Session INSTITUTIONS: What organizational configurations have structured international/ regional inquiries?

# *Building Capacity for Comparative and International Social Sciences: Inter-organizational Collaboration and EU Research Funding & Degree Programs*

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In this essay, I present global mega-trends in higher education and science (expansion, competition, collaboration), discuss regional shifts in scientific publication globally since 1900 and systematic attempts to build capacity for knowledge production, especially in research universities. Pure exponential growth in the publication of research articles is matched by rising international, interorganizational, and transdisciplinary collaboration. The implications of these patterns, especially for international and comparative social sciences, are then briefly delineated on the basis of the case of EU research funding (Framework Programmes) and joint degree programs (Erasmus Mundus) that promote sustainable collaborations across borders in Europe.

*Globalizing Higher Education and Science*

Globally, **unprecedented investments in higher education have vastly improved science capacity.** "Pure exponential growth" in science production around the world has resulted from rising investments in formal learning opportunities, especially the "worldwide triumph of the research university" (Powell et al. 2017). Universities everywhere provide robust infrastructure, sustain innovative networks, educate scientists across the disciplines, and foster diverse scientific outputs. Among other organizational forms that produce most research—extra-university research institutes, government agencies, private companies, and hospitals—**research universities are the driving force behind the global growth of scientific productivity.** They connect all types of knowledge-producing organizations and contribute the majority of scientific publications (Powell & Dusdal 2017).

Focusing on articles published in world-leading journals since 1900 provides insights into the cutting-edge of fundamental research. Charting global shifts in the scientific "center of gravity" shows changing regional scientific output (Powell et al. 2017). Along with the **US** and **Canada**, European countries remain essential global players (esp. **Germany, UK, France, Italy, Spain**), with their centuries-old research universities being emulated worldwide. Over the past few decades in East Asia, massive government support in **Japan, China, South Korea,** and **Taiwan**, for example, have triggered explosive growth of science capacity—and ensuing production. Researchers have only just begun to explain how and why certain countries have succeeded differentially in expanding their research capacity and which organizational forms and funding instruments do most to facilitate scientific serendipity as well as long-term impact.

Countries invest heavily into scientific output and technological innovation, as advanced knowledge is applied in ever more fields, themselves reshaped by that knowledge, for example in computing and robotics. **Specialization in higher education and science reshapes labor markets, increasingly defined by academic distinctions and occupational boundaries** (Baker 2014). This self-reinforcing evolution of employment segments develops higher education and science through the shifting supply and demand for credentials and expertise. Yet innovative science also calls for enhanced and targeted investments, from diverse sources. In the inexorable race for breakthroughs, difficult choices are necessary. **Competition on multiple levels has become more potent.** In place of well-founded, in-depth comparisons, performance measures and quantitative indicators are continuously generated. Although imperfect proxies, ratings and rankings often become the basis for decision-making, in policy arenas, organizations, research teams, and individual careers.

Simultaneously, **collaboration across institutional, disciplinary, organizational, and cultural boundaries expands the possibilities of discovery.** Indeed, if competition in this context reflects a learning race to achieve new knowledge, participation in networks and inter-organizational linkages, with continuous communication and collaborations of different sorts, will be crucial to success (Powell 1998). Scientific collaborations, with the goal to achieve new scientific knowledge, often begin informally, in bottom-up processes. Collaboration leads to more influential, often-cited research, especially among scholars in different countries (Katz & Hicks 1997; Fortunato et al. 2018)—a key argument for further globalizing the scientific enterprise and recognizing the **"brain circulation"** and **intercultural teamwork** that facilitates recognition and impact across scientific communities (Sugimoto et al. 2017). As scientists increasingly work in teams, extend their

understanding, and compete to discover important ideas, they need to meet, understand, cooperate, and collaborate, doing so for myriad reasons. In fact, in some fields today, there is no choice, as work becomes so complex that individual scientists cannot achieve meaningful results without collaborating: the **"collaboration imperative"** (Bozeman & Boardman 2014). A century ago most research papers published in diverse disciplines were written by single authors. **Today, the modal paper in the natural and social sciences represents the work of multiple authors, often from different organizational and cultural contexts.** The collective shift toward teamwork in research and the implied specialization extends from fundamental research in the natural and social sciences to the applied world of patents (Wuchty, Jones & Uzzi 2007; Mosbah-Natanson & Gingras 2013). Thus, competition and collaboration at the intersection of higher education and science are research topics requiring attention if we hope to understand the present and future of scientific discovery and production, with its understudied yet increasingly incontrovertible effects on individuals and societies.

**If competition is now fully global, so too is collaboration, as scientists in nearly all countries contribute to our shared stores of legitimated knowledge.** Most often, scholars conduct their work in increasingly research-oriented universities, which have proliferated around the world, especially since WWII. Indeed, **university-based research has risen to become the driving force of science production globally.** Despite universities operating successfully in all societies, substantial regional differences in contributing to cutting-edge scientific communication and disciplinary debates continue to exist. This further emphasizes the **need for intercultural research collaborations**, in particular across the hemispheres; beyond the extensive links that exist across the global North. **Currently, the shifting "center of gravity" away from North America emphasizes the relative decline of the US as European and Asian countries invest heavily in their national higher education and research capacity** (Powell, et al. 2017). At the same time, cutting-edge knowledge production increasingly relies on building international, intercultural, and interorganizational bridges to facilitate joint learning processes and scholarship recognized by diverse scientific communities. **R&D demands investments not only in individuals within organizations and infrastructures but also, more than ever, in the networks, connections, and exchanges that facilitate discoveries.**

*Trends in and Drivers of Competition and Collaboration*

Neither the potential of contemporary science can be understood nor the pathways to its further development charted without examining two contrasting trends—rising competition and collaboration across and within nations: If countries continue to fund most scientific research, **(international) collaborations among scientists across levels and teamwork in diverse types of research organizations have facilitated remarkable growth in knowledge production** (Adams 2013; Powell, Baker & Fernandez 2017). The future of (higher) education and science—and attempts to grapple with complex, vexing environmental and social problems—now depends on how we (re)organize these fields to enhance collaborative in the face of global competition between teams, organizations, and countries.

**Transnationalization (and regionalization) of higher education and science challenge traditional nation-based studies.** The diffusion of worldwide ideas and norms in science is a powerful driver of global similarities, as no country can resist global standards (Drori et al. 2003). **Scientization is significantly driven by the research universities.** If the key organizational form remains the university, with its tremendous capacity for transferring knowledge intergenerationally, between disciplines, and across cultural boundaries, then research must delve deeper into the learning opportunities, networks, and types of collaboration this central organizational form enables. The main driver of scientific capacity is the education and training of each generation of scientists poised to push the cutting edge.

Factors, from research policy and funding instruments and system development to scientific communication, have also transformed the ways science is conducted and the scope and speed of knowledge diffusion around the world. **If markets for scientific talent have always been wide, today they are nearly boundless, at least at the peaks and with the dominance of English as the contemporary *lingua franca*.** Elaborate migratory flows, massive government and philanthropic programs, and everyday mobility enormously facilitate the exchange that leads to scientific networks, **"brain circulation," and the potential for collaboration on a vast scale** (see Sugimoto et al. 2017). For example, the European Union's Erasmus program or the US Fulbright Fellowships have enabled millions of students and faculty to visit other universities to broaden their horizons and explicitly collaborate interculturally. Yet **the social sciences remain stubbornly parochial in the face of cultural diversity and massive global challenges**, with the university's myriad contributions

to knowledge unquestionable, but underspecified and underappreciated (Kurzman 2017; Stevens, Miller-Idriss & Shami 2018).

**Throughout history, large-scale migration flows, especially of elites, have led to the transfer of ideas across cultural, linguistic, and geographical borders. States, foundations, and international organizations have systematically increased educational exchange and mobility of scientists and students.** These trends are more than symbolically significant, as border crossings transform individual careers and epistemic networks. Yet such opportunities remain highly stratified along such lines as class and gender, despite transnational higher education and mobility having witnessed tremendous growth (Zippel 2017). This globalization manifests itself in joint, dual, or franchised programs, online and distance education, and international branch campuses, with research developing apace (Kosmützky & Putty 2016). What will be the consequence of these elite border-crossings in the face of humanitarian crises of restricted migration and mobility, such as Europe's waves of refugees and newly-constructed walls between countries? Indeed, those responsible for governance of global, regional, and national systems face a crisis of legitimation that challenges higher education and science in their traditional means of generating expertise (Kennedy 2015). Thus, **amid calls for more "relevance" and "impact," the governance by and of science must address the age-old inequalities, new subjectivities, and persistent gaps between research, policies, and practices.** Not only for scientists in countries experiencing rising nationalism, mobility is far from luxury, but rather sustains academic life. Fundamentally, in complex globe-spanning higher education and science systems, the diffusion of ideas and mobility of scholars, which crucially also sustain collaborations, are necessary for innovation and influence. **The strongest science systems are open: those with most international co-authorship and highest mobility of the research workforce excelling** (Wagner & Jonkers 2017).

Yet even without the growth of spatial mobility, the revolution spurred by **information and communication technology (ICT)** has quickened learning processes and scientific work. Networked computers (and big data) have significantly increased the power of diverse methodologies to explore and explain. They reduce barriers to collaboration across boundaries, cultural and hierarchical.

Albeit with large field-specific differences, **language remains a barrier to understanding and the sharing of research problems and findings.** Whereas humanities' scholars and social scientists remain more-or-less dedicated to their national languages, the natural sciences publish their crucial findings in English-language journals. The scientific *lingua franca* has shifted from French to German to English over the past two centuries. **Translation devices applying the tools of computational linguistics and artificial intelligence are poised to radically facilitate the transfer of ideas.** Machine learning may well reduce the advantages that Anglophone scientists have long enjoyed. As scholarship becomes increasingly accessible, also to those outside the academy and in diverse cultural contexts, further transformation is likely.

Yet not only the languages of science pose a barrier to universal collaboration. Academic, intellectual styles go far beyond language itself to affect relative foci on paradigm-development, on description or explanation, and on commentary; all with varying modes of interaction (Galtung 1981). **Among the determinants for successful (international) collaboration are team characteristics, worldviews and motivations, and collaboration processes.** Long-term collaborations that combine formal and informal interactions between researchers may remain creative and productive for decades. The basis for productive collaborative networks are pre-existing relationships of the involved researchers and organizations, repeated interactions, and intellectual affinities (Ulnicane 2015). **Policymakers could bolster organizations to support such networks**, as done in the **EU's Framework Programme** of cross-border research funding and in the **Erasmus Mundus Joint Degree Programme**, which has supported tens of thousands. Researchers could analyze collaboration in multicultural teams and the conditions for optimal sharing of expertise—minimizing misunderstandings and conflicts—since compositional diversity in teams has both positive and negative effects on teamwork.

*Policy Learning, Comparisons, and Supranational Coordination*

With differences in influence depending on past colonial relationships, languages, and politics, **leading countries in education and science worldwide, including Germany, the United States, and China, have differentially developed their higher education and science systems.** Policymakers continue to look across borders for inspiration, guidance, or practices as they reform education and science to sustain or increase their competitiveness. **Systematic international exchange enhances policy learning, in turn increasingly**

**affected by global competition in education and labor markets.** In some regions, supranational coordination further strengthens such diffusion. Today, competitiveness is continuously monitored by comparative indicators used by policymakers, scholars, and administrators to generate reform goals, to identify standards and best practices, and to empirically verify policies and programs. Increasingly, countries have enacted policies that emulate—or are legitimated by reference to—successful foreign models. Mechanisms of such cross-cultural transfer include **"continuous competitive comparison"** in such forms as rankings, benchmarking, and best practices; policy learning and networks; and intergovernmental negotiation and supranational coordination. All of these unfold positive and negative effects at the nexus of collaboration and competition.

**For centuries, few regional centers of learning were highly influential, depending on economic and cultural power, as on linguistic dominance. Today, based on quantitative and qualitative indicators, universities in many countries compete worldwide for talent, funding, and prestige.** If most universities have little chance of succeeding to become preeminent, overall academic drift in higher education that combines teaching and research missions has resulted in rising credential levels and broadened science capacity. **Today, two hundred countries now contribute to scientific knowledge production in leading peer-reviewed journals.** If continuous competitive comparison within and between countries creates winners and losers, more than ever universities and scientific communities are linked globally, via communication networks, conferences, and exchanges, answering competitive pressures with collaboration.

*Governance through "Programmification" at the Nexus of Evidence and Policymaking*

**Supranational, regional coordination facilitates the definition of standards, extends cross-border mobility, and enables collaboration.** In education and training, the open method of coordination now stretches far beyond the EU in engaging countries in reform initiatives, such as the Bologna process in higher education, and funding instruments, such as the **EU Framework Programme for Research and Innovation (currently: Horizon 2020; nearly €80 billion of funding, 2014–2020).** Through standardization, mobility, and transparency, supranational coordination relies on a range of instruments to strengthen European competitiveness.

In many countries, governance has evolved within differentiating systems and through increasing R&D investments. **Ministries and other government agencies increase their influence on research agendas through the proliferation of specifically-defined thematic programs. Such "programmification"** symbolizes more educated policymakers and administrators with aspirations to guide scientific development and target resources in the hopes of facilitating innovation. On the other hand, especially when such funding lines question or substitute for needed infrastructure, subvert peer review or reduce scientific autonomy, such programs **may counter necessary long-term commitments** to fundamental research and scientifically-driven priorities. Along with unprecedented structural expansion of higher education to facilitate the "knowledge society," the **perceived importance of evidence-based policymaking and notions of quality, excellence, relevance, and impact has risen** (Zapp, Marques & Powell 2018). Government-funded R&D and research councils' substantial growth in both funding and large-scale, long-term planning, including thematic choices, are evidence of such "programmification".

If the importance of external models has grown in an era of transnationalization, translation occurs at every governance level, resulting in specific research models and priorities, with comparative social science needed now more than ever. Researchers study such diffusion of ideas, norms, and policies in an era of starkly rising competition and collaboration. **While the potential for collaborations may indeed grow with proliferation of such thematic research programs, the tools required to coordinate such complex research projects worldwide thus far exist more in certain fields**, often those requiring enormously costly facilities, such as quantum physics or astronomy. In the humanities and social sciences, **deep linguistic and cultural knowledge remains a scarce resource** that requires considerable time to acquire, making comparative social science relatively rare in an era in which such understanding is increasingly crucial.

**Regardless of discipline, science and policymaking have become increasingly intertwined, resulting in new challenges of authority and conflicts over research priorities and output measures.** Not only are different conceptualizations of disciplinary research and development across countries and regions crucial to analyze, but also the distinct legacies thereof. For example, **the distinct, expansive role of the EU in constructing a European Research Area, in establishing cross-border networks, and in shaping research agendas shows how supranational governance simultaneously offers incentives and puts pressure on national**

**and local actors to align their research** to overarching priorities and themes—**and to collaborate interculturally.** Over the past several decades, political interest in evidence-based policy-making, quality assessment, and research evaluation, and direct involvement of various decision-makers has led to the establishment of new organizations, funding instruments, programs, and training programs. Often, such developments challenge old paradigms, disciplinary divisions of labor, and boundaries between science and policy. Especially on-going EU initiatives, such as the Erasmus Mundus Joint Degree Programme (2004–), as an incentive-based program, have resulted in **sustainable university networks across Europe** and tertiary degrees that facilitate student mobility across borders. As program participation increases considerably across cycles and established networks across Europe (and in select other countries, such as the US) consolidate, **such inter-organizational networks provide crucial regional capacity-building for international and comparative perspectives and sustained collaboration across diverse fields and in all sciences.**

*Outlook: Mega-trends and Challenges*

The presented mega-trends in higher education and knowledge production have been analyzed by various established fields, including the sociology of higher education and science and bibliometrics. **Challenges include disciplinary divisions of labor; data selectivity and methodological nationalism; lack of synthesis; and few longitudinal analyses. In-depth comparative research is needed** to extend our knowledge beyond dominant science-producing regions and countries and **improve our understanding of cultural and disciplinary diversity.** Yet science viewed as a complex and continuously-evolving network of individuals, teams, projects, ideas, and publications **demands innovative research that compares, transcending the national level to demonstrate regional embeddedness and global flows.**

In terms of data and methods, the science of science uses more and better data (and calculation capacity) to explore developments in scholarly inputs and outputs, from funding and collaborations to production and evaluation (Fortunato et al. 2018). **Multi-level approaches and mixed methods** extend the possibilities for analysis and explanation. The evolution of journal publications since 1900 shows major shifts in the global, regional, and national development of higher education and science systems. **The remarkable expansion of science reflects contrasting and simultaneous trends: rising competition at all levels matched by diverse forms of collaboration among scientists working in different disciplinary contexts, countries, and organizational forms. The future of science is indeed global, but much research remains parochial and particularistic. Thus, more internationally and interculturally comparative research is warranted**, especially on the cross-border exchange of researchers and ideas.

**Transdisciplinary collaborations among individual scientists, research teams, and organizations—across national and linguistic borders—demand enhanced attention.** Analyses of interactions between institutions (economy, politics, society) and organizational forms and their respective networks promise insights into contemporary competition and collaboration patterns. **The establishment and maintenance of truly global scientific networks responsible for addressing many of the most crucial scientific and societal puzzles will be an increasingly important topic.** International, transdisciplinary, and interorganizational collaborations deserve encompassing studies. If higher education and research policies are to optimally promote scientific productivity and innovation, such **interventions should be developed upon deeper understanding of drivers and dynamics of intercultural and interorganizational research collaborations.**

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