Technology and Policy: *building an International School of Advanced Studies*

A preliminary discussion note

by

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The new conditions for the social construction of technological systems in both developed and developing societies require to be discussed and studied in terms of their impact on the emergence of new social realities in many countries, including Brazil. **An International School of Advanced Studies** is an adequate initiative to deepen our understanding of related themes. The increasing access to higher education and the continuous trends for the specialization of scientific, technological and industrial bases should be particularly discussed, including their impact for science, technology and higher education policies as factors of economic and social development on a global scale. It is suggested that related issues are discussed and analyzed under the context of a policy framework for science and technology development.

Brazil and many emerging and developing countries are now facing the need and the opportunity of large investments in science, technology and higher education, aiming at responding to the explosive social demand for higher education and to the vast social and political transformations already induced by new waves of educated youth. These investments not only seek new skills and but also the certification of quality that may be expected from working along together with well established academic and scientific institutions from developed countries. In addition, new research on the design of higher education at a world level and in very different socio-economic and cultural contexts is expected to help guiding the modernization of our societies worldwide.

The School of Advanced Studies should be based upon evidence and research, aiming at training a new generation of science and higher education policy leaders for Brazil and many other emerging and developing countries. Three main themes are suggested, as follows.

Theme 1: Transforming R&D and human capital into productivity gains

It is not a trivial matter to understand of the processes that enable investments in R&D and human capital to be transformed into productivity gains. Actually, there is a widespread view among economists that this kind of investment is too costly for the economic efficiency gains it provides.

This however is a too naïve and superficial approach. Viewed from a wider perspective, in the longer term R&D and human capital investments do matter and are probably the most important factor in explaining economic growth. However the naïve view has a point: it is not automatic the transition of human capital to growth. Specific actions are needed to make this transition happen successfully.

This challenge is particularly true for many developing and emerging regions worldwide, as well as increasingly relevant for many peripheral regions in Europe and North America (e.g, South Europe). It is certainly very relevant to Brazil and many other regions in Latin America.

This justifies a "School of Advanced Studies", oriented towards new research and the training of experts. The approach to follow may be based on three main subordinated themes and filed work:

- the identification of factors that explain the evolution of productivity - both as a technical indicator and as creation of value per capita – in developing economies
- a critical review of case studies on developing regions of both successes and failures in the performance of investments in R&D and human capital.
- The identification, design and discussion of policies towards endogenous development of developing regions.

Theme 2: industrializing beyond national systems of innovation

The concept of "national systems of innovation" has evolved during the last two decades, first in association with the need to fight against "market failures", then against "system failures". And it helped building new nationalistic policies all over the world, but just as business and science are becoming increasingly transnational. The end result has been a frustration of national policies, on one hand, and a further move toward the multi-nationalization of business, on the other.

This requires many observations and, certainly, deepening the debate in relation to the current economic and social situation in the US and EU, as compared to those in newly industrialized regions and the, so-called, BRICS. First, the myth of "national" high tech industries and related policies to protect them requires to be better understood, if analyzed in terms of the increasing unemployment rates. Second, the debate itself on "national innovation policies" is in any case naïve. No country, even in non-democratic regimes, ever seems to have had a broad, well coordinated innovation policy, mainly because of the complex structures associated with any "innovation ecosystem".

Looking at the last two decades, the picture that is emerging at a global level is not very much different from that discussed by Sylvia Ostry and Dick Nelson[1] in the early 90´s. In other words, one of increasing internationalization of private business strategies, while government innovation polices and science funding agencies remain overwhelmingly national. This is leading to new dilemmas for policymaking and to new sources of international friction, although with new boundaries and new players. The key issues to answer include what are the implications of increasing *technoglobalism* for national and international innovation policies, namely US and EU innovation policies? And, also, what new approaches are required to reduce international frictions and where do public policies need wider integration?

For the case of the US, the key message that emerges from analyzes of long-term patterns of investments in S&T is that of a diversity of policies that led over time to increased opportunities for citizens, as well as to increased institutional specialization based on a clear separation of the role of private and public incentives to support S&T[2].

For Europe, recent analysis[3] also argues that the debate on climate change, the recent financial crisis, and the new Chinese dominance of the world market, mean there is a need to revisit the role and design of industrial policy. This has been used to justify the need for renewed targeted sectoral intervention of governments, namely to redirect production and innovation towards clean technologies, as well as to make industrial policy more competition-friendly and more innovation-enhancing.

Analysis in the literature has also clearly shown that China's capacity to innovate is evolving, but still limited as compared especially to the capacity of the US[4]. A similar comment could be

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[1] Ostry, S. and Nelson, R. (1995), "Techno-nationalism and techno-globalism: conflict and cooperation", The Brookings Institution, Washington.

[2] P. Conceição, M. V. Heitor, G. Sirilli and R. Wilson (2004), "The Swing of the Pendulum from Public to Market Support for Science and Technology: Is the US Leading the Way?", Technological Forecasting and Social Change, 71(5), pp. 553-578.

[3] Aghion, P., Julian Boulanger, J. and Cohen, E. (2011), "Rethinking Industrial Policy", Bruegel Policy Brief, June 2011

[4] McKinsey Global Institute (2012), "Manufacturing the future: The next era of global growth and innovation"; November.

raised about Brazil, India or Russia and, therefore, there is a large scope to better discuss innovation policies in a broad international context, well beyond national borders. In addition, a new paradigm of international academic, scientific and technological cooperation that seems to emerge[5].

The ultimate goal should be to orient the discussion towards deepening our understanding of modern industrial policy. Looking at the US, together with other most developed economies (including Germany), we can identify some common factors, but also opportunities that need to be understood in international comparative terms: strong industrial bases, diversified economy, and supply chain and knowledge networks' complexity (Amsden, 2001[6]; Hidalgo and Hausmann, 2009[7]).

Approaching this question through a "School of Advanced Studies" requires the setting-up of a large task force for the "observation" of industrialization, to cover various aspects, including:

- The geography and dynamics of economic development and specialization – how scientific, technological and industrial bases evolve and impact socioeconomic development.
- The structure, geography and dynamics of supply chains and knowledge networks in different sectors and markets.
- Policy tools to foster local industrialization processes (e.g., public procurement, local production agreements, public expenditure in R&D and training).
- Deindustrialization processes, characterizing them and identifying, analyzing and governing related risks.

It should be clear that a new generation of industries will drive the economic recovery over the next decade, fuelled by long-term changes in technology, society and geopolitics. The recession has not been only a point of change, and many argue that it has acted as a catalyst for growth. As the business landscape alters, we will see the emergence of new ways of doing business in an increasingly interconnected world.

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[5] Heitor, M.V. (2012), "How far university global partnerships may facilitate a new era of international affairs and foster political and economic relations?", Science and Public Policy, submitted to publication.

[6] Amsden, A. H. (2001), "The Rise of "the Rest" – Challenges to the West from Late-Industrializing economies", Oxford University Press.

[7] Hidalgo, C. A., Hausmann, R. (2009), "The building blocks of economic complexity", *Proceedings of the National Academy of Sciences of the United States of America*, vol. 106, no. 26, 10570-10575, 30 June 2009

Theme 3: Strengthening the pillars

Science policies emphasizing the advanced qualification of human resources, together with democratizing the access to science and internationalizing the science base, are shown to help building the necessary conditions driving brain gain over time.

The goal is to explore themes of science and technology for development, including the advanced training of human resources and the role of infrastructures, institutions and incentives, together with the analysis of instruments and tools for scientific development (funding, evaluation, assessment and monitoring).

Specific case studies should be presented and discussed by providing a dynamic approach and exploring new sets of data for developing and emerging regions. The case studies may focus on the analysis of flows of doctorates with the ultimate goal to help promoting the absorptive capacity that emerging regions and countries worldwide need to acquire to learn how to use science for economic development. This is because analysis for many regions (including Portugal in 2000-2010) shows a notable process of brain gain and, above all, it provides a dynamic approach to the cumulative process of attempting to build knowledge-based societies. The results show the need to consider the co-evolution of brain gain, drain and circulation over time and space. In addition, they suggest the importance of a few major counter-intuitive policy instruments to facilitate the co-evolution of human capital formation and research capacity building. For example, these instruments have included in some cases (e.g., Portugal) a centralized program of research grants, research careers independent of traditional faculty career tracks, and a diversified system of funding research units and institutions established upon research assessments through international peer reviews.

Again, this justifies a "School of Advanced Studies", oriented towards new research and the training of experts. The approach to follow may consider:

- the identification of instruments promoting the scientific development and advanced training of human resources in developing economies, including forms of international scientific cooperation.
- a critical review of case studies on developing regions of both successes and failures in the performance of such instruments, including forms of avoiding brain drain from those regions.
- The identification, design and discussion of policies towards endogenous development of developing regions.

Shaping a School of Advanced Studies: a preliminary proposal for discussion

An International School of Advanced Studies may take the form of a research consortium aimed to foster the process of building human capital and scientific competencies in emerging regions and countries, which do require adaptable and resilient scientific and academic institutions. It should consider new research activities and fieldwork, together with the advanced training of a new generation of academic, scientific and policy leaders for emerging regions and countries, with emphasis on China, Brazil and Russia. Five main dimensions maybe considered, as follows:

- An annual "School of Advanced Studies", two weeks long, for doctoral students and post-doctoral researchers involved in research studies on science, higher education and policy in emerging countries and regions.
- An annual "High Level Workshop on Governance and Policy Studies, three days long, for on the job training of high level officials, policymakers, university and science and technology leaders from emerging countries and regions.
- A Policy Fellowships Program (2 to 4 months) for field work in developing countries and regions, oriented towards the preparation of policy briefs about selected and specialized themes on science and HE development, by involving doctoral students and doctorate researchers worldwide in short and medium term research periods, with themes and people to be competitively selected at an international level.
- A Research Fellowships Program (6 to 9 months) for new research and fieldwork in emerging countries and oriented towards new research on science and HE development, by involving post-doctoral and senior researchers in research residences in universities in emerging countries and regions.
- Specialized publications, including a Book Series, promoting new material to assess and steer science and HE development policies in emerging countries and regions.