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National Innovation Systems and Entrepreneurship

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Abstract:

Porter (1990) argues that the future battles for competitiveness will not be fought just between organisations but also between nations. Looking at the nation as the unit of analysis, one way to become more competitive is to be innovative. Nelson (1993) directly addresses the innovativeness of nations using the concept of National Systems of Innovation (NSI). These are defined as “a set of institutions whose interactions determine the innovative performance.....of national firms” (Nelson, 1993). The main premise of this concept is that innovation is central to competitiveness, and the key driver of innovation is knowledge, “the most fundamental resource in the modern economy” (Lundvall, 1992). NSI serve to stimulate the creation of knowledge. In the process they also stimulate economies, essentially taking on the role of a modern national production system.

In tandem with NSI is the concept of entrepreneurship, which “involves identifying and exploiting opportunities in the external environment” (Hitt et al. 2000), such as the opportunity to commercialise innovation. Given that National Systems of Innovation seek to foster innovation, and entrepreneurship has innovation as a central component, this paper proposes that the existence of a NSI should promote entrepreneurship within an economy. To date, academic research to support this conclusion has been lacking. As a result, this paper offers a preliminary investigation into the relationship between the strength of the national system of innovation within an economy and the level of entrepreneurship occurring within that economy.

Keywords: National Systems of Innovation; Entrepreneurship;

1. INTRODUCTION

National Systems of Innovation are responsible for innovation primarily through the creation and application of new knowledge. During this process, NSI have the positive side effect of stimulating economic growth, and often show potential as national production systems. The main economic stimulus is the application of new knowledge, i.e. the commercialisation of innovation, or, as it is better known, entrepreneurship. This paper proposes that the existence of an NSI should promote entrepreneurship in an economy.

To accomplish this, a three-country comparative case study was undertaken. For each country, the strength of the NSI was estimated by examining elements of economic activity critical to NSI. Levels of entrepreneurial activity were measured using criteria provided by a number of OECD studies (2000, 2001, 2002, 2002b). A number of analytical frameworks (Guillen and Suarez, 2001, Peng and Lee, 2002) were then applied to the results of the case studies to determine any correspondence between the factors involved.

From the evidence available, it is difficult to draw any correlation between NSI and entrepreneurship. However, this study has taken an initial step towards defining a framework for analysis of National Systems of Innovation that may be built upon to define a more detailed and elaborate research method.

2. LITERATURE REVIEW

2.1 National Systems of Innovation

Using National Systems of Innovation (NSI) as a means of explaining the competitive advantage of nations is relatively new, having only appeared in the last two decades. Coming from a practical rather than a theoretical background and based on research into social and economic occurrences, it appears to provide a guideline for economic success in the current information age.

Regarding economic success in the previous century, the predominant ideology was based upon the Fordist mass production model (production models are microeconomic concepts for managing industrial organisations, competition and relations, but also assist with macroeconomic industrial regulation (Boyer and Durant, 1993, p. 7), in effect graduating from industrial production models to national production models). Delivering the maximum number of standardised products while incurring minimum production costs, Fordism was “compatible with the macroeconomic dynamics of the post-war period” (Boyer and Durant, 1993, p. 3). However, as the economic climate changed Fordism could no longer cope, and “by the 1980’s almost all its elements appeared to be hampering competitiveness” (Boyer and Durant, 1993, pp. 12-19). Meanwhile, the Japanese economy, with its emphasis on flexible specialisation and research and development (R&D), was extremely successful, prompting the realisation that “qualitative factors affecting the national systems had to be taken into account as well as the purely quantitative ones” (Freeman, 1995) in order to account for the unsatisfactory results that the linear production model was providing. Freeman accomplished this in his book “Technology Policy and Economic Performance: Lessons from Japan” (Freeman, 1987), where, according to Kern (2000), he “identified several major elements in the Japanese system of innovation to which its economic and innovative success could be attributed”. It was also within this work that he introduced the phrase “National System of Innovation”.

Lundvall (1992) went into more detail in his book “National Systems of Innovation”. His perspective was based on two assumptions, that “the most fundamental resource in the modern economy is knowledge, and, accordingly, that the most important process is learning” and that learning “is a social process which cannot be understood without taking into consideration its institutional and social context” (Lundvall, 1992, p. 1). Through analysis into the theoretical framework and institutional elements involved in NSI he determined that national systems of innovation are “constituted by elements and relationships which interact in the production diffusion and use of new, and economically useful, knowledge and that a national system encompasses elements and relationships, either located within or rooted inside the borders of a nation state” (Lundvall, 1992, p. 2).

The most significant factors of such a system are the relationships mentioned. Occurring between the actors and institutions within a system, they create heterogeneous economic environments, the implication being that there is no single best way of stimulating an economy using the National System of Innovation. There are, however, common elements to each NSI that can be treated in a similar manner despite national differences.

2.2 Entrepreneurship

There is a problem with the common perception of entrepreneurship, as it is thought to be solely concerned with the creation of new ventures by adventurous capitalists. This is somewhat limiting. Drucker (1985, p. 23), expanding Schumpeter's (1949, p. 268) assertion that "when we speak of the entrepreneur we do not mean so much a physical person as we do a function", describes entrepreneurship as being a "behaviour rather than a personality trait". These definitions allow for the full scope of actions that can easily be considered entrepreneurial. It is important to make this distinction between perception and definition, as studies of entrepreneurial activity are often limited to examinations of the rate of new firm creation within an economy, which while important, also suggests limits to the extent of entrepreneurial influence on the condition of the economy that fall far short of reality. For example, the OECD directorate for Science, Technology and Industry (OECD 2002b, p. 3) informs us that entrepreneurial failure is a considerable boon to economic success as "this dynamism in firm turnover (i.e. entry and exit) reflect the ability of countries to expand the boundaries of economic activity, shift resources and adjust the structure of production to meet customers' changing needs". Regardless of success or failure, the overall result when judging the significance of entrepreneurship within an economy is that "increases in entrepreneurial activity tends to result in higher subsequent growth rates and a reduction of unemployment" (OECD 2002b, p. 3).

The OECD SME Outlook (2000, p. 42) informs us that "entrepreneurship is frequently associated with the process of business start-ups and business creation" and that "de-novo entrants are nearly always small". Also, as SME's make up 60% to 70% of employment in most OECD countries (OECD, 1998, p. 3), their significance

within the economy cannot be understated. Bearing both these pieces of information in mind, it's possible to see a correlation between the importance of entrepreneurship to SME's and of SME's to entrepreneurship. The two are so tightly bound together that Audretsch and Thurik (2000) have proposed using the relative share of economic activity accounted for by small firms as a method of entrepreneurial measurement (Audretsch and Thurik, 2000, p. 29).

In the information age, many of the most successful entrepreneurs have been those that commercialised innovations (Bill Gates at Microsoft, Larry Ellison at Oracle, Steve Jobs at Apple or Jeff Bezos at Amazon.com). Given that many countries seek to encourage innovation through the NSI mechanism, is it not possible that a corresponding rise in entrepreneurial endeavour should accompany the increased stimulation of innovation within national economies?

3. METHODOLOGY

To test this assumption, a meaningful method of comparison between the strength of National Systems of Innovation and entrepreneurship must be provided. In order to accomplish this, we will attempt to estimate the strength of NSI, and the level of entrepreneurship in three separate, but similar, countries.

3.1 Measuring NSI

With regard to the first issue, determining the strength of NSI is a difficult matter. There are no standard metrics available. However, the constituent parts of each system are not dissimilar, are measurable, and also are often comparable. Thus, by examining the elements contained within a system, we can reach a conclusion about the strength of individual NSI. The next question is then, which elements should be used as indicators of strength?

We require a mix of qualitative and quantitative indicators. Systemic concepts can't be assessed by statistics alone, qualitative measurements are essential to fill in the gaps left between the different quantitative methods. What is important is that when combined, the chosen measures provide as good an indication of NSI strength as can

be provided. The indicators chosen combine to provide a holistic picture of the state of an NSI, and are listed below:

- Innovation. Despite the fact that it is an individual measurement, production of innovations is the ultimate goal of NSI and so it must be included. To estimate the level of innovation being produced, we will follow OECD directions. Typically, input measures are concerned with expenditure on innovation while outputs are considered to be at least one technically new or improved product or process from a firm (OECD 2002, A.11). We will also include the amount of patents applied for from the European Patent Office and the production of scientific publications as evidence of the production of innovations.
- Knowledge Flows. They can be viewed as the lifeblood of the system. The creation and diffusion of knowledge throughout the system is required in order to aid in the creation of further knowledge from the stock currently available. This touches upon all elements within the system. To analyse this will require an examination of statistics concerning R&D, human resource aspects, linkages between institutions and the technical balance of payments.
- Policies. Policy cannot be measured statistically but are vital to our estimation of the NSI as a process. Also, policies provide an insight into what governmental priorities are and how governments attempt to dictate institutional behaviour to guide the system. Implicit in reviewing policy is the concept of path dependency, as policy can be viewed as the steps governments take to guide an economy from one position to another. As NSI are a relatively new concept, it is best only to look at recent policy implementations that directly affect constituent elements of the individual national systems of innovation.
- Industrial Clusters. In the NSI context, clusters allow us to view the functionality of the system in operation. Encompassing institutional mechanisms, the production of knowledge, knowledge flow and diffusion, path dependency (including the breaking of any dependency) and innovation, the cluster view provides an example of the NSI elements in concert. There is no universal agreement on direct measurements of cluster productivity. Analysis of clusters in each country will be qualitative, focussing on the

existence, purpose and apparent success of clusters rather than their adherence to theoretical models (as not all identifiable clusters in each country adhere to the definitions provided by theoretical models).

3.2 Measuring Entrepreneurship

It is widely acknowledged that measuring entrepreneurship is a difficult task, given the limitations of measurement instruments (Audretsch and Thurik; OECD 2000b). As a result, measurements adopted by this paper will draw on previous work by the OECD (2000, 2001b, 2002, 2002b) that provides guidance for assessment of, and statistical information about, entrepreneurial activity in national economies, and will include statistics about the percentage of self-employed people in an economy (where available), the share of SME's among the total firms in the economy and also the productivity of these firms as a percentage of total productivity. Much entrepreneurship is associated with SME's, a healthy SME population should have positive correlations with levels of entrepreneurship.

The purpose of entrepreneurial policy is best described as being an attempt to instil a culture of entrepreneurship within a nation. Successful entrepreneurial cultures encourage people to attempt to create new ventures and don't seek to punish failure. With this in mind, a number of policy areas regarding firm entry and exit to markets, and access to venture capital will be examined. This includes regulations concerning institutional investors (I refer to investments by pension funds, insurance companies and other institutions that provide large amounts of venture capital), and procedures for firm entry and exit into markets (easy entry and exit encourage entrepreneurship).

4.0 RESULTS

4.1 Ireland

Knowledge Flow

Although Irish R&D is low, its significance within the economy is increasing. R&D intensity (business enterprise sector R&D expenditure as a percentage of domestic product of industry) has risen from 0.8 per cent in 1991, to 1.34 per cent in 1997. This

represents an average annual growth rate of approximately 17 per cent for the period 1991 to 1997, third highest among recorded OECD countries.

Ireland compares very poorly to other OECD nations when it comes to independent research financed by government or higher education facilities. Research amounting to 0.09% of GDP is funded by the government and higher education does work equivalent to 0.26% GDP.

In the area of human resources and knowledge creation, the percentage of scientists and engineers employed as a percentage of the work force in Ireland is very high (17.3%). Regarding internationalization, Ireland's inward share of FDI as a percentage of GDP is 1.77%, which is above average for EU states.

Innovation

Ireland's expenditure on innovation falls below the European average in both manufacturing and services, being 3.3 % (EU average is 3.7%) and 2.1% (EU average is 2.8%) respectively. However, innovation statistics are high, with 73% of manufacturing firms and 71% of services firms are producing innovations.

Patent applications from Ireland to the European Patent Office are very low, averaging a share of less than 0.15% of applications annually. Although the patent application figures are low, it is worth bearing in mind that there are a significant number of other nations producing similar numbers. The average is distorted by the disproportionate amount of applications from larger countries like Germany, France, the United States and Japan.

Scientific publications, at 0.3% of all OECD scientific publications, or 401 articles per million population, are slightly below the EU average.

Clusters

According to a report by the Irish Spatial Planning Unit (SPU, 2000, p. 56) "clusters of multinational software companies have successfully developed in Dublin, Galway, Limerick and Cork" with major IT hardware multinationals also springing up in the

same regions. This is related to the supply of qualified staff available, as all the cities mentioned contain a number of third level institutions.

Green et al (2001, p. 51) provide more information on the structure of the Irish ICT clusters, “the electronics sector continues to be dominated by large multinational companies – with significant technology and skills transfer – employment in software products and services is more evenly divided between overseas and Irish companies, which consist mainly of small and medium sized enterprises”.

Policy

Irish NSI policy has been built upon, and is still heavily dependent on, the strategy of encouraging Foreign Direct Investment. An institutional structure is in place to accomplish this. The Industrial Development Agency (IDA) is “in charge of promoting foreign investment through some of the most attractive incentive packages in Europe” (Guillen and Suarez, 2001, p. 359), and Enterprise Ireland (EI) is responsible for promoting growth in indigenous industry through support for R&D, the commercialisation of innovations and maintaining the feedback/flow of knowledge from industry to research organisations.

THE NETHERLANDS

Knowledge Flows

Dutch expenditure on R&D is approximately 2% of GDP, which is in the top half of OECD countries measured. Although the percentage of firms funding government research is very high (18.4%), less than 12% have an actual co-operative agreement with the government.

One third of the Dutch labour force is employed in the science and technology sector.

Foreign Direct Investment plays an important part in the Netherlands. As home to a number of multinational firms that invest extensively abroad, outward direct investment flows (constantly increasing throughout the 1990's) are significantly higher than inward flows, making the Netherlands a net exporter of innovation,

Innovation

Spending on innovation in the Dutch manufacturing sector was at 3.8% of total sales in 1998. This is over twice the service sector expenditure on innovation (1.6%). These figures are not exceptional though, as the manufacturing expenditure is just above the EU average, while spending in the service sector is just below.

75% of manufacturing firms introduced a new product or process to the market between 1994 and 1996. A very high figure, this ranked third in OECD measurements over that time period. In the services sector, over 55% of firms have introduced innovations to the market a reasonably high proportion of innovative firms.

The share of EPO applications coming from the Netherlands is very high (2.8% - 2367 applications), and they also have one of the highest percentages of scientific publications in the OECD (2.7%).

Clusters

The concept of knowledge clusters have been a focus of the Dutch governmental approach since the mid 1990's, in an attempt to "improve the Dutch economy's knowledge intensity to guarantee long term competitiveness in the international context" (Kern, 2000, p. 14). Crucial to this policy was "co-operation between firms and the knowledge infrastructure" (Kern, 2000, p. 14). Hampering the goals of cluster policy was a lack of seed capital for new ventures throughout the 1990's and a lack of entrepreneurship among the domestic population (Kern, 2000).

Policy

1979 saw the beginnings of the Dutch system of innovation, as governmental policy changed focus from linear innovation development to one that emphasised "reinforcement of innovation activities with industry and R&D institutes and a better allocation and use of existing technological knowledge" (Kern, 2000, p. 9). This prompted the government to set up institutions for the transfer of knowledge from universities to industry, showing early understanding of the importance of diffusion in the innovation process. However, it has not all been success, as Den Hertog, Maltha and Brouwer (2001, p. 146) imply that the Dutch government could do more to help

the functioning of clusters and could also play a greater role as leading technology procurer.

FINLAND

Knowledge Flows

Finnish business R&D doubled to 3.4% throughout the 1990's. Finland also spent the largest share of GDP on ICT R&D in the manufacturing sector in 1999 (1.08%). Non-industry R&D is particularly strong in Finland ranking second in OECD research for 1999. Government and higher educational facilities spent 0.99% of GDP on research

Of the R&D done by the Finnish government, 14% of the research is paid for by Finnish industry. Over 38% of Finnish firms have co-operative arrangements with government, (an extremely high amount). However, Finnish industry sponsored a very small proportion of the higher educational research (4.7%). Links between industry and Finnish third level institutions are quite weak.

The share of scientists and engineers among the employed population is very high (7.6%), representing a small subset of the high share of labour force employed in the science and technology industry (29.9%).

Inward flows of foreign investment are quite low (0.05% GDP) and exceeded by outflows of 0.08% GDP.

Innovation

Spending on innovation amounts to approximately 4% of total sales in the manufacturing sector and 2.4% of sales in the services sector. 54% of firms in the manufacturing sector brought new innovations to the market and 40% of firms in the service sector doing likewise.

Finland's patent applications account for 1% of applications to the EPO, which is good in relation to population size. Scientific publications of Finnish origin seem to share this rule of moderation, being below average in absolute figures, but high in terms of population size.

Clusters

According to Paija (2001, p. 20) the ICT cluster is oriented towards telecommunications, having both service and manufacturing sectors as key industries and surrounding these key industries with complementary supporting industries (e.g. education and R&D). However, the Finnish ICT cluster is overly dependant on Nokia to supply its core strength, proven in her statement that “Nokia has acted as an effective catalyst and forerunner in creating ‘new generation’ relationships” (Paija, 2001, p. 35)

Policy

The historical structure of the Finnish ICT industry encouraged government policy to recognise and encourage innovation, thus providing a strong basis for current policies in the national system of innovation. Paija (2001) points to the Finnish government as having assumed the role of facilitator and co-ordinator in the national system of innovation. Schienstock and Hamalainen (2001, p. 44) reinforce this by describing the Science and Technology Policy Council of Finland as the “dominant coordination mechanism” within the innovation system.

ENTREPRENEURSHIP DATA

Ireland

Ireland is above the OECD average in entrepreneurship measures, having 11% of the adult population engaged in start-ups and 12.9% self-employed (OECD, 2002b, p. 25).

SME's make up 99.4% of the total number of firms in Ireland, slightly below the European average of 99.8% (OECD, 2000, p. 135), though growth of small firms is outstripping that of large (8.1% relative to 7.5%).

Firm entry in Ireland is not a particularly difficult matter. Setting up a corporation in Ireland cost 650 ECU's, took a maximum of four weeks using three services and involving only six procedures (OECD, 2000, p. 99).

Venture capital funding from institutions is below the EU average (60%) in Ireland (OECD, 2002b). Banks and insurance companies account for 25% while pension funds make up 20%, not a very liberal market.

Also, firm exit appears to be a disincentive in Ireland. Creditors have claims on bankrupt firms assets for up to twelve years (OECD, 2001b, p. 107).

The Netherlands

Just above 6% of the Dutch population are engaged in start-ups, with only 10% are registered as being self-employed.

SME activity in the Netherlands is very healthy, accounting for 99.5% of firms (EU average is 99.8%). Firm entry in the Netherlands is more difficult than in Ireland or Finland. The formalities involved in establishing a corporation are more inconvenient. It takes up to twelve weeks, costs 1400 ECU's (more than both Ireland and Finland) and while you only have to use one service, there's at least seven different procedures to go through (OECD, 2002b, p. 99). There are also significant administrative regulatory barriers to entrepreneurship (OECD, 2002b, p. 100). Venture capital funding does not appear to have been liberalised in the Netherlands. Banks and insurance companies are the primary source of capital, supplying approximately 65% of the market, with pension funds supplying less than 10%.

Firm exit is not a disincentive however, as the Netherlands only makes bankrupt firms liable to creditors for three years (OECD, 2001b, p. 107),

Finland

SME activity is high in Finland, accounting for 99% of firms in the Finnish sectors of manufacturing, utilities and services. Firm entry to markets is not difficult. It costs 1050 ECU's to form a corporation, and takes a maximum of six weeks. There is only one service to use, but a minimum of seven procedures to perform before incorporation is guaranteed. However, regulatory barriers to entrepreneurship are reasonably high, with significant amount of administrative burdens on start-ups and a large amount of regulatory and administrative opacity (OECD, 2001b, p. 101)

Banks and insurance companies supply a large percentage of venture capital (30% from pension funds and 40% from banks and insurance companies) (OECD, 2002b, p. 15) and Finnish law regulates that creditors have claims on bankrupt firms assets for up to ten years (OECD, 2001b, p. 107)

5. DISCUSSION

It is possible to represent the measurements of the four NSI indicators with the following table, where Finland, Holland and Ireland are each represented by the abbreviations Fi, Nl and Irl respectively.

	Strong	Average	Weak
Knowledge Flow	Nl, Fi		Irl
Innovation	Nl	Irl, Fi	
Clusters	Fi	Nl	Irl
Policies	Nl, Fi	Irl	

The Irish NSI is considered to have weak knowledge flows resulting from low levels of R&D, poor diffusion of knowledge and a heavy dependence on FDI. The amount of innovation occurring appears high, but is not backed by significant expenditure or academic results, earning an average rating. Though Irish clusters are currently productive, their dependence on foreign firms as focal points is too high causing severe doubts about their independence, strength and potential longevity and so earning a weak rating. Finally, Irish policies are moving in the right direction, but still emphasise FDI as the main stimulus, weakening the NSI and resulting in an average rating on this scale. Overall, the Irish NSI must be considered weak until the dependence on foreign investment is overcome.

The Dutch NSI is in much better condition. Extensive knowledge flows garner the highest rating on this scale. A high degree of innovations, both industrial and academic results in the Innovation indicator also being considered strong. Though policies encourage Dutch firms to cluster, the implementation of the policy is

questioned, leaving the Cluster indicator with an average rating. Some policy implementations are questionable, but overall Dutch policy in relation to NSI is nothing if not progressive. In all returning a strong rating for the Dutch policy indicator.

Finland's NSI appears to be equal to that of Holland's according to our indicators. Though innovation levels are moderate, knowledge flows in the Finnish system are excellent as is the productivity of Finnish clusters and the guidance of Finnish governmental policy – all of which is reflected in the indicators related to each topic. As with the Netherlands, the Finnish NSI must be considered to be very strong.

Entrepreneurial activity in these countries does not appear to be as successful as NSI. The overall impression of Irish entrepreneurial endeavour is that it is average. While self-employment and start-up businesses are in evidence, venture capital funding is not very strong and regulations regarding firm exit of markets act as a disincentive to new ventures, however, firm entry is relatively easy in Ireland.

Dutch entrepreneurship does not look any better. The SME population is quite strong, but regulation hampers firm entry to markets and access to capital is poor. This appears to be a weak entrepreneurial system producing weak entrepreneurial endeavour.

Finland's SME activity is high, and firm entry to markets is not difficult. However, regulation of entry and exit could be perceived as stifling and access to capital is not great. Overall, Finnish entrepreneurial indicators merit an average rating.

	Strong	Average	Weak
Entrepreneurship		Fi, Irl	Nl

On direct examination there appears to be little correlation between the strength of a National System of Innovation and entrepreneurship levels. Holland has a strong NSI overall, but shows weak entrepreneurship levels, Finland also has a strong NSI, but only shows average entrepreneurship levels. Ireland has a weak NSI but shows

average levels of entrepreneurship. No conclusions can be drawn about the relationships between National Systems of Innovation and Entrepreneurship.

	Entrepreneurship		
	Strong	Average	Weak
NSI	Nl, Fi	Fi, Irl	Irl Nl

Guillen and Suarez (2001) described a broad framework for country comparison at institutional level that we will adopt here. Removing the indicators for innovation and clusters we are left with Knowledge Flows (the representation of institutional functionality) and Policies (the definition for institutional functionality) against which we shall compare the entrepreneurship results.

	Entrepreneurial Endeavour	
Knowledge Flow & Policy	Strong	Weak
Strong	Fi	Nl
Weak		Irl

Reflecting the initial examination of our indicators, this further examination using only institutional indicators proves inconclusive. There is no apparent correlation between the institutional indicators and the level of entrepreneurial activity represented by the entrepreneurship indicators.

Peng and Lee (2002), in their paper presented to the Academy of Management Annual Conference, suggest the “real options” policy perspective as a framework under which to examine the level of entrepreneurial endeavour in a country. Their paper encourages governments to maximize the variance between policies, creating a policy bundle that maximise positive gains while minimising negative losses. They suggest a number of policy domains that can be seen as such a bundle. Using some of these domains as comparative material, it may be possible to make a connection between some of the policy issues arising in both the NSI policy indicators and the

policy discussions on each countries entrepreneurial activity and the entrepreneurial activity statistics themselves.

Policy Domains

Maximise Upside Gains	<ol style="list-style-type: none"> 1. Government policies toward reducing industry entry barriers will encourage entrepreneurship development by facilitating new entries by start-up firms and enhancing the competitiveness of incumbent firms. 2. Strong enforcement of antitrust regulations will encourage entrepreneurship development by encouraging competition, maximizing variance, and increasing upside gains for an industry. 3. Government deregulation policies will encourage entrepreneurship development by facilitating new entries by start-up firms and enhancing the competitiveness of incumbent firms.
Curtail Downside Losses	<ol style="list-style-type: none"> 1. Enacting and enforcing entrepreneur-friendly bankruptcy legislations, which ease the exit process for bankrupt business owners, will encourage entrepreneurship development by curtailing the downside risk of entrepreneurs. 2. Moving away from traditional industrial targeting and protection will encourage entrepreneurship development by curtailing the downside risk associated with failing firms and industries and enhancing the option value of the bundle of a country's entrepreneurial assets.

According to the policy data collected in both the NSI and entrepreneurship data sections, the Irish government offer a policy bundle that contains the initial three

points that are suggested to help maximise upside gains (adherence to point two is implied in point three, and market deregulation is a lynchpin of Irish competitive strategy) and one of the policies that should help curb downside losses (deregulation implies that traditional industrial protectionism is now out of favour in Ireland). However, as was mentioned in the entrepreneurship policy section, Irish bankruptcy legislation is a disincentive to the creation of new ventures.

Similarly, policy in the Netherlands follows four of the five dictates from Peng and Lee (2002) that are associated with our set of countries. In this case, the high barrier to entry is the only dissimilar policy in comparison to the proposals mentioned. Finland's policy structure is similar to Ireland's, given the low barrier to entry and high barrier to exit. The decentralised telecommunications system suggests that antitrust and deregulation have played a small part in Finnish industry.

Examining the three countries policies under the guidance of Peng and Lee's (2002) real options framework does not shed any new light on the relationship between the countries policy efforts and entrepreneurial rewards. Ireland and Finland have almost identical policy set-ups, but reap different entrepreneurial gains. Holland has some significant differences with Ireland (regarding barriers of entry and exit to markets) and yet has a similar entrepreneurial performance.

6. Conclusion

The purpose of this paper is to investigate any potential relationship between the concept of national systems of innovation and entrepreneurial endeavour. To accomplish this, we have provided background information on NSI and determined a novel method of comparative analysis. This has resulted in an original and informative contribution to the literature, extending Freeman's national descriptions by attempting direct comparisons between countries, providing a new model of analysis for national systems of innovation, and also a potential model of comparative analysis between NSI and entrepreneurship. These models have potential for further use, albeit with an increased focal specificity. This paper has further contributed to the literature by highlighting some of the flaws of current economic measurements in areas relating to both national systems of innovation and entrepreneurship. Future

studies in the area would benefit by narrowing the focal points of the comparison and also changing the direction of the study slightly towards a more policy based bias, as it appears that the most important areas of study were related to the policies implemented in different countries. Though the results were inconclusive, the thesis remains valid and worthy of further examination so that the relationship between NSI and entrepreneurial endeavour can be fully determined.

Bibliography:

Audretsch, D. and Thurik, R. (2000), "Linking Entrepreneurship to Growth", STI Working Paper Series, OECD, Paris.

http://www.oecd.org/dsti/sti/prod/sti_wp.htm

Boyer, R. and Durand, J. (1993), "After Fordism", Macmillan Business, London.

Den Hertog, P., Maltha, S., Brouwer, E. (2001), "Innovation in an Adolescent Cluster: The Dutch Multimedia Cluster", in OECD (2001), Innovative Clusters, Drivers of National Innovation Systems, Paris.

Drucker, P. (1985), "Innovation and Entrepreneurship", Butterworth-Heinemann Ltd, Oxford.

Freeman, C. (1987), "Technology Policy and Economic Performance; Lessons from Japan", Pinter, London.

Freeman, C. (1995), "The 'National System of Innovation' in historical perspective", Cambridge Journal of Economics, 19, 5-24.

Green, R., Cunningham, J., Duggan, I., Giblin, M., Moroney, M., Smyth, L. (2001), "The Boundaryless Cluster: Information and Communications Technology in Ireland" in OECD (2001), Innovative Clusters, Drivers of National Innovation Systems, Paris.

Guillen, M.F. and Suarez, S.L. (2001), "Developing the Internet: entrepreneurship and public policy in Ireland, Singapore, Argentina, and Spain", Telecommunications Policy 25 (2001) 349-371.

Hitt, M., et al., Strategic Entrepreneurship: Entrepreneurial Strategies for Wealth Creation. Strategic Management Journal, 2000. 22: p. 479-491

Kern, S. (2000), "Dutch Innovation Policies for the Networked Economy: a new approach?", TNO Strategy, Technology and Policy, Delft, Holland.

Lundvall, B-A, (1992), “National Systems of Innovation”, Pinter, London.

Nelson, R. (1993), “National Innovation Systems”, Oxford University Press, New York.

OECD, (1997), “National Innovation Systems”, Paris, France.

OECD, (1998), “Small Businesses, Job Creation and Growth: Facts, Obstacles and Best Practices”, Paris.

OECD, (2000), “OECD Small and Medium Enterprise Outlook”, Paris.

OECD, (2001), “Innovative Clusters: Drivers of National Innovation Systems”, Paris, France.

OECD, (2001b), “Drivers of Growth: Information Technology, Innovation and Entrepreneurship”, Paris.

OECD, (2002), “Science, Technology and Innovation Scoreboard”, Paris.

OECD, (2002b), “Benchmarking: Fostering Firms Creation and Entrepreneurship”, Paris.

Paija, L. (2001), “The ICT Cluster: the engine of knowledge driven growth in Finland”, in OECD (2001), Innovative Clusters, Drivers of National Innovation Systems, Paris.

Peng, M. and Lee, S. (2002), “Governments, Entrepreneurs, and Positive Externalities: A Real Options Perspective”, presented to the Academy of Management Annual Conference, Denver, Colorado, USA, 9-14 August 2002.

Porter, M. (1990), “The Competitive Advantage of Nations”, Harvard Business Review, Vol. 68, Issue 2, pp. 73-94.

SPU, (2000), “Report On Information Technology Infrastructure”, Spatial Planning Unit, Department of the Environment & Local Government, Ireland, November 2000.

Schienstock, G. Hamalainen, T, (2001), “Transformation of the Finnish Innovation System: A Networked Approach”, Sitra, Helsinki, www.sitra.fi.

Schumpeter, J. (1949), “Economic Theory and Entrepreneurial History”, in History of Management Thought: Entrepreneurship, 1998, Ashgate, Dartmouth.

About CISC

The Centre for Innovation & Structural Change (CISC) is a multidisciplinary research centre which undertakes programmes of research and research training related to the innovation processes and policies that underpin the knowledge-based economy and society. CISC is based at NUI Galway is partnered with DCU Business School and the Michael Smurfit Graduate School of Business at UCD, with other national and international collaborative arrangements.

The origins and consequences of innovation and technological change can be interrogated at many levels, and interpreted from different perspectives. Thus, CISC's research is interdisciplinary and its structure collaborative. The complexity of innovation and structural change motivates CISC's disciplinary openness and methodological diversity within the community of scholarship. Participants include economists, geographers, management scientists, as well as specialists in industrial relations, human resource management, and information systems. Research at CISC is structured into five priority research areas:

Systems of innovation.

Industry clustering

Internationally traded services

Inter-organisational systems

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