-Tech Enterprises
Collaboration are
ance



raz.

3

and Low-Tech Enterprises
Collaboration are
tance



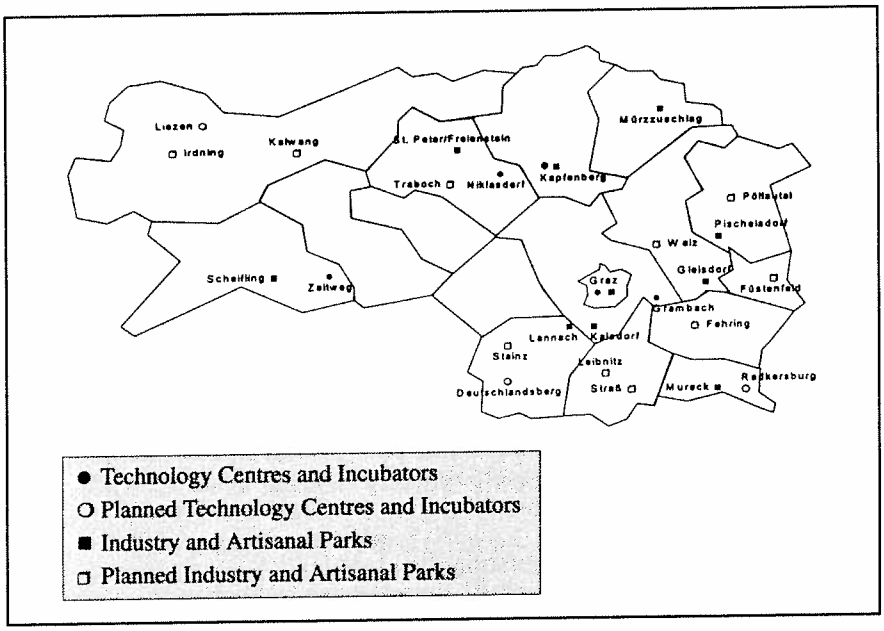
nology.

4. TECHNOLOGY INFRASTRUCTURE IN STEIERMARK

At present, there are 5 *Technologieparks* and *Gründerzentren* (technology parks and parks for business start-ups) and 9 *Industrie-* und *Gewerbeparks* (industrial and artisanal parks) in Styria with a total of 62 businesses, 26 alone in STP *Steirischer Technologiepark* in Graz. The following map (6.2) shows the regional distribution of the parks.

MAP 6.2

Location of Technology Parks in Steiermark



The extent of co-operation was another subject of the empirical survey, especially in terms of co-operation with regional agencies. The five technology parks have become centres of regional networks and thus important instruments of a new regional development strategy. Networking with different institutions of regional policy is definitely very substantial. Whether technology parks have also become motors of regional inter-firm collaboration remains to be seen. Inter-firm networking among the technology park firms, usually on a very informal basis ('coffee-break knowledge-transfer'), can be seen as a major advantage of these institutions. For instance, new start-up firms induced from graduating PhDs at Graz University of Technology are offered a low-rent unit on a Technology Park according to the extent of their *complementarity* with firms already present. Competitor firms are

discouraged. This is meant to enhance the *learning* and collaboration potential of all firms in such settings by reducing the prospect of loss of proprietorial knowledge.

5. THE STYRIAN AUTOMOTIVE CLUSTER INITIATIVE

Based on experiences in other countries and scientific findings including a study by IWI, Vienna (1994), the *Industriellenvereinigung Steiermark* (Association of Industrialists) and the SFG *Steirische Wirtschaftsförderung* have recently launched the *Automobil-Cluster Steiermark* (automotive cluster Styria). This cluster was identified as the one with the greatest growth potential in a recent regional study. Although there is no car manufacturer in Austria, Styrian companies supply a broad range of components to the international car industry.

The methodological approach to constructing the cluster study is the following:

(1) Analysis of three Styrian *Leitbetriebe* (lead enterprises), i.e. *AVL Graz* (combustion engine development), *Steyr Daimler Puch Fahrzeuigtechnik* (4-wheel drives, gearboxes) and Chrysler Eurostar (assembling of Chrysler Vans and Jeeps). The survey tries to give a picture of the regional situation and identifies the following weaknesses:

- Dominance of very small enterprises, lack of medium sized ones which could supply whole systems (not only components);
- High cost for personnel and tools;
- Bureaucracy;
- Qualification shortfalls; languages, social competencies, project management;
- SMEs have a lack of knowledge about the decision process in Large Enterprises (LEs);
- LEs have a lack of knowledge about potential regional suppliers.

(2) Identification of SMEs in different sectors and research institutions which deliver parts and services to car manufacturers:

(3) Initiation of Round Tables, Workshops, 'Get-Together-Events' so LEs and SMEs get to know each other . More than 50 head managers of S workshop in Graz co-operations and ec obstacles.

(4) Based on these event

The project will terminate at the and be used as an important in future.

6. THE ACTIVE TECHNO

In 1993/94, a pilot project calle *Technologietransfer TU Graz –* (technology transfer from Graz enterprises) was launched. It v Technology, Industrial Liaison Council, Department for Econor

Objectives of this 1-year-progra

- To identify a target grou seem most suitable for focusing on SMEs with institutions;
- To contact, visit and i capacities, scientific acti Technology (GUT) and (
- To stimulate co-operatic ranging from informal t companies, diploma thes

Core measures:

- Computer-aided identific which might be interest company profile *(a prior*
- Brief company audit: ar status of every company and organisational proble
- Consequent after-care: (proposals, research for p organisation of meetings

the *learning* and collaboration
reducing the prospect of loss of

CLUSTER INITIATIVE

and scientific findings including
striellenvereinigung Steiermark
and the SFG *Steirische*
unched the *Automobil-Cluster*
This cluster was identified as the
a recent regional study. Although
tyrian companies supply a broad
l car industry.

ructing the cluster study is the

itbetriebe (lead enterprises), i.e.
ne development), *Steyr Daimler*
wheel drives, gearboxes) and
ng of Chrysler Vans and Jeeps).
ture of the regional situation and
nesses:

enterprises, lack of medium sized
ply whole systems (not only

nd tools;

languages, social competencies,

vledge about the decision process
);
wledge about potential regional

different sectors and research
er parts and services to car

s, Workshops, 'Get-Together-
et to know each other . More than

50 head managers of Styrian businesses participated in a recent workshop in Graz to discuss the programme, potential co-operations and economic and cultural circumstances and obstacles.

(4) Based on these events, co-operations will be initiated.

The project will terminate at the end of 1995. Its results will be evaluated and be used as an important input for Styrian Industrial Policy in the future.

6. THE ACTIVE TECHNOLOGY TRANSFER INITIATIVE

In 1993/94, a pilot project called *Schwerpunktsprogramm zum aktiven Technologietransfer TU Graz – Grazer Wirtschaft* (programme for active technology transfer from Graz University of Technology to regional enterprises) was launched. It was carried out by Graz University of Technology, Industrial Liaison Department and funded by Graz City Council, Department for Economic Promotion and Tourism.

Objectives of this 1-year-programme were:

- To identify a target group of about 70 enterprises in Graz which seem most suitable for technology and knowledge transfer, focusing on SMEs with little or no experience with scientific institutions;
- To contact, visit and inform these SMEs about know-how capacities, scientific activities and services at Graz University of Technology (GUT) and other agencies;
- To stimulate co-operation in any form during these meetings, ranging from informal talks between university scientists and companies, diploma theses, to co-operative R&D.

Core measures:

- Computer-aided identification of know-how and services of GUT which might be interesting for the company according to the company profile *(a priori)*;
- Brief company audit: analysis of technology and qualification status of every company visited, identification of technological and organisational problems and needs for collaboration;
- Consequent after-care: quick processing of the questions and proposals, research for problem solvers in and outside of GUT, organisation of meetings, project control.

Accompanying measures:

- Initiation of GUT consultant-pools: scientists are invited to define and offer their knowledge and skills, marketing support of existing activities (*Ökoprofit* for environmental issues, CampusArt for software, COMTEC for industrial engineering);
- Organisation of expert talks, e.g. *Kontaktgesprache Wissenschaft-Wirtschaft* (contact group Research Economy).

Quantitative Evaluation:

During the 70 meetings, about 200 concrete requests for knowledge – transfer in different fields of technology were identified, which led to:

- Diploma Theses: especially for SMEs, diploma theses are a suitable medium for technology transfer (no financial and personal capacity for large-scale co-operative R&D projects);
- Informal consulting by university scientists (e.g. state of the art in laser technology);
- Use of services at GUT (measuring, testing, expert evidence, databases);
- Contracts with university assistants ('small form' of co-operative R&D);
- Use of external services by institutes of GUT;
- Job offers for students and alumni.

Some requests were forwarded to other enterprises or regional agencies (information broking). Approximately 10 out of 70 companies have already started co-operative projects as a result of this programme, 10 more are definitely willing to collaborate. The programme was extended to 1995.

However, the fear of most SMEs is to give away know-how or intellectual property. This has clearly become obvious in the course of the 70 audits. Other key results of this programme (qualitative evaluation) are:

- Active marketing via company visits is the most successful way of marketing;
- It is useful to ask managers for project ideas that have never been followed up;
- Basic R&D and company information (demand and supply side) are as crucial as non-bureaucratic after-care;
- Due to an overload of d about each other and re
- Universities are regard trusted;
- SMEs like to use scient
- SMEs like to employ pooled in students' assc
- Long-term co-operativ institutions is very rare.

As one key objective of the p knowledge gained during the n technology transfer agencies *ERFA-Gruppe Aktiver Techn* Group).

7. AN ASSESSMENT OF SYSTEM

As is clear from the foregoing, developing innovation system links amongst firms and enterpri is already receptive to an unus essential ingredient of economi overstate the co-operative a Steiermark, nevertheless it is im (and Styrian) political cultu pronounced:

- A long history of Social I way that, for example, t unions, business suppo organised by Christian D
- Centralised, corporatist produced long-lasting m spending, relatively high
- Early recognition in Sty system was breaking up, early supply-side industry to retain and enhance its (Graz);

- Due to an overload of daily business, SMEs have little knowledge about each other and regional agencies;
- Universities are regarded as neutral institutions which can be trusted;
- SMEs like to use scientists as 'living encyclopaedias';
- SMEs like to employ students, especially if their workforce is pooled in students' associations such as 'Junior Enterprise';
- Long-term co-operative R&D between SMEs and scientific institutions is very rare.

As one key objective of the programme was the dissemination of the knowledge gained during the meetings, a network of 14 Styrian public technology transfer agencies was initiated and established as the *ERFA-Gruppe Aktiver Technologietransfer* (Technology Transfer Group).

7. AN ASSESSMENT OF THE STEIERMARK INNOVATION SYSTEM

As is clear from the foregoing, Steiermark has established a viable and developing innovation system based on encouraging the deepening of links amongst firms and enterprise support institutions in a culture which is already receptive to an unusually high degree of co-operation as an essential ingredient of economic activity. While it is important not to overstate the co-operative aspect of economic co-ordination in Steiermark, nevertheless it is important to note some features of Austrian (and Styrian) political culture which make co-operation rather pronounced:

- A long history of Social Partnership in Austria, exemplified in the way that, for example, training institutions are owned by trade unions, business support (e.g. Chambers of Commerce) are organised by Christian Democrats;
- Centralised, corporatist bargaining and a hard currency policy produced long-lasting macroeconomic stabilisation, high welfare spending, relatively high growth rates and low unemployment;
- Early recognition in Styria that the established welfare policy system was breaking up, exacerbated by EU membership and that early supply-side industry measures were needed if the region was to retain and enhance its status of second Austrian *Land* and city (Graz);

which there is widespread intellectual anxiety about its traditional monoindustrial culture. There is some degree of threshing around to seek new industries such as multimedia, solar energy and biotechnology to, as it were, leapfrog out of a possibly decline sector. This overlooks the past failure of many regional and national economies to leapfrog into semi-conductors and high-tech in the 1970s and 1980s. On the whole these efforts did not achieve objectives to reproduce Silicon Valley clones elsewhere. Rather, what should happen in Baden-Württemberg as elsewhere is that judicious policy encouragement can be given to integrate older and newer technologies to produce more, for example, environmentally-friendly evolved products such as transportation equipment. In Ireland, a useful evolutionary path will be to strengthen linkage between foreign and indigenous sectors and develop more opportunities for interfacing and interaction among indigenous firms to enhance learning gains.

(ii) Regionalisation

The emphasis on dynamic growth *regions* in this commission is no accident. Presciently, it recognises that nation states, as Ohmae (1995) puts it, become increasingly dysfunctional as supranational trading blocs, such as the European Union, take shape. Ireland, of course, is a nation state, but of comparable size to some of the regions presented here; one-third the size of Baden-Württemberg but bigger than Wales or Steiermark, at least in population terms. Ireland makes a suitable size as a Euro-region, at least in *economic* terms. This is important for three key reasons consistent with the evolutionary developmental perspective.

First, in the era of global fiscal rectitude, tight budgets and monetary metrics reflecting ERM soundness, there is precious little by way of traditional national industry policy – "picking winners", protecting "national champions" and tariff barriers – to be observed in most European countries. Ireland remains more closely-wedded to an industry policy of attracting FDI and "backing winners", to some extent because of a need for more job-generation, strong GDP growth and in recognition of the relative success of the strategy in approaching both aspirations during recent years.

Nevertheless, it could be said that Irish industrial policy is now closer in spirit to the kind of judicious regional interventions that writers like de Vet (1993) and Begg and Mayes (1993) have noted as the successors at sub-national level of old-style industrial policies at national level. The difference, they conclude, is that while the latter were often unsuccessful, sometimes spectacularly so, the former are often highly successful because they integrated elements of the enterprise support system with

the, increasingly specialised, regional economies. The element of specialisation, or "stickiness" as economists sometimes refer to it (Krugman, 1991), is seen also as a product of borderless trading and comparative advantage being transformed into competitive advantage. This advantage derives not from natural resource endowments, but by proactive, evolutionary "neo-mercantilist" industry support policies promoting regional economies in the global market.

Where such promotion is high on authenticity and low on hyperbole, such regional economies enter the virtuous circle of attracting global FDI in the same specialisation into the region. Ireland has been successful in two-thirds of this strategy but now needs to complete the circle by developing its indigenous industry as a supply-base for global FDI. Wales has, to some extent, achieved this, in the medium-tech automotive and electronic engineering sectors. The supply-chain linkages, still attenuated it must be said, are nevertheless emergent and "club-goods" are being captured from such institutions as the "forum" and "supplier development group" which firms run for themselves after earlier animation by the development strategy. The Steimermark auto-cluster is based on concertation of about 40 key players, both large and small, while the Emilian industrial districts are supported by regional government initiatives to set up business innovation centres to support more organic networking propensities. All in all, some of the most interesting and exciting industrial policy is to be seen operating at regional level.

(iii) Institutional Learning

The more the business process moves outside the large firm into the supply-chain, whether embryonic or mature, the more demand there is for smaller firms to get up to speed on quality, price, delivery, reliability and innovation. Hitherto, smaller firms, even in *Mittelstand* heartlands like Baden-Württemberg have either produced to their own design for their local or niche market or to blueprints provided by customer-firms. Now that has changed. High performance engineering firms like Mercedes-Benz now demand innovation in components and systems from suppliers. This has created stresses because of the steep learning-curves down which such hitherto adaptable but non-innovative firms must move at speed. The response, in Badan-Württemberg was "model projects" based on *network co-operation*. Here, innovators form a club, moderated by a trusted research institute which protects proprietary knowledge, while ensuring the non-proprietary value-added from the know-how circulates amongst the innovators. The anchor for such collaborative learning is the *Land* Ministry of Industry giving incentives to firms to become laboratory or hiring a design eng

In Denmark, this approach has generalised Network Co-Operat innovator firms but intended to i of a wide range of firms willing a other firms in a club-like atmo prepare action plans to solve ther sometimes with innovative resul small-firm networks have more n Six Welsh slate companies joine £400,000 contract on that bas programme only having run for ju is not a panacea and too tight a ne as some have argued can afflict i networks are looser, less geogr many national and state governm to Portugal and, of course, Denm of improving firm competitiv institutionalised learning.

(iv) Path-Dependence

According to Arthur (1994), path- all computer keyboards follow keyboards by starting from top le logical reason why this should b dependent. He continues:

> Of recent fascination to ..... e systems..... where positive patterns or structures that em there is a multiplicity of long-term self-reinforcemen early on "pushes" the dynan and thus "selects" the structu into (Arthur, 1994, p.33)

This is clearly an evolutionary pr set which constrain the possible economy is capable of. When to th *specialisation* which, as Krugman the decline of "national economie path-dependence becomes a m policy-makers.

al economies. The element of
onomists sometimes refer to it
roduct of borderless trading and
med into competitive advantage.
:al resource endowments, but by
tilist" industry support policies
lobal market.

ıticity and low on hyperbole, such
circle of attracting global FDI in
ı. Ireland has been successful in
ıeeds to complete the circle by
;upply-base for global FDI. Wales
:he medium-tech automotive and
ɔly-chain linkages, still attenuated
gent and "club-goods" are being
ɔrum" and "supplier development
ɛs after earlier animation by the
mark auto-cluster is based on
both large and small, while the
ɔorted by regional government
ı centres to support more organic
ɔme of the most interesting and
ɔperating at regional level.

ɜ outside the large firm into the
ıature, the more demand there is
quality, price, delivery, reliability
s, even in *Mittelstand* heartlands
ɔroduced to their own design for
ints provided by customer-firms.
rmance engineering firms like
ion in components and systems
ɜtresses because of the steep
:rto adaptable but non-innovative
nse, in Badan-Württemberg was
operation. Here, innovators form
earch institute which protects
the non-proprietary value-added
ɨt the innovators. The anchor for
nd Ministry of Industry giving

incentives to firms to become innovators by opening a small R&D laboratory or hiring a design engineer.

In Denmark, this approach has been developed further into a more generalised Network Co-Operation Programme applicable not only to innovator firms but intended to improve the efficiency and effectiveness of a wide range of firms willing and able to benefit from interfacing with other firms in a club-like atmosphere to identify common problems, prepare action plans to solve them, followed by implementation of plans sometimes with innovative results. The Welsh supplier clubs and lateral small-firm networks have more modest but essentially similar ambitions. Six Welsh slate companies joined forces in a formal network and won a £400,000 contract on that basis at the end of 1995, the network programme only having run for just over one year. Of course, networking is not a panacea and too tight a networking culture may lead to "lock-in" as some have argued can afflict industrial districts in unstable times. But networks are looser, less geographically restrictive relationships and many national and state governments from Australia and New Zealand to Portugal and, of course, Denmark have adopted the policy as a means of improving firm competitiveness by risk-spreading based on institutionalised learning.

(iv) Path-Dependence

According to Arthur (1994), path-dependence explains, for example, why all computer keyboards follow the earlier generation of typewriter keyboards by starting from top left with QWERTY. There is no longer a logical reason why this should be so, but the design has become path-dependent. He continues:

> Of recent fascination to ..... economists are non-linear dynamic systems..... where positive feedback's may cause certain patterns or structures that emerge to be self-reinforcing. Often there is a multiplicity of patterns that are candidates for long-term self-reinforcement; the cumulation of small events early on "pushes" the dynamics into the orbit of one of these and thus "selects" the structure that the system eventually locks into (Arthur, 1994, p.33)

This is clearly an evolutionary process in which certain parameters are set which constrain the possible range of diversification that a given economy is capable of. When to this is added the enhanced propensity for *specialisation* which, as Krugman (1991) notes, is a systemic feature of the decline of "national economies" and the rise of supranational ones, path-dependence becomes a matter of considerable importance to policy-makers.

This is not least because traditional development theory suggests economies can, with judicious intervention, break-out of a dependence upon, say, agriculture and develop a more diversified industrial and services economy. Yet, countries with a strong agricultural inheritance often retain aspects of that endowment even when direct agricultural employment declines. Denmark, for example, has not diverged substantially from its important, traditional, sectors such as food-production, furniture-manufacturing and clothing design and fabrication. Some of the most successful networks were formed in such industries with the support of the Network Co-operation programme.

The trick is to remain competitive in such industries by moving up-market in terms of quality, reliability and marketability, something which suggests that, in its benign form, path-dependence is a distinct asset because it builds on inherited skills, technologies and reputation. However, it can be seen as a liability, something which, perhaps surprisingly, is presently animating industry and the governance system in Baden-Württemberg where there is anxiety about over-dependence upon the automotive industry. There, ideas of leap-frogging into multi-media, solar energy and bio-technology have substantial local credibility despite the failures, not least in Germany, to leap-frog into high-tech, especially computing, in the 1970s and 1980s. Path-dependence suggests evolution out of aspects of key industry into complementary areas embodying newer technologies is the safer way to proceed. Of course, where old industries are doomed, as with coal in Wales, new strengths must be forged, but even there this was done by building on long-established secondary industries such as automotive components and consumer electronics, supplemented by a wave of new inward investment in the 1980s, rather than leap-frogging. Despite appearances, the newer path-dependence in Wales grew from an already existing but less visible manufacturing base.

(v) Interactive Innovation

This is an important concept for two reasons. First, it lies at the heart of evolutionary economic theory through the pioneering work of Nelson and Winter (1982) and, second, it has stimulated a great deal of practical policy thinking which has influenced governments world-wide. In respect of the latter achievement, the findings of innovation theorists and researchers have caused the retreat of the so-called "linear model" of innovation whereby invention led sequentially to innovation and diffusion, in favour of the more systemic, network-based model of interactive innovation. Official recognition of this is testified to in the rise in importance of such notions of "user-power", "near-market research", "university-industry relations" a agencies and offices of science an

Interactive innovation brings all innovation arena. Supplier firms technical consultancies, customer agencies, chambers of commerce, potentially key members of the in is no longer conceived as a top-d than hierarchical. Information flo networks according to the reputati members in question.

Denmark, as a small economy wit as a percentage of GDP, nevertl functioning as an open, interactive resources from abroad as w Baden-Württemberg has the full basic, through applied, to SME t diffuse valued innovation knowl know. Where the system displays out-sourcing – rapid response f innovation action and diffusion c co-operation-based innovation ar achieves comparable robustness government and development age business innovation centres in the has recently taken innovation serio first Regional Technology Plan, a s and club styles of interaction into

(vi) Economies of Association

In hierarchies, authority flows fron are authorised by exchange of res governed purely by utility-maxi neither of these categories of influ other heterarchic and systems relationships. So we need systemat it breaks down and how to learn t as it were, the product of systemat

Trust is the mutual confidence tha the other's vulnerability. If trust i arrangement and everyone will sa the pursuit of self-interest. If there

development theory suggests
ion, break-out of a dependence
more diversified industrial and
a strong agricultural inheritance
t even when direct agricultural
example, has not diverged
itional, sectors such as food-
clothing design and fabrication.
were formed in such industries
ration programme.

industries by moving up-market
arketability, something which
-dependence is a distinct asset
technologies and reputation.
ty, something which, perhaps
stry and the governance system
anxiety about over-dependence
, ideas of leap-frogging into
nology have substantial local
in Germany, to leap-frog into
in the 1970s and 1980s.
of aspects of key industry into
technologies is the safer way to
s are doomed, as with coal in
ut even there this was done by
industries such as automotive
upplemented by a wave of new
r than leap-frogging. Despite
in Wales grew from an already
ase.

sons. First, it lies at the heart of
pioneering work of Nelson and
lated a great deal of practical
rnments world-wide. In respect
s of innovation theorists and
he so-called "linear model" of
quentially to innovation and
mic, network-based model of
n of this is testified to in the rise
ower", "near-market research",

"university-industry relations" and so on in reports by government agencies and offices of science and technology.

Interactive innovation brings all the players of consequence into the innovation arena. Supplier firms, large and small, research institutes, technical consultancies, customer firms, universities, technology transfer agencies, chambers of commerce, banks and other financial actors are all potentially key members of the interactive innovation process. Learning is no longer conceived as a top-down process, it is heterarchical rather than hierarchical. Information flows amongst trusted members of such networks according to the reputation, reliability and inclusiveness of the members in question.

Denmark, as a small economy with a relatively low expenditure on R&D as a percentage of GDP, nevertheless manages to remain innovative functioning as an open, interactive learning system, absorbing innovation resources from abroad as well as generating them at home. Baden-Württemberg has the full range of innovation institutions from basic, through applied, to SME technology-transfer organisations that diffuse valued innovation knowledge very rapidly to all who need to know. Where the system displays failure – as in the case of innovation out-sourcing – rapid response from the governance system restores innovation action and diffusion capacity. The Steiermark approach of co-operation-based innovation and close university-industry relations achieves comparable robustness. In Emilia-Romagna, the regional government and development agency established more or less successful business innovation centres in the heart of the industrial districts. Wales has recently taken innovation seriously, accessing and producing the EU's first Regional Technology Plan, a strategy for simulating growth of forum and club styles of interaction into the field of innovation.

(vi) Economies of Association

In hierarchies, authority flows from the top down. In markets, transactions are authorised by exchange of resources or contracts. Relationships are governed purely by utility-maximisation. In heterarchies (networks), neither of these categories of influence dominates. Rather, networks and other heterarchic and systems arrangements rely upon trust in relationships. So we need systematically to analyse why trust works, why it breaks down and how to learn to make it work better. Studied trust is, as it were, the product of systematising that analysis.

Trust is the mutual confidence that no party to an exchange will exploit the other's vulnerability. If trust is absent no-one will risk initiating an arrangement and everyone will sacrifice potential co-operation gains to the pursuit of self-interest. If there is a sufficiently high profitability of a

breach of trust in, say, a supply chain, each actor will seek to cease trading at the last-but-one point before breakdown point. Self interest is furthered by withdrawing from exchanges, even those that are trustworthy. In recent work, Sable (1993) demonstrates that trust is a prudent course of action because it integrates actors into a society. Pushing this further several authors discuss the *'constitutional order'* or *'microconstitutional regulation'* by which *social capital* is successfully deployed. (see Chapter 1, Section 5). Heterarchies or networks develop "constitutions" or rules and routines of the game by which members regulate themselves and each other. Breaches of *trust* betray microinstitutional regulation mechanisms, destroying the constitutional *order* and devaluing the social capital of the network.

Dynamic growth economies of the kind we have explored tend to approximate or aspire to such 'economies of association'. In these, the previously central role of the State in leading all kinds of programmes and enterprise support promotions tends to have moved away from centre stage. This is where it is perceived that social or economic groups have shown responsibility and thus earned the trust to have some programme management responsibility devolved to them, to act as a kind of civic, not merely social, capital. Where trust is not breached, where the network is confident and forward looking, institutional learning, by-doing, by-using, by-searching, by-exploring, by-interacting, by-learning itself, can thrive. Interactive learning results in two processes; one, of augmenting an individual, firm or institutional stock of knowledge; two, causing the forgetting of redundant knowledge. The convergence of new and existing knowledge, in the form of innovative ideas and projects, leads, after an institutional selection process, to potential social as well as industrial innovation.

Economies of association are "club-goods" that economically rational and cooperatively-minded actors seek from risking faith in each other's trustworthiness. Sometimes such "club-goods" are furthered by "rent-seeking" or "rent-capturing practices" towards resources intended for enterprise support by public agencies such as the European Commission, State governments or regional programmes. More often, economies of association arise in the shape of formalised networks or informal cluster arrangements amongst firms and where, to some extent, "rent-captured" resources may also be available.

Baden-Württemberg in particular, and Germany more generally, possesses a culture in which economies of association through seeking "club-goods" by "market-capturing" or "rent-capturing" behaviour is rather well developed. The notion of *selbstverwaltung* or "responsible self-management by associations" (e.g. IHK or Steinbeis Stiftung, Fraunhöfer Gesellschaft or Ma
builds upon the economy-cultu
UK more generally, such d
hegemony of nationalised indu
shown, there are interesting i
association now developing. In
three key conditions to be full
ceding of functions to associatic
division of authority into the
domains; transparent informati
implementation backed by app

(vii) Systems Integration

Each of the economies studied
or is in the process of building, v
(or National in the case of D
innovation system integrates all
that flows of information and pr
actors are maximised. Inc
agenda-setting and priority-ran
kinds of research will not be
perceived strength or opportunit
of working with the grain of the

Logically speaking, the interact
innovation needs to be built up
no strong tradition of such inte
programme can be the means of
and specific support agencies wi
to interact. In time, an option is
come to a consensus about the s
opportunities for the economy
taken in Wales and Steirmark,
endowments in Baden-Württem
the first two, a loose network
diversified in ways that have
cluster-like relationships a
cluster-promotion strategy for th
clusters in question were by no
basis of pre-existing network
relationships. In the other cases
path -- dependence over the long
have given rise to a distinctiv

Fraunhöfer Gesellschaft or Max Planck Institutes) contributes to but also builds upon the economy-culture of associationalism. In Wales, as in the UK more generally, such developments were snuffed-out by the hegemony of nationalised industries and the welfare state, though, as was shown, there are interesting instances of new forms of economies of association now developing. In practical terms *associationalism* requires three key conditions to be fulfilled if it is to work well in society: the *ceding of functions* to associations of democratic governance by the State; division of authority into the largest feasible number of *subsidiary* domains; transparent information flow and consultation prior to policy implementation backed by appropriate financial mechanisms.

(vii) Systems Integration

Each of the economies studied as comparators to the Irish case either has, or is in the process of building, what may be called an interactive Regional (or National in the case of Denmark) Innovation System. A regional innovation system integrates all the items discussed thus far in such a way that flows of information and processes of interaction between the diverse actors are maximised. Increasingly, it involves questions of agenda-setting and priority-ranking. At national level, this means some kinds of research will not be funded whereas others, where there is perceived strength or opportunity, will. At regional level, it is more a case of working with the grain of the regional economy.

Logically speaking, the interactive dimension of systems-integration of innovation needs to be built up by example, particularly where there is no strong tradition of such interfacing. A formal Network Co-operation programme can be the means of bringing together not only firms but firms and specific support agencies with which it may be necessary or desirable to interact. In time, an option is for networks themselves to interface and come to a consensus about the strengths and weaknesses, challenges and opportunities for the economy in question. This is very much the route taken in Wales and Steirmark, with variants due to differences in initial endowments in Baden-Württemberg, Emilia-Romagna and Denmark. In the first two, a loose network approach became more formalised and diversified in ways that have led to the informal development of cluster-like relationships and structures in Wales and formal cluster-promotion strategy for the automotive industry in Steiermark. The clusters in question were by no means build *de novo*, but rather on the basis of pre-existing network (though not necessarily formally so) relationships. In the other cases, except Denmark, clusters existed from path – dependence over the long-term and, in Baden-Württemberg, these have given rise to a distinctive regional innovation system while in

Emilia-Romagna it is a more localised one. Denmark represents the case of networking being deployed as a means of building inter-firm learning, co-operation and innovation to complement the limitations of a weak national system of innovation. In some cases, geographical industry clusters have been strengthened following the success of the Network Co-operation Programme.

In brief, the lessons that can be learned from cases such as those quoted are that a Regional or National System of Innovation is a desirable aspiration for any economy, but that a modern one needs to build upon "bottom-up" demand for interactive enterprise support by firms interfacing with agencies. A formalised, though modest, networking culture can be built and this can evolve, with judicious policy-support into a wider industry cluster with legitimate calls upon a national or regional system of innovation.

2. CURRENT STRENGTHS AND WEAKNESSES

(i) Structural Adjustment and Recent Performance

It is now recognised that the Irish economy has gone through a dramatic structural adjustment in the past 25 years. While this has been a painful experience, it has created an economy with considerable strengths, as well as weaknesses. It has meant that the Irish economy consists primarily of SMEs. It has meant that the Irish economy is significantly reliant on inward direct investment and sub-supply to TNCs. While Ireland has a weak indigenous sector (see below), it is one which has been severely tested by competition. All the firms in manufacturing, and many in services, are now living in a highly competitive environment. Nevertheless, as noted above, it remains difficult to fully assess the renaissance of the indigenous Irish economy.

(ii) Selectivity, Networks and Clusters

There has, indeed, been a change in Irish industrial policy in recent years. O'Malley (1992) notes the increased recognition of the importance of nurturing Irish-owned industry by selective incentives. Technological capability, export marketing and skills (including management) were increasingly supported, at the expense of fixed asset investment. In addition, more targeting, selectivity and less wasteful automatic grant giving have been major themes. This selectivity focuses on supporting firms with good growth potential, using performance indicators as conditions for grant payment, and exchanging state funds for equity shares, with a view to yielding a return on the state's investment.

Fixed asset investment decline
to 43 per cent of the industry bu
11 per cent to 20 per cent, and
cent. Despite this, the overall le
only rose from 51 per cent to 5
1985 and 1989. However, the
applied meant that more reso
period. Hence, by the late 1980
seen, more or less successfully,
winners', then of 'backing win
the heavily grant-aided indige
necessarily supporting the exi
selectively awarded according t
which received assistance wer
position to develop. O'Malley'
were to be cut, this would have
of these firms – is worrying. Th
should be weaned off this suppo
rather than deprived. At least, c
the support given to 'strong' firr
equity or a range of other bu
propitious for a mixed approach
enable firms to help themselves
may be poised at the stage
management of enterprise supp
support for self managemen
development of 'economies of a
O'Donnell, 1995).

Greater selectivity, as evidenced
a cluster strategy. If Ireland's cu
horizontally and vertically linke
this should be pursued. The centr
is that a networking policy consti
development of deeper clusters i

O'Sullivan (1995) notes that Irish
in inculcating learning process
manufacturing sector. As earlier
and innovation are two of the ke
dynamic economies in Europe. M
are identifiable as weakness
noteworthy exceptions) particul

. Denmark represents the case
f building inter-firm learning,
ent the limitations of a weak
cases, geographical industry
; the success of the Network

m cases such as those quoted
of Innovation is a desirable
dern one needs to build upon
nterprise support by firms
though modest, networking
ı judicious policy-support into
ls upon a national or regional

EAKNESSES

Performance

has gone through a dramatic
While this has been a painful
considerable strengths, as well
conomy consists primarily of
ny is significantly reliant on
o TNCs. While Ireland has a
one which has been severely
nanufacturing, and many in
competitive environment.
difficult to fully assess the
y.

lustrial policy in recent years.
gnition of the importance of
ve incentives. Technological
ıcluding management) were
f fixed asset investment. In
ess wasteful automatic grant
tivity focuses on supporting
performance indicators as
ıging state funds for equity
he state's investment.

Fixed asset investment declined in the period 1985-91, from 61 per cent to 43 per cent of the industry budget, while technology support rose from 11 per cent to 20 per cent, and marketing support rose from 11 to 14 per cent. Despite this, the overall level of expenditure on indigenous industry only rose from 51 per cent to 54 per cent of the industry budget, between 1985 and 1989. However, the more stringent selectivity criteria being applied meant that more resources were going to fewer firms in this period. Hence, by the late 1980s to early 1990s, the Irish government was seen, more or less successfully, to be sustaining a policy, if not of 'picking winners', then of 'backing winners'. Superior economic performance of the heavily grant-aided indigenous enterprises should not be seen as necessarily supporting the existing policy approach. Its assistance is selectively awarded according to growth potential. The result is that firms which received assistance were those which were already in a strong position to develop. O'Malley's suggestion – that if the industry budget were to be cut, this would have a negative effect upon the performance of these firms – is worrying. There is an underlying sense in which they should be weaned off this support system, with the emphasis on weaned rather than deprived. At least, consideration should be given to whether the support given to 'strong' firms should take the form of capital grants, equity or a range of other business services. The timing too seems propitious for a mixed approach in which state assistance is provided to enable firms to help themselves, perhaps by helping each other. Ireland may be poised at the stage in its economic history where state management of enterprise support may begin to transmute into state support for self management of business support, through the development of 'economies of association' (Geroski and Knight, 1991; O'Donnell, 1995).

Greater selectivity, as evidenced in recent years, is not the same thing as a cluster strategy. If Ireland's current challenge is to develop clusters of horizontally and vertically linked sub-sectors, it is important to ask how this should be pursued. The central policy recommendation of this report is that a networking policy constitutes an important first step towards the development of deeper clusters in the Irish economy.

O'Sullivan (1995) notes that Irish industrial policy has not yet succeeded in inculcating learning processes sufficiently within the indigenous manufacturing sector. As earlier portions of this study stressed, learning and innovation are two of the key attributes of successful firms in more dynamic economies in Europe. Marketing and technological applications are identifiable as weaknesses amongst indigenous firms (with noteworthy exceptions) particularly in respect of international markets

and networks. O'Sullivan (1995) continues, in line with the thesis developed here:

> The basis for continuous innovation has not been established on a widespread basis either in individual indigenous companies *nor on the basis of linkages between them* (O'Sullivan, 1995, p.385; emphasis added).

She concludes that companies have concentrated on low-skilled, low value-added activities, instead of seeking to take "the high road". Part of the reason for this is that:

> ... there has historically been hardly any long-term co-operation between Irish small firms in the provision of purchasing, marketing, financial services or through supply linkages (O'Sullivan, 1995, p.386).

This is perhaps too strong, since on linkages at least, some success has been noted for the National Linkage Programme. Nevertheless, it correctly highlights the relationship between weaknesses in marketing, technology, training and innovation, on the one hand, and weak inter-firm relations and co-operation, on the other.

3. FROM STATE SUPPORT TO NETWORKING AND CLUSTERS

(i) New Requirements for Economic and Business Development

Our central conclusion is that Ireland's state economic development apparatus – which has been the mainstay of the economic development process in Ireland – needs to adjust its focus and change its objectives to encompass the new requirements for economic and business development. Amongst these are the need for:

(i) Integration of the foreign and domestic sectors;

(ii) Upgrading and refocusing of the domestic sector;

(iii) Encouragement of a co-operative ethic among firms;

(iv) Promotion of the idea that self-help through networking can improve enterprise performance;

(v) Stimulation of an interactive learning culture among firms and intermediate institutions;

(vi) Advancement of the innovation capability of Irish science and technology by closer interaction with firms;

(vii) Development of a N linking "top-down" interactive innovation

(viii) Focusing these develc

(ix) Seeking to build stroi architecture of interac

Key elements of these recommei

It was recommended above that t foreign and domestic sectors b manufacturing SMEs to entering suited to such integration, encc means of networking and learn institutionalisation of an interact linking complementary, secto companies was required. This e indigenous manufacturing sector is how to proceed?

There is a role for policy but it is firms to help themselves. The ab need to take measures in suppor Irish firms along three dimensio

- Networking of Firms;
- Clustering of Firms;
- The National System of I

The aim should be to achieve int by taking practical steps to sup firm-agency collaboration. One presently. However, before that i in definitional terms between net

(ii) Networking

Confusion can easily arise in the c concepts. According to Rosenfe refers to a group of firms with re contractual, business objectives members of a network choose co-operate in some way and to Networks may more readily dev

nues, in line with the thesis

has not been established
individual indigenous
linkages between them
ıdded).

centrated on low-skilled, low
to take "the high road". Part of

ıy long-term co-operation
provision of purchasing,
hrough supply linkages

ges at least, some success has
Programme. Nevertheless, it
een weaknesses in marketing,
one hand, and weak inter-firm

O NETWORKING AND

ınd Business Development

state economic development
of the economic development
ıs and change its objectives to
ır economic and business
for:

omestic sectors;

e domestic sector;

ve ethic among firms;

-help through networking can
;

rning culture among firms and

capability of Irish science and
ı with firms;

(vii) Development of a National Innovation System capable of linking "top-down" and "bottom-up" capabilities in an interactive innovation system;

(viii) Focusing these developments around key sectors;

(ix) Seeking to build strong industrial clusters around the system architecture of interactive innovation.

Key elements of these recommendations are elaborated below.

It was recommended above that there is a perceived need to integrate the foreign and domestic sectors by, in part, re-focusing the indigenous manufacturing SMEs to entering vertical supply chains. For firms not so suited to such integration, encouragement of a co-operative ethic by means of networking and learning were advocated. Beyond that, the institutionalisation of an interactive innovation culture in which clusters linking complementary, sectorally diverse but industrially-related, companies was required. This examination of the performance of the indigenous manufacturing sector reinforces this argument. The question is how to proceed?

There is a role for policy but it is one in which the State can usefully help firms to help themselves. The above recommendations boil down to the need to take measures in support of building competitive advantage for Irish firms along three dimensions. The three concern:

- Networking of Firms;
- Clustering of Firms;
- The National System of Innovation.

The aim should be to achieve integration of the overall business system by taking practical steps to support both inter-firm collaboration and firm-agency collaboration. One way of doing this will be outlined presently. However, before that it is necessary to make a key distinction in definitional terms between networking and clustering.

(ii) Networking

Confusion can easily arise in the definition of these two enterprise support concepts. According to Rosenfeld (1995) the term network generally refers to a group of firms with restricted membership and specific, even contractual, business objectives likely to result in mutual gains. The members of a network choose each other; they agree explicitly to co-operate in some way and to depend on each other to some extent. Networks may more readily develop within clusters, especially where a

wide range of business transactions conducted over a substantial period of time has developed the reputation of partners and helped build up trust in their reliability and willingness to exchange as well as deliver products or process knowledge.

(iii) Clustering

A business cluster, suggests Rosenfeld (1995) is a 'geographically bounded concentration of similar, related or complementary businesses, with active channels for business transactions, communications and dialogue, that share specialised infrastructure, common opportunities and threats' (p.5). Clusters have no formal membership requirements, can encourage specialised services to locate in a region, are based on high-trust transactional relationships between firms, in the vertical and lateral dimensions, and foster implicit co-operation around a collective vision rather than common goals. Clusters should be statistically demonstrable and, ideally, geographically distinctive in terms of higher than average location quotients, trade shares and the like. They should be important to their economy and they may embody a range of products or services. At one extreme, they may be a single product, such as knitwear, at the other they may be united across a product range such as electronics where, to some extent, skills and technologies rather than products link cluster members. Vertical linkages may be more prominent in clusters than in networks and they will rely on a collective training, technology transfer, business services and innovation infrastructure, particularly for SMEs, as a consequence.

TABLE 8.1

Networks and Clusters Summary Table

Networks give access to specialised services at lower costs *Clusters attract specialised services to a region*
Networks have restricted membership *Clusters have open membership*
Networks rely on informal or formal-contractual agreements *Clusters are based on shared norms of reciprocity*
Networks facilitate more sophisticated business practices *Clusters facilitate firm-acquisition of wider competencies*
Networks have common business goals *Clusters have shared vision*

Source: After Rosenfeld (1995).

(iv) Networks as a Route to

Both approaches to policy are r
been commended to the Irish gc
the present report, while ac
medium-term objective, recon
networking as a policy me
manufacturing sector. This
inter-firm dimension, but its
appropriate, in the vertical di
attention could be devoted to t
industry or the publishing indu
actions to improve technologic
skills in the industry as a whol
participate in a Network Co-op
in Denmark.

The requirements would be
broker-training, an incentive sy
networks and firms to join ther
design joint action plans, again
cover costs of specialist technic
the stage of implementation of
into electronic publishing for a p
to a level that makes it feasibl
network partners. The full rang
technology through skills develo
in the network support measures

In the vertical dimension, the par
small number of, perhaps sophist
the trained broker's function
integration of the customers, as
supplier firms, involved as netw
clear set of objectives would
technological, managerial, logi
deliverability criteria, and a joint
to achieve those objectives. Mee
atmosphere would be an essential
an implementation programme, a
be expected to result in the anticip
in operating the National Linkag
incorporated into the design of su
that a rather larger number of firm
may have been the case with NLI

ıcted over a substantial period
·tners and helped build up trust
nge as well as deliver products

(1995) is a 'geographically
or complementary businesses,
actions, communications and
ıre, common opportunities and
ıembership requirements, can
e in a region, are based on
veen firms, in the vertical and
-operation around a collective
ısters should be statistically
distinctive in terms of higher
es and the like. They should be
embody a range of products or
ngle product, such as knitwear,
ɔduct range such as electronics
ɔgies rather than products link
ɔe more prominent in clusters
ɔollective training, technology
infrastructure, particularly for

ummary Table

·vices at lower costs *region*
ɔntractual agreements *eciprocity*
l business practices *der competencies*
s

(iv) Networks as a Route to Clusters

Both approaches to policy are relevant in the Irish case and clustering has been commended to the Irish government in the Culliton report. However, the present report, while advocating clustering as an appropriate medium-term objective, recommends that attention is first devoted to networking as a policy measure aimed at the indigenous Irish manufacturing sector. This can apply primarily in the horizontal inter-firm dimension, but its rationale can also be justified, where appropriate, in the vertical dimension. For instance, as in Denmark, attention could be devoted to the furniture industry, the contract mould industry or the publishing industry, with a view to encouraging shared actions to improve technological marketing, management and employee skills in the industry as a whole, or at least that part of it persuaded to participate in a Network Co-operation Programme of the kind pioneered in Denmark.

The requirements would be the same: a broker service, intensive broker-training, an incentive system which encourages brokers to form networks and firms to join them. Thereafter, network members should design joint action plans, again with a degree of incentive provided to cover costs of specialist technical, financial or business advice. Finally, the stage of implementation of the project – say, in publishing, a move into electronic publishing for a pilot product – should also be subsidised to a level that makes it feasible, but still demands joint-funding from network partners. The full range of implementation requirements from technology through skills development to marketing, should be embodied in the network support measures.

In the vertical dimension, the partnership might be focused on a single or small number of, perhaps sophisticated, final customer-firms. In this case, the trained broker's function would involve interaction with and integration of the customers, as well as the supplier firms or would-be supplier firms, involved as network members. Through this process, a clear set of objectives would be defined in terms, let us say, of technological, managerial, logistics, quality, reliability, pricing and deliverability criteria, and a joint action plan would be prepared to seek to achieve those objectives. Meetings in an associational or "club"-like atmosphere would be an essential element of this kind of networking and an implementation programme, also funded on a joint-cost basis, would be expected to result in the anticipated actions being realised. Experience in operating the National Linkage Programme (NLP) would usefully be incorporated into the design of such networking, but it could be expected that a rather larger number of firms would become network members than may have been the case with NLP.

Clearly, the wisest step would be to run some pilot projects, preferably in already reasonably robust sectors, such as furniture, printing and publishing, metals engineering and automotive, knitting and food. To these might be added electronics components, given the known presence of an exacting and globally competitive high technology sector in Ireland. The overarching aim should be to encourage the indigenous Irish sector away from "the low road" route, towards "the high road" of higher skill, higher value-added and higher incomes. In the process of learning from each other, from brokers, experts and customers, Irish firms will be engaging in the upgrading, innovation-seeking activity that seems at the moment to be the province of so few.

Later, as the Network Co-operation Programme is extended, the population of receptive firms will have grown. On that basis, say two-to-three years after the start of the pilot programme, serious attention could be given to promoting, amongst those cross-sectoral, complementary firms that are receptive to networking, the concept of broader, looser cluster building. Here, awareness of the differences between networking and clustering will have been made clear. But, again, state agencies could take on the animator or facilitator function to stimulate a broader dialogue between, say, "networks of networks", as appropriate. Rather than dictating which kinds of industry should be given support towards becoming clusters, and which not, a dialogue and demand-driven approach should be sought.

(v) The National System of Innovation

As these processes gain momentum, supported by the recommended policy action, it is likely that technological and other innovation-related demands will arise. There is a case for encouraging adjustment both to the culture of interaction between the scientific and technological organisations, the state agencies and business, and the priorities of public and industry innovation spending within Ireland. Smaller, successful economies, such as those of Denmark and Norway, tend, first, to scour others countries' science and technology output findings (from databases, contacts and the like) to identify what is of interest and relevance to their innovation system and its firms. Second, they try not to cover all areas in their science support portfolios. Rather, prioritisation of applied science expenditure – towards research areas in which there is comparative competitive advantage, or new areas which may be expected to yield it – is the route chosen. Interaction between the science base, research institutes, development agencies and firms is common and regular.

The "Inter-Firm Co-operation
Technology and Innovation Adv
much along the lines being disc

> The basic structural proble
> and scale of operation of
> directly tackled through a
> together in co-operating gr

In making this recommendation,
Network Co-operation Programı

While it is crucial to distinguish
practices of innovation, the spen
narrowly-based. Estimates in
indigenous firms at 214 in numl
per cent of expenditure, food and
6 per cent. Only 4 per cent of I
activities. However, as noted abo
as assessing the results of R&I
learning and innovation approac
4 can, to some extent, compensa
level of expenditure on R&D is in
of firms. On balance, the fewer
lower the R&D spend, since SM
research expenditure over other

Thus, without making or deman
business expenditure on R&D, i
commercialisation of patented
increased by enhancing the cap
knowledge with innovation poter
as "learning-by-searching" anc
network model of enterprise supp
and the firms. The innovation
research community, research in
(e.g. the Office of Science and T
agencies, technology consulta
technology parks, training agenc
"angels" and information provide

To make such a network architec
consensus of the kind so usefull
arrangements at the macro-level,
the innovation and enterprise

The "Inter-Firm Co-operation Programme" proposed by the Science, Technology and Innovation Advisory Council (STIAC) seems to be very much along the lines being discussed here. It states that:

> The basic structural problem of Irish industry – the small size and scale of operation of most indigenous firms – must be directly tackled through a programme to bring enterprises together in co-operating groups (STIAC, p.70, 1995).

In making this recommendation, STIAC notes the success of the Danish Network Co-operation Programme as the model for this approach.

While it is crucial to distinguish between the conduct of R&D and the practices of innovation, the spend by indigenous sector firms is low and narrowly-based. Estimates in STIAC (1995) put R&D performing indigenous firms at 214 in number, with engineering accounting for 30 per cent of expenditure, food and furniture/timber 16 per cent, and textiles 6 per cent. Only 4 per cent of Irish firms are engaged in formal R&D activities. However, as noted above, *doing* R&D may not be as important as assessing the results of R&D conducted elsewhere. An interactive learning and innovation approach, as described for Denmark in Chapter 4 can, to some extent, compensate for a relatively low R&D spend. The level of expenditure on R&D is initially conditioned by the scale and reach of firms. On balance, the fewer the large indigenous multinationals, the lower the R&D spend, since SMEs are generally unlikely to prioritise research expenditure over other possible investments.

Thus, without making or demanding large increases in government or business expenditure on R&D, innovation, which is here defined as the commercialisation of patented or other new knowledge, could be increased by enhancing the capacity of Irish firms to access and use knowledge with innovation potential. This approach, which is referred to as "learning-by-searching" and "learning-by-exploring", requires a network model of enterprise support linking the "innovation architecture" and the firms. The innovation architecture includes the university research community, research institutes, relevant government agencies (e.g. the Office of Science and Technology (OST)), technology transfer agencies, technology consultants, innovation centres, science and technology parks, training agencies, banks, venture capitalists, business "angels" and information providers.

To make such a network architecture function, it must be recognised that consensus of the kind so usefully put together in the social partnership arrangements at the macro-level, needs to be forged amongst players in the innovation and enterprise support field. A "Technology Policy

Concept" approach, such as that described for Steiermark (Chapter 6), could have an important role to play in this process.

Envisaged in the Technology Policy Concept model is a set of mechanisms for ensuring that the innovation architecture has the capacity to function as an integrated system, with flows of information and authority clearly specified. In the stylised representation in Figure 8.1, the key elements are the Government, the Science and Technology Policy and Advisory bodies, the Agencies of economic development and the Social Partners (possibly including local government and others). Clearly, the system membership would include those bodies and interests with a remit for the Irish innovation system at the levels of industry and the Irish governance machinery. The diagram is illustrative rather than exhaustive. For example, in the "Co-operative Forum", the "Research Community" interest would include university, college and research institute representation. In the "Agency" box, other agencies may need to be included (e.g. Forfás).

The clear aim of the system-members would be to mould the disposition of resources for innovation to a strategic programme, agreed in all essentials through the consensus-building and management process, by all key players and interest-representatives. It should entail decisions to *privilege* certain kinds of research, scientific and technological policies in terms of government resource allocation and to pursue enhanced innovation capacity objectives for firms, in line with the strategically agreed resource allocation priorities. Detailed measures, involving, for example, a Network Co-operation Programme or a Cluster Support Programme should be infused with, though not necessarily limited by, the Technology Policy Concept. Establishing a mechanism such as the one described – with the understanding that it has permanence and legitimacy built into its terms of reference, with a regular cycle of action-oriented fora and other kinds of meetings to ensure the correct flows of information, proposals, strategies and measures – is of crucial importance to the construction of a National Innovation System for Ireland.

4. THREE FORERUNNERS OF A NETWORK PROGRAMME

If there is to be a move towards the development of a both well-networked and, ultimately, interactive innovation system, underpinning and infusing the Irish economy, then it will be helpful if there are some suitable examples on which to build. In the following, three more-or-less well-known instances are chosen to illustrate policies and processes that may be of value as forerunners of the kind of thinking that may need to become pervasive.

(i) The National Linkage Pr

This programme seeks to enco indigenous sectors. By first id supply to the multinationals, t investigate these prospects furt beyond, this programme sho understanding contemporary procedures. Clearly, if you do no terms of quality, price, reliabili them to win contracts. So, this ki is an essential first step.

On *Forbairt's* statistics, for the of £492 million in Irish raw mat in supplier companies, looks Government Task Force note co-ordination between IDA and it appears, criticism of the hig candidates which excluded the m to some extent, understandable, targets. Nevertheless this contr Network Programme, albeit remarkably *inclusive* of a large sh without criticisms of its own to b is to be welcomed but, once agai near-elite, rather than seeking sys programme. Some combination philosophy with the Network Pro clustering and systemic innovatio not necessarily significantly mo discourse and learning is valuabl

(ii) Orbitech

This is a more confined instance requirements of a world-class m separate companies had been i produce components for their k Rennick's and Ballymount Prec Apple to supply integrated syst Assisted by the Electronic Linka Orbitech group as an alliance of

l for Steiermark (Chapter 6), process.

Concept model is a set of ı architecture has the capacity h flows of information and representation in Figure 8.1, cience and Technology Policy nomic development and the vernment and others). Clearly, se bodies and interests with a evels of industry and the Irish trative rather than exhaustive. , the "Research Community" ege and research institute er agencies may need to be

ld be to mould the disposition c programme, agreed in all and management process, by . It should entail decisions to fic and technological policies ion and to pursue enhanced in line with the strategically iled measures, involving, for amme or a Cluster Support not necessarily limited by, the a mechanism such as the one as permanence and legitimacy gular cycle of action-oriented nsure the correct flows of ures – is of crucial importance n System for Ireland.

ETWORK PROGRAMME

nent of a both well-networked m, underpinning and infusing ıl if there are some suitable llowing, three more-or-less ıte policies and processes that l of thinking that may need to

(i) The National Linkage Programme

This programme seeks to encourage the integration of the foreign and indigenous sectors. By first identifying the prospects for indigenous supply to the multinationals, then deploying procurement officers to investigate these prospects further with customer-firms in Ireland and beyond, this programme shows awareness of the importance of understanding contemporary purchasing culture and assessment procedures. Clearly, if you do not know where your supplier firms are, in terms of quality, price, reliability and deliverability, you cannot assist them to win contracts. So, this kind of auditing and sensitising procedure is an essential first step.

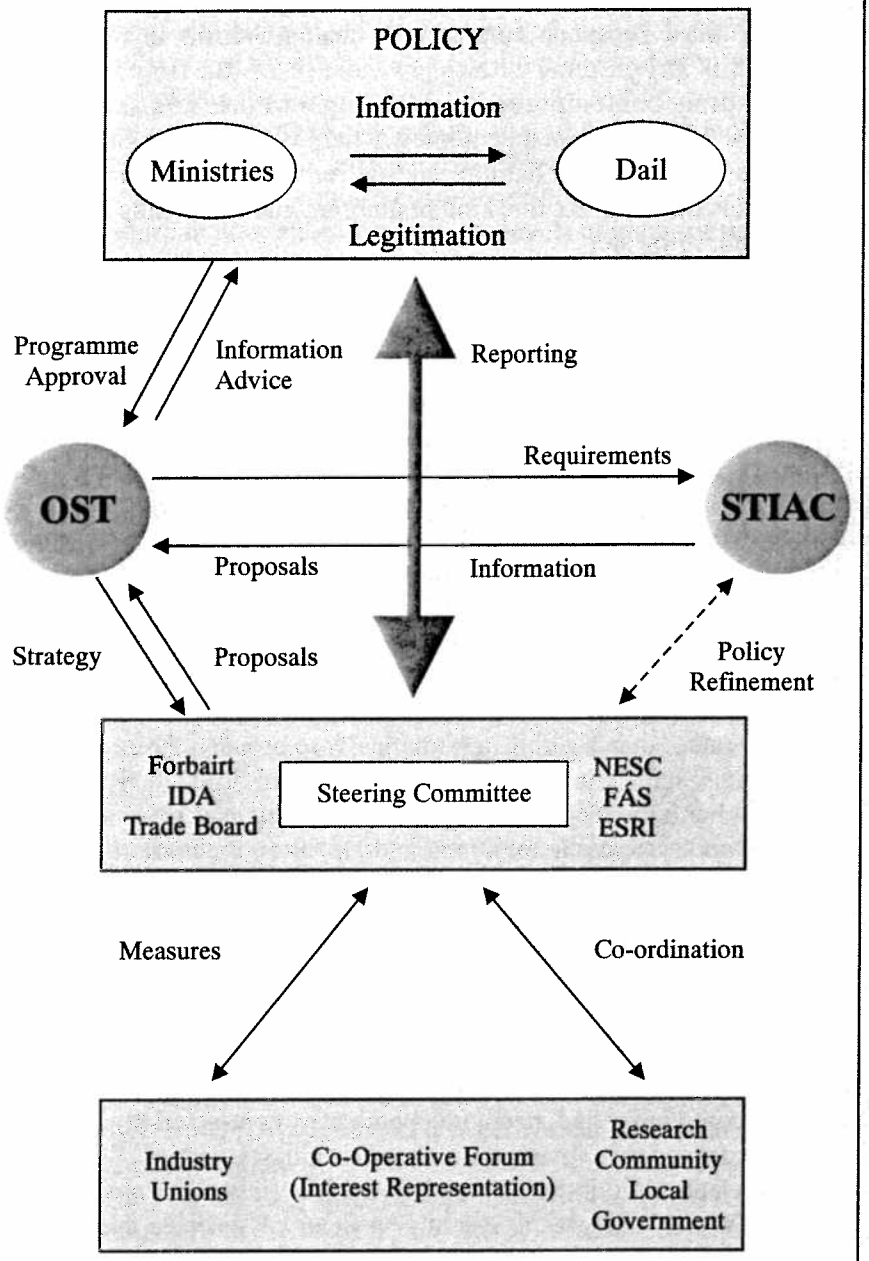
On *Forbairt's* statistics, for the eight-year period, 1985-93, the increase of £492 million in Irish raw material purchases, supporting 11,000 jobs in supplier companies, looks impressive. However, as the 1993 Government Task Force noted: there was concern about lack of co-ordination between IDA and ABT over the Linkage Programme, and, it appears, criticism of the high degree of *selectivity* of supply-firm candidates which excluded the majority of indigenous suppliers. This is, to some extent, understandable, because of the need to hit performance targets. Nevertheless this contrasts rather markedly with the Danish Network Programme, albeit with its different goals, which was remarkably *inclusive* of a large share of the Danish SME sector, albeit not without criticisms of its own to bear. The Regional Linkage Programme is to be welcomed but, once again, it seems to focus on the small elite or near-elite, rather than seeking systematically to broaden the appeal of the programme. Some combination of the National Linkage Programme philosophy with the Network Programme thinking, set in the context of clustering and systemic innovation, could result in much more return for not necessarily significantly more investment. The basic approach of discourse and learning is valuably present in the Linkage Programme.

(ii) Orbitech

This is a more confined instance of lateral linkage to meet the exacting requirements of a world-class manufacturer, Apple-Macintosh. Three separate companies had been independently contracted by Apple to produce components for their keyboards and sub-frames. Top Tech, Rennick's and Ballymount Precision Engineering were requested by Apple to supply integrated systems, instead of discrete components. Assisted by the Electronic Linkages Team of *Forbairt*, they formed the Orbitech group as an alliance of complementary companies who were

FIGURE 8.1

A Technology Policy Concept Model for Ireland



Source: After Joanneum Intereg (1995)

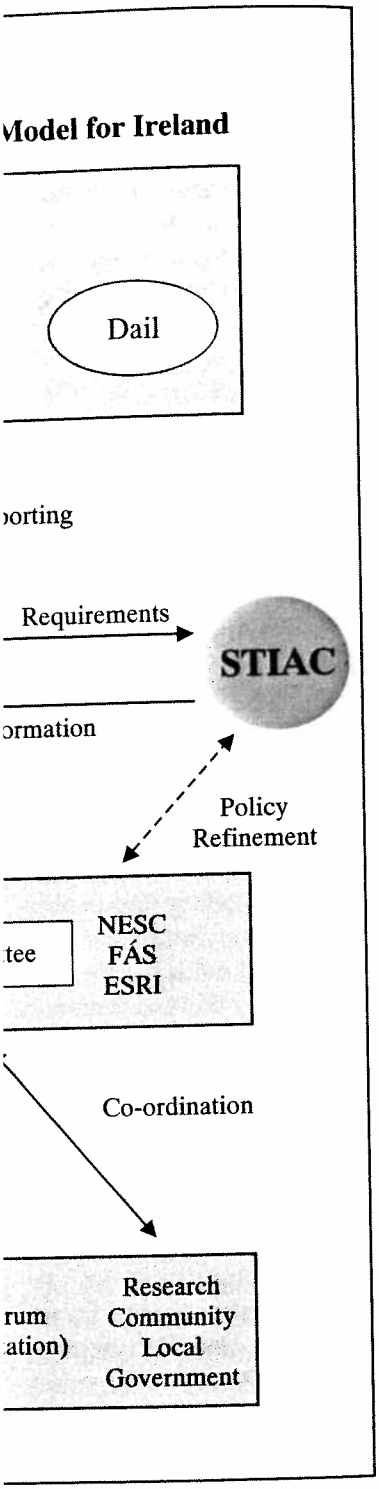
able to innovate collectively in tl
customer. Orbitech has successfi
as a consequence of its new struc
in demanding roles *vis á vis* exa
challenge through a co-operativ
customer and a state agency.
investigation.

(iii) Contract Mouldmaking

The foreign sector has created
moulding (e.g. Rennicks, as discu
and abroad – by Irish SMEs. M
tooling industry which supplie
element of an obvious supply-
electronics industry. As far back
analysis of the industry's poten
perceived barriers to the developr

- A need to help companies
- A requirement for the crea
- A need for companies to s
- A need for greater co-oper
- A need to attract new entr

Contract mouldmaking is a good e
it is possible to facilitate an emergi
of regional embeddedness that hel
is a geographical district from v
numerous spin-off companies. Du
sub-cluster centres. In the 1988 st
expressed the belief that advantage
co-operation among companies, sc
sub-contracting and sharing of
Realistically, they saw this as unli
companies, but envisaged small-sc
companies as feasible, rather as h
kind of industry that can be sensibly
support for enterprise in the fields o
marketing. Links with research bo
potential.



able to innovate collectively in the face of a demand-change from a key customer. Orbitech has successfully won contracts of up to £25 million as a consequence of its new structure. This points to the capacity of firms in demanding roles *vis á vis* exacting customers in Ireland to meet the challenge through a co-operative strategy, working with both a key customer and a state agency. This experience would repay further investigation.

(iii) Contract Mouldmaking

The foreign sector has created a growth market for plastic injection moulding (e.g. Rennicks, as discussed) capable of being filled at home – and abroad – by Irish SMEs. Moulding, and especially the upstream tooling industry which supplies the mouldmaking capacity, is one element of an obvious supply-chain cluster constructed around the electronics industry. As far back as 1988, when O'Malley produced his analysis of the industry's potential, the following were amongst the perceived barriers to the development of the industry:

- A need to help companies improve technology;
- A requirement for the creation of more skilled labour;
- A need for companies to specialise in market segments;
- A need for greater co-operation amongst companies;
- A need to attract new entrants to the industry.

Contract mouldmaking is a good example of the kind of industry in which it is possible to facilitate an emerging industrial cluster to develop the sort of regional embeddedness that helps give it competitive advantage. Sligo is a geographical district from which an original firm gave birth to numerous spin-off companies. Dublin and Limerick/Shannon are other sub-cluster centres. In the 1988 study, managers of mouldmaking firms expressed the belief that advantage would come from developing greater co-operation among companies, so that specialisation, export marketing, sub-contracting and sharing of large orders could be facilitated. Realistically, they saw this as unlikely because of competition between companies, but envisaged small-scale co-operations among two to three companies as feasible, rather as has occurred with Orbitech. This is the kind of industry that can be sensibly encouraged to develop with judicious support for enterprise in the fields of quality, deliverability, reliability and marketing. Links with research bodies could yield enhanced innovation potential.

5. CONCLUSIONS AND RECOMMENDATIONS

This chapter, like much of the foregoing text, has been a lengthy disquisition upon the matter of "economies of association". The Network Co-operation Programme, the Cluster Support Programme and Technology Policy Concept are all predicated on the basic insight of evolutionary economics, which is that successful economic activity involves a judicious mix of co-operative and competitive practices by firms, institutions and individuals. In the Irish context, with its dualistic economic structure – in which a somewhat detached, dynamic, foreign-owned sector co-exists with a slowly-improving but still fragile indigenous sector in which SMEs are more than usually predominant – the case for encouraging greater inter-firm collaboration is very strong. This is not least because the alternative of seeking to channel support to individual growth companies has not yet proved adequate to the task of re-directing Irish firms from the low to the high road of higher value-added, higher skill, more innovative and thus more competitive production of goods and services.

Developing a more co-operative approach – among firms, between firms and agencies, and among agencies – is now an imperative if Irish firms are to become more internationally competitive. Ireland's main continental European competitor economies have in place at national, and in some cases regional, systems derived from economy-culture traditions (such as the "Rhine-model" of co-operative production described in Albert, 1993) based on precisely these principles. Moreover, the most successful global competitors, Japan and the East Asian "tigers", operate on this principle.

It is also noticeable that interest in promoting measures that encourage inter-firm and firm-agency collaboration is being expressed in official reports commissioned by the State and commentary on Irish policy. The Culliton report expressed the desire to see encouragement given to clustering amongst Irish firms. The Science, Technology and Innovation Advisory Council both referred approvingly to Culliton and advocated a Danish-style Network Co-operation Programme. A recent NESC (1994) paper has commented positively about the ways in which the State may now increasingly be expected to provide an institutional framework in which policy networks (i.e. where actors and representative institution members interact to develop and implement policy which was previously the province of government alone). The Irish EU Community Support Framework programme 1994-99 is also supportive. These networks may include enterprises and, we would add, could consist mainly of enterprises where a programme managed by the state in support of, say, collaborative manufacturing, was envisioned. But the aim of networks is always to bring about the necessary non- necessary to address problem individualistic competition th competitive advantage by comp

Hence, the recommendations of

- In general, seek to dev among firms and state interactive innovation cu that clearly explains co opposition against, com
- Seek to develop a Natio suggested, by adopting which integrates existi innovation system. Wit resources, this report en
- Establish, first in pilot fo (NCP) to elicit horizo indigenous SMEs. Such system, action plans and costed at a comparable circa £15-20 million ove
- Develop, by broadening proven National Linkag their vertical relationshi become suppliers to glo could warrant a commitr with NCP a comparable bill to that proposed by S
- Select, initially, and for horizontal dimension) publishing, engineerin programme targets if the engage in such a program
- Ultimately (say two-to-th the Irish Network Co-ope to cluster formation via a C large sectors such as fo perhaps textiles, by devel the two networking pro enhanced National Link

MENDATIONS

oing text, has been a lengthy
es of association". The Network
ter Support Programme and
dicated on the basic insight of
t successful economic activity
e and competitive practices by
Irish context, with its dualistic
hat detached, dynamic, foreign-
ly-improving but still fragile
ore than usually predominant –
rm collaboration is very strong.
of seeking to channel support to
t proved adequate to the task of
v to the high road of higher
tive and thus more competitive

h – among firms, between firms
now an imperative if Irish firms
competitive. Ireland's main
ies have in place at national, and
from economy-culture traditions
rative production described in
principles. Moreover, the most
l the East Asian "tigers", operate

noting measures that encourage
n is being expressed in official
ommentary on Irish policy. The
o see encouragement given to
nce, Technology and Innovation
ngly to Culliton and advocated a
gramme. A recent NESC (1994)
he ways in which the State may
le an institutional framework in
rs and representative institution
ent policy which was previously
e Irish EU Community Support
supportive. These networks may
ould consist mainly of enterprises
e in support of, say, collaborative
e aim of networks is always to

bring about the necessary non-hierarchical co-ordination, increasingly necessary to address problems of fragmentation, dualisation and individualistic competition that bedevil small-firm efforts to seek competitive advantage by competitive means alone.

Hence, the recommendations of this report are as follows:

- In general, seek to develop and promote a co-operative ethic among firms and state agencies with a view to developing an interactive innovation culture in Ireland. This to be done in a way that clearly explains co-operation as complementary to, not in opposition against, competition;
- Seek to develop a National System of Innovation along the lines suggested, by adopting an active Technology Policy Concept which integrates existing diverse innovation players into an innovation system. With respect to substantive, action directed resources, this report endorses STIAC (1995);
- Establish, first in pilot form, a Network Co-operation Programme (NCP) to elicit horizontal co-operation amongst groups of indigenous SMEs. Such a programme to involve a "brokerage" system, action plans and plan-implementation. The whole to be costed at a comparable sum to that conducted in Denmark, i.e. circa £15-20 million over 3 years.
- Develop, by broadening the target number of firms, the already proven National Linkage Programme to upgrade Irish firms in their vertical relationships to have a far better opportunity to become suppliers to global firms in Ireland and beyond. This could warrant a commitment of a further £15 million (combined with NCP a comparable overall networking support programme bill to that proposed by STIAC).
- Select, initially, and for the pilot networking programme (in the horizontal dimension) industry segments such as furniture, publishing, engineering, knitting and meat processing as programme targets if the industry representatives are willing to engage in such a programme.
- Ultimately (say two-to-three years from first implementation of the Irish Network Co-operation Programme) seek to give support to cluster formation via a Cluster Support Programme for reasonably large sectors such as food, electronics, pharmaceuticals and, perhaps textiles, by developing and enlarging the experiences of the two networking programmes (Network Co-operation and enhanced National Linkage programmes). The key element in

cluster-building is the "forum" and "club" type of arrangement, where firms of consequence to each other self-help but call down enterprise support as appropriate and as necessary.

In overall terms, link together, compare and contrast, interact and learn, above all monitor and evaluate from the co-operative experiences of the two network programmes and the cluster support initiative. This is to be done within the context of the Technology Policy Concept as the basis for an "innovation governance mechanism", the aim of which is to become the Irish National System of Innovation.

Abe, S. (1995), 'The Regional I
Tohuku', Paper to Confer
Stuttgart: CTA, October.
Albert, M. (1993), *Capitalisa*
Books.
Alessandrini, P. and G. Can
Evolution and Prospective
Districts and Local Economi
Amin, A. (ed) (1995), *Post-Fora*
Argyris, C. and D. Schon (1978
Action Perspective. Reading,
Arthur, B. (1994), *Increasing*
Economy. Ann Arbor: Michi
Baxter, A. (1994), 'Europe's
September, p.22.
Becattini, G. (1989), 'Sectors
Conceptual Foundations of I
al (eds), *Small Firms and*
Routledge.
Becattini, G. and E. Rullani (199
Economia e Politica Industri
Begg, I. and D. Mayes (1993), '
and Monetary Union in Euro
Belussi, F. (1996), 'Local Syste
Networks: Towards a New
Economics', *European Plann*
Best, M. (1990), *The New C*
Restructuring. Cambridge, M
Bianchi, P. and M. Giordani (19
National Levels: The Case of
Studies, vol. 1, no. 2, pp.25-4
Blackwell, J. and E. O'Malley (1
on Irish Industry' in P.J. Dru
3, *Ireland and the European*
Boisot, M. (1995), *Information S*
Boyer, R. (1986), *The Theory of*
La Découverte (in French).
Braczyk, H., Schienstock, G
-Württemberg - Still a Sto
Technology Assessment.

and "club" type of arrangement,
ach other self-help but call down
: and as necessary.

: and contrast, interact and learn,
: co-operative experiences of the
:r support initiative. This is to be
ogy Policy Concept as the basis
.nism", the aim of which is to
novation.

REFERENCES

Abe, S. (1995), 'The Regional Innovation System in Japan: The Case of Tohuku', Paper to Conference on *Regional Innovation Systems*. Stuttgart: CTA, October.

Albert, M. (1993), *Capitalisam Against Capitalism*. London: Whurr Books.

Alessandrini, P. and G. Cannullo (1994), 'The Marche Districts: Evolution and Prospective', Paper to Conference on *Industrial Districts and Local Economic Development in Italy,* Bologna, May.

Amin, A. (ed) (1995), *Post-Fordism: A Reader*. Oxford: Basil Blackwell.

Argyris, C. and D. Schon (1978), *Organisational Learning: A Theory of Action Perspective*. Reading, Mass: Addison-Wesley.

Arthur, B. (1994), *Increasing Returns and Path Dependence in the Economy*. Ann Arbor: Michigan University Press.

Baxter, A. (1994), 'Europe's Metal Fatigue', *Financial Times*, 12 September, p.22.

Becattini, G. (1989), 'Sectors or Districts: Some Remarks on the Conceptual Foundations of Industrial Economics' in E. Goodman *et al* (eds), *Small Firms and Industrial Districts in Italy*. London: Routledge.

Becattini, G. and E. Rullani (1993), 'Local Systems and Global Markets', *Economia e Politica Industriale*, no. 80, pp.70-83 (in Italian).

Begg, I. and D. Mayes (1993), 'Cohesion, Convergence and Economic and Monetary Union in Europe', *Regional Studies*, vol. 27, pp.29-38.

Belussi, F. (1996), 'Local Systems, Industrial Districts and Institutional Networks: Towards a New Evolutionary Paradigm of Industrial Economics', *European Planning Studies*, no. 4, pp.5-27.

Best, M. (1990), *The New Competition: Institutions of Industrial Restructuring*. Cambridge, MA: Harvard University Press.

Bianchi, P. and M. Giordani (1993), 'Innovation Policy at the Local and National Levels: The Case of Emilia-Romagna', *European Planning Studies,* vol. 1, no. 2, pp.25-42.

Blackwell, J. and E. O'Malley (1984), 'The Impact of EEC Membershp on Irish Industry' in P.J. Drudy and D. McAleese (eds) Irish Studies 3, *Ireland and the European Community*. Cambridge: CUP.

Boisot, M. (1995), *Information Space*. London: Routledge.

Boyer, R. (1986), *The Theory of Regulation: A Critical Analysis*. Paris: La Découverte (in French).

Braczyk, H., Schienstock, G. and B. Steffensen (1993), *Baden -Württemberg - Still a Story of Success?* Stuttgart: Centre for Technology Assessment.

Brödner, P. and W. Schultetus (1992), *Success Factors in the Japanese Machine Tool Industry*. Eschborn: RKW (in German).
Brusco, S. (1990), 'The Idea of the Industrial District: Its Genesis' in F. Pyke, G. Becattini and W. Sengenberger (eds), *Industrial Districts and Inter-Firm Co-operation in Italy*. Geneva: IILS.
Casson, M. (1995), *Essays in the Economics of Trust*. London: Routledge.
Coase, R. (1937), 'The Nature of the Firm', *Economica*, no. 4, pp.386-405.
Cogan, J. (1993), 'The Irish Experience with Literature-Based Innovation Output Indicators' in A. Kleinknecht and D. Bain (eds), *New Concepts in Innovation Output Indicators*. London: Macmillan.
Cooke, P. (1988), 'Flexible Integration, Scope Economies and Strategic Alliances', *Society and Space*, no. 6, pp.281-300.
Cooke, P. (1995), *The Rise of the Rustbelt*. London: UCL Press.
Cooke, P. and K. Morgan (1990), 'Industry, Training and Technology Transfer: The Baden-Württemberg System in Perspective, *RIR Report No. 6*. Cardiff: CASS.
Cooke, P. and K. Morgan (1992), 'Regional Innovation Centres in Europe', *RIR Report No. 10*. Cardiff: CASS.
Cooke, P., Morgan, K. and A. Price (1993), 'The Future of the *Mittelstand*: Collaboration versus Competition', *RIR Report No. 13*. Cardiff: CASS.
Cooke, P., Davies, S. and R. Huggins (1995), *The South Wales Technopole: Design of the Network*. Report to EU-DG13SPRINT. Cardiff: CASS.
Crotty, R. (1986), Ireland in Crisis: *A Study in Capitalist Colonian Underdevelopment,* Dingle: Brendan Book Publishers.
Culliton, J. (1992), see IPRG (1992).
Dalum, B. (1995), 'Local and Global Linkages: The Radiocommunications Cluster in Northern Denmark', Paper to Conference on *Regional Innovation Systems, Regional Networks and Regional Policy,* Oslo, October.
de Vet, J. (1993), 'Globalisation and Local and Regional Competitiveness', *STI Review*, vol. 13, pp.89-121.
Dei Ottati, G. (1994), 'Co-operation and Competition in the Industrial District as an Organisational Model', *European Planning Studies*, no. 2, pp.463-483.
Dempsey, J. (1994), 'Difficult First Year for Traub and Heckert', *Financial Times*, 10 May, p.12.
Eisenhammer, J. (1994), 'Deckel Maho Files for Insolvency Protection', *The Independent* (UK), 30 April.
Enright, M. (1995), 'Regional Clusters and Economic Development', Harvard Business School (mimeo).
Felder, J. and E. Nerlinger (19
Firms', *ZEW Economic An*
Franchi, M. (1994), 'Developn
Paper to Conference on *I*
Development in Italy, Bolo
Freeman, C. (1987), *Technolc*
Lessons from Japan. Londc
Fukuyama, F. (1995), *Trust: Tl*
London: Hamish Hamilton.
Garvin, T. (1981), *The Evolutio*
and Macmillan.
Gassmann, P. Hansen, I., He
Innovation and Social
Mettler-Toledo, Albstadt. Fi
Gelsing, L. and G. Knop (19
Copenhagen: Report to Da
Trade.
Geroski, P. and K. Knight (1
London: Fabian Society.
Girvin, B. (1989), *Between 1*
Independent Ireland, Dublir
Goodwin, M., Duncan, S. and S
Local State and the Transiti
no. 11, pp.67-88.
Goss, T., Pascale, R. and G. At
Risking the Present for a Pov
January, pp.1-12.
Granovetter, M. (1985), 'Econ
Problem of Embeddedness',
pp.481-520.
Hansen, A. (1991), *Archipelago*
of Denmark, FAST-MONIT
Hatch, R. (1988), *Flexible Ma*
Competitiveness in a Global
for Enterprise Development.
Hirst, P. (1994), *Associative*
Massachusetts Press.
Huggins, R. (1995), 'Designing
Firms in Denmark', *RIR Rep*
Huws, G. (1994), *Business Netv*
Inglis, T. (1987), Moral Monopl
Society. Dublin: Gill & Macı

cess Factors in the Japanese
V (in German).
ial District: Its Genesis' in F.
(eds), *Industrial Districts and*
/a: IILS.
: *of Trust*. London: Routledge.
Firm', *Economica*, no. 4,

ı Literature-Based Innovation
l D. Bain (eds), *New Concepts*
n: Macmillan.
ope Economies and Strategic
.281-300.
London: UCL Press.
ry, Training and Technology
:m in Perspective, *RIR Report*

ional Innovation Centres in
ASS.
1993), 'The Future of the
petition', *RIR Report No. 13*.

(1995), *The South Wales*
:eport to EU-DG13SPRINT.

tudy in Capitalist Colonian
ook Publishers.

Global Linkages: The
rthern Denmark', Paper to
tems, Regional Networks and

ınd Local and Regional
op.89-121.
Competition in the Industrial
ropean Planning Studies, no.

ar for Traub and Heckert',

:s for Insolvency Protection',

ıd Economic Development',

Felder, J. and E. Nerlinger (1994), 'Innovation Slowdown in Machinery Firms', *ZEW Economic Analysis*, no. 2, pp.96-114 (in German).

Franchi, M. (1994), 'Developments in the Districts of Emilia-Romagna', Paper to Conference on *Industrial Districts and Local Economic Development in Italy*, Bologna, May.

Freeman, C. (1987), *Technology Policy and Economic Performance - Lessons from Japan*. London: Pinter.

Fukuyama, F. (1995), *Trust: The New Foundations of Global Prosperity*. London: Hamish Hamilton.

Garvin, T. (1981), *The Evolution of Irish Nationalist Politics,* Dublin: Gill and Macmillan.

Gassmann, P. Hansen, I., Herzer, H., Pitz, K. and S. Roth (1993), *Innovation and Social Business Culture: The Example of Mettler-Toledo, Albstadt*. Frankfurt: IG Metall.

Gelsing, L. and G. Knop (1991), *Status of the Network Programme*. Copenhagen: Report to Danish National Agency for Industry and Trade.

Geroski, P. and K. Knight (1991), *Targeting Competitive Industries*. London: Fabian Society.

Girvin, B. (1989), *Between Two Worlds: Politics and Economy in Independent Ireland,* Dublin: Gill and Macmillan.

Goodwin, M., Duncan, S. and S. Halford (1993), 'Regulation Theory, the Local State and the Transition of Urban Politics', *Society and Space*, no. 11, pp.67-88.

Goss, T., Pascale, R. and G. Athos (1993), 'Reinvention Roller Coaster: Risking the Present for a Powerful Future', *Harvard Business Review*, January, pp.1-12.

Granovetter, M. (1985), 'Economic Action and Social Structure: The Problem of Embeddedness', *American Journal of Sociology*, no. 91, pp.481-520.

Hansen, A. (1991), *Archipelago Europe - Islands of Innovation: The Case of Denmark*, FAST-MONITOR Report 297, Brussels.

Hatch, R. (1988), *Flexible Manufacturing Networks: Co-operation for Competitiveness in a Global Economy*. Washington DC: Corporation for Enterprise Development.

Hirst, P. (1994), *Associative Democracy*. Amherst: University of Massachusetts Press.

Huggins, R. (1995), 'Designing Networks for Small and Medium-Sized Firms in Denmark', *RIR Report No. 20*. Cardiff: CASS.

Huws, G. (1994), *Business Networking in Wales*. Cardiff: CASS.

Inglis, T. (1987), Moral Monoploy: *The Catholic Church in Modern Irish Society*. Dublin: Gill & Macmillan.

Institute of Welsh Affairs (1993), *Wales 2010*. Cardiff: IWA.
IPRG (1992), *A Time for Change: Industrial Policy for the 1990s*. Report of the Industrial Policy Review Group. Dublin: Government Publications.
IWI (1994), *The Economic Case for a Steiermark Auto Cluster,* Vienna: IWI (in German).
Jessop, B. (1993), 'Towards a Schumpeterian Workfare State? Preliminary Remarks on Post-Fordist Political Economy', *Studies in Political Economy*, no. 40, pp.7-39.
Joanneum INTERREG (1995), *A Technology Policy Concept for Steiermark*. Graz: Joanneum Research (in German).
Johnson, B. (1992), 'Institutional Learning' in B. Lundvall (ed), *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter.
Johnson, B., Kristensen, A., Christensen, J., Mulvad, M. and L. Storgaard (1991), *Science, Technology and Social and Economic Cohesion in the Community*. Brussels: EU-DG12 FAST.
Kennedy, K.A., Giblin, T. and D. McHugh (1988), *The Economic Development of Ireland in the Twentieth Century*. London: Routledge.
Kennedy, K. (1992), 'The Context of Economic Development' in J. Goldthorpe and C. Whelan (eds), *The Development of Industrial Society in Ireland*. Oxford: Basil Blackwell.
Krugman, P. (1991), 'Increasing Returns and Economic Geography', *Journal of Political Economy*, 99, pp.483-499.
Lee, J.J. (1989), *Ireland 1912-1985: Politics and Society,* Cambridge: CUP.
Lipietz, A. (1987), *Mirages and Miracles*. London: Verso.
Lundvall, B. (ed) (1992), *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter.
Lundvall, B. and B. Johnson (1994), 'The Learning Economy', *Journal of Industry Studies*, no. 1, pp.23-42.
Maillat, D. (1991), 'Local Dynamism, Milieu and Innovative Enterprises' in J. Brotchie *et al* (eds), *Cities of the 21st Century*. London: Longman.
Maillat, D. (1995), 'Territorial Dynamic, Innovative Milieus and Regional Policy', *Entrepreneurship and Regional Development*, pp.157-165.
Marsden, T. (1995), 'Rural Change, Regulation and Sustainability', *Environment and Planning A.*, no. 27, pp.683-703.
Marshall, A. (1919), *Industry and Trade*. London: Macmillan.
Ministry of Economics of Baden-Württemberg (1993), *Community Initiative Economy and Policy*. Stuttgart: Ministry of Economics BW (in German).
Mjøset, L. (1992), *The Irish Economy in a Comparative Institutional Perspective*, NESC Report No. 93. Dublin: NESC.
Naschold, F. (1993), *Gl Competitiveness of Germa* Centre (in German).
Nelson, R. and S.G. Winter (1 *Change*. Cambridge, Mas University Press.
NESC (1982), see Telesis (19
NESC (1986), *A Strategy for I* 83. Dublin: NESC.
NESC (1989), *Ireland in t Prospects and Strategy*, NI
NESC (1990), *A Strategy f Structural Change*, NESC
NESC (1994), *New Approache* 97. Dublin: NESC.
O'Donnell, R. (1995), 'Irish Autonomy to Social Partne
Ohmae, K. (1995), *The End c Economies*. New York: The
O'Malley, E. (1980), 'Depend Republic of Ireland', *IDS I* University of Sussex.
O'Malley, E. (1987), *The Irish and Policy Recommendatio*
O'Malley, E. (1988), 'Report Contract Mouldmaking Indu
O'Malley, E. (1989), *Indus Challenge for the Latecome*
O'Malley, E. (1992), 'Proble Goldthorpe and C. Whelar *Society in Ireland*. Oxford:
O'Malley, E. (1993), 'Develop Mid-1980s', Paper to Confe *System*, University College
O'Malley, E. (1995), *An Analy with Manufacturing Industr*
O'Malley, E., Kennedy, K.A. *Industrial Development Age*
Ostrom, E. (1992), 'Commu Common Problems', *Jou* pp.343-351.
O'Sullivan, M. (1995), 'Manu O'Hagan (ed), *The Economy*

· *2010*. Cardiff: IWA.
rial Policy for the 1990s. Report
Group. Dublin: Government

teiermark Auto Cluster, Vienna:

umpeterian Workfare State?
t Political Economy', *Studies in*

chnology Policy Concept for
:h (in German).
ng' in B. Lundvall (ed), *National*
a Theory of Innovation and
:.
, J., Mulvad, M. and L. Storgaard
cial and Economic Cohesion in
FAST.
IcHugh (1988), *The Economic*
eth Century. London: Routledge.
Economic Development' in J.
The Development of Industrial
ıckwell.
rns and Economic Geography',
).483-499.
olitics and Society, Cambridge:

es. London: Verso.
stems of Innovation: Towards a
Learning. London: Pinter.
'he Learning Economy', *Journal*

[ilieu and Innovative Enterprises'
21st Century. London: Longman.
amic, Innovative Milieus and
ip and Regional Development,

Regulation and Sustainability',
7, pp.683-703.
e. London: Macmillan.
ürttemberg (1993), *Community*
gart: Ministry of Economics BW

in a Comparative Institutional
Dublin: NESC.

Naschold, F. (1993), *Global Innovation Competition and the Competitiveness of German Industry in the 90s*. Berlin: Social Science Centre (in German).

Nelson, R. and S.G. Winter (1982), *An Evolutionary Theory of Economic Change.* Cambridge, Mass and London: Belknap Press of Harvard University Press.

NESC (1982), see Telesis (1982).

NESC (1986), *A Strategy for Development 1986-1990*, NESC Report No. 83. Dublin: NESC.

NESC (1989), *Ireland in the European Community: Performance, Prospects and Strategy*, NESC Report No. 88. Dublin: NESC.

NESC (1990), *A Strategy for the Nineties: Economic Stability and Structural Change*, NESC Report No. 89. Dublin: NESC.

NESC (1994), *New Approaches to Rural Development*, NESC Report No. 97. Dublin: NESC.

O'Donnell, R. (1995), 'Irish Policy in a Global Context: From State Autonomy to Social Partnership', NESC (mimeo).

Ohmae, K. (1995), *The End of the Nation State: The Role of Regional Economies*. New York: The Free Press.

O'Malley, E. (1980), 'Dependency and the Experience of Industry in the Republic of Ireland', *IDS Bulletin*. Intitute of Development Studies, University of Sussex.

O'Malley, E. (1987), *The Irish Engineering Industry: Strategic Analysis and Policy Recommendations*, ESRI Paper No. 134. Dublin: ESRI.

O'Malley, E. (1988), 'Report on the Future Development of the Irish Contract Mouldmaking Industry', ESRI (mimeo).

O'Malley, E. (1989), *Industry and Economic Development: The Challenge for the Latecomer*. Dublin: Gill and Macmillan.

O'Malley, E. (1992), 'Problems of Industrialisation in Ireland' in J. Goldthorpe and C. Whelan (eds), *The Development of Industrial Society in Ireland*. Oxford: Oxford University Press.

O'Malley, E. (1993), 'Developments in Irish Industrial Policy Since the Mid-1980s', Paper to Conference on *The State of the Irish Political System*, University College Cork, May.

O'Malley, E. (1995), *An Analysis of Secondary Employment Associated with Manufacturing Industry*. Dublin: ESRI.

O'Malley, E., Kennedy, K.A. and R. O'Donnell (1992), *The Impact of Industrial Development Agencies*. Dublin: ESRI.

Ostrom, E. (1992), 'Community and the Endogenous Solution of Common Problems', *Journal of Theoretical Politics*, no. 4, pp.343-351.

O'Sullivan, M. (1995), 'Manufacturing and Global Competition' in J. O'Hagan (ed), *The Economy of Ireland*. Dublin: Gill and Macmillan.

Piore, M. and C. Sabel (1984), *The Second Industrial Divide*. New York: Basic Books.
Porter, M. (1990), *The Competitive Advantage of Nations*. New York: The Free Press.
Putnam, R. (1993), *Making Democracy Work*. Princeton: Princeton University Press.
Pyke, F. (1993), *Small Firms, Technical Services and Inter-Firm Co-operation*. Geneva: International Institute for Labour Studies.
Romer, P. (1990), 'Endogenous Technical Change', *Journal of Economic Literture*, no. 98, pp.338-354.
Rosenberg, N. (1994), *Exploring the Black Box*. Cambridge: Cambridge University Press.
Rosenfeld, S. (1990), *Technology, Innovation and Rural Development*. Washington DC: The Aspen Institute.
Rosenfeld, S. (1995), *Production Systems and Regional Development*. Chapel Hill: Regional Technology Strategies Ltd.
Ruane, F. (1984), 'Manufacturing Industry' in J.W. O'Hagan (ed) *The Economy of Ireland: Policy and Performance*. Dublin: IMI, fourth edition.
Rullani, E (1993), 'The Small Firm in Economic Theory' *Italian Review of Economics Demography and Statistics*, 47, 11-25 (in Italian).
Ruth, K. (1991), *Industrial Culture and Machine Tool Industries: Competitiveness and Innovation Trajectories*. Bremen: Institute of Technology and Education.
Sabel, C. (1992), 'Studied Trust: Building New Forms of Co-operation in a Volatile Economy' in F. Pyke and W. Sengenberger (eds), *Industrial Districts and Local Economic Regeneration*. Geneva: IILS.
Sabel, C. (1993), 'Constitutional Ordering in Historical Context' in F. Sharpf (ed), *Games in Hierarchies and Networks*. Frankfurt/Boulder, Campus/Westview.
Sabel, C. (1994), 'Learning by Monitoring: The Institutions of Economic Development' in N. Smelser and R. Swedberg (eds), *Handbook of Economic Sociology*. Princeton: Princeton University Press.
Schumpeter, J. (1944), *Capitalism, Socialism and Democracy*. London: Allen and Unwin.
Semlinger, K. (1992), 'Small Firms in Big Sub-Contracting' in N. Altmann, C. Köhler and P. Meil (eds), *Technology and Work in German Industry*. London: Routledge.
Semlinger, K. (1993), 'Economic Development and Industrial Policy in Baden-Württemberg: Small Firms in a Benevolent Environment', *European Planning Studies*, no. 1, pp.435-464.
STIAC (1995), *Making Knowledge Work for Us*. Dublin: Science, Technology and Innovation Advisory Council.
Streeck, W. (1989), 'Success
Katzenstein (ed), *Industr*
Cornell University Press.
Telesis (1982), *A Review of*
Dublin: NESC.
Thurow, L. (1992), *Head to H*
Varaldo, R. and L. Ferruci (19
within Industrial Distric
pp.27-34.
Waller, D. (1994), 'Profits Ric
p.14.
Weber, M. (1980), *Economy a*
Williamson, O. (1985), *The I*
York: The Free Press.

Industrial Divide. New York:

ıtage of Nations. New York:

Work. Princeton: Princeton

al Services and Inter-Firm ştitute for Labour Studies.
Change', *Journal of Economic*

Box. Cambridge: Cambridge

tion and Rural Development.

and Regional Development.
egies Ltd.
y' in J.W. O'Hagan (ed) *The* rmance. Dublin: IMI, fourth

ıomic Theory' *Italian Review* cs, 47, 11-25 (in Italian).
d Machine Tool Industries: ctories. Bremen: Institute of

New Forms of Co-operation ınd W. Sengenberger (eds), *Regeneration*. Geneva: IILS.
; in Historical Context' in F. *Networks*. Frankfurt/Boulder,

The Institutions of Economic wedberg (eds), *Handbook of* on University Press.
sm and Democracy. London:

Big Sub-Contracting' in N. ş), *Technology and Work in*

ment and Industrial Policy in a Benevolent Environment', 35-464.
k for Us. Dublin: Science, Council.

Streeck, W. (1989), 'Successful Adjustment to Turbulent Markets' in P. Katzenstein (ed), *Industry and Politics in West Germany*. Ithaca: Cornell University Press.
Telesis (1982), *A Review of Industrial Policy*, NESC Report No. 64. Dublin: NESC.
Thurow, L. (1992), *Head to Head*. New York: Morrow.
Varaldo, R. and L. Ferruci (1996), 'The Evolutionary Nature of the Firm within Industrial District', *European Planning Studies*, no. 4, pp.27-34.
Waller, D. (1994), 'Profits Rich in Culture', *Financial Times*, 1 February, p.14.
Weber, M. (1980), *Economy and Society*. New York: Bedminster Press.
Williamson, O. (1985), *The Economic Institutions of Capitalism*. New York: The Free Press.

NATIONAL ECONOMIC AND SOCIAL COUNCIL PUBLICATIONS

NOTE: The date on the front cover of the report refers to the date the report was submitted to the Government. The date listed here are the dates of publication.

	Title	Date
1.	Report on the Economy in 1973 and the Prospects for 1974	April 1974
2.	Comments on Capital Taxation Proposals	July 1974
3.	The Economy in 1974 and Outlook for 1975	Nov 1974
4.	Regional Policy in Ireland A Review	Jan 1975
5.	Population and Employment Projections: 1971-86	Feb 1975
6.	Comments on the OECD Report on Manpower Policy in Ireland	July 1975
7.	Jobs and Living Standards Projections and Implications	June 1975
8.	An Approach to Social Policy	June 1975
9.	Report on Inflation	June 1975
10.	Causes and Effects of Inflation in Ireland	Oct 1975
11.	Income Distribution: A Preliminary Report	Sept 1975
12.	Education Expenditure in Ireland	Jan 1976
13.	Economy in 1975 and Prospects for 1976	Oct 1975
14.	Population Projections 1971-86: The Implications for Social Planning - Dwelling Needs	Feb 1976
15.	The Taxation of Farming Profits	Feb 1976
16.	Some Aspects of Finance for Owner-Occupied Housing	June 1976
17.	Statistics for Social Policy	Sept 1976
18.	Population Projections 1971-86: The Implications for Education	July 1976
19.	Rural Areas: Social Planning Problems	July 1976
20.	The Future of Public Expenditure in Ireland	July 1976
21.	Report on Public Expenditure	July 1976
22.	Institutional Arrangements for Regional Economic Development	July 1976
23.	Report on Housing Subsidies	Feb 1977
24.	A Comparative Study of Output, Value-Added and Growth in Irish and Dutch Agriculture	Dec 1976
25.	Towards a Social Report	Mar 1977
26.	Prelude to Planning	Oct 1976
27.	New Farm Operators, 1971 to 1975	April 1977
28.	Service-type Employment and Regional Development	July 1977
29.	Some Major Issues in Health Policy	July 1977
30.	Personal Incomes by County in 1973	July 1977
31.	The Potential for Growth in Irish Tax Revenues	Sept 1977
32.	The Work of the NESC: 1974-1976	Sept 1977
33.	Comments on Economic and Social Development, 1976-1980	July 1977
34.	Alternative Growth Rates in Irish Agriculture	Oct 1977
35.	Population and Employment Projections 1986: A Reassessment	Oct 1977
36.	Universality and Selectivity: Strategies in Social Policy	Jan 1978
37.	Integrated Approaches to Personal Income Taxes and Transfers	Mar 1978
38.	Universality and Selectivity: Social Services in Ireland	June 1978
39.	The Work of the NESC: 1977	June 1978
40.	Policies to Accelerate Agriculture Development	Sept 1978
41.	Rural Areas: Change and Development	Sept 1978
42.	Report on Policies for Agricultural and Rural Development	Sept 1978
43.	Productivity and Management	Feb 1979
44.	Comments on Development for Full Employment	Dec 1978
45.	Urbanisation and Regional Development in Ireland	June 1979
46.	Irish Forestry Policy	Sept 1979
47.	Alternative Strategies for Family Income Support	April 1980
48.	Transport Policy	Mar 1980
49.	Enterprise in the Public Sector	May 1980
50.	Major Issues in Planning Services for Mentally and Physically Handicapped Persons	Oct 1980
51.	Personal Incomes by Region in 1977	
52.	Tourism Policy	
53.	Economic and Social Policy 1980-83	
54.	The Future of the National Economic	
55.	Urbanisation: Problems of Growth ar	
56.	Industrial Policy and Development: A to the Present	
57.	Industrial Employment and the Regic	
58.	The Socio-Economic Position of Irel Community	
59.	The Importance of Infrastructure to I Telecommunications and Water Supp	
60.	Minerals Policy	
61.	Irish Social Policies: Priorities for Fu	
62.	Economic and Social Policy 1981 - A	
63.	Population and Labour Force Projecti	
64.	A Review of Industrial Policy (A Sur	
65.	Farm Incomes	
66.	Policies for Industrial Development:	
67.	An Analysis of Job Losses in Irish M	
68.	Social Planning in Ireland: Its Purpos	
69.	Housing Requirements and Populatio	
70.	Economic and Social Policy 1982: Ai	
71.	Education: The Implications of Demc	
72.	Social Welfare: The Implications of I	
73.	Health Services: The Implications of	
74.	Irish Energy Policy	
75.	Economic and Social Policy 1983: Ai of Recent Demographic changes for I (Background Paper)	
76.	The Role of Financial System in Fina	
77.	The Criminal Justice System: Policy a	
78.	Information for Policy	
79.	Economic and Social Policy Assessm	
80.	The Financing of Local Authorities	
81.	Designation of Areas for Industrial Pc	
82.	Manpower Policy in Ireland	
83.	A Strategy for Development 1986-19 separately)	
84.	Community Care Service: An Overvi	
85.	Redistribution Through State Social E 1973-1980	
86.	The Nature and Functioning of Labou	
87.	A Review of Housing Policy	
88.	Ireland in the European Community: I	
89.	A Strategy for the Nineties: Economic	
90.	The Economic and Social Implication	
91.	Women's Participation in the Irish Lal	
92.	The Impact of Reform of the Commoi	
93.	The Irish Economy in a Comparative	
94.	The Association between Economic G Ireland	
95.	Education and Training Policies for E	
96.	A Strategy for Competitiveness, Grow	
97.	New Approaches to Rural Developme	
98.	Strategy into the 21st Century: Conclu	
99.	Strategy into the 21st Century	

COUNCIL PUBLICATIONS

ers to the date the report was submitted
ites of publication.

	Date
r 1974	April 1974
	July 1974
	Nov 1974
	Jan 1975
	Feb 1975
y in Ireland	July 1975
ons	June 1975
	June 1975
	June 1975
	Oct 1975
	Sept 1975
	Jan 1976
	Oct 1975
r Social Planning -	
	Feb 1976
	Feb 1976
ing	June 1976
	Sept 1976
r Education	July 1976
	July 1976
	July 1976
	July 1976
evelopment	July 1976
	Feb 1977
rowth in Irish and	
	Dec 1976
	Mar 1977
	Oct 1976
	April 1977
it	July 1977
	July 1977
	July 1977
	Sept 1977
	Sept 1977
76-1980	July 1977
	Oct 1977
ssessment	Oct 1977
cy	Jan 1978
Transfers	Mar 1978
id	June 1978
	June 1978
	Sept 1978
	Sept 1978
pment	Sept 1978
	Feb 1979
	Dec 1978
	June 1979
	Sept 1979
	April 1980
	Mar 1980
	May 1980
hysically Handicapped Persons	Oct 1980

51. Personal Incomes by Region in 1977
52. Tourism Policy ... Dec 1980
53. Economic and Social Policy 1980-83: Aims and Recommendations ... Nov 1980
54. The Future of the National Economic and Social Council ... Feb 1981
55. Urbanisation: Problems of Growth and Decay in Dublin ... Sept 1981
56. Industrial Policy and Development: A Survey of Literature from the Early 1960s to the Present ... Feb 1981
57. Industrial Employment and the Regions 1960-82 ... May 1981
58. The Socio-Economic Position of Ireland within the European Economic Community ... Sept 1981
59. The Importance of Infrastructure to Industrial Development in Ireland - Roads, Telecommunications and Water Supply ... Sept 1981
60. Minerals Policy ... Oct 1981
61. Irish Social Policies: Priorities for Future Development ... Nov 1981
62. Economic and Social Policy 1981 - Aims and Recommendations ... Oct 1981
63. Population and Labour Force Projections by County and Region, 1979-1991 ... Oct 1982
64. A Review of Industrial Policy (A Summary of this report is available separately) ... Oct 1982
65. Farm Incomes ... Nov 1982
66. Policies for Industrial Development: Conclusions and Recommendations ... Oct 1982
67. An Analysis of Job Losses in Irish Manufacturing Industry ... June 1983
68. Social Planning in Ireland: Its Purposes and Organisational Requirements ... April 1983
69. Housing Requirements and Population change, 1981-1991 ... August 1983
70. Economic and Social Policy 1982: Aims and Recommendations ... April 1983
71. Education: The Implications of Demographic Change ... April 1984
72. Social Welfare: The Implications of Demographic Change ... April 1984
73. Health Services: The Implications of Demographic Change ... April 1984
74. Irish Energy Policy ... April 1984
75. Economic and Social Policy 1983: Aims and Recommendations. A Review of the Implications of Recent Demographic changes for Education, Social Welfare and the Health Services (Background Paper) ... April 1984
76. The Role of Financial System in Financing the Traded Sectors ... Oct 1984
77. The Criminal Justice System: Policy and Performance ... Feb 1985
78. Information for Policy ... July 1985
79. Economic and Social Policy Assessment ... Jan 1985
80. The Financing of Local Authorities ... May 1985
81. Designation of Areas for Industrial Policy ... Nov 1985
82. Manpower Policy in Ireland ... Jan 1986
83. A Strategy for Development 1986-1990 (A Summary of this report is available separately) ... Nov 1986
84. Community Care Service: An Overview ... Nov 1987
85. Redistribution Through State Social Expenditure in the Republic of Ireland: 1973-1980 ... Dec 1988
86. The Nature and Functioning of Labour Markets ... Dec 1988
87. A Review of Housing Policy ... Mar 1989
88. Ireland in the European Community: Performance, Prospects and Strategy ... Sept 1989
89. A Strategy for the Nineties: Economic Stability and Structural Change ... Oct 1990
90. The Economic and Social Implications of Emigration ... May 1991
91. Women's Participation in the Irish Labour Market ... Jan 1992
92. The Impact of Reform of the Common Agricultural Policy ... May 1992
93. The Irish Economy in a Comparative Institutional Perspective ... Jan 1993
94. The Association between Economic Growth and Employment Growth in Ireland ... Feb 1993
95. Education and Training Policies for Economic and Social Development ... Oct 1993
96. A Strategy for Competitiveness, Growth and Employment ... Nov 1993
97. New Approaches to Rural Development ... Feb 1995
98. Strategy into the 21st Century: Conclusions and Recommendations ... Oct 1996
99. Strategy into the 21st Century ... Nov 1996