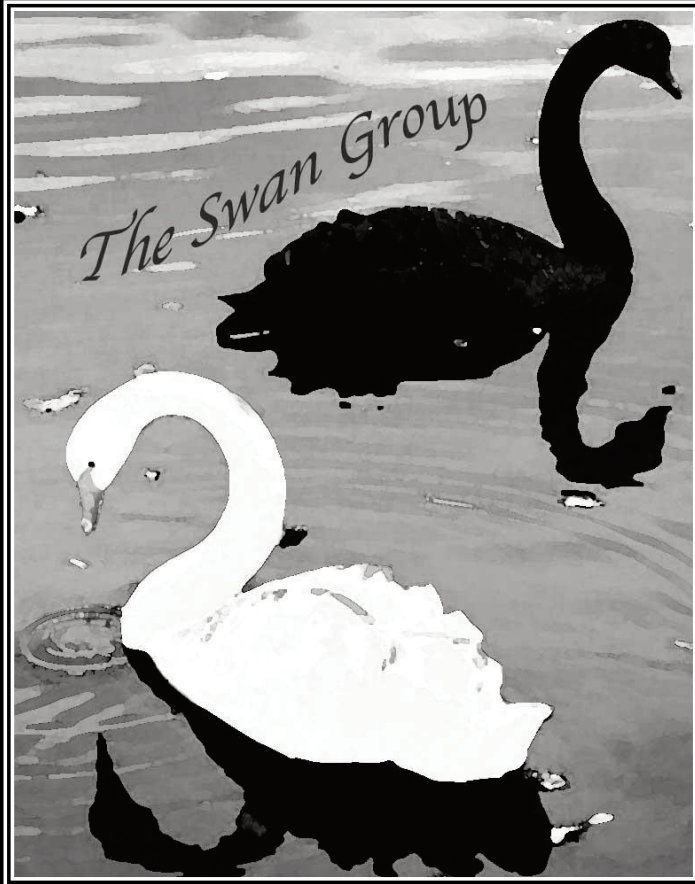


Irish Education Policy for a Globalised World



A Policy for Chasing **Black** and White Swans

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Foreword

The record decline of over 9% in Irish GDP in 2009 provides the backdrop to this important study. Government expenditure has grown rapidly in the Celtic Tiger era without much evidence of a value for money culture in any area of public spending. Unsustainable borrowing and tax increases postpone only briefly the need for better appraisals of public policies and spending in Ireland. Education is the first area of public spending to be studied through the generosity of the FBD Trust in this series.

I thank the Trust for their support for public policy research in economics in our universities. It is vital that research in economics does not become a state monopoly. I thank the authors for their dedication and commitment to the project.

Dr Sean Barrett, FTCD.

Academic Adviser.

FBD Trust

Contents

Opening Statement	5
Section 1	12
Intro	13
Section 2	19
Pre Third-Level Education in Ireland	20
Some Considerations for Pre Third-Level Education in Ireland	24
Section 3	27
The University in the Society, Polity and Economy	28
The Innovation Institutional Model	48
Section 4	62
Where the Law is in Education	63
4.1 Intro	63
4.2 Legislation and Powers	63
4.3 Quality Assurance and Accreditation	69
4.4 Reform	70
4.5 Non-Governmental Organisation	71
4.6 Observation	73
4.7 The Bologna Process	73
4.8 The Influence of European and International Measures on Irish High Education	79
Section 5	82
Education and the Role of Human Capital in Economic Theory	83
Section 6	90
Innovation as Irreversible Investment and the Consequences of Discounting	91
6.1 Intro	91
6.2 Irreversible Investment as an Option	95
6.2.1 Risk Neutrality and Option Value	97
6.2.2 Enter Risk Aversion	98

6.2.3 Incomplete Markets and Ambiguity Aversion	100
6.3 An Illustration	101
6.4 Consequences for Policy	105
Section 7	107
7.1 Ireland's need for Homeric innovation	108
7.2 The Matter of Education	109
7.3 The Misguided notion of Innovation	114
7.4 The Problem of the Law and Governance	116
Bibliography	119
About the Authors	131

Opening Statement

A brief essay¹ on education policy and innovation would typically begin with a discussion of the profundity of change taking place in the structures of the world economy. When this project was first proposed at the end of 2007 the world was in an economic slowdown but had yet to experience the consequences of the fall of Lehman Brothers and near collapse of the global financial system and the subsequent acute economic contraction. Ireland, for domestic reasons, had already begun to experience a strong economic downturn partly as a result of the construction/housing bubble busting (it also included a large element of Ireland's loss of competitiveness). The general milieu of solutions and ideas from the media and the government focused on the new "smart economy" embodied by the *Strategy for Science Technology and Innovation* (2006) and the *Building Ireland's Smart Economy: A framework for sustainable economic renewal* (2008). Unfortunately, much of the policy discussion has not focused enough on the events that were at hand, resulting in two policy design failures. First, a lack of the appreciation of the role of risk and uncertainty has brought about a near financial armageddon and, second, a lack of perspective on how innovation and technology strategies have been created in other countries and the importance of institutional and legal structures in

¹ This essay is not an academic publication. Therefore it will not contain the careful citations that scholars have come to expect. It does, however, contain an extensive bibliography. The views expressed in this essay are those of authors and not of their respective departments or institutions. Further clarifications and explanations may be sought by contacting the authors. Charles Larkin of the Department of Economics, Trinity College Dublin, Dublin 2, Ireland is the corresponding author.

fostering economic activity and innovation.

An easy source of insight into the identification and solutions to both of these failures can be found in the work of John Maynard Keynes, who has recently regained his status as perhaps the most influential economic theorist. His *General Theory of Employment, Interest and Money* (1936) is resurgent as a font of wisdom on how to remedy the current malaise of market economics. Chapter 12 of his *magnum opus* offers two important insights to the policymaker. Uncertainty and risk are given a thorough analysis by Keynes, and the entirety of that volume can be seen as a continuation of his larger exposition on risk, uncertainty and the power of human prediction. In addition, Chapter 12 offers insights from the mercantilist authors of the seventeenth and eighteenth centuries, drawing heavily on the work of Eli Heckscher and his *Mercantilism* (1935). Heckscher and members of the economic schools of thought respectively known as Historicists (Continental Europe in general and Germany in particular) and the Institutionalists (the United States and Ireland) provide the *raison d'être* for national interventions and the explanations for the creation and sustained influence of the institutional structures on how economies behave. Though these schools are now largely defunct they have left a lasting theoretical legacy: the concept of human capital. This concept has existed since the origins of economics but was given form by an Irish economist, John Kells Ingram, in the mid-nineteenth century, subsequently expanded on and developed by Richard T. Ely, John R. Commons and Theodore Schultz in the first half of the twentieth century before being systematized by Gary Becker, Edmund Phelps and Robert

Lucas in the 1960s and 70s.

It may come as a surprise to many but the so-called “smart economy” or “knowledge economy” or “technopolis economy” are actually very old ideas wrapped in rather new and shiny packaging. The concept of the concerted effort on the part of the State to encourage and design an economy that would return higher economic growth rates and improve standards of living dates back to Early-Modern Europe and if one were to conduct more systematic research, one could undoubtedly find examples that date back even further. What many consider to be “novel” is the link between education and innovation. This is a tried and true model of economic development. One must only visit the old capital and trading cities of Europe and see the names of streets and districts to see clear examples of how rulers saw what is now referred to as human capital as the engine of economic activity. Modern innovation policies and their complementary education policies are the successor movements to these State-driven economic movements of the past. Were they successful? In some cases yes. Prussian industrial policy and education structures were very successful but placed considerable political strain on existing institutions and may not have been possible without the *tabula rasa* provided by the destruction of universities and social structures during the Napoleonic Wars. In some cases they worked for a brief period of time, as was the case in Sweden. In some states it resulted in the primacy of goods dependent on state patronage, as in Colbert's Gobelins tapestry factory. Other states, most notably the United States, engaged in a *de facto* two region policy with an industrial North and agrarian South that eventually amplified political fractures

but also gave rise to a powerful system of general education. England also fostered innovation and the importation of persons with high levels of human capital but imposed draconian export and movement limitations on machine tools and those with industrial know-how. Other states systematically engaged in the art of rent-seeking embodied in the term *rentenier*. Even the mighty Dutch Empire put away its enterprising ways and went to work on manipulating bureaucratic structures to the best ends of an individual or vested interest group. Is there any common ground in all of these models, beyond that they constituted an aspect of the “economics of statemaking” as Gustav Schmoller referred to it? Are similar innovation policies today merely the acceptable face of mercantilism in our time?

Can one equate innovation policy with mercantilism in the first place? Mercantilism is the philosophy of a system of economic policy whereby a state attempts to gain economic advantage and garner subsequent income gains. In the past this was related to the economics of protectionism and the subsequent trade negotiations by alternative methods that turned the seventeenth century into the century of war. The later view was that this was the economics of statemaking, whereby emergent states fostered industries and through a policy of state-enforced asceticism engaged in an export-led strategy for economic growth where a constant positive balance-of-trade and subsequently balance-of-payments were the objectives. The current policy of innovation is to enable countries, especially small open economies like Ireland, to engage in an advantageous export-led growth strategy. European Union policy is to attract back scholars and researchers from the United States with labs, salaries and

legal structures, such as the Blue Card, that will enable them and their families to work and live within the European Union with ease. This is a policy in direct competition with the United States, Japan and the newly industrializing countries of the BRICs (Brazil, Russia, India & China). The efficacy of this programme of government is measured by number of patents issued, gross expenditure on research and development, numbers of doctoral-level researchers and the inflow and retention of researchers within the Europe Union. Research and development and subsequent marketable innovations that it is hoped it begets will be at the core of Europe's comparative advantage *vis-à-vis* the rest of the world. This is also the policy of the United States, China, Russia, Japan, Korea and most other non-European OECD countries. The policy that has been embraced by the G20 group of nations has been to address global imbalances, which partly placed export led recoveries at the heart of national economic policies. The problem is that this plan of action is seen within a zero-sum framework by many nations and the beginnings of protectionism in its classic form have begun to emerge.

States raced against one another for trade routes in the past eventually embracing free trade in all things but engineering skill and materials. Technologies eventually diffused and the late nineteenth century, despite all its globalization, gave way to the naval contests determined as much by human capital inventing steam turbine propulsion as by the blood and iron, coal and steel that filled so many volumes on military science and political economy at the time. Vannevar Bush, former adviser to President Franklin Delano Roosevelt, in his *Science – the Endless Frontier* (1945)

and *Modern Arms and Free Men: A Discussion of the Role of Science in the Preserving of Democracy* (1949) made the case for extensive state support for higher education and innovation as not being a matter of economic importance but key to defeating the growing Soviet Empire. The American innovation machine was a creation of strategic concern supported by an influx of human capital from Europe (the place of origin of most Nobel Prize winners prior to the 1960s) both *ante-bellum* and immediately *post-bellum*. Policies of strategic secrecy, export bans and the limited commercial and academic interaction between East and West further reinforced mercantilist policies of innovation. The current phase of competition has been placed in the area of human capital and innovation where Ph.D.s per 1000 inhabitants and patents filed vie to become the new missile gap. To further complicate this discussion the gap that exists between the two cultures of science and humanities has not been bridged successfully, resulting in a debilitating lack of engagement by either group fulfilling C.P. Snow's fears of a rift within the academy characterized by debate fueled by hearsay and ignorance. The Snow's Rede Lecture at the University of Cambridge in May 1959 was a declaration of the debilitating effects of the pigeon-holing of various academic disciplines which resulted in a clear delineation between science and the "literary arts". This was partly a function of the linguistic limitations and social selection of what defined science in the Anglo world, a term in definition and connotation that was much narrower than the German idea of *Wissenschaft*. As education demanded further and further specialization, it closed off to the majority the ability to become fluent in the basic foundations and linguistic conventions of the different schools resulting in the present lack of

interaction between the two cultures, which is not only detrimental to education but also to innovation.

In this essay matters of higher education, human capital, innovation policy, uncertainty and economic development will be discussed. The objective of this exercise is to illustrate that innovation policies are useful but are the product of determined public policy that is aimed at the production of new goods and services that will generally advance national wealth. Education and the institutions that facilitate it are at once wholly part and separate to the execution of any innovation programme. This essay will attempt to knit these several aspects together and provide a clearer picture of what Ireland must do not only to be successful but also to be the sort of cosmopolitan knowledge society it so strongly desires to become.

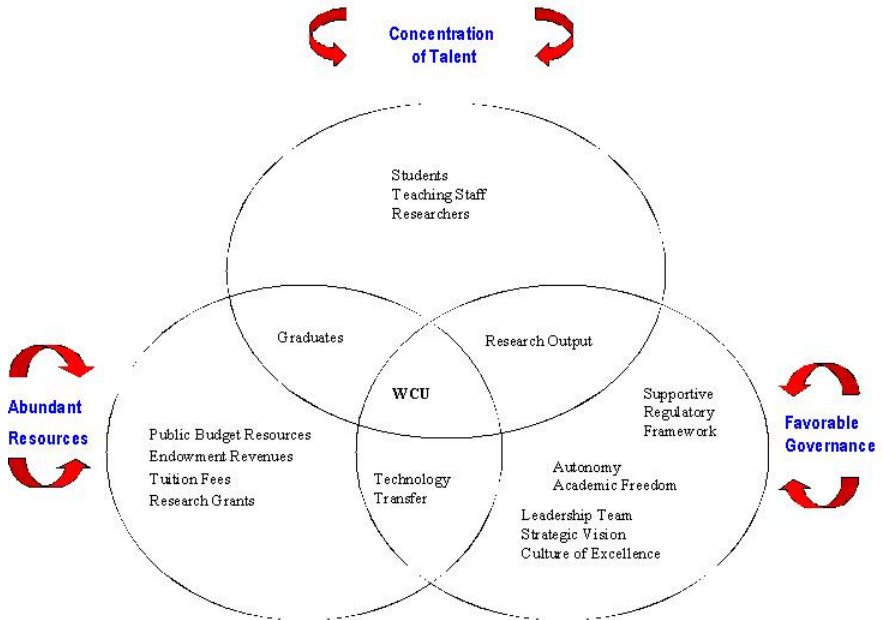
Section 1

Introduction

Key ideas that need to be looked at in this work relate to the development of individuals and of the economy in general. The discussion of creating an “innovation society” or a “knowledge economy” has been an important part of political discourse at national and supranational (i.e. European Union) levels since the early 1990s. The rationale behind this project has been the desire to fulfill what is seen as the categorical imperative of government – economic growth, and more importantly, the jobs that it creates and sustains.

At the core of this model is the “World Class University” (WCU) that acts as the source of innovation and economic development. Jamil Salmi of the World Bank provides a visual description of what constitutes such an organisation:

Characteristics of a World-Class University Alignment of Key Factors



Source: Elaborated by Jamil Salmi

Source: Salmi, J. (2009) *The Challenge of Establishing World Class Universities*. Washington, D.C.: World Bank, p.8.

This work is a combination of two sections, one is a general look at the “innovation-knowledge economy” and what that means for the economic analysis of labour markets. Second is essentially a comprehensive case-study of the Irish experience of an adapting education sector contending with entry into an internationally competitive environment. The breadth of countries, supranational bodies and other actors included in this section are a reflection of the first six words of any economics

course taught with respect to Ireland – *Ireland is a small open economy*. Governments, most especially governments that either come from small countries or are situated in sub-national entities are acutely aware that good governance is not so much the protection of rights or effective legislation but the procurement of sustained economic growth and the jobs that economic development supposedly ensures.

Education has been considered an important part of this process and it has been considered an essential part by economists and policy specialists. Recently, policymakers and analysts have forged a direct link between education, economic growth, innovation and long-term competitiveness. This education-innovation-competitiveness mantra has driven much of the policy changes in Ireland since the mid-1990s. The purpose of this section of our work is to first state the theoretical foundations of this assertion. We will subsequently challenge these assertions with both theoretical constructions at the macro and microeconomic level and accompany those theoretical solutions with facts taken from systems where these policies have been applied and have largely failed. This debate also is essentially one of accrual of personal benefits, which are rival and exclusive; versus economic and social benefits, which are by definition, non-rival and non-exclusive. Education, from the point of view of an economist, has public good aspects, most especially at the primary and secondary levels, but essentially it is a private good that is subject to public provision. This is due to the fact that the majority of the benefits accrued through education are enjoyed by the individual. There are several corollaries to this

analysis, which will be discussed below.

The Irish higher education context is framed by two crucial legal structures: the European Union's Bologna Process and Ireland's 1997 *Universities Act*. The 1997 Act makes an explicit statement as to the future of Irish higher education in Sections 12 & 13:

12.—The objects of a university shall include—

- (*a*) to advance knowledge through teaching, scholarly research and scientific investigation,
- (*b*) to promote learning in its student body and in society generally,
- (*c*) to promote the cultural and social life of society, while fostering and respecting the diversity of the university's traditions,
- (*d*) to foster a capacity for independent critical thinking amongst its students,
- (*e*) to promote the official languages of the State, with special regard to the preservation, promotion and use of the Irish language and the preservation and promotion of the distinctive cultures of Ireland,
- (*f*) to support and contribute to the realisation of national economic and social development,
- (*g*) to educate, train and retrain higher level professional, technical and managerial personnel,
- (*h*) to promote the highest standards in, and quality of, teaching and research,
- (*i*) to disseminate the outcomes of its research in the general community,
- (*j*) to facilitate lifelong learning through the provision of adult and continuing education, and
- (*k*) to promote gender balance and equality of opportunity among students and employees of the university.

13.—(1) The functions of a university are to do all things necessary or expedient in accordance with this Act and its charter, if any, to further the objects and development of the university.

(2) Without limiting the generality of subsection (1), a university—

(*a*) shall provide courses of study, conduct examinations and award degrees and other qualifications,

(*b*) shall promote and facilitate research,

(*c*) may establish by incorporation in the State or elsewhere, or participate in the establishment of, such trading, research or other corporations as it thinks fit for the purpose of promoting or assisting, or in connection with the functions of, the university,

(*d*) may collaborate with educational, business, professional, trade union, Irish language, cultural, artistic, community and other interests, both inside and outside the State, to further the objects of the university,

(*e*) shall maintain, manage and administer, and may dispose of and invest, the property, money, assets and rights of the university,

(*f*) may collaborate with graduates, convocations of graduates and with associations representing graduates of the university both inside and outside the State,

(*g*) may purchase or otherwise acquire, hold and dispose of land or other property, and

(*h*) may accept gifts of money, land or other property on the trusts and conditions, if any, not in conflict with this Act, specified by the donor.

It is from this limited license that the Irish story of “academic capitalism” begins.

The mantra of innovation and concepts from endogenous growth models has caused some actors within Irish academic and policymaking circles to grouse and others to sing songs of praise. The European Union has categorically stated that the higher education sector across the Union is in crisis. In the European Unions *Frequently Asked Questions: Why European Higher Education Systems Must be Modernised*,

MEMO/06/190 (10/05/2006) the EU lists a series of discrete problems:

1. European higher education is fragmented and exists without sufficient linkages
2. National regulations are over-detailed, diminishing responsiveness
3. European universities have a tendency to uniformity that has sequestered world-class research and reduced access
4. Universities are insufficiently prepared for global competition
5. Funding for universities is far too low
6. Access to universities is far too low

Higher education reform within this context appears to be nothing more than a series of changes that are to be made to the system of higher education, but when this is placed alongside the statements of the Union on the creation of a European Institute for Innovation and Technology and the Lisbon Process Objectives for 2010 which will enable Europe to be the most competitive economy in the world with a focus on information communication technology (ICT) and 70% of the working-age population in employment. The universities and the education system in general are saddled with the *duty and obligation* to assist the state (in the national and supranational sense) to achieve these objectives.

Section 2

Pre-Third Level Education in Ireland

The Departments of Education and Science (DES) mission statement states:

The mission of the Department of Education and Science is to provide high-quality education, which will:

- Enable individuals to achieve their full potential and to participate fully as members of society, and
- Contribute to Ireland's social, cultural and economic development.²

The primary objective of education within this context is first for social capital development but also explicitly for human capital development that would enable students to enter and perform in the labour market. The Irish government's white paper on education *Charting our Education Future* echoes these sentiments:

The State's role in education arises as part of its overall concern to achieve economic prosperity, social well-being and a good quality of life within a democratically structured society.³

Pre-school Education

Pre-school education in Ireland is mainly carried out by private individuals, local councils or grant assisted voluntary agencies through pre-schools, play groups, day nurseries or crèches. These pre-schools come under the regulation of the Health Service Executive. The DES run some specific pre-school projects including the Early start programme and the Rutland Street pre school project which specifically

² Government of Ireland, 2005, p.6

³ *Charting our Education Future*. pp. 6.

target disadvantaged areas. At present the primary schools cater for much of the early education (0-6 years) provision. In The DES Annual Report of 2006 it was noted that almost half of four year olds and all (99.9%) of five year olds in the country were enrolled in the primary school.⁴

First Level Education

Although many children start aged four in the Irish primary school the compulsory starting school age is six years. The DES recorded 3,284 primary schools in Ireland in 2006 catering for over 450,000 children countrywide. The average primary school involves eight age-grouped classes from junior infants to sixth class (4 to 12 years of age).⁵ The DES state the aims of first level education as:

- to enable the child to live a full life as a child and to realise his or her potential as a unique individual
- to enable the child to develop as a social being through living and co-operating with others and so contribute to the good of society
- to prepare the child for a continuum of learning.

This overall vision is then structured through a process of teaching and learning through the primary curriculum. The key subject areas in the curriculum are Language; Mathematics; Social, Environment and Scientific Education; Arts Education; Physical Education; and Social, Personal and Health Education.

⁴ Government of Ireland, 2006, p. 11

⁵ Government of Ireland, 2004, p.9

The curriculum in Ireland went through radical changes in 1971 where a child-centered approach replaced a traditional teacher-centered model. A revised primary curriculum was put in place in 1999 which similarly endorse this principle and aims to “enable children to meet, with self-confidence and assurance, the demands of life, both now and in the future”.⁶

Second Level Education

Second level education in Ireland is quite different in its structures, policy and curriculum to first level schools. The government aids 735 second level schools (DES statistics section, 2006) in the country and there are approximately 40 private non-aided schools. The post-primary sector comprises secondary, vocational, community and comprehensive schools. The majority of schools are secondary schools which are privately owned and managed, the vast majority by religious orders. The teacher salaries however are remunerated by the State as well as the State providing for various grants and allowances. Vocational schools are administered by Vocational Education Committees (VECs) and almost entirely State funded. Community and Comprehensive schools benefit from individual state funding and are managed by Boards of Management.

The Department of Education outline the aim of second level education to: provide a comprehensive, high-quality learning environment which aims to prepare individual students for higher or continuing education or for immediate entry into the workplace.⁷

⁶ Government of Ireland, 1999, p.6

⁷ Government of Ireland, 2004, p.13

The post-primary curriculum is divided between a junior and senior cycle. The junior cycle involves a three-year Junior Certificate Programme (12 – 15 years age bracket). The senior cycle is a two-year Leaving Certificate Programme (16 – 18 years age bracket). The senior cycle may be extended with an optional Transition Year Programme taken after the Junior Certificate Programme. This Transition Year is interdisciplinary in nature and focuses on self-directed learning.

The senior cycle has experienced significant changes in recent years. There are now three programmes in existence, each leading to a State Examination. These are the Leaving Certificate, the Leaving Certificate Vocational Programme (LCVP) and the Leaving Certificate Applied (LCA). The Leaving Certificate carries a high social status in Irish society due to its long established tradition. Students take a minimum of five subjects at one of two levels; ordinary and higher. Foundation level is offered for Irish and Mathematics. This Certificate acts as the main source of entry to universities, institutes of technology and colleges of education through a points system linked to grades achieved. 54,000 students took the Leaving Certificate examination in 2007.

The Leaving Certificate Vocational Programme (LCVP) was introduced to the senior cycle in 1989. The focus is on technical subjects or modules with a vocational focus. It gains financial assistance from the European Social Fund. The programme after review was modified in 1994 to broaden the types of subjects taken to include Enterprise Education, Preparation for Work and Work Experience. This programme is completed alongside a minimum of five other Leaving Certificate subjects.

The Leaving Certificate Applied (LCA) Programme was introduced in 1995 and is separate from the Leaving Certificate. It is a two-year course which intends to assist in the:

Preparation of participants for adult and working life through relevant learning experiences, which develop the following areas of human endeavor: spiritual, intellectual, social, emotional, aesthetic and physical.⁸

The programme consists of general education, vocational education and vocational preparation. The LCA cannot be used to gain entry to third level education.

Some considerations for pre-Third Level education

It was Lionel Robbins's (1981) concern, reflecting a little over a decade after the commission he chaired brought about widespread changes to the UK higher education system, that students were not entering the university system with a broad enough education. This was in part a function of the UK A-Levels but also reflects a larger specialist models of education delivery that is reinforced in higher education. In Ireland, this was never the case but a question can be placed over the efficacy of that earlier broad education. Part of the problem relates to the lack of knowledge between education levels of what an incoming student's previous academic curriculum entailed. Approximately 50% of secondary teachers are unfamiliar with the primary curriculum, rendering them poor judges of the skills that students

⁸ Government of Ireland, 2004, p.14

possess upon entry to second level. More disturbingly the skills that students have upon entry to the secondary sector can be considered suspect. This is especial the case in the area of mathematics, where 28% of Irish primary school teachers feel themselves to be poorly prepared to teach mathematics curriculum. Another problem is that the added value of the leaving cert is not clear. ESRI research, for instance, shows that mathematics and reading test scores do not significantly change between entry to secondary school and the Junior Certificate.

The most common terminal examination and the key to entry into Third Level education, the Leaving Certificate Established, is easily open to being “gamed” by test takers. Due to the demand driven nature of the examination and conventions relating to marking and the determination of examination questions students are subject to strong incentives to “get the points”. This typically manifests itself in course selections that are less difficult and memorization. Students become rent-seekers before they enter university. University education, like the Irish primary school education, is developmental where the students are encouraged to internalise skills and learning tools. The current secondary system and the Leaving Certificate Established do not encourage this approach to learning.⁹ As will be discussed below, the “knowledge economy” as defined on its own terms, requires people who are versed in Mode 2 knowledge and have the ability to acquire tacit knowledge. The

⁹ One of the authors of this report encounters this problem every year in lecturing first year Business, Economics and Social Science students in Statistics. These students are typically focused on regurgitation, not on the application of deeper knowledge to new problems and often lacking basic numerical skills. This, in turn, leads to a lack of confidence in students which often causes great deals of stress and anxiety.

current secondary system does not encourage the development of those trans- and interdisciplinary skills. If the aim of Irish education prior to Third Level is to provide the social and human capital to enable an individual to become a participant in the modern economy it needs to create willing entrepreneurs and foster intellectual flexibility. If one considers the knowledge economy to be a new form of mercantilism, then the battleground is not located in the rarefied halls of government but in the poorly equipped 24.5:1 classrooms of Ireland.

Section 3

The University in the Society, Polity and Economy

The most common perception of the university is as the place of learning for the 18 to 25 year-old age cohort with bucolic campuses and woolly-headed professors. The image of the university that is seen by modern policymakers and innovation gurus is a place somewhat akin to that of the ancient city of Memphis by the Egyptian Pharaohs. Universities have become the center of the knowledge economy, or to be more correct, have become the third side of the iron triangle of government and industry, in a new form of social partnership, in a world of diminishing union power. The universities were capable of performing two essential tasks for the state – one was the creation of “innovation”, a catch-all word for the developments that were taking place in the advanced economies; the second was the training of new members of the labour market that could become the “symbolic analysts” of the “new economy”. This new labour market dynamic was first outlined by Robert Reich, who went on to become Secretary of Labor under the Clinton Administration, in his book *The Work of Nations* (1992). Reich divided the “new economy” into three sectors, those providing basic personal services (waiting tables, call centre, low-wage jobs), those involved in production (the traditional middle class Taylorist/Fordist worker), and the the “symbolic analysts” (doctors, lawyers and engineers) that are at the top of the economic hierarchy. These “symbolic analysts” are then divided into two subcategories: national and global. Global members of this caste are the persons on a par with Peter Sutherland, global actors that direct multinational organisations and firms. The entry criterion to this caste of the

symbolic analyst is obtaining a university degree. This brings us back to the first part of this discussion, which related to the idea that the university is an essential component in the new labour market system. The identified trend, as production jobs move to lower-cost centres of production, such as China and India, is that there will be low-value-added services jobs and high-value-added “symbolic analysis” jobs, which will themselves be stratified by national and global orientations. This, combined with the high numbers of nationally-orientated science and engineering graduates in China and India, has placed Europe and the United States in a difficult position according to Reich, who finds that the expansion of research and development facilities and the number of university level graduates as the only possibility of preventing the US from losing competitiveness or creating too large an income gap between the internationally competitive symbolic analysts and their nationally competitive counterparts.

To look at the question directly. What is the university supposed to “do” to an undergraduate?

Goals for individual students

- Cognitive learning
- Emotional & Moral development
- Direct Competence
- Direct satisfactions and enjoyments from college education.
- Avoidance of negative outcomes for individual students.

Goals for Society

- Advancement of knowledge
- Discovery & encouragement of talent
- Advancement of social welfare
- Avoidance of negative outcomes for society

There were several other benefits perceived from attending university: for the state, increased tax revenues, greater productivity and increased workforce flexibility with private benefits of higher salaries and benefits, higher savings levels and improved working conditions. Wider social capital goods were reduced crime rates, increased charitable giving/community service and increased quality of civic life. Public health benefits were improved health/life expectancy, better consumer decision making and increased personal status.¹⁰

It appears even on a basic level universities seem to be responsible for fulfilling many obligations. A task on a par with the cleansing of the Augean Stables some would argue. To this complex set of economic and social tasks assign the thorny political issues of equality of outcome versus equality of opportunity and compound that with the issue of university finance. Universities in the United States and Europe opened their doors to new entrants on a scale never thought imaginable. The financing of this new desire to bring about a modicum of equality of outcome through a large dose of equality of access where in Europe and America the public

¹⁰ Bowen, H. *Investment in Learning: The Individual and Social Value of American Higher Education*. San Francisco: Jossey-Bass, 1977. pp. 54-5.

purse bore the costs. In the US it was via the G.I. Bill of Rights Act (Serviceman's Readjustment Act, 1944) and in Europe as part of a series of social democratic policies brought in to solidify the Western European social contract faced with rebuilding and the start of the Cold War.

The universities, by the 1970s had benefited greatly from this programme of expansion, but the economic realities of the Vietnam War and the first and second OPEC shocks, stagflation and high unemployment across Western Europe and the United States resulted in harsh financial decisions being made. In the United States, easier access to credit allowed the expansion of tuition fees, creating a self-reinforcing cycle eventually known as the “Chivas Regal Syndrome” where institutions competed on the basis of academic reputation and price. The European universities were faced with less flexibility and largely answered resource problems with expanding student numbers combined with reduced resources per student. In some Western European countries, the solution has been to reintroduce fees, but on a limited and centrally regulated scale. Ireland is unique amongst wealthy nations in entering the mass higher education market very late.

The second question is related to the general policy thrust of the HEA, the Department of Education and the Department of Enterprise. This policy structure is based on the idea that there is a direct causation between the number of scientific researchers and economic growth. This model, based on an incremental notion of innovation that draws a vague justification from the theories of the Austrian School

of Economics (most notably Joseph Schumpeter) is contrary to actual evidence. Some of the clearest statements on the extreme risk that this policy option comes from the US National Science Foundation which shows that approximately 30% of all Ph.D. graduates facing unemployment upon completion, with humanities Ph.D. graduates at a rate of unemployment upon completion of 58%. Those who are engaged in employment, only 27% are engaged in industry or self-employment, the rest working in academic, government or other types of employment.

The levels of investment required to develop a knowledge economy are also daunting, and would have appeared so even at the height of the boom. Ireland spends 1.54% of GNP on Gross Expenditure on Research and Development (GERD) but this metric does not reflect the importance of the general level of investment in R&D. For example 1.54% of Irish GNP is still quite small when compared with similar proportional expenditure from other EU economies. US GERD is 2.5% of GDP, amounting to \$330,045.5 million in 2006, far outstripping the raw expenditure levels quoted below.

Research & Development Expenditure, Gross

	Germany	France	UK	Ireland
2007, Millions, Current €	2,428,200	1,894,646	2,044,133	189,751
€ on R&D	61,433	39,409	35,977	2,922
% of GDP on R&D, Ireland GNI	2.53	2.08	1.76	1.54

Source: CSO & ECB.

Even for supporters of the incremental model, like Dr. Dan Breznitz of MIT, innovation policy is still considered far too FDI-orientated to be successful. It seems like the sole purpose of the HEA has been to produce a labour force that is attractive to foreign investment without developing a base for innovation-based homegrown industries. Breznitz squarely places the blame on the fact that the Irish government's financial support policies for innovation have single-handedly created one of the smallest and least developed venture capital markets in the developed world. This stark reality has been combined with a banking sector whose lending practices have almost exclusively considered projects that are directly related to the property sector, thus stifling any prospects of diversification or the development of a homegrown innovation sector.

To return to the question at hand, the jury is still out on the policies of the HEA with respect to redirecting higher education in Ireland towards innovation. Mr. Paul Tansey in his February 29th, 2008 article in the *Irish Times* entitled "Innovate or Stagnate" outlined a cogent critique of government policy on education, with which we largely concur. If there is to be an implementation of efficiency metrics there needs to be a series mid-term analyses of the objectives of the HEA, the Department of Education and the Department of Enterprise on the future of Third Level education in Ireland, since the current recurrent grant allocation model is directly designed to facilitate the application of policy objectives via financial incentives. The application of efficiency metrics will only add a brokerage mechanism to this model that will hardwire top-level priorities from the larger system of governmental

education policy preferences, further “nudging” academic freedom and creating a Matthew Effect for those institutions that comply with the sycophancy that defines the “strong bureaucrat” method of education that George Santayana condemned Harvard University of suffering from in the first half of the twentieth century. I therefore advise caution in the application of efficiency metrics to resource allocation until a reappraisal of educational policy objectives has taken place. Once a measure becomes a target it ceases to be a measure. Instead it creates incentives and, thereby, more often than not, rent seeking and a tool for vested interests.

Higher education itself has changed remarkably over the past century. Harvard President Charles Eliot redesigned the delivery of courses that went from a curriculum with 80% required courses in 1890 to one with 70% elective courses by 1901, eventually settling at an average of 40% required courses. From 1945-2000 there has been an eight times increase in bachelor degrees being issued, averaging 1.2m per annum.

At the same time, this increase in graduate production has not been matched by a commensurate increase in academic publications. According to the US Department of Education, fewer than half of the staff of all of the US universities publish as much as 1 article per annum (this must be qualified slightly, since a single high quality article or groundbreaking text can be much more valuable than half a dozen parochial and mediocre articles in low quality journals).¹¹ Fully 70% consider themselves teachers and not researchers, which is, of course, not necessarily a bad

¹¹This is why in many systems research quality is measured through impact factors and citation scores.

thing. This is in keeping with the distribution of universities in the US, where 45% of the college population are based at two-year institutions, commonly referred to as “community colleges”. The primary purpose of these institutions is to teach and they generally only award associate's degrees (2 year undergraduate degrees) and have bachelor degrees as their terminal qualification. The importance of teaching to many of the smaller colleges in the US has also created a great deal of concern about the future of higher education in America, outlined in a book by the former president of Harvard University, Derek Bok, entitled *Our Underachieving Colleges* (2006). He finds that US universities are ignoring some important aspects of education delivery, namely, pedagogy, college majors (i.e. ignoring majors which have limited *prima facie* marketability or ability to draw external funding) and the neglect of moral and civic development. These problems within the American academy are most clearly seen in the teaching of English composition. This subject is supported by a supply of teaching provided mostly by low paid and time poor adjunct professors. Academic career prospects and a general disdain for the job of teaching remedial English composition has resulted in the low-cost, low-fuss solution being sought by most faculties. Though this may appear to be immaterial to the “knowledge economy”, according to the *Wall Street Journal* poll “Work Week” (12/29/98 p. A1) communication skills were the most important skills to firms and the skills that most college graduates would be lacking. An example of the lack of interest in this aspect of academic development of undergraduates can be seen by the singular lack of research conducted in the role of universities in critical thinking development. The sole monograph, to our knowledge, on the topic dates from 1990 (*Critical Thinking:*

A Statement of the Expert Consensus for the Purposes of Educational Assessment and Instruction (1990)). Universities, despite the fact that undergraduate education defines a large part of their role, are not terribly interested in the delivery of this education. How did this happen?

The focus on research as a principle concern for universities finds its origin in early nineteenth century Prussia.¹² The idea of a system of higher education as outlined in France and Germany following the Napoleonic era was based on the concept of professor as state functionary. The crucial difference between the French and the German (Humbolt) models was that the French desired to train their students and prepare them for state teaching responsibilities and the Germans designed a system where individuals could acquire the “tools” to pursue knowledge and make discoveries. The UK universities and Trinity College Dublin were unique universities within the European context, having retained a clerical focus and a residential system with substantial financial resources in the form of land grants and endowments. They retained an older view of humanism (i.e. Early Modern) and saw the creation of degrees as the principle objective of their operations.

The intellectual importance of the German theologian Schleiermacher was key to the design of the German university. The role of *Wissenschaft* (the systematic acquisition, pursuit and discovery of knowledge) and how it was to be taught was

¹² Much of the information for this part on the origins of the research university is drawn from Rüegg, Walter, Ed. *A History of the University in Europe Volume III: Universities in the Nineteenth and Early Twentieth Centuries (1800-1945)*. CUP, 2004.

key to these early reforms and how these institutions (and those of the rest of Northern Continental Europe) were designed from the outset.

The power of the Schleiermacher model of the university was carried on through the link of philosophical speculation on scientific ideas into empirical science. The science of language was the start of this process. “This new scientific spirit, whose 'enthusiasm and joy' (*Begeisterung und Seligkeit*) according to Niebuhr, enlivened the first years of the University of Berlin; this nuclear method pushed research to the innermost core of all things and opened the way to the surge of the modern university.”¹³

Before World War I the German speaking universities were so deeply convinced of the unity of philosophy with mathematics and natural philosophy. The creation of separate departments in these subjects took place quite late, as they were only created in Tübingen (1869), Strasbourg (1872) and Heidelberg (1890) and Frankfurt-am-Main (1914) and later in the British Isles. The conviction of the institutions was that philosophy would provide the necessary core, the unity of the humanities with the natural sciences and the social sciences. This conviction was so strong that Vienna and Graz did not create separate departments until 1975.

“...Werner von Siemens (1816-92), who had stated that mankind had entered the age of science in which the natural sciences were orientated towards practical use, thus

¹³ Ibid at 15

making good Francis Bacon's (1561-1626) postulate that nature can be dominated through science."¹⁴ This linked the new German university with the older pre-modern *universitates* concept but now fostered the modern *scientias* concept.

"Wiehem von Humbolt took this as the basis of his idea of a university: 'The university's domain is what man can only find through and within himself – insight into science. Freedom is necessary and solitude helpful to this self-act in its own understanding, and the entire outer organization of the university flows from these two points. Attending lectures is only secondary; what is essential is that for a series of years one lives in close connection with like-minded people of the same age, who are aware that in this same place there are many thoroughly learned people, dedicated solely to the elevation and diffusion of science.'

As a university professor, Schleiermacher gave new meaning to the delivery of and attendance of lectures, in order to apply the liberal idea of the student's own responsibility for his studies more concretely than did the private man of learning and statesman... Humbolt: 'The teacher must produce everything he says before his listeners: he must not narrate what he knows, but rather reproduce his own way to knowledge, the action itself. The listeners should not only collect knowledge. They should directly observe the activity of intelligence producing knowledge and, by observing it, learn how to do it themselves.'"¹⁵

Universities in this new Humboltian arrangement were very much "creatures" of the State as opposed to the Catholic or Protestant Churches as they had been in the past. The original intention of having universities outside of the main city in a principality was to enable the authorities to keep track of the student population and movements within it from a distance and the small locations provided ease for this observation. There were various responses to political unrest. One was to suppress students, as was the case in Germany but in France, the curriculum was so tightly put together that the students were actually supportive of the regime and the discipline of the university system.

¹⁴ Ibid at 19

¹⁵ Ibid at 21

The reforms of Napoleon I were generally considered to bring about an academic desert, where no real research or innovation took place. The sole places allowed these indulgences were the Sorbonne, Collège de France and the Institut de France. The State awarded the degrees, determined the curriculum and offered only specialist routes to state service of one kind or another.

“In Germany the pressures of modern technology resulted in changes in the university system, whereby it became much more hierarchical. Student numbers, which had remained roughly constant between 1830 and 1865, had quintupled by 1914 to a total of 61,000.

This growth benefited the small universities and the arts faculties in particular. For the first time for centuries there were more students in the arts faculties than in law, and registrations in the theology faculties had dropped by a half over the period 1830 to 1914. These developments mirrored the change in orientation of university study towards modern careers. In addition to the established universities, technical universities had developed from the former state or private specialist colleges: Aachen in 1879-80 (founded in 1865 as a polytechnic), Berlin in 1879 (1799, a royal building academy), Brunswick in 1877 (1745, *Collegium Carolinum*), Danzig in 1904, Darmstadt in 1868 (1812, a school for building), Dresden in 1890 (1742, an engineering academy), Hanover in 1879 (1831, a higher school of commerce), Karlsruhe in 1865 (1800, Weinbrenner's school for building), Munich in 1868 (1827, a poly technical central school), Stuttgart in 1876 (1829, a united art, science and commerce school).

The new students, who were less likely to come from the educated middle classes than before, took a pragmatic view. Studying in order eventually to earn their living (*Brotstudenten*), they had little sympathy for Humboldt's educational ideals and sought instead a training for a particular career. This often led to misunderstandings with the professors, who were becoming ever more specialized in their particular fields and more remote from existing society, some of them taking refuge in a profound yearning for a lost Germany. The growth in student numbers and the multiplicity of possible fields of study awakened conservative fears of 'an academic proletariat'. Indeed, there was a lack in the German university system of a regulatory mechanism like the French *concours*. ...

The crisis also affected those who sustained this ideal, the professors, as can be seen in the structural, social and ideological changes in the teaching body. The first change led to a rapid growth in non-professorial staff, who in certain disciplines, such as the sciences and medicine, formed the majority without having any say in the decisions of their faculty. The disparity between the numbers of professors and those of readers or private tutors slowed down and made career advancement more difficult. All of this encouraged a dissatisfaction, which found expression before 1914 in a movement founded by the non-professorial staff. The rapid growth of non-professorial staff can only be explained in part by the financial policies of the state, which benefited from teachers with lower salaries or indeed with none at all. It was also a consequence of the greater social status of the professorship, which attracted ever more candidates. A further factor was the growing specialization of scholarship, which usually meant that the emergent fields of study were delegated to non-professorial colleagues, at least initially. This had a positive effect on their innovatory powers, but at the same time it produced frustration, for it was not possible to promote all of them. The difference in status was reflected in the levels of income. Candidates for a professorship either had to have their own income until they were appointed, or had to make do with a second class position. Shortly after the First World War, Max Weber (1864-1920) declared that: 'In essence a career in academic life in Germany is based on a plutocracy'.

In addition, the autonomy of the universities was increasingly circumscribed by the interventions of the state in appointments to professorships - as indeed was the case in the whole of Europe - and by an increasing dependency on the state for the financing of research institutes in the sciences, of medicine, of research expeditions, and for the funding of expanding library expansion in the arts. In Berlin the salaries of the main professorships formed the major part of the university budget in 1860. From 1870 onwards it was the seminars and institutes, and their costs were growing faster than those of the personnel, so that in 1910 half of the university budget was taken up by the running costs of the institutes and seminars, to which must also be added the costs of buildings and equipment. ... On the one hand the removal of 'large-scale research' (*Grossforschung*), as demanded by Theodor Mommsen (1817-1903) in 1890, was supposed to prevent the university from turning into 'a huge factory' (*Grossbetrieb*), ... and the link between research and teaching was in fact maintained in the universities. On the other hand, however, the German university and academic system as a whole, if one ignored the *concours-system* and the elite universities in the form of the *grandes ecoles*, was getting perilously close to the

Napoleonic model which in its origins it had rejected totally.”¹⁶

The German academic situation at the turn of the century reflects the current circumstances in the US and Ireland. Rapid expansions, technological changes and a caste system within academic employment placed the German system in a position of sclerotic conservatism and undermined their machinery civic development while at the same time using the aims of invention and quality assurance as protections from scrutiny. The research-driven university model, a model that was embraced and modified in the US during the twentieth century has made considerable progress in advancing science and leading to industrial innovation but the current system is not without academic or economic costs. Universities, though they appear to be just another element of service provision within the economy, are highly complex institutions that do not follow standard models of supply and demand. Educational institutions, like medical institutions, determine their own supply and demand on the basis of different legal and associative structures and not by market activities alone. In the area of pricing, the pure information mechanism of the market, education and medicine typically do not operate clear pricing structures and rely heavily on different forms of subsidy to perform their various activities. If one takes the example of one course, economics, the university determines that supply by the number of places. The academics determine the course on the basis of academic research. The academics themselves are determined by a non-market mechanism

¹⁶ Ibid at 57-61

that sees academic distinction and prestige as its key principles. The students enter on the basis of a centralized procedure of examination and are charged fixed prices that bear no resemblance to their educational costs. Students cannot, for the final five seats in a course, bid-up their fees to gain entry. Students and academics make choices on which university to attend or be employed by on the basis of non-market determinants, such as overall prestige or the presence of certain eminent persons on the faculty. Though Harvard, Columbia and Yale make much of their respective endowment managers and their respective war chests, academics and students flock to Harvard for its prestige and its pre-eminence in scholarship, not its fourth quarter earnings. The desire to compete in this market for prestige is expensive and as a general principle it can be considered that all institutions of learning and medicine suffer from a simple resource allocation model. They will desire to obtain all the revenue they can possibly gain and then find ways to spend all the revenue they have gained. Put quite simply, the nature of these organisations is to be insatiable. A realisation of that principle is part of the reason why methods of academic governance have become so complex. Academic governance has devolved into a situation of “Balkanisation” which comes with material effects on the social capital of individuals within universities. It has also brought about different models of resource allocation.

“The fundamental problem for research universities which have such a rich reservoir of information of value to integrated regional development can be summed up simply. The organisational forms and institutional support and reward systems which have served the expansion of knowledge so well have resulted in (a) fragmented academic disciplines, each with (b) distinct vocabularies and methodologies for developing and communicating about knowledge which are (c) neither easily

accessed nor understood by the other smart and dedicated contributors to the knowledge-driven economic development process.

This lack of fit and difficulty in communicating and collaborating across knowledge boundaries which separate spheres of expertise and authority is what needs to be addressed by universities if they are to be truly valuable contributors to regional economic development.”¹⁷

To understand some of the deeper problems within the academy's personnel policies, look at this quote from a recent study on academic governance:

“The university is a cruel institution. It takes the best and the brightest, promises them the world, and then it throws most of them to the dogs. The vast majority of scholars start out as fresh-eyed and bushy-tailed newly minted assistant professors; their careers peak as they become tenured associate professors; from then on their human capital declines steadily for reasons that are mostly not under their control. As a result, there is a lot of bitterness and resentment floating around in the heads of the tenured faculty. If the resulting morale problem is not properly addressed, it will clog the collective decision-making processes of the university. A well-designed university picks up its burned-out faculty and moves them into other activities they can take pride in, such as teaching or administration.

(Empathy with burned-out tenured faculty might come across as misplaced, given that the tenured faculty contribute to the overproduction of Ph.D.s, as a result of which many of the best and brightest never reach the level of assistant professor in the first place, which creates a lot of unhappiness. A mind is a terrible thing to waste, and this mass wastage of minds is a disgrace to the university. Politically speaking, however, frustrated tenured faculty are more important than are the rejects of the academy: the latter don't vote.)”¹⁸

The market for Ph.D.s was suffering from a glut of graduates as early as 1994, from when this quote on the state of the market for doctoral-level educated labour was written:

“The training-job transitions of new Ph.D. recipients is becoming increasingly difficult and uncertain everywhere, because there is a structural shortage of the academic jobs for which they are primarily being trained. As the use of postdoctoral research positions is increasing and being extended, precariousness among young

¹⁷ Mitra, Jay & Piero Formica, Eds. *Innovation and Economic Development: University-Enterprise Partnerships in Action*. Dublin: Oak Tree Press, 1997. pp 58.

¹⁸ Ehrenberg, Ronald. Ed. *Governing Academia*. London: Cornell UP, 2004, 85. Quoting a UCLA Political Science professor.

researchers is increasing well beyond any 'reasonable' limit. A certain degree of precariousness at the beginning of academic careers – associated with the well-known phenomenon of the labour queue – seems to be inherent in the nature of scientific and academic research, in that time is needed for the selection process in a situation of uncertain quality. As we have seen, this precariousness was traditionally managed through the relationships between actors and organisations in the networks that operate in the intermediate space. Nevertheless, the rapid development of the systematic use of post-doc positions, which are regarded in part as a source of cheap labour, is tending to unbalance or even disrupt the intermediate labour market. The public authorities have an important role to play in bringing this market segment back under control through the use of various regulatory or incentive mechanisms. Without intervention, which should certainly be adapted to each country's circumstances, the pool of young researchers may well dry up, either through depletion or because young people are discouraged from entering academia. In the long term, this would undermine the very basis of knowledge production upon which the new 'knowledge economy' rests.”¹⁹

The university governance structures can be seen as the outcome of external and internal forces to ensure that the university supplied what these interest groups desire. Organizational structures with departmental-specific and college-specific jurisdictions can produce Pareto-inferior choices for the top-level administrator.

“The hierarchical structure of organizations can largely be interpreted as a device for the resolution of conflicts, with each grade of the hierarchy specializing in resolving the conflicts of the grade beneath it. The very structure of an organization can be regarded as a “constitution,” a constitution being defined as a previously agreed method of resolving conflicts which have not yet arisen. We can go further and argue that virtually all organizational decisions are the end product of a process of conflict resolution between the points of view of various section and departments.”²⁰

The development of a successful model of university financial management has also

¹⁹ Caroline Lanciano-Morandat & Hiroatsu Nohara. “The Labour Market for Ph.D.s. (chap. 12)” Cole, Johnathan; Barber, Elinor & Stephen Graubard, eds. *The Research University in a Time of Discontent*. London: Johns Hopkins UP, 1994. pp306.

²⁰ Boulding, Kenneth. “A Pure Theory of Conflict Applied to Organizations.” in *The Frontiers of Management Psychology*. George Fisk, Ed. 41-49. NY: Harper & Row, 1964, 48-9.

been elusive:

“... the reason for inefficiencies in the RCM [Revenue Centre Management, the basis for the HEA Recurrent Grant Allocation Model, HEFCE Model in the UK and the original Trinity College Academic Resource Allocation Model] model is the imperfect competition associated with a small number of units competing for many types of students. In particular, quality level are set below the levels that perfectly competitive units would choose. Similarly, imperfectly competitive private firms that sell a good at a single unit price usually supply an inefficiently low amount of this good, in an attempt to drive up the price. It is well known, however, that this inefficiency could be eliminated if these firms were able to perfectly price discriminate, selling each unit of the good at a different price, namely, the maximum price that consumers are willing to pay for each unit. In this case, supply would be expanded to the point where the price of the next unit equalled the cost of the next unit, which is the necessary efficiency condition.

Under centralized budgeting, something akin to perfect price discrimination is also occurring. At the margin, each unit is offering to “sell” another increment of educational services to the center in return for additional funds equal to the true cost of these services. In other words, the provision of additional services is generating no additional profits for the unit. ... The units are able to generate positive profits, however, by collecting fixed payments from the center [central budget holder/common communal funds].”²¹

In the situation where social welfare (in the wider sense of overall well-being) is the concern of the centre the end result is that the true social costs of the last unit of educational service is paid by the centre. The price of education at the margin is only being efficiently priced in the centralised model not by RCM. RCM only provides financial compensation for the student in one course regardless of the content or quality of that course. This creates long-term viability issues as matters of educational quality, which is key to the university's ability to participate in the market for prestige, are not paid for by the individual RCM units but by an ever dwindling pool of resources from the centre. The final result is that RCM forces

²¹ Ibid at 146-7

decisions to be made with respect to educational delivery and quality that has an impact on the general health of the institution's finances. These results are robust with a variable population of students. RCM does not deliver a superior result to centralised budgeting.

The issue of space rental from the centre is a factor that would potentially entrench the system if university policy is aimed at using improved/enlarged spaces as a method of attracting students. RCM has focused on least-cost methods, entrenching many of the less favorable outcomes outlined above on the problems of undergraduate education. The only solution found with these models was to abandon them over the medium term or to rely upon a large endowment to engage in consumption smoothing. American state university systems commonly use this structure but engage in active trade-offs. The University of California system being the most successful example using Clarke Kerr's "Master Plan" of the 1950s which combined resource allocation models with an apex structure of universities. As a result the UC system has some of the poorest community colleges in the US but also academic leaders, such as UCLA and UC Berkeley. This skewing of resources has been eschewed by most state universities but these systems also do not have leading colleges. This is not to say that they do not provide an adequate or in some cases superior undergraduate education but they typically do not enter into the Doctoral Granting or Research University categories of the Carnegie Classification system for universities (the top two rungs). Policymakers, in state-funded higher education systems, must make distinctions between what they desire – efficiency or equity.

Due to their financial structures, Irish universities, like virtually all their European counterparts, must compare themselves to American state universities, not the princely-funded giants like Harvard, Yale, and Princeton.

The innovation institutional model.

The US shows a decline in Business Expenditure on Research and Development over the 1990s while the EU begins to expand at that stage bar the French. The US being a benchmark would state that the EU should reduce involvement in this area. During the 1990s the US and Ireland showed strong investment figures, with the rest of the EU declining. Much of this can be explained by the greenfield nature of Ireland as well as the US innovation model moving out of publicly funded research and development. In addition, the Irish case was distorted by the influence of heavy Foreign Direct Investment in computer technology, skewing GDP growth figures while at the same time showing a decrease in R&D.

“If we take Ireland out of the equation it would imply a *negative* relationship between the public-private research factor and growth. This does not necessarily mean that there is anything wrong with public-private linkages, but perhaps too much is being expected of them in the European context.”²²

Excessive expectations are part of the structure of European innovation policy development. The Lisbon 2010 Strategy relies upon using various benchmarking exercises. Those benchmarks are US-based and have not been altered to take account of the fact that the US system has different institutional and legal structures. These include very important instances of path dependency. Research on innovation structures illustrate that path dependency can be both a strong source of assistance or hindrance to policy effectiveness. The general openness of civil society to

²² Lorenz, Edward & Bengt-Åke Lundvall. *How Europe's Economies Learn: Coordinating Competing Models*. OUP, 2006, 41-2.

innovation and the *general* level of education in society are also factors strongly correlated to countries and regions where state-driven innovation policies have been a success. This is seen in the discussion of knowledge spillovers. Knowledge spillovers continues to be a major discussion topic in the innovation strategy sector – the problem with this stream of literature is that much of the current trade research does not place that much weight on the idea of spillovers, only the macromodels are willing to engage in such speculation.

It is important to note that correlation is not the same as causation and that many policies attempt to recreate environments artificially that existed in other successful locations organically in order to exploit a misunderstanding between correlation and causation. This policy failure is further amplified when it is accompanied by high expectations, based upon a flawed notion of prediction where innovation is considered to be incremental and easily effected. This may be true, to a certain extent, of process innovation (e.g. building a better toaster) but not of fundamental innovation (inventing a new mathematical algorithm for computer processing). Fundamental innovations, such as Google, are by their nature uncertain and cannot easily be planned, timed or replicated.

As mentioned above national systems of innovation (NSI) is an area of economics that apparently goes back to Fredrich List (1841) *Das Nationale System der Politischen Ökonomie*. Modern researchers, drawing from List's original work, use a typology of knowledge for their analysis:

	Individual	Collective
Explicit	Embrained Knowledge	Encoded Knowledge
Tacit	Embodied Knowledge	Embedded Knowledge

Source: Lorenz, Edward & Bengt-Åke Lundvall. *How Europe's Economies Learn: Coordinating Competing Models*. OUP, 2006, 117.

Mode 1 and Mode 2 of knowledge production

Mode1

Produced in strict academic environment

Disciplinary

Homogeneous

Hierarchical organisation

Not Socially Accountable

Produced by academics or technicians

Mode2

Produced in relation to its application

Transdisciplinary

Heterogeneous

Non-Hierarchical organisation

More socially accountable

Produced by a wide set of actors

Much of these models of knowledge processing and creation are related to firm structure, most notable bureaucracy models of firm organisation. The importance of these hierarchical structures within the university was outlined above but it also applies to private sector firms and society at large. Again the importance of wider society to accept innovations and work freely between the different dimensions of the knowledge typology matrix is key to greater knowledge creation and turning human know-how into viable income flows. The necessity of this “knowledge

society” to innovation indicts overly narrow education systems, both in scope and in participation. The narrow education system is the one that is embodied by the US/UK model where there are narrow professional education streams and a strong focus on academic credentials and little regard for expertise that is acquired from practical problem solving learning, i.e. vocational training. This results in a highly educated elite and a larger poorly educated general population. A broad education system is one that is competence-based and has important roles for both the vocation and academic education streams, such as in the Netherlands, Germany and Japan. Essentially, the narrow model of learning will only result in limited innovation since it is so heavily focused on the creation of a bureaucracy model of economic growth with little regard for society. In the end this model gives rise to the dreaded *rentier* model of economic activity. A quick analysis of the current economic practices in Ireland and the lobby system in the United States provides affirmation of much of what this hypothesis of innovation pass-through posits.

The one interesting aspect of much of this work on innovation is the fact that it does consistently suffer from an over-determined, typically linear but sometimes cyclical, system of analysis. Writers such as Walt Rostow²³ and Nikolai Kondratiev are partly

²³ Rostow's five stages:

- The Traditional Society (pre-Newtonian)
- Preconditions for Take-Off (driven by invasion/exogenous)
- Take-Off (Endogenous/Blocks to progress removed/Technologically driven)
- Drive to Maturity (Sustained economic growth with technology spreading across all sectors of the economy/import substitution/new import requirements/expansion of exports)
- Age of High Mass-Consumption (An economy focused on the creation of durable goods/factory employment/social welfare created)

to blame for these concepts of innovation and economic development. The focus of their ideas is, in essence, the notion of progress. Progress in the sense of the consistent march that gave rise to Herbert Spencer and Robert Malthus both using the terms “evolve” and “evolution” in their work. The idea that this system of continuous “change” or “innovation” will be at the outset (1) positive and (2) employment producing is part of an analysis that looks at the particular and attempts to project (in the form of theoretical statement) to the general. This projection of a description of the particular to the general is done without making any considerations for sample size or for the over-arching pitfalls that are at the core of Bacon's warnings about the idols that science must avoid and combat. The nature of investigation and the nature of development are being intertwined in this discussion of innovation policy, with one crucially buttressing the other.²⁴

Part of the attraction of this early theory of innovation and growth grows out of underlying issues with the accounting for technology in economic growth. Joan Robinson wrote an account of the various failed attempts to understand the links between technology and growth in “Misunderstandings in the Theory of Production” *Greek Economic Review* Volume 1 (1979). The mid-twentieth century assessment of the US Institutional School addressed the initial response of the US

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- Beyond Consumption (Pursuit of satisfaction in areas beyond the control of material goods and the marginal utility of consumption/reflected in a baby-boom)

²⁴ For those that do not know the Baconian idols they are from Sir Francis Bacon in his *New Atlantis*:

Idols of the Tribe (peculiarities to the race) *idola tribus*
Idols of the Den (peculiarities to the individual) *idola specus*
Idols of the Marketplace (abuse of language) *idola fori*
Idols of the Theater (abuse of authority) *idola theatri*

academy to the problem of growth and technology. The general scorn for high theory held by the Institutionalism resulted in an analytical framework where detailed descriptions of economic facts became the exposition of economic theory. That description became theory was most notably a problem in Veblen's work. This is important to remember since Veblen is one of the intellectual progenitors of human capital theory.

“A latter-day saint of the institutionalist school, C.E. Ayres, provided one of the most intriguing accounts of the historical interaction of technology and institutions; but, like Veblen's, his 'theory' is really description, and flawed description at that. According to Ayres, technology is a dynamic, 'progressive' force – impersonal, automatic, self-propelled – whereas institutions are uniformly resistant to change. In Ayres' view, economic development – indeed, history itself – was the outcome of the permanent tension or struggle between progressive technology and conservative (or reactionary) institutions. However fascinating for undergraduate readers, Ayres's 'theory' shared the faults of his predecessors' in the institutionalist and historical schools as well as their neglect of and contempt for market processes.”²⁵

In the Irish case the theory of rapid-innovation based industry (RIB) was applied. This was largely due to the idea of useful economic backwardness. This is a concept that sees economic development as eased in less advanced countries since industry and technology are afforded greenfield status since there are no pre-existing obsolete capital goods that need to be ushered aside to bring about “progress”. This theory of development was associated with Alexander Gerschenkron (1962) and the policy focus was that the more backward the country the more state intervention required to cause growth.

²⁵ Cameron, R. “Technology, Institutions and Long-Term Change” *Economics in the Long View: Essays in Honour of W.W. Rostow*. Charles Kindleberger & Guido di Tella, Eds. In 3 Vols. London: Macmillan, 1982. Vol 1. pp27-43.: pp30.

Daniel Breznitz provides the clearest analysis of the impact of a state-driven approach to innovation and economic growth:

“There are two main strands of systems-of-innovation theories. The American strand focuses more on the influences emanating from the different ways in which R&D is organized and finance (Nelson 1993). The European school, originated at Ålborg, has been more focused on explanations based on users (or user sectors) to producers, and has a stronger emphasis on the role of the quality of demand on the development of capabilities; that is, greater attention is given to the correlation between the sophistication level of customer and users and the overall innovation capability of their suppliers. (Lundvall 1992, Lundvall et al. 2002).

Systems-of-innovation theories implicitly argue that three main variables explain the amount and intensity of industrial R&D of each system, all intimately connected to the fact that industrial R&D is a semipublic good. The first variable is the location of industrial R&D activities within the industrial system. The levels of industrial R&D sophistication and capabilities differ according to whether most of the industrial R&D is conducted by the firms themselves or by public and semipublic organizations like research institutions and universities. Systems-of-innovation theories contend that there are major differences between systems depending on the location (public or private) and the identity of the agents that typically conduct most of the R&D. While most writers do not deal with these issues in detail, the logical conclusion of their argument is that the more R&D that is conducted by private firms, the more private industry develops sophisticated R&D capabilities.

The second variable is financing. Different financing modes affect not only the location of R&D activities but also the focus (time horizons and product versus process innovation) and amount of industrial R&D.

...

The third explanatory variable highlighted by systems-of-innovation theories is the industrial-opportunity structure: the composition of the local industry, including the links among producers, between producers and customers, and between the local industry and the global production networks, in particular, with the MNCs that control them.”²⁶

In his context he compares Ireland with Israel and Taiwan. All have slightly different approaches to innovation-driven economic growth. Taiwan is high focused on

²⁶ Breznitz, Dan. *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*. London: Yale UP, 2007. pp. 26/7.

certain leading industries and is defined by heavy regulation. It has much in common with the neo-mercantilist economic policies of the ASEAN group. Israel is a more neutral approach in both regulation and industries. What Israel has excelled at was the development of a deep and broad venture capital system which has continually supported and advanced their innovation-growth policy. Ireland is between Taiwan and Israel. Ireland has not created a robust, deep or broad venture capital system due to crowding out effects of organisations such as Enterprise Ireland, that undermine established venture capital business models. The relative inexperience of universities has also been detrimental to the development of a more comprehensive innovation system. This is partly the result of internal political difficulties that marry a neo-liberal approach to government regulation and intervention with a strongly stateist approach to economic development, particularly innovation policy. In Ireland the state remains the single largest source of venture capital, a situation which is not replicated in other high-growth, innovation-led small open economies. Enterprise Ireland does not provide sufficient levels of early state investment (the Angel Investor stage to use the jargon) to encourage the sort of technology-driven start-ups that state policy desires. This can be seen in some of the “success stories” of Irish economic history.

Ireland's economic development as accepted policymakers, according to Breznitz, is the story of T.K. Whitaker and *Economic Development* where a strong change in state policy with state fostered industry gave rise to the eventual “Celtic Tiger” economy. The facts relating to Irish economic history are clearly not as simple.

Despite the importance of Whitaker's planning to Ireland's development there were additional factors.

One of those additional factors was the influence of outside organisations of Irish economic and education policy. This was most clearly seen in the response of Minister for Education Donogh O'Malley to the OECD reports on education in Ireland *Investment in Education* (1965) and *Review of National Education Policies – Ireland* (1969). The opening up of free secondary education was a watershed event.

Ireland's policy to education has always been driven by economic imperatives. “Better education will support and stimulate continued economic expansion. Even the economic returns from investment in education and training are likely to be as high in the long run as those from investment in physical capital”²⁷ Education was about jobs and economic development. It was the position taken in the 1960s and it has continued to the present day. Ireland wanted to expand universities rapidly but did not apply the two stream approach of the Northern Europeans. Ireland's focus was to intertwine technology and education. This was reaffirmed in the Culliton Report. Science, technology, research and development were the rallying cries of ministers and policymakers alike when it came to education. The unfortunate problem was that the education policy debate froze in the early 1970s and never progressed, with the same underlying principles and objectives being recycled

²⁷ White, Tony. *Investing in People: Higher Education in Ireland from 1960 to 2000*. Dublin: Institute of Public Administration, 2001. pp 27.

regardless of what party was in power or the condition of the public finances.

What continues to be consistently underestimated by Irish policymakers is the importance of secondary education to the development of the economy in the past and in the future. Claudia Goldin and Lawrence Katz in *The Race Between Education and Technology* (2008) illustrate using US and European historical data how the systematic policy of primary education in the early nineteenth century and the expansion of free secondary education throughout the late nineteenth and the first half of the twentieth century placed the United States at an advantage industrially *vis-à-vis* Europe. Secondary education especially seemed to be the deciding factor. Even within the European context the comparative strength of the Prussian education system was considered partly responsible for the easy routing of the Austro-Hungarian army.

“The OECD influence was also critical in the early 1960s in the establishment of the regional technical colleges, which have been recently upgraded to institutes of technologies (OECD 1965,1969). This was the first in a series of changes that overhauled the Irish higher education system, first in the 1960s and continuing in more vigorous fashion in the 1980s after the IDA included education policy in its overall view of the supply side of Irish industrial policy.”²⁸

State intervention in education in the 1960s was not always welcome or successful. The failure of the merger between Trinity College and UCD had a long lasting impact. The origins of the computer software industry in Ireland can be found in an

²⁸ Ibid at 154.

attempt on the part of Trinity College to counter what was seen as a predatory attack on its engineering department in 1969. UCD responded by expanding its own computer science programme and produced the foundation for the successes in ICT of the recent years. This is a clear case of the universities responding against government policy and producing a growth inducing result.

The creation of Science Foundation Ireland (SFI) was yet another attempt at government led economic growth. SFI's structures are based on the National Science Foundation (NSF) in the US. William Harris, one of the first SFI directors, was in charge of one NSF division prior to his appointment.

“By establishing these two programs [SFI and PRTL] in 1998 the Irish state indicated its seriousness about transforming the academic research infrastructure. However, there are still many caveats as to the continuous state support for SFI and its medium- and long-term influence. Moreover, even when finally moving to upgrade the Irish research apparatus, the Irish state still employs FDI orientation – for example, in its insistence on the participation of foreign-based scientists. Hence questions remain as to whether the goal of the SFI is a genuine attempt to change the Irish economy capabilities toward rapid innovation-based industrialization or just the last stage in supply-side policies to create MNC-attracting human capital.

Thus, although the development of the Irish education system is unprecedented in Irish history and has greatly helped to propel Ireland along the track of high-skills IT industrial development, it appears that the strategic view behind these developments treated education mainly as a way to produce high-skilled labor, not innovation and research. Only in the past five years have policies with a vision of making Irish higher education system more research orientated been implemented.”²⁹

State innovation policies are not without serious political implications:

“...growing awareness that its main beneficiaries are company stockholders rather than local interests is currently encouraging much reconsideration. As flexible

²⁹ Ibid at 156.

production organization begins to supplant mass production as the leading edge of capitalist development, a clearer sense of the differences of radical local economic transformation seems to be in the air, and more realistic attempts to build incrementally on what already exists are now a major focus of attention. This situation is underscored by the widening internationalization of production and markets, and the imperative of maintaining the competitiveness not so much of lagging regions as of leading regions. In this, the needs of growing flexible production agglomerations have become paramount. Thus, innumerable trial efforts in institution-building and social regulation directed to heighten innovativeness and the search for superior product quality in such agglomerations are not on foot in many different countries, e.g., the United States and other parts of the World. An extensive but scattered corpus of theoretical speculation about the appropriate forms and functions of collective action in flexible-production agglomerations has also started to unfold. Some stock-taking seems to be in order.”³⁰

Ultimately, state-led policies are not the only solution. In many ways Ireland's political confusion combined with a desire to exploit its corporate rate of tax for FDI inflow purposes has resulted in a policy defined by a lack of commitment. The Irish State's policies have at once created incentives for rent-seeking by individuals, which undermines entrepreneurial activity and innovation but at the same time a slavish focus on MNC-driven taxation revenue (which was later added to by a property bubble) has turned the policymaking structure itself into ultimate rent-seeker. The Irish government must also be aware of the potential pitfalls of an FDI-driven policy of innovation. Issues related to the use of public funds for facilities and tax breaks and government (be it fully or partially) funded intellectual property need to be made clear to the various actors directly involved and to the electorate. The lack of success in innovation in Ireland is due to an endemic lack of focus and home-grown vision.

³⁰ Scott, Allen. *Technopolis: High-Technology Industry and Regional Development in Southern California*. Oxford: University of California Press, 1993. pp 258.

This is not to say that European Union research policies will necessarily result in a well-balanced approach to research of education or in innovation. The focus on the need for “useful” research within the EU Framework Programmes has resulted in the near elimination of EU level support for basic fundamental research. The implications of this policy for groundbreaking innovation is explored in Section 4 of this essay.

The recent EU “Network of Excellence” system is an example of the problems of merging education policy so closely with innovation-led growth. Universities are expected to pour significant amounts of their own internal funds into becoming a point within the European network. The incentives produced by this protracted and expensive networking process has been the growth in number and power of research bureaucrats (both at European and National level) whose main competence is precisely in networking, “steering”, writing lengthy reports and directing researchers do the same.

At first the EU policy was a simple adaptation of the small business innovation research (SBIR) programme with the objectives being similar to that of the Bayh-Dole Act. Essentially, restart the European (American) economy via the universities. This was not altogether unusual since science and technology have always been at the heart of the European politics since the 1950s with Euratom.

Science, technology and universities again attracted more political attention in the

early 1980s. The Delors Commission had a firmly integrationist agenda and was attempting to overcome the unemployment and slow growth of the post 1970s period. European universities begin the process of integration when Commissioner Peter Sutherland creates the Erasmus programme. Jacques Delors successfully grasped this momentum by putting forward a whole package of initiatives, among them the large technology programme (the so-called Framework Programme (FP)). This had two effects. EU involvement in scientific technological matters and the pursuit of competitiveness were to be the guiding forces on education. The Lisbon 2010 objectives is the culmination of this process, which has become a major *raison d'être* of the European Union.

Has the European policy of frameworks produced economic fruits? According to the data, information from science journals provides only 7.2% of the cited inputs into patented inventions.³¹ Despite EU incentives the development of human capital remains a national affair and firmly within the confines of the subsidiarity rule. The EU is actively encouraging university-firm linkages but these are largely determined along national lines and rely heavily on pre-existing social capital and legal structures to be successes or failures. This is what makes the Irish situation so important. Over the past fifty years Ireland has taken most of its education cues from external sources. In certain circumstances they have been a stunning success but in other they have encouraged rent-seeking and tribal hostilities.

³¹ Barré, Rémi, Michael Gibbons, Sir John Maddox & Pierre Papon. *Science in Tomorrow's Europe*. Paris: Economica International, 1997.

Section 4

Where is the law in education?

4.1

Introduction

In this section we review the regulation of higher education in Ireland. The complicated series of controls (not all of which appear on the face of the statutory record) is apparent. Therefore, the link between economic issues and the development of HE takes place in an environment of particular complexity. As noted in prior chapters, there are seven universities and 14 "institutes of technology" (ITs) in Ireland, as well as a number of other public institutions (such as teacher training colleges), private institutions, and a growing further education sector. They are governed by a patchwork of domestic legislation, administrative practices and international instruments.

4.2

Legislation and Powers

In terms of the awarding of qualifications, universities and the Dublin Institute of Technology award their own degrees and are controlled by the Universities Act 1997 and the Dublin Institute of Technology Act 1992 respectively. Other higher education institutes are either associated with a university or come under the auspices of the Higher Education Training and Awards Council (HETAC)

(established by the Qualifications Act 1999), who can then delegate award-making power to an individual institution. Around 150,000 students are in higher education in Ireland, with an age cohort participation of over 50% - a significant increase over the course of 20 years, though the persistence of underrepresentation, considered in the historical chapter that opens this paper, remains a significant and stubborn public policy challenge.

The universities are creatures of charter or public legislation (from the Charter of Queen Elizabeth founding Trinity College “near Dublin” in 1592 to the Dublin City University Act and University of Limerick Act in the 1980s) but are governed in practice by a significant piece of general legislation, the Universities Act 1997 in terms of functions, powers, duties etc. For so long as a university is in receipt of public funds, it is bound by the Act; the funding is channelled through the Higher Education Authority (HEA) established by the Higher Education Authority Act 1971 (the Act has been amended a number of times, typically to extend the Authority's powers and functions). The HEA has certain statutory powers in relation to university activities, primarily in relation to finance, although some general review powers – in the areas of equality and quality review, for example – are potentially wider in scope. However, the extent of the engagement by Government with still autonomous institutions (which, in the context of publicly funded institutions, are relatively autonomous by international standards) is limited both by express powers allocated to universities and by the removal of clauses objected to by universities during the difficult gestation of the Act over the course of a number of years. The

institutes of technology are governed by the Institutes of Technology Act 2006 operating in conjunction with the Regional Technical Colleges Act 1992, and now also receive their funding through the HEA. Prior to 2006, the ITs were funded directly by the Department of Education and regulated by the prescriptive Regional Technical Colleges Act 1992 with significant involvement of local Vocational Education Committees.

Funding and Policy

HEIs in Ireland typically depend on State funding for the vast majority of income. This has traditionally been distributed under two headings, 'block grant' (allocated as a general grant without subheadings or targeting) and funding 'in lieu of fees' (tuition fees for Irish or EU students having been abolished in 1995). A new financial model (recurrent grant allocation model or RGAM) is currently being rolled out. This is carried out on a purely administrative basis, i.e. without any primary or secondary legislation, but is of particular interest to institutions and indeed the various interest groups as it can (in a classic exercise of power through budgetary control) influence the decisions and internal processes of institutions; it also contains a number of features that purport to contribute to the achievement of policy goals of interest to our project in terms of social and economic factors.

The abolition of tuition fees, though an internationally notable aspect of Irish higher education policy, was implemented on an entirely non-statutory basis, and could be

changed by a Government without any changes to the law – indeed, section 41 of the Universities Act 1997 (which post-dates the abolition of undergraduate fees) explicitly maintains the power of the university (and not central government) to set fee levels. In practice, the fee for eligible undergraduates will be set by reference to the subvention that the institution will receive, although this again depends on voluntary cooperation between the institutions, their representatives (the IUA) and State authorities. It is also worth noting that a number of influential reports have recommended the reintroduction of some form of fees (OECD 2004, National Competitiveness Council 2005, Royal Irish Academy 2005) – but the political climate is such that until recently, this was not a realistic prospect, and was not a serious proposal in the most recent election (2007). The current Minister for Education, though, suggested in 2008 (in an extraparliamentary context and without formal Government support) that the matter is to be reviewed. In any event, the fact that Government support is tied up in the grant ‘in lieu of fees’ (an administrative/budgetary concept) has caused significant problems for institutions who argue that overall financial support has dropped, and the debate on tuition fees during the summer of 2008 allowed this matter to be raised once more by institutions.

Other sources of funding include targeted grants (e.g. for QA, e-learning, etc) and tuition fees for postgraduates (2nd/3rd cycle) and non-EU students. Little if any of this funding, in the case of targeted grants, is pursuant to a particular statute or statutory instrument; instead, it is typically funded through the Higher Education

Authority's budget which is allocated to it in the annual Estimates and must be spent in a fashion that is not inconsistent with the Authority's statutory mandate; however, this mandate is not constrained in a particularly onerous fashion. Ireland's system of administrative governance is in transition, with a plethora of new arms-length agencies established in recent years (examples include the Commission for Communication Regulation, the Commission for Taxi Regulation, the proposed Dublin Transport Authority, and the controversial Health Services Executive). The factors that lead to this situation include a strengthening economy (until recently) and a reluctance (in the context of prevailing policy wisdom in the European Union) to engage in command and control economic planning. In addition, an understandable distrust of political influence, exacerbated by the hyper-local context of Irish politics through the parliamentary/executive model, the operation of proportional representation through the single transferable vote in multi-seat constituencies, and the record of corruption and malpractice that has emerged in recent Tribunals, means that independence occupies a high priority in political discourse. Finally, the relatively slow development of administrative law and 'agency law' in Ireland in the 20th century means that some of the accountability and scrutiny measures familiar in other jurisdictions have not yet been enacted in this state. While there is some convergence between policy aims of central government and funding, such decisions are essentially acts of executive discretion and, subject to the normal restrictions of public law (judicial review of administrative action in limited situations) and of parliamentary oversight (at least in theory), there is a relatively wide freedom of action granted to the designers of such

funding schemes. Similarly, the fees set for students other than those included in the ambit of the 'free fees' scheme (in practice, the fees payable by many postgraduate students and all non-EU undergraduate students) do not see the involvement of the Department of Education nor the Higher Education Authority and thus reflect a flexible, uncomplicated method for institutions to increase and diversify their funding without regard to other authorities; whether this is appropriate or efficient in the context of national policy objectives is debatable.

The OECD report of 2004 made a number of other significant recommendations (which do overlap with aspects of the Lisbon Agenda as discussed later in this) that would require legislative change, such as the reduction in the size of university and IT governing authorities (regulated by the Universities Act, the private act applicable to TCD, and the legislation governing the Institutes of Technology), which include student and staff representation, and many external members in most cases.

These recommendations have not been implemented. However, the detailed HEA guidance on governance (set out in the Code of Governance), published in late 2007, is an alternative approach, not requiring further legislation but codifying statutory and other principles into a single, influential document.

4.3

Quality Assurance and Accreditation

It was also suggested (in the OECD report) that the system of quality review be rationalised. At present, the universities have statutory responsibility for ensuring that their QA procedures are reviewed externally, although this role is delegated to the Irish Universities Quality Board, an unusual legal structure co-funded by the HEA and the universities (the latter acting through the Irish Universities Association), incorporated as a private company and governed by a Board including representatives from each university (a minority of the total) and from a range of other constituencies. Additionally the HEA may (Universities Act, section 49) review the QA procedures of a university (though, in the light of the Qualifications Act, these functions must now be performed after consultation with the NQAI); this is the legislative basis for the important review carried out (under contract) by the European Universities Association (EUA) in 2004 on behalf of the universities acting through the IUQB and the HEA.

In the case of the institutes of technology and indeed private higher education institutions, receiving their accreditation or delegated authority from HETAC, it is HETAC that is responsible for agreeing quality assurance systems with the institution. In the case of the Dublin Institute of Technology, its QA is reviewed by the National Qualifications Authority of Ireland. Finally, a number of institutions (such as colleges of education that are autonomous but have their degrees awarded

by a university) do not fit easily into any category.

Overall, though, the level of scrutiny is somewhat lower than that applied by the Quality Assurance Agency in the UK (in particular in the case of the universities) It should also be noted that some professional associations (such as the Institute of Engineers in Ireland) as well as statutory professional bodies (such as An Bord Altranais ('The Nursing Board')) are involved in the regulation of higher education through the accreditation of programmes in institutions (including universities and institutes of technology); this process, not yet aligned with quality review nor with HETAC approval, is an interesting one as, at the level of the programmes that seek professional accreditation, the granting or withholding of such status is of paramount importance and thus the system of accreditation and review is influential. In the context of the gatekeeper functions (and support of rent-seeking behaviour) of the professions in Ireland, this sliver of educational control is worthy of careful consideration.

4.4

Reform

Virtually all considerations of curricular change can be dealt with under the Government's desire to see "higher education reform"; the principles of such development and reform being defined by government as including lifelong learning, economic development, the building of capacity for research, and

improvements in teaching and learning quality.

In the Budget announced in 2005 and in subsequent budgets, the Minister for Finance announced that €300m (over 5 years) would be allocated to a Strategic Innovation Fund, the creation of which had been announced by the Minister for Education earlier that year. The seven purposes of the fund were defined as rewarding internal restructuring/rationalisation, improving performance management, staff and structural reform, teaching and learning reform (inc. modularisation and e-learning), quality improvement, and 'access, transfer and progression' between institutions and levels. These purposes draw from the principles of reform as outlined above and overlap with areas of particular interest from the existing legislation (for example, access transfer and progression is a function of the NQAI; quality improvement, of course, is part of the partially-legislative quality assurance question more generally). There have now been two rounds of strategic funding (SIF 1 and SIF 2).

4.5

Non-Governmental Organisations

A key player in the contemporary higher education field is the Irish Universities Association (IUA), which acts as a lobby group, a mechanism for coordination, a partner in the quality review system, among other things. In parallel with the professionalisation of Universities UK (UUK) in the neighbouring jurisdiction, the

IUA has an increasingly significant secretariat / central function, and is, in its own right, of particular relevance to any survey of the formation of higher education policy. The IUA document of 2005 on 'Fourth Level Ireland' is generally recognised (even by those who disagree with the substance of the IUA's proposals) as an especially influential intervention. On the other hand, it is not uncommon for individual heads of universities (acting alone or in concert with others) to pronounce on important issues of HE policy and the tension between the collective and individual approaches has yet to be resolved.

There are a number of other collective organisations in the sector, such as Institutes of Technology Ireland (IOTI, undergoing some development at the moment) and the relatively informal Council of Heads of Irish Colleges of Higher Education (CHOICE) and Higher Education Colleges Association (HECA) (private HETAC-accredited institutions). The Union of Students in Ireland (USI) is an association of local students' unions (which, unlike the UK, are not dealt with by law; they are also not directly analogous to trade unions or service associations and differ in terms of autonomy and financing across the jurisdiction) which, in practice, acts as both lobby group and nominator of 'student representatives' or 'learner representatives' to bodies such as the HEA, NQAI and HETAC. Higher education workers (academic and non-academic staff) are represented by a number of trade unions, including general unions such as SIPTU (the largest Irish trade union) and sector-specific unions like the Irish Federation of University Teachers (IFUT). Most of the organisations mentioned in this section participate in relevant European bodies; for

example, HETAC is a member of the European network of quality assurance agencies (ENQA) and USI is affiliated to the European Students' Union (ESU).

4.6

Observations

The involvement of public bodies and the achievement of policy objectives in Irish higher education is therefore a complex picture story that lacks a single author. As we note below, the European and international landscape of higher education has seen significant reforms; in Ireland, though, these developments, including the soft power of the OECD, is refracted through administrative action, collective self-regulation or co-regulation, budgetary decisions and influence of NGOs. The difficult debate of the 1990s on higher education legislation and the ongoing anxieties in relation to the status of the 'binary system' and the institutes of technology seeking university status thus do not represent the totality of higher education regulation; a study of the Universities Act, for example, would not explain in full how the HEA influences the development of universities.

4.7

The Bologna Process

The Bologna Process is a relatively unconventional structure in legal terms. While having a strong relationship with the Council of Europe and in particular the

European Cultural Convention that the Council is responsible for (states must accede to the Convention if they wish to 'join' the Process), its decision-making structures are not those of a familiar intergovernmental organisation, and the Council's role is quite limited. Ireland 'joined' the Process at the first summit of Ministers in Bologna in 1999.

The Process includes regular Ministerial summits (the most recent being in London in 2007) which have each issued a Communiqué and a Secretariat (based in and typically using staff from the state due to hold the next summit) but the work between summits and – in practice – much of the drafting and planning for a communiqué and for future events takes place under the watchful eye of the Bologna Follow-Up Group (BFUG). Each member state (that is to say, members of the Process) are full members of the BFUG (as is the European Commission), and a variety of 'stakeholder' organisations such as the European Universities Association, the European Students' Union and Education International (trade union) are non-voting members of the BFUG, although these organisations tend to play a very active role at meetings and in Bologna activities. The BFUG establishes various Working Groups (with membership typically including a number of member states and organisations) and organises or recognises seminars and conferences. From each working group or event, a report or set of recommendations may emerge. Many of these will be referred to in a future communiqué and indeed the details are invariably contained in such documents; an example is the evolving European Quality Assurance Register in Higher Education (EQAR) launched in March 2008

that has emerged from a number of Bologna follow-up processes.

Signatory states are required to participate in various reporting activities, and play a role in the planning of future activities and action lines (although participation varies and not every state is represented at every meeting). Civil servants in the relevant national ministry attend BFUG meetings, and parallel structures are expected at national level (i.e. with representation of stakeholders) to ensure that the national representatives are fully briefed on Bologna implementation. Similarly, the consultative members of the Process provide training, information and resources to their affiliated national or sub-national organisations, a particularly significant part of dissemination.

Thus, the Process can be seen as exhibiting evidence of traditional intergovernmental organisation (the privileged role granted to nation states and the role of civil servants and Ministers at appropriate junctures), the current European reality (the full membership of the European Commission), the developing practice in international organisations (involvement of civil society) and a 'soft law' approach (no formal compliance mechanisms). However, one particularly interesting element of the Bologna Process is that it is not governed by a treaty or convention; it has evolved over time and, for example, the BFUG structures were not part of the original Communiqué. Thus, the legal basis is primarily based on trust and co-operation rather than on a more conventional intergovernmental approach.

Bologna Cycles

The impact of Bologna has differed from state to state. The development of 'cycles' (initially two cycles, typically three years (bachelor) and two years (master) in duration; recently the 'third cycle' (doctoral) has been added and discussion on postdoctoral research is ongoing) has dominated the perception of Bologna within institutions in particular, and the Irish and UK systems have thus enjoyed a position of comfortable ignorance of the Process (as distinct from, for example, the significant changes to the entire higher education system in Germany). However, the Bologna Process involves much more than cycle-reform, and compliance by signatory states is keenly watched by stakeholders in particular, rarely missing an opportunity to (directly or through an affiliated organisation) highlight a perceived failure to comply with a particular benchmark or target. Furthermore, the 'stocktaking' element of the Process (where progress is measured and assessed) is again a source of peer pressure within the community of nation states. The results in respect of Ireland have broadly been favourable (in that strong compliance is reported) although the alternative analyses produced by universities and students note deficiencies in the headline measurements. Probably the most notable challenge to be dealt with over the coming years is the status of the Bologna Process internationally and whether the international expectation of standardised cycles and processes will lead to further changes in Irish higher education. Given the well-documented criticisms of the 'one-year Masters degree' familiar in the UK, the

elements of Irish HE that duplicate British practice, with the said Masters programmes being but one example may be similarly challenged.

Working with Bologna

In Ireland, the National Qualifications Authority of Ireland (NQAI) is charged (under the Qualifications Act 1999) with the development of a National Framework of Qualifications (NFQ). This framework has been completed and significant progress made on 'mapping' existing qualifications to it (the obligations on institutions vary; for example, the universities have a statutory obligation to cooperate and assist (section 40, Qualifications Act) whereas other institutes seeking HETAC validation or delegated authority will automatically work within the framework as a condition precedent to approval. Although the Act does not in any section mention or suggest any aspect of the Bologna Process, the Irish framework has been aligned (or such alignment is being confirmed) to the Bologna framework (EHEA-QF) and also to the EU's European Qualifications Framework (EQF), a non-binding framework that encompasses all levels of education including higher education.

Quality assurance is another example of where the Bologna Process reinforces developments at the national level. As discussed above, a number of institutions of varying origin engage in QA activities in Ireland. Some of these bodies (the IUQB and HETAC) have in turn been reviewed externally so that they may be in a position

to apply for membership of the EQAR, as under the Standards and Guidelines approved in the Communiqués, such review is necessary before an application can be accepted. This is an important verification of how the regulation of a key aspect of university reform and development (and QA is more significant than a mere checking of procedures, as it is a driver of investment and modernisation in many areas) that involves not just the statutory scheme but crucial non-statutory decisions (such as the IUQB which was not even contemplated in the Universities Act) and the persuasive power of Bologna Process decisions.

Bologna Summary

The Process thus does represent an external constraint on the independent development of the Irish higher education system, albeit one freely entered into and – it is understood – not a significant burden, at least as compared to other signatory states. Indeed, the latter stages of Bologna Process development (with a focus on social cohesion, quality assurance, research and other topics) may be a more significant source of regulation or compliance-driven development. Within Ireland, Bologna Process compliance is monitored by a national Bologna Steering Group made up of stakeholder representatives (Department of Education as chair, IUA, IOTI, DIT, HEA, HETAC, NQAI, USI).

4.8

The influence of European and international measures on Irish higher education

The EU is restricted to acting within the competences assigned to it by its Treaties - a matter that was at the heart of the recent referendum on the Lisbon Treaty. Higher education is *not* within Union competence (and the Lisbon Treaty would not change this state of affairs), but the Union's role is derived from Article 149. Thus, in its desire to contribute to quality education, the Commission contains a directorate (Education and Training) and commissioner (Figel') and has a significant work programme, while the Treaty sets the Union's role in "encouraging cooperation" and "supporting and supplementing" Member State action, focused on issues such as mobility, distance education, international cooperation and "incentive measures" that do not represent the harmonisation of national laws.

Notably, educational outcomes are a key component of the 'Lisbon Agenda' or 'Lisbon Growth and Jobs Strategy'. The Strategy (not to be confused with the unrelated Lisbon Treaty) is a classic example of the use of soft law (the open method of coordination) where there is neither a legal basis nor political will for full processes based on law. Alongside other areas of employment and social policy that are similarly situated, education and research form part of the goals to be met by Member States and are the subject of a number of benchmarks. In addition, vocational training is the subject of separate Treaty provisions (Article 150) which

provides for a more significant Commission role. Thus, the level of EU involvement can follow an educational/vocational divide; this reflects in part the historic treatment of vocational education under pre-Maastricht treaties.

The progress reports of the Irish government with regard to the Lisbon Strategy and education indicate that while the targets and goals of Lisbon have an influence on the content of the debate and policy process on education in Ireland, they are treated as one influence among many. The Irish government has for many years highlighted the role of education and training in the development of the Irish economy; in addition, major reforms in higher education took place during the 1990s, including as just some examples the abolition of undergraduate tuition fees for all full-time Irish or EU students, the enactment of new university legislation, the evolution of the regional technological colleges into ITs, and the planning of the National Framework of Qualifications. However, there has been a recent move towards further 'reform', in which the influence of Lisbon, especially at the doctoral level, is apparent; the meeting of Lisbon targets therefore receives significant attention from the Government and stakeholders. For example, although the Irish target was to see gross expenditure on R&D increase to just 2.5% by 2013 (short of the European target of 3%), from a 2001 position of 1.4%, this is still considered an ambitious target, especially in conjunction with the related ambition to almost double the number of researchers in the economy, and is likely to be the subject of pressure in the forthcoming Budget. However, the most recent budgets have included

designated funding for academic and non-academic research and the developing RGAM incentivises research through allocation formulae.

It should not be forgotten that Ireland also has obligations under international human rights law to develop its education system, such as the obligations contained in Protocol 1 of the European Convention on Human Rights and Article 13 of the International Covenant on Economic, Social and Cultural Rights; the latter is particularly significant in that the State declares its commitment to the "progressive abolition of tuition fees". However, as the ICESCR lacks a conventional enforcement mechanism, and the ECHR's obligations are somewhat distant from most aspects of higher education regulation, it is fair to say that even the persuasive force of the international legal instruments is not nearly as influential as that of the newer (and less legal) Bologna Process and Lisbon Agenda.

Section 5

Education and the Role of Human Capital in Economic Theory

The role of education in economic models is rather fuzzy at best. A look at the two volumes of the *Handbook of the Economics of Education* reveals that much of the research done in this area is related to empirical studies on issues like teacher quality, the effects of school choice, the graduate premium.

Though much of the analysis done on the statistical side of education is very important it must also be considered in light of many caveats. Education statistics have only recently (the OECD's *Education at a Glance* was first published in 1991) become comparable across nations (and that is only using instruments that come with their own caveats, such as TIMSS (Trends in International Mathematical and Science Study) and PISA (OECD Programme for International Student Assessment) but also a general problem of paralysis by analysis brought about by these metrics.

The processes of innovation and education are extremely nuanced and statistics often are forced into measuring and counting intermediate factors that are not immaterial to certain static points in the innovation process but that do ignore important internal dynamics and incentives. In the case of education only very “academic” types of intelligence are typically measured. This creates an automatic hierarchy whereby those with more vocational and technical abilities are placed at an evaluative disadvantage and policies aimed at making these students excel become afterthoughts. In addition, there is a tendency for policymakers to turn statistics into targets. This again creates incentives that distort natural behaviours.

This can be by either creating an unhealthy fixation with the metric and over-allocating resources in the form of time, manpower and money towards improving the earmarked statistics or in careful avoidance and management of the metric so as not to incur displeasure or further action by policymakers.³²

On the theoretical front in economics there are two main theories that deal with education and innovation: a macroeconomic one and a microeconomic one. In macroeconomics the main impetus for studying education is in the formation of human capital, which serves as an endogenous driver of economic growth. Without explicitly modelling the educational sector these models, which are associated with Nobel Prize winning economist Robert Lucas, *assume* that there is a one-to-one relationship between investment in and the stock/growth rate of human capital. Human capital, in turn, creates output in combination with capital goods. In other words human knowledge, when applied to machines, factories and other productive technologies has a material impact on the productivity of individuals. Growth in human capital is an endogenous (systematically internal) driver of economic growth.³³ So, from this perspective it is clear that higher spending on human capital increases to higher growth. This is, however, simply due to assumptions that link between human capital and production. A slightly different perspective takes a more Schumpeterian (creative destruction) stance. This modification of the endogenous

³² In the realm of monetary economics this is known as Goodhart's Law. It refers to the near instantaneous nullification of a monetary metric for central bank analytical and policymaking purposes once it has become known to the wider financial community.

³³ Prof. Charles Jones in his text *Introduction to Economic Growth*. (1998) provides a basic step-by-step view of education-driven endogenous growth.

growth model is characterised by the seminal work of Phillippe Aghion and Peter Howitt.³⁴ This Schumpeterian model does not predict a smooth march of growth, but rather argues that growth takes place in fits and starts. The driver of economic growth is the number of increases in the productivity of capital and labour. These increases are stochastic, meaning that they take place at random intervals. This model's policy implication for investment into human capital is that the more resources directed towards investment in human capital development and R&D increases the expected number of innovations per unit of time. Again, the positive link between human capital formation and growth is *assumed*.

The development of human capital is not necessarily the same as education of course. Many forms of knowledge are acquired through practice or are self taught. Education policymakers often have difficulties making the development of tacit knowledge part of a formal curriculum. In addition formal education structures suffer from time lags with respect to advancing technologies. A clear example of this was the dominance of typing classes which used typewriters up until the mid-1980s even though personal computer technology had made significant inroads and was already a ubiquitous tool of modern commercial activities.

In microeconomics the signaling role of education has been emphasised, notably by

³⁴ Phillippe Aghion has recently published a technical work on what is required to improve European universities. The report is published by policy think-tank Bruegel. Aghion, P., M. Dewatriopt, C. Hoxby, A. Mas-Colell & A. Sapir. (2008) *Higher Aspirations: An Agenda for Reforming European Universities*. Brussels: Bruegel.

Michael Spence.³⁵ In these models one generally abstracts away from any productivity-enhancing effect education might have. Instead it is assumed that agents are heterogeneous in their productive abilities and knowledge of personal productivity is only known to the individual. Education then becomes a device for individuals (agents) to signal to employers what is their relative productivity *vis-à-vis* the rest of the labour market. The underlying idea is that it is easier for more productive agents to obtain a given level of education than it is for less productive agents.

The cost of education is of primary concern in this literature. If, namely, education is too cheap it is possible that an equilibrium exists where all agents obtain the same level of education, implying that high productivity agents can not signal their quality anymore. Since wages are a function of known productivity this results in their subsequent wages being lower. If, however, the cost of education is sufficiently high, only the most productive agents will engage in education, which helps employers identify the most productive workers and pay them a wage accordingly. Some more recent research along this line of thought has argued that if costs of education are too low, “counter-signalling” may take place. This literature typically assumes three levels of productivity: low, average, and high. If education is cheap there exists an equilibrium where low and average productivity types invest in education, whereas high productivity types separate and signal their high productivity by *not taking*

³⁵ By signaling it is meant the process by which an item of information about an individual (or firm) is publicly imparted to the market in general and is used by that individual to differentiate him or herself from the rest of their respective cohort.

education. (Some evidence can be seen in US data with respect to university students who do not complete courses at the undergraduate and doctoral levels in the areas of computer science and engineering. Students elect to leave prior to receiving qualification due to their extremely high abilities in computer programming and engineering.) This would lead to a situation where, in equilibrium, employers know that people who obtain a high level of education are actually the lower productivity ones, whereas the higher productivity types choose not to forgo wages and leave the education sector early. This is obviously an undesirable situation and has to be seriously taken into account when designing educational policy.

In a more recent National Bureau of Economic Research (NBER) working paper Robert Lucas argues for a different approach to endogenous growth altogether. The central tenant of his argument is that economic growth is driven by the presence of ideas and that ideas are scarce (a similar concept occurs in some parts of the literature on the economics of innovation, see the work of Susan Scotchmer³⁶). In such a set-up growth is driven by ideas. Each individual can, in turn, decide how much schooling they get. (It is important to note that in real life decisions many cultural and social factors influence the education decision and not solely human capital aims.) In this model Lucas assumes that more education leads to a higher *probability* of an individual having total factor productivity (TFP, a notion that is typically thought of in terms of the “Solow Residual” in that it is the residual term that accounts for growth once all aspects of capital and basic labour are taken

³⁶ Scotchmer, Susan. *Innovation*. Cambridge, Mass: MIT Press, 2005.

account of) improving ideas. In this line of thought it can be argued that the main role of education is not so much about meeting standards, but about improving people's skills to develop useful ideas.

The aim of education as a process by which individuals improve their skills so as to be better able to articulate and give action to new ideas is linked to the work of Andrei Shleifer *et al.* about productive human capital versus rent-seeking human capital.³⁷ This is a theory driven by incentives. If institutions make rent-seeking more attractive the most talented people in an economy will not engage in welfare enhancing entrepreneurial efforts, but will choose rent-seeking. In the Irish economy, institutional habits and structures related to everything from the “points race” associated with the Leaving Certificate Established to the regulatory and association/union apparatus that enables the protected sectors to retain high margins and wages.

These models have important implications for educational policy. They argue that educational performance should be measured through an individual's capacity for original thought and entrepreneurship. And here we enter a conundrum that relates to our earlier comment on statistics: these qualities are very difficult to measure in a standardised way. After all, as soon as quality is measured through specific

³⁷ Shleifer, Andrei, Kevin Murphy & Robert Vishny. “The Allocation of Talent.” *Quarterly Journal of Economics*. 106.2: 503-30. See also Shleifer, Andrei, Efi Gildor & Gene D'Avolio. “Technology, Information Production, and Market Efficiency.” in *Economic Policy for the Information Economy*. A Symposium sponsored by the Federal Reserve Bank of Kansas City, August 2002.http://www.economics.harvard.edu/faculty/shleifer/files/Technology_paper_final.pdf

qualitative measures, educationalists, parents, and children are incentivised to game the system, i.e. to become rent-seekers. This results in an environment where entrepreneurial activity is stifled and what was at first small instances of rent-seeking on the part of individuals becomes a culture of using the apparatus of the state as method of gaining more protections and influence. This sort of institutional practice was what James Galbraith warned of in his book *The Predator State* (2008) where firms and groups no longer engage in market competition but in lobbying power eventually creating a malignant lump at the heart of the state and the economy that undermines growth and democratic politics as the notion of the common good sinks into the miasma of rent-seeking activity.

There is no ready solution to this problem. In a general sense transparency, eliminating pre-existing legally based socially detrimental incentives and a process of constant reform are the closest prescriptions for remedy. The best we can do for now is to be aware of the problems involved and to be frank and open about them. It is important not to shy away from confronting vested interests. After all, the presence of vested interests is a sign of rent-seeking in the system. If Lucas and Schleifer *et al.* are correct in their modeling of growth this is the one thing one does not want to see in an education system.

Section 6

Innovation as Irreversible Investment and the Consequences of Discounting

6.1

Introduction

“Innovation” and the “knowledge economy” are currently the talk of the town. Elsewhere in this section issues surrounding education and governance are studied in relation to innovation. Here we focus attention on a specific element of innovation, namely its relation to investment policy.

Innovation can not take place without investment. Investment in people (education being of particular importance here), in capital, in natural resources, etc. A fundamental feature of innovation is that its outcomes are uncertain. You simply do not know whether all the money that is put in actually leads to some positive payoff in the end. In fact, you do not know beforehand whether all the inputs will lead to an innovation in the first place. The money, time, and effort spent in the process, however, can not be recouped. In the jargon, they are “sunk costs”. In other words, the investment made in innovative activity is *irreversible*.

A second important feature of investment is that it can be *postponed*. It does not have to take place today. One can wait and see how the uncertain environment in which it takes place develops. An investment that looks bad today, may look very promising next year.

Together these two features, irreversibility and the ability to postpone, imply that the decision-maker essentially has an *option to invest*; the right, but not the obligation to do so. The decision-maker has flexibility in the face of uncertainty. The study of the value of investment projects, which puts uncertainty and flexibility centre-stage, is called *real option theory*. The term *real option* is chosen to distinguish these options from the more well-known financial options that are traded on the world's derivatives markets. It alludes to the fact that here we are talking about options on investment in the real economy: factories, labs, mortar and bricks; not financial claims.

An important factor in determining the value of an investment project is how the decision-maker *discounts* future payoffs. The basic idea behind discounting is that a Euro tomorrow does not have the same value to people as a Euro today. Firstly, there is the simple issue of time value. A Euro tomorrow can not be spent today and, therefore, one has to be recompensed for having to have a degree of patience. This patience has a value, which leads to a discounting on tomorrow's Euro. Secondly, there is a risk value. In an uncertain environment it is not sure what the actual (relative) value of your Euro tomorrow is. For example, the risk of inflation implies that the value of your Euro might be lower tomorrow than it is today. If you are *risk-averse*³⁸ this risk implies you will discount the value of tomorrow's Euro. Finally, and especially important in a discussion on innovation, there might be *ambiguity*.

³⁸ Roughly speaking one is risk-averse if one prefers a certain EUR 50 to a 50:50 bet between EUR 100 and EUR 0.

Imagine that you are IBM's CEO Thomas Watson in the early 1940s. At that stage you might very well have claimed that "there is a world market for no more than five computers" (the 1943 comment is surrounded with quite a bit of speculation as to its veracity but it has entered the cannon of computer science historical quotes). Ridiculous as such a claim seems with the benefit of hindsight, IBM's CEO did not have any hindsight to base his claim on. One can perhaps compare innovation to walking into a casino without knowing whether the roulette wheel is European or American. In other words, the odds are not clear. Economic experiments show time and again that people do not like ambiguity: they are *ambiguity averse*. Ambiguity aversion has only quite recently been taken up in axiomatic decision theory (Gilboa and Schmeidler (1989)), even though informal accounts go back to, at least, Knight (1921).

This is also where the all-important distinction between *procedural* and *fundamental* innovation comes in. Procedural innovation takes place if existing products are improved, in whatever shape or form. The risks surrounding the success of such innovation can be calculated relatively accurately based on past performance. A fundamental innovation is one that opens up new markets, or changes the way society operates (the computer, the internet, CD's are recent examples). The risks surrounding the success of such innovations is unknown. To paraphrase Donald Rumsfeld, procedural innovation deals with "known unknowns", whereas fundamental innovation lives in the realm of the "unknown unknowns".³⁹

³⁹ In actual fact, many fundamental innovations seem to arise as by-products of the quest for

The main argument of the section is simple. Innovation takes place, by definition, in an environment of ambiguity. The more fundamental the innovation, the more ambiguity. The people who take decisions are usually accountable to other people, be they shareholders or voters; take the wrong decision and you lose your job. (Unfortunately accountability in business and government has become a bit more irregular since late 2008 adding a whole new dimension of moral hazard to how governments and firms do business.) This makes decision-makers ambiguity averse. The more diffuse the lines of accountability, the more ambiguity aversion can be expected. The more ambiguity averse the decision-maker, the less investment (and therefore innovation) takes place. Thus, one would expect (relatively speaking) to see most innovation in single owner firms, less in publicly listed firms, and less further in government controlled environments.

In this chapter, we will use a microeconomic theory to argue this case. Specific attention is paid to arguing the link between ambiguity-aversion and investment as it is the most opaque link in the argument. It is organised as follows. In Section 4.2, the viewpoint of investment as an option is elaborated upon a bit further. In Section 4.2.1, the effect of time preferences on investment is discussed, whereas in Section 4.2.2, risk aversion is added. These sections are based on Thijssen (2009a). In Section 4.2.3, which is based on Thijssen (2009b), ambiguity enters the picture. An illustration of the theory is given in Section 4.3, whereas Section 4.4 discusses some consequences for policy.

procedural innovations. This is not considered here and is a topic for future research.

6.2

Irreversible Investment as an Option

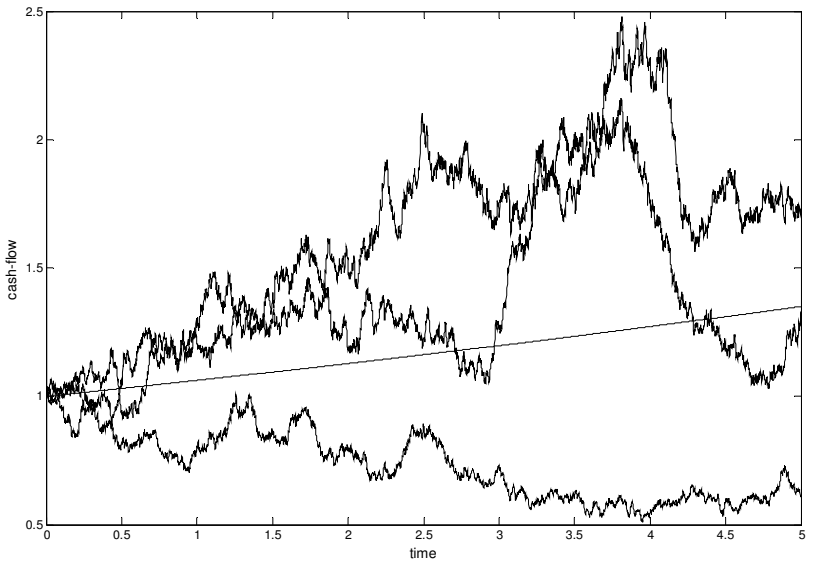
As is well-known from the literature on financial economics, the flexibility that a (financial) option gives has economic value. In fact, this flexibility leads to a dichotomy. Imagine one has the option to build a factory for the next generation of LCD screens. Obviously, the success of such an enterprise is uncertain and the costs of building the factory are high. This gives the decision-maker an incentive to wait with the investment decision. This is the value of the option. However, as soon as the decision-maker decides to go ahead and build the factory, the option loses all its value, since, in effect, the option has been exercised. In return, however, the decision-maker gets the future revenues of the factory. The discounted stream of future revenues net of the sunk investment costs is called the *net-present value* (NPV).

The decision-maker now faces the following problem: Given the appropriate rate of discounting future payoffs, find a time where it is optimal to replace the option value of waiting with the actual NPV of investment (i.e. find the optimal time to exercise the option).

In the literature this problem is compared to the problem of the valuation of American options in (mathematical) finance. An American call option is the right, but not the obligation, to buy, at any time (up to and including the time of maturity)

a stock at a pre-specified price (the strike price). The problem of finding the optimal exercise time is, in fact, a particular application of *optimal stopping theory* (see Shiryaev (1978)).

In most models in real option theory the cash-flows accruing from an investment project are assumed to follow a so-called *geometric Brownian motion* (GBM). This is an example of a stochastic process in continuous time. Let V_t denote the cash-flow at time t . Then the evolution of V_t depends on two parameters, a trend μ_V , and a volatility σ_V . The trend measures the expected (exponential) growth rate of the cash-flows over time, whereas the volatility parameter measures the risk in the evolution of V . The geometric Brownian motion is such that at each time t , the value V_t is log-normally distributed. To be precise, $\log(V_t)$ is normally distributed with mean $\mu_V t$ and variance $\sigma_V^2 t$ (standard deviation $\sigma_V \sqrt{t}$). Note that this specification implies that the uncertainty surrounding V gets bigger, the further away in the future one looks. To get a feeling for what a GBM looks like, the plot below gives some possible sample paths. The smooth line denotes the case if there were no risk.



6.2.1

Risk Neutrality and Option Value

Suppose that the decision-maker is risk neutral, i.e. is indifferent between EUR 50 for sure or a 50:50 bet on EUR 100 or EUR 0. The problem that now confronts this decision-maker is to determine the optimal time at which to exercise the real option and invest.

This optimal time depends on two things. Firstly, it depends on the value of V itself. This is obvious, since the NPV depends on V . It turns out that there is a specific threshold value V^* , which tells us that investment should take place as soon as V

crosses this value from below. Through time the value of the option then becomes dependent on the question how likely it is that V^* is going to be reached in future given the value of V at that particular time. This implies that the optimal time at which investment takes place is not deterministic. Rather, it is a random variable itself. This, of course, makes the problem much more complicated from a mathematical point of view.

Secondly, the optimal time depends on how the decision-maker discounts the future. In other words, it depends on how impatient the decision-maker is. What rate of impatience should the decision-maker choose? Given that she is risk neutral, the only value that she has to take into account is the pure value of time. A good proxy for this can be found by looking at alternative uses of the decision-maker's money. If she were to invest her money in, say government bonds, instead of considering it for the investment, then she would get a rate of return (the interest rate) equal to, say r . In general, the larger r , the higher the opportunity cost of the investment and – therefore – the lower the value of investment.

6.2.2

Enter Risk Aversion

Let us now assume that, in addition to time preferences, the decision-maker is risk-averse and – therefore – has specific risk preferences as well. How should this change the appropriate discount rate? Again, it pays to look at alternative

investments the decision-maker can make. Suppose that there exists an asset (or a portfolio of assets) in the financial markets, the risk of which is perfectly correlated with the risk in the project. Investing in this asset would give a return, say, μ_S , and involve risk, say, σ_S . Note that these characteristics are the result of market forces: the asset prices result from demand and supply of these assets in the financial market. Using this information one can find out how investors in the market value the risk. This value is called the *market price of risk*.

In order to find the market price of risk we need a theory of how prices arise from investors' behaviour. After all, each investor discounts the returns on the bond and the risky asset in a particular way. Pooling all these individual discount rates together leads to the actual characteristics r , μ_S , and σ_S . A standard practice is to invoke the *principle of no-arbitrage*. This principle states that asset prices are determined such that they do not admit arbitrage opportunities. An arbitrage opportunity is a situation where one can buy a portfolio of assets today at no cost and sell it tomorrow at a guaranteed profit. The argument is that such strategies should not be possible in equilibrium.

We already know that the rate of time preference is the return on the bond, r . It turns out that, under the principle of no-arbitrage, the market price of risk equals $h_S = (\mu_S - r)/\sigma_S$, which is called the *Sharpe ratio* of the risky asset. The total discount rate can now be shown to equal $r + h_S \sigma_V$. Most importantly, this discount rate is larger than the one in the case of risk neutrality. In addition, it depends explicitly on the volatility of

the cash-flow process. This should not come as a surprise since, after all, the decision-maker cares about this risk as she is risk-averse.

6.2.3

The Final Nail in the Coffin? Incomplete Markets and Ambiguity Aversion

An important feature of innovation is that it explores new territory. In the previous subsection it was assumed that one could find a risky asset in the financial markets whose risk is perfectly correlated with the risk of the cash-flows. This is an unrealistic assumption. It seems more worthwhile to assume that an innovation relates to some *new* risk that is not yet traded on financial markets. In such a case one can not rely on the Sharpe ratio of the risky asset alone to determine the market price of risk. Invoking the no-arbitrage principle here does not help, since there are infinitely many market prices of risk that all avoid arbitrage opportunities. In the jargon of economists, the investment takes place in *incomplete markets*.

One way to think about this is to view incomplete markets as a case of ambiguity. After all, if all the risk of the project *were* traded, we would know the correct market price of risk. We are, however, ambiguous about what this price could be. As a simple case we could say that the price could be anything in the interval $[h_S - \kappa, h_S + \kappa]$, for some fixed value κ , which measures the degree of ambiguity.

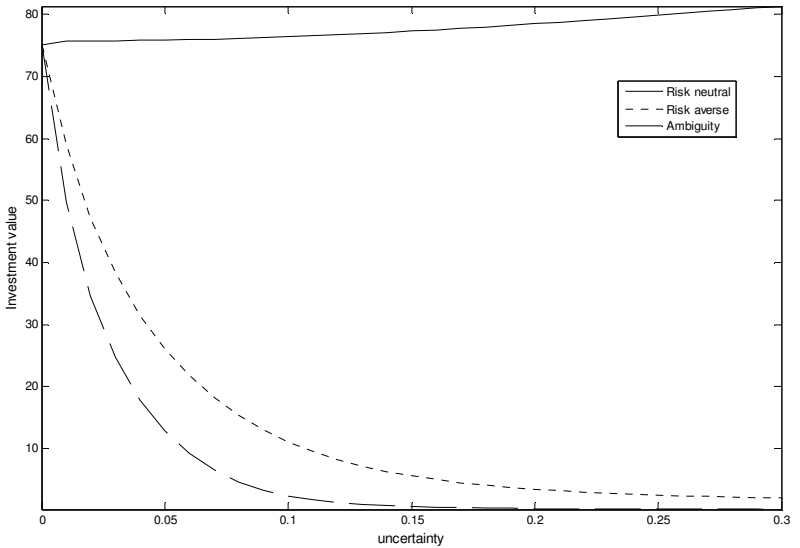
If we now assume that the decision-maker is ambiguity averse (and there is plenty of

experimental evidence to support such an assumption), then it turns out that the appropriate discount rate is $r + [\rho h_S + (h_S + \kappa) \sqrt{(1 - \rho^2)}]$, where ρ denotes the correlation between the risk in the cash-flows and the risky asset. This discount rate, in turn, is bigger than the one in the case without ambiguity.

6.3

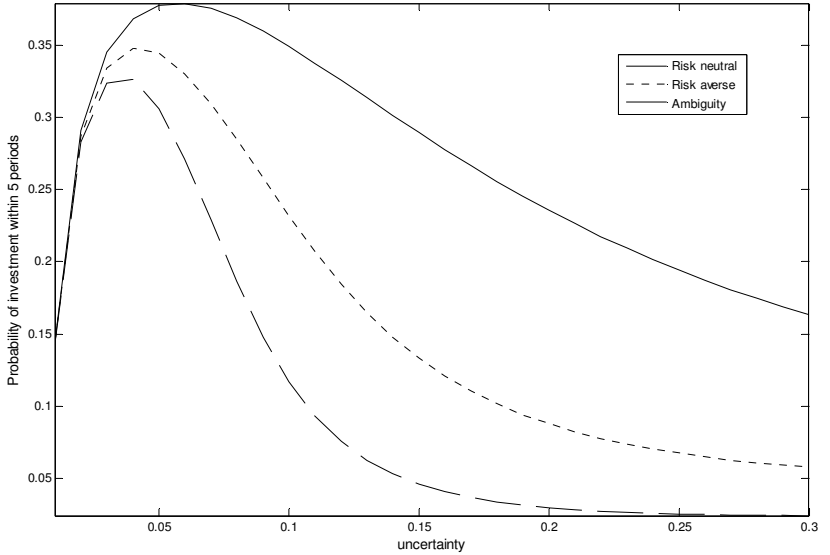
An Illustration

In this section we give a numerical illustration of the consequences of these different discount rates for several quantities of interest. First, we look at the value of the investment project itself. That is, we look at the optimal value, which takes into account the optimal time of exercising the option. The result is plotted in the figure below.



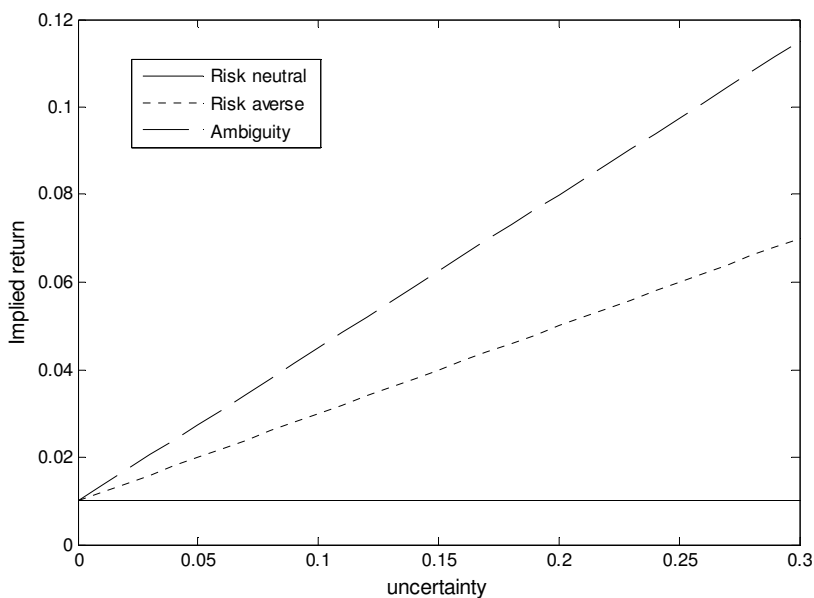
One can see that, as uncertainty increases the value of the project under risk neutrality increases. This may seem counter-intuitive, but it is due to the fact that the option value increases for higher uncertainty. At the same time, since the decision-maker is risk-neutral, the NPV of the project does not change. All of this changes if the decision-maker is risk-averse. Then the NPV decreases with uncertainty and the total value decreases exponentially in the level of uncertainty. Under ambiguity this effect is even more pronounced.

Secondly, we look at the probability that investment actually takes place within, say, 5 years. That is to say, the probability that the optimal investment trigger V^* is reached within that time frame. The result is shown below.



For all three plots one can see that, initially, the probability of investment actually increases as uncertainty increases. This is a well-known effect and occurs in many such models. The reasoning is as follows: even though higher uncertainty increases the optimal investment trigger V^* puts a downward pressure on the investment probability, the higher volatility means that the probability of bigger upward jumps is higher, which puts an upward pressure on the investment probability. For low values of uncertainty the latter effect dominates, whereas for bigger values the former dominates. Furthermore, one can see that the probability of investment is uniformly lower in the case of risk aversion and lower again in the case of ambiguity.

Finally, we draw another parallel with financial markets. If we view the project as an asset traded on the financial market then μ_V denotes its rate of return. It follows that the stock pays a dividend at a rate equal to the discount rate net of the return μ_V . We could also turn this upside down: suppose that we fix the dividend rate, what return would investors demand, given the uncertainty in the stock. The plot below shows this implicit return.



As one can see the implied return is constant in the case of risk neutrality, which is not surprising since the decision-maker in that case does not care about risk. In the

case of risk aversion the rate is increasing in uncertainty: the higher the uncertainty, the higher the return an investor needs to be tempted to invest in the asset. The effect is even more pronounced in the case of ambiguity.

As should become obvious, ambiguity creates a disincentive for investment. The more radical the innovation, the more ambiguity is to be expected. This might go some way to explain why we do not see that much investment in fundamental innovation: the option value is so big that one hardly ever exercises. It is argued in the next section that this effect is particularly present in government-sponsored innovation.

6.4

Consequences for Policy

If a private firm invests, the only people at risk are its shareholders. It is, therefore, tantamount that managers, when making investment decisions, have a clear idea about the risk attitudes of their shareholders. In a single-ownership firm or a partnership this is not an onerous assumption as the owner is usually the manager as well.

In a publicly listed firm, however, the problem becomes more acute, since one does not know exactly who the investors are. This creates ambiguity in the case of decision-making in incomplete markets, which is usually the case with innovative

activity. In fact, the more fundamental the innovation, the more incomplete the market in which the decision has to be taken and, therefore, the more ambiguity is involved. Ambiguity in this case is, thus, due to an information problem. The assumption of ambiguity aversion might not seem a bad one in such a case. After all, the manager is accountable to the shareholders. If she takes too risky a decision, she might lose her job. As we have seen, this ambiguity aversion can be expected to dampen innovative activity.

We would argue that this situation is even worse in the case of publicly funded investment in innovation. After all, here the managers (i.e. politicians) have to take decisions in the interest of all tax payers. If the manager of a publicly listed firm faces an information deficit, the manager of a public enterprise faces an information desert. Ambiguity, combined with accountability, lead to ambiguity aversion. The nature of the political cycle, and indeed the fraught relationship between elected officials and public servants, serves to amplify this problem.

One could argue, therefore, that the ambiguity that is facing a politician is greater than that facing a manager of a listed firm, which is greater than that facing a single-owner firm. And, as we have seen, ambiguity is a disincentive to innovate. This would lead to the empirically testable implication that we would expect relatively more fundamental innovation from single-owner firms, relatively less from listed firms and relatively least from government sponsored innovation.

Section 7

7.1

Ireland's Need for Homeric Innovation

Perhaps the best way to begin this brief statement on education, innovation and the economic future of Ireland is to begin by recounting a story by one of the world's first innovators. It is a story that should be familiar to some of our students.

Enchanting, enveloping, ensnaring – thus is the nature of the Sirens' song. First it appears enchanting, a spell of beauty. Then it becomes enveloping, filling the mind of the mariner with its chords. Finally, its true purpose is clear, the song is ensnaring, drawing the mariner and his craft to their impending doom. Odysseus, assured of his inability to withstand their powerful song, orders his men to tie him to the mast and fill their ears so they cannot hear any sounds and not follow Odysseus' orders to make course for the certain destruction. Their small craft and its captain survive but only by the judicious use of caution and ingenuity. They do not succumb to the fatal flaw of hubris which would have them ignore the warning they were given and pit their will and reason against the enchantresses' song.

This story was told centuries ago by Homer, an innovator who was blind but could see into the dark depths of the human condition. Like Odysseus' small craft upon the waves of the Aegean, Ireland and her economy are buffeted by political and economic winds and waves with which Fortune intends to batter her small barque. It is within this context that one must discuss the question of innovation. Here we will briefly introduce some points of view into the policy debate about the drive towards the “knowledge economy” in Ireland. The symphony of sounds calling for the creation of the knowledge economy has charged the education system with this duty. A combination of funding realities, governance failures and a fundamental misunderstanding of what constitutes innovation has turned this symphony into cacophony.

The policy debate surrounding the drive towards the “knowledge economy” in

Ireland is filled with many different agencies and vested interests. The work presented in this paper has been an attempt to try to get to the nub of the matter, mainly, the consistent policy of placing *ad hoc* strategies on top of existing and deeply rooted systems.

7.2

The matter of education

Higher education (third level) participation has gone from 5% of school leavers in 1970/1 to 55% of school leavers in 2006/7. Let us first look at the numbers. In 2004 Ireland spent €7,445 per student, per annum on core educational services. This figure reflects the intended expenditure on education. An unofficial estimate produced by a university source has less than a quarter of this figure reaching classrooms, with the majority being consumed by an internal reallocation mechanism. Though this raw number of €7,445 places Ireland on a par with universities in Finland and with most state colleges in the United States, actual educational expenditure is much lower. When research expenditure is included in the figure, Ireland spends €10,211 per student, per annum in 2004. This compares with a per student, per annum figure of approximately €5,000 in 1992/3, before the advent of SFI and the other research funding bodies. Despite talk of a funding shortfall, the gross figure of income for the universities has increased considerably and rapidly. TCD's public accounting statements illustrate an income increase of 85.9% between 2000 and 2005. Much of this increase was the result of growing student numbers and research income. A caveat must always be added to any discussion of these numbers that policymakers and practitioners fall into the trap of equating inputs with outputs]

The argument that the universities are underfunded is valid on one level. The funding levels of Irish third level education are insufficient if the sector is expected to educate almost 200,000 students, act as a centre of internationally renowned research and development, and serve as custodian of teacher training, pilotman of

innovation and priest of the knowledge economy. There would be no exchequer capable of funding organisations with so many disparate purposes. Trinity College Dublin has no less than 94 strategic planning goals for the time between 2009-2014. This planning has also not taken into account the current acute and potentially protracted economic downturn and consequential reduction in funds available from the public exchequer. Trinity College alone aims to have a Ph.D. cohort of 2000 students by 2013/14 and “deliver” 50% of Ireland's Fourth Level SSTI target in conjunction with the TCD-UCD Innovation Alliance.

The TCD-UCD Innovation Alliance is a clear example of where the aspirations of policymakers reaches the limits of credulity even to their peers. In an October 2009 interview in *Public Affairs Ireland* DCU President Ferdinand von Prondzynski outlined his concerns that the promises for employment growth made by the alliance were unobtainable:

“Professor Von Prondzynski was also critical of some of the promises made around the alliance. ‘The big concern that I would have with the Trinity-UCD alliance is that they made one or two promises that they will not be able to keep. In particular, that they will create 30,000 jobs: they will not create 30,000 jobs, and in fact they will be very lucky if they create 300 jobs. It is a mistake for them to have said that, because it generates an expectation of what all universities can do, which is simply wrong. If you are commercialising research, which is what this is based around, the likelihood of that leading to significant commercial benefits is subject to various risks, and probably more than half of what you commercialise will not make it to anything. Those that do, won’t generate those benefits for some time.’”⁴⁰

The argument fails when one connects higher education directly to economic growth. Ireland's university sector, unlike the rest of Western Europe, did not slowly evolve and change prior to World War II and did not have a dramatic increase in the higher education student population until 25 years after Europe and the United States. Ireland was also late in providing for free secondary education, with it being introduced in 1968. The beneficial effects of free secondary education and the

⁴⁰ Smyth, T. (2009) “A Time of Uncertainty in Third Level Education” *Public Affairs Ireland*. No. 62: 1-2, 2.

expansion of the third level sector on the Irish economy, as outlined in the economic works of former Taoiseach Garrett FitzGerald and Prof. John FitzGerald of the ESRI, are clear but education does not tell the entire story of Ireland's "long boom" from the early 1990s to late 2007.

The Government's copper-fastened link between education and innovation is seen in the *Strategy for Science, Technology and Innovation 2006-2013*. The doubling the number of Ph.D.s graduating every year was seen as the key. The Higher Education Authority, in its recent strategic plan, boasts of how this goal of almost 1,300 Ph.D.s is within sight. Somehow, activity has been confused with achievement. In the United States, what is considered to be the birthplace of the "knowledge economy", some 30% of Ph.D. graduates are unemployed upon exit from their programmes and of those who are employed, only 27% are working in industry or are self-employed, with the remaining persons working in academe, government or what the US National Science Foundation refers to as "other", this coming from a system where the 2004 Eurostat figure for government expenditure on research & development amounted to €143,439.93 million, whereas Ireland spends €1,840.40 million.

This is still a country that invests a comparatively low level (about €5,500 in 2006) in primary education, with 25 students to a class, making Ireland one of the highest student-teacher ratio holders in the EU. In an education system where 28% of primary teachers who see themselves as poorly prepared for teaching mathematics, the key issue is how to recapture Ireland's ability to compete on a human capital basis. Research conducted by the NCCA in 2007 illustrated that the mathematical ability of students entering secondary education are predictive of Junior Certificate results and subsequently Leaving Certificate results.

The failure of policymakers to see the learning and policy outcomes of education from the primary level up to and beyond third level has been a large part of why IBEC and others have filled the pages of newspapers and the time on the airwaves with concern about 5,000 students failing mathematics and the subsequent focus of

students on law and medicine and not science, mathematics or engineering.

Short-term policy objectives and a lack of focus on deep knowledge and understanding has been the objective of the top down approach to education. Human capital competitiveness is no longer about deep knowledge and the inherent flexibility it brings but a mechanical and simplistic model that sees an Ireland where 77% of school leavers attend university and 1,300 doctorates are awarded per annum. In the United States, only 35% of the population attends university and on a population basis graduates less than half the number of Ph.D.s per annum. At the level of researchers per 10,000 persons, Ireland has 51, compared to the Netherlands' 50 and the UK's 55, putting Ireland on a par with its European partners but this metric is not an indicator of success. The USA has 81 researchers per 10,000 persons but 47.3% of those unemployed in the US have a third level education, compared to only 24% in Ireland, 14.6% in the UK and 12.4% in the Netherlands. The linkages between education and economic are not as clear-cut as policymakers would like to indicate.

The quote below is from Lionel Robbins, the London School of Economics professor that chaired the famous *Robbins Report (also known as the Report of the Committee on Higher Education)* that resulted in the great expansion of British higher education in the 1970s and 80s. Robbins' own lack of certainty between higher education and economic growth is important to note.

“I simply cannot take seriously any attempt to trace any obvious correlation between rates of growth of gross national product – however this nebulous quantity is measured – and the proportion of the relevant age-groups receiving higher education. Needless to say there must be some correlation between the proportion of highly trained engineers and the prevalence of successful industry attending their operations. It would not be absurd to attempt to establish some connection between the proportion of competently educated doctors and the improvement of health. But I should be greatly surprised if, outside specific vocational correlations of this sort, anything much wider and tangible could be found; the variables are so numerous and the connections are often so indirect. ...There are indeed such considerable variations, both in time and place, between the effectiveness of the organisation of higher education that more quantitative comparisons must be open to considerable

question. Moreover the causes of variation in productivity are themselves so various that any attempt to isolate the influence through time of any one factor must be the subject of serious doubt. And considerations of this sort apply *mutatis mutandis* to scholarship and research. Many sophisticated investigations have been directed to the establishment of tangible connection of the kind I have been discussing. But I must confess that, interesting as they may be, in the outcome they leave me completely unconvinced; and I would regard their use in discussions of public policy regarding higher education in general as specious.”⁴¹

In general, this myth of the knowledge economy is the most pernicious of all those perpetrated by politicians and policymakers since it offers the most hope but delivers the greatest uncertainty.

Much of what was stated above is not purely about finances and high theory, it also relates largely to the governance and a misguided understanding of innovation. Fintan O’Toole stated in his recent article in the *Irish Times*, Ireland’s “knowledge economy”, that the “knowledge society” is part of this illusion. Engineering, computer science, mathematics and science in general are not being embraced by students. This can be partly explained by some of the issues mentioned by Mr. O’Toole, but the economist may find the cause in something much more prosaic – money. At present, engineering, computer science and many of the hard sciences do not appear to provide incomes that will allow people to enter the bottom rung of property ladder. Property, the boom that has now turned to bust, has skewed many elements of the market but the blame does not entirely sit with that sector’s voracious consumption of capital and tendency towards rent-seeking (acquisition of excessive profits through manipulation of institutions and policies).

The professions and the medical sector, protected by the law and lobby groups present a surer pathway to high income to those sitting the Leaving Cert this year and to their parents. These students do not want to become innovators, they want to become rent-seekers, acquiring wealth through a combination of protectionism and political activity. There are fortunes to be made in financial mathematics,

⁴¹ Robbins, Lionel. *Higher Education Revisited*. London: Macmillan, 1980.P.10.

cryptography, artificial intelligence, new business practices and cultural activities but it is safer to be a doctor, a lawyer, a nurse or to gain entry into some other protected sector of Ireland's economy; the product of an economy now denuded of its competitiveness and saddled with massive levels of private debt as a result of the unholy cocktail of rent-seeking and property madness.

Some see the solution to the problems of education and the dominance of the professions simplistically, where competition is the sole solution. There is indeed a need for competition but it needs to be in combination with control and regulation; it is a failure of imagination across public and private spheres that we continue to see the professions as so important. Put simply, Government refuses to regulate and steer, the courts refuse to interfere, and the public refuse to challenge or complain.

The Leaving Certificate is another example of where governance needs to be held to account. There remains a general lack of reform - we still have much the same exam as we had 30 years ago (cosmetic changes aside) and, with the exception of medicine and some access programmes, the CAO system is similarly unchanging. Higher education still penalizes part-time study and has virtually no serious distance learning. Ireland's higher education sector still lags 25 years behind most of the planet.

Ireland's "knowledge economy" may be the myth that Mr. O'Toole rightly makes it out to be but much of that blame lies not with the government but with the polity, Cassius' remonstrance rings as true today as in ancient Rome: *The fault dear Brutus lies not in our stars but in ourselves.*

7.3

The misguided notion of innovation

Many of the problems in the education sector are repeated in the area of research and development in Ireland. Ireland has consistently confused matters of risk and

uncertainty. Risk deals with known unknowns, whereas uncertainty deals with unknown unknowns. Risk can be managed, ambiguity cannot. The Government's fear of uncertainty has caused it to support policies that actually stifle innovation. This is due to a failure to see the differences between inputs and outputs, resulting in input consumption being seen as a sign of success. The secondary response to this situation is to arrange for government agency control, resulting in its own complications for innovation.

Education and research, much like health care, are insatiable consumers of funding, partly because expenditure is considered a proxy for quality. At a local level, this leads to the "Matthew Effect", where those that have been given more grant income will be rewarded with yet more money with a high probability.

Let us look at this question from the point of view of policymakers who are making decisions from international league tables. Expenditure on research becomes a proxy for quality, and in what is seen as an international competitiveness "arms race" the level of general expenditure on research and development is seen as a proxy for economic vibrancy and efficiency. This interpretation of how economic competitiveness is maintained has been the crux of Ireland's innovation strategy.

Patents have been also used a metric of the quality and depth of the knowledge economy. The 1980 Bayh-Dole Act was intended to kick-start the American economy this way. University patenting had exploded a few years before but this created incentives to measure success by the number of patents. The impact has been to find gainful employment for the majority of US patent lawyers (44% in the top 20 US universities) and to increase the cost of research due to licensing fees. It was a point of law, not government policy, which enabled the patenting of life in *Diamond v. Chakrabarty* (447 U.S. 303) [1980] and kick-started the biotechnology industry. The impact of a policymaking approach that confuses inputs with outputs is to blindly increase education expenditure to non-optimal levels, in so far as spending too much of GDP on third level education and research (the creation of the so-called

“Fourth Level”, a descriptive/marketing term for postgraduate study that does not exist outside of the Republic of Ireland) and ignoring the primary and secondary sectors, where expenditure arguably has a higher economic and social return.

7.4

The problem of the law and governance

Let us close by combining the problems of governance with a confused concept of innovation. We currently have a plethora of separate agencies regulating our economy. Many of these agencies are orientated towards education, some towards regulation, such as Comreg, others are major service providers, such as the HSE. All of these organisations exist within an antiquated system of administrative law, that does not allow the citizen, firm or entrepreneur a clear set of structures by which to engage with these agencies and call them to account. These bodies have been set up to deal with particular tasks that central government used to do, others encouraged by European law requiring “independent” regulation, others because existing departments didn't have the skills or were created by ministerial order. There is also a parallel track of hybrid bodies, such as the CAO, which while legally a private company owned by the universities (who are themselves of peculiar legal status) carries out “functions” that interact with the functions of the State.

At the moment the Government has been talking about cutting back on the number of bodies as a cost-saving measure. The overall number of agencies is not the problem – it is how they relate to good governance. It is quite difficult for a citizen to deal with the State, but it is often more difficult when dealing with an “independent” agency. The objective is to defuse the old-fashioned parish pump politics. That these agencies are designed not to operate within the realm of the openly political is noble but it has its dangers (democratic control, lack of accountability, industry capture to name a few). A century ago US Supreme Court Justice Oliver Wendell Holmes said that sunlight remains the greatest disinfectant. Transparent institutions are by their very nature accountable. Even the tools

designed to allow public or media participation and scrutiny have a very uneven application across the bodies – you cannot say for certain whether a body is Freedom of Information Act (FOI)-applicable without looking it up and there seems to be no rule of thumb (the question is whether it is on an exclusive list contained in regulations, there is no general “public functions” test so it is never legally possible to FOI a body that is not explicitly on the list).

Judicial review is similarly difficult – the system of Irish administrative law rests upon the ability to seek judicial review of a decision but that is limited by judicial self-restraint (deference) which does seem to be applied very generously in the case of agencies. The process itself is expensive and the outcomes of proceedings are subject to great uncertainty.

There is no general pattern to Irish quangos. This presents difficulties for the citizen or the entrepreneur to know how to deal with the agencies when every agency has different procedures, governing bodies, and appeal mechanisms. There exists at present no unified rule-making system as in the US, and no formal collation of agency decisions, this again it varies from body to body.

Ireland has created an environment that stifles innovation, by creating a legal structure where education (HEA, HETAC, FETAC, FAS, CAO, NCCA), innovation (IRCHSS, IRCSET, SFI, IDA, HRB, Enterprise Ireland, Forfas) and many other aspects of our lives (Comreg, HSE, etc) are controlled by obscure agencies. This environment does not encourage the entrepreneur or the innovator. Instead, it rewards the rent-seeker who desires to “work the system” above all other objectives. Once again we return to Cassius' rebuke.

So what is to be made of this present situation? Two stories from Classical Greece and Rome were woven into this brief narrative. The stories have an important lessons for policymakers today. The song of the knowledge economy is melodious and clear but it can trap those unwilling to acknowledge its potential dangers.

Education is important to the Irish economy but it has little to offer if investments are made on the basis of short-term objectives where inputs are confused for outputs and activity is confused for achievement. Finances may be one aspect of this policy debate but a deeper and more important one is the issue of governance. Governance skews resource allocation, it distorts incentives, it can destroy innovation and encourage rent-seeking. The current superstructure of the education/innovation system in Ireland suffers from a governance problem, a problem that seems pervasive throughout the entire political and economic system. If the 1980s were about getting Ireland's fiscal house in order, the 2010s will be about getting the institutional house (and from the exchequer borrowing requirement figures for 2009 and 2010 once again getting its fiscal house) in order. Institutional structures and incentives will be partly to blame for the failure of the establishment of a knowledge economy in Ireland. Policymakers and the polity in general must learn that the fault lies not in our stars but in ourselves. In summation Odysseus and Cassius have important lessons for us, since both remind us in different ways not to succumb to hubris. Ireland cannot control its entire destiny but it can ensure that the ground is prepared through measured and careful public investment in education and a supportive political and legal system, then and only then will Ireland successfully absorb investment and have an innovative economy. Such a policy option is not quick or easy. Neither was Odysseus' journey home – but it was worth the effort.

Select Bibliography

Books & Periodicals

Adriaans, P & Van Benthem, J. Eds. (2008) *Philosophy of Information*. London: North Holland.

Aghion, P. and Howitt, P. (1998). *Endogenous Growth Theory*. MIT Press, Cambridge, Mass.

Angel, D (1994). *Restructuring for Innovation: The Remaking of the U.S. Semiconductor Industry*. London: The Guilford Press.

Archibugi, D., Howells, J & Michie, J. Eds. (1999) *Innovation Policy in a Global Economy*. Cambridge University Press.

Archibugi, D & Lundvall, B. Eds. (2001) *The Globalizing Learning Economy*. Oxford University Press.

Ashby, E. (1963) *Technology and the Academics: an essay on universities and the scientific revolution*. Macmillan; St. Martin's Press.

Ayres, C.E. (1944) *The Theory of Economic Progress*. Chapel Hill: University of North Carolina Press.

Ayub, M. (2007) *Understanding Islamic Finance*. Chichester: John Wiley & Sons, Ltd.

Barré, R., Gibbons, M., Maddox, J., Martin, B & Papon, P. (1997) *Science in Tomorrow's Europe*. Paris: Economica International.

Barro, R.J. and Sala-i-Martin, X (1995). *Economic Growth*. McGraw Hill, New York.

Belfield, C & Levin, H. Eds. (2003) *The Economics of Higher Education*. Cheltenham: Edward Elgar.

Berquist, W., Gould, R., & Miller Greenberg, E. (1981) *Designing Undergraduate Education*. San Francisco: Jossey-Bass Publishers.

Birnbaum, R. (1988) *How Colleges Work: The Cybernetics of Academic Organization and Leadership*. San Francisco: Jossey-Bass Publishers.

Birnbaum, R. (2001) *Management Fads in Higher Education: Where they come from, What they do, Why they fail*. San Francisco, Jossey Bass Publishers..

- Bok, D. (1982) *Beyond the Ivory Tower: Social Responsibility of the Modern University*. Harvard University Press.
- Bok, D. (2006). *Our Underachieving Colleges: A Candid Look at how much students learn and why they should be learning more*. Oxford: Princeton University Press.
- Borch, K & Mossin, J. Eds. (1968) *Risk and Uncertainty*. Macmillan.
- Borrás, S. (2003) *The Innovation Policy of the European Union: From Government to Governance*. Cheltenham: Edward Elgar.
- Bowen, H. (1977) *Investment in Learning: The Individual and Social Value of American Higher Education*. San Francisco: Jossey-Bass Publishers.
- Bowen, W. (1968) *The Economics of Major Private Universities*. Berkeley: Carnegie Commission on Higher Education
- Boyd, W. (1956) *Emile for Today*. London: Heinemann.
- Boys, C.J., Brennan, J., Henkel, M. Kirkland, J., Kogan., M & Youll,P.J. (1988) *Higher Education and the Preparation for Work*. London: Jessica Kingsley Publishers.
- Breen, R & Whelan, C (1993) 'From Ascription to Achievement? Origins, Education and Entry to the Labour Force in the Republic of Ireland during the Twentieth Century' *Acta Sociologia* 36(1)
- Breznitz, D. (2007) *Innovation and the State-Political Choice and Strategies for Growth in Israel, Taiwan and Ireland*. London: Yale University Press Ltd.
- Burleigh, Michael. (2005) *Earthly Powers: Religion and Politics in Europe from the Enlightenment to the Great War*. London: Harper Collins.
- Butterfield, J & Earman, J. Eds. (2007) *Philosophy of Physics*. London: North Holland.
- Carter, Charles & J L Ford, Eds. (1972) *Uncertainty and Expectations in Economics: Essays in Honour of G.L.S. Shackle*. Oxford: Basil Blackwell.
- Carter, E. (1980) *College Financial Management: Basics for Administrators*. Lexington, Mass.: Lexington Books.
- Casson, M. Ed. (1991) *Global Research Strategy and International Competitiveness*. Oxford: Basil Blackwell.

Chevalier, A. (2000) *Graduate Over-Education in the UK*. Centre for the Economic of Education.

Chevalier, A, Harmon, C, Walker, I and Zhu, Y. "Does Education Raise Productivity or Just Reflect it?" *CEPR Discussion Paper Series* No. 3993. July 2003

Clark, W. (2006) *Academic Charisma and the Origins of the Research University*. London: University of Chicago Press Ltd.

Clotfelter, C., Ehrenber, R., Getz, M & Siegfried, J. (1992) *Economic Challenges in Higher Education*. London: University of Chicago Press Ltd.

Clotfelter, C. (1996) *Buying the Best: Cost Escalation in Elite Higher Education*. Princeton, NJ: NBER/ Princeton University Press.

Clough, D.J., Lewis, C.G. & Oliver, A.L. (1974) *Manpower Planning Models: Proceedings of a conference held in Cambridge, UK, under the aegis of the NATO Science Committee and the NATO Advisory Panel on Operational Research*. London: The English Universities Press, Ltd.

Cole, J., Barber, E & Graubard, S. Eds. (1994) *The Research University in a Time of Discontent*. London: Johns Hopkins University Press.

Conway, P.F. and Sloane, F.C., (2005) *International Trends in Post-Primary Mathematics Education: Perspectives of Learning, Teaching and Assessment* (Dublin: NCCA).

Cooke, P., Boekholt, P & Tödting, F. (2000) *The Governance of Innovation in Europe: Regional Perspectives on Global Competitiveness*. London: Pinter.

Coolahan, J (2003) *Attracting, Developing and Retaining Effective Teachers: Country Background Report for Ireland* (for OECD)

Coolahan, J. (1981) *Irish Education: Its History and Structure* (Dublin: Institute of Public Administration)

Corbett, Anne. (2005) *Universities and the Europe of Knowledge: Ideas, Institutions and Policy Entrepreneurship in European Union Higher Education Policy, 1955-2005*. London: Palgrave Macmillan.

David, P. (1985). The Economics of Qwerty. *American Economic Review* 72(2) 332-7

Day, C, Sammons, P, Stobart, G, Kington, A and Gu, Q (2007) *Teachers Matter – Connecting Lives, Work and Effectiveness* (Maidenhead: Open University Press)

Deem, R., Hillyard, S. & Reed, M. (2007) *Knowledge, Higher Education, and the New Managerialism: The Changing Management of UK Universities*. Oxford University Press.

Delany, H. (2001) *Judicial Review of Administrative Action – A Comparative Analysis* (Dublin: Round Hall).

Dewey, J. (1897) 'My pedagogic creed', *The School Journal* LIV(3) (January 16, 1897) pp.77-80.

Dickman, H. (1993) *The Imperiled Academy*. Transaction Publishers.

Dolton, P & Vignoles, A. (2000) The incidence and effects of over-education in the UK Graduate Market. *Economics of Education Review* 19 pp.179-198

Donders, D. & Volodin, V. (2007) *Human rights in education, science, and culture : legal developments and challenges* (Aldershot: Ashgate)

Dressel, P & Associates. (1971) *Institutional Research in the University*. San Francisco: Jossey-Bass Publishers.

Duggan, R. (1974) *Our Invaded Universities*. NY: Norton.

Ehrenberg, R. Ed. (2004) *Governing Academia*. London: Cornell University Press.

Elliott, I. (2006) *Irlande: L'enseignement supérieur en mutation 1960-1997*. Paris: L'Harmattan.

Etzkowitz, H., Webster, A & Healey,P. (1998) *Capitalizing Knowledge: New Intersections of Industry and Academia*. Albany, NY: SUNY Press.

Etzkowitz, H & Leydesdorff L. (2001) *Universities and the Global Knowledge Economy: A triple helix of university-industry-government relations*. London: Continuum.

Facione, P. (1990) *Critical Thinking: A Statement of the Expert Consensus for the Purposes of Educational Assessment and Instruction*. The California Academic Press.

Fagerberg, J., Mowery, D & Nelson, R. Eds. (2005) *The Oxford Handbook of Innovation*. Oxford University Press.

Freeman, R.B. (1976). *The over-educated American*. New York: Academic Press.

Freire, P. (1970) *Pedagogy of the Oppressed*. New York: Continuum.

Frischmann, B. (2000) Innovation and Institutions: Rethinking the Economics of US Science and Technology Policy. *Vermont Law Review* 347

Garvin, David. (1980) *The Economics of University Behavior*. London: Academic Press.

Gerschenkron, A. (1962) *Economic Backwardness in Historical Perspective: a book of essays*. London: Oxford University Press

Gilboa, I. and D. Schmeidler (1989). "Maxmin Expected Utility with Non-Unique Prior." *Journal of Mathematical Economics*, 18, 141–153.

Gleeson, J. (2004) 'Concurrent teacher education (post-primary) in the Republic of Ireland: some issues and trends' in Burke, A. (ed) (2004) *Teacher Education in the Republic of Ireland: Retrospect and Prospect* (Armagh: Centre for Cross-Border Studies).

Guzzetti, L. (1995) *A Brief History of European Union Research Policy*. Luxembourg: European Commission.

Hargreaves, A. (2003) *Teaching in a knowledge Society: education in an age of insecurity* (Maidenhead: Open University Press).

Hargreaves, H. (2002) 'Teaching in a box ; Emotional geographies of teaching' in Sugrue & Day (eds).

Hayek, F.A. (1967). *Studies in Philosophy, Politics and Economics*. Routledge and K.Paul.

Heckman, J. (2008) 'Schools, Skills and Synapses' NBER working paper 14064 (Cambridge, MA: National Bureau of Economic Research).

Hirshleifer, J. (1982) "Evolutionary Models in Economics and Law: Cooperation Versus Conflict Strategies" *Research in Law and Economics* 4:1-60.

Hoey-Heffron, A & Heffron, J. Eds. (2001) *Beyond the Ivory Tower: The University in the New Millennium*. Dublin: Mercier Press in association with Convocation of the National University of Ireland.

Hopkins, D & Schroeder, R. Eds. (1977) *Applying Analytical Methods to Planning and Management*. London: Jossey-Bass Inc.

Ioannidou, A (2007) 'A Comparative Analysis of New Governance Instruments in the Transnational Educational Space: a shift to knowledge-based instruments' *European Educational Research Journal* 6(4) pp. 336-347.

- Jacquette, D. Ed. (2007) *Philosophy of Logic*. Oxford; North Holland.
- Johnes, G. (1999) The Management of Universities. *Scottish Journal of Political Economy* .46.5.
- Jones, C. (1995). R&D Based Models of Economic Growth. *Journal of Political Economy*. Vol. 103 pp.759-784
- Kagan, D. (1992) 'Professional Growth Among Preservice and Beginning Teachers' *Review of Educational Research* 62(2).
- Karlsson, C., Flensburg, P & Hörte, S. Eds. (2004) *Knowledge Spillovers and Knowledge Management*. Cheltenham: Edward Elgar.
- Keynes, JM. (1937) The General Theory of Employment. *Quarterly Journal of Economics*. Vol 51.pp.209-223.
- Kindleberger, C & D Tella, G. Eds. (1982) *Economics in the Long View: Essays in Honour of W.W. Rostow*. London: Macmillan.
- Kuipers, T. Ed. (2007) *General Philosophy of Science: Focal Issues*. North Holland: London.
- Lanciano-Morandat, C & Nohara, H. (2003) [The New Production of Young Scientists \(PhDs\): A Labour Market Analysis in International Perspective. DRUID Working Papers.](#)
- Lleras, M. (2004) *Investing in Human Capital: A Capital Markets Approach to Student Funding*. Cambridge University Press.
- Layard, R., King, J., & Moser, C. (1969) *The Impact of Robbins*. Penguin.
- Larédo, P & Mustar, P. Eds. (2001) *Research and Innovation Policies in the New Global Economy: An International Comparative Analysis*. Cheltenham: Edward Elgar.
- Libecap, G. Ed. (2005) *University Entrepreneurship and Technology Transfer: Process, Design and Intellectual Property*. London: Elsevier.
- List, F. (1841) *Das Nationale System der Politischen Ökonomie*. London; Cass.
- Lorenz, E & Lundvall, B. (2006) *How Europe's Economies Learn: Coordinating Competing Models*. Oxford University Press.
- Lucas, R.E. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22, pp. 3–42.

Lucas, R.E. (2008). "Ideas and Growth." *NBER Working Paper 14133*.
<http://www.nber.org/papers/w14133>

Maki, U. Ed. (2001) *The Economic World View: Studies in the Ontology of Economics*. Cambridge: Cambridge University Press.

Maki, U., Gustafsson, B & Knudsen, C. Eds. (1993) *Rationality, Institutions and Economic Methodology*. London: Routledge.

Marglin, Stephen. (2008) *The Dismal Science: How Thinking Like an Economist Undermines Community*. London: Harvard University Press.

McCorkle, C & Archibald, S. (1982) *Management and Leadership in Higher Education*. London: Jossey-Bass Publishers.

McNay, I. Ed. (2006) *Beyond Mass Higher Education: Building on Experience*. Berkshire: The Society for Research into Higher Education & Open University Press.

Middlehurst, R. (2004) 'Changing Internal Governance: A Discussion of Leadership Roles and Management Structures in UK Universities' *Higher Education Quarterly* 58(4) pp. 258-279.

Millet, J. (1962) *The Academic Community: An Essay on Organization*. McGraw Hill: New York.

Mitra, J & Formica, P. Eds. (1997) *Innovation and Economic Development: University-Enterprise Partnerships in Action*. Dublin: Oak Tree Press.

Mowery, D.C., Nelson, RR, Sampat, DN & Ziedonis, AA. (2004) *Ivory Tower and Industrial Innovation*. Stanford: Stanford University Press.

Nelson, R. and Phelps, E. (1966). Investment in Humans, Technological Diffusion, and Economic Growth. *American Economic Review*, 61, pp. 69–75.

Newman, J.H. (1886) *The Idea of a University* (London: Longman)

Noble, D.F. (1977) *American by Design: Science, Technology and the Rise of Corporate Capitalism*. NY: Alfred A. Knopf.

Ó Brolcháinn, P. (1922) quoted in *Irish School Weekly*, 11th February.

O'Riain, S. (2004). *The Politics of High-Tech Growth: Development Network States in the Global Economy*. Cambridge: Cambridge University Press.

Osborne, Robert. (1996) *Higher Education in Ireland: North and South*. London: Jessica Kingsley Publishers.

Papanastassiou, M & Pearce, R (1999). *Multinationals, Technology and National Competitiveness*. Cheltenham, UK: Edward Elgar.

Paviit, K. (2001) [Public Policies to Support Basic Research: What Can the Rest of the World Learn from US Theory and Practice? \(And What They Should Not Learn\)](#). *Industrial and Corporate Change*. 10.3. pp.761-79.

Pratt, J & Silverman, S. (1988) *Responding to Constraint: Policy and Management in Higher Education*. Milton Keynes: The Society for Research into Higher Education & Open University Press.

Reich, R. (1992) *The Work of Nations* (New York: Vintage)

Reinelda, B. & Kulesza, E. (2006) *The Bologna Process* (2nd ed.) (Leverkusen: Budrich)

Riesman, D. (1980) *On Higher Education: The Academic Enterprise in an Era of Rising Student Consumerism*. London: Jossey-Bass Publishers.

Robbins, L. Lord. (1980) *Higher Education Revisited*. London: Macmillan.

Robinson, J. (1979) "Misunderstandings in the Theory of Production" *Greek Economic Review* Vol. 1

Rodrigues, M. Ed. (2002) *The New Knowledge Economy in Europe: a strategy for international competitiveness and social cohesion*. Cheltenham: Edward Elgar.

Rodrigues, M. (2003) *European Policies for a Knowledge Economy*. Cheltenham: Edward Elgar,

Rostow, W.W. (1960) *The Stages of Economic Growth: A Non-Communist Manifesto*. Cambridge University Press.

Rothschild, M & White, L. (1995) Some Simple Analytics of the Pricing of Higher Education. *Journal of Political Economy*. Vol.103 pp.573-586.

Royal Irish Academy (2005) *Cumhacht Feasa*

Rüegg, W. Ed. (2004) *A History of the University in Europe. Volume III: Universities in the Nineteenth and Early Twentieth Centuries (1800-1945)*. Cambridge University Press.

Salmi, J. (2009) *The Challenge of Establishing World Class Universities*.

Washington, D.C.: The World Bank.

Scotchmer, Susan. *Innovation*. Cambridge, Mass: MIT Press, 2005.

Scott, A. (1993) *Technopolis: High-Technology Industry and Regional Development in Southern California*. Oxford: University of California Press

Scott, P. Ed. (2000) *Higher Education Re-formed*. London: Falmer Press.

Shattock, M. (2006) *Managing Good Governance in Higher Education* (Maidenhead: Open University Press)

Shiryayev, A. (1978), *Optimal Stopping Rules*, Springer

Shleifer, A., K. Murphy & R. Vishny. "The Allocation of Talent." *Quarterly Journal of Economics*. 106.2: 503-30.

Shleifer, A., E. Gildor & G. D'Avolio. "Technology, Information Production, and Market Efficiency." in *Economic Policy for the Information Economy*. A Symposium sponsored by the Federal Reserve Bank of Kansas City, August 2002. http://www.economics.harvard.edu/faculty/shleifer/files/Technology_paper_final.pdf

Shreve, S.E. (2004). *Stochastic Calculus for Finance II: Continuous-Time Models*. Springer, New York.

Smith, H. (2000) *Technology Transfer and Industrial Change in Europe*. London: Macmillan Press Ltd.

Smyth, E., Dunne, A., McCoy, S., Darmody, M (2006) *Pathways Through the Junior Cycle: the experiences of second year students* (Dublin: Liffey Press)

Smyth, E., McCoy, S., Darmody, M. (2004) *Moving Up: The experiences of first-year students in post-primary education* (Dublin: Liffey Press)

Speser, P. (2006). *The Art and Science of Technology Transfer*. Hoboken, NJ: John Wiley & Sons, Inc.

Stark, J. S., & Latucca, L. R. (1997). *Shaping the college curriculum: Academic plans in action*. Boston: Allyn & Bacon.

Sugrue, C & Day, C. Eds. (2002) *Developing Teachers and Teaching Practice: International Research Perspectives* (London: Routledge)

Thijssen, J. (2008) "Incomplete Markets, Knightian Uncertainty, and Irreversible Investment." http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1277906

Thijssen, J. (2009a) "Irreversible investment and discounting: an arbitrage pricing approach." *Annals of Finance*.

<http://www.springerlink.com/content/r8p93phr50l85713/?p=c26c1cd1e1b24d64aa7e5683bcf96310π=0>

Thijssen, J. (2009b) "Non-Exclusive Real Options with First-Mover Advantages." http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1130813

Tuschling, A. & Engemann, C. (2006), 'From Education to Lifelong Learning: The emerging regime of learning in the European Union' *Educational Philosophy and Theory* 38(4) pp. 451-469.

Vaizey, J. Ed. (1964) *The Residual Factor and Economic Growth*. Study Group in the Economics of Education. OECD: Paris.

Verry, D & Davies, B. (1976) *University Costs and Outputs*. Oxford: Elsevier.

Walshok, M. (1995) *Knowledge without boundaries: What America's Research Universities can do for the Economy, the Workplace and the Community*. San Francisco: Jossey-Bass Publishers.

Watts, W (2008) *A Memoir* (Dublin: Lilliput)

White, T (2001) *Investing in People: Higher Education in Ireland from 1960 to 2000* (Dublin: Institute of Public Administration)

Woods, P 'Teaching and Learning in the New Millennium, in Day & Sugrue (Eds).

Official Publications

Carnegie Commission on Higher Education. (1979) *Giving Youth a Better Chance: Options for Education, Work and Service*.

Central Bank of Ireland. (Various Issues) *Quarterly Bulletin*

Department of Education, *Investment in Education – report of the survey team* (1962)

Department of Education (1995) *Charting our Education Future: White Paper on Education*

Department of Education and Science (2004) *A Brief Description of the Irish Education System*

Department of Education and Science (2005) *Beginning to Teach*

Department of Education and Science (2005) *Mission Statement*

Department of Education and Science (2006) *The DES Annual Report of 2006*,

Department of Enterprise, Trade & Employment (2006), *Strategy for Science, Technology and Innovation 2006-2013*.

Department of Education and Science (2007) *Ready for Tomorrow's World? The Competencies of Ireland's 15-year-olds in PISA 2006*

FETAC (2006) *FETAC Annual Report 2006*

Government of Ireland (1999) *Primary School Curriculum-Introduction*

Higher Education Authority (2004) *Strategy Statement 2004-2007*

Higher Education Authority (2007), *Strategic Plan 2008-2010*

Higher Education Authority (2007) *Higher Education Key Facts and Figures 05/06*

Higher Education Authority (2007) *Code of Governance*

National Competitiveness Council (2005) *Competitiveness Challenge*.

National Competitiveness Council (2009) *Statement on Education & Training*.

NCCA (2002) *Developing Senior Cycle Education: Consultative Paper on Issues and Options*

NCCA (2006) 'Commentary on ESRI research into the experiences of students in the second year of junior cycle'

NCCA (2007) *Getting Up for the Exams: ESRI research into the experiences of students in the third year of junior cycle and in transition to senior cycle* Dublin: Liffey Press

NCTE (2006), *Annual Report*

OECD (1965) *Investment in Education*.

OECD (1969) *Review of National Education Policies – Ireland*.

OECD (1971) *Science, Growth and Society: A New Perspective: Report of the Secretary General's Ad Hoc Group on New Concepts of Science Policy* , OECD, Paris. (Brooks Report)

OECD (2005) *Teachers Matter: Attracting, Developing and Retaining Effective Teachers*.

OECD (2008) *Tertiary Education for the Knowledge Society*.

OECD (2009) *Higher Education to 2030*.

OECD (2009) *Education at a Glance*.

OECD (2009) *Doing Better for Children*.

News reports

New York Times, 15 November 2008: Hernandez, J. 'Teachers Win Bonuses at High-Need Schools'

Irish Times, 10 July 2008: Masterson, S. 'State must proceed with technology in classroom plan'

Irish Times, 11 August 2008: Flynn, S. 'University fees for better off are back on agenda says O'Keefe'

Times Higher Education, 2 October 2008: Fearn, H. 'The long and the short of it'

Consulting Report

http://www.mckinsey.com/client/service/socialsector/resources/pdf/Worlds_School_Systems_Final.pdf

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