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# Path-dependency in International Academic Careers

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- analyse migration as part of broader global change
- contribute to new theoretical approaches
- advance understanding of the multi-level forces driving migration

## Abstract

The impact of globalisation processes and economic integration on the internationalisation of higher education has mainly been discussed with respect to students and their mobility to date. Less attention has been devoted to academics themselves as the producers of knowledge and providers of educational services, despite the fact that academic careers have long been associated with high levels of geographical mobility. Using unique data from a recent survey of about 10,000 Indian academics worldwide, this paper examines the drivers and dynamics of international academic mobility among one of the largest academic diasporas worldwide. Overall, we find a strong 'path-dependency' in academic career trajectories, indicating the importance of previous career steps in facilitating future career opportunities and mobility steps. For instance, excellent grades in high-school and/or international experience as a student seem to be pre-conditions for later academic employment abroad. Path-dependency is also embedded in geographical choices, as we were able to identify unique pathways to the prime international destinations in academia (US, UK), as well as a growing importance of social capital and networks in choosing rather newly emerging destinations. In addition, socio-economic background seems to be an important driver for early career steps but becomes rather irrelevant for future academic employment.

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# Contents

# 1 Introduction

There are an estimated 7 million academics world-wide, of which about 3.5 million are employed in developing and middle-income countries (Altbach 2012, Royal Society 2011). As primary knowledge providers and educators of future generations, the academic profession is often considered the 'linchpin of development' (Altbach 2012). Very little is known about this group of academic professionals, however, particularly regarding their career paths and (international) mobility patterns. This paper examines the importance of prior migration stages in shaping academics' future geographic mobility choices, as well as the factors that moderate the path-dependency of international academic careers. It focuses on the case of Indian researchers, which in many countries make up the largest number of foreign students and academics.

The academic world is hierarchical, and research universities in highly developed, mostly Western countries are at the core of the international knowledge system, while the academic profession in developing countries is a profession on the periphery (Shils 1972, Altbach 1998). The bulk of academic knowledge generation is undertaken at a few hundred universities and research institutions in these highly developed countries, and these 'core' institutions are setting global standards and norms of academic work. On the other hand, academics at teaching-oriented universities are mostly peripheral to these research-oriented academic gravity centres. Only a few developing countries, and India is a good example, have developed a small number of outstanding academic institutions with research facilities and employment opportunities comparable to most Western academic institutions. These institutions are able to offer research facilities, career prospects and remuneration that are internationally competitive and attractive enough for students to be trained and to retain top scholars.

Overall, though, students and academics, trained and employed in developing countries such as India, fall short of academic standards and practices prevailing at the 'core' of the global knowledge system. Academics employed in developing countries generally spend most of their time teaching, and if able and willing, conducting some research. Most scholars find it difficult both to acquire necessary funding and almost impossible to get their work published in respected (Western) international journals. Although developing country scholars have to follow research and publication standards defined by the Western knowledge system, they cannot compete in many respects due to limited research funding, poor facilities and low quality of training. Thus, many young and bright students with good prospects for an academic career decide, mostly at an early stage of their career, to choose an international academic pathway that opens greater academic opportunities and career prospects instead of staying put at a higher education institution in their home country that offers only mediocre academic prospects. Foreign academic training and international (Western) degrees are often favoured in academic recruitment procedures, mainly because of higher quality and prestige reasons. Thus, students and graduates from a developing country background and with an intention to pursue an academic career usually have to move abroad for gaining international experience and advanced degrees that will facilitate return when attractive opportunities come up in the domestic academic system (Altbach 2012). Many students from developing countries, however, do not return after having obtained their advanced foreign degrees because of a systematic lack of competitive academic opportunities at home.

Previous research has studied the international mobility of students and that of academics separately, giving rise to two lines of literature that rarely communicate. Yet, evidence shows that a large share of academics working abroad have previously studied abroad, most often in the same country (Van de Sande et al. 2005; Hansen 2003). Thus, examining what drives the migration of academics should also imply an analysis of drivers of student mobility and the retention of students by the destination countries. Using new and unique data from an online survey of Indian researchers around the world which collects retrospective information on their educational and professional trajectories,

this paper contributes to the literature by bridging the two lines of research and analysing, in a unitary framework, drivers of international migration for study and for academic work reasons.

A second contribution that this paper makes is to quantify the extent to which prior migration decisions influence subsequent mobility choices in academic careers. As discussed above, the importance of past migration experience on future moves has been acknowledged by existing studies, but few of these have gone beyond a descriptive assessment of the phenomenon. In this paper we investigate the extent to which individual academic careers are (geographically) path-dependent asking, for example: how important is it – in the case of Indian-born researchers – to have studied abroad for the likelihood of being employed abroad? We further explore the factors which may 'moderate' the observed path-dependency, or, in other words, which may help students and researchers 'break the (geographical) path' in their academic careers. We explore the influence of both contextual-level factors – such as the discipline or the time period where these careers unfold – and of individual-level factors, such as the scores researchers obtained for their end of high-school exam, their gender or their social background.

## 2 Academic career trajectories and path–dependency

The international mobility of researchers and academics has so far received less academic attention than that of other high-skilled professions such as physicians or IT workers. Academics, however, perhaps to a larger degree than other professionals (Chompalov 2000), are increasingly expected to be mobile (Ackers 2001; 2005). International experience has become necessary for career progression in many academic labour markets, though to a different degree across national contexts and disciplines (Ackers 2001). According to Chompalov (2000), natural scientists are more likely to emigrate than social scientists. On the one hand this may be due to the fact that their knowledge is "more readily convertible" (2000:17); on the other, it may reflect the importance of physical access to high-quality infrastructures. However, it has been argued that social sciences and other disciplines outside the hard sciences have experienced a similar trend, though perhaps international experience is less essential for their profiles (Ackers 2001: p. 71).

The importance of the expectation of mobility also varies by national context. Students and researchers from the core of international knowledge systems, such as the US or UK, are less pressured to move abroad, whereas for the others, including continental Europeans, a "foreign stint is seen as a feather in a postdoc's professional cap" (Balter 1999). For the latter, the pressure to move abroad comes both from reduced education and employment opportunities at home – a situation that academic migrants share with other categories of movers – and from the premium attached to international exposure, which is more specific to the academic profession (Ackers 2001). Thus, mobility is not so much a choice as a necessity to be embraced for those who want to progress in research careers, blurring, to some extent, the boundary between "voluntary" and "forced" in the case of international academic mobility (Kind 2002).

Previous work has also focused on the motivations underlying their mobility choices and argued that academics can best be described as "knowledge migrants" rather than "economic migrants" (King 2002; DTI 2002; Ackers 2005). According to these studies, researchers are primarily attracted by centres of research excellence, which cluster high quality infrastructure, facilities and top quality researchers. The prestige of the institution is an extra pull factor, as well as the level of autonomy they can achieve in their work. While not the primary motivation in their moves, economic factors remain influential in academics' migration choices (Ackers and Oliver 2005). Better salaries – which also signal a higher social status of the academic position -, higher research funding, and more generous social benefits, exert an important influence in attracting academics to a particular destination.

There has also been some research on factors that shape individuals' ability to respond to the motivational factors discussed above, such as gender, the life-stage and in particular the family situation. Being in a couple and having children deters international mobility among students and academics, especially for women (Bauder 2012; Ackers 2001; 2005). This often leads to gender-imbalanced stocks of foreign academics: for example, in the US, 64.4 per cent of foreign scholars are men and only 35.6 per cent women (Institute of International Education 2010). In dual-science careers, common among academics, it is generally women who sacrifice their career and follow their partners (Ackers 2001).

Furthermore, social and professional networks have been found to influence mobility decisions (Bauder 2012): on the one hand, information circulated through peers and supervisors' networks situated abroad may increase both the aspiration and the ability to move (Korys 2003). On the other hand, the social and academic networks accumulated on the spot may attach people to particular places and discourage mobility – a phenomenon that Williams' et al (2004: p. 41) and others conceptualise as location-specific insider advantages.

Previous research has also shown the importance of prior experiences of mobility for subsequent professional migration as a researcher or academic. In particular, a high share of scientists moving abroad for work reasons had experienced some form of student mobility, at undergraduate or post-graduate levels (Ackers 2005). Two thirds of researchers in the Marie Curie Fellowship scheme interviewed by Van de Sande et al. (2005) had lived or studied abroad prior to their application. A similar finding was reached by Hansen (2003) with respect to EU-born researchers in the US. Yet, most research has not gone beyond a descriptive evaluation of the phenomenon. If prior student mobility is so important in determining the likelihood to work abroad as an academic, the phenomenon to be explained is less that of professional mobility than that of student migration and retention.

Louise Ackers argues in her seminal review of the scientific mobility literature in the European Union that "any new research should curb the existing boundaries between undergraduate and other forms of academic mobility" (2005: p. 108). So far, the literatures on student and researchers mobility have remained separate. Since only a minority of students seek academic or research careers, a promising approach for integrating the two phenomena is a biographical or life-history approach of academic careers, which addresses student mobility retrospectively (Ackers 2005). This is the approach we also take in this paper, which seeks to analyse the interdependence between prior (student) migration stages and future mobility choices.

## 2.1  Path-dependency, a useful angle for analysing international academic mobility

In the following we propose the concept of 'path dependency' as the theoretical framework for understanding career and mobility trajectories of academics. The initial idea of this concept was that a small initial advantage or a few minor random shocks along the way can affect the course of history (David 1985). In general, path dependence implies that a current or future state or outcome of a process depends on its history, which is on the sequence of previous states, decisions and actions made by agents and resulting outcomes, and not only on contemporary conditions and states of the environment. Previous investments and decisions constrain future behaviour, whether of governments, firms or individuals (Bercovitz et al., 1996, Pierson 2000).[1] A path-dependent process can be caused by

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[1] Theoretical, historical, and empirical studies of path dependence cover topics ranging from the selection of institutions, the formation of government policies, the choice of technologies, the location of cities, to the formation of languages and law (Page 2006).

*increasing returns* or positive externalities, which imply that the more often a certain decision is made or a certain action is taken, the greater are the respective benefits in the future. But also negative externalities caused by any form of constraint (financial, spatial, time, or even cognitive) can create path dependence. Positive and negative externalities can change incentives, and incentives are important drivers in human decision-making: e.g. regarding professional career steps. Past decisions or actions that influence the way how people respond in the future create positive or negative externalities for later decisions (Page 2006, Medin and Atran 2004). A path-dependent processes is self-reinforcing, which suggest that making a certain decision or taking a certain action establishes a set of forces or institutions that facilitate that a choice to be sustained in future decisions.

Path dependence assumes that collective or individual processes are characterized by a built-in tendency towards 'optimal paths'. On the other side, 'wrong' decisions or missed opportunities can divert a career trajectory to a suboptimal pathway. Thus, path dependency implies some inflexibility in career trajectories. Evolving academic careers can get locked into given paths of personal or academic development, excluding a host of other, perhaps more efficient or desirable options. As a consequence, later adjustments or corrections towards perhaps more preferred ('optimal') outcomes are often ruled out (Hodgson, 1996). Basically, the exclusion of alternatives drives a path-dependent process.

An individual path-dependent processes such as the development of an academic career and mobility trajectory is integrated into a collective path-dependent process of an academic mobility system. At the meso-level, *positive feedback* of a certain action or choice creates positive externalities when that same choice is made by other people. Here, lock-in mechanisms imply that a certain choice or action becomes better than any other because a sufficient number of people have already made that choice. In a path-dependent process such as academic career development, behavioural routines, social connections, or cognitive structures are built up around an institution (Page 2006). This is the consequence of a localised nature of learning where individual learning about opportunities and constraints is concentrated in and around previous activities. This activity- and place-specific learning from peers conditions future career trajectories and mobilities (Baláz and Williams 2007).

Formalised in a model of path-dependency in academic career and mobility trajectories, the probability of choosing destination $X = \{1, 2, \ldots, D\}$ in period $t$ as the destination of the next career step in $t + 1$ is given by:

$$\Pr(X_{t+1}) = H_t(h(X_t), s_t),$$

where $s_t$ represents the state or environment of a decision-maker including e.g. the information available about opportunities or constraints, or other exogenous factor in a given period t. $h(X_t)$ captures the individual trajectory of career steps and respective locations $X_t$ and all other historical factors until the current period $t$. The dynamic function $H_t$ transforms the current history into a probability distribution for the next career step. This path-dependent process is non-deterministic, but stochastic and biased toward past decisions. That is, certain outcomes are understood to be more likely than others, but none of these are necessarily 'optimal'. In this sense, although processes of career development are cumulative and path dependent, they can also be interrupted by unforeseen factors or events (Page 2006). Furthermore, this dynamic process generates increasing returns (or, positive externalities) if an outcome of any type in period $t$ increases the probability of generating the same or a similar outcome in the next period $t + 1$.

A refinement of this general model may distinguish between early and recent path-dependency, which represent different weights assigned to respective historical periods. A career process is early path dependent if the choice of a future career step depends mostly upon the history up to a certain period in the past. A recent path-dependent process, in contrast, emphasises the outcomes and

opportunities in the more recent past – i.e. outcomes such as place of birth, schooling, etc. may be rather irrelevant for future academic career steps. We may assume that academic careers to reflect a more recent path dependency, for example, having obtained the PhD abroad should be more influential in the likelihood to take up a Post-doc abroad than having obtained one's undergraduate degree abroad.

Both the structure of opportunities and constraints in the global academic labour market, and individual aspirations may explain why academic careers are expected to be geographically path-dependent. The Indian higher education system is still at the periphery of the international knowledge system, which implies that those with Indian-only degrees may find it increasingly difficult to move closer to the global 'scientific core'. At the same time, as they go up the academic ladder from BA, to MA, PhD and beyond, individuals also form families and social attachments that keep them in place. Thus, their aspirations to move abroad may also decrease. Conversely, those who moved closer to the academic core countries during their education years, have less academic incentives to return to the periphery (although they might have the ability and opportunity to do so) and have in turn developed social and professional attachments in their host countries.

As discussed above however, path-dependency is not a deterministic process, as it may be influenced by a series of contextual and individual-level factors. First, and the next section will discuss this in more detail, the Indian higher-education landscape has been undergoing substantial changes in recent years. International experience is increasingly required to get a position in top institutions such as the highly regarded Indian Institutes of Technology (IITs), national universities or research institutes. At the same time, obtaining a PhD, mostly in natural sciences and engineering, from these highly selective institutions is well-regarded by foreign universities. This changing structure of opportunities and constraints means that a growing number of top students will prefer to stay in India for their PhD, but will be confronted with the need to get out of India for a Post-doc if they want to find a good job later on within the Indian academic and research system. These recent changes should therefore reduce the geographical path-dependency of Indian research careers.

Second, we expect these dynamics to be especially visible within certain disciplines, such as the natural sciences, mathematics or engineering, in which India has invested substantially in recent years. In contrast, those who want to engage in social science or humanities careers have both fewer opportunities to do a high-quality PhD in India and less employment opportunities afterwards. For them, international careers are still a better option altogether.

Besides these contextual dynamics, individual-level factors may also moderate the weight of past mobility decisions on future migration trajectories. First, outstanding or high-performing individuals may be more likely to gain admission in the universities at the global scientific core – in the US or the UK – even with an all-Indian education. They may thus be more likely to 'break the path' set out in front of them, should they wish to do so. Second, individuals from privileged backgrounds, with high-educated parents, may also have better cultural and linguistic resources than those from less priviledged backgrounds, which may gain them admission abroad in the absence of prior foreign qualifications. Last, previous research has shown that female students and academics are less likely than men to be internationally mobile. We may thus expect women's disadvantage to accumulate international experience over their trajectory, especially as family considerations become more important. Thus, we expect men will be more likely to break the path, and be more likely than women to move abroad for the first time at later stages of their careers.

# 3  Academic careers in the Indian higher education system

India's higher education system, the third largest academic system after China and the US, has expanded rapidly over recent decades, in particular in recent years. Since 2007/08, post-secondary student enrolments grew by more than 25 percent, reaching 20 million students in 2013. In the same period, the number of higher education institutions has increased by about 10,000 reaching more than 36,000 in 2013 (UCR 2013). This expansion in academic capacity though came mostly at expense of quality. The Indian higher education sector is a complex system of hundreds of 'teaching colleges' –private and public – affiliated with public universities. Public universities are funded by federal states or the central government, while private institutions do not receive any public funding. In 2013, there existed 700 degree-granting public or private institutions and more than 35'000 colleges affiliated to state universities (UCR 2013).[2] There are about half a million academics working at these higher education and research institutions of which approximately 50 percent are teaching (and doing little research) in humanities and social sciences (DFID 2011). While India used to have a relatively strong academic tradition in the humanities and social sciences, India's recent expansion in research budgets in higher education focuses mostly on science and technology. Of the total research expenditure allocated by the University Grant Commission in 2009/10, less than 12 percent was allocated to research in social and basic sciences (DFID 2011).

Due to ever increasing student enrolment volumes, India (like many other developing countries) has been building up a large academic system. Higher education systems in all developing countries are generally of relatively low quality, and India is no exception in this respect. It is estimated that 95 percent of all India-based academics work in an environment that is significantly below international standards (Jayaram 2003).

Like most higher education systems in the developing world, the Indian academic system is characterised by some broad long-term trends such as a massification of higher education with ever increasing student enrolments and high teaching loads. A privatisation of the higher education sector as a consequence of internationally imposed structural adjustment programs in the early 1990s in combination with an increasing marketization in which academics are expected to some extra entrepreneurial activities, have left the academic profession in an unsatisfactory state (Altbach 2012). An increasing proportion of Indian academics work on part-time contracts and are subject to a second or third academic or non-academic job due to low and often insufficient salaries. The majority of academics only hold a bachelor's or master's degree and are subdued by teaching responsibilities. Limited qualification – such as a missing PhD – of early and mid-career academics is often the key obstacle for further upward academic mobility. Modest qualifications of university and college teachers affect also the quality of training provided to students.[3]

Indian academics, alike most scholars working in developing countries, tend to come from the more privileged segments of their societies, that is, from the well-educated and mostly urban families. But interestingly, academics usually do not come from 'elite families' mainly due to comparatively low salaries and limited prestige and social recognition of the academic profession (Altbach 2011). This is also reflected by a relatively low interest in research-oriented courses among students. Only one percent

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[2] The degree-granting institutions comprised 44 central universities, 306 public state universities, 154 private state universities, 129 'deemed' (private or public) universities and 67 institutions of 'national importance' such as the Indian Institutes of Technology.

[3] Employability rates of Indian graduates are estimated at between 34 % and 53%, reflecting a vast 'skill gap' and mismatch between graduate skills and labour market demands. It is assumed this is in part because of quality of school education - students entering college are not well-prepared) and the quality of college education itself (The Conversion 25 April 2014).

of students pursuing tertiary education opt for a research degree (Times of India 2013). The number of doctorates awarded between 1991 and 2001 increased only by 20 percent (compared to 85 percent in China), and only a small pool of students enrol in a PhD programme at an Indian higher education institution. For instance, India produces only 125 PhDs in computer engineering a year, despite nearly 1.7 million engineering students graduating every year (Mishra 2013). The director of the Indraprashtha Institute of Information Technology in New Delhi, Prof Pankaj Jalote, explains this phenomenon by the fact that "a large number of students think that becoming an academic is the only career option after completing a PhD. Several did not want to do a PhD in India because they felt the research work was poor and an Indian PhD has a low market value" (quote from Mishra 2013).

The low domestic supply of highly qualified doctorate holders may be largely the consequence of limited career opportunities in India. Its higher education sector is swamped by a large number of temporary teachers and colleges and universities are not recruiting teachers on regular posts. Instead they hire non-regular and contractual teachers of which many lack advanced graduate training and qualification. Temporary teachers are hired to compensate for long-standing vacancies. In 2013, at central universities about 38 percent of teaching posts were vacant (Times of India 2014). Teaching and research usually do not go together as the higher education sector is divided into teaching-focused universities and colleges on the one hand and specialised research institutions on the other, with most universities not engaging in cutting-edge research. While in most Western countries the largest share of research funding comes from government bodies, only about 10 percent of the Indian government's research funding goes to the universities (Mishra 2013). As a consequence, Indian universities are unable to attract and retain top scholars which results in a lack of qualified research manpower. Even at the reputable Indian Institutes of Technology (IITs), a large number of faculty positions often remain vacant for a long period of time (Mishra 2013). The IIT Bombay as one of the most reputable technical institutes in the world, which ranked 36th in the Times Higher Education Rankings for Engineering and IT Universities in 2008, scores rather low on indicators such as international faculty members and international students (Mukul 2009, Jayaram 2011). As a consequence of these structural deficiencies in the higher education sector, India has the largest diaspora of researchers world-wide, with now 40 percent of India-born researchers working overseas and 75 percent of its scientists moving to the US and about 25'000 IIT-alumni have settled in the US since 1953 (Friedman 2006). Return rates are generally low with only five percent of Indians who go to the US to earn a doctorate are returning home (Chang and Milan 2012).

India aims to reverse this brain drain by a rapid expansion of its higher education infrastructure. Since recently the Indian government allows foreign universities to set up non-profit campuses and to offer foreign degrees. Before, foreign universities had to joint-venture with a local education provider in order to offer courses, and degrees awarded were not considered foreign degrees. Additionally, India's elite institutions (IITs and IIMs) have put in place flexible recruitment policies, more generous research grants and industry-academic collaborations in order to attract researchers back home. For instance, at IIT Delhi, two-thirds of academics have now a PhD or Post-doc from a foreign university, or IIT Bombay has hired more than 100 Indian assistant professors with international experience in the past three years (Mishra 2013). There has also been an increase in research funding over past years, e.g. IIT Bombay has had a ten-fold increase in research funding over the past decade (Mishra 2013). Partly as a consequence of these policies, India has been able to attract an increasing number of researchers back home. However, Indian universities still don't make it at the top of global university rankings. In the 2014/15 Times Higher Education ranking, only four Indian institutions appeared in the global top 400, not one in the top 200 (best were Indian Institute of Science and Panjab university, both at 276–300), which shows that the Indian higher education sector has still a long way to go to become a competitive player on the global, but also the rapidly emerging Asian knowledge market. Indian higher

education institutions in general are still not attractive enough to retain or incentivise return of prospective Indian academics.

The following analysis is dedicated to explore in greater detail international career and mobility paths of India-born academics with a particular focus on the timing and path-dependency of these academic careers.

# 4 Career and mobility paths of Indian academics

## 4.1 Data and Methodology

In order to study the drivers of academic mobility among Indian researchers, we use data from the *Global Survey of Researchers*, an online survey we conducted between February and July 2014. We adopted a multi-sited strategy, interviewing both mobile researchers currently living around the globe, and researchers based in India who never lived abroad or who had returned to India. Since researchers are a highly educated group, it was possible to use web-based survey methods to reach them, thereby enabling us to interview Indian academics in a large number of countries. We surveyed active researchers, who published at least one article, research paper, conference proceeding or book indexed in Thomson Reuter's *Web of Knowledge* database in the last four years in all disciplines. Thus, our survey is not only focused on academics – i.e. those who hold an academic position in a higher education institution – but targets all those publishing academic research, whether they are employed in a public or private research institute, a university, still studying, retired or unemployed.

In order to especially target Indian researchers we adopted a *name-based sampling strategy*. Among this population, we selected those with an *Indian surname.*[4] We then selected those co-authors for whom an email address was present in the database. This generated a target population of almost 150,000 different researchers who published at least one article in the last four years in a journal indexed by Thomson Reuters, who had an Indian surname according to our definition and for whom an email address was recorded.

We contacted these researchers and invited them to complete our *questionnaire* to collect information on their educational and professional trajectories, including the locations (country and institution) of each major degree or work transition (BA, MA, PhD, first job, current job, aspired future job) as well as the reasons for choosing these locations. Information was further collected on the academics' shorter mobility trips – such as visiting fellowship or fieldwork abroad – and on their patterns of international collaboration. Their professional aspirations in terms of location and position were also recorded, and how their aspired position would compare with their current one on a series of dimensions. Last, the questionnaire also collected socio-demographic and other background information from the respondents, such as their region of origin, their end of high-school examination grades, their parents' educational background and their family situation (marital status, partner's educational and professional background, children's ages and location). As the survey was implemented online, a full retrospective design was not possible as it is too time-consuming. Nonetheless, time-dated information was collected on several dimensions of respondents' trajectories (year in which highest

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[4] In order to determine whether a name was Indian or not, we first generated a comprehensive list of surnames of researchers affiliated at an Indian-based institution and who published an article in the past 12 months that was indexed in the Thomson Reuters *Web of Knowledge* database. We then compared the frequency of each of these 24,000 different surnames within the pool of *Indian-based* researchers to their frequency in the *worldwide* pool of researchers. We considered those names that were more frequent in the Indian pool than in the worldwide pool as Indian (for example: Kumar, Singh). We further selected the names that were similarly frequent in the Indian pool and in the worldwide pool in order to capture such names as D'Souza (that may be Indian but also Portuguese or Brazilian). We excluded names that were more frequent worldwide than in India (the most extreme example being Wang or Kong).

degree was obtained, year of start of first and current job, year of marriage, ages of children, etc.). This allows accounting of the sequencing of events when studying their drivers, going thus beyond what has been done by other surveys on academic mobility that have been entirely cross-sectional in their design.

We used the platform Qualtrics to administer the questionnaire.[5] The survey and invitation letter was in English. Each researcher was emailed at most three times (two reminders) during a period of three months (February–July 2014). The platform also recorded partial answers, allowing respondents to return to the survey at a later date (within three months). Around *19,000 researchers* began our survey, amounting to a total *response rate* of 14.3 percent (excluding bounced emails). A recent feature of the Qualtrics platform allows us to see the number of emails that were opened, and thus the number of panel members who actually saw our invitation. Only about 30 percent of the panel members opened the email invitation; it is likely that a large number of unopened emails went to spam folders. The total response rate out of the opened emails was 46.3 percent. In this paper, we only use complete answers (i.e. respondents who got to the last question of the survey and submitted their responses) of Indian-born researchers who have obtained their PhD degree, which gives us a sample size of almost 4,600 individuals. Table A1, in the Appendix, presents descriptive statistics for our dependent and independent variables.

In a second stage, we contacted a subsample of the respondents and conducted around 45 follow-up qualitative interviews via Skype. In selecting our interviewees, we tried to diversify as much as possible their current geographic area of residence, their gender, discipline and age group, based on the information they provided in the survey. The interviews were more in-depth on the factors driving our respondents' decisions of where to study and work, of the role of migration policies in shaping their mobility trajectories, and of their future geographic and professional aspirations.

We employ two types of methods to analyse our data. First, we use sequence analysis to visualise the level and the timing of geographic mobility within educational and professional trajectories. We further compare researchers of different age-cohorts, disciplines, social origins and high-school performance in their mobility trajectories. Second, we conduct logistic regression analysis to model the mobility decisions that researchers took at different points in their educational and professional careers: whether they went abroad for their BA, MA, PhD, for their first job after their highest degree, for their current job (if different from their first). Multinomial logistic regression was also used in order to further distinguish between different geographic destinations (i.e. India, Other Asia, North America, UK, Other Europe, Rest of the World) at three key moments of the respondents' careers: their PhD, their first and their current job.

## 4.2 Typologies of trajectories

Cross-sectional descriptive statistics are limited since they don't take into account the sequencing of events within an individual trajectory, which is of particular interest for our analysis. In a second descriptive step, we use sequence analysis in order to visualise researchers' trajectories over time and space, and across different groups. Our questionnaire does not collect information on complete academic trajectories (i.e. all degrees obtained and all jobs held), but covers several key educational and professional transitions. The figures below display the geographic locations of Indian researchers' BA, MA, PhD degrees and of their first and later (current) jobs, in this order. Each horizontal line represents an individual trajectory made up of these five steps, and six different geographical areas are distinguished (India, Other Asia, North America, UK, Other Europe, Rest of the World). The vast

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[5] www.qualtrics.com

majority of India-born researchers surveyed have done their BA degree in India, with a small minority (around 3 percent) studying abroad, mostly to North America, and particularly in the US (Figure 1).
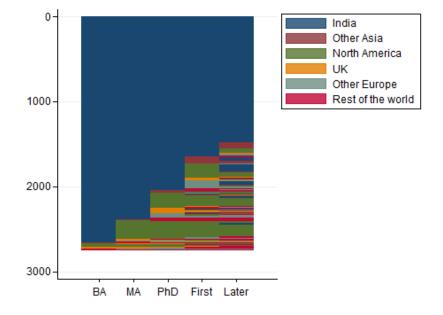
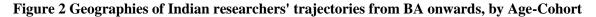**Figure 1 Geographies of Indian researchers' trajectories from BA onwards**



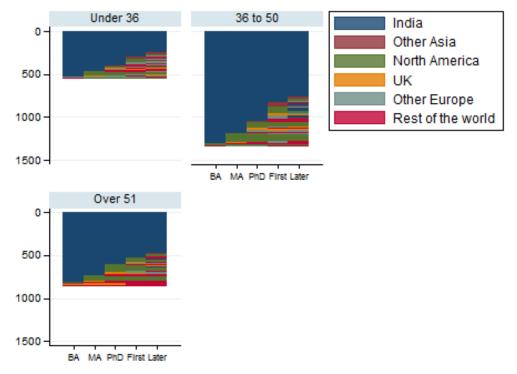Note: Only Indian-born researchers having completed these 5 career steps are included.

The share of those who study abroad increases at the Masters and Doctoral levels, 11 and 23 percent of our sample respectively. While most of those who study abroad end up working abroad (not necessarily in the same country), around 10 percent of our respondents take up a first job outside of India after an all-Indian education. This mobility is less likely to intervene at a later-job stage, though it is not completely absent either (in less than a tenth of the cases, respondents move abroad for their later job after having studied and started their professional career in India). In all, around 40 percent of Indian researchers were abroad for at least one of their major degrees or for a professional experience. In terms of their region of destination, those who study abroad mostly choose North America, with the UK and other European countries claiming a sizeable share at the PhD level. Destinations become more diverse at the level of the first or a later (current) job abroad, particularly so for those who obtained their major degrees from India and moved abroad for the first time for professional reasons.

Table 1 provides more detail on top country of destination at each stage. The Anglo-Saxon destinations US, UK and Canada are by far the major destination for various career stages of Indian academics. Almost 75 percent of our sample completed their PhD in India, while about 17 percent obtained a PhD in these 3 destinations. Other important destinations outside India are in Europe: such as Germany, France, Sweden, Italy, the Netherlands, and Switzerland; or Asia: such as Japan, Singapore, South Korea and Malaysia. This allocation by destination does not change significantly for later employment spells, with some exceptions. For instance, many Indians with a doctorate from an Indian higher education institution, leave their country for a Post-doc position in one of the three Anglo-Saxon destinations. In particular the US and to a lesser extent the UK are attracting a high number of academics with an Indian PhD for Post-doc positions. However, this seems rather temporary as allocation of Indian academics at later career stages resembles more the allocation at PhD levels. On a lower level, highly developed Asian countries such as Japan, South Korea and Singapore are able to increase their share in India-born Post-docs and more senior academics compared to respective shares at PhD level.

**Table 1 Allocation of top 15 PhD destinations and subsequent employment (in percent)**

| Rank | Country | PhD | First job (Post-doc) | Current job |
|------|---------|-----|----------------------|-------------|
| 1 | India | 72.18 | 55.47 | 65.98 |
| 2 | USA | 13.25 | 21.48 | 13.43 |
| 3 | United Kingdom | 2.91 | 4.48 | 3.31 |
| 4 | Canada | 1.03 | 3.20 | 1.71 |
| 5 | Germany | 0.99 | 1.16 | 0.86 |
| 6 | Australia | 0.94 | 1.11 | 1.18 |
| 7 | Japan | 0.39 | 0.81 | 0.46 |
| 8 | France | 0.33 | 0.87 | 0.25 |
| 9 | Sweden | 0.28 | 0.52 | 0.36 |
| 10 | Italy | 0.24 | 0.47 | 0.07 |
| 11 | Singapore | 0.24 | 0.76 | 0.50 |
| 12 | South Korea | 0.22 | 1.40 | 0.71 |
| 13 | Netherlands | 0.22 | 0.47 | 0.29 |
| 14 | Switzerland | 0.18 | 0.29 | 0.25 |
| 15 | Malaysia | 0.12 | 0.47 | 0.82 |

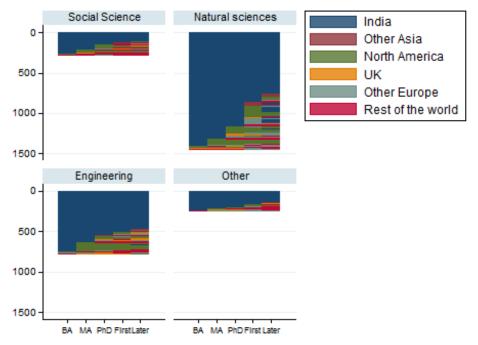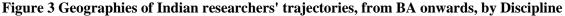**Figure 2 Geographies of Indian researchers' trajectories from BA onwards, by Age-Cohort**



These geographic patterns and the timing of migration seem to have changed over time. If we compare the different generations of Indian academics (Figure 2) the oldest cohorts – researchers who were over 50 at the time of the survey – predominantly chose North America and the UK as study and work destinations, whereas European and Asian countries are much more common destinations for the youngest generation, i.e. those under 36 years at the time of the survey.[6] Furthermore, while very few of the oldest cohort-members moved abroad directly for a professional opportunity without having first studied abroad, this trend became much more frequent in the younger cohorts, i.e. of those under 50 years old. In Figure 2, this is apparent in the much larger increase in those located abroad between the PhD and the first job stages.

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[6] International mobility is underestimated in this cohort since due to the younger age of the respondents.

Figure 3 displays that patterns of international mobility differ greatly by scientific discipline. Those engaged in the social sciences and humanities, who make up only a small share of our population, appear much more likely to move abroad for their studies, and especially at the doctoral level (around 44 percent), than other disciplines. In comparison, less than a fifth of those in natural sciences (as well as mathematics or computer science) go abroad for their Masters or PhD degrees. Instead, a much larger share of the latter moves directly for a first job abroad, followed, in many cases, by a return to India. Those in engineering fall somewhere in between, as their likelihood to study abroad is higher than for the natural scientists, but they are less likely to work abroad as academics, especially if they haven't first studied abroad.

**Figure 3 Geographies of Indian researchers' trajectories, from BA onwards, by Discipline**



There are other aspects of researchers' background that appear to shape the level of international mobility they experience, the timing of the moves in their trajectories, and the destination chosen. Figure 4 illustrates the influence of fathers' level of education, arguably correlated with their social class. Those researchers whose father has a university-level degree appear much more likely study or work abroad, to move earlier, and to go to the 'traditional' destinations in North America and the UK. These patterns are even more accentuated for those whose fathers have a Masters or PhD level degree compared to those who only have a Bachelor's degree.

Figure 5 compares researchers' trajectories by the self-reported grade or score at the end of high-school national examination,[7] which is a key exam that greatly impacts upon their chances of entering the preferred university. In its turn, this measure is probably also correlated with their social origin (and parental level of education), therefore the findings are not surprising: those who reported having obtained the highest ('excellent') scores at the end of high school are also those who leave India in greater numbers, who leave earlier and who mostly choose the US and the UK as destinations. In sum, these figures illustrate the prevalence of international mobility among Indian-born researchers, but

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[7] Admittedly, this measure may not be very accurate given, on the one hand, the inevitable retrospective bias involved and, on the other hand, its great regional and temporal variability in the way scores are recorded. To minimize the latter limitation, we offered respondents the possibility of recording their answer by choosing from five different scales (the ones most frequently used in India).

also its path-dependent character. Moving abroad for studies or work at an earlier stage shapes subsequent trajectories and future destinations. However, the figures also show that the observed patterns vary greatly by cohort, by discipline and by researchers' social origin and high-school performance.
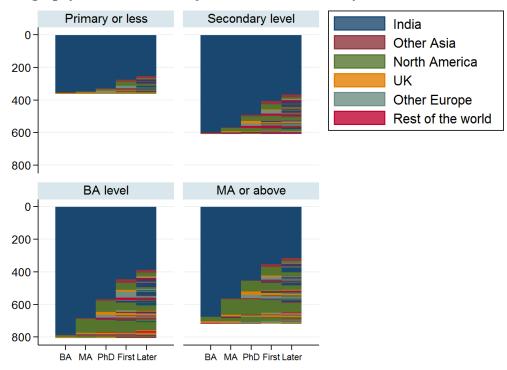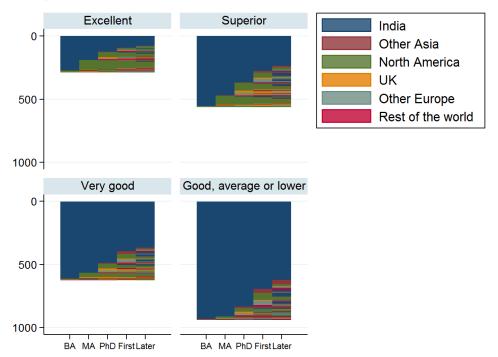
**Figure 4 Geography of researcher's trajectories (BA onwards) by Father's level of education**



**Figure 5 Geography of researchers' trajectories (BA onwards) by High-School Exam Scores**

## 4.3  Drivers and dynamics of international academic mobility

The previous descriptive analysis of career trajectories revealed some path-dependent patterns in individual career trajectories of India-born academics. The following analysis will explore these path-dependencies more systematically also by assessing their importance in comparison to other drivers of international academic mobility. Table 2 displays logit estimates (marginal effects) of the probability to move abroad at the five different stages of an academic career that were also considered in the previous section. Besides the role of previous international career steps (i.e. BA, MA, PhD degrees and First job, respectively), we test various individual-specific factors such as disciplinary background, age, gender, parents' educational background and place of birth in addition to our assessment of path-dependency in international career trajectories.

By comparing marginal effects of disciplinary backgrounds on the probability for international academic mobility across all five career steps (models 1–8), we find that social scientists (reference category) tend to move abroad much earlier than natural scientists who on average move internationally to a larger extent than social scientists only after having acquired their PhD for seeking a Post-doc position abroad. But also for later positions after the Post-doc years, social scientists have a higher probability of moving or staying abroad than colleagues in the so-called 'hard sciences'. We also identify some cohort effects which show that international mobility at various stages of an academic career has become more common than it used to be for earlier periods. This trend however, is more salient for international academic employment where younger cohorts (below 36 years old) have an about 5 to 10 percent higher probability of working abroad than older cohorts. For the study years, the effects across cohorts are rather mixed. For instance, older cohorts (aged 51 and above) had a slightly higher probability of doing the bachelor's degree or a PhD abroad than younger cohorts. This implies that younger cohorts of India-born academics seem to move abroad slightly later than older colleagues used to do.

The gender composition of our sample (25 percent female) reflects the well-established fact that females are generally underrepresented in academia, and particularly in the hard sciences (75 percent of our sample). Interestingly, female academics are even more underrepresented in international mobility at various stages of their academic career. While female and male academics have similar propensities for starting their academic trajectory with an international BA, male academics have a significantly higher probability of seeking both graduate education and Post-doc position abroad compared to their female colleagues. Only at later stages of academic employment, i.e. after Post-doc, does the gender bias in international academic mobility again disappear.

We further explore the influence of parent's educational background and social class on academic career trajectories by distinguishing four educational levels (primary, secondary, BA, MA or above) for each parent, as reported by our respondents. We find that parents' educational attainments are only an influencing factor in study decisions. They do not significantly influence decisions regarding academic employment, once the degree location is taken into account. Interestingly, the decision to go abroad for an international degree at Master or PhD level is more influenced by a tertiary education of the mother than the father; whereas international mobility at an undergraduate level is more likely if fathers are tertiary educated. Estimates of the place-of-birth variable show that academics who grew up in rather remote rural areas have a lower probability to integrate international spells in their career. This negative effect exists for all career stages but is only statistically significant at educational stages.

**Table 2 Drivers of academic career steps and the role of path-dependency (marginal effects after logit)**

| DV: Degree/Job [Abroad] | (1)<br>BA | (2)<br>BA | (3)<br>MA | (4)<br>PhD | (5)<br>First job | (6)<br>First job | (7)<br>Later job | (8)<br>Later job |
|---|---|---|---|---|---|---|---|---|
| FIRST job [Abroad] | | | | | | | 0.244**<br>(0.021) | 0.243**<br>(0.022) |
| PHD degree [Abroad] | | | | | 0.538**<br>(0.018) | 0.499**<br>(0.022) | 0.215**<br>(0.025) | 0.176**<br>(0.027) |
| MA degree [Abroad] | | | | 0.637**<br>(0.030) | | 0.153**<br>(0.035) | | 0.091**<br>(0.032) |
| BA degree [Abroad] | | | 0.358**<br>(0.052) | | | | | 0.062<br>(0.064) |
| End high-school exam scores [1-7(=top)] | | 0.009**<br>(0.002) | 0.050**<br>(0.004) | 0.045**<br>(0.005) | 0.030**<br>(0.005) | 0.029**<br>(0.005) | 0.015*<br>(0.007) | 0.011<br>(0.007) |
| School graduation [Abroad] | 0.426**<br>(0.049) | | | | | | | |
| Discipline [Science] | -0.001<br>(0.006) | 0.005<br>(0.005) | -0.086**<br>(0.016) | -0.083**<br>(0.019) | 0.119**<br>(0.017) | 0.122**<br>(0.017) | -0.068*<br>(0.027) | -0.065*<br>(0.027) |
| Discipline [Engineering] | -0.015+<br>(0.008) | -0.003<br>(0.007) | -0.005<br>(0.013) | -0.054**<br>(0.018) | -0.034<br>(0.023) | -0.040+<br>(0.024) | -0.073**<br>(0.028) | -0.080**<br>(0.029) |
| Discipline [Other] | -0.044**<br>(0.014) | -0.015<br>(0.012) | -0.052*<br>(0.020) | -0.092**<br>(0.024) | 0.064*<br>(0.028) | 0.065*<br>(0.029) | -0.046<br>(0.035) | -0.043<br>(0.036) |
| Age [36-51] | 0.003<br>(0.005) | 0.000<br>(0.005) | -0.025*<br>(0.010) | -0.033*<br>(0.013) | -0.100**<br>(0.015) | -0.100**<br>(0.015) | -0.083**<br>(0.022) | -0.073**<br>(0.023) |
| Age [>51] | 0.012*<br>(0.005) | 0.009*<br>(0.004) | -0.006<br>(0.011) | 0.022+<br>(0.012) | -0.092**<br>(0.017) | -0.096**<br>(0.017) | -0.055*<br>(0.024) | -0.053*<br>(0.024) |
| Gender [Female] | -0.003<br>(0.005) | -0.003<br>(0.005) | -0.072**<br>(0.012) | -0.066**<br>(0.013) | -0.043**<br>(0.015) | -0.040**<br>(0.016) | -0.022<br>(0.021) | -0.016<br>(0.021) |
| Education [Mother; 1-4] | 0.002<br>(0.002) | 0.000<br>(0.002) | 0.028**<br>(0.005) | 0.017**<br>(0.006) | 0.009<br>(0.007) | 0.003<br>(0.008) | -0.005<br>(0.010) | -0.006<br>(0.010) |
| Education [Father; 1-4] | 0.008*<br>(0.003) | 0.006*<br>(0.003) | 0.013*<br>(0.006) | 0.014*<br>(0.006) | -0.005<br>(0.007) | -0.004<br>(0.007) | 0.005<br>(0.010) | 0.003<br>(0.010) |
| Place of birth [Rural] | -0.011*<br>(0.005) | -0.005<br>(0.005) | -0.065**<br>(0.010) | -0.033**<br>(0.011) | -0.014<br>(0.013) | -0.011<br>(0.013) | -0.028<br>(0.018) | -0.021<br>(0.018) |
| Observations | 4,403 | 4,231 | 4,125 | 4,132 | 4,133 | 4,021 | 2,345 | 2,266 |
| Pseudo-R2 | 0.27 | 0.08 | 0.25 | 0.34 | 0.30 | 0.30 | 0.27 | 0.27 |
| chi2 | 308.14 | 48.02 | 481.25 | 590.65 | 960.88 | 887.25 | 582.84 | 546.86 |
| Log-likelihood | -430.35 | -359.58 | -991.12 | -1386.56 | -1847.72 | -1788.54 | -1058.14 | -1007.85 |

SE in parentheses: ** p<0.01, * p<0.05, + p<0.1. Reference categories: School graduation [India], Discipline [Social Sciences], Age [<36], Gender [Male], Place of birth [Urban]

Evidence on the relative importance of parents' education on offspring's educational attainment is well-established in the literature (Duncan and Duncan 1968; Bourdieu and Passeron 1964). This study, however, brings fresh evidence that more educated parents increases one's chances of engaging in an international academic career: first, by directly increasing the likelihood of studying abroad, then, by indirectly raising the chances of staying abroad for an academic employment. However, while parents' education seems still to matter at later career stages, the relevance of this 'inter-generational' path-dependency is relatively minor compared to earlier academic career stages, as estimates of educational career steps show.

Models 1 and 2 report estimates of the probability of moving internationally to acquire a BA. The marginal effect of having graduated from high-school outside India, despite being born in India, increases significantly the probability (by 43 percent) of staying abroad for the undergraduate study. For those who graduated at an Indian high-school (models two to eight), the self-reported scores obtained at the end of high-school national examination seem to matter in predicting future international study mobility. Top students with excellent marks have about three percentage points higher probability of moving abroad for a BA than those with 'only' good marks. School performance seem to matter even more for seeking advanced international degrees on a Master or PhD level. Here, excellent marks at high-school baccalaureates predict a 15 to 20 percentage points higher probability to pursue an international degree than students with only good results. Interestingly, school marks remain an early indicator for later international mobility for academic employment, even though to a lesser extent.

These 'early signs' of an international academic career are reinforced by later educational steps such as an international Masters or PhD. Model 3 for instance shows that a previous international BA degree increases the probability of staying abroad for a Master's degree by about 36 percent compared to students without previous international experience. This effect of a previous international degree on the probability of a later international mobility is even stronger at the PhD level. Students who have obtained their Master's degree abroad have a 64 percentage point higher chance of doing also their PhD abroad (model 4). This high probability can partly be explained by the fact that Master programmes are often integrated or the first step in a PhD programme. When it comes to international academic employment, students with an international PhD have about 54 percentage points higher probability of staying abroad for their first job, which is usually a researcher or Post-doc position. Model 6 includes not only the previous PhD but also the Master degree as predictors of seeking the first job outside India. Including the Master's stage diminishes only marginally the predictive power of an international PhD, whereas an international Master's degree adds another 15 percent probability in predicting first academic employment abroad. This suggests that later career steps are still driven by international experience at early career stages, and that there is a *cumulative* effect of previous mobility experiences. Models 7 and 8 estimate the probability of international employment at the time of the survey, if that employment is different than their first job[8]. This employment may be more or less senior depending on the age of the respondent, which is controlled for. Interestingly, the decision to seek international employment at later stages of an academic career is still significantly driven by the location of their PhD degree, but to a lesser extent than the first employment. An international PhD increases the probability of being currently employed outside of India by 18 to 22 percentage points, which is only slightly lower than the marginal effects of an international Post-doc. Model 8 estimates the effect of all career stages for which we have data on current employment location, and finds an almost linear decrease in the effect of previous international experiences on a later academic position, with earlier experiences being less influential than later ones. While an international first academic employment

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[8] Only a part of our respondents had two or more jobs after their highest degree, which explains the decrease in sample sizes between Model 6 and 7.

increases the probability to work abroad at the time of the survey with about 24 percent, an international PhD only contributes about 18 percent, while an international Master's adds another 9 percent and an international Bachelor's contributes only an insignificant 6 percent. Interestingly, end of high-school scores no longer matter. These results suggest a strong element of *recent path-dependency*, in which earlier stages in international academic career trajectories lose in importance but are still relevant.

Results reported in Table 3, based on the same core model as the specifications in Table 2, further explore the role of the previous two career steps on the probability of moving abroad for a PhD (Model 1), the first job (Model 2), and a later academic employment (Model 3), by focusing on the sequencing of international experience stages. Estimates on Model 1 show that the probability of moving or staying abroad for pursuing a PhD is significantly higher if either a BA or a MA degree were attained abroad. If both degrees were acquired abroad then with near certainty also the PhD is pursued abroad. However, in case only one degree prior a PhD is done abroad then an international MA has a slightly higher predictive power in explaining international mobility for a PhD degree.

**Table 3 Path-dependency in Individual Career Trajectories (marginal effects after logit)**

| DV: Degree/Job [Abroad] | (1) PhD abroad | (2) First job abroad | (3) Later job abroad |
|---|---|---|---|
| *Ref: BA[India] & MA[India]* | | | |
| BA[abroad] & MA[abroad] | . (^) | | |
| | | | |
| BA[India] & MA[abroad] | 0.626** | | |
| | (0.032) | | |
| BA[abroad] & MA[India] | 0.509** | | |
| | (0.089) | | |
| | | | |
| *Ref: MA[India] & PhD[India]* | | | |
| MA[abroad] & PhD[abroad] | | 0.629** | |
| | | (0.017) | |
| MA[India] & PhD[abroad] | | 0.498** | |
| | | (0.020) | |
| MA[abroad] & PhD[India] | | -0.019 | |
| | | (0.077) | |
| | | | |
| *Ref: PhD[India] & FIRST job[India]* | | | |
| PhD[abroad] & FIRST job[abroad] | | | 0.507** |
| | | | (0.025) |
| PhD[abroad] & FIRST job[India] | | | 0.088+ |
| | | | (0.050) |
| PhD[India] & FIRST job[abroad] | | | 0.237** |
| | | | (0.023) |
| Other controls | yes | yes | yes |
| Observations | 4,039 | 4,008 | 2,266 |
| Pseudo-R2 | 0.34 | 0.30 | 0.26 |
| chi2 | 598.87 | 851.14 | 550.14 |
| Log-likelihood | -1350.08 | -1781.00 | -1008.91 |

Note: Standard errors in parentheses: ** p<0.01, * p<0.05, + p<0.1. All models include other controls on Discipline, Age, Gender, and Place of birth. (^) Alternative 'BA [abroad] & MA[abroad]' has been omitted due to near perfect prediction of PhD abroad.

Model 2 displays that the probability of staying abroad for the first academic job after an international Master *and* PhD is 63 percentage points higher than if both degrees were obtained in India. An international PhD is hereby far more important in explaining first international employment than having obtained only the Master degree abroad. Students who have only done their PhD abroad but not the Masters have a probability for first international employment which is 50 percentage points higher

(i.e. about 13 percentage points lower than in the case were both degrees were obtained abroad) than those who did none of these degrees abroad. Interestingly enough, if Indian students return after their international Master for a 'domestic' PhD, the probability of moving abroad again is not significantly different from the case were all degrees were done in India. That is, pursuing a PhD back home absorbs the value of international experience gained by an international MA and diminishes prospects for future international employment. On the other hand, it may also reflect strong personal preference attached to living in India and therefore a decision to return permanently.

A similar pattern in the sequencing of international spells exists for later employment outside India. The strongest effect on the likelihood to seek international academic employment at later stages of the academic career is highest if both the PhD and Post-doc were done abroad. This trajectory predicts an about 50 percentage points higher probability for a later job abroad than if both previous career steps were located in India. If only one of the two career stages were done abroad, then the international Post-doc has a significantly higher predictive power for pursuing later academic employment than in the case where an academic returns home after having obtained the PhD degree abroad. These results show that the strongest predictor for the location of the next step in an international academic career is the status quo location. However, earlier career stages also matter which result in path-dependent academic career trajectories. This implies that academics without any current or previous international experience are also less likely to move abroad at a later stage. International academic careers start early and the longer academics stay abroad the less likely becomes their return. If academics return after a certain period abroad, future (re-) migration for employment is unlikely.

We have not yet differentiated between international destinations. Table 4 displays marginal effects of previous career steps (degrees) on the probability of staying in India or moving to a certain destination for a PhD (Panel A); their first academic job (Panel B); and later academic employment (Panel C). We run this multinomial logit regression twice, first without differentiating between the place of the previous career step; then by distinguishing between the three major Anglo-Saxon destinations (US, Canada and the UK) and other international destinations outside India (Rest of World).

Estimates on the role of an international MA degree on the destination choice for a PhD (Panel A) shows that the probability of pursuing a PhD at an Indian institution after an international MA is significantly lower than choosing an international PhD, no matter where the MA was obtained outside India (1a-6a). On the other hand, international experience at the Master's level significantly increases the probability of pursuing a PhD at a North American institution (model 1c). However, it would be an illusion to believe that *any* international MA would increase chances for a North American PhD. Master degrees acquired at North American or British universities increase the average probability of a PhD at a North American institution by 62 percentage points compared to a Master degree from an Indian university, whereas a Master degrees from other universities outside India do not significantly increase chances to obtain a North American PhD (model 3b). British doctoral programmes, on the other hand, seem to be able and willing to attract not only Master degree holders from North American universities, but also from other universities outside India. Thus, there appears to be a strong path-dependency in the entrance of North-American PhD programmes, where a Master degree from an Anglo-Saxon university seems essential. In comparison, British doctoral programmes seem to recruit more widely. This pattern seems to reflect, at least partially, tighter selection processes of North American and, to a lesser extent, British universities. Top students with excellent school marks have a significantly higher probability of selecting or being selected by a North American or British university for their PhD than students with only average grades. Selection patterns of universities in other countries outside India seems not significantly different from Indian institutions in terms of students' school performance.

**Table 4 Path-dependency in destination choice of career trajectories (marginal effects after multinomial logit)**

| | (1a) India | (2a) Other Asia | (3a) North America | (4a) UK | (5a) Other Europe | (6a) Rest of World | (1b) India | (2b) Other Asia | (3b) North America | (4b) UK | (5b) Other Europe | (6b) Rest of World |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | PANEL A: Place of PhD | | | | | | |
| MA [abroad] | -0.377*** | 0.022*** | 0.230*** | 0.042*** | 0.058*** | 0.026*** | | | | | | |
| | (0.019) | (0.006) | (0.011) | (0.006) | (0.007) | (0.004) | | | | | | |
| MA [US \| CAN \| UK] | | | | | | | -0.681*** | -0.015*** | 0.616*** | 0.048** | 0.010 | 0.021 |
| | | | | | | | (0.033) | (0.002) | (0.035) | (0.017) | (0.014) | (0.013) |
| MA [RoW] | | | | | | | -0.683*** | 0.087* | 0.008 | 0.083* | 0.335*** | 0.171*** |
| | | | | | | | (0.059) | (0.041) | (0.032) | (0.039) | (0.061) | (0.052) |
| School grad marks [1-7] | -0.046*** | -0.000 | 0.039*** | 0.006*** | 0.000 | 0.000 | -0.045*** | -0.000 | 0.035*** | 0.007*** | 0.002 | 0.001 |
| | (0.005) | (0.002) | (0.004) | (0.002) | (0.002) | (0.002) | (0.005) | (0.002) | (0.004) | (0.002) | (0.002) | (0.002) |
| | | | | | | PANEL B: Place of First job | | | | | | |
| PhD [abroad] | -0.456*** | 0.051*** | 0.283*** | 0.039*** | 0.052*** | 0.030*** | | | | | | |
| | (0.015) | (0.008) | (0.012) | (0.007) | (0.008) | (0.006) | | | | | | |
| PhD [US \| CAN \| UK] | | | | | | | -0.656*** | -0.005 | 0.586*** | 0.077*** | -0.011 | 0.009 |
| | | | | | | | (0.021) | (0.011) | (0.028) | (0.018) | (0.010) | (0.009) |
| PhD [RoW] | | | | | | | -0.610*** | 0.140*** | 0.097** | 0.017 | 0.193*** | 0.162*** |
| | | | | | | | (0.036) | (0.034) | (0.036) | (0.015) | (0.037) | (0.035) |
| School grad marks [1-7] | -0.038*** | 0.001 | 0.026*** | 0.001 | 0.012** | -0.002 | -0.038*** | 0.003 | 0.018** | 0.000 | 0.016*** | 0.000 |
| | (0.006) | (0.003) | (0.006) | (0.003) | (0.004) | (0.003) | (0.006) | (0.003) | (0.006) | (0.003) | (0.004) | (0.003) |
| | | | | | | PANEL C: Place of Later job | | | | | | |
| First job [abroad] | -0.342*** | 0.031*** | 0.234*** | 0.032*** | 0.024*** | 0.021*** | | | | | | |
| | (0.011) | (0.008) | (0.015) | (0.008) | (0.007) | (0.006) | | | | | | |
| First job [US \| CAN \| UK] | | | | | | | -0.511*** | -0.001 | 0.437*** | 0.058*** | 0.015 | 0.002 |
| | | | | | | | (0.025) | (0.011) | (0.025) | (0.012) | (0.008) | (0.006) |
| First job [RoW] | | | | | | | -0.395*** | 0.112*** | 0.051** | 0.026* | 0.089*** | 0.116*** |
| | | | | | | | (0.031) | (0.021) | (0.019) | (0.011) | (0.019) | (0.022) |
| School grad marks [1-7] | -0.029*** | -0.008* | 0.030*** | 0.004 | 0.001 | 0.002 | -0.019** | -0.007 | 0.019** | 0.003 | 0.001 | 0.002 |
| | (0.007) | (0.004) | (0.006) | (0.003) | (0.003) | (0.002) | (0.007) | (0.004) | (0.006) | (0.003) | (0.003) | (0.002) |

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. All panels include other controls on Discipline, Age, Gender, and Place of birth. Full tables are available on request.

Interestingly, a similar geographical path-dependency exists also for academic mobility at the Post-doc level (Panel B). Holders of a North American PhD have a 59 percentage points higher chance of staying for their Post-doc years in the North American market than PhD holders from an Indian institution. This difference in average probability is significantly smaller (only 8 percentage points) for academics who have obtained their PhD from a British university. What is true for the PhD level holds also for the Post-doc level: academics hardly return back to India after they have obtain their PhD abroad. Instead, they seem to stay where they have obtained their PhD. Interesting though is that the North American academic job market seems to be more open at the Post-doc level than at the PhD level for graduates with degrees from non-North American or British universities.

For more senior level academic jobs, mobility patterns seem to become more diverse, or less path-dependent. Diversification of academic career trajectories after, for instance a North American Post-doc, is still very limited. The probability of Indian academics, who have done their Post-doc in North America or the UK, to continue their academic career at another institution outside this Anglo-Saxon scientific core is not significantly different from returning back to India. In fact, return to India seems much more likely after a Post-doc than after the PhD, although return after a Post-doc in North American or the UK is less likely than returning home from another higher education or research institution outside India.

Interestingly, our results show that it is not only the academics with the best school grades who choose or are chosen to spend their early academic career in North America (and Britain), but it is the brightest students who stay long-term in North America. For all other destinations outside India, school marks cannot by identified as relevant indicators of future academic career mobility.

In summary, our results so far have shown some evidence of a temporal and geographical path-dependency in academic career and mobility trajectories. Academics seem to select into international careers at a very early stage of their education and follow these paths throughout their careers. We have identified some predictors of this selection into international careers such as the educational background of the parents, the high-school performance, or the socio-demographic background. Under certain circumstances, however, an academic path-dependency can be 'broken' or moderated.

## 4.4 'Breaking the path': contextualising path-dependency

This last section examines the conditions under which the strong weight of previous career locations on future ones is moderated. We investigate this by introducing interaction terms between some of our controls and the previous career step.

**Path-dependency variations across disciplines**

As the descriptive sequence analyses have also shown, there are important differences between the disciplines in the extent to which it is possible to move for a first academic employment abroad without an international degree. We examine this by extending Model 5 (Table 2), which estimates the likelihood of taking up a first academic employment outside India, and adding an interaction term between respondents' discipline and whether the PhD degree was obtained within or outside India. Figure 6 displays estimates of these interaction terms, which show that there is no significant difference by discipline in the probability to work abroad for those who have a PhD from abroad. Among those who obtained their PhD degree from India, however, those in the natural sciences, and to a lower extent those in other disciplines, have a substantially higher chance to work abroad than those in SSH or in engineering.
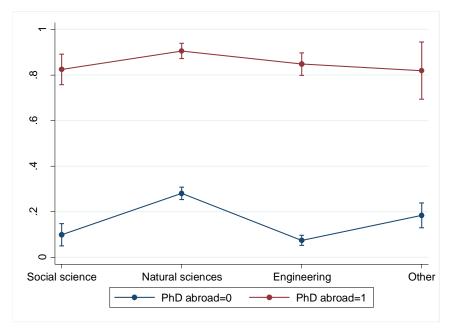
**Figure 6 First job abroad: Predictive margins of academic discipline and PhD location**



In other words, while far from absent, the observed path-dependency at the stage of first employment is lower within the natural sciences. We can relate this to recent changes in the higher education landscape in India, as opportunities to do a PhD in hard sciences at a good institution in India have increased, whereas the same cannot be said regarding doctoral programmes in the social sciences. On the other hand, as discussed above, international experience is highly valued by prestigious Indian institutions when they recruit their academic staff, which creates a strong incentive for those with Indian PhDs to do also a Post-doc abroad. These findings are closely echoed in our qualitative interviews with physicists, chemists, mathematicians and other scientists who preferred to stay in India for their PhD in prestigious institutions such as the IITs, but felt it necessary for their career progression in India to obtain some international exposure. This most often took the form of a three or four year Post-doc – no longer since presumably detrimental to a successful reintegration – preferably in an Anglo-Saxon country such as the US, the UK or Canada. Thus, PhD graduates in hard sciences from India have both a relatively higher-valued PhD degree on the international job market and a strong incentive to look for a first job (post doc) abroad. This difference in the structure of constraints and opportunities may explain their different geographical mobility paths compared to their peers in the SSH. The case of engineering PhD graduates is slightly puzzling as we expected them to experience a similar structure of incentives as those in natural sciences; instead, their migration chances in the absence of a PhD abroad resemble more those of the social scientists.
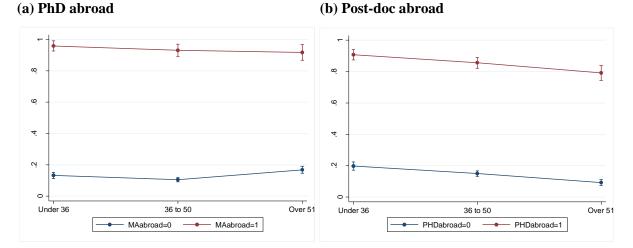
Conversely, those in the natural sciences have the lowest likelihood to be employed abroad at later career stages if their first employment was abroad. In other words, compared to other disciplines, they are the most likely to return to India after a Post-doctoral job outside, followed by those in engineering and the other disciplines. The probability to remain abroad is significantly higher for the social scientists, which, again, presumably reflects the lower employment opportunities in these fields back in India.

## Path–dependency varies over time and across generations

The importance of previous career steps has also changed over time, as Figure 7 illustrates. The younger cohorts (and particularly those between 36 and 50 years old) were significantly, though not substantially less likely to study abroad for their PhD in the absence of an international Masters' degree than the

oldest cohort (over 51 years old). In contrast, the probability to remain abroad for the PhD once you have an MA degree from outside India does not appear to have changed over time. The transition from PhD to the first academic employment experienced a different evolution: among both foreign and Indian PhD graduates, the likelihood to go abroad for a Post-doc has increased among the younger generations, presumably reflecting the increased pressure to have some international work exposure.

**Figure 7 PhD & Post-doc abroad: Predictive margins of age group and MA/PhD location**

**(a) PhD abroad**

**(b) Post-doc abroad**



## Individual ability, a useful resource for breaking into international career paths

Another factor potentially moderating the geographic path-dependency is individual ability or performance. We may expect outstanding students or researchers to be more likely to 'break the path', and move abroad for study or work even in the absence of a previous international degree. Individual performance is, on the other hand, difficult to measure in an online survey, especially in a retrospective manner. In our survey, we have chosen to focus on an early measure of performance, the scores obtained at the end of high-school national examination, which has the advantage of pre-dating all career transitions that are of interest in our analysis. While playing an important part in university applications, these scores are also a measure of individual ability more generally, and are therefore likely to be correlated with other academic performance indicators.
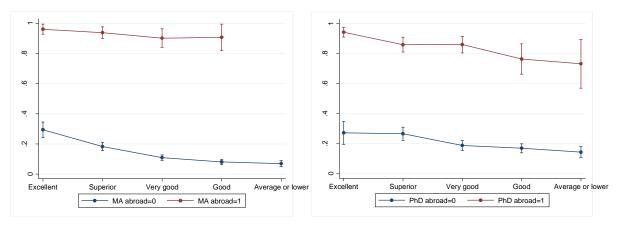
Figure 8a and 8b examine this issue by adding interaction terms between exam scores and the location of the previous degree when estimating the likelihood to study abroad for a PhD (Figure 8a) and the likelihood to take up a first academic employment abroad (Figure 8b). As Figure 8a illustrates, the end of high-school exam scores do not influence the probability to study abroad for a PhD for those with an MA degree from outside India. On the other hand, these scores are significantly and quite substantially shaping the propensity to do one's PhD abroad for students who obtained their MA degree from India. Far from entirely compensating for the lack of an international MA degree, excellent scores significantly increase the chances of a student with an Indian MA degree to move abroad for his or her PhD. It is interesting to read this finding the other way around as well: acquiring a MA from abroad entirely makes up for relatively poor exam scores at the end of high-school, which no longer shape the chances of getting into an international doctoral programme.

End of high-school exam scores continue to shape the probability to take up a first academic employment abroad, but in a similar way for both PhD graduates from abroad and from India, as Figure 8b illustrates. However, their effect is overall smaller and not always significant.

**Figure 8 PhD abroad vs Post-doc abroad: Predictive margins of school performance and previous location**

**(a) PhD abroad**

**(b) Post-doc abroad**



## Social origin, a limited influence

We may further expect that individuals coming from more privileged class backgrounds will be more likely to overcome the disadvantage of lacking an international degree by compensating with other resources (cultural or financial capital). We find only slight evidence in this direction: students with an Indian MA whose mother has a university degree are significantly more likely to go abroad for their PhD than students whose mother has only a primary level education or less (Figure 9). However, the difference in probabilities is minor.
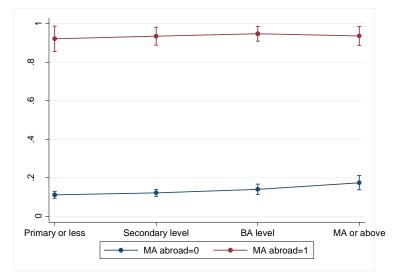
**Figure 9 PhD abroad: Predictive margins of MA degree and education of mother**



Social origin does not affect probabilities of joining a foreign PhD programme for those who already have a foreign MA degree. Similar findings are reached when taking into account the father's education. Parental education has no significant effect on later transitions, from a PhD to a first employment, or from the first to the later employment. Thus, it seems that the main advantage of those coming from privileged backgrounds in terms of parental education is that they start their international "career" early, by pursuing a degree outside of India, which places them on the right path for working abroad as an academic. Additionally, a privileged social origin may slightly compensate for a delayed start, and offer a small extra help to catch up with the early movers up to the PhD level.
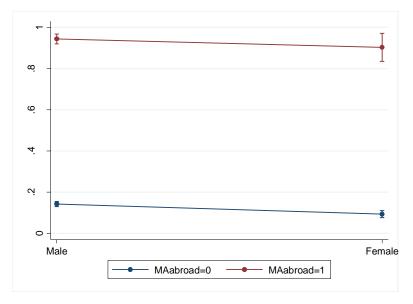
**Figure 10 PhD Abroad: Predictive margins of gender and MA degree location**



## Gender, a slight disadvantage only for the first departure

Finally, we examined whether men and women have different chances of 'breaking the path'. Indeed, we find a slight and significant disadvantage of women compared to men in their likelihood to take up a PhD abroad when they don't already have an MA abroad. In contrast, no significant gender difference is found when both hold an MA from a non-Indian institution (Figure 10). The same results are found with respect to later transitions: to a first academic employment or a later job. Thus, we find that females experience an initial disadvantage making their first international move (either for study or for work), but once abroad they have the same probability as men of staying abroad for their next career stage.

# 5 Conclusion

Most of the literature to date has examined international student mobility and the migration of researchers or academics separately. Our paper illustrates the importance of studying student and (professional) academic mobility at the same time: working as an academic in another country is to a very large extent explained by the fact of having studied abroad, most often in the same country. Student and professional mobility among researchers and academics are thus inextricably linked as academic careers are highly path-dependent in geographic terms.

This study finds the following patterns: international academic careers start early and usually follow a certain geographical trajectory for multiple careers steps (including degrees). This usually implies that early study decisions drive the later academic career trajectory. North American or British universities are highly selective in admitting students, which is also reflected in our survey in which academics with the best high-school grades decided and had the opportunity to study in these countries. While only very few academics who were able to enter the North American academic market, moved to other destinations or even returned after their PhD or first job experience, British universities are more of an 'academic stepping stone' from where graduates or Post-docs continued their career either in North America or moved to other destinations either in Europe or prime institutions in Asia such as Singapore, Japan, Hong Kong, or some newly established institutions in the Gulf. Return to India seems more likely if graduates or academics moved to other destinations outside these Anglo-Saxon academic core countries as those 'second tier' destinations often offer less opportunities for high-quality research and may establish larger cultural or linguistic barriers compared to the English-speaking countries.

The concept of path-dependency seems appropriate for describing academic career trajectories as our analysis showed that international academic mobility becomes very unlikely if Indian academics missed the chance to gain some early study experience abroad. However, under certain circumstances, academics are able to break this path-dependency. Individual ability, which we attempted to measure through the scores obtained at the end of high-school national examination, is one such factor moderating the weight of prior mobility choices. Excellent scores compensate, to some extent, for the huge disadvantage represented by the lack of a foreign MA degree in the likelihood to do one's PhD abroad; similar results were found for later transitions. In contrast, parents' tertiary educational background increase only a marginally the probability to acquire a PhD abroad if all previous studies were done in India, thus reducing a bit the 'PhD abroad gap' with those who hold an MA from outside India. The benefit of coming from a privileged background lies rather in the opportunity to have a head start on the international academic path, as parents' education has a significant impact on the likelihood to move abroad at the early stages of the career trajectory - for an undergraduate or a Masters' degree.

Furthermore, we find geographic path-dependency to be highly contextual. First, changes in the Indian higher education system are probably responsible for shifts in international mobility patterns between generations. In particular, younger generations of academics – those currently under 50, and even more those under 36 – have less 'deterministic' trajectories with a greater geographic diversification of destinations. Among older cohorts of academics, only very few have moved abroad for the first time for employment reasons. In contrast, a substantial share of those under 50 years old finish their entire education in India and move abroad for the first time to take up a first academic employment mostly at Post-doc level; and a sizeable proportion of them subsequently returns to India. We argue that this more recent pattern of mobility, where geographic path-dependency plays a smaller role, is due to larger opportunities for obtaining a high-quality PhD in India. This is coupled with an increasing emphasis on international experience as a 'sine qua non' for a getting good academic position in India, which has shaped these new and less path-dependent dynamics in international academic mobility of Indian students and academics.

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# Appendix

**Table A1 Descriptive statistics of variables for Indian-born researchers with a PhD degree**

| Variable | N | % |
|---|---|---|
| **International mobility** | | |
| All-India (major career steps) | 2835 | 61% |
| Currently abroad | 1236 | 27% |
| Returned | 517 | 12% |
| **Career stages and locations** | | |
| Obtained BA degree abroad | 136 | 3% |
| Obtained MA degree abroad | 487 | 11% |
| Obtained PhD degree abroad | 1048 | 23% |
| First job after PhD abroad | 1,393 | 32% |
| Current job (if different than first) abroad | 808 | 32% |
| **Discipline** | | |
| Social Sciences | 452 | 10% |
| Natural sciences, math, stats | 2416 | 53% |
| Engineering | 1259 | 27% |
| Other | 454 | 10% |
| **Gender** | | |
| Women | 993 | 22% |
| Men | 3536 | 78% |
| **Age-cohort** | | |
| Under 36 years | 1299 | 29% |
| 37 to 50 years | 2026 | 44% |
| 51 years or above | 1247 | 27% |
| **Mother's education** | | |
| Primary education or less | 1824 | 40% |
| Secondary education | 1297 | 29% |
| BA level | 861 | 19% |
| MA or above | 557 | 12% |
| **Father's education** | | |
| Primary education or less | 727 | 16% |
| Secondary education | 1087 | 24% |
| BA level | 1462 | 32% |
| MA or above | 1268 | 28% |
| **End of high-school exam scores** | | |
| Over 91%/ Excellent | 785 | 13% |
| 81%-90%/ Superior | 1,478 | 24% |
| 71%-80%/ Very good | 1,667 | 27% |
| 61%-70%/ Good | 1,451 | 23% |
| 51%-60%/ Satisfactory | 664 | 11% |
| 41%-50%/ Average | 115 | 2% |
| 33%-40%/ Pass | 9 | 0.1% |
| Fail | 7 | 0.1% |