



What does the knowledge-based economy mean for Wales?

Julian Hodge Institute of Applied Macroeconomics

Annual Lecture

Professor Danny Quah Economics Department LSE

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Bank**



Danny Quah is Professor of Economics at the London School of Economics and Political Science (LSE). He joined the LSE in 1991 from the Massachusetts Institute of Technology where he was assistant professor in the economics department. Before that he had received his A. B. from Princeton and his PhD from Harvard, both in Economics. Professor Quah publishes widely in the professional journals and has made contributions in a number of areas, ranging from time-series econometrics, business cycles,

inflation, and international income inequality to, most recently, technology and economic growth. He is credited with having developed the concept of the weightless economy.

Professor Quah's research has been supported in part by the British Academy, ESRC, the Andrew Mellon Foundation, and the MacArthur Foundation. His current work is on intellectual property rights and worldwide patterns of economic growth and income distribution.

Julian Hodge Institute of Applied Macroeconomics

In May 1999, Cardiff Business School and Julian Hodge Bank announced a major new initiative, the establishment of the Julian Hodge Institute for Applied Macroeconomics. The aim of the institute is to carry out research into the behaviour of the UK economy, and to study in particular its relationship with the other economies of Europe. This research is given added urgency by present discussion about the UK's possible adoption of the euro in place of the pound. The new institute aims to develop research relevant to this important debate.

The institute's first Director is Professor Patrick Minford, of Cardiff Business School, who is also

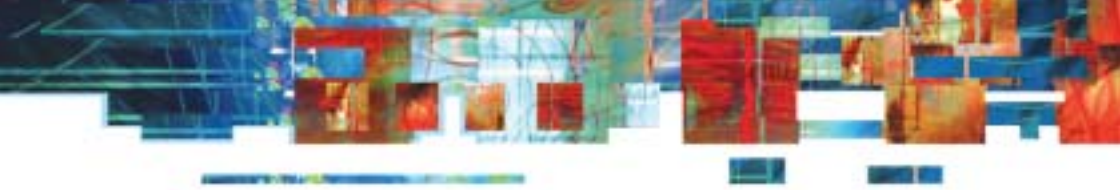
the Economic Adviser to Julian Hodge Bank. The institute's staff of researchers are mainly based in the school. Research activity in the area of applied macroeconomics is already considerable; work on a variety of issues related to the topics the new research will study has been published in leading scientific journals and books. The institute draws on the previous work in particular of the Liverpool Research Group in Macroeconomics which Professor Minford founded and which has been based mainly in Cardiff for a number of years, producing forecasts and policy analysis of the UK and other major economies.



Thank you for this opportunity to speak on the knowledge economy in Wales. In high-quality scientific publications per head of population, Cardiff has one of the highest citation counts worldwide. The ongoing work at the Julian Hodge Institute for Applied Macroeconomics continues that distinguished intellectual tradition. I am honoured and privileged to be part of this Annual Lecture series.

I am a macroeconomist who studies economic growth, technology, and income distribution within and across countries. Anyone who has been concerned about these matters has

necessarily also been concerned about the knowledge economy. One hundred years ago, one billion people walked this planet. Now, six times that number live on Earth. Compared to a century ago, the average human today is eight times better off in measured income and immeasurably better off by a range of other welfare indicators. A historically unprecedented 50-fold explosion has occurred in human well-being over the last 100 years. Almost all economists point to the accumulation of knowledge as the single cause most responsible for this.



When Patrick Minford approached me to deliver this Julian Hodge lecture on Wales and the knowledge economy, and I started to think over how to do it, I began to appreciate how this lecture would differ from others I have given on the knowledge economy. This has been a chance for me to examine, through the perspective of the knowledge economy, an exciting and fast-growing region within a national unit - a region that shows exciting and interesting emerging patterns of development and autonomy. Every nation is different; every sub-region even more so. Public policies and business strategies useful for one need not be so for the other. The task is to tease out what is essential and shared, what differences matter, and what others are only superficial and distracting. This experience has been, for me, most stimulating and educational.

What conclusions have I reached?

To get to one bottom line quickly, I don't know which Welsh businesses are most likely to succeed, just as I don't know which are the best places to visit as a tourist in Wales. But then again, more generally, I also don't know which countries to invest in worldwide, or which financial stocks to buy or sell. So, really, my continuing ignorance is by no means restricted to Wales.

What I do know is that the knowledge economy that we are now in or that towards which we are


heading can be discerned by economists mostly only through general principles. Measuring the extent of the knowledge economy is not like measuring, say, the volume of cotton harvested or the quantity of coal mined. What I want to describe to you this evening, therefore, is two-fold. First, what does a knowledge economy look like; how do we know when we bump into one? Second, how do the indicators that we do have, imperfect though they are, show the knowledge economy in Wales? Underlying both questions is a possibly larger theme, What should we do about the knowledge economy?

And what I will have argued by the end is also two-fold. First, infrastructure and skills-wise, Wales is not dramatically out of step with the rest of Great Britain. Second, it is the demand side where improvement is most needed. Consumption and use of knowledge-intensive goods and services; the demand for high-skilled workers:

On both these fronts the Welsh economy appears to lag behind the rest of Great Britain.

1 What is a knowledge economy?

A knowledge economy is much like an ordinary economy, except how value is created, embedded, exchanged, and consumed and what form that value takes are more intangible than in a cement economy or acorn economy.



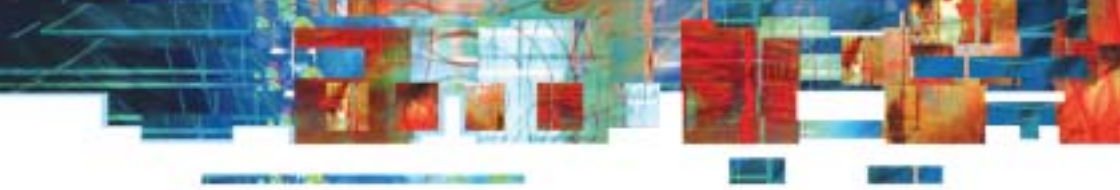
An ordinary economy has people in it, technologies to produce goods and services for those people to consume, and rules of the game - legal and social institutions - that dictate how value flows between its different constituents. There is a flow of economic value every time investment happens, production occurs, and goods and services get exchanged and consumed. When an economy is not closed but trades with the rest of the world then international trade - national imports and exports - matter too. In a market economy, value flows are voluntary to and from those who hold property rights over goods and services. Prices mediate that exchange between supply and demand.

So too in a knowledge economy, except we insert "knowledge-intensive" or "skilled" every time something happens. People enjoy the knowledge-intensive goods and services that they've chosen to consume. Production happens through skilled people creating and using knowledge, to make yet more knowledge-intensive goods and services, if not just yet more knowledge itself. Structures - institutional, physical - must be in place to facilitate value flows in knowledge-intensive goods and services. International trade can occur. Clusters of production - industrial centres, cities - can emerge to articulate the economic landscape.

Each of these points can be folded back into language that academic economists recognize and that I'd used earlier to describe a more ordinary economy.

But some twists emerge that make a knowledge economy not just a direct, immediate translation from an ordinary economy. Exchanging knowledge isn't like exchanging corn or cement. For the latter handing over 5kgs means you're immediately out 5kgs corn or cement; but for exchanging knowledge, handing over however much of it leaves your holdings of the knowledge intact and invariant. Exchanging knowledge means creating copies inadvertently; it does not mean handing over an item of economic value that remains fixed in quantity. How cheaply, easily, and invisibly copies are thus made measures how knowledge-intensive those goods and services are, and by extension how much of a knowledge economy the economy we live in has become.

Content industries - media, film, music - feel threatened by the perfect reproduction of digital products. This represents one extreme. Widespread availability of the means to consume that content (in computer hardware and software) and the anonymous, global-distributed dispersion of the Internet together heighten the effective knowledge-intensity of these goods. Robert Lucas said that there is no such thing as US knowledge or



Korean knowledge; knowledge is just knowledge. The same insight works for the knowledge, if you want to call it that, that is intensive in a Britney Spears music video recording encoded in MP3 or MPEG format.

This discussion raises three points about the knowledge economy.

First, such an economy comes intimately tied to physical geography, in one extreme form or the opposite. Just as its codified intangibility allows knowledge to copy itself across vast physical distances quickly and easily, its related tacit intangibility can tie its communication firmly to local language, culture, and norms. The relocation of call centres works well for servicing certain kinds of telephone queries; abysmally for others. For certain work, R&D scientists collaborate best when they can see each other's body language and randomly run into each other in the hallway; for others, it suffices to exchange mathematical formulas over email. To capitalise on locally spatial spillovers when they exist, clusters of economic activity might be natural and useful outcomes in a knowledge-intensive economy, to a degree over and above that in other kinds of economies.

The clusters of excellence we see in Cardiff and Cambridge in general or, more specifically, in North Wales for electronics or surrounding the M4 motorway between Swansea and London


for software thus might well be fruitful and productive results from both enlightened policy and spillover externalities in tacit knowledge.

But for other knowledge-intensive work, public policy that encourages co-location might be simply wasteful at best, or actually counterproductive at worst.

Second, the usual rules of the game for markets-based exchange - hallowed institutions such as voluntary exchange mediated through a price system and inviolate property rights - no longer necessarily produce the best social outcomes. This conclusion is critical for public policy and perhaps is not understood as widely as it should.

Historically, well-performing economies have usually come hand in hand with strong property rights over goods and services. This insight informs work from that of Nobel laureates such as the economic historian Douglass North through to current popular, influential economic authors such as Hernando de Soto. It is a central plank in Adam Smith's reasoning and has for the last two hundred years been fundamental for pretty much all of economic thinking.

The story goes like this. Strong property rights legally identify an owner. They transform mere assets out there into property specific to



particular individuals. In doing this, those property rights sharpen the incentive to develop and put to productive use the resources owned, for the benefits from such improvement accrue then fully to the owner and to no one else. Society gains as well through the provision of worthwhile goods and services. Society will not overconsume the resource as the owner will disallow usage beyond where he finds it worthwhile, relative to the price that society is willing to compensate him. If not for the property rights vested in that owner and the consequent protective behavior that they induce, society would fritter away the productive asset. For the same reason but run in reverse, society will not under-consume the resource either, in that when society's valuation exceeds what the owner demands in payment, the owner will simply provide more. If he doesn't, yet others will who have property rights over similar or related goods and services.

This is an extremely orthodox, neoclassical economic story - the kind that we teach to students in universities worldwide. Strong property rights and voluntary exchange, through markets or otherwise, lead to socially optimal outcomes. Such arrangements, almost magically, align the self-serving behavior of individual property owners with the good of society at large, and through the endogenous unfolding of exchanges occurring voluntarily, reveal the value to society of different goods

and services, and of the inputs that go into making them. This proposition is not just a creed of conservative, right-wing apologists for the capitalist system. It is an insight that serves well for a simple reason: It works.

Since economically valuable knowledge also form productive assets, the seductive and easy parallel conclusion is that intellectual property rights - property rights over knowledge - should lead similarly to good social outcomes. The stronger the better.

This conclusion, unfortunately, is wrong.

I had earlier talked about how trade in knowledge differs from trade in other things economically valuable. The reasoning I have just rehearsed on why voluntary exchange succeeds in delivering so much good to so many breaks down for knowledge. When the owner of knowledge sells it, he continues to keep possession; similarly, whoever he's sold knowledge to. Both of them and all others in similar situations will see incentive to keep selling (and in the process making) copies of knowledge as long as the market price remains positive, given market competition, and given that the opportunity cost to them of providing further copies of the knowledge is zero - for they continue to retain the knowledge to use or consume however they wish. The process ends only when the market is completely saturated. But a forward-looking, purposeful



entrepreneur - the creative knowledge-worker, the putative newly-entitled intellectual asset owner - will realize this dynamic is in place long before we do reach total saturation: He sees no gain for himself in instantiating a new piece of knowledge in the first place, and moves on to do something more financially rewarding.

Societies can put in place some friction to that free competitive exchange and dissemination of knowledge. Useful knowledge could be kept as trade secrets, divulged only to specific individuals or to particular industry groups, forming trusted coalitions. Knowledge-products could be handed over only with tight restrictions

on what can be done with them. Laws could be set up that do no more than disallow competition between alternative knowledge-producers. Technologies might be built that slow down the transmission of knowledge.

Whatever it turns out to be - and in the real world, combinations of all of these can be observed - these arrangements work by disrupting markets. Through curtailing the distribution and dissemination of knowledge, these arrangements raise its exchange price.

Intellectual property rights are one such disruption in markets.

They are not ordinary property rights. And they do not produce socially optimal outcomes. Any serious policy-making in knowledge economies needs therefore to re-think the role of markets in organizing economic life.

The reason we should be against intellectual property rights is not because we don't believe in markets, but because we do.

For many businesses in the frontline of the economy today, such concerns over the rules that underly the way we organize economic activity might seem remote or, perhaps more damning, merely academic.

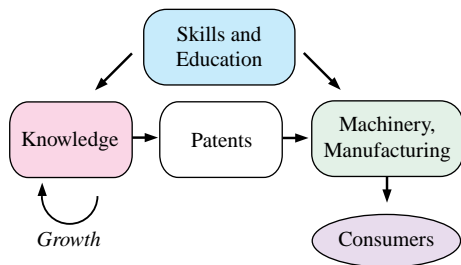
But we're talking about Adam Smith here. Adam Smith's enduring insights on the workings of markets have been fundamental and profound, and have historically served us well. Only now, in a knowledge economy, property rights need to be re-thought. And it is the academic's job to fret over matters like that. Moreover, I would argue that, ultimately, right-thinking policy-making and business strategy-formulation need to be concerned with such longer-term issues as well, rather than tinkering with and fine-tuning what system already exists today.

The third feature that this discussion has pointed to is that the knowledge economy is not just about R&D and productivity. UK policy making at the level of the Department of Trade and

industry or Her Majesty's Treasury pays mind to the knowledge-based economy. But it is a focus only on how we can improve the productivity of the UK economy. The discussion we have just gone through, however, tells us that the knowledge economy is more than short-run productivity.

The Figure is a simple, stylised description of how much policy making approaches the knowledge-based economy. It is a statement about technology and economic growth. It also happens to how economists have traditionally viewed economic growth and technological progress.

Technology and Growth



In the Figure, there is on top of everything else skills and education, human capital, intellectuals in society that have skills and are productive, and can be put to work. Skills and education drive knowledge; knowledge is the source of economic growth - there is no controversy over



this. The Figure shows this with a circular arrow describing economic growth in terms of knowledge feeding on itself.

The Figure also shows that skilled, educated people see competing uses for their time. They can decide to go and work in research and development, they can work developing new rules of the game by which we organise society, or they can go work in the manufacturing sector as managers and white-collar bureaucrats.

All these are critical ingredients in any knowledge-based economy. Knowledge advances on the left side of the Figure, is

protected by intellectual property rights, and is then, on the right side of the Figure, put to use in the manufacturing or industrial sector to deliver goods and services to consumers.

The knowledge-based society/economy that focuses on a picture like this is about raising productivity. It is about R&D, and many other traditional features, at all of which, the Welsh economy, by many indicators, is already successful. But the knowledge-based or knowledge-intensive economy is more than this.

To think through how, we need to think through what we want out of economies and societies,



and what we need intelligent policy making to do. We need to understand the effects of changing the rules of the game.

2 Outcomes

What do we want out of the knowledge economy?

The answer: the same things we have always wanted out of any economy.

To get there, we need to go through some changes, again, as we have always needed to do. In this economy and similar others that have already had to undergo gut-wrenching and painful adaptation in the past, from relying on

natural resources like coal to heavy manufacturing, this might seem daunting and to be resisted.

Now at the LSE I am fortunate enough to get to lecture to just under 950 students a year, all told combining both undergraduate and postgraduate students. Like the worldwide MacDonalds hamburger chain, I have served that many each and every year for a half-dozen years now. I am also lucky enough to have at home two little boys, aged nine and seven, from whom every day I learn just that little bit more about life.

Many of us here today are, similarly, teachers, parents, or just interested observers of the young growing up around us. We recognize that their development into mature responsible adults, whether in Wales, London, or the US, entails a number of common features.

We see that as young people grow, their circle of interactions enlarges: They exchange ideas, progressively earnestly, with acquaintances, friends, and eventually colleagues. Some of these ideas are for entertainment (i.e., consumption). Others help them become more productive members of the workplace or in society at large. As young people leave university, they focus what they do on fewer and fewer things; they don't have to try everything any more. The work they undertake progressively specializes, they become better at



what they've selected for themselves, and they leave to others around them to provide what they themselves choose not to do. A circle of mutual trust and understanding allows them this. But even those young people who don't go to university, more and more as they progress through the workplace, come to rely on the support structures of others who work around them.

This is nothing out of the ordinary. Societies, new and old, practically everywhere in the world see this happen all the time. Such development is remarkable only in its ubiquity, and because of that, in turn, it is often not worth remarking on at all. Young people leave the protective fold of family that they've known since childhood and go on to make their own way in the world. As they do so, no single unit - the immediate or even extended family - any longer provides all the facilities, support, and backing on which they, as infant and child, had previously drawn. They lose total self-reliance within the close-knit family unit, but in turn gain immense benefits from interacting with the wider circles of society around them.

That is the natural order of things. Indeed, we think it unnatural when we want it to be different. None of us plays football as well as Ryan Giggs or David Beckham [although for David Beckham we now know he does many

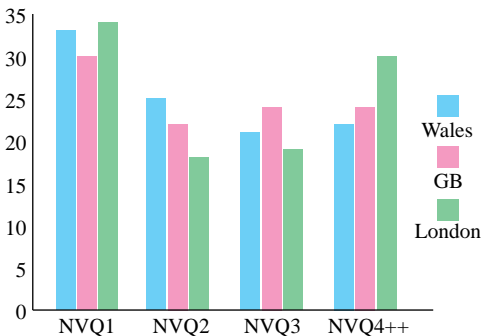
other things well too]. The world is a much better place that Beckham take the free-kicks at goal, and we be the educators, policy-makers, brain surgeons, bankers, and financiers. Few of us have the skills to harvest corn; grow coffee; bake bread in the hundreds or thousands; make movies; sing and dance; fly aeroplanes; construct the buildings wherein we live. Other people, different people, do these things, and we depend on their doing so reliably in exchange for what we in turn provide them. In this web of interactions we rely on society around us having evolved the trust and institutions - the social capital, the legal structures that protect property rights when it's right and that enforce voluntary exchange when it's appropriate - that allows all of us to operate interdependently, safely. That way we know that when we walk down to the neighborhood supermarket, we can reliably buy the bread and fruit that we wish, or if we go to the Royal Arcade here in Cardiff we can get quality Welsh-made blankets and candlesticks.

Just as with individuals, so too entire economies and regions.

When exchange occurs freely and societies' properties are not involuntarily deprived or forcibly expropriated, then the natural outcome obtains where trade benefits all. Change and adaption towards specialisation is needed for that.

Is Wales much the same as Great Britain?

Distribution of qualifications not markedly different:



3 Wales, Great Britain, and London

But what should Wales specialise in, in the knowledge economy? To clarify that, we now need to delve a bit more into the detailed structure of the Welsh economy.

I will now point out, in a more organised way, details that I have just referred to in passing earlier as I then developed the argument.

In Wales we see spectacular successes in intellectual enterprises, scientific publications, and a range of other activities. This economy has gone from coal mining and steel production to new technologies that are among the world's best in aerospace and electronics, in biosciences and computer software, in the automotive industry, and in semiconductor research.

General Dynamics, through military contracts, undertakes extensive research and development just outside Cardiff. Broadcasting, I have already described to you. North Wales has economically vibrant opto-electronic clusters. ADSL broadband availability to the Welsh population has exploded from 35% two years ago to 70% the year after that.

This supply or production side of the knowledge-intensive economy is therefore all in place. (To clarify, everything that we talk about in the knowledge-intensive economy is what macro economists in the 1980s would typically refer to as the supply side. So when we later talk about the demand side that too is what is also conventionally a supply side to the macro economy. This terminology is, as we can see, not always edifying but it is one that has stuck.)

But what of the demand side to the knowledge-intensive economy in Wales?

When I introduced this talk I had also told you the conclusion to which I will drive us: It is the demand side of the knowledge-intensive economy where this particular economy appears to be most lagging.

Turn now to some indicators on this. Begin with ADSL broadband: Wales's 70% availability is pretty much as good as it gets anywhere in the world. The supply side is strongly in place.



But only one-fiftieth of that 70% of the population for which broadband internet connection is available have actually signed up for it. The demand side has not gotten to where it appreciates and enjoys knowledge-intensive goods and services. Under 60% of SMEs have internet access - that's an awfully small number of private businesses using an internet infrastructure already in place. And of that 60%, few are using integrated e-commerce systems. People are not doing business on the internet, leaving unused this 70% internet infrastructure already available. It will not be socially worthwhile to extend availability without having users take up what's already extant. (And most of what goes on in businesses with internet usage here would likely be just email, not fully-integrated e-commerce systems that might have a better chance of driving supply-side productivity.)

In the current political and economic climate, one often hears concerns over high-tech call centres relocation. More generally, what of the perception that low qualifications and an economically inactive population can harm an area, as most employers active there might not be indigenous and therefore are instead highly mobile with no strong local commitment? What keeps economic activity here, rather than forcing it there?

I want to delve a little more into this by looking at some relevant numbers against the backdrop

of the knowledge intensive economy, to see where public policy and longer-term business strategising might need to take these ideas forwards. To carry out this exercise, we need a real-world yardstick as well, not only a conceptual one. For simplicity then let's compare Wales in national context. Is Wales pretty much the same as the rest of Great Britain, and if not where does Wales fall behind?

First, in the skills of its working population the Welsh economy is not hugely dissimilar from the rest of Great Britain. The Figure shows NVQs (National Vocational Qualifications), descriptions of competency standards for particular occupations, across Wales, Great Britain, and London. NVQs reflect the knowledge required to do a job well; the higher the number, the greater the knowledge. They reflect not just academic qualifications but practical, on-the-job knowledge as well.

Let me take a few seconds to describe what goes on in this Figure, even though it's a relatively simple graphic. Different things happen in it, and by understanding what goes on here, we will be able to approach the rest of the Figures more easily.

In all the Figures I will describe to you in the remaining time, the horizontal axis will be a description of skills and knowledge intensity. As we move rightwards in this picture we will



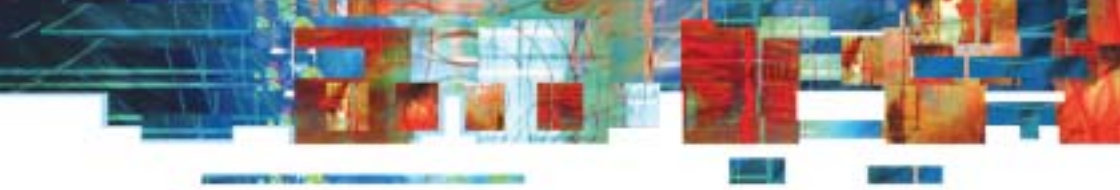
be driving towards ever higher skills or ever higher knowledge intensity.

In all the Figures there will be three bars in each column. These three bars will constitute the comparison that we need to make. They are always the following: The first bar denotes Wales, the second bar Great Britain and, for comparison, the third bar London.

This graph describes the distribution of skills at doing a job, not just vocational qualifications, and not just academic qualifications. We need to get away from thinking the knowledge-intensive economy as being only about getting paper

degrees. It is about having the knowledge to do a job. If we look at the first and second bar, running across skills, the Welsh distribution of skills and qualifications is pretty much the same as Great Britain's.

There is about the same fraction of relatively low-skilled qualifications and there is about the same fraction of relatively high-skilled qualification. Looking across skills, there is the same dip and then return for both Wales and for Great Britain. Wales is not dramatically out of step with the rest of Great Britain.



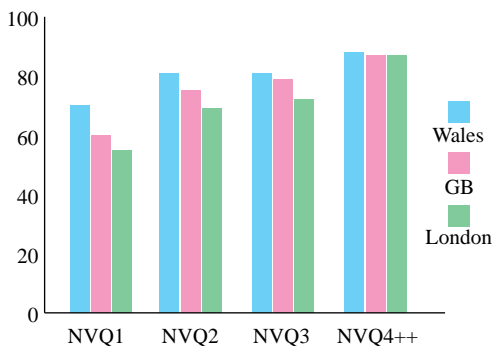
But here is something else surprising: Both these distributions, those for Wales and for Great Britain, are also not markedly different from London's. London shows the same U-shaped distribution that we have just seen for Wales and Great Britain more generally: we have many skilled people and many unskilled people, but in the middle we are relatively under-resourced.

The distribution of qualifications across the Welsh workforce is pretty much the same as the distribution in Great Britain and the distribution in London. The first, tentative conclusion then is that this is not where the Welsh knowledge-intensive economy is going to differ from the rest of Great Britain or from London.

Putting the emphasis differently, the supply side of skills is not hugely different in Wales compared to anywhere else in Britain. This similarity will carry over to a range of other economic indicators - I will now quickly go over how the skill patterns in employment, unemployment, and relative wages are very similar for Wales and for Great Britain. London, however, begins to show a difference that will become more and more marked as we go along. In the end, I hope we will agree on where things need to be patched up if Wales is to take the path that London has gone.

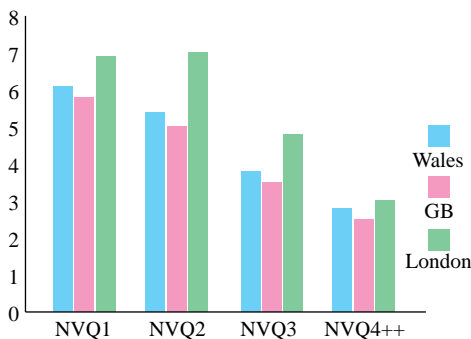
The next Figure shows employment rates across skills and regions.

Employment rates, 2000



In year 2000 across each of the three regional economies employment rates by skills all hug one another - they are all very similar. Wales is not dissimilar from London; neither is hugely dissimilar from Great Britain overall.

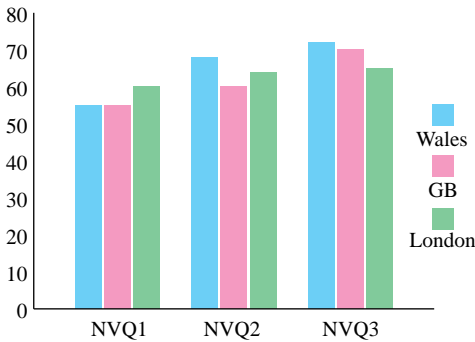
Unemployment rates, 2000



In the next Figure we see that unemployment rates are not hugely different either across these

three regional economies. Indeed, to the extent that statistics point to economic imbalance, it is London where unemployment across relatively low-skilled, relatively unqualified segments of the workforce shows rates higher than average. Wales is pretty much spot on the norm for Great Britain.

Relative wages, 2000



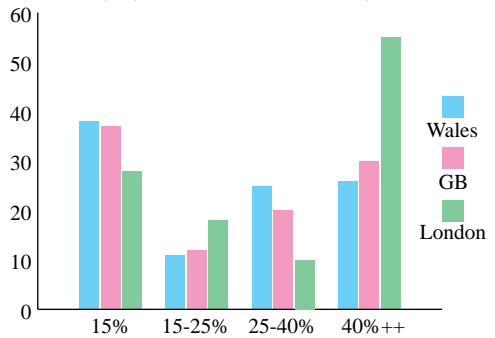
Next turn to wages. Unlike the numbers we have just been considering, wages can fluctuate across regions not because of any physical, structural differences but, instead, for measurement reasons alone.

Varying costs of living are one leading example. I attempt to minimize such inconsistencies here by taking wages in each region relative to that observed for the highest-skilled category. The next Figure shows that these relative wages for different qualification groups are again not

hugely dissimilar across regions. Welsh relative wages at intermediate skill levels turn out to be comparatively high, and aren't lower than the Great Britain average for the unskilled. The unskilled in London turn out to be relatively well-paid, reflecting their higher demand in the capital.

Is Wales much the same as Great Britain?

Of total employment, distribution across industry by education not markedly different:



In the next three Figures, the percentage given on the horizontal axis describes industrial sectors that have the stated fraction of university graduates among their employees. The higher that percentage, the more knowledge-intensive the industrial sectors. The vertical columns in these figures show the fraction of total employees in the region working in industry sectors of whose employees, in turn, have the specified



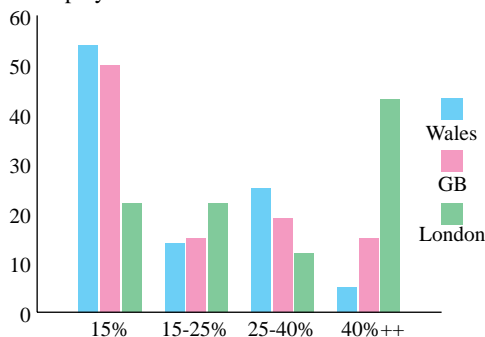
percentage university graduates. The higher this column, the more knowledge-intensive the environment generating jobs.

Demand for workers in the 15-40% industrial sectors is lowest in London, and for Great Britain overall not as large as for Wales. But overall Wales has a high degree of inclusiveness in the knowledge-intensive economy. Of total employment the distribution across industries by education is not hugely different across Wales and Great Britain becomes significantly different only when we focus on London. The distribution of total employment across differentially skilled industries, across different segments of the knowledge intensive economy Wales is pretty much a mirror image of the rest of Great Britain. London shows a difference in that in the very high-skilled end of the spectrum London contains a concentration of employment.

But next is where things begin to carry more of a sharp policy implication for Wales. In private-sector employment Wales diverges markedly from both the London economy and the economy in Great Britain overall. Begin by noticing that in the next Figure Wales shows levels of private sector employment similar to Great Britain - although perhaps not so for London. But on the right side of the picture, for relatively high-skilled industries, Welsh private sector employment is tiny.

But...

...in Wales highest skilled private sector employment is small:

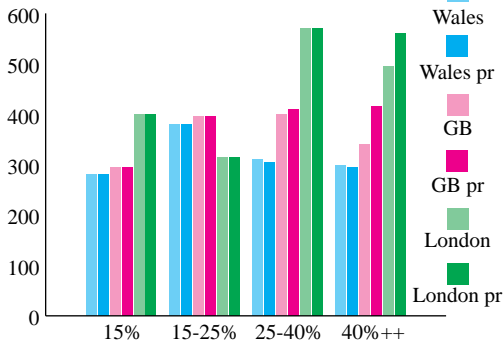


Economic growth in the private sector that drive the frontier in using high-skilled workers - while present in isolated instances in Wales - is not present in significant enough quantities to make an observable dent in these statistics. This fact shows up even more strongly when we look, in the next Figure, at how Welsh wages differ in private sector employment. For overall employment, Welsh wages, we have already seen, are pretty much in line with everywhere else.

But turn to private sector skilled wages. Here is how we read this Figure - the blocks describe wages across regions in pairs, each pair alternating total with private sector employment wages.

...and

...in Wales private sector skilled wages usually worse than public:



Look what happens at the relatively low end of the skills spectrum. Private sector wages in Wales are pretty much in line with the overall total; public sector wages in Wales, similar, at relatively low ends of the skills spectrum. But this alignment starts to diverge once you move higher and higher up the skills spectrum. Once you reach the high-skilled end of the spectrum private sector wages in Wales are actually at a discount relative to public sector employment, in stark contrast to what we see elsewhere in Britain.

In other words the use of skilled human capital in the Welsh economy, for now, is being driven by the public sector. An entrepreneurial forward-looking private sector demanding high-skilled human capital seems sharply absent.

The supply side of the knowledge intensive economy in Wales is in place and is similar to that we see everywhere else. However, a demand side articulated by private-sector entrepreneurial activity is not yet present in sufficiently large quantity, to drive the Welsh profile of skills usage forwards, to reach levels comparable to that in the rest of the British economy.

4 Conclusion

So what have we learned here? We have talked about the knowledge economy in concept. We have seen what is the same in it and what is different from ordinary economies. We have talked about intellectual property rights and how the knowledge-intensive economy is not just productivity and research and development.

Then we used those ideas to focus on the knowledge-intensive economy in Wales to compare with that in Great Britain and elsewhere. We have seen some of the spectacular successes that have already occurred in the Welsh economy. But we have also seen how there continues to be an imbalance in the private sector, entrepreneurial, fast-growing demand side of the knowledge-intensive economy. That is where we see greatest room for public policy and long-term business improvement.



A history of past lectures

The first Julian Hodge Institute of Applied Macroeconomics Lecture was delivered in 2000. Since this time the lecture series held in Cardiff, has included some of the world's leading economists.

- 2000 - Sir Alan Walters - former Chief Economic Adviser to Mrs (now Lady) Margaret Thatcher.
- 2001 - Professor Otmar Issing - Board Member and Chief Economist, European Central Bank
- 2002 - Sir Alan Budd - Member of the Bank of England's Monetary Policy Committee and Chief Economic Adviser to the Treasury from 1991-1997.
- 2003 - Professor Bennett T. McCallum - H.J. Heinz Professor of Economics in the Graduate School of Industrial Administration at Carnegie Mellon University

Before this a series of lectures associated with Sir Julian Hodge commenced in 1970 entitled the Jane Hodge Memorial Lectures.

- 1970 - The Rt. Hon. Sir Leslie O'Brien GBE , Governor of the Bank of England.
- 1971 - M. Pierre - Paul Schweitzer, Managing Director of the International Monetary Fund (IMF).
- 1973 - David Rockefeller LLD, PhD, Chairman, Chase Manhattan Bank.
- 1973 - H.R.H. The Prince Philip Duke of Edinburgh.
- 1976 - His Excellency Sheikh Ahmed Zaki Yamani.
- 1984 - Robin Leigh Pemberton, Governor of the Bank of England.
- 1990 - Sir George Blunden, Deputy Governor of the Bank of England

The Julian Hodge Institute of Applied Macroeconomics therefore carries on the very proud tradition of promoting debate and understanding of present day economic issues.



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