

Moving People and Knowledge: The Mobility of Scientists within the European Union

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Abstract

Drawing on the findings of recently completed studies², this paper is concerned to develop our understanding of the processes shaping the mobility of highly skilled scientists and the impact of this form of mobility on the regions and individuals concerned. In order to achieve this we first need to conceptualise the phenomenon and then to develop appropriate operational tools. The term 'highly skilled migration' involves two key concepts; the concept of skill (or knowledge) and the concept of migration. Salt defines a highly skilled migrant as someone possessing a 'tertiary level education or its equivalent in experience' (1997, p5). This definition masks considerable diversity in the processes and conditions shaping the mobility of skilled people in different employment sectors. Drawing on Salt's work, Kofman (1997) points to the heterogeneous nature of the population of highly skilled migrants and distinguishes twelve categories including corporate transferees, professionals, consultants, entertainers, business people, academics, researchers and students, and finally the spouses and children of these categories. Our own research focuses on the specific situation of academic/scientific mobility. Focusing on this sector enables us to identify more closely the factors shaping the career and migration decision-making processes of this group of people and the context within which they are moving. Analysis of the impact of these forms of mobility demands an understanding not only of who is moving (and the quality of their skills) but also the nature of their migration. This might include consideration of the direction or location of flows, their frequency, duration and permanency and the propensity to return.

Finally, in order to evaluate the impact of these processes on the regions concerned and develop appropriate policy responses, we need to examine the relationship between these two concepts. Put simply, what is the relationship between scientific mobility and the transfer of knowledge?

Drawing on research experience, this paper identifies key contextual factors shaping the processes and consequences of scientific mobility in the European Union. In so doing, it hopes to develop the potential of migration research to conceptualise and evaluate the impact of this phenomenon and to inform policy responses.

From 'Brain Drain' to 'Brain Circulation': Conceptualising Highly Skilled Migration

The language of 'brain drain' entered the migration literature in the 1960s and was focused primarily on the perceived losses of highly skilled workers from Europe (and primarily the UK) to the US which Lowell describes as the 'world's largest skills magnet' (2003, p1). Whilst this concern persists and continues to dominate political debate in the UK, the research and political agenda has shifted somewhat to encompass the flows of highly skilled migration (HSM) from developing regions to the West. Only recently have researchers begun to address the flows of HSM within Europe (Salt, 1997, p5). Notwithstanding clear evidence of 'imbalance', it is fair to say that within even these debates the focus has been on East-West movements with little if any attention paid to intra-European Union flows. Our recent evaluation of the European Commission's scientific mobility programme, the 'Marie Curie fellowship scheme' provides evidence of significant imbalances in the geography of current intra-EU flows (Ackers, 2001). Italy, Spain, France, Germany and Greece constitute the five most important sending countries, contributing more than 75 per cent of applicants under this scheme and the United Kingdom is undoubtedly the most popular destination attracting 36 per cent of applications followed by France (20%) and Germany (10 %). The question is whether such imbalances matter and whether it is meaningful to conceptualise them in terms of 'brain drain' or 'brain gain'?

In recent years, research in the field of HSM has begun to raise serious concerns about the inherently negative connotations of 'brain drain' reflecting an appreciation of the complexity of the phenomenon of highly skilled migration and the limitations of attempts to conceptualise it in such a simplistic manner as a 'zero-sum game'.

Salt describes 'brain drain' in terms of 'net unidirectional flows of HSM' or the 'reverse transfer of technology' (1997,p). According to this definition, 'brain drain' can be said to occur in circumstances

¹ The author would like to thank Bryony Gill and Helen Stalford for their comments on this paper.

² The research reported on here is mainly drawn from a study supported by the ESRC's Science and Society Programme (Mobility and Excellence in Science Labour Markets: the Question of Balanced Growth' Ref:L144250042). This research complements other recently completed and on-going studies of science mobility. Further details of these studies can be found at <http://www.leeds.ac.uk/law/cslpe>

where a direct relationship exists between the flows of human capital (or numbers of people moving) and the transfer of knowledge. Presumably the size of these flows, in proportion to the science base of the regions concerned, is also of importance. Evidence of significant out-flows of scientific talent, un-matched by compensatory inflows or returns such as in the case of Italy, for example, may indicate a net loss of knowledge or scientific expertise to the sending country and potential gain to the recipient[s]. The concept of 'brain circulation' supports a broader approach encouraging us to conceptualise migration in terms of on-going processes rather than single permanent moves but also, importantly, to distinguish the issue of knowledge transfer from the physical presence of the individual migrant (recognising that forms of transfer may take place in other ways).

In common with other writers, Meyer refers to the 'paradigm shift' from 'brain drain' to 'brain circulation' shaping approaches to the theorisation and observation of highly skilled migration patterns with important policy implications;

In the circulation paradigm, the complexity of flows prohibits such simple accounting exercises. Positive aspects of the 'circulation' model include the ways in which the compensation mechanisms, such as scientific cooperation and co-authorship, or the transfer of technology, mitigate its disadvantages (2003 p2).

Meyer suggests that emerging forms of HSM can be characterised differently. Mobility may be temporary with occasional returns, it may be multi-directional instead of unilateral and it may affect developed as well as developing countries or regions. In a similar vein, Regets notes the relative decline in the pre-eminence of the US and the emergence of new potential locations or 'hub' countries; as 'the creation and transfer of knowledge, the emergence of a skilled and educated workforce, and the fostering of commercial ties are shared to some extent by countries on both sides of the 'equation''. (2003, p1). A recent review of skills shortages in UK science labour markets (the Roberts Review, 2002), whilst acknowledging the attractiveness of the UK to foreign scientists, cautions against complacency and refers to the 'elasticity' of flows and their sensitivity to changes in demand and conditions in potential sending and receiving countries.

Certainly the geography of flows is becoming more complex as the status of countries changes and new destinations emerge. Within the EU, Ireland is a good example of a country traditionally characterised as an exporter of highly skilled labour that has transformed into a net importer. A recent report refers to the 'dramatic reversal in Ireland's emigration trends...with emigrants flocking back to Ireland bringing their experience and education with them' (George, 2004). In the context of EU enlargement, Poland is another interesting case with evidence of a general reduction in the intention of the highly skilled to move in response to economic and political stabilisation, improvements in living standards and the growth in foreign research contracts (Salt, 1997 p15). These same processes that might stem the emigration of highly skilled people may also encourage in-migration from other regions. The prospect of European integration will undoubtedly influence the resource framework shaping migration decisions in these regions. The improved opportunities for free movement, and labour mobility generally, which have attracted so much media attention in recent months might, on the one hand, augment flows. Such legal changes will also lubricate return³, however, and make it much easier for people and knowledge to move to and fro over time and space.

The brain circulation 'paradigm' enables us to consider more carefully the potential consequences of HSM and its impact on regions and individuals. There is some danger that this new paradigm which characterises HSM as a 'normal' and indeed desirable process (Meyer, 2003, p.1) might induce complacency, however, and throw a 'gloss' on these processes. Whilst there is little question that the routine exchange of high level skills reflects the healthy operation of labour markets and the transfer of knowledge it is important to address the issue of reciprocity, balance and differential opportunity.

Referring to the Italian context, Pelizon underlines the importance of distinguishing between two separate phenomena, 'the mobility of human resources, that is, those who leave Italy temporarily to broaden their knowledge of research and other cultures and the loss of brains forever; a one-way process that is not balanced by repatriations or by attracting foreign scientists to Italian public institutions' (2002, p.2).⁴ In a similar vein, Paterlini contends that whilst international exchange constitutes the 'lifeblood of research', the failure of Italian scientists to return has led to a 'true state of emergency' in Italian science (2002, p3).

Indeed, other authors identify worrying trends that might reinforce the imbalance in current flows, 'undermining development at home and worsen[ing] inequalities in the global economy' (Abella, 2003 p1). Mahroum thus points to the increasing levels of specialisation at the highly skilled end of labour markets which, coupled with scarcity, and 'imminent demographic decline' will support further the 'global

³ By this I am referring to the impact of legal changes which render such movements legal and dispense with the obstacles associated with work permits. On this basis a worker may return in the knowledge that they will be free to leave again should they wish to.

⁴ Dickson (2003) makes a similar point.

sourcing' of skills. He concludes that, 'Migration is becoming an inseparable segment of national technology and economic development policies ... competition for highly skilled labour will continue to be fierce' (2001, p 27). Others predict 'enormous changes in the magnitude, composition and direction of international migration' (Iredale and Appleyard, 2001, p3), 'aggressive shifts' in policies to recruit highly skilled workers (Lowell, 2003, p2) and a growing 'war over skills' (Iredale, 2001, p21). The impact of these processes on the flows of scientists and transfer of scientific expertise remain to be seen.

Existing conceptualisations of these processes in terms of brain 'drain', 'circulation' or 'stagnation' are clearly limited in their explanatory and predictive potential and arguably generate the kind of 'paradigmatic closure' that Castles identifies as, 'the enemy of an effective, sympathetic study of human migration' (Castles, 2000:15-25).

The remainder of the paper aims to identify some of the key variables and dynamics of highly skilled, scientific, mobility essential to a more careful and subtle evaluation of impact.

Understanding the Mobility of the Highly Skilled; The Need for a New Approach?

According to Iredale, 'The current state of theory in relation to highly skilled migration is far from adequate in terms of explaining what is occurring at the high skill end of the migration spectrum' (2001, p7). Kofman makes a similar point adding that, 'it is virtually impossible to find much discussion of women or gender relations in studies of skilled international migration' (2000, p46). One of the reasons for this, she suggests, is the influence of British research on typologies of migration and its emphasis on economic determinants to the neglect of the social dimension (p48).

Capturing the nature and impact of the phenomenon of highly skilled migration demands new theoretical and methodological approaches capable of going beyond quantitative analysis (or the mapping of flows)⁵ to begin to understand and explain the processes of migration and career decision-making, and the relationship between these and the transfer of knowledge. Mahroum suggests that it is not so much a question of numbers but the quality of flows that shapes the impact of HSM with movements of the 'brightest and best' having the greatest impact (1998 p17).

Understanding the relationship between migration and the transfer of knowledge clearly calls for more in-depth, qualitative, approaches which enable us to identify motivational factors shaping mobility and how these effect the characteristics of flows, where the investment in skills take place (where knowledge or 'excellence' is generated) and where and how it is 'expended'. Moreover, explaining the differential opportunity that highly skilled migration generates on the individual level (between different groups of scientists) demands the development of approaches capable of capturing the subject and extending our analysis beyond the individual to understand the wider context of household or family decision-making.

In a recent paper on the challenges facing migration theory, King talks of how 'established forms of international migration .. have for too long now shaped our thinking about how migration is conceptualised and theorised' (2002, p89). In particular, he refers to the contribution of skilled and professional people and student migration to these new and more diverse modalities deriving from 'new motivations, new space-time flexibilities, globalisation forces and migrations of consumption and personal self-realisation' (p.89). Together, he suggests, these changes in patterns and motivations blur the 'never straightforward boundary between migration and mobility to melt away some of the traditional dichotomies' (p90). King goes on to identify some key facets of contemporary migration processes which he suggests challenge these dichotomies. Of particular relevance to the question of scientific mobility he refers to the temporal nature of migration, the distinction between forced and voluntary movements (inevitably linked to the recognition of non-economic determinants in migration decision-making) and the impact of European integration on resource frameworks.⁶

In common with many other areas of life, decisions about whether and where to move and for how long do not take place in a vacuum; neither do they take place in a fully informed and 'rational' manner. Migration decision-making, of the highly skilled at least, can best be described as the exercise of choice (or agency) within a shifting framework of resources and constraints; shifting not only in objective terms in response to changing conditions but also in response to evolving levels of awareness and need. In order to begin to understand how highly skilled migrants make these kinds of decisions or indeed reverse them, it is imperative that we pay full attention to the nature of the resource framework and the issue of context. I have emphasised the importance of contextualisation in comparative research in previous studies (Ackers,

⁵ The accuracy of statistics on international migration is a major cause for concern in any event (Salt 1997).

Enlargement of the EU might improve this situation in some respects, where sound accounting procedures are in place such as undergraduate and doctoral registrations, but in many other areas the corollary of free movement is weaker monitoring as people are able to flow freely over borders and institutions.

⁶ King also refers to the importance of gender and life course. This is an explicit feature of our research but is not developed in this paper. See Stalford in this issue.

1998; 2002; 2004). In a similar vein, King (2002) refers to the value of ‘embeddedness’ in migration research. Of course, in any given situation, the salient features of context will necessarily vary.

Much of the research on HSM identifies the dangers of generalisations across occupational and professional categories. It also draws attention to the impact of global and supra-national processes and their impact at national and institutional level on resource frameworks and migration decision-making.

Our research has sought to examine some of these issues in an empirically-grounded and contextualised fashion. Building on the findings of this and other related work, this paper takes some of the key challenges identified by King and examine these in the context of our work with scientists. In the process it seeks to progress our understanding of highly skilled, scientific, mobility and its implications for scientists and regions and also to identify some of the key factors shaping these trends. In particular it considers the following issues:

The nature of migration decision-making and the relationship between structure and agency in scientific migration

The influence of ‘regional blocs’ and the EU in particular on these processes

The temporal character of scientific mobility

The relationship between scientific mobility and the transfer of knowledge

The impact of other ‘compensatory mechanisms’ mitigating the effects of HSM

Understanding Structure and Agency in Migration Decision-Making

The relevance of traditional approaches to migration theorising to the study of highly skilled migration has perhaps been restricted by a tendency, on the one hand, to focus on forms of economic or labour migration at the lower skilled end of the spectrum (Kofman, 2000, p46) and also, as King (2002) indicates, to distinguish between forms of ‘forced’ or ‘voluntary’ migration. Furthermore, evaluation of the dynamics of these ‘voluntary’ forms of migration have tended to be dominated by highly individualistic and economically deterministic perspectives which have largely reduced the ‘resource framework’ under analysis to the consideration of respective remuneration and living costs (Raghuram, 2003). These approaches, to some extent reflecting the disciplinary ‘myopia’ of migration research, have restricted awareness of the complexity of issues shaping migration behaviour and the ‘relational’ nature of migratory processes (Ackers 1998; Ackers and Stalford 2004; King, 2003; Kofman, 2000). Of course, it is relatively easy to define some forms of migration as ‘forced’ when people are fleeing from political oppression or famine.⁷ In most cases, however, and certainly in the context of HSM this distinction is hard to maintain and potentially misleading. The extent to which moves in search of economic improvement or career progression constitute a form of voluntary or forced migration depends on the context and also the individual’s perception of that. While income differentials and the cost of living constitute key variables, they are by no means the sole or necessarily the determinative factors. The respective weight attached to such considerations may vary both between individuals and over the life-course as decisions are under constant appraisal and review. Where employment opportunities simply do not exist then the language of voluntarism is perhaps inappropriate. Similarly, whilst simple formulaic approaches prioritising economic determinants might function reasonably well in explaining the mobility of young early stage single researchers, they are certainly less effective in explaining the moves of partnered scientists, particularly when (as is often the case) both partners are scientists and the needs of children or elderly parents come into the equation (Ackers, 2004a).

The following section begins to outline some of the motivational factors shaping the migration and location decisions of highly skilled migrants. This discussion should inform our understanding of the quality of flows (the characteristics of the migrants) and the directional implications of these with important implications for both theory and policy.

Working and Moving in Science; ‘Knowledge Migrants’

Rather than discussing the motivational factors shaping HSM in a vacuum, it is perhaps better to ‘embed’ this discussion in the context of scientific migration and the nature of science careers. The importance of understanding the heterogeneous nature of HSM and taking into account the ‘market dynamics of the specific employment sector’ is emphasized in Raghuram’s work on migrant doctors (2003). Iredale similarly points to the ‘unique situation that pertains in each professional area and the need to differentiate by profession when examining skilled migration’ (2001, p15). That said, there is very little work that considers in any detail the specific situation of scientists and the relationship between mobility and career progression in the scientific sector. Indeed, recent work has tended to focus on the situation of employees in transnational corporations and, in that context, highlights the importance of industry-driven flows and the

⁷ There is certainly evidence of such ‘forced’ moves in the context of South-eastern Europe.

'lubrication' provided by companies and relocation agencies in these circumstances (Iredale, 2001, p.9; Baláž* and Williams, 2003, p3). This tendency to focus on transnational corporations is identified by Kofman as one of main explanations for the invisibility of skilled female migrants in studies of skilled migration in Europe, as employment in these sectors and particularly at higher levels remains 'resolutely male-dominated' (2000, p45).

Scientists in the academic sector do not generally enjoy the 'ease of migration' provided via these 'organisational channels' (Peixoto, 2001 p1030) and their migration is not so much driven by industrial recruitment companies but rather through networks, individual motivation and risk. Baláž and Williams's study of Slovakian students similarly highlights occupational differences concluding that, 'Researchers especially from academic sectors, still tend to be more prone towards migration and they migrate through their own ad hoc networks' (2004, p.101). Our own research supports this emphasis on the importance of networks and personal contacts to both the propensity to move and also the location decision. Interestingly, the work with Marie Curie fellows identified some gender differences in terms of both levels and sources of awareness of mobility schemes with women scientists generally more reliant than men upon formally advertising as opposed to personal networks (Ackers, 2001). So, whilst science careers place enormous pressure on people to move in order to access the best opportunities and develop their skills, there is not the same kind of organisational support that we identified amongst those scientists who were moving as part of a company relocation policy. In the main, academic scientists and their families are moving with very little corporate support.⁸ It is very rare for them to receive the kind of assistance with accommodation or support for partners in terms of finding employment and more general social integration for families.

Although I have referred to the importance of mobility to career progression in science the relationship between migration and progression depends on the national and disciplinary context and the response of individual scientists to these pressures, varies.

A recent study of the migration motivations of highly skilled migrants in the UK (which included a sample of bio-technologists) found that,

While prospects for economic improvement in terms of earnings were a significant factor for some from developing countries it was not a dominant factor overall. As such, the surveyed migrants can be considered 'knowledge migrants' rather than economic migrants (DTI, 2002, p12).

The report went on identify a number of 'motivational factors'. These can be grouped to include aspects of employment (opportunities for career advancement, the existence of global centres of excellence, wage differentials and the quality of research facilities), wider economic and quality of life factors (living conditions) and finally, more esoteric issues (personal development associated with travel and experiencing another culture).

A European Science Foundation report places similar emphasis on occupational-related dynamics and identifies new concerns around status and autonomy that are less directly connected to economic resources:

Researchers want centres of scientific excellence and access to the best and latest scientific equipment. They want increased research funding and better salaries. They look for a society where science is respected and where their social status is esteemed .. Young scientists need independence and autonomy and through the development of research teams, to acquire scientific and financial responsibility. (Martin-Rovet 2003 p1)

Perhaps substantiating the DTI point about personal development, other authors talk more generally of 'the drive of scientific curiosity' (Mahroum, 1998, p18) and the 'dream of self-realisation' (King, 2003, p95) to describe some of the non-economic determinants shaping HSM.

Our work with men and women scientists suggests that a very wide range of factors come into play to shape migration decisions and that both the 'menu' and the priority attached to individual factors might vary over the life-course. The reference to 'opportunities for career advancement' in the DTI report is unsurprising and would constitute a clear motivational factor in most forms of labour migration. It implies, however, that scientists might move in order to access improved opportunities in another country (in this case the UK). For many scientists, experience of international mobility is not simply a way of accessing better opportunities abroad, however, but equally a means of gaining the credentials necessary for their subsequent progression in home labour markets. Career progression in scientific research demands a very high level of mobility although the specific emphasis placed on this 'expectation of mobility' differs

⁸ Scientists moving within formal mobility schemes (such as the Marie Curie fellowship scheme are in a different situation to those negotiating moves individually). Nevertheless, even these mobility schemes do not provide the kinds of direct support characteristic of corporate moves. The European Commission is trying to improve the level of information exchange so as to enable scientists to make more informed choices and support their integration in the host state through the pan-European Researcher's Mobility Portal. For details see <http://europa.eu.int/comm/research/rtdinfo.htm/> . Our findings suggest that scientists working in industry receive far better support from corporate re-location schemes including accommodation and family support packages.

significantly between disciplines (as Mahroum (1998) predicts) and also national contexts (Ackers 2001; 2004). Disciplines such as physics and more highly specialised areas of science where physical access to key infrastructures is essential to their research or to the development of new skills place an even higher premium on mobility as do some countries (such as Italy, Greece or France) compared to the UK.

Where such a strong expectation of mobility exists and shapes in a very direct way the career prospects of scientists, it is difficult to speak of migration as 'voluntary' but neither is it 'forced' in the traditional sense of the term. It is thus perhaps useful to think in terms of King's idea of a 'continuum' of choices and constraints shifting over time and space and the life-course (2003, p92). Other key factors identified in our own research suggest the importance of autonomy at work and the freedom to work effectively or as scientists often put it, to 'do good science'; the attraction of transparent and fair (i.e. meritocratic) recruitment and progression systems with objective approaches to the evaluation and rewarding of excellence (Ackers, 2001; Sockanathan, 2004). Hellemans' identification of the factors contributing to a scientists' decision to leave Italy include 'the relatively low level of investment in science, a cumbersome bureaucracy and an advancement system that many say has more to do with cronyism than quality' (2001, p4.)

Scientists place considerable emphasis not only on their personal financial situation, however, but on the funding of science more generally and the impact of this on their ability to work effectively. Dickson concludes, with reference to the Italian situation, that 'the haemorrhage [of scientists] will continue as long as a country fails to integrate science into its political priorities or fails to back up such a commitment with the financial and other resources ... many scientists leave their home countries not so much because of wages but rather to seek an environment in which they can 'work effectively with enthusiasm and support' (2003, p1). Pelizon develops this point, referring to the 'cumbersome appointments system which is difficult for Italians to navigate and virtually impenetrable for foreigners' and argues that it is not just greater but also 'fairer' opportunities abroad that attract scientists. (2002, p3).⁹

Of course, economic issues remain highly influential in migration decision-making processes and scientists frequently refer to the salience of income differentials and even more commonly (perhaps reflecting the specific nature of scientific employment) contractual insecurity, as factors shaping both outward moves and potential return. They rarely see this in narrow terms, however, but rather in the context of the wider costs of living (including travelling) social benefits (especially healthcare and childcare), access to families and pensions.

As I have indicated above, both the menu and significance of the factors identified above might change over time as careers develop and lives evolve. They may also be gendered. The importance of autonomy could be less of an issue for established professors than early stage researchers (such as doctoral students and post-docs) and the importance of proximity to informal sources of support at home may become more salient when scientists have children. In our research on the Marie Curie programme the highest demand for fellowships came from Italian and Greek applicants seeking doctoral fellowships reflecting the lack of funding opportunities in these countries but also the nature of the student-supervisor relationship at this stage in their career. Italian respondents in the MOBEX study also suggested a greater interest in returning once they had achieved a high status position and were in a stronger position to secure autonomy in their work. It is important that the 'quality' of the flows of scientists from and into particular regions (their skill levels and training) are taken into account when assessing the potential impact of these forms of movement on sending and receiving countries. I will return to this point later in the paper.

Our own research corroborates the emphasis in the DTI report (above) on 'global centres of excellence'. The attraction of such centres reflects a number of features of science careers particularly where highly specialised infrastructures and forms of expert collaboration are concerned. Of course the growing tendency of scientific opportunities to 'cluster' in this way further reinforces the 'expectation of mobility' and the pressure on scientists to accept repeated international moves. Mahroum points to the 'magnetic effect' of centres of excellence arguing that 'European research institutes (in comparison with the US) ... lack the magnetic power that can transform them into pivotal centres in their fields' (1998 p21). For Mahroum such centres have a multiplying effect drawing 'star scientists' who, 'though few in number, are critical to the movement of staff. They tend to go where the best facilities are, and their reputation attracts the best young talents. (2003 p2).¹⁰

Linked in many ways to the issue of 'clustering' is the progressive internationalisation of science. Mahroum describes this process of internationalisation as 'a strong pull-driver of talent from overseas .. a prerequisite for sustained participation in, and access to, the international pool of researchers' (2003 p4).

⁹ These points are developed in Morano-Foadi (2004).

¹⁰ The policy and effects of 'clustering' are discussed in Millard's paper in this issue. Such policies have been actively pursued at both national and European level with important implications for mobility. For a discussion of their impacts on the decision-making processes of dual science career couples see Ackers, 2003.

Reinforcing this point, Meyer refers to the international mobility of the highly skilled as a 'natural extension of the traditional cosmopolitan character of the world's scientific community' (2003, p2).

Our own findings underwrite the importance of international environments and research clusters to the location decisions of migrant scientists both in terms of 'push' factors encouraging emigration from Italy (which not only experiences the out-migration of Italians but attracts very few scientists from abroad) but also in terms of shaping location decisions. Clusters in areas such as Cambridge and London offer mobile scientists a wider range of opportunities and also more cosmopolitan and international environment which they generally prefer both for scientific and social reasons¹¹.

Whether it is entirely accurate to refer to this as a process of 'internationalization' is questionable, given the emphasis on English as the 'lingua franca of science' (Mahroum, 2003, p4) or the 'ground floor language' (Baláz and Williams, 2003). This situation, which delivers clear benefits to English-speaking regions and scientists, is further compounded by the 'Anglo-phying' of national academic systems within the European Research Area (Mahroum, 2003, p4).¹²

Whilst the attractions for individuals of working in such 'international' clusters are evident it is also important to consider their impact on regional development and the distribution of employment opportunities which places great pressure on scientists to tolerate repeated mobility. For Dickson; 'the very universality of science has made the problem [in terms of uneven development] worse, since it means that those trained in one country can, almost more than in any other profession, easily function in another that offers them better working conditions' (2003, p1). As we have seen, the draw of such centres is more complex than the reference to 'better working conditions' implies and responding to employment opportunities in such 'locationally-constrained' careers is by no means 'easy' for migrant scientists adapting to life and work in a new social and cultural context and particularly if they have partners and families.

The DTI study (referred to above) notes how skill levels, 'life-stage' and country of origin shaped the way individuals responded to 'motivational factors' identified. Our research has placed great emphasis on the importance of gender and life-course to the migration decision-making processes of male and female scientists¹³. Partnering, particularly in the context of dual science career situations, constitutes a serious challenge to the migrant scientist as does parenting and the need to support family members in other countries. These issues are developed in more detail elsewhere (Ackers, 1998;2001;2004a; Kofman, 2000)

Having outlined the breadth of considerations shaping the migration behaviour of scientists the following section focuses on the significance of some key contextual factors that might be expected to influence the level and nature of science mobility in the European Union and their impact on the countries concerned. The discussion turns firstly to the 'magnetic' effect of science clusters and their specific encouragement under the European Research Area (ERA) strategy. Secondly and linked to this debate, I consider the wider impact of European integration processes and the evolving legal and policy framework with its emphasis on the facilitation of mobility. Having considered how these processes may shape migration trends, the discussion then moves to consider the impact of these on the Member States concerned; the nature of the relationship between migration and the transfer of knowledge and the 'compensatory' or mitigating effects of HSM from the perspective of sending regions.

The European Research Area – Lubricating Mobility?

One of the 'binaries' or 'dichotomies' identified by King (2002) in his critique of migration theory concerns the tendency, within the field both theoretically and in terms of empirical emphasis and discipline, to focus on either aspects of international or internal migration. This has also been pointed out in some of my own work on the gender dynamics of highly skilled mobility and care (Ackers, 2004b; Ackers and Dwyer, 2002). Our research underlines the importance of understanding the fluid and evolutionary nature of migration decision-making rather than conceptualising it as a 'one-time event' (Baldassar and Baldock, 2002, p.64). As King indicates, 'internal migration is often sequenced or interleaved with international migration' (2003, p92). For many scientists international migration is often associated with very high levels of pre- and post-migration internal mobility.

This to some extent reflects the constraints evident within science careers and in particular the pressure to accept fixed-term contracts (Oliver, 2004) and the specific challenges facing dual science career couples as

¹¹ In terms of social integration our research has found that migrant scientists, in common with other ex-pats, tend to socialise in the main with other migrants.

¹² The extent to which this is the case remains to be seen. Certainly, trends in the direction of harmonisation in the HE sector under the Bologna process will bring EU Member States closer together and, to that extent, facilitate greater mobility (cf Hackl, 2001).

¹³ Professor Ackers is currently directing a study focusing specifically on the relationship between mobility, gender and career progression. For details see <http://www.leeds.ac.uk/law/cslpe/mobisc>.

they attempt to reconcile work and family life (Ackers, 2004). The Italian respondents in the MOBEX study reported high levels of commuting within Italy prior to migration and, quite commonly, high levels of post-migration commuting within the UK. Such situations and tolerance to them on the part of scientists often living separately from their partners reflects the clustering of scientific activities and their response to new opportunities arising post-migration.

The issue of European integration throws a different light on this 'dichotomy', however, effectively re-conceptualising the very notion of international and internal. Certainly, the European Commission, in developing its policies for the promotion of the European Research Area (ERA) would consider the kinds of migration that the MOBEX project has examined as forms of 'internal' migration. This is not just a question of political identity of course but also reflects the very real and tangible legal and policy developments at EU level designed to proactively facilitate mobility in the scientific sector. Whilst the processes of internationalisation and clustering referred to above have their own dynamic they have also been specifically nurtured by national and European research funding strategies¹⁴. A recent Council Resolution on the profession and the career of researchers within the European Research Area specifically recognizes and seeks to promote the 'inherent international dimension of research'¹⁵ reflecting the importance attached to mobility in the ERA strategy.

King (2003) refers to the ways in which these processes generate 'new permeabilities' for both migrants and their families blurring the boundaries between nations and shaping the resource framework within which migrants are exercising choices and making decisions. The permeability of national boundaries within the EU has changed in many respects. On a more general level, the development of European Citizenship (Article 18EC) and its relationship with the expansion of free movement rights has opened up rights of entry and residence to all Community nationals. The European Court of Justice has worked hard to ensure that any remaining barriers to the mobility of workers within the European Union are dismantled, extending employment and social rights to the families of migrant workers in an effort to encourage mobility (Ackers, 1998; Ackers and Stalford, 1999). The extension of free movement rights post-enlargement and the potential impact of this is high on political agenda at the present time. Whilst the dominant view, at least in political and media circles, reflects concern that this situation may result in a significant out-migration of both unskilled and highly skilled workers it is likely that these provisions will have a more complex effect. Kouzminov (1993) identifies the limited opportunity to re-enter home labour markets (and potentially leave again at will) prior to accession as 'holding factors' restricting out-migration. Conceivably, the 'looser' post-transition regime enabling people to move to and fro will support a higher degree of 'circulation' or 'shuttle migration' although the net flows may remain unidirectional.¹⁶

Of more specific relevance to highly skilled migrants, Iredale identifies the role of the EU in 'lubricating the flow of highly skilled labour' through the 'internationalisation of higher education', the 'mutual recognition of qualifications' and the 'harmonisation of training' (2001, p9-10)¹⁷. Whilst some of these developments, such as the mutual recognition of qualifications, for example, have a long history and are relatively uncontroversial (as measures designed to promote the free movement of persons), recent years have witnessed more comprehensive and explicit attempts to link the promotion of the European Research Area to the Bologna process and the progressive harmonisation of higher education policy through the creation of a European Area of Higher Education (EAHE).¹⁸

Until recently the development of the ERA took place largely independently of legal and policy developments in the area of education where limited legal competency coupled with political sensitivities, supported a more cautious approach to policy development. This is perhaps an area where the pressure to maintain the often spurious distinction between Community 'social' policy (and Member States' competence in that terrain) and 'economic policy' (which permit more interventionist approaches) has begun to blur. As Hackl indicates, recent developments 'seem to contradict the traditional resistance of the EU Member States to any harmonisation policy in education and to increased Community competencies'

¹⁴ For a discussion of the impact of the UK research assessment process on clustering see Sockanathan, 2004.

¹⁵ Council Resolution no. 14636/03 November 2003 at para. 4.

¹⁶ The new system will also support an increase in frontier movement with people commuting across national borders on a daily basis. Okolski refers to this as a 'split living set-up' (2001, p109).

¹⁷ Important developments in the education sphere also include the extension of the rights of the children of EU migrant workers (cf Stalford, 2000) and the progressive blurring of boundaries between 'general' education and vocational training reflected in the introduction of new Articles in the Maastricht Treaty (cf Shaw, 1999).

¹⁸ Professor Ackers is a members of the steering committee of a new European Universities' Association project specifically concerned with developments in the field of doctoral training for example – add ref/website? For details of EU policy in this field and the role of benchmarking' see the Communication from the Commission - European benchmarks in education and training: follow-up to the Lisbon European Council [COM/2002/0629 final]

(2001, p2). Arguably the increasing importance of education to the economies of Member States (as an export or commodity) and concerns over the issue of brain drain from the EU to other regional blocs has further fuelled this process. Indeed, the Council Resolution referred to above explicitly recognises ‘the importance of research as an integral part of higher education across Europe’. Moves are afoot then not only to promote mutual recognition and credit transfer but in a more substantial sense, to begin to harmonise undergraduate and postgraduate programmes, including doctoral research, albeit through the open method of co-ordination.¹⁹

In addition to policy development in the area of training and mutual recognition, the EU also plays a wider role in terms of its research strategy and funding mechanisms and its specific encouragement of scientific mobility. In January 2000 the European Commission adopted a Communication, ‘Towards a European Research Area’²⁰. This document refers to the importance of mobility to scientific development and excellence in the EU: ‘*Greater mobility of researchers, promoting a European dimension into scientific career and making Europe attractive to researchers from the rest of the world are among the key elements for achieving the human resources to meet the future needs of European research*’. The Lisbon European Council followed this up with a request for the Commission and Member States to take necessary steps to ‘remove obstacles to mobility by 2002 and to attract and retain high-quality research talent in Europe’.²¹ Finally, the Framework Programme for European Research refers to the promotion of transnational mobility as, ‘a simple, particularly effective and powerful means of boosting European excellence, as well as its *distribution* in the different regions of the EU creating opportunities for significantly improving the quality of training and circulation of knowledge. [It] ‘helps to establish world-class centres of excellence leading to the attainment of critical mass’ (CEC 2001 p20). The promotion of scientific mobility is central to European science policy and a necessary dimension of its commitment to the development of ‘centres of excellence.’

Recognition of the potential tension between the desire to promote scientific specialisation (and its corollary ‘circulation’) and concerns to ensure ‘balanced growth’ have begun to surface on political agenda not least in the context of EU enlargement. A recent report refers to ‘the insufficient link between policies promoting balanced regional development and policies promoting geographic and occupational mobility’ (CEC 2002a p.3). The ERA strategy explicitly acknowledges the need to protect candidate countries from the consequences of ‘increased competition for highly qualified researchers’ and concludes that, ‘special attention should be paid to prevent new forms of ‘brain drain’ from countries with less developed research capacity’ through the introduction of new funding mechanisms designed to support a ‘symbiotic collaboration’ enabling them to build up their own research capacity (CEC, 2001d, p.6).²²

The National Context

Whilst developments at European level clearly shape the resource framework and migration decision-making of scientists, it is important to exercise caution when considering their potential impact. Although they explicitly encourage convergence, the extent to which such measures are implemented and enforced at national level varies enormously.²³ From that point of view, the changing global or European situation simply adds another ‘layer’ of context and demands evaluation of the interaction of national and supra-national policies. It is clear from our research that, whilst these developments might ‘lubricate’ the emigration of Italians, the Higher Education sector in Italy has not, as yet, adapted sufficiently to attract scientists from abroad and indeed it has failed to implement EC law in some key areas (such as applying the non-discrimination principle to the employment of foreign lecturers, for example and the mutual recognition of qualifications).²⁴ Furthermore, the relative attractiveness of EU funding opportunities (such as the Marie Curie fellowship scheme for example) depends on the opportunities available at national level.²⁵ In some situations applications to the Marie Curie scheme, for mobility fellowships reflected not so

¹⁹ The Commission Report, ‘The Concrete Future Objectives of Education Systems’ (COM(2001) 59 final (31.01.2001) proposes the ‘open method of co-ordination proposed by Lisbon, which takes account of the degree of subsidiarity attaching to education; and concludes that the objectives set out in the report cannot be achieved by Member States alone, and thus need co-operation at European level’. (p16).

²⁰ COM (2000) 6 final

²¹ Final Report of the High Level Expert Group on Improving Mobility of Researchers, 4 April 2001.

²² Specific Marie Curie Actions include new Host Fellowships for the Transfer of Knowledge (TOK) designed to encourage transfer of knowledge into less favoured regions. A compulsory return phase attached to out-going international fellowships encourages return as do ‘re-integration grants’.

²³ The issue of implementation and enforcement of EC law is developed in Ackers (1998) and Ackers and Stalford, 2004).

²⁴ Add cases

²⁵ Professor Ackers is currently working on an IMPACT assessment of the Marie Curie Scheme which considers these questions. For details see <http://impafel.apre.it/>

much a desire for mobility, but rather the sheer lack of opportunities for scientific research in the home country (Ackers, 2001).

Certainly, the impact of EU policies on scientific development and mobility will vary depending on the national context. With reference to the accession countries, the Wellcome Trust acknowledges the extent of variation between individual countries and cautions against generalisations²⁶. Despite the 'massive upheaval' that these countries have experienced it refers to the 'long tradition of excellence in biomedical science' that exists in Poland, Hungary, the Czech Republic and Estonia, countries which, the report suggests, have significant potential and are characterised by a strong commitment to science, the existence of adequately equipped labs, the introduction of scientific peer review and merit-based grants. According to this report, biomedical sciences are at a 'critical stage' in these countries and there is a 'need to encourage brilliant young scientists not to migrate permanently, and to invest their talents at home' (2003, p.2).

Other work reinforces the importance of contextualising research on the impact of highly skilled migration in a sound understanding of the national situation and national labour markets. The corollary of international brain drain may not be flourishing national labour markets but 'internal brain drain' into industry (Sretenova, 2003; Mahroum, 1999, p.18), 'brain freeze' (Sretenova, 2003), 'brain waste' (Kofman, 2002; Iredale, 1999; Mahroum, 2001) or 'brain stagnation'. Some authors are less pessimistic about the current 'asymmetry' of flows given the significant over-supply and unemployment in the scientific sector in some countries. Italy would 'appear' to generate a surplus of scientists at least in relative terms, compared to the number of opportunities available. In such circumstances the impact of scientific emigration needs to be analysed in the context of alternative scenarios – of under and unemployment and deskilling. Such situations can, however, change quite rapidly. Hellemans cautions against complacency based on notions of over-supply predicting some serious challenges to the Italian economy. The 'exodus of scientists', she suggest, must be viewed in the context of the demographic ageing of its population of active scientists about 30% of whom are due to retire by 2005 (2001, p.4).

Salt talks of the situation in accession countries where scientific sectors were often 'over-staffed yet under-financed' (1997, p20). In a similar tone, Sretenova (2003) refers to the situation in Bulgaria where massive cuts in scientific employment in the 1990s have resulted in unemployment and 'over-supply'. The concepts of 'brain waste' or 'stagnation' have been used to describe these situations where scientists are forced to move inter-sectorally and accept other forms of work or combine scientific work with other work in order to make a living. Salt describes this as a form of deskilling which occurs, 'when highly skilled workers migrate into forms of employment not requiring the application of the skills and experience applied in the former job' (1997, p22)²⁷. The effects of scientific emigration then need to be considered alongside the alternative prospects of 'internal brain drain' within countries which may dwarf the losses through international migration. Kouzminov argues that these kinds of 'inter-sectoral movement' can account for as much as 90% of the absorption of the unemployed from the science sector' in accession countries (1993, p21). In such a situation it may be politically and economically more acceptable for these scientists to work abroad; indeed, even a form of 'investment' allowing the receiving countries to underwrite the costs of their training until they are required back home. Meyer refers, by way of illustration, to the 'deliberate policy' in China aimed at 'storing brainpower overseas for subsequent use' (p2).²⁸

Understanding the impact of scientific mobility thus demand as detailed attention to the specificity of national context in order to capture how knowledge is generated, transferred and used. This is important not only to the analysis of impact in a regional sense but also in terms of individual opportunity. Those unable to take advantage of mobility may forgo the advantages of higher salaries and working conditions and find it difficult to progress in local science labour markets. Our research suggests that the ability to respond to the opportunities (in terms of career but also quality of life) are not universal or random but differential reflecting family status, life-course and gender dynamics (Ackers, 2001:2003). Research in this field needs to address the question of whether those 'frozen' brains left behind or indeed those 'stored' abroad are gendered.

²⁶ Although many accession countries are facing serious economic crises, they present a very different situation to that evident in other 'developing' countries. Of particular relevance to the current paper is the relatively high level of undergraduate science education (cf Gill, 2003).

²⁷ Of course de-skilling may also occur in the host context particularly where discrimination is permitted. Salt (), Fassman et al (1993) and Hyyniewicz et al (1992) all provide evidence of this. Enlargement and the implementation of European law in the area of non-discrimination (Article 12 EC) should protect scientists from the accession countries from direct forms of nationality-based discrimination.

²⁸ This approach was evident in the last few years in the case of the 'loan' of Finnish nurses to the UK national health service which was carefully negotiated between the respective Trades Unions.

This latter point draws our attention not only to the importance of national context to migration decisions but also to the permanency of moves and the importance of return.

Migration or Mobility: the Temporal Quality of Moves?

One of the migration 'binaries' referred to by King (2002) in his 'mapping exercise' and of particular significance to our population of migrant scientists, concerns the traditional distinction in migration research between those researchers who focus on permanent forms of 'migration' and those whose work considers more temporary forms of 'mobility.'

The general consensus at least among theorists of highly skilled migration would seem to be that this distinction now holds little validity and may indeed constrain our understanding of this phenomenon. Salt thus refers to the reluctance of migration researchers to 'accept that [HSM] is really migration at all, since there is no intention to settle in the destination country' (1997, p4). Piracha and Vickerman's statement that 'within Europe, most migration is not permanent, but part of a process of mobility in which both return and serial migration are natural economic responses to a dynamic economy' (2002, p 1) underlines Salt's point. Wallace makes a similar point in the context of moves from accession countries suggesting that these 'short-term circulatory movements .. might better be described as mobility' (2002, p.603).

Iredale and Appleyard concur that the distinction 'between temporary and permanent moves 'has lost its prominence' (2001, p4). Just as internal and international migration may be inter-leaved, the temporal nature of scientific moves may vary both between individuals and over the life-course and career trajectory. Many scientists make at least one international move often to different locations (Ackers, 2001). Such moves, as King suggests, are often 'multiple and spatially capricious' (2002, p.98).

Whilst any arbitrary theoretical distinction or categorisation of forms of migration based on the length of stay (or the concept of 'settlement' may be spurious, particularly given the fluid and uncertainty of these processes, the issue retains its relevance in terms of assessing impact at the regional and individual level.

The significance of factors such as the length of stay, the intention to remain or return will clearly vary in different circumstances.

From the perspective of individuals' migration decision-making (and especially in terms of assessing return moves), length of stay remains significant in important ways not least in terms of accruing citizenship entitlement.²⁹ Our research suggest that this is a significant consideration for scientists with partners and children who need to reassure themselves that their mobility will not jeopardise their family's entitlement and, in the case of maternity rights and childcare, may enable them to continue to work effectively (Ackers, 2001; Stalford, 2004). In another respect, our findings indicate the continued importance of length of residence to a scientist's ability to successfully re-integrate in the sending country although this varies according to the national context. Some countries become very difficult to re-enter once someone has left and disengaged from key networks. Ironically some of these countries (such as Italy for example but also Germany) are also those which encourage and reward (in different contexts) international experience. In these situations, the decision about whether to move and for how long demands very careful planning and attention to risk. Those scientists who have successfully negotiated this process have often managed to retain key links with the sending country and its academic networks perhaps through unpaid research positions or continued involvement in conference activities and research collaboration. In addition to the importance of scientific links to reintegration (which I return to later) of course the majority of migrant scientists retain personal and familial links with more than one country often spending extended vacations in the home country³⁰ and perhaps planning to return there either when they have children, when they are fully established³¹ or when they retire. Baldassar and Baldock use the term 'transnational' to describe the situation of migrants, such as these, who, 'live their lives across borders and develop and maintain ties to two or more homes, even when the countries of origin and settlement are geographically distinct' (2002, p.64).

Migration is a process, constantly open to re-negotiation and review as lives evolve and circumstances change. Our research has found, unsurprisingly but rarely documented, high levels of post-migration partnering often involving couples from different national backgrounds (cf Ackers and Stalford, 2004)³². In

²⁹ For more discussion of the social rights available to migrants workers and their families see Ackers (1998) and Ackers and Stalford (2004).

³⁰ Arguably such forms of migration are similar to other forms of 'seasonal' migration. The research on retirement migration would, however indicate a relationship between forms of tourism, seasonal migrations leading to 'settlement' and eventual return (cf King et al 2000; Ackers and Dwyer, 2002).

³¹ A number of Italian respondents said that they would only considering return to Italy when they had achieved a high status position. At that level they would be in a stronger position to circumvent the complex system of 'concorsi' (cf Morano-Foadi's paper) and negotiate their entry terms.

³² King refers to the failure of migration theory to acknowledge the importance of 'love migrations and the transnationalisation of intimacy' (2003, p100), a point developed in Ackers, 1998.

these situations scientists and their families may develop a complex web of relationships both professional and personal across international space. As King concludes, 'the time-space continuum of migration/mobility is truly continuous' (2003, p93).

Clearly other factors might influence the resource framework within which individuals are exercising choices in this respect. Many scientists spoke to us about the influence of accessing cheap flights on their location decisions and also the benefits of laptops in promoting more flexible approaches to work enabling them to tolerate extended forms of 'commuting' or what King might call 'shuttle migrations'. Salt and Ford even suggest that, 'there are some grounds for thinking that migration, secondment, short term assignment and business visits are increasingly substitutable ... Modern air travel means that it may no longer be necessary to have a permanent expatriate presence' (1993, p27). Meyer makes similar reference to the impact of new forms of communication, transportation, geopolitics and inter-cultural relations in fostering these new forms of movement'.

Of course these same processes may impact in different ways. In some contexts they may actually lubricate moves, encouraging people to move who might otherwise have stayed. They might also impact more on the location decision than the decision to move per se. Our interviews have highlighted the importance of location in the 'escalator' regions of South East England, for example, to Italian scientists who wish to either retain close contacts with Italy for personal or professional reasons or who are actively trying to manage dual career situations (Ackers, 2004). Speaking in the context of accession countries, Kouzminov (1993) identifies the relatively high costs of air travel as 'holding factors' restricting HSM – a situation that is currently changing rapidly. The net impact of these developments is thus somewhat difficult to predict.

Linked in important ways to these concerns around length of stay and permanency of moves and of great significance to the current debate, are the issues of retention and return.

Retention and Return

From the perspective of receiving countries and regions, there is a concern to retain scientific expertise. Iredale identifies retention and 'successful labour market integration' as a key issue for such countries (1999, p109). The UK government's review of skills shortages in science (the 'Roberts Review', 2002) predicted that the positive effects of science mobility may be mitigated by the propensity to return. No evidence is presented, however, to support this contention. Another UK study found that 'a relatively high proportion of the skilled migrant workers interviewed are planning to stay' (DTI, 2002, p64)³³. Our own work with Italian scientists did not indicate a high rate of attrition but rather a continued and valuable presence.³⁴ They also convey influential messages to scientists in the sending communities shaping future location decisions and migration flows (Portes & Borocz, 1989). Issues of post-migration retention and progression are highly significant dimensions of the knowledge transfer equation. However, the temporal dimension of this requires careful attention. When can we say someone has left for example or returned and for how long will they remain. Moreover, as Regets cautions, if they do leave can we assess that in terms of net loss when 'they still provide much in the way of research and teaching before they depart' (2003, p2)?

Of course, the issue of integration is of even greater concern in the context of return and the impact of HSM on sending countries.³⁵ One 'binary' King does not identify concerns the tendency in migration research to deal separately in both a theoretical and practical sense (in terms of empirical focus) with the issue of migration (which generally implies outward moves) and return.³⁶ The issue of return needs to be considered in the light of movement in general. Arguably, from a scientific perspective, it is not so much the issue of the nationality of the incoming scientists but whether indeed the country in question is attracting highly skilled migrants at all. Certainly the MOBEX findings suggest that the factors shaping the return decisions of Italians may be similar to those restricting the attractiveness of Italy to other scientists from abroad. The problems in funding and the nature of recruitment and progression and the very lack of an international presence in Italy deters both Italians and other nationalities³⁷

Despite the symbolism attached to return in the debates around scientific brain drain, there is considerable evidence suggesting that return flows may not lead to an equivalent transfer of knowledge. To achieve such transfers the returning scientists needs to be able to re-enter the local labour markets and work in an environment conducive to the exercise and nurturing of their skills and knowledge. Our work supports

³³ 44% compared to 28% planning to leave (of which 62% planned to go home). 28% did not know yet.

³⁴ Although the lack of permanent positions in the UK poses a serious problem to more senior scientists.

³⁵ For more detailed discussion of return see Gill's paper in this issue.

³⁶ Our own work with retired and child migrants considered both dimensions as part of the fluid and evolutionary nature of migratory processes (cf Ackers and Dwyer, 2002; Ackers and Stalford, 2004).

³⁷ Of course the issue of language and recognition of qualifications constitutes a bigger barrier for non-Italians. See Morano-Foadi in this issue.

Balter's findings that many 'Europeans who do post-docs abroad face re-entry problems' and 'struggle to reintegrate themselves into their native scientific communities' (1999, p.1). Paterlini refers to the 'broken promises and disappointed scientific hopes' of Italian returnees' (2002, p3) who face considerable re-integration problems and are unable to apply their skills and knowledge effectively due to weaknesses in infrastructure. Where networks are of particular importance to progression (such as in Italy) the dislocation caused by migration opens up 'gaps and discontinuities in the home country's networks [which] have thus often made the outcome of their undertakings unpredictable, sometimes, even frequently, leading to a decision to re-emigrate' (Meyer, 2001, p101). Linked to this issue of networks, one particular concern raised by our Italian respondents concerned the general lack of a relationship between excellence or performance and progression in Italy with the result that stay-at-home Italians that had 'served their time' in the academic system were often privileged over and above well published and experienced potential returnees.³⁸

On a more positive note, Baláz and Williams found some evidence of effective knowledge transfer associated with early stage return although they emphasise the importance of taking a very broad view of 'knowledge' to include a 'wide range of competences, rather than narrower measures of qualifications and formal courses of studies'. Many of their respondents reported improvements in their employment status and welfare on return due in part to the 'development of language, attitudinal and inter-personal competences, as well as networking' (2003, p23).³⁹

Of course evidence of return, coupled with the internationalisation of national science labour markets, would indicate the existence of the kind of 'brain circulation' so important to scientific competition and development. On the other hand, where such evidence does not indicate high levels of return, can we assume there has been a 'brain drain' or 'reverse knowledge transfer' with all the negative connotations associated with this term? Certain authors have pointed to other factors which might at least mitigate the effects of uni-directional flows of human capital. At one level, it has been suggested that the failure to take account of the financial value of flows of remittances into sending countries is itself a compensatory factor. Certainly this case has been argued strongly in the case of the emigration of nurses from the Philippines - to such an extent that there is talk of a policy of training nurses for export! In the context of scientific migration from the third world, Abella argues that concerns about the effects of highly skilled migration have been 'overblown' in that they neglect 'the substantial impact of migrants' incomes and investments in their home countries' (2003). The findings of a recent UK government report would support this assertion to some extent. According to this study, about 50% of respondents were sending money home and many were sending 'a sizeable proportion' of their salary. The scientific group in their sample were, however, found to be sending the lowest amounts partly due to their lower wages and relatively young age (DTI, 2003, p63). While evidence of remittances may indicate an important financial return to the economies of the sending regions, this is unlikely to have a direct impact on science in those regions and, in that sense does not dampen concerns about balanced growth in the ERA.

Whilst one might question the rationale of distinguishing between different groups of migrants on the basis of length of stay and the theoretical relevance of the distinction between 'mobility' and 'migration', this 'binary' retains some significance in terms of understanding the impact of moving on individuals⁴⁰ and on sending and receiving countries. In particular it constitutes an important factor in the debate about the relationship between human capital mobility and the transfer of knowledge - a debate so central to the arguments around 'brain drain' and the impact of HSM.

How Skilled is Skilled? The Generation of Knowledge and Quality of Expertise

Understanding the phenomenon of HSM and its impact on sending and receiving countries clearly requires more than the measurement of the direction and volume of flows. Research needs to capture, in a more comprehensive fashion, a whole range of dynamics. It needs to consider the 'quality' or 'excellence' of these flows to determine who is moving where and at what stage in their life-course and career trajectory. Are certain flows dominated by undergraduates or doctoral students and others by the experienced 'research stars'? Are some locations losing experienced people and attracting junior scientists? This is not to imply that the loss of more junior talent is less serious. Indeed, as Salt indicates, in situations where up to 70% of a country's undergraduates seriously consider moving abroad (such as in Russia or Bulgaria for example) these countries might lose 'the youngest, most able people with the greatest potential in the most important sectors or disciplines for the future economic development of their countries' (1997, p23). A

³⁸ These issues are developed in Morano-Foadi's contribution to his issue.

³⁹ This study focused on the experiences of young undergraduate students often coming to the UK for short courses and language training. It does not, as such, touch on some of the more specific issues around re-integration in science labour markets and, as such, the reference to a wide range of competences is not surprising.

⁴⁰ The impact on citizenship status and social entitlement is explored in depth in Ackers, 1998: Ackers and Dwyer, 2002 and Ackers and Stalford, 2004 and will not be developed in this paper.

recent report by the European Foundation for the Improvement of Living and Working Conditions (Krieger, 2004) echoes these findings and talks in terms of the 'brain and youth drain' facing the new Member States and particularly Romania and Bulgaria. The results of their attitudinal survey suggests that some 10% of younger people in Bulgaria and Romania show a 'firm intention' to leave. The 'typical migrant in these situations is 'young, well-educated or studying third level education and living as a single, non-cohabiting person' (p3 of summary). These trends Kreiger argues, may 'erode a country's long term competitive position [with] negative repercussions on a country's developmental process.' (p.1 of summary). The demographic and economic implications of these processes clearly go beyond a concern with science.

Baláz and Williams' research highlights the neglect in migration theory of student mobility which 'provides the "seeds" for future international skilled labour migration' (2003, p25). This point is echoed in King's paper which expresses 'surprise' that, the migrational significance of students going to university has scarcely been studied' (2002, p99). Krieger points to the 'strong influence' of higher education on migration as a 'pull and facilitating factor' (2004,p5).

Our own work would support this contention. Indeed a very high proportion of scientists moving at doctoral and post-doctoral level had experienced some form of undergraduate mobility and often used the networks developed at that stage in their career as the basis for future mobility. Certainly many of the Italians we interviewed had spent time in the UK during their final dissertation year and returned to the same institution or supervisor. This 'process' may support Baláz and Williams' findings, in the Slovakian context, that whilst many undergraduates may plan to return, their failure to secure reasonable positions, coupled with a new appetite for, awareness of and confidence in accessing opportunities abroad, may stimulate a subsequent 're-emigration of failure' transforming brain circulation into brain drain.

The volume of potential undergraduate mobility is clearly an important consideration. I opened this paper with a discussion of the definition of highly skilled and referred to Salt's definition of those people with tertiary level education. Arguably this definition could and indeed should be further broadened to include the fast-growing population of mobile undergraduates particularly as research indicates a clear link between this form of early stage career mobility and subsequent moves (Baláz and Williams, 2004; King, 2002; Ackers, 2001).

On the other hand, even small international movements can have very serious negative effects on source countries. As Salt indicates, 'the departure of a few top-level specialists in certain sectors of basic research could lead to the collapse of national scientific schools' (1997, p22). I have already referred (above) to the ability of science clusters to attract 'star scientists' and the multiplier effect of this in terms of subsequent recruitment. The mobility of such established scientists and the consequences of this in terms of the losses of human capital (their own expertise and that of their research group) coupled with sources of external funding represents a serious concern for less developed regions.

In addition to these concerns around the volume and quality of flows, we need also to consider the nature and location of the investment in training. Put simply, where is 'value added' or in the words of Meyer, 'when and where were people's skills developed' (2001 p92). So, for example, how do we compare (in terms of both impact and ethical responsibilities) the situation of an undergraduate who moves to the UK for their degree and doctoral research and then remains to someone who has trained in Italy and reached an established position and then leaves for the UK? Tomiuc expresses concern at the outward migration of elites from South-eastern Europe which he suggests has reached 'alarming proportions' and constitutes a 'huge blow to the economy, because the higher education of one person is something quite expensive and the investment was made by the State' (2003, p.2). Meyer makes a similar point arguing that most data on 'brain drain' is retrospective and, 'ignores when and where [] skills have been developed' (2001, p.92).

The corollary of investment (or training) is expenditure. What do we know about the nature of the knowledge transfer process and how scientists 'expend' or disseminate their knowledge? Does this take place primarily 'in situ' or is it more diffuse? Does it matter where they attend or organise conferences and other dissemination events or where and in what language they publish? Are they enabled to utilise their skills effectively or are they effectively de-skilled in the host country or, alternatively, 'frozen' on their return? Can we talk of 'brain drain' when there is high under or unemployment and de-skilling in a region? Finally, are these different forms of movement entirely random or do patterns or trends exist enabling us to predict the net impact on regions? Understanding the impact of highly skilled migration demands attention to these complex issues.

The Impact of Scientific Diasporas on the Transfer of Knowledge

More recent attention to the potential value of scientific 'diasporas' suggest a more complex relationship between human flows and the transfer of knowledge and a potentially more direct compensatory effect. Meyer's research on 'intellectual diaspora networks' concludes optimistically that, 'highly skilled expatriate networks, through a connectionist approach linking diaspora members with their countries of

origin, turn the brain drain into a brain gain' (2001, p91). Other authors support this view that such 'international knowledge networks' might constitute a 'powerful means of profiting from skilled emigration' (Lowell, 2003, p2) through the 'exchange of knowledge and useful contacts' (Regets, 2003 p1).⁴¹

Whilst Mahroum acknowledges the potential of diasporas to contribute to the international transfer of knowledge, his tone is less optimistic suggesting that the focus on diasporic communities might reflect a kind of 'resignation' on the part of sending countries which have reached the 'irreversible point' and more or less 'given up on trying to attract the diaspora back' (2003, p.3).⁴² Furthermore he alludes to the potential of diasporas to augment out-migration: 'The fast growth of scientific diaspora .. can by itself act as a magnet ... Local talent seeking maximum career return find now an easier and greater access to international careers through their own diaspora' (2003, p.3). Such networks may 'facilitate the migration process' and diminish the risks and costs of migration (Meyer, 2001 p93).⁴³ The MOBEX research showed evidence of the 'channelling' function of diasporas with migrant scientists and especially established senior scientists (or Mahroum's 'research stars') acting as 'bridge-heads' for fellow migrants. In many cases Italian scientists in the UK had first made contact with their host institution or supervisor either through an Italian scientist who had been or remained in the UK or someone in Italy who had contacts in the UK with other Italians. Likewise our research found evidence that supervisors who had been mobile were likely to encourage their students to become mobile too.

Indeed, Meyer's conclusion that 'networks are, in fact, 'making migrants' and, 'most positions are acquired via connections' (2001, p93/94) has a strong resonance in the Italian situation and may compound the situation where employment opportunities are allocated on grounds other than individual excellence and merit. Rather than selecting the 'brightest and the best' on the basis of individual merit and competition the processes shaping HSM may be dominated by the power of networks:

'This is not a volatile population of separate units in a fluid environment but rather a set of connective entities that are always evolving through networks, along sticky branches' (Meyer 2003,p96). We have already referred to the potential of improved and cheaper travel which may help to maintain what Meyer calls these 'umbilical links' with regions of origin.

Certainly, one might predict a relationship between HSM and the development of international networks, particularly in the scientific sector where dissemination via conferences is so important. I have already referred to the blurring of boundaries between forms of more permanent migration and on-going internal or international mobility. The issue of on-going international mobility via conferences and research collaboration is a particular feature of scientific research that is likely to shape the impact and experience of mobility and potentially temper any direct relationship between migration (or residence) and the transfer of knowledge. Indicative findings of an on-going study of the relationship between gender, mobility and progression in science careers⁴⁴ suggests gendered differences in the ways in which scientists use their working time with important implications for progression. One element of this concerns the amount of time devoted to foreign travel in order to present papers at international conferences, to develop collaborative projects and to visit key research infrastructures and centres of excellence. Although the findings are not yet fully analysed it is not uncommon for scientists to report spending an equivalent of at least 6 weeks per year working abroad.⁴⁵ Other current work⁴⁶ asks scientists more explicitly to identify the frequency and location of conference presentations and research collaboration and the nature of any links they have maintained or developed in their home (and other) countries. This kind of information should provide a useful starting point for more careful analysis of the relationship between their own migration and the transfer of knowledge. Academic careers are perhaps somewhat unique in this respect in fostering such a close relationship between concepts of excellence (and progression) and international activity. Mobility, in the context of scientific careers, could thus be seen as operating on two inter-linked continua. The first of these might 'measure' the physical employment-related moves made by scientists in the course of their careers whilst the second might capture the degree of on-going employment-related travel.

The impact of diaspora on knowledge flows remains unclear and further research is required to develop our understanding of how these processes operate in different cultural contexts and how they impact on sending and receiving countries and individuals. The difficulty is developing research tools capable of capturing the

⁴¹ Regets suggests that levels of co-authoring might be useful indicators of this process.

⁴² 'Brain Gain, Brain Drain: an international overview' background paper for the Austrian Ministry for Transport, Innovation and Technology:

⁴³ Meyer lists amongst the resources such diasporas may provide to potential migrants, information about procedures, financial support, job prospects, administrative assistance, and emotional solidarity.

⁴⁴ The 'MOBISC' project, [www...](#)

⁴⁵ In some fields such as astronomy or oceanography where research demands access to key sites or laboratories this figure may be significantly higher.

⁴⁶ [IMPAFEL study ref](#)

quality of these networks and their impact on the migration/ knowledge transfer relationship. As Baláz and Williams conclude, existing research gives, 'little insight into how 'human capital transfers are constituted' (2004, p.4). Vizi's inference of a simple and direct correlation between migration and knowledge transfer such that 'when the best scientists leave their laboratories, they take with them not only their scientific knowledge, but also their reputations' (1993, p.102) clearly fails to grasp the wider contextual issues and the dynamics of knowledge generation and transfer. Meyer challenges this kind of approach and its implicit conceptualisation of skills as 'individual-based properties bounded by human bodies' (2001, p.95) arguing that skills are relational and 'actors' [scientists in our case], composite entities whose embedded knowledge can only be understood in the context of its connection with extensive networks at home and abroad.

The 'network' or 'connectionist' approaches advocated by Meyer perhaps offers some potential, in combination with other forms of inquiry, to evaluate the complex and fluid relationship between human mobility and the transfer of knowledge, and promote our understanding of the impact of highly skilled, scientific, migration. In an interesting reference Meyer suggests that much of the research on 'brain drain' fails to take account of 'professional time' and the spatial and temporal dynamics of knowledge acquisition and expenditure. Capturing these processes demands a socio-historical perspective 'showing the weight of previous migratory events on the course of those occurring at a given time' and, more specifically, the importance of human mediation in migration (2001, p.93).

Conclusions

This paper has attempted to identify and discuss some key concerns that shape the nature of highly skilled, scientific, mobility and its impact. Building on the work of others, and King (2002) in particular, it hopes to encourage a new approach to migration theorising, at least but not limited to the movement of highly skilled people. In so doing, I have tried to move the debate around 'brain drain' and 'brain circulation' on to support more sensitive and contextualised approaches to the study of the causes and consequences of scientific mobility. The paper has highlighted the close relationship between theoretical development in this field and the development of approaches to impact assessment. Capturing the complex (and gendered) dynamics of these processes presents important methodological challenges. Baláz and Williams suggest the need to adopt a 'total human capital' approach which pays more attention to individual social biographies'. (2003, p23) They also emphasise the importance of context to an understanding of how 'structural parameters' relate to 'individual agency' and the 'relational nature of skills (p24). King and Ruiz-Gelices similarly argue for a biographical approach to support an understanding of how 'individuals enrich their biographies through social and geographical mobility' (2003, p24). These concerns around the choice of appropriate and sensitive tools are echoed in our own approach to research on science mobility and the assessment of 'impact'.

The results of the MOBEX study indicate the existence of significant and unidirectional haemorrhaging of scientific talent from Italy and in favour of the UK and other locations. This situation not only poses serious challenges to Italy but also to those Italian scientists working in Italy and the UK whose only means of progressing and working effectively in science is through emigration. I hope that this paper, building on the experiences of previous research, has taken the debate forward and begun to identify the parameters of a new research agenda capable of enhancing our understanding of scientific migration in an enlarging European Union and supporting sensitive and evidence-based policy making.

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Word Count: **(excluding references)**

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