The global competition for talent: Life science and biotech careers, international mobility, and competitiveness

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CHAPTER 3: STUDY METHODOLOGY AND ANALYTICAL FRAMEWORK – ASSESSING THE GLOBAL COMPETITION FOR TALENT

RESEARCH OBJECTIVES

The primary aim of this study is to critically analyze the concept of a global 'competition for talent,' (see Table 1 in the introduction) a term that is widely used but typically not applied in a theoretical way that has been built up through research. This research both defines aspects that are important in understanding the global competition for talent and then applies the research to a narrower field for work and study, life sciences and biotechnology, which has scarcely been researched in regard to general workforce characteristics or skilled migration paths.

The secondary research objectives include: 1) theoretically discuss and empirically delineate factors influencing the (assumed) global competition for talent; 2) utilize individual scientist and industry perspectives to explain the attractiveness of cities and countries for work and study 3) discuss and compare regional/national 'situations and strategies' related to attracting and retaining the scientific workforce; 4) describe recruitment processes/barriers in light of European and international mobility.

The biotechnology industry was selected as the main field of study, given strong attention to its development in various policy reports, but the near absence of discussion about these scientists in the migration literature. I also wanted to simultaneously be able to examine this sector both in view of global and national contexts and concerns. While it is not possible through my research design to state the effects of interactions between the global, national and local, it is possible to identify key topics and recent changes that have occurred on each level.

RESEARCH CHALLENGES

Many challenges were confronted in setting up this research project, which also influence the analysis. These challenges related both to the data availability and its international comparability, issues related to assessing deciding on correct units of analysis for competitiveness (micro-, meso- or macro-), and the start of the global economic crisis during the fieldwork period. These challenges also influence the applicability of this data to other contexts, whether to other countries or regions, years, or industries.

International comparison and statistical gaps

Internationally comparative statistics are either not readily available or complete for the main topics of this study. A standardized definition of biotechnology was not implemented until 2004, and there are still differences in how countries calculated and count biotechnology companies, for instance. Furthermore, collecting comparative immigration statistics involve similar problems. Similar to the issues seen in finding a common definition for 'biotechnology,' definitions of 'skilled migration' are also varied. As discussed further in chapter two, although skilled migration is in no way a new phenomenon, the magnitude of it and policies that guide it have been rapidly changing across the globe, particularly since the 1990s. Furthermore, little data

is available on an international level that allows for comparison of the life science or biotech workforce. Further details on data availability can be found in Appendix D.

These data shortcomings, changing dynamics and lack of research on the topic also present theoretical challenges, which are further discussed in this study. Given these limitations, the research undertaken could not yet adopt a comparative, case study methodology in the strict sense (for instance, as defined by Lijphardt, 1971), although this would be insightful as the concepts and theory surrounding the global competition for talent becomes more developed. It does, however, aim to collect various examples in diverse contexts and frame them within larger global mobility patterns and for life science jobs in particular.

Assessing competitiveness

In the past few decades, there has been increasing attention on creating various indexes for competitiveness, to compare the relative positioning of places and for policy guidance, for both the regional and national levels. One of the most utilized reports is the World Economic Forum (WEF) Global Competitiveness Rankings of countries, which was started in 1979, along with the International Institute for Management Development (IMD) World Competitiveness Yearbook started a decade later in 1989. Both of these indexes use a combination of statistics and survey data among executives. These studies were used for ideas on assessing competitiveness, but were not found as the most relevant to discuss biotechnology competitiveness.

Another of the biggest challenges in this research was to create a framework, data collection and analysis framework that can aptly address the various levels with an impact on competitiveness and hence the global competition for talent, ranging from the micro-level of individuals and/or individual research institutes or companies, to city or regional competitiveness and clusters, to the macro-level with countries as the main units of analysis. All of these levels are influential and while earlier versions of the research proposal tried to narrow the focus to just one level, the final result aims to collect information that combines all of these aspects, through both a global survey of life scientists. The benefit of this approach is its breadth, and the possibility to use the information for further exploration. The risk of this approach is a lack of depth for some of the aspects discussed.

Global economic crisis

The third, unexpected challenge occurred when the global economic crisis hit around 2008, when the empirical research was just beginning. Initially, the research plan involved launching the surveys and interviews in various waves, first in a broad global survey and later with a slightly revised survey focused only on specific case countries. However, given the complexities of building a meaningful project to discuss the new topic global competition of talent, without being influenced by the political and economic changes from the recession, it was decided that the primary data collection, that is the surveys and interviews, should be limited to the earliest stages of the research, from late 2008 to the middle of 2009.

In order to better examine skilled migration concepts and processes, this analysis comes in the form of an exploratory study, with the goal of generating or building theory. This approach was deemed as necessary to answer the research questions, given the limited data collection on the biotechnology workforce and its mobility, as discussed in more detail later in this chapter. Although theory building is an accepted and commendable goal of research, its methodology is much less defined then that of the most predominant stream of research based quantitative hypothesis testing or the qualitative-based hypothesis-generating research often associated with grounded theory approach. The *SAGE Dictionary of Social Research Methods* (Jupp, 2006, p. 111) explains, "Exploratory research is a methodological approach that is primarily concerned with discovery and with generating or building theory." Jupp further argues that exploratory research has often been misconstrued as being limited to pilot studies and qualitative research, whereas it actually can contain any range of methods. Exploratory research has been linked most closely to not only qualitative research, but also specifically to grounded theory (Glaser and Strauss, 1967), as is implied for instance by Stebbins (2001); although by definition it can contain any number of methods that best illuminate the theory in question. While this study on the global competition for talent represents the outcome of an exploratory study, it does not utilize a grounded theory approach. Grounded theory, as set up by Glaser and Strauss (see Glaser & Strauss, 1967), avoids looking at existing theoretical discussions before the research occurs and preconceptions and instead aims to create keywords to be explored further. However, my goal is to further understand the 'global competition for talent,' not as a buzzword, but instead theoretically and building on *existing* theories and research (where possible) falling under two main theoretical strands that have scarcely been combined: 1) workforce availability, including aspects of skills, mobility and migration 2) economic competitiveness. As discussed in other chapters, there are clearly shortcomings in applying theories related to labor migration to current day skilled migration in the knowledge economy, as well as a general lack of theory which can link economic change and workforce characteristics within the knowledge economy or more generally to the global competition for talent. Stebbins (2001, p. 42) explains that "literature reviews in exploratory research are carried out to demonstrate that little or no work has been done on the group, process, or activity under consideration and that an open-ended approach to data collection, is, therefore wholly justified." These wide gaps in both theory and data are the primary reasons that make exploratory research the necessary choice for this study, and the gaps are addressed through the extensive review of the theoretical literature in the first part of the study and empirically as relates to life science careers in the second part of the study.

It should also be noted that in saying I am undertaking theory building or theory developing research, I do not presuppose that a grand theory is presented here. Development of theory, that is ideas and hypotheses which can be tested, refuted and revised and then hold to a wide range of situations (cases), takes a lifetime of work of not one researcher, but of many advocates and opponents. Rather, this study contributes to theory building primarily through adding conceptual understandings and empirical observations linked to the global competition for talent as a building block or stepping stone which could be catalysts for additional research, as further reflected upon in the concluding chapter. It could also be said to focus on concepts and generalizations rather than causal "laws" and their verification.

Exploratory research, by its very nature, calls for a large degree of 'flexibility' on the part of the researcher, a willingness to redefine goals (Stebbins, 2001) and a possibility of adopting any range of qualitative and quantitative methods (Jupp, 2006; Stebbins, 2001). The 'flexible' nature of this research process was important in this study as well. The original goals entailed focusing on the global competition for talent by observing specific biotech clusters and welfare state models. Yet, as the research progressed, it became clear that not enough work had been done yet for this work to proceed: Too little was known about both skilled mobility in Europe and the biotech workforce. Furthermore, the clusters assumed in the literature to be important for advancing competitiveness were not necessarily easily identified. How should the cluster be defined – a science park, a district, a city, a group of nearby cities in one country, or a cross-border cluster? Other research on biotechnology has been inconclusive on how to define a biotech cluster (see e.g. Teigland & Lindqvist, 2007) as biotechnology encompasses a wide range of both research disciplines and goals – from medical technologies, to environmental solutions such as biofuels, to improvements in industrial processes, to name a few. Is it fair that clusters for these various forms of biotechnology are the same? As a result of this gap in the supporting research, the focus became more generally on looking at the *development of the global competition for talent on the whole* and then linking this to observations in the *context of life science careers*. Both the issues examined in this research and the ones that were considered but not assessed will likely remain as key issues in the future, as the global competition for talent develops and understandings of its mechanisms advance. Reflections on topics for further research are presented in the concluding chapter.

The research questions and methods adopted are listed in Table 7.

Exploratory research and an original survey are both appropriate methods to look at how the global competition for talent is developing as seen through the life sciences, because few (if any) studies have been able to address this topic. Part I set out to better understand what structures, the global competition for talent, as a concept. It was recognized that more research is needed first to understand the various elements that are shaping the global competition for talent. This was done primarily through desk research, including reviewing academic sources in a range of disciplines, compiling statistical data, and reviewing government reports to answer the research questions on the structural aspects. Following that analysis, there is a need to better assess them globally, as statistical data on the life science workforce is not comparable or detailed enough to address these research questions. I therefore decided to design an original survey to find out more information about topics where statistics and research were scarce.

Understanding life scientists' international mobility through survey data

The second research question involves understanding individual life scientists' work history and individual goals related to mobility. Namely, how important/prominent is international mobility in life science careers? Which countries are attractive to life scientists and why? Which factors are considered and influence life scientists' intentions to move or their actual moves abroad? In order to explore life science and biotechnology careers and international mobility within these fields, the Careers in Life Sciences (CiLS) project was developed, in partnership with the Young European Biotech Network. The first phase of the project utilized an online survey method to

TABLE 7 RESEARCH QUESTIONS AND METHODS

Main question for exploration: What structures the global competition for talent? How can concepts and data (policies, statistics detailing changes) related to skilled migration and competitiveness be linked to better understand the global competition for talent? (Part I) Which patterns have influenced the development of the global competition for talent as observed in the life sciences/biotechnology in particular? (Part II)	
Sub-questions for further exploration	**Methods**
Structural factors How have skilled migration policies and other policies facilitating international mobility of students and scientists developed in Europe? What are the main features of these policies within the European Union? What are the features of the labor market within which life scientists work?	• Various policy reports, statistical data and other desk research • Desk research combined with CiLS data on interest in various employers, working within industry versus academia, and international mobility
Which cities and countries are seen as the most competitive for biotechnology globally?	• Desk research and policy analysis including a summary of *biotechnology* competitiveness, based on existing competitiveness indexes and other reports • CiLS survey results regarding biotechnology competitiveness
Individual Life Scientists: Explore individual goals related to mobility How important/prominent is international mobility in life science careers? Which factors are considered and influence life scientists' intentions to move or moves abroad? Which countries are attractive to life scientists and why? Which duration of stay is most desired for moves for life science jobs in the US and in Europe? What effect do life scientists expect international mobility to have, in terms of staying abroad or returning to their home country to work?	• International survey of approximately 600 life scientists and their career goals and mobility • Review of academic literature and governmental reports • Participant observation as member of the Young European Biotech Network • In-person interviews with life scientists, expert interviews

better understand the career and mobility interests of life scientists. An online survey method was deemed most appropriate for numerous reasons:

- It was expected that young scientists, a highly-educated group, would be both comfortable with and easily reached through an internet-based study.
- It allowed the study to easily be international, rather than focused on a single receiving country as has been done in most skilled migration research to date.
- Given the very limited human resources to work with the data, it allowed parts of the research to be 'automated' in order to facilitate data processing and analysis, given that this study was undertaken independently, without any financial backing for the data collection secured.

The survey was researched (based on desk research on the determinants of skilled migration and studies on the biotech workforce), written and programmed, as well as the data cleaned and processed, primarily by me. The CiLS project team (made up of five other PhD or students in various life science disciplines from various nationalities and living across Europe) gave feedback for the survey content and helped with online testing of the survey. A pilot study was conducted among 15 life scientist from their personal contacts before the survey was launched to test the wording for an international audience, relevance, and web-programming of the questions and look and feel of the survey. The survey was designed to take roughly 30 minutes to complete, but given both skip patterns to make questions relevant (for example longer section on employment for full-time workers), and numerous rating scales as well as some open-ended questions, actual times varied largely by respondent. The main results of the scientist survey, as linked to understanding the global competition for talent, is discussed in the second part of this study.

The survey was programmed and hosted through the service, SurveyMonkey.com. This site allows for custom design, unlimited response collection, for full data to be exported easily to SPSS via Excel[8], and features such as sophisticated skip patterns. The survey was set up to be an exploratory tool and contained both closed-ended questions (such as yes/no and Likert scales of agreement for attitudes) and open-ended questions, to better understand the global competition for talent. Coding was done as responses were read and emerged from the data, rather than being predetermined. SPSS was used for the quantitative analysis and MaxQDA 10 was used to code and analyze the open-ended survey responses. Open coding was used, whereby main categories were created and codes were put into these classifications.

It is important to note that the survey was *not* set up as a study on international mobility per se, but rather as discussing life science careers. Although my own research goal involved exploring

[8] SurveyMonkey currently has a feature for exporting data directly into SPSS, but this was not available when the data was first processed.

the concept of the global competition for talent, the research also aimed to see *if* it existed, and as such, international mobility was not required of respondents. The survey contained seven main sections: Profile of highest education completed; current studies or current work; internships; perception of skills and competencies needed in life science careers; interest in international mobility and factors influencing international mobility; perceived 'strength' of various regions and countries in the life sciences and biotechnology; and demographics and other classification categories that could be important for mobility opportunities (such as completion of degrees with honors) or mobility intentions (dual careers of spouse either in or outside of life sciences; currently being in a long-distance relationship).

The survey data shown in the quantitative section was collected between 1 November, 2008 and 1 July, 2009 and include 594 completed surveys.

Only completed surveys were analyzed and there was a completion rate of 39.20%. Response rates cannot be calculated due to disperse forms of collecting the data through links to the web survey. However, to better monitoring the survey, the percentage of completes can be calculated based on the link selected, as unique 'collectors 'were created based on the source of the link clicked on. Respondents were found through four main avenues:

- A button, inviting 'young scientists' to participate in the study was placed on Naturejobs.com, one of the largest life science job search engines globally for one month (5 November – 4 December 2008). As *Nature* is one of the most highly esteemed publications for life science researchers (in terms of both reputation and factors such as citation indexes). This extended a possibility to reach a group active in the life sciences, whether working in academia or industry, and broadly could be seen as offering as close to a random sample as possible without a list being available (keeping aside the personal factors that determine whether or not someone chooses to participate). According to a report supplied by Naturejobs, approximately 58,700 unique users were exposed to the button from 5-28 November 2008 and the click through rate during this period was 0.11%. From the records recorded by SurveyMonkey, the link posted on Naturejobs led to 194 (32.7 %) of the completed surveys.
- The survey was announced within the Young European Biotech Network (YEBN), with a link to the survey on its homepage and newsletter, and YEBN members were encouraged to personally invite their own contacts to participate in the study. The Young European Biotech Network is an umbrella organization of various biotechnology student groups and is particularly strong in Germany, Italy, Poland, Switzerland, and Spain. 176 completes came from either the YEBN electronic newsletter's announcement (86 completes) or the YEBN website (90 completes) and an additional 18 from the blog setup and hosted by BTmagazine (established by the largest student biotechnology association in Germany) as part of YEBN's career conference, February 2009 in Frankfurt. The links to the survey sent by emails to various contacts of YEBN members yielded 18 responses.
- Universities within countries where YEBN is strong were contacted in order to increase the sample size. Email invitations for the survey were circulated at interested universities and institutions in countries in Spain and Italy (distributed through personal contacts,

with most completes made through either the link on the YEBN website or the YEBN newsletter), and through Swiss Universities (ETH Zurich, University of Bern, and EPFL Lausanne – 93 responses, with 70 from EPFL). MDC graduate school in Berlin, Germany also agreed to participate (25 responses).

- In additional, the study was announced through articles in two academic journals *Nature* and *New Biotechnology* (see Danilowicz, 2007; Rindoks & Danilowicz, 2008). As these were print publications, unique survey links were not designed for them, but rather for simplicity, readers were encouraged to access the survey on the YEBN website. It therefore is not clear how much interest was generated by these articles. A list of number of responses from the various collectors is provided in Appendix A.

Respondents were not able to go back and change their answers after completing a screen, and were informed of this in the introduction. In the testing phase, it was found that going back had led to some inaccurate data collection on survey monkey. In order to measure if respondents had made any mistakes, some key questions were asked multiple, related ways (for example, citizenship at the beginning of the survey and country of birth at the end). There were also a number of open-ended questions where respondents could explain their reasoning for their choices. In some cases, respondents mentioned previous errors, which could then be changed as the survey results were processed and the data cleaned.

No quotas were used, as statistics on the demographic and educational profile of biotechnology students and workforce were not readily available at the time of launching the survey (more information on the availability of statistics is discussed in Chapter 5) to allow appropriate quotas to be set. The sampling, therefore, is a form of non-probability sampling, as is common for web-based surveys (Baker et al., 2013), since it relies on self-selection for participation. Sampling error therefore cannot be determined[9]. Diverse methods of data collection were used in order to have better web survey sampling. All survey methodologies contain some form of bias or error, whether from sampling error or measurement error. The CiLS survey used very broad screening criteria in order to have a sample that could be used to further explore the concept of the global competition for talent and life science careers, as is recommended for exploratory research (Stebbins, 2001). The CiLS survey used an internet methodology in order to reach a broader group, which was not limited to nationality, stage of career, or the current workplace in either academia or industry. Rather the goal was to collect information from anyone active in the life sciences. The only screening requirements are having a higher education (above the high school level, ranging from apprenticeships to postdoc positions) focused on the life sciences, chemistry, or medical sciences or work experiences in 'life sciences or a related industry'. While the sampling method does not allow for ascertaining or projecting the main characteristics of *all* global life scientists, it is a first step in filling in the data gap to discuss observed differences. Additional description of the main characteristics of the sample is found in Appendix B.

[9] See http://www.aapor.org/AAPORKentico/Education-Resources/For-Researchers/Poll-Survey-FAQ/Opt-In-Surveys-and-Margin-of-Error.aspx, Accessed 4 March, 2015

There are several unique departure points for this study. First, most previous work on scientific mobility and migration focuses one or two specific, national contexts, that is scientists residing in, coming from, or returning to one or a few *specific* countries. The CiLS study aimed to reach an international audience. Second, some of the research focuses on scientists as one group, rather than looking at field of work and study, although research suggests there are very different career trajectories by scientific field. By looking at life scientists in particular and their careers, broader nuances of the global competition for talent and potential strategies in various countries can be discussed. Third, much of the current survey research on life scientists utilizes databases of *published* scientists for sampling or various bibliometric techniques (Jonkers, 2011; Jonkers & Cruz-Castro, 2013; Zucker & Darby, 2007). Although this method allows for random sampling, it is also limiting in that it contains a narrow group of scientists, namely those who are at a senior enough stage to have published and largely those working on research in academia, instead of in various companies (where publication is often not seen as a core part of the job). Another sampling approach sometimes taken involves sampling at select schools. However, taking this approach limits the geographical spread of the data and typically limits the data collected to current students, who may not yet be clear on what the job market for life scientists can offer. The broad data collection used in the CiLS survey allows for a look for key career and mobility issues of global importance, while also allowing the YEBN a tool for finding issues relevant to career planning. The CiLS survey was presented at several life science career workshops around Europe (see list in Appendix C), which also gave good feedback from those involved with the issue, including students, employers, and policy makers.

Scientific mobility was identified as the best term to apply to the CiLS research, and is viewed as being a particular category or type of skilled migration. While there is not one strict definition of scientific mobility, it generally assumes an importance of shorter stays, which is in contrast to the permanence assumed by much of the skilled migration literature. A very broad definition of scientific mobility is applied throughout the chapters in this study and data from the CiLS project: Scientific mobility is defined as individuals with a higher education in the life sciences who have moved internationally for "stays of two months or longer, not including holidays/vacations." This definition also allows for scientific mobility to include a broad range of forms, whether from international degree programs where study occurs in multiple universities, internships abroad, or employment abroad.

The data are analyzed primarily by country of current residence and/or countries of citizenship, depending which is more relevant to the question being discussed. Information was also gathered on city of residence, but it was too disperse to be used as an analytical unit. Country of birth was also collected, but citizenship is used instead as the main analytical unit, as this is what most effects access to various labor markets, including the crucial example of free mobility within the EU. The data on citizenship is typically presented based on a few main groups. One of the main classifications is by countries where there is a sufficient sample, namely Germany, Italy, Spain, Switzerland, Poland, and the other EU-10 countries as a group, for Europe, and India.. A third classification is based on developing countries, outside of the EU. This list was compiled based on the World Bank's classifications. India is not included with the other developing countries, given the large number of responses. While not all countries are represented evenly, the

combination allows for a broad analysis of career goals or patterns of scientists from developing countries to compare with those within Europe.

Like any methodology, this survey has some advantages and shortcomings. Its main advantage is that it is international, with 594 responses from citizens of 69 countries (see Figures 2 and 3), and very little research of this type on mobility exists. However, it is not representative of all countries equally, nor of the scientific population in each place. For example, the total sample contains few scientists residing in the US or UK, both seen as top scientific markets globally, as the focus of the original study was on understanding dynamics of other European countries. The survey was also only available in English, which would also influence the response rates. The uneven sampling across countries means that the CiLS data is not suitable for many advanced, statistical analyses, but instead lends itself mainly to descriptive statistics and qualitative discussions based on answers to various open-ended questions. It is important to note that the data therefore cannot be used to ascertain the ranked position of destinations globally, but rather for discussing changes and highlighting similarities and differences in various countries to attract or retain life science talent. The survey could also be used as a springboard for new research, which then could use a different sampling method and inferential statistics and statistical modelling to determine rankings. In other words, the data is used for discovery-based research on a new and relevant topic, not for hypothesis testing or statistical modelling.

Interviews in Lithuania

Another qualitative element of the study was conducted in Vilnius, Lithuania, where I was living in 2008-2009 during the data collection time period reflected in this study. Interviews from Lithuania allow for the perspective of a new EU member state. Lithuania is considered to be a transition economy following the collapse of the Soviet Union, independence around 1990, and then EU membership in 2004, which includes the right of free mobility to other EU countries. It often has not even been featured in comparative reports on biotechnology, yet has a handful of internationally competitive biotech companies. Also, along with EU membership also comes the requirement to invest in R&D as set out in the Lisbon Agenda, the period of time in focus, the interviews were primarily gathered here through interviews with various experts, including scientists, policy makers, and researchers on migration and brain drain in Lithuania. These interviews are used to further interpret contextual differences related to the impact of international mobility of scientists as relates to a new EU member state.

The original intention was to launch the CiLS scientist survey in Lithuania and company interviews. However, given the broad effect of the economic crisis threatening making the first and second waves of data incomparable, this stage never materialized. However, the interviews and observations are still relevant to allow for a broader look at both the life sciences in various European contexts and dynamic of the global competition for talent, but cannot be said to add systematic comparison.

Participant observation

While not initially conceived as part of the research design, participant observation has held a crucial role in this study. Even without saying anything about my own life to the respondents, my

FIGURE 2 CAREERS IN LIFE SCIENCES (CILS) SAMPLE - CITIZENSHIP

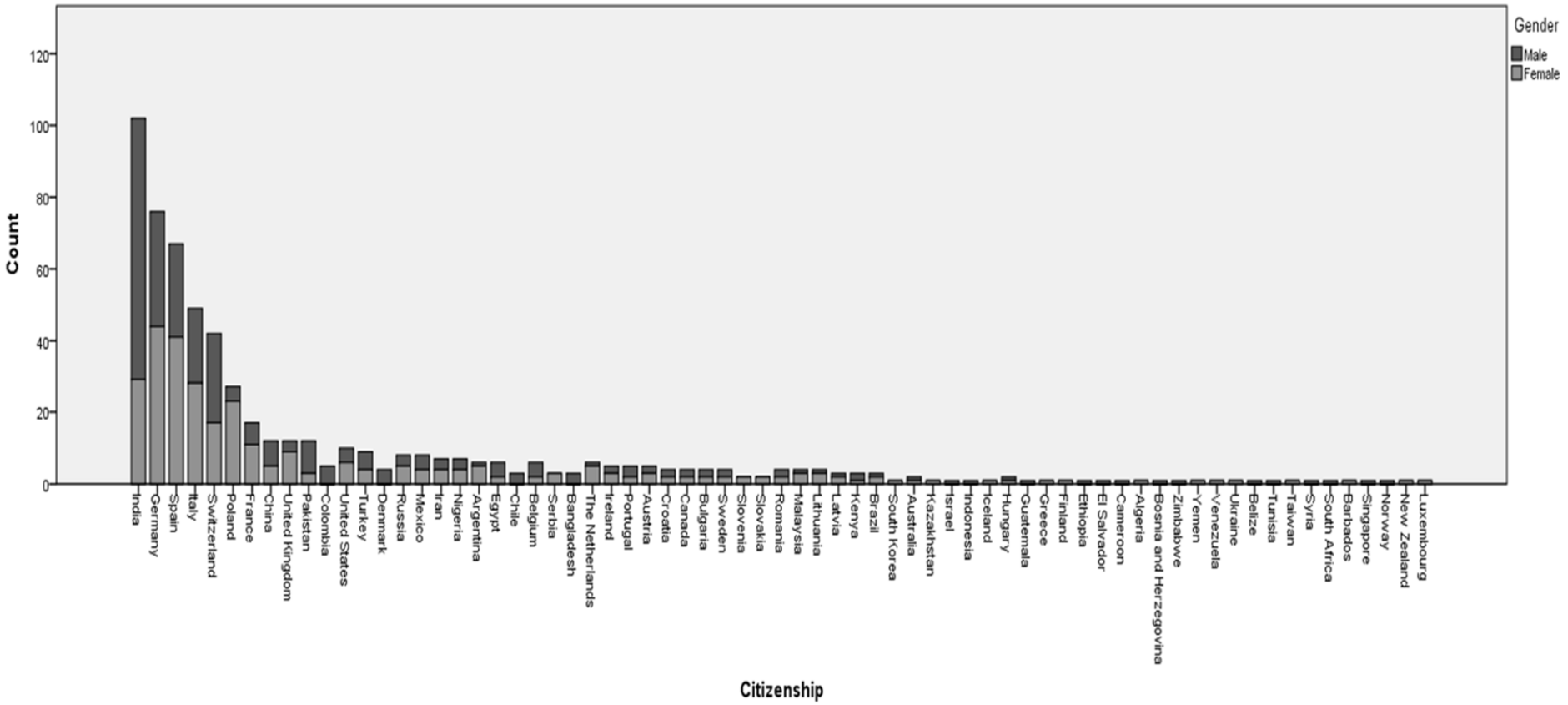
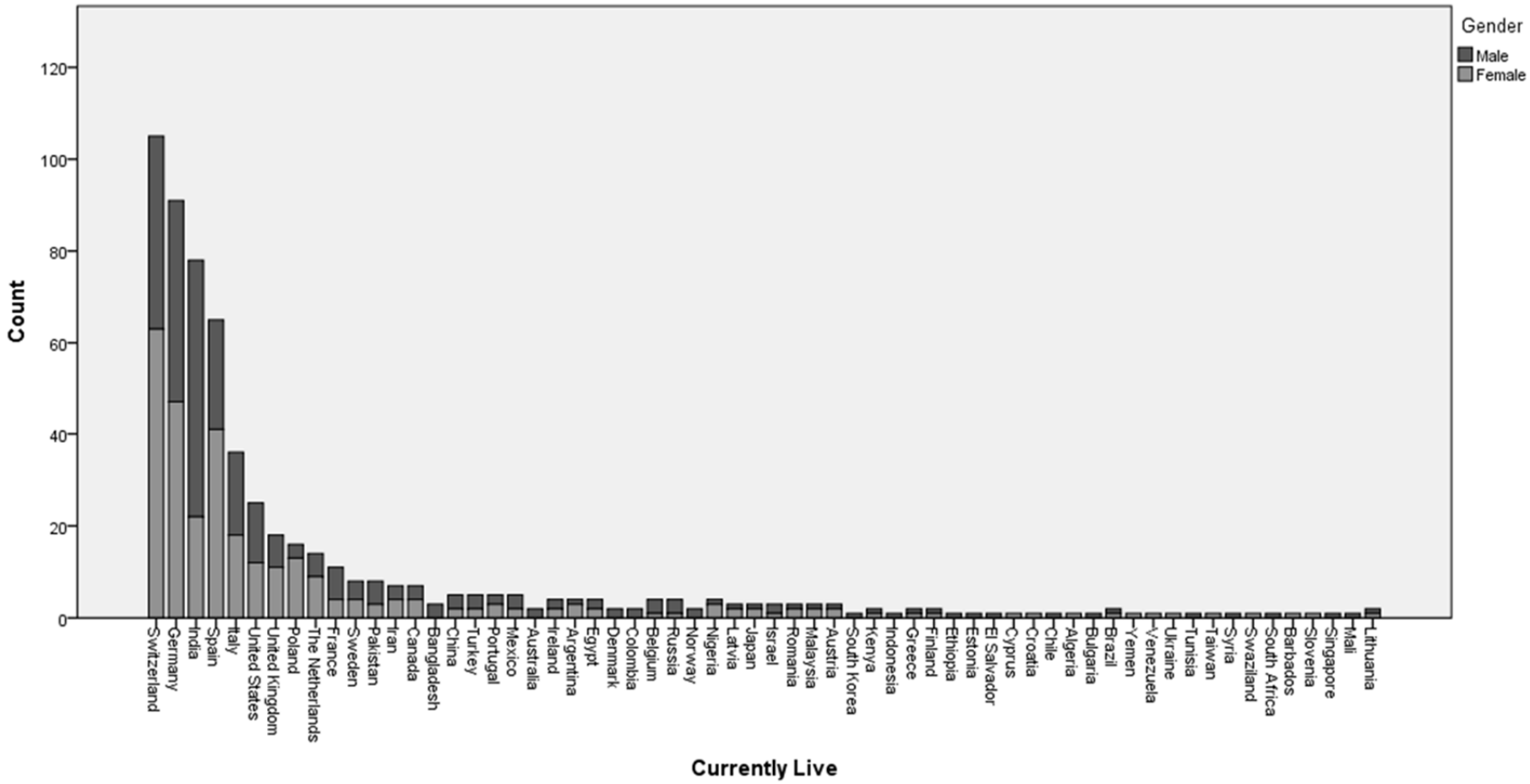


FIGURE 3 CAREERS IN LIFE SCIENCES (CILS) SAMPLE - COUNTRY OF RESIDENCE



personal experiences have undoubtedly shaped the questions explored in this study. Stebbins (2001, pp. 52-55) notes that the strength of exploratory research is often built not just as a project, but in that it is often reflective of the researcher's lifestyle.

One aspect of the 'participant observation' regards my own experiences with international mobility, both in developing and developed countries, and discussions I have had with other 'migrants,' including many skilled migrants or international students, across the world. In the time I spent completing this PhD, I lived in four countries: I was formally based the Netherlands, had a one year Fulbright scholarship in Lithuania, another year-long scholarship from the Swedish Institute to study in Sweden, and finished the writing while living in Slovakia, where my husband is from. In addition, I also I spent several months working on the proposal while in the US, my own so-called home country, unsure if funding would come through and if I'd be able to attain the residence permit to complete this study in the Netherlands. I know firsthand that while others either often idealize or are completely perplexed by such an 'international lifestyle', it comes with both advantages and challenges. I have personal experiences as to how a lack of skilled migration in the past in Europe can mean that systems are not in place, ranging from things such as no online banking outside of the national language (for instance no English-language webpage in major banks in the Netherlands when I first arrived, and none in the Swedish bank during the course of my stay there in 2009), to policies that seem deliberately designed not to 'attract' but to prevent people from outside the EU from sticking around too long. It also means that I am in many ways seen as an 'outsider' and other 'migrants are often comfortable discussing their true feelings about the place where they are living. In every place, some common negative perceptions experienced by the 'foreigners' can be identified, often regardless of their own national background, and although these 'common problems' vary greatly by country, they are largely tied to either dominant cultural differences or institutional difficulties (quality of medical systems, for instance; bureaucracy). My personal mobility experiences began long before this PhD period and Europe, and includes life in seven US states, completion of junior high and high school at an American school in Germany, being one of very few US citizen active in the international students association in college, through a Bachelor's semester abroad at the University of Ghana in Accra and working as a skilled employee in a multinational marketing and advertising research consultancy in Taipei, Taiwan. While I am generally a researcher who is inclined to keep the personal details and anecdotes out and focus on the objective results, I find I am inevitably asked about my background just about every time I present my research. Additionally, in setting up the survey later, I made sure it could capture complex mobility patterns, like the ones experienced by myself and of others I have known closely, without overemphasizing international mobility for those who have lived primarily in one location.

Another aspect of participant observation occurred through the partnerships I formed with the YEBN, which I had found online listed as conducting research on brain drain. After contacting them about my research interests, I was invited to join one of their meetings in Bern, Switzerland in June 2007 and from there, not only a partnership, but a new synergy for this research project merged the initially expected distance between social and life sciences. We created a new project, Careers in Life Sciences (CiLS) during that first meeting. In other words, from the start,

I have been enthusiastically welcomed and have acted as a YEBN member and not as an outside observer. In turn, as one of the founders of the new CiLS study, I presented our project design and results at YEBN annual meetings and conferences, as well as also attended one or two internal CiLS team weekend meetings, scattered across Europe, a year and was accepted as an important YEBN member, rather than as an outsider. This participation allowed me to get feedback on whether or not the findings fit and were relevant for biotechnology, as many of the YEBN meetings included expert panels with people from the European Commission, national research agencies, or companies and confirmed that findings 'fit' within other known contexts. I was also able to hear about issues relevant to life scientists, not only abstractly, but through one-on-one conversations, based in daily life and concerns, rather than as a research agenda. While I would not find it appropriate to detail their 'life stories' in this study and methodologically using too much description is seen to distract from theory development (Stebbins, 2001, pp. 44-45), the observations I had held immense value for me. Particularly illuminating were their international mobility experiences– for instance stories of short-term projects of students in Western Europe to places unexpected, such as Kazakhstan (science has no borders) to Cuba (quite strong in biotech, as I was told in that conversation) and barriers – including feelings of discrimination or exclusion when based in some labs in foreign countries to family concerns, have been influential in identifying issues, in questioning how questions can and should be asked in understanding the current dynamics and drivers of the global competition for talent.

My experiences allow me to have a critical lens when reviewing other studies, both to identify where conclusions may be missing critical examples, as well as where findings may be too enthusiastic, based on the more negative side of the realities surrounding the other side of the noted success. These experiences influence the creation of 'interpretive theory' (Jorgensen, 1989, pp. 16-17):

> The methodology of participant observation provokes concepts and generalizations formulated as interpretative theories. These concepts and generalizations may be used to examine critically existing hypotheses and theories. Concepts, generalizations, and interpretations inspired through participant observation are useful for making practical decisions (see Chenitz and Swanson, 1986; Williams, 1986).

In other words, participant observation helped to shape concepts and find ideas for further exploration particularly for discussion of the individual's attitudes and experiences within the concept of the 'global competition for talent', while the survey and interviews allowed an initial gauging of the predominance of these ideas on a larger scale and for specific groups, such as those based on nationality, of life scientists.

ANALYTICAL FRAMEWORK FOR UNDERSTANDING THE GLOBAL COMPETITION FOR TALENT

Increasing productivity has become associated with ensuring economic competitiveness and economic prosperity, as discussed in the previous chapter. The project builds from the theories discussed in Chapter 1, applying Porter's emphasis on competitiveness evident through productivity with the importance of workforce characteristics, as explained by the 'competition'

for workers and Florida's viewpoint on *individual* preference for choosing regions for employment. In this section, the various arguments implied in the 'global competition for talent' are divided into a new schematic with four basic classifications: productivity, people, place, and policies. Each of these will be explained to further highlight what is implied in the 'global competition for talent'. Although the framework presented above lists out the four main components that drive the 'global competition for talent' separately, each of these factors cannot be seen as acting in isolation and understanding the overlap among these various topics is essential. For instance, the interactions of productivity, people, place, and policy have become central to analysis on skilled migration and can be seen both in *processes* such as 'knowledge spill-over' or 'knowledge transfer' as well as in their *effects,* reflected in terminology such as 'brain gain' and 'brain drain'. The 4P framework clearly echoes the work of Florida's (2002; 2005) 3Ts (technology, talent and tolerance) and the research behind his thesis are important in its development, although his data is not necessarily accepted as the best measures. The 4P concept was developed both to give Florida credit where it is due and also so that the ideas are not equated with the research of Florida, as this research feels the concepts each need to be defined further. Productivity is a much broader concept then technology alone and is one that will apply to any economic activity, even for regions that aim to compete but do not have relative technological advantages. As a theory building study, the definitions and examples used in this typology will be further expanded through original data collection and coding of the CiLS survey.

Productivity

In the rest of this research, competitiveness is defined as "status as a leader". While this is clearly a simplified definition, it is important to note that this definition of competitiveness can tie into several different levels of analysis, ranging from the national to the individual. Productivity would then examine the underlying reasons why a place is seen as a leader. According to Wyckoff & Schaaper (2005, p. 12),

> The market for the highly-skilled has transformed from one where demand originated largely from a single buyer, the US, in the 1990s to one where demand is now more differentiated across buyers, including the EU, Japan, Canada, Australia as well as the large supply countries themselves – China and India. This shift is just beginning, and will probably move in fits and starts, but several indicators suggest that it will continue and strengthen, leading to the formation of a truly global market for the highly-skilled (Harris, 2004). This evolution of the market could have profound implications for individual national innovation systems, macroeconomic policy, the generation and flows of knowledge and correspondingly the shape and operation of the network through which knowledge is shared.

Hence, discussions on productivity are both highly relevant to science and technology personnel and are an essential component in understanding the development of the conceptual underpinnings of the "global competition for talent" and policy developments more generally. The productivity aspect frames the economic goals that are used to argue in favor of skilled migration policies, particularly as related to knowledge-based sectors or other fields where

'global' labor shortages have been reported, particularly at the time of the initial rise in global attention to highly skilled migration in the early to mid-2000s.

The term, productivity, like competitiveness, can be assessed at different levels. These can range from identifying the most productive individuals (talent) to the most productive countries in a given field or industry. It applies to various institutions as well, whether in speaking about the most successful or efficient companies or the most prestigious, for instance in numbers of publications or awards, university departments. It also applies to region, for instance in identifying top clusters in biotech. To the best of my knowledge, the concept of productivity has not been applied in other research to discuss the global competition for talent.

The goal of this study is not to measure productivity, but rather to use it as a basis to better the biotechnology industry as well as, more generally, how productivity relates to the other aspects of the framework, and hence to immigration.

People

The category of 'people' covers the aspects of the 'global competition for talent' that are linked to individual choices to migrate as well as those linked to defining the concept of talent:

- **Based on the individual determinants of migration.** In other words, why is it that some people stay and others go? This has long been a top question of migration research. Many of the factors seen as determining migration fall into other categories – particularly the long-held belief that people migrate predominantly to maximize their income. However, outside of economic opportunities, a number of other factors have been determined as important in individual and family decision-making, based on career opportunities and lifestyle choices, as explained more in the section on place. Demographic factors and their influence on location choice are also important, including but not limited to gender, age and life stage, and citizenship.

- **Based on human capital.** Human capital has long been seen as one of the most important elements of skilled migration. Human capital is usually assessed based on an individual's skills, education, training, and work experience. Human capital is a concept that is used in literature looking at individual job outcomes, in an organizational capacity, and also for migration policy-making (for instance, in the form of points based systems that assess and individuals 'desirability' for migration).

- **Based on demand for high-skilled labor in given occupation.** The term 'talent' seems to increasingly be associated with *certain occupations* in demand, rather than solely individual characteristics and qualifications. In other words, 'talent' seems to be emerging as a buzzword whose use points both to the areas where labor is in demand. This perspective is often used in skilled migration policy-making, through assessment of labor demand or for simplified and expedited visa processes for specific occupations.

- **Based on assessing individual merit and excellence (talent):** This classification is based on various measures of merit, when talent is defined by excellence. For scientists,

these include scholarship recipients, academic citations, patents and prestigious awards such as the Nobel Prize. This narrower definition of talent can be incorporated into policy. It is also often used simply as a rhetoric for promoting skilled migration, with claims that it brings in 'the best and the brightest'.

- **Based on organizational needs:** 'Talent' or 'top talent' have become core concepts in human resources and in company strategies and planning. The talent perspective in the human resources literature and that in the skilled migration literature seem to have evolved independently, and few studies examine the overlap. From the organizational view, talent encompasses the individuals with strong skills in core areas of their business, and includes not only human capital based characteristics, but also soft-skills and personality factors that influence whether the person is a good fit for the organization and specific job role.

(Perceptions of) Place

The next aspect of the 'global competition for talent' relates to the image that one holds of the place and how this influences the decision on where to move, and more generally to economic geography. The 'place' element of the global competition for talent also includes recognition that an individual can make a great contribution to the country they move to; an aspect closely linked to the use of the word 'talent.' As eloquently summarized by Trippl & Maier (2007, p. 1),

> In the past years, there has been a growing recognition that knowledge and highly skilled individuals as "carriers" of knowledge are a key driving force for regional development, growth and innovation (Lucas 1988, Romer 1990, Glaeser 2004, Florida 2002a, 2005a). Given the importance of well educated people for regional dynamism, the geography of talent and the mobility patterns of the highly skilled class are increasingly attracting the attention of both academic scholars and policy agents.' Zucker and Darby (2006) find that 'star' scientists tend to 'become more concentrated over time, moving from areas with relatively few peers to those with many in their discipline.

Ackers (2005b) found a similar result indicating 'clustering' towards specific institutions of 'networks of excellence' in Europe when examining Marie Curie scholarship holders and a similar clustering effect was reported by Millard (2005) in research on scientific clustering in the UK. The perception of the place can is formed on a multitude of levels and can be divided further into three main categories:

- **Country and city image:** As Metz (2002, p. 96) states about economic development, "Image is no longer the result of developments; it is their cause.". Some countries have become viewed as holding more opportunities, being more open and tolerant, allowing individual freedom, or simply as being seen as 'nice' places to work and live, based on a multitude of factors such as the lifestyle, atmosphere, climate, and 'culture' they offer. While some images are directed by personal experience (from one's self and the experience of others who are known or trusted), they are also formed through mass channels of communication. Here media plays a strong role in forming images, as does

the place marketing that directs these images and associations. Place marketing is currently seen as one of the processes for boosting economic competitiveness. As Anholt (2002) comments, most place marketing is not about creating a brand new image of a place, but rather about brand management, about supporting existing positive associations and limiting the negative ones. It is also about the communication of opportunities in order to 'attract' tourists, investors, and the 'desired' would-be migrants (skilled or occupations in demand). Communication aimed at any of these audiences may in fact spur the image and associations formed among other groups as well; that is to say that a place that seems attractive for a vacation may also seem like an attractive option for a place to live. The image can also be driven by associations related to the business environment or even the reputation of specific corporations operating in and associated with this city or country.

- **Opportunity structure -- Work life and professional opportunities:** Economic opportunities have long been viewed as the main driver of international migration. However, as noted by D'Costa (2008, p. 59), 'Salary differentials alone do not explain international mobility. Challenging assignments, favourable working conditions, and access to relevant peer groups are significant professional factors…' In other words, place must be examined not only in the context of the city or country one is moving to, but also in terms of the specific job offer or study program and all the conditions that surround it. It is further influenced by other aspects that shape the opportunity structure, including but not limited to competitive versus non-competitive hiring practice or discrimination.

- **Quality of life and lifestyle:** Quality of life and lifestyle point to two very different aspects, that of the availability of amenities (leisure consumption) and that related to the provision of needed services. This is the aspect of place related to amenities and consumption is discussed in the most detail by Florida (2005, p. 218). Florida asserts that 'Creative people (that is 'talent' in other words) are not moving to these places for traditional reasons… What they look for in communities are abundant high-quality amenities and experiences, an openness to diversity of all kinds, and above all else the opportunity to validate their identities as creative people.' Cities such as London or New York are seen as attractive not only due to economic opportunities but also because of the lifestyle and general diversity of population they can offer. On the other hand, the availability of social services can also be important. Favell (2003) discusses some of the barriers to 'free' mobility in Europe on the individual level among highly skilled Europeans, largely that many of the factors that influence 'quality of life' as relates to provision of services, are still determined on the national or local level. Furthermore, the same factors discussed in 'integration' of low-skilled migrants can apply to assessing the situations of the highly skilled: patterns of friendships with locals, ties to the 'homeland,' access and use of various community institutions or services, political participation, or involvement in the neighborhood, to name a few. Favell further explains that among 'expats', who often move from city to city as decided by their company or firm, various

degrees of attachment to the 'place' exist ranging from indifference to a stronger involvement.

Policies

Recent research (Eggers & Hagel, 2012, p. 10) argues:

> *The global contest for talent is likely to define which countries lead the world economy for years to come. […] Talent competitiveness represents a multidisciplinary policy challenge.*

Building from the work of Eggers and Hagel (2012), policies for ensuring adequate supply and quality of the workforce can be grouped into four main aspects:

1) Skills and education
2) Immigration
3) Innovation, research and development policies
4) Competitiveness in international markets, which also includes foreign direct investment, intellectual property law

The first two aspects are directly related to ensuring the availability of a skilled workforce, while the third aspect of innovation, research and development policies may include the human capital dimension in addition to other policies, such as research funding. The aspects related to international markets are crucial for looking at the competitiveness of knowledge-based economic activities, but are both complex and are assumed to be more related to firms location choices than to individuals, and hence are only briefly discussed in this study. This list may not be exhaustive, as understandings of how various policy fields intersect to impact the global competition or talent are still developing. Furthermore, the framework is best suited to looking at policies on the regional or national level.

Another change is that governments are increasingly seeing it as their role to foster 'attracting' skilled immigrants, in addition to also facilitating processes for companies to hire people they feel meet their needs. Immigration is increasingly being viewed as part of a country's labor market strategy (see Niessen & Schibel, 2005). Trippl and Maier (2007, p. 6) insightfully recognize two main drivers. They explain, 'Over the last two decades a global "migration market for skills" (Salt, 2005) has emerged. The main driving forces of this trend are a growing demand in advanced countries for IT and other skills in science and technology as well as the emergence of more selective immigration policies that favour highly skilled migrants (Cervantes 2004, Salt 2005).' These drivers also reflect various assumptions made in discussing the 'global competition for talent. First, is the idea that there is a demand to recruit internationally. This assumption applies most to specific jobs and industries that are in demand, where there is either a labor shortage (with IT as the most commonly cited example and global labor shortages reported from the 1990s on) or where exceptional skills are seen to make a large contribution (top scientists, medical specialists, artists and athletes). Second, it is often assumed that people with the education and skills levels desired can choose where they would like to relocate. Yet, in reality migration policies are not the same across countries and some nationalities face greater

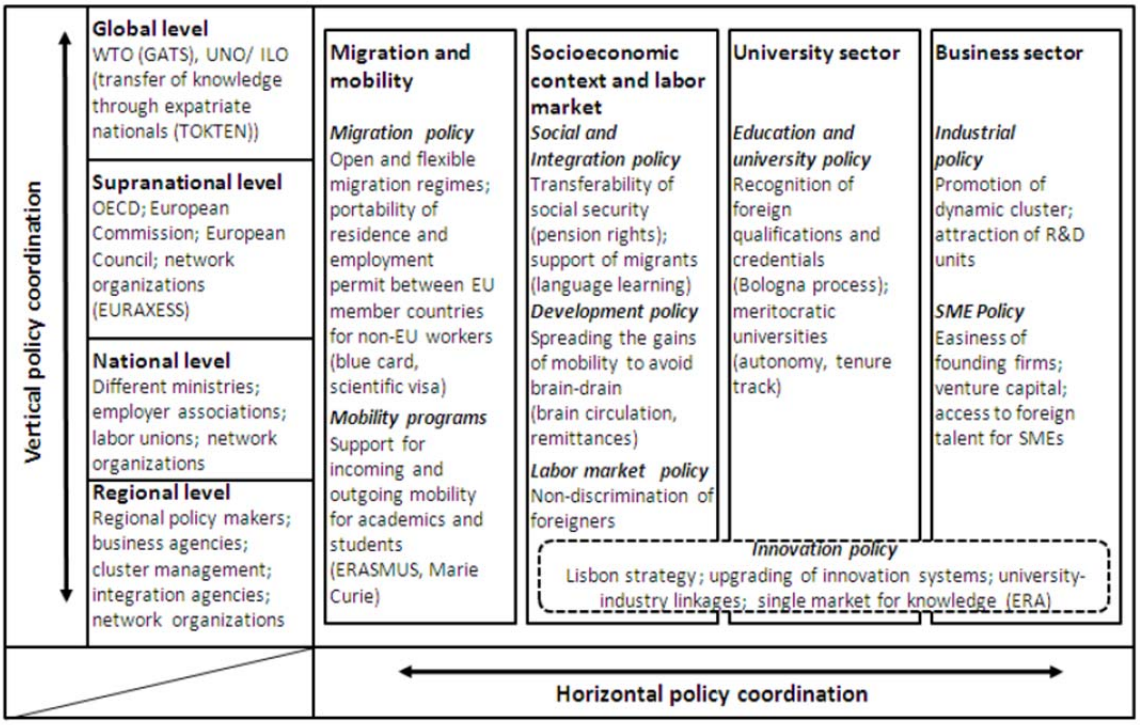
restrictions, for instance Africans often seem to face barriers in migration. Third, it is assumed that policies, particularly immigration policies for receiving countries and policies aimed at creating networks through the diaspora for sending countries (see OECD, 2008; Solimano, 2008) help to steer both the processes and effects of international mobility. Mobility of the highly skilled has increasingly been explained as a win-win situation, enabling skills development for individuals and resources in the form of both financial remittances and knowledge transfer for developing countries (e.g. Kapur, 2001; Mahroum, 2005; Solimano, 2008).

While Eggers and Hagel's analysis involves diverse policy types, the nuances are even more complex yet. For instance, policies that explicitly support the migration of 'talent' range from setting general, more global skilled migration programs to allow individuals to come in from across the world to specific grants aimed to attract a specific type of researcher or other specific occupations. When skilled migration policies are adopted, there is a varying continuum of forms. It is important to remember that while policy is not the only factor that influences migration and mobility patterns as discussed in the previous section, it is important in shaping the type and magnitude of the inflows (Grogger & Hanson, 2008) and changes across time. Abella (2006) looks at policy goals and distinguishes four policy approaches (which are not mutually exclusive) to skilled migration:

- the human capital: often permanent migration through points based systems,
- labor market needs: based on labor shortages and specific skills in demand,
- business incentives: special incentives given to investors or managers, such as permanent residency, citizenship, or labor market access for family members,
- academic-gate approaches: focused on attracting international students to university degree and research programs and facilitating their labor market access after graduation.

Understanding policy influence on the global competition for talent is also challenging as it occurs on a wide range of scales. Reiner (2010, p. 15) presents a framework (see Figure 4) of the various policies for what he calls "brain competition policy," and notes that policies occur on multiple levels ranging from the global level such as the GATS treaty, to the international level such as through the EU, the national level and the regional level in his framework. In addition to migration and mobility, Reiner points out that labor market policy, particularly nondiscrimination measures, university recruitment and recognition of foreign credentials, and business policy all play important roles. All of these various policies have an impact on the global competition for talent. Given this complexity, policies relevant for the global competition for talent cannot be examined in full in this study. Instead, the study aims to point to some key features of policies that are having an impact on scientific mobility within and to various European countries.

FIGURE 4 FRAMEWORK FOR UNDERSTANDING "BRAIN COMPETITION POLICY"



Source: Reiner 2010, Which policy options for Europe in the global competition for talent. Brain competition policy as a new breed of locational policy with positive externalities. *SRE - Discussion Papers*, 2010/01. WU Vienna University of Economics and Business, Vienna. p. 15

CONCLUSION

This study begins to map out the currently uncharted territory surrounding the concept of the global competition for talent. As a first drawing, it is a map that cannot be said to sketch the situation of the entire world, to detail each of its unique features and position therein or the borders surrounding the concept, but rather begins the outlines for further explorers to fill in. The data in Part II represents the views of life scientists across many corners of the globe, as well as discusses some of the specific 'situations and strategies' within various countries in Europe. These situations and strategies, or cases, to use the term loosely, discussed in this book have been chosen based both on availability of data, based on numbers from the original international survey results explained above, to illuminate a wide range of situations and understudied cases in the global competition for talent. For instance, one goal from early on was to include an example of biotech from an EU country in Central or Eastern Europe, while the data on Indian life scientists came about unexpectedly. Furthermore, the focus of this study is primarily on adding some examples to provide context for how the global competition for talent plays out *within life science careers*.