LINKING RESEARCH TO KAZAKHSTAN'S STRATEGIC PRIORITIES: THE CASE OF INTERNATIONAL FACULTY AT NAZARBAYEV UNIVERSITY

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Recently, the number of research universities seeking to achieve world-class status has been increased by an additional one from Central Asia, Nazarbayev University (NU). The university seeks to achieve high quality research by its faculty and researchers. In particular, the role of international faculty is highlighted in an agenda to build research capacity and in a subsequent contribution to the country's development. Several studies from the US on faculty productivity showed that international faculty produce greater output than their local counterparts do. However, it remains unclear whether research conducted by international faculty when working in non-Western contexts is relevant to the national research priorities of the host countries.

The purpose of this study is to examine the extent to which international faculty in a non-Western country align their research output to the research priorities determined by the government. To address the research purpose, we used content analysis method. The study relied on secondary publication data from abstracts of articles published by NU international faculty in peer-reviewed journals included in the Thompson Reuters' Web of Science. The results of the content analysis revealed that international faculty from NU largely produce research relevant to the country's needs. This is particularly typical of researchers in sciences whose research generally aligned to the country's research priorities; meanwhile, researchers in social sciences and humanities produce a greater number of irrelevant articles in their total number of publications. Several possible explanations for the revealed results were discussed. This study attempts to provide a comprehensive picture on the role of NU and its international faculty in pursuing the country's needs.

Introduction

Given the world-wide acknowledgement that an important requirement for economic growth in the context of the global knowledge-driven economy is having a well-developed national research and innovation systems (Altbach, 2013; Castells, 2009), strengthening existing and creating new research universities has become an important task on the economic development agendas of many governments, especially in middle-income economies. Most countries with limited public resources focus their efforts on developing a limited number of globally competitive universities (Salmi, 2009). These universities are referred to as "world-class" or "flagship" in the existing literature. The world-class universities "have highly ranked research output, a culture of excellence, great facilities and a brand name which transcends national borders" (Douglass, 2014, p.1); while the flagship universities are also "research-intensive or in the process of becoming so" (Douglass, 2014, p.2), but, in contrast with the world class universities, are expected to serve the public within their local, national, and regional boundaries (Douglass, 2014). Given the high cost of establishing and maintaining world-class universities, many governments are now following the advice of international experts on higher education and are re-orienting their efforts towards promoting flagships.

One of the key defining characteristics of flagship universities, according to Douglass (2014), is internationalization. Flagships are frequently built following the prototype of top research universities, which have a high degree of internationalization as one of the defining characteristics (Horta, 2009). Jacob and Meek (2014) linked the growing extent of internationalization of research universities to the emergence of the global knowledge production system, whereby knowledge production and transfer occur at the global vs. local scale via world-wide scholarly networks. To be included in the global knowledge production system, a flagship university needs to link its faculty to international research networks by either inviting foreign faculty from abroad or by sending its faculty to other countries (Douglas, 2014).

In many research universities in non-Western world, the proportion of international faculty is increasing (Wildavski, 2012). The governments of these countries are willing to spend lots of money to attract foreign faculty out of the belief that international faculty will enhance local research capacity and assist in knowledge and technology transfer (De Witt, 2009; Stromquist, 2007). Several studies from the US showed that foreign born faculty bring a considerable contribution to domestic science (Black & Stephan, 2010; Corley & Sabharwal, 2007; Kerr, 2008; Stephan & Levin, 2001; Stephan & Levin, 2003) and produce greater output than local researchers (Hunt, 2009; Mamiseishvili & Rosser, 2010). However, it remains unclear how international faculty actually contribute to research capacity building in non-Western countries.

One of the gaps in the existing knowledge is a lack of clarity on whether research conducted by international faculty when working in non-Western contexts is relevant to the national research priorities of the host countries. The purpose of this study is to examine the extent to which international faculty in a non-Western country align their research output to the research priorities determined by the government. More specifically, the study analyzes the data from Nazarbayev University (NU) in post-Soviet Kazakhstan, which was established in 2010 to address the problem of low local research capacity, which emerged as a result of out-migration of intellectual cadre from the country after the dissolution of the U.S.S.R.. The NU hires an impressive number of foreign faculty and receives ample funding and relative autonomy from the government to implement the explicit public-service-oriented mission to "be a model for higher education reform and modern research in Kazakhstan" (Nazarbayev University, 2013).

Methods

The study was organized around the following research question:

To what extent do foreign faculty employed at NU pursue areas of research which have been defined as strategic by the government of Kazakhstan?

To answer the research question content analysis method was used. Content analysis is a technique used to make inferences about the content of recorded text (Miller & Whicker, 1999, p. 6). The dataset for analysis consisted of abstracts of articles published by NU international faculty in peer-reviewed journals included in the Thompson Reuters' Web of Science during the period from the date of establishment of the NU in 2010 till July 30th 2016 when the data was harvested.

In the analysis, the challenging task was to determine who of the researchers in the dataset were locals and foreign. We identified all Kazakh and Russian family name holders in the dataset as local faculty since we assumed that these two dominant ethnicities of the country should be representatives of the local faculty in the university. We then compared the sub-set with the names in the university telephone directory, as well as background information on the Internet. However, this approach did not ensure inclusion of ethnic minorities, such as Koreans or Germans. Because representatives of the ethnicities are very few at the NU, we decided to ignore the issue and to treat the minorities as international faculty. Thus, final dataset included 171 abstracts published by the subset of foreign faculty.

Research priority areas were extracted from the two annually published national reports on research, produced by the Ministry of Education and Science (MES) in 2014 and 2015. These reports describe general characteristics of Kazakhstani research, identify research priorities, and provide detailed analysis for research capacity of the country for the respective years. Table 1 summarizes five large research priority areas and sub-priorities extracted from the text of these reports.

Content analysis was implemented on the text of the abstracts of the articles produced by foreign-born faculty. We set the research priorities identified by the government as themes (nodes) in NVIVO. We then coded each abstract from NU foreign faculty to one of the themes. Finally, we calculated the frequency of occurrence of particular research priority areas in the dataset.

Table 1 Government Research Priority Areas

Priorities	Rational use of natural resources, processing of raw materials and products	Energy and machinery	Information and telecommunication technologies	Life science	Intellectual potential of the country
Sub-Priorities	Minerals	Nuclear energy	Telecommunication technologies	Pharmacy	Natural sciences research in a-e
	Oil and gas	Heat and electric energy	Creating geographic information systems	Anti-aging	a) Biology (microbiology and virology, genetics, physiology, botany and bio ecology etc.)
	Exploration and geology	Laser and plasma technologies	Information and telecommunication technologies in economy, management systems, defense and security, and education.	Biological research	b) Chemistry (organic chemistry and polymers, inorganic chemicals and fertilizers, petrochemicals and catalysis, electrochemistry and corrosion, etc.)

Sub-Priorities	Processing raw materials		Image processing theory	Biotechnology	c) Physics (semiconductor physics, nuclear physics, astrophysics, nanotechnology and new materials, theoretical physics, technical physics, etc.)
	Water resources	Hydrogen energy	Intelligent information technology	Ecology	d) Mathematics (differential equations, probability theory and mathematical statistics, computational mathematics, mechanics, etc.)
	Research in mining	Nanotechnology in the energy sector	Intelligent robotic systems	Industrial biotechnology	e) Geology and geography
Sub-Priorities	Creating new materials, including construction and engineering materials and technologies	Renewable energy sources (wind energy, hydro- and biofuels and photovoltaics)	High Performance computing technologies	Medical research (surgery, oncology and radiology, pulmonology, cardiology, immunology etc.)	Research in social science and humanities (history and archeology, philosophy, education, economics, law, literature and art, and others)
	Research in metallurgy (ferrous and nonferrous metallurgy, refinement processes, electrolytic, metal production by electrolysis, precious, rare and rare-earth metals)	Power machines, rocket and space technology, agricultural machinery, transport	Methods and technologies for information security and data protection	Agricultural science (animal husbandry and veterinary science, agriculture, genetic engineering in agriculture industry etc.)	Astrophysics (deep physics, numerical simulation, nuclear astrophysics)
	Environmental protection	Impact of the energy sector on the environment			
	Seismology				

Results

Our analysis showed that out of the 171 articles analyzed, 149 (87%) were relevant to government's research priorities. Table 2 illustrates distribution of relevant articles by large research priority areas (as defined by the government). Slightly more than half of the publications (51.01%) were found to be relevant to the broadly defined *intellectual potential of the country* priority area comprised of natural science, and humanities and social sciences. Within this large priority area as well as among remaining areas, the largest number of publications was published in natural sciences (43.62%). The next priority area to which NU foreign faculty's publications were relevant is life sciences, followed by information

and telecommunication technologies (13.42%). A much smaller number of articles was published in humanities and social sciences (7.38%).

One of the potential explanations is that three out of four schools associated with social sciences at NU are professional/graduate schools, and they employ less faculty than the School of Engineering and the School of Science and Technology. Hence, numerically, there are more faculty members specializing in natural sciences at NU than the faculty specializing in social sciences and humanities. In addition to that, much of the NU research in the early years was produced by specialized research centers – Center for Life Sciences, Center for Energy Research, Interdisciplinary Instrumental Center, and Nazarbayev University Research and Innovation System. These centers have received ample funding from the government and are staffed by full-time research staff and technicians, and control access to equipment and laboratories. Some faculty in natural sciences are affiliated with the research centers and might have had a higher productivity due to the support and funding provided by the centers.

Table 2 Distribution of Relevant Articles by Large Research Priority Areas

Priorities	**n**	**%**
Intellectual potential of the country	76	51.01
Natural science	65	43.62
Humanities and social science	11	7.38
Life science	33	22.15
Information and telecommunication technologies	20	13.42
Rational use of natural resources, processing of raw materials and products	11	7.38
Energy and machinery	9	6.04
Total	149	100

We categorized irrelevant articles in two categories: natural science, and humanities and social science (Table 3). The results of the content analysis revealed that 22 articles (13%) were not relevant to any of the five large research priorities determined by the government. Moreover, it is important to note that analogously to the *relevant articles*, many (64%) of the irrelevant articles were from *humanities and social sciences*. Examples of such articles included a completely irrelevant study of Zeno Cosini's philosophy of humor or the indirectly relevant study of regulation of financial services in the Republic of China.

Several possible explanations could be drawn to explain why some publications were not relevant as for research priorities. First, irrelevant publication(s) could have been in progress before foreign faculty and/or researcher(s) came to NU and published afterward on the behalf of NU. Second, some articles might have been converted from Ph.D. dissertation; thus, it is reasonable to account that some publications were not relevant to the country's research priorities. Third, international faculty members might have been involved in the projects that were not relevant to the country's research priorities because they were run and initiated by their colleagues outside Kazakhstan. The factors affected relevance of research in social sciences and humanities more because, unlike research in natural sciences and life sciences, research in these fields might be of less universal applicability. In addition to

that, government might have favored research in natural sciences and life sciences more in distribution of funding, which affected the choice of research topics. Social scientists and scholars in humanities did not have to meet government expectations in terms of research priorities if they were not provided with funding.

Table 3 Distribution of Irrelevant Articles

Priorities	**n**	**%**
Humanities and social science	14	63.64
Natural sciences	8	36.36
Total	22	100

Conclusion

The study revealed an important finding: international faculty members employed in a flagship university in Kazakhstan largely produce research relevant to the country's needs. This is particularly typical of researchers in sciences. Meanwhile, researchers in social sciences and humanities produce not only a smaller number of priorities-relevant articles compared with other fields, but also produce a greater number of irrelevant articles in their total number of publications. The difference between the disciplines is largely related to the nature of knowledge generated in the fields (more universally applicable or more contextually determined), as well as government's funding priorities.

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