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#17 EUROPE OF THE FUTURE AND THE FUTURE OF EUROPE: THE INNOVATION/AUSTERITY CHOICE[1]

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INTRODUCTION

Although innovation policy usually follows the business cycle, it is both desirable and possible to reverse this trend. Perhaps the most telling commentary on contemporary Europe is the silence that met the presentation at the recent European Parliament Innovation conference of the Chinese R&D spending curve passing the European Union curve in 2013. This intersection is a symptom of a deeper divergence in response to economic downturn between societies committed to innovation and those committed to austerity. One response to the downturn is to double down on fiscal stimulus in order to increase spending in the short-term and create jobs, exemplified by the early Obama Administration's relatively modest stimulus package. Another response is to pull back, decrease government spending or, at best, hold it constant as in the UK. The optimal response, as exemplified by China's continuing infusion of resources into higher education and advanced technology development, is for government to pursue fiscal expansion targeted toward innovation, providing short-term economic stimulus while accelerating the transformation from a manufacturing-based economy to a knowledge-based economy.

Both private venture capital and government innovation appropriations, absent strong countervailing measures and societal commitment, typically decrease in an economic downturn. Legislatively set R&D funding typically rises in the upturn and falls in the downturn of the business cycle, as a function of the political cycle cogwheel that operates with a brief time delay. Both developed and developing economies are affected by this dynamic, but we set forth the counterintuitive hypothesis that developing countries, like Ecuador, Malaysia and China, may keep up and even increase their efforts to achieve knowledge-based innovation in order to catch-up, leapfrog over and displace current leaders. The European Union's promising Lisbon Agenda of projected R&D increase to 3% of GDP, formulated in relatively good economic times as part of a strategy to make Europe the most innovative world region, was foiled by this exigency. Similarly, as part of its development strategy, Mexico committed to raise its public R&D funding to the level of 1% of GDP from less than 1⁄2%. Despite significant increases in the past few years, it is struggling to reach that goal, let alone to join world leaders like Sweden and Finland, having learned from the early 90's Scandinavian recession, have kept above the 3% level (Benner, 2012).

This paper outlines a counter-cyclical innovation strategy, derived from an innovative project, the California Institute for Regenerative Medicine (CIRM). CIRM was founded to provide an alternative

[1] Preliminary version of the Position Paper invited for presentation to the Joint Institute for Innovation Policy (JIIP), 40th Anniversary Conference, Vienna,

source of support for stem cell research in the US, in response to political strictures on this emerging scientific field (Etzkowitz and Rickne, 2014). CIRM's novel feature is that it extends the physical infrastructure funding format of bond funding into the realm of intellectual infrastructure. In the following sections, we discuss the negative effects of economic downturn on innovation strategy and practice, and propose a methodology to turn it around. However, widespread institution of this method requires a paradigm shift of mind-set in response to economic crisis that is as yet only modestly underway, especially in Europe.

INNOVATION PARADOX

The "innovation paradox" is that the very point at which the business cycle tempts legislators to view austerity as a cure for economic downturn and reduce innovation spend, is when increase is most needed to create new industries and jobs and innovate out of recession or depression (Etzkowitz, 2012). Theoretically, the downturn is a good time to invest in new firms and in new ideas. Traditional capital as embodied in machinery and technology, as well as human capital embodied in people are more available, and thus less expensive, in the downturn than in the upturn when there is likely to be a shortage. However, the downturn is almost by definition the point at which so-called "animal spirits" are deflated, and thus funds are least available. Although the political cycle does not have to follow the business cycle, there are strong ideological and practical pressures for the political cycle to conform to the business cycle, especially during the downswing.

Europe's Innovation strategy has been more closely tied to support of existing firms, in contrast to the US where the encouragement of start-ups has been the implicit strategy. This distinction is, of course, relative: the US is the home to defense related systems integration behemoths, while Europe increasingly encourages entrepreneurship and startups, especially as an employment strategy. Nevertheless, US Small Business Innovation Research (SBIR) program funding has classically been a form of public venture capital for S&T based startups, from academic, industry and government labs while the EU framework programs have classically subsidized and expanded upon the R&D programs of large firms (Etzkowitz, Levitt and Gulbrandsen, 2000).

Europe's response to the economic downturn of 2008 has been singular. In contrast to the US, China, Japan, and other leading world economies that have engaged in various mixes of fiscal stimulus and pseudo-fiscal quantitative easing, Europe, led by Germany, has cut budgets in the hope that a reduced public sector would make room for an enlarged private sector. The negative effects increase in intensity, looking from northern to southern Europe, where unemployment levels are higher than seen in the 1930's depression. All this in spite of strong evidence suggesting that periods of near-zero short term interest rates are precisely when stimulative fiscal policy has the lowest costs and highest benefits (DeLong and Summers, 2012), and that what little fiscal stimulus was undertaken in Europe during the most recent downturn was effective (Coenen, Straub, and Trabandt, 2012).

Austerity-driven economic depression has also begun to fuel political fragmentation, polarization, and nationalism throughout Europe. Extremist parties of both the far left and far right have risen from the ashes to challenge the political status quo in both comparatively well-performing creditor countries such as Germany and Finland, and thoroughly depressed debtor countries like Greece, Spain, and Italy. Though some of these opposition parties thoughtfully oppose austerity, many bring to the table deeply held nationalist, anti-immigration, anti-EU, and anti-trade beliefs. Each year of painful and counterproductive austerity increases the power and appeal of radical elements. Hungary

has been at the vanguard of this sort of populist political upheaval, and the costs of an analogous political breakdown throughout Europe are incalculable. Not only is Europe's economic dynamism at risk; so too are the stable politics of European nation states, not to mention any hopes for increased European integration.

When John Maynard Keynes analyzed the causes and cure for the great depression in the 1930s, the US economy was based on a physical productive apparatus, focused on making artefacts like steel, automobiles and the like (Janeway, 2012). The Keynesian model was based on putting people back to work by getting the existing productive apparatus to operate by government putting money into large-scale building projects such as dams and bridges, the Public Works Administration (PWA) approach, or simply putting people to work with picks and shovels, typewriters and cameras, the Works Progress Administration (WPA) approach. Employing 8.5 million people, public facilities such as schools, offices and roads were constructed, large numbers of trees were planted to avert "dust bowls," murals were painted, theatres organized and state guidebooks written, employing visual artists, writers, actors and musicians as well as unskilled laborers (Etzkowitz, 2015).

Although Keynes held that even digging and filling holes was a better economic policy than allowing people to remain idle, in fact, the WPA approach, focused on generating employment, accomplished such diverse results as reforestation and public art (Taylor, 2008). Although significant resources were committed, it took additional massive public investment in rearmament and R&D to close on full employment at the onset of World War II. Rather than crowding out the private sector, an enhanced public investment in innovation would allow growth in the private sector. The problem of the contemporary economic crisis is how to put underutilized brainpower and capital to work, in addition to underutilized physical productive capacity (Leighninger, 2007). Thus, a new model for addressing, what may in the future be recognized as a second great depression, is required (Mazzucato, 2013).

As we move from a physical apparatus to an intellectual apparatus that underlies much of the economy, what is especially underutilized now is the brainpower that is being created. Graduates and PhD's are trained in ever higher numbers. Whereas in 1940 only one in twenty US adults had completed bachelor degrees, one in four had such degrees or higher by 2000. Growth of higher education is a global phenomenon, transforming an elite into a mass experience. Idle resources in the form of underutilized capital are hugely important, but the innovation conundrum is really a two-part equation, with idle brain power and idle capital. When nobody else wants to put their money on the line and invest, government must step in and utilize society's resources by borrowing massively on the cheap.

EUROPE'S FUTURE AT RISK?

Consider that the Dutch government can borrow for ten years at an interest rate of .67%. .67%!!!! The returns to traditional fiscal stimulus are clearly high enough to justify borrowing at these rates, not to mention the added public goods created from investing in scientific research and innovation.

The influence of this intellectual transformation on the economy and of the role of knowledge in society was apparent by the 1970's, when it was conceptualized as the emergence of post-industrial society, characterized by the shift from manufacturing to services, the rise of science-based industries and the growth of technical elites (Bell, 1974). The departure of manufacturing to low wage countries, the rise of the rust belt, and shrinkage of employment opportunities for persons lacking

higher education was concomitant with post-industrialism (Bluestone and Harrison, 1982).

Intellectual infrastructure has become the equivalent of physical infrastructure as government issued bonds; a financial mechanism heretofore utilized primarily for roads, canals, bridges, and the like, is used to support research and innovation, as well. In the transition from industrial to knowledge society, science and innovation must be treated as infrastructure, like the roads and bridges that provided the underpinnings of industrial society. This basic recognition of scientific research as a public good was established more than six decades ago (Nelson, 1959), yet establishing government support remains challenging. Mechanisms that were heretofore utilized to fund long-term investments in physical infrastructure may similarly be applied to construct knowledge infrastructure. These investments will not only directly repay government through interest payments, but generate incremental growth and thus increased tax revenues.

What might the contribution to European innovation be if large- scale funding was targeted at mid and longer term strategic bets, managed by equivalent agencies to US DARPA and NIH. But where will those funds come from if even the relatively modest Lisbon Agenda of increased innovation spend in national budgets could not be achieved? A transformative experiment in innovation potentially solves the problem of uncertain funding support tied to the ups and down of the business cycle by reappropriating the traditional Keynesian logic of debt-financed government stimulus from physical to knowledge infrastructure. Large scale projects, whose future benefits are expected to cover present costs with interest, justifies borrowing against that future on the credit of the state. When these projects have the potential to stimulate not only short-run demand, but to increase the long-run productive capacity of the economy through scientific discovery, all the better!

Another method to raise public funds is, of course, to increase taxes. In the wake of historical analysis (Piketty, 2014) and Occupy movements highlighting increasing inequality, tax policy is increasingly attractive both to those who wish to reduce inequality as well as to those who wish to increase tax benefits for the wealthy. However, as New York’s Mayor de Blasio learned in the course of his recent successful effort to expand early childhood education, taxing the rich is a strategy fraught with difficulty, engendering blocking opposition even from among those within his own party who agreed with his social objective. On the other hand, in 2012, California’s Governor Jerry Brown managed to overcome the opposition to increase taxes by going directly to the state’s voters who passed a proposition that combined a regressive 1/4% sales tax increase with a progressive income tax increase on residents earning more than $250.000 per annum. The proceeds were channelled to improve public education through the community college level.

THE CALIFORNIA INSTITUTE OF REGENERATIVE MEDICINE

When the George Bush Administration severely restricted federal government support for stem cell research in 2004, California stem cell scientists and their allies raised the banner of states rights and created an alternative science and technology policy at the state level that in the stem cell field is larger and more far reaching than any initiative that has yet been taken at the national or supranational level. What was novel in 2004-2005 California was that a coalition of citizens and scientists “bottom up” created an innovative R&D system in response to the anti-abortion movement’s successful campaign to restrict federal government support of stem cell research. Upon passage of Proposition 71, three billion worth of bonds issued on the credit of the state, created the California Institute of Regenerative Medicine (CIRM) to disburse R&D funds for a ten-year period to advance stem cell innovation (Etzkowitz and Rickne, 2014).

Research funds are distributed through peer review, carried out by out of state reviewers to reduce the potential for conflict of interest. A novel feature is that rejected applicants may appeal to a Citizens Review Panel, including patient advocates, to override a negative decision and this has occurred. CIRM funded PhD training programs at universities across the state, in its special field, are on a larger scale than traditional NIH programs. CIRM supported research facilities construction made it possible for stem cell research to be carried on in buildings separate from those that had been supported by federal funding where it was, for a time, disallowed. These building projects were also naming opportunities and often received additional private support. Through CIRM support, a third California concentration of stem cell research has been created as the Los Angeles basin has achieved critical mass in this research area, previously dominated by the San Diego and San Francisco biotechnology complexes.

California's Constitution contains a direct democracy provision that, upon collection of a requisite number of qualified voters' signatures, mandates votes on ballot initiatives. When the first author initially heard about this initiative in California in 2004, it represented an intriguing change in the basis for public S&T funding, in shifting from a general appropriations model to a targeted debt funding model. We suggest that this exemplary instance has broader implications, as it has the potential to be extrapolated into a new model for the funding of scientific and technological innovation as the infrastructure of knowledge-based society, as a counter-cyclical innovation policy that stimulates the creation of new clusters.

This model stands in stark contrast to the European status quo, in which counterproductive austerity policy starves, or at best maintains a steady state in the knowledge producing institutions that are the source of future knowledge based innovation and growth. The same logic typically used for financing physical infrastructure, selling bonds on the credit of the state to build roads or bridges, and then collecting a toll on the bridge and eventually paying off those bonds, can be used to finance knowledge infrastructure. Here the hypothesis is, that the science itself will produce tangible economic benefits, and that, bondholders will be paid off directly from earnings on intellectual property or equity in firms that it has helped fund. Further, debt ratios will be reduced over time as investment in S&T helps spark economic growth, not to mention the improvement in the long run economic wellbeing of citizens.

EUROPE'S INNOVATION CHALLENGE

Government can best boost innovation through enhanced industry- university interaction. The success of KU Leuven shows that significant spin-off activity is not only the province of MIT, Stanford, and Imperial College. It is necessary to enhance support mechanisms for university research groups to cross the university- industry boundary and create spin-offs at higher rates. Such actions are key to resolving the so-called European paradox of economic activity from useful results, lagging research advance. University leadership in Europe and elsewhere would be well advised to take efforts to restructure the relationship of universities to regions.

The Triple Helix thesis is that in knowledge based society, the potential for future industrial development increasingly lies in the university, not only because of its research potential, that may be underutilized, but because the university has the students, an ever- renewing source of new ideas. Students may be encouraged and trained to be entrepreneurs, and be inspired to take up new roles as firm founders in a society that have become overly dependent on a small set of large corporations, some of which are dinosaurs that are becoming extinct while others are moving major parts of their

enterprise abroad. For example, much of Volvo's automotive production capacity has been relocated to Volvo Street in Jinan, China. With production and design increasingly taking place along Volvo street, coupled with transfer of formal ownership, an iconic Swedish firm is bringing its engineering and safety expertise to a Chinese automotive company that is expected to be one of the first that the Chinese Government will allow to export to the West.

Can China take global leadership in innovation from the US and Europe? Expectations that China's economic rise will stall due to rising labor costs may be misplaced if China's economic success is based on innovation, rather than inexpensive labor (Zhang and Zhou, 2015). An incremental innovation dynamic, spread widely through industries at different levels of technology, suggests that China's economy can sustain higher wages. Beyond relying on technology transfer for access to advanced technology, can China produce more fundamental forms of innovation that derive from university-industry government (Triple Helix) interactions based on an open Civil Society?

A democratic society is a competitive advantage in innovation. The former Soviet Union was able to advance in a few areas of military and space technology but failed to innovate more broadly. In the post Soviet era of increased leeway, universities improved their research capabilities and some initiated bottom-up efforts to foster entrepreneurship and create start-ups. However, in recent years, with the increase in military budgets and the growth of state orders, there is a movement to return to previous patterns of tight top-down control that never entirely loosened. By contrast, governments in continental Europe are allowing universities increased freedom of action, allowing and often incentivizing entrepreneurial initiatives. Spurred by metrics that show relatively few of their universities in the highest categories, France and Germany, among other countries, have begun programs to provide special subventions to universities that are expected to rise in the rankings. However, these special programs are rarely tied to innovation objectives as well, since the latter are not yet a significant measure in most rankings schemes (Tijssen, Gray and Etzkowitz, 2015).

CONCLUSION

Ecuador's audacious 2 billion dollar commitment to founding four entrepreneurial universities is an innovation beacon from a developing country to the rest of the world. Aalto in Helsinki, and Skoltech in Moscow, are two contrasting experimental bets on new foundations to which significant resources have been committed. It has been a half century since the wave of so-called plate glass universities were founded in the UK, primarily intended to expand higher education opportunities to a larger segment of the population, an implicit equivalent of the GI Bill that expanded access to higher education in the US. Moreover, exemplified by York University, they have made significant contributions to their local economies through spin-offs, replacing jobs lost in older industries. A new wave of entrepreneurial university foundation should be undertaken in the UK and across Europe. Amsterdam is following New York creating an MIT-like university through collaboration between Cornell and Technion, in filling the entrepreneurial academic gap in its intellectual infrastructure.

Nobody wants to spend in a recession or depression; everyone wants to save. This is evident both in stagnant GDP, and in historically low government bond yields (as more and more want to save, the yield on bonds falls ever lower). At a time when the economy needs stimulus, and when the government can borrow money at extremely low rates; what better policy could there be than to invest in innovation? After trial and failure, European austerity policies should be abandoned and replaced with innovation policies, making a bet that significant success downstream will more than

cover the debts incurred. Debt funding mechanisms could speed the transition to a knowledge- based society, a transition that is hindered, even stalled, if not reversed by economic downturn left unattended or deepened by counterproductive austerity policies.

As industrializing and industrialized societies alike attempt to make the transition to a knowledge-based regime, novel methods must be invented that supplement and support the venture capital format, a relatively limited model focused on potentially fast growing firms, based on novel technologies and business models[2]. Instituted in Massachusetts during the early post-war and transferred to northern California during the 1960's, the venture capital format spread more broadly in recent decades albeit with significant gaps even in its country of origin. Nevertheless, even given its recent extension into social and philanthropic realms, venture capital provides only a partial model for knowledge based development (von Bergmann-Winberg, 2104) We submit that the CIRM experiment has potential for generalization into a general model for S&T and innovation support.

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[2] General George Doriot, French-born Harvard Business School Professor and head of American Research and Development (ARD), the original US venture firm, attempted to introduce the concept to his native land in the 1960's but it failed to take root at the time.

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