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Researchers in the European Research Area

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This second paper in this stream of ResIST work charts the policies towards scientists and technologists in Europe and the distribution of such 'Knowledge workers' across countries and sectors. The Lisbon European Council of March 2000 established a strategic goal for the EU to become 'the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth'. The European Research Area (ERA) is central to the achievement of the Lisbon strategy through increasing the volume, quality and interconnectedness of researchers, in the interests both of higher research standards and enlisting these in the service of competitiveness. The ERA has reshaped scientific governance within the EU, with the adoption of European-wide targets and the assessment of individual countries in relation to them.

Analysis of Europe's competitive position suggests that the US continues to 'race ahead through…its ability to retain the highest calibre researchers…and its active policy of immigration for the best and the brightest', and the effective use of human capital underpins the success of the ERA.

The Commission calculates that 700,000 new scientists (in addition to those required to respond to demographic concerns) will be needed in Europe by 2010 to meet the Lisbon objectives. In addition there is a concern to encourage labour mobility to respond to imbalances in supply and demand across sectors and regions. Mobility is thus central to the ERA strategy in two respects – firstly, increasing the *volume* of human capital through policies to retain researchers in the ERA and attract new researchers to the ERA from third countries; and secondly, shaping the distribution of this human capital within the boundaries of the ERA. These two goals are often linked in that European Centres of Excellence are important in keeping scientists in the ERA and in attracting them to it.

Thus the concepts of the ERA and knowledge economy are inextricably linked to the utilization of human capital and research capacity. The report maps out key factors in relation to R&D personnel in the EU: investment in R&D, the distribution of R&D personnel, and internationalisation and mobility in the ERA.

Investment in R&D in the EU

The original Lisbon Strategy target was a target of three per cent GDP expenditure of R&D by 2010; in 2005 the EU-25 average was 1.85 per cent. Only two countries exceeded the 3% target in 2005 – Sweden and Finland – with Germany, Denmark, Austria and France over 2%. Sweden and Finland also had the highest

proportion of business enterprise expenditure on R&D, followed by Germany and Denmark. In absolute terms, Germany spent the most on R&D, followed by France and the UK.

Distribution and growth of R&D Personnel

In 2005 there were more than 51 million people working in S&T in the EU-25, equivalent to 27.7% of the labour force, of whom around 57% had completed an S&T education. The highest proportion of researchers in the labour force within the EU was in Finland (2.2%) (although Switzerland and Iceland, EU Associate countries, had higher proportions) followed by Austria and Germany (1.2 and 1.1 % respectively – 2004 data). Bulgaria, Cyprus and Romania were amongst the lowest proportions – equal to Turkey with 0.3%.

Between 2002-2004 there was faster growth in the number of researchers than that of the general R&D workforce in the EU - 3.5 per cent compared to 1.9 per cent. In the EU 25, R&D personnel in business enterprise were on average growing faster than across all sectors between 1999-2004. In this period only Bulgaria and Romania experienced a decline in R&D personnel across all sectors.

Between 2000-and 2003 there was an annual average growth of 2.2 per cent in the number of scientists and engineers working in the EU-25. Within Europe there were big differences – the UK and Germany experienced limited growth at 0.5 and 0.6 per cent respectively. Slovenia (+12per cent), Hungary and Ireland (each +8.3 per cent) had the most rapid growth in scientists and engineers during this period, whereas Bulgaria experienced a substantial decline in numbers (-10.3 per cent) as did Luxembourg (-6.9 per cent) and Estonia (-6.1 per cent). Some European countries have a limited number of younger workers.

Concentration of resources

The distribution of R&D workers in the ERA is heavily skewed; in 2003, 54 per cent of R&D personnel in the EU-25 were concentrated in Germany, France and the UK. Spain, Greece, Bulgaria, Hungary, Poland and Romania show low concentrations of professionals and technicians as a proportion of the labour force, Scandinavia, Germany, The Netherlands and Switzerland show some of the highest.

In 2004, seven of the top fifteen European regions with the greatest concentrations of scientists and engineers in the labour market were in Germany, two were found in both Belgium and Spain, and one each in France, Finland, the Netherlands and the UK. At the same time, Poland had five of the European regions with the least scientists and engineers in the labour force, Portugal had the three lowest concentrations, Greece had three, and Malta, Italy, Slovakia and Hungary each had one.

Diversity is evident in the sectors in which R&D is being conducted in the EU - partially influenced by where research funding is channeled nationally and by the presence of, and attractiveness to, business. In 2003, there were more R&D personnel in the EU-25 working in the business enterprise sector than in Government, or Higher Education. Luxembourg, Finland, Denmark and Sweden had the largest proportion of researchers working in business R&D.

There are more male R&D workers than female in Europe. A 'horizontal segregation' of female researchers exists; women tend to congregate in publicly funded research (in governmental research centres or higher education) rather than in the industrial sector. In the EU, as a whole, the majority of research & development expenditure is in the industrial sector but women are least likely to research in this sector. In Germany - the country with the largest research base in Europe - only 25 per cent of R&D staff were women in 2003. There is also evidence of vertical segregation. In the EU-15 men are on average 2.9 times more likely than women to end up in a top academic post. This obvious disparity between men and women's achievement of seniority cannot be explained purely by the lower numbers of women in science.

Internationalisation and mobility of R&D personnel

Little data is available on the proportion of foreign R&D or science and engineering staff that are working, or visiting, different countries in Europe, as European workers have the right to work in other EU countries there are few sources that provide data on intra-EU flows.

The last thirty years has seen a massive growth in the number of students studying at tertiary level in a different country from 0.6 million worldwide in 1975 to 2.7 millions in 2004 The US was the largest host of

foreign students in 2004 (22 per cent), followed by the UK (11 per cent), Germany (10 per cent) and France (9 per cent). The number of students undertaking tertiary level studies in the EU continues to increase, and had reached around 895,000 in 2002, an increase of 19% from 1999. Students studying in another EU country accounted for around half of all foreign students. The UK and Germany stand out as the two major EU host countries for students. Around a third of all foreign students in Finland, Germany and the UK study in science and engineering (although in total S&E students only accounts for 2 per cent of students in Finland, 10 per cent Germany, 13 per cent UK).

The ERASMUS scheme has been a major route to intra-European mobility during a first degree. In 1987/88, there were 3244 mobile students in the Erasmus scheme; this had grown to 123,957 in 2002/03. The natural sciences, maths and computing are among the least mobile fields under the Erasmus programme.

A study funded by the World Bank notes that skilled workers usually move to industrialized nations. Using census data they found that in 2000, the UK had the largest emigration stock of skilled workers in the world (1 542 011), followed by the Phillipines (1 260 879), India (1 021 613), Germany and China (1 016 007). The US was at tenth place (428 078).

Germany hosted the most S&T workers from elsewhere in Europe in its domestic S&T labour force, 84.5 per 1000, followed by the UK with 43.4 per 1000 and France with 32.7 per 1000. The UK, Germany, France, Belgium, Sweden and Luxemburg all hosted more European S&T workers than they sent to other countries in Europe. All countries in the EU-15 send more S&T workers to Germany than Germany sends to them.

A 2005 impact assessment of the Marie Curie Fellowship Scheme (FP4 and FP5) revealed unbalanced flows of fellows within Europe - certain countries received more fellows than went abroad. In proportion to the scientific work force per country, this was notably the case for the UK, Denmark, the Netherlands, and Norway. Other countries could be considered 'sending' countries. The Marie Curie Programme is responsive to these 'imbalances' and has developed measures with the objective of, 'promoting scientific and technological cohesion of the Community, particularly with respect to its less favoured regions.'

Mobility Strategy and the 'Balanced Growth' Debate

The increasing emphasis on the development of the 'knowledge economy' focuses attention on the role of international mobility as the basis for the transfer of knowledge and, in particular, scientific expertise. The broader ERA perspective promotes market liberalization, unfettered individual competition and mobility as the vehicles to achieve these goals. The 'free market' is the means by which to recruit and retain the 'brightest and the best' and to 'match' skills and resources optimizing scientific potential. Individual decision-making and the 'matching process' associated with it is central to the European Commission's commitment to meritocratic recruitment, competition and excellence and mobility, an important 'instrument for the transfer of scientific knowledge.' Mobility plays a critical role in the ERA in terms of;

- Raising the scientific excellence of *individual researchers* and furthering the creation of internationally renowned centres of excellence attractive to researchers from all over the world
- Improving the quantity and quality of research training, by offering the best available opportunities *regardless of where this expertise is situated.*

The wording of this text underlines the emphasis on individualism in the ERA; the whole thrust is to identify 'excellent' individuals and facilitate their mobility in order to maximize their scientific productivity.

The careful fusion of economic and social goals reflected in recent ERA policy, with social objectives essentially underpinning the competitive ethos, may be symptomatic of a new approach to the European Social Model. Rather than being presented as some kind of moral imperative with high social costs and potentially draining effects on competitiveness, equality objectives are now tied closely to the latter. The language and approach adopted in many of the ERA policy instruments and the Researchers' Charter and the Marie Curie Fellowship Scheme illustrate what Barnard et al refer to as the 'dynamic tension' that exists between the development of social rights and economic integration. For them, the year 2000 'saw an ever greater stress on the economic dimensions of social policy and in particular its links to the 'knowledge economy.' As evidence of this 'dynamic tension,' Barnard et al identify the emergence of a 'new conceptual

language' linking social and economic objectives. In particular, they refer to the use of the concept of 'capabilities' in the Supiot Report which 'opened up a new front in the argument over the role of social policy'. They explain the concept of capabilities as follows:

> *'The relevance of the concept of capabilities for the knowledge economy lies in the idea that mobilizing the economic potential of individuals is not simply a process of providing them with the necessary financial resources to exploit their endowments. Rather the institutional framework of the market has to be examined in order to establish how far it facilitates or constrains the potential of individuals to achieve their desired economic functionings.'*

Viewed in this light, European social policy plays a critical role in supporting economic progress and ensuring optimal productivity or as the authors put it, 'European social law and policy can now be firmly regarded as a 'productive factor' which aids competition rather than hindering it. In this context, the promotion of equality and quality (through competition) go hand-in-hand.'

The Lisbon objectives refer explicitly to the idea of 'sustainable economic growth'. What is unclear, however, is the unit of analysis. If one takes the whole of the ERA as the appropriate level of analysis then one might argue, as many scientists indeed concur, that intra-EU mobility is effectively no different to internal mobility within an individual Member State. On the other hand, if the aggregate effect of individual career and migration decisions, fuelled by policy and resource allocation decisions within the ERA, leads to serious imbalances in flows and significant losses to less developed countries then one might question the compatibility of free market economics with sustainability at Member State level.

The European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers explicitly recognizes these inherent policy tensions both in terms of researchers coming into the ERA from third countries and imbalances within the ERA:

> *'The development of a consistent career and mobility policy for researchers to and from the EU should be considered with regard to the situation in developing countries and regions within and outside Europe, so that building capacities within the EU does not occur at the expense of less developed countries or regions'.*

Conclusions

This report has provided evidence of the great diversification between members states in expenditure on science, sizes of research communities and the sectors in which research is conducted. Levels of internationalisation, clustering policy and mobility drives towards scientific hotspots may exacerbate these differences. Inherent in the European Research Area strategy lies a fundamental tension between the pursuit of two different dimensions of equality, namely individual equity (and the individual human right not to be discriminated against on grounds of nationality) and sustainable development within the European Union (sometimes referred to as 'balanced growth'). Although they are often not expressed as such, concerns around 'brain drain' within the ERA – and policy responses to it - need to be understood as facets of this wider debate.

Is there a fundamental tension between the commitment to individual equity and agency on the one hand and sustainable economic growth on the other or is the situation more complex and nuanced? Can the concept of capabilities, as Barnard et al propose, help us to understand these processes and gain a more accurate and nuanced understanding of what has become known as 'brain drain'. To give one example, to what extent might the free movement provisions coupled with the non-discrimination principle not only underpin the individual mobility and employment rights of scientists but also support their efficacy enabling them to realize their potential avoiding the risks of 'brain stagnation' or 'brain waste' that is often the consequence of 'staying put'. A number of respondents spoke of how the European Commission funded Marie Curie fellowship gave *'the opportunity to scientists from less-favoured countries to develop a career'* or, in another case, *'gave possibilities for Eastern European scientists to carry out high quality research in those areas which have much larger instrumental needs than those provided in the home country'.* Arguably in these cases, the alternative to mobility would be unrealized potential to the detriment of both the individual scientist, the sending and receiving country and European science as a whole.