POLICY IMPACT

ASSESS • EVALUATE • COMMUNICATE

BIS
Department for Business Innovation & Skills

Interactions between research capital and other research resources in UK Higher Education Institutions

Final Report

June 2013

MANCHESTER 1824

This document was prepared for BIS.

Authors

Mariell Juhlin, Managing Director, Policy Impact LTD.
Kate Barker, Senior Lecturer, MIoIR, Manchester Business School.
Dr Chiara Marzocchi, Research Associate, MIoIR, Manchester Business School.
Dr Thordis Sveinsdottir, Research Associate, MIoIR, Manchester Business School.

Disclaimer

Any enquiries about this report should be directed to: mariell.juhlin@policy-impact.co.uk.

Acknowledgements

The authors would like to thank all stakeholders that participated in the research with special thanks to interviewees and survey participants from UK Higher Education Institutions as well as staff in the UK Higher Education Funding Councils that facilitated data access. We would also like to thank HESA and the University of Manchester for providing feedback on the survey questionnaire. Lastly we would like to thank the BIS Steering Committee, David Rosenfeld and Rosa Fernandez in particular, for their feedback and support.

Contents

Tables

Figures

List of abbreviations

BIS	Department for Business Innovation & Skills
CIF	Capital Investment Framework
CSR	Comprehensive Spending Review
DELNI	Department for Employment and Learning Northern Ireland
HEFCE	Higher Education Funding Council for England
HEFCW	Higher Education Funding Council for Wales
HEI	Higher Education Institution
HESA	Higher Education Statistics Authority
JIF	Joint Infrastructure Fund
LFCF	Large Facilities Capital Fund
QR	Quality Related (Fund)
RCUK	Research Councils United Kingdom
REF	Research Excellence Framework
RIF	Research Investment Fund
RPIF	Research Partnership Investment Fund
SFC	Scottish Funding Council
SR	Spending Review
SRIF	Science Research Investment Fund
STEM	Science, Technology, Engineering and Mathematics

1.0 Executive summary

Purpose and Aims

This report was commissioned by BIS to Policy Impact Ltd in cooperation with the Manchester Institute of Innovation Research, University of Manchester. It analyses public funding for research capital in UK Higher Education Institutions (HEIs) and, in particular, how the funding streams support and interact with decision-making at the level of individual HEIs, including the interactions between research capital and other resources and performance over time. In order to provide BIS with baseline evidence, and to understand what the impact of cuts in Formula Research Capital (FRC)[1] funding associated with the 2010 Spending Review (SR) are, the study covers the following:

1. Longitudinal analysis of the structure of public research capital funding,
2. Cross-sectional analysis of the structure of discretionary research capital funding, and
3. Understanding complementarities between research capital funds and other resources.

Approach, method and main definitions

The study has used different methods for data collection and analysis, including a review of literature, comparative analysis of international evidence, a survey and interviews. Interviews with 27 stakeholders, including the higher education funding councils and several HEIs, were complemented by a review of secondary data sources and policy documents such as evaluations of past funding. An online survey aimed at Finance Directors in HEIs provided bespoke data to answer the central research questions. The 25 survey responses from some of the main recipients of public research capital funding, were combined with HESA and funding council data to construct a database and generate analyses.

The definition of research capital used in this report includes facilities and equipment funded wholly or partially through UK public funds and facilities and/or equipment owned and managed by the HEIs.

Research capital funding, funding strategies and HEI processes

There have been around ten years of a relatively stable funding environment for HEIs since the first research capital block-funding scheme (SRIF) was put in place. BIS and its partners have allocated just under £5 billion in research capital funding to UK HEIs between 2002 and 2015 through the formula-based funding stream. There is ample evidence of achieving benefits to UK research and industry from this funding. Meanwhile average allocations of public block funding for research (QR) have

[1] We define Formula Research Capital as dedicated, regular research capital funding delivered to HEIs by the funding councils that is wholly or partly allocated on the basis of a formula and that does not require an application from the HEI.

remained fairly level between 2005-2015 and amounting to around £15 billion in total over this 10-year period[2].

After the 2010 CSR, the average drop in available funds for formula-based research capital across the four funding councils was 58 percent, largest in Wales (a 64 percent drop) and the smallest in Scotland (49 percent less). This large reduction in formula funding can be viewed as a major policy shift and change in the funding environment.

All HEIs have seen their Formula Research Capital funding heavily cut or extinguished. The mean FRC allocation to the most research-intensive HEIs (in TRAC peer group A) [3] has fallen by £10 million between the CSR 2004 allocations and the 2010 CSR amounting to a 67 percent decrease. For the second most research-intensive group of HEIs (TRAC peer group B), the mean reduction in FRC allocations per HEI is £2.7 million. The overall number of institutions receiving allocations has dropped over time. In 2005/06, 149 HEIs received FRC compared to 119 in 2011/12.

Lessons from the international comparison are that the UK is the only country found in the comparison group (DE, DK, SE, NO, IS, US) that has reduced research capital funding. At the same time, it is the only country that earmarks funding for capital expenditure. No comparative figures on research capital funding or expenditure were available.

Formula-based capital funding has become more concentrated in the largest, most research-intensive institutions simply because of the funding conditionality, part of which is based on having secured other competitive project funding and part in proportion to levels of HEFCE QR funding and other external research income. This concentration is more apparent in the devolved regions due to Wales and Scotland applying thresholds that eliminated 6 Welsh and 10 Scottish HEIs from receiving the FRC in 2011/12.[4]

The most research-intensive HEIs (TRAC peer group A) has a much larger research capital spend than the other groups and report a mean research capital expenditure on small items of around £20 million per year in 2011/12, following the latest CSR, but are expecting to more or less recover to 2005/06 spending levels by 2015/16. Average annual expenditure among HEIs the second most research-intensive group (TRAC peer group B) amounted to just over £6 million in 2011/12. Although the average drop was not significant from 2005/06 levels, HEIs in this group remain less optimistic about the future and expect spending levels to drop to £5 million by 2015. Larger capital expenditure is limited to a handful of TRAC Peer Group A institutions and despite a sharp drop in 2011/12; it shows an upward rising trend from £14 million per year on average in 2005 to £19 million in 2015.

[2] The difference in reporting periods for QR vs. FRC funding stem from the fact that these funding stream have been allocated under different budgets in the past which hinders comparablility of data going back in time.
[3] For a definition of TRAC Peer Group please see **Table 6** on page 78 of the Data Annex.
[4] Some changes in number of HEIs over time are due to mergers.

Over time, HEIs have relied more heavily on their own sources (some of which are from other public funding schemes) to fund ongoing capital expenditure: on average, the proportion covered by own sources of funding more than doubled to just over 48 per cent in 2011/12 from just under 20 per cent in 2005/06. Some of this will be from other public funding streams. The short-term effect has been particularly dramatic for HEIs in the second most research-intensive group (TRAC peer group B) with a research income of 22 percent or more of total income (excluding the Russell Group that are mainly in TRAC peer group A), where we see a small rise in the proportion of funding from other public sources and a larger rise in funding from own sources. The larger-income, top research performers show more ability to generate alternative funds both public and private to sustain capital expenditure and this started before the present cuts in formula funding. TRAC peer group A members are also deliberately pursuing private sources of funding and appointing dedicated resources to secure investment. TRAC peer group B members have attracted less external funding and show a more varied response to sustaining expenditure. They report the importance of retaining central funds to a greater extent than HEIs in TRAC peer group A.

Research capital expenditure

Among the surveyed HEIs, there are differences between HEIs of different scale and research intensity, which relate to planning processes and motivations for research capital investments. The small HEIs devote more effort to internal planning and allocation of smaller capital investments in order to maintain standing and retain top researchers. The larger ones have central planning but more devolved powers for larger sums, and report recruitment of top researchers and improving research standing as the most important motivations for spending.

The top areas for research capital investment include the most resource-intensive ones including Medicine, Dentistry and Health, Engineering and Technology, and Biological, Mathematical and Physical Sciences. HEIs are more likely to invest in already strong areas than weaker, but potentially strategic, areas. Growing demands for capital investment from hitherto equipment-light disciplines (e.g. social science and humanities) will increase pressures on HEI budgets and prioritisation may become a larger issue than it is now.

HEIs are spending on research capital from private and other sources and these have partly replaced the formula funding. Although a source of optimism, there is a growing discrepancy between those institutions that find external funding and those that use their own sources of funding to sustain investment. Medium-income HEIs appear to be particularly dependent on the formula-based block grants. This is a worrying trend for these medium-income HEIs in the medium to long-term and may require consolidation, particularly if funding levels remain at similar levels to the present.

Wider impacts and the links between capital expenditure and research standing

Our findings suggest that, in the big picture, capital follows research excellence in the sense that the highest research performers not only manage to win a bigger proportion

of public funding, they are also better able to access substantial sources of private funding on the basis of reputation. This in turn bolsters the reputation of the high performers through outputs and development of expertise.

Future outlook

There is currently no requirement for HEIs to report to HESA on their actual or planned research capital expenditure. This hinders effective and on-going monitoring of the health of the research capital base in UK HEIs.

The funding councils have adopted varying strategies in relation to funding allocations. In Scotland and Wales funding is directed to the highest research performers. In England, HEFCE has adopted an approach aimed at ensuring stability and minimising perturbation. The consequences of these strategies are not yet known.

Evidence on the link between research capital investment and capacity for excellent research is only just emerging; our research highlights a vacuum in terms of the data available to monitor long-term outcomes associated with different funding approaches. More systematic monitoring would allow Funding Council to assess differential impacts of their funding strategies on HEIs of different sizes and research intensities.

Although it would make financial sense for many HEIs to share equipment and facilities, examples of this occurring are few and far between (except in Scotland). There are barriers such as competition between HEIs. There are also costs to sharing that need to be met. Also, no funding scheme (outside Scotland) incentivises equipment sharing between HEIs at present and there is no concrete evidence of increasing efficiency.

2.0 Background and objectives

The Department for Business, Innovation and Skills (BIS) has an interest in understanding how the public research capital funding schemes they support, interact, if at all, with decision-making at the level of individual Higher Education Institutions (HEIs). In particular, BIS needs to have a view of how recent changes to research capital funding allocations have affected capital investment decisions among HEIs and how this compares against longer-term trends. A base of evidence is now required which goes beyond case studies, to be able to explore quantitatively the relationships between capital grant allocations, other research income and performance. It is against this background that the current study on the interactions between research capital and other research resources in UK HEIs has been commissioned.

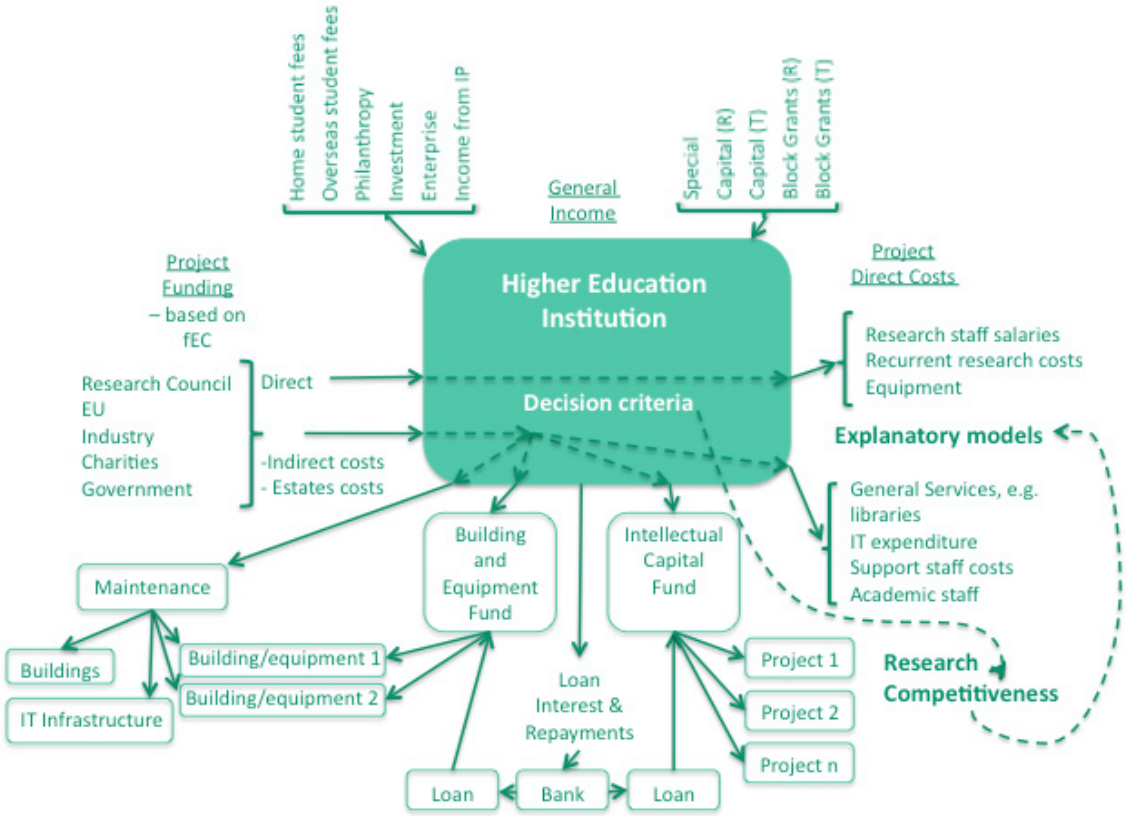
2.1 Background

BIS and its partners fund research in UK Higher Education Institutes (HEIs) with the goal of achieving the highest levels of excellence of outputs (benchmarked at internationally excellent standards) and socio-economic impacts which can be seen in terms of improved quality of life for citizens and competitiveness of UK firms.

Central Government funding for University research is mainly channelled through the Science and Research Budget and the dual route of institutional block grants, via the Higher Education Funding Councils on the one hand, and competitive (peer reviewed) project funding, via the Research Councils, on the other. Central Government funds in support of research capital investments are channelled to HEIs via these same BIS partners using formula-based approaches as well as competitive project funding and one-off, initiative-based schemes.

BIS and its partners allocate the funding, but don't necessarily know how the funding streams and pots are combined within the HEIs. The HEIs make decisions internally on how to make their investments and this represents something of a "black box". Significantly, UK HEIs have a large degree of strategic autonomy. BIS needs to understand patterns of research capital expenditure in order to anticipate the effects of reducing or increasing funding, particularly the overall effects on the science base and its capacity to remain world class and as a key component of the UK's innovation performance. The figure below, taken from the Wakeham review (2010), shows typical income and expenditure flows in HEIs. HEIs may deploy discretionary block grants as they wish (within the agreement rules). They may pass them back to departments and groups according to who "earned them", or retain some centrally for strategic investments. They may combine them with project-based funding and their own income from IP, philanthropy and so on. Discretionary, non-capital funding may be spent on research equipment and capital, but earmarked capital funding must be spent on capital items. Creating an overall view of expenditure patterns will complete an understanding of HEIs and research capital, which BIS needs in order to steer the sector.

Figure 1: Deriving explanatory models



Source: Elaborated on the basis of the Wakeham 2010[5].

Evaluations and economic impact studies of successive waves of research capital funding have all agreed that it has been highly effective in delivering improvements in research, research training, recruitment of researchers and benefits to users, including industry. At the same time there is evidence that capital investment in research has been curbed in past periods of financial stringency leaving university-based researchers with out-of-date equipment that can neither produce the highest quality outputs, nor be useful for industry, or for training researchers. At the end of the 1990s there was both anecdotal and systematic evidence that much of the UK's research infrastructure was out-dated. This led to a more systematic approach for funding research capital investments in HEIs. Research undertaken to date[6], as well as the international review which is reported in section 3 of this report, suggests that maintaining the quality of the science base requires attention to the steering of capital investments particularly since, as equipment and research infrastructure becomes more sophisticated, it also becomes more expensive, notwithstanding automation and productivity gains from the deployment of ICTs and e-science. The current report should hence also try and understand the extent to which capital follows research or whether excellence fuels yet more capital investment.

[5] UUK and Research Councils UK (2010) Financial Sustainability and Efficiency in Full Economic Costing of Research in UK Higher Education Institutions.
[6] For an early source, see PREST and CASR (2000) *Research Equipment Needs in UK Universities: a Snapshot Study* CVCP

2.2 Aims & objectives

The objective of the current study is to understand how public resources for capital are combined with non-capital resources for supporting research activity at the level of the Higher Education Institution. The study focuses on understanding the interaction between the availability of funding and trends in research capital expenditure over time, across disciplines and whether there are discernable spending models underpinning decision-making in the HEIs and factors that can explain any differences in patterns. The study also aims to establish the impacts, if any, of recent funding cuts, such as those associated with the 2010 Spending Review. More specifically, the study specification requested the following elements:

1. Longitudinal analysis of the structure of public capital funding overall considering:
    a. Broad allocations from BIS to its partners and where applicable how these partners subsequently allocate resources to HEI.
    b. Recent developments in the balance between discretionary and directed capital funding for research since CSR2010.
    c. Comparative assessment of sources and, where possible, levels of public funding for research capital in other countries, and how it is used.
2. Cross sectional analysis of the structure of discretionary capital funding considering:
    a. Early assessment of the aggregate balance in capital and non-capital funding from BIS and other sources across Higher Education Institutions before and after CSR2010.
    b. Inventory of uses of discretionary capital funding across HEIs (covering a plausible proportion of the funding).
3. Understanding complementarities between research capital funds and other resource including:
    a. Model understanding of how research capital funding interact with other non-capital resources at the level of inputs and at the level of outputs: is capital a lead or a follow factor in research excellence and does this role differ across HEIs?
    b. Test the implications of the model against the opinions of experts in the field.

3.0 Approach and methods

3.1 Methodology

The study has employed a mixed methods approach involving quantitative and qualitative data collection and analysis methods and covering secondary as well as primary data sources. This has involved undertaking:

- A review of existing published literature and a comparative analysis of international evidence drawing out possible lessons for the UK, including interviews with stakeholders in six other countries (see Annex 3 for a list of stakeholder interviewees).
- Qualitative interviews with various stakeholders including funders (HEFCE, BIS, HEFCW, DELNI, SFC), HESA and HEIs, to inform the study (see Annex 2 for interview schedule and Annex 3 for a list of interviewees).
- A review of secondary data sources, mainly from the UK Higher Education Funding Councils and HESA, particularly those covering discretionary and directed research capital income and expenditure at the level of HEIs.
- An online survey aimed at Finance Directors in HEIs (see Annex 2 for survey questions) with a view to capturing missing data to answer the central research questions.
- Development of a database of quantitative data at HEI level combining secondary and survey data to enable relevant quantitative, statistical and qualitative, explanatory analyses of the data against the research questions.
- Analyses and synthesis of data using various tools (Excel, SPSS version 17.0) and enabling the drafting of findings, conclusions and recommendations.

3.2 Participants in the study

A total of 27 interviews were held with stakeholders during the inception and interim phases. The online survey targeted all Finance Directors in English, Welsh, Scottish and Northern Irish HEIs. After the initial launch, and in order to boost responses, HEIs in TRAC peer groups A and B containing the top UK recipients of research capital funding where targeted with personalised emails and phone calls. This resulted in 25 completed survey responses (see **Table 7** in the Data Annex for a break down of the respondents demography). Despite the low number of responses, the survey provided good coverage in terms of recipients of formula-based research capital funding under last spending period[7] in all nations except Wales and covering 68 percent of all funding in England, 72 percent in Northern Ireland and 43 percent in Scotland.

[7] The percentages were derived by adding up the percentage of funding each respondent received from the total pot in the individual nation since the 2010 CSR. In the case of HEFCE and DELNI this covered actual allocations from 2011/12 through to projected allocations in 2014/15. For Scotland this reflected the 2011-12 allocation of the total budget available.

3.3 Definitions

The research has been guided by various definitions of research and research capital.

The definition of research capital used in this report includes facilities and equipment that are:

1) funded wholly or partially through UK public funds that are not restricted (e.g. SRIF), and
2) facilities and/or equipment owned and managed by the HEI (regardless of other funders involved).

Excluded hence are other public funds for designated capital equipment or facilities like those channelled through the Large Facilities Capital Fund or funds for facilities managed by the Research Councils.

As regards research capital expenditure it is defined as investments in buildings, renewal, upgrading of HEIs estates and research equipment.[8] The report tends to use the terms expenditure and investment interchangeably although it is recognised that investments can be planned and amortised over the length of the life of an investment that is different from actual expenditures made in any one year. This is why the terms research capital expenditure was used in the survey.

Given the diversity of HEI activities and research intensity, the definition of research applied in this study has been kept deliberately broad and is in line with the REF definition.

Dual Funding Support is defined as the system in which public funding for University research is provided via the twin route of institutional block grants from the Funding Councils based on periodic quality assessment exercises and funding won in peer reviewed competition from the Research Councils.

Dedicated formula-based research capital funding delivered to HEIs by the funding councils has been termed Formula Research Capital (FRC) throughout the report but is used interchangeably with the terms formula-based and discretionary block funding for research capital. The allocation of FRC and block funding for research, i.e. the mainstream Quality Related (QR) research funding, has been analysed using already established groupings of HEIs (i.e. TRAC peer groups), as defined in the guidance developed by the Joint Costing and Pricing Steering Group,[9] as well as on the basis of groupings derived from HESA income data.

[8] As defined in Moore et al. (2012): "Evaluation of Research Capital Funding (SRIF2006-08) to Higher Education Institutions 2006-2008", Report by PACEC to the four UK higher education funding bodies and the Department for Business Innovation and Skills, HEFCE, 2012.

[9] The guidance (http://www.jcpsg.ac.uk/guidance/2008/).uk/) was developed as part of an eight year project to develop effective costing and pricing approaches for Higher Education Institutions, and to encourage their implementation and use across the HE sector.

3.4 Caveats

In numerical terms, the overall response to the survey was low although not entirely unexpected. The survey was conducted during a busy time of the year, HEIs are likely to have received multiple parallel survey/information requests, the survey included new questions that required additional effort to complete, survey requests may not have reached its intended respondents due to personnel changes, etc. Despite this, as outlined above, the survey covered a majority of research capital funding in England and Northern Ireland and just under half in Scotland. Of course this implies a response bias towards those HEIs that received research capital funding in the past but this was considered less important given the emergent nature of the evidence-base and the need for information. Clearly, the fact that no HEI in Wales responded to the survey limits the explanatory variables available to interpret the Welsh funding data. This does not, however, limit the overall validity of UK level results around funding allocations since all UK Funding Councils provided this data.

Another possible limitation of the survey data is that the survey deliberately did not distinguish between expenditure in buildings versus equipment. The reason for this was that a more detailed breakdown would have made it untenable for respondents to take part. Hence, it is likely that the expenditure figures provided by the survey respondents are skewed towards investments in buildings.

Lastly, because the number of survey responses received was fewer than required for modelling and statistical testing, we have not attempted this type of analysis of the survey data.

4.0 International experience

The following chapter summaries the findings of an international comparison of research capital funding for HEIs in six countries besides the UK including: Germany (DE), Denmark (DK), Sweden (SE), Norway (NO), Iceland (IS) and the United States (US). The aim is to situate the UK policy for research capital funding for HEIs in an international context by identifying what other models of research capital funding exist elsewhere and what lesson, if any, could be applicable to the UK context. The evidence in this section draws on secondary sources[10] and interviews with university and policy representatives in the various countries (see the Annex for a list of stakeholders consulted).

4.1 Summary of lessons and implications

Overall, on the basis of the evidence assembled, which is by no means complete, it is clear that the recent economic downturn has increased the disparity between countries' effective R&D spend further with countries like Sweden and Norway increasing spending on Higher Education dramatically whilst many others such as Spain and Greece are cutting their spending. A report from the EUA shows that many HEIs affected by cuts in funding have adapted to cost cutting measures by sharing equipment and/or facilities both with other universities and industry, alongside entering into public-private partnerships to fund property development. Understandably, a majority of European universities are pessimistic about the future levels of public funding for teaching, facilities and research: although most recognise the need for greater financial sustainability, they also see public sources as crucial to survival.[11]

Although considerable debate has been ongoing for years in Europe about the need for research infrastructure investments to maintain and develop competitiveness, this debate has tended to focus on the large-scale infrastructure projects with little focus put on the role played by on-going, smaller-scale research capital investments at the level of individual HEIs. Hence neither Eurostat nor ERA-WATCH produces any comparative data on the levels of research capital funding or expenditure across the EU27 countries. However, the differences in the funding arrangements would make that difficult, and this may explain why this data is not available. The following table summarises and compares some of the key features across the countries in the comparison. In terms of systematic differences, the UK appears to be rather different than the others although it is worth bearing in mind that the sample is small and biased towards countries in Northern Europe. For instance, the UK appears to be the only country that provides targeted block funding for research capital. The other countries

[10] At the outset we sought published sources such as policy reviews, internationally comparative data from sources such as the OECD and EUROSTAT, DG Research of the European Union and the European Network of Indicators Developers as well as searching at country level and via ERA-WATCH which compiles information about research and innovation policies for the European Commission. This yielded very few results and no comparative data that could be compiled which primary data was sought through interviews.

[11] http://www.eua.be/Libraries/Publications_homepage_list/Financially_Sustainable_Universities_II_-_European_universities_diversifying_income_streams.sflb.ashx

tend to provide overall block grants for HEIs to spend as they wish. Having said that, most countries, including the UK, allow for a proportion of competitive, project-based funding to be used for capital investments.

The UK is knowingly the only country that has made explicit cuts to available funding in this area. The majority of countries have either maintained or substantially increased public funding for research in recent years. Nevertheless, because of the small sample, and the fact that no other country specifically earmarks funding for research capital, it may be that in the overall scheme of things UK HEIs are still receiving a competitive level of funding vis-à-vis other countries.

Table 1: Features of different funding research capital funding systems by country

Country/ Feature	Earmarked public research capital funding	Ring-fenced expenditure of research capital funding	Degree of freedom of expenditure at the level of HEIs	Role of research councils/funding bodies in Research Capital Funding	Recent funding trends
UK	Yes, dedicated block (formula-based) as well as project/Initiative-based schemes	Not since CSR 2010 but traditionally it has been the case	Medium to high, due to some conditionality, but ability to use research funding for capital	Four Funding Councils provide block funding and initiative-based funds, RCUK funds project-based funds	Cuts to available funding, Funding Council strategies diverging
DE	No, regional core funding for HEIs	No, HEIs decide on proportion spent on research capital	High, HEIs are free to spend their block funding as they see fit	DFG is the major funder for research and research capital	Slight increase in budget Creation of core facilities
DK	No, research block funding to HEIs, partly based on output since 2010 The government set aside six million in 2010 for the renovation of laboratories	No	High, HEIs are free to spend their block funding as they see fit though since they cannot own buildings they are tied into long leases	Agency for universities and internationalisation provides block-funding, various Research Councils provide project-based funding or funding for Centres of Excellence incl. facilities	HEI funding has been maintained
NO	No, overall research block funding to HEIs	HEIs usually earmark portion of block funding for research capital expenditure	High, HEIs are free to spend their block funding as they see fit	RCN funds RC through project and infrastructure funding	HEI funding has been increased
SE	No, overall research block funding to HEIs	No, HEIs decide on proportion spent on research capital	High, HEIs are free to spend their block funding as they see fit though since cannot own buildings they are tied into long leases	Research Council has Infrastructure funding initiative for facilities of national importance	HEI funding has been increased
IS	No, overall research block funding to HEIs	No, HEIs decide on proportion spent on research capital	High, HEIs are free to spend their block funding as they see fit	Research council funds equipment via project and infrastructure funds	HEI funding has gone up slightly after the financial crises
US	No, research capital funded by various other means (federal, regional, institutional funds, industry)	No	High	HEIs themselves fund a large share of RC.	HEI funding has been maintained, if slightly increased

As this comparison shows, there is very little evidence about how the real costs of ongoing research capital investments in HEIs compare between countries and whether certain types of funding schemes enable HEIs greater or lesser comparative advantages in terms of the research they are able to produce.

Some lessons for the UK that can be tentatively drawn from the international comparison are as follows:

- The mode of core grant and project grant funding gives strategic flexibility to HEIs, but seems to lead to under-funding of capital items. This characteristic is shared with other pluralistic funding systems (even a larger and more abundant one which is the USA and a closely monitored one which is Norway). Other governments periodically run research capital funding programmes to redress under-spending (as indeed has the UK).
- Competitive capital funding schemes and those requiring sharing of equipment are found, and justified according to the need to maintain research competitiveness. In the USA, the mission-oriented funders (for example the Department of Energy and Department of Defence) have also put in considerable sums of money for renewing research capital, and not only the basic research funders. We do not see such a spending pattern in the UK.
- It would be highly unlikely that the UK could move to a public ownership model as found in Sweden and in any case this model has not prevented underfunding and weakens strategic investment decisions at HEI level.
- It is likely that demands from hitherto equipment-light disciplines (e.g. social science and humanities) for high-end computer equipment may be on the rise.[12] The likelihood of increased funds in equipment pots is low; hence prioritisation may become a larger issue over time than it is now and include social sciences and humanities as well as natural sciences and engineering.

More detailed information about the situation in each country looked at as part of the review can be found in Annex 4.

[12] As evidenced through international policy stakeholder interviews and the fact that the level of applications and funding for Social Sciences and Humanities research infrastructure within the European Union Framework Programme for Research has increased in recent years.

5.0 Research capital funding in UK HEIs

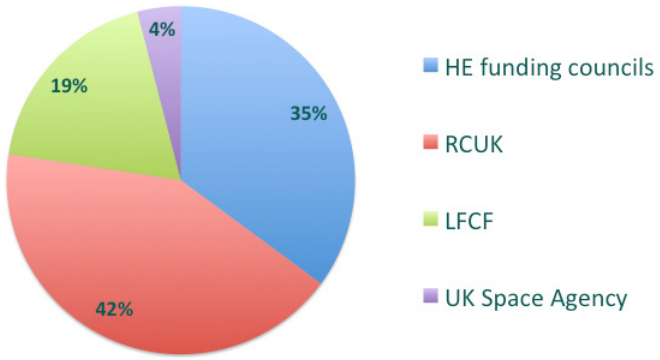
This chapter focuses on understanding the UK research capital funding landscape with particular focus on available funding schemes for research capital, BIS allocations to its funding partners and their subsequent allocations of funding across UK HEIs over time. The findings draw upon analyses and syntheses of interviews, published literature, secondary and primary data sources.

5.1 Funding landscape, structures and scale

Landscape of research capital funding sources

The Department for Business, Innovation and Skills (BIS) and its predecessors[13] have over time tended to provide funding for research capital investments across a range of partner organisations and schemes. The following figure (**Figure 2**) gives an idea of the distribution of total central government (BIS) funding for research capital under the current Science Budget (2011-2015). This indicates that the proportion of discretionary research capital funding channelled via the Higher Education Funding Councils in the four nations: HEFCE in England, DEL in Northern Ireland, HEFCW in Wales and SFC in Scotland, constitute around 35 percent of the overall central research capital budget available over the current budgetary period and constitutes the main source of recurrent, discretionary public funding for research capital to UK HEIs.

Figure 2: Central Government funds for research capital via BIS partners, CSR 2010



Source: Derived from BIS (2010).

Note: These figures exclude top up funding added by the Welsh, Scottish and N. Irish administrations.

Other central government funding set aside in the Science budget for research capital investments includes funding for research infrastructures of national and/or international significance through the Large Facilities Capital Fund (LFCF). Such facilities are not necessarily owned by HEIs themselves and are hence not the focus of this study. A relatively large proportion of public research capital funding (42 percent) is provided through funding via the UK Research Councils. In addition, there are initiative-

[13] Office of Science & Technology (OST) and Department for Innovation, Universities and Skills (DIUS).

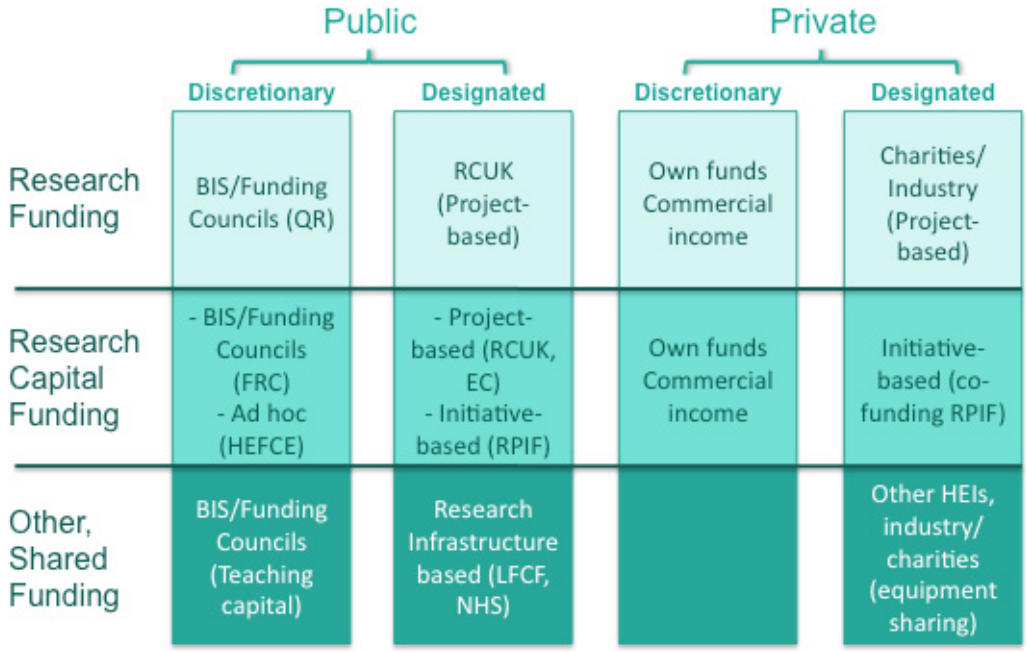
based funding schemes like the recent UK Research Partnership Investment Fund (RPIF) worth £300 million over three years (2012-15). Historically, ad hoc schemes providing dedicated public research capital funding have also appeared such as a two-year HEFCE scheme (2006-08) worth £88 million.[14]This was referred to in the HEFCE circular letter 03/2006 as "additional research capital funding 2006-07 and 2007-08".

Public funding to UK HEIs for University research and research capital purposes is hence mainly channelled via a dual funding structure consisting of institutional block grants and competitive funding. The institutional block grant for research also known as mainstream Quality Related (QR) funding is based on periodic quality assessment of research in UK HEIs via the Research Excellence Framework (REF).[15] The institutional block funding for research capital investment here termed Formula Research Capital (FRC) is made up of a succession of schemes over time. The block funding is discretionary in the sense that the HEIs themselves can invest the means as they see fit although capital funding is expected be used for capital expenditure whereas QR funds can be used more flexibly. Other types of public funding, such a competitive project or initiative-based, is inevitably tied to a designated purpose (see figure below). As highlighted in the international comparison, the UK is one of very few countries that separate out research capital funding from general block-based research funding for universities. The idea is to ensure that HEIs make ongoing capital investments in order to secure a competitive research base over time. Depending on the type, available funding can be used by HEIs to invest in own facilities and equipment or for using/sharing facilities owned/managed by others (either other HEIs, the RCUK and similar). As outlined above, the focus of this study is particularly on understanding how capital and non-capital discretionary funds are used to fund investments in own equipment and facilities.

The below figure tries to provide an overview of the types of funding available that could be used for own research capital expenditure (buildings, equipment or facilities).

[14] HEFCE, Circular letter number 03/2006, 27 February 2006.
[15] The REF succeeds the previous Research Assessment Exercise (RAE) last undertaken in 2008. The next REF is due in 2014.

Figure 3: Sources of funding for research capital in UK HEIs



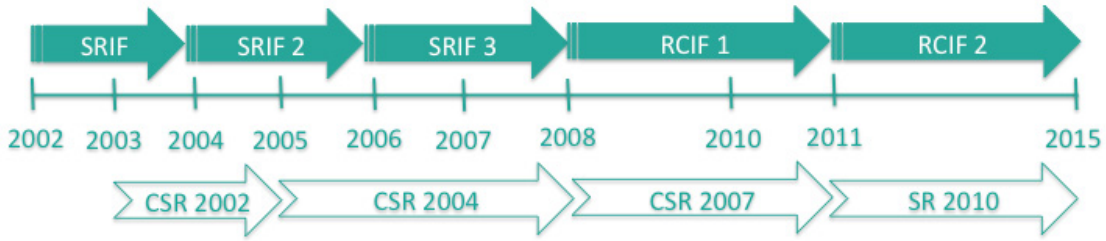
Clearly the figure above points to a complex picture in which discretionary income for research could be allocated to research capital expenditure or in which parts of teaching capital allocations could be used for dual purpose investments (in which teaching equipment and/or buildings are shared with research). It is also a situation in which directed funds for research capital expenditure could emanate from many levels of government; central as well as local and regional government, semi-public institutions (NHS) and international institutions (European Commission). By the same token, private funds could emanate from: own discretionary funds gained through IP or commercial ventures, project-based charities/industry funding, or stem from equipment/facility-sharing with other HEIs, industry or charities. These various income streams combine different allocation mechanisms some of which are forward-looking, backward looking or a combination of both.

For the purposes of the current study, the focus of analysis is on the structure and allocation of public discretionary funding for research capital delivered by BIS partners in the four nations.

Discretionary Research Capital Funding: evolution of schemes

The strategy and overall budget for public research capital investments are very much decided within the framework of the UK Government's Spending Reviews (SRs), a periodic process through which government spending priorities are set over a four year period. The below figure shows the timings of successive discretionary (formula-based) research capital programmes and related Spending Reviews. These can overlap but are increasingly falling within the same time scales.

Figure 4: Timeline – Spending Reviews & discretionary research capital funding schemes



1998 Comprehensive Spending Review led to the launch of a dedicated, discretionary scheme for research capital investment. The scheme known as Joint Infrastructure Fund (JIF) was co-funded by government and the Wellcome Trust and worth £750 million. Central Government allocated similar amounts of around £1 billion to SRIF and SRIF 2 with SRIF 3 slightly over this amount. The allocations had the intention of building upon and improving the state of research capital buildings and equipment that had started through the JIF programme.[16] The funds could be used for new premises, refurbishment of existing buildings and new, or upgraded, equipment for research.

Past evaluations of the SRIF funding have been extremely positive. JM Consulting reviewed the impact of the programme of capital funding allocated to the higher education sector through SRIF during its first two rounds[17] as part of looking into the future needs for capital funding across the UK on behalf of the four funding councils. It found that the funding had been "very successful" and had "facilitated an enormous improvement to research infrastructure at the UK level", which by 2006 was in a much better and improving state than had been the case in 2001. Moreover, the study estimated that the maintenance backlog, which had been estimated at around £10 billion for teaching and research capital in 2001, had been halved by 2006, reduced to a level in the order of £5 billion. The official evaluation of SRIF 2[18]by the Funding Councils uncovered wide-ranging and multiple benefits to HEIs ranging from improved research inputs and outputs as well as wider benefits.[19] HEIs were said to be able to behave more strategically than previously (although this evaluation was of SRIF 2 it also showed benefits from the first SRIF). Some of the reasons quoted for HEIs being in favour of continued funding through the scheme included: lack of ability to fund medium-to-high-cost equipment, horizontal/generic equipment and infrastructure or maintenance through project grants or other sources.

[16] The funding was aimed at: contributing to the long-term financial sustainability of HEI research activities and the physical infrastructure supporting them; contributing to addressing past under-investment in HEIs' physical infrastructure for research; promoting collaborative partnerships between HEIs, industry, charities, government and NHS trusts; and, promoting high-quality research capability in areas of national strategic priority, as set out in the government's ten year investment framework for science and innovation. Moore et al 2012, p 18

[17] JM Consulting (2006): "Future needs for capital funding in higher education; A review of the future of SRIF and Learning & Teaching Capital", HEFCE, 2006.

[18] Technopolis (2009) Science Research Investment Fund: a review of Round 2 and wider benefits report to HEFCE. The methodology was based on surveys and case studies, but provided sufficient evidence of the success of the schemes in terms of achieving objectives.

[19] Benefits included improved research productivity, research performance, and new types of research. The funding was also found to promote inter-disciplinarity, research training and more collaboration between HEIs as well as generating wider benefits such as business engagement, recruitment and retention of researchers, even job creation (including 3,300 new posts).

A later evaluation study, covering the third round of SRIF[20] demonstrated very similar outcomes and impacts, and concluded that SRIF 3 was a highly successful funding instrument.

The 2007 Comprehensive Spending Review announced a new programme, RCIF, which included transitional funding in its first round. In addition to the previous SRIF criteria for funded projects around renewal and remedial action, collaboration and high quality research capability, RCIF added in criteria concerning carbon emission reductions as a result of the investments. The total value of RCIF (1) was £1.3 billion for 2008-2011.[21]

The 2010 Spending Review maintained the science budget in cash terms over the period of the review at £4.6 billion per year. However, the discretionary research capital block funding (formula-based) was subjected to cuts documented in this report. BIS took an overall cut of 52 percent in its capital budgets and a 25 percent cut in Departmental Programme and Administrative budgets for the period.[22] The government has aimed to offset this overall reduction in discretionary funding by introducing a new initiative-based scheme in which HEIs need to leverage government funds from the private sector at a ratio of 2:1.[23] Announced in the March 2012 budget, the Research Partnership Investment Fund (RPIF) invited HEIs with a "significant track record of research excellence" to bid for research capital project funding within fairly short time windows. According to the BIS website, £300 million was allocated to the scheme over 3 years and projects of at least £10 million up to £35 million of public funding were eligible. The projects, to be selected on a competitive basis, must demonstrate that they will enhance research facilities, encourage strategic partnerships, stimulate additional investment and help the research base contribute to economic growth. In the first funding round a total of £220 million was allocated to 14 institutions. Not surprisingly, the Russell Group HEIs have been best placed to make the case for research excellence, industry or other user relevance and to leverage additional investment as required by the rules. With RPIF, BIS has taken a different approach to capital funding focussing on large projects and private-public partnerships. This is a change from the block funding allocation. By holding back a sizeable amount of funding, there is some concern among funding council partners in the devolved administrations that such new funding approaches may clash with those of the devolved governments.[24]

An emerging agenda for research capital: equipment sharing

Following the Wakeham review, which considered the financial sustainability of research undertaken in universities and other institutions of higher education in the

[20] PACEC (2012) Evaluation of Research Capital Funding (SRIF 2008-08) to Higher Education Institutions 2008-2008, report by PACEC to the four UK higher education funding bodies and the Department of Business Innovation and Skills
[21] HEFCE (2008) 2008/04 Capital Investment Fund.
[22] BIS (2010): " The allocation of Science and Research Funding 2011/12 to 2014/15. Investing in World-class Science and Research", Department for Business, Innovation & Skills, December 2010.
[23] The HEIs have had to double the funding, that is to find £2 to match every £1 requested.
[24] Stakeholder interviews.

United Kingdom, many HEIs have formed regional groups (e.g. N8[25], GW4[26], M5[27]) to consider and act upon the following recommendations made:

> "*a greater intensity of utilisation of assets by HEIs should be encouraged, particularly the sharing of research equipment and facilities.*'(p.6)[28]"…and… *"the assessment processes of the Research Councils should encourage more intensive use of existing assets across the research base."* (p.7)

With limited discretionary capital available, it remains clear that an increase in the extent of sharing of research equipment is required and needs to be facilitated. The N8 group has carried out extensive preparation work to facilitate increased sharing between its universities.[29] The synthesis report (Georghiou, 2012[30]) based on the first phase of their work reveals that there are many barriers to sharing, e.g. cost (facilitation, booking, training, travelling etc), competition within the field of science, ownership barriers, and IPR barriers.

When discussing increased sharing of scientific equipment, the issue of cost comes to the forefront as sharing ideally, as presented in the Wakeham review, should lead to savings overall. The question as to whether implementing greater sharing will end up costing facilities and individual scientists more in the long term thus becomes very important.

A study by Halfpenny, Georghiou and Yates 1997[31] revealed that equipment sharing requires substantial management input and is far from cost-free. Firstly, charging and access arrangements need to be established. Daily rates need to be calculated and they need to cover cost and depreciation to an extent. These may however not be so high as to act as a barrier for possible users, some of whom may have limited funds, such as PhD students and post-docs. Secondly, increased use will inevitably lead to higher levels of maintenance and these will need to be costed in. Thirdly, facilities and labs may need to hire additional staff to supervise and/or train possible users, for managing bookings or to control access. The work of the N8 group, which is outlined in work strand and synthesis reports, confirms these issues.

As of yet, work in the area of facilitating research equipment sharing between HEIs has not indicated whether significant cost savings will be made. The N8 group's report on the issue states that "sharing is far more likely to be an economic proposition when larger items are under consideration. There is no fixed cut-off as maintenance and

[25] http://www.n8research.org.uk/
[26] http://www.bath.ac.uk/news/2013/01/24/gw4-announcement-2/
[27] http://www.m5universities.ac.uk/
[28] *Financial Sustainability and Efficiency in Full Economic Costing of Research in UK Higher Education Institutions.* Report from Research Councils UK and the Universities UK Task Group (2010) Chair: Sir William Wakeham
[29] http://www.n8research.org.uk/assets/N8%20WorkstrandreportsJune2012.pdf
[30] Georghiou, L. (2012)On behalf of the N8 Research Partnership. *Sharing for Excellence and Growth.* Available at: *http://www.n8research.org.uk/assets/14137%20N8%20Sharing%20for%20Excellence%20and%20Growth%20Report_WEB.pdf*
[31] Georghiou, L. and Halfpenny, P. (1997). Assessing the Stock, Condition and Needs for Research Equipment in British Universities. In *Equipping Science for the 21st Century*. Irvine, J.M. et al. (eds.) Cheltenham: Edward Elgar Publishing Ltd.

other requirements vary but it is unlikely that equipment below a threshold of between £200-500k will be viable for anything beyond casual opportunities" (Georghiou, 2012:1). The report furthermore points out that the N8 Universities are collaborating on bids for large scale equipment purchases, which will be shared between the member universities and that new equipment procured in this manner is likelier to facilitate a more successful sharing culture than older equipment which already has established ownership and sharing patterns.

Discretionary research capital funding: strategies & trends

On a strategic level, the Funding Councils in England, Scotland, Wales and Northern Ireland distribute the discretionary, formula-based funding for research capital (FRC) in agreement with BIS to fund excellence wherever it is found but applying varying strategies and within very different higher education contexts. On an operational level, there are many similarities in the way that funding is allocated to HEIs but also differences. The overall cuts associated with the latest CSR seem to have prompted the adoption of new and more differentiated strategies across councils, which will be further explored below.

HEFCE, as the biggest funder, allocates capital funding according to a formula that takes into account how successful HEIs have been at securing research income from UK Research Councils and other, competitive sources as well as each HEIs' research competitiveness following the Research Assessment Exercise (RAE). For instance, SRIF was allocated to HEIs on the basis of a formula driven by research excellence and volume, partly according to QR allocations and partly based on external research income. In SRIF 3, 50 percent was allocated in proportion to HEIs' formula funding for research and the remaining 50 percent allocated on the basis of the combined total of HEI external research income. Since 2008, HEIs have been allocated capital investment funds for teaching and research allocated by formulae. The Research Capital Investment Fund (RCIF) is given out as Research Capital (based on the QR grant and other external sources of income) and HEI Research Capital (based on competitively awarded grants from RCUK organisations). The latter is to act as a top up for the 80 percent of Full Economic Costs that the Research Councils give to HEIs. Similarly to the QR funding, discretionary research capital funding is backward looking but with the added element of being partly based on successful competitive project funding.

Where the funding councils' allocation strategies vary particularly is in relation to the minimum amount of competitive funding needed in order to benefit from the formula-based research capital funding. These differences have recently been accentuated through the councils' varying responses to the 2010 CSR cuts in overall funding.

The proportion of the budget allocation set aside for formula-based research capital funding in England post-2010 is roughly a tenth of the non-capital QR funding. HEFCE allocates most of the research capital allocation to English HEIs using a formula. The

remainder is used to fund particular initiatives such JISC[32], SDF and the Revolving Green fund. In fact, in the context of recent reductions to research capital, HEFCE has maintained investment in museums, galleries and collections and JISC, which are all highly relevant to research.

Traditionally in England, the HEFCE funding formula for research capital has contained two objectives: one to increase/maintain capacity and the other to fund excellence where it occurs. The first would tend to act in favour of funding more HEIs. Funding HEIs with highest level of excellence has tended to concentrate funding to fewer players because of the stratified nature of the HEIs (i.e. the varying levels of research excellence of different HEIs). There is a minimum threshold amount of £50K Research Council income per year needed in order to qualify for discretionary research capital funding. This means that institutions with less than the threshold in England do not qualify to get formula based capital funding from HEFCE. HEFCE's has chosen to maintain its comparatively low threshold. This fits with HEFCE's response to the recent funding cuts, in which it has pursued a funding strategy aimed at ensuring stability and minimising perturbation in the sector. In other words, the post 2010 CSR strategy has been to ensure that as many of the previous recipients as possible still got something. Against this background a low threshold makes sense.

The response to recent cuts elsewhere has been very different. In Wales it has meant adopting a threshold for the first time and one that is five times higher than HEFCE's at £250k. This forms part of a clear strategy in the sense that Welsh policy is aimed at focusing both research capital and QR funding to the better research performers. In the case of research capital, this means that a relatively small number of HEIs (4 at present) currently benefit from this funding in Wales. In Scotland, allocations are based on the percentage of total RCUK research income received by institutions averaged over a period of 5 years. The SFC uses the latest 5-year data set from RCUK to allocate the budget. Similarly to Wales, the latest cuts have prompted the Scottish funding council to introduce a £100k funding threshold (in place since the financial year 2011-12). The introduction of a threshold might be a way for the SFC to address the issue of sufficient scale amidst the cuts. The Northern Irish situation is different from the other nations all together, both in terms of scale and when allocations are made. Not only does Northern Ireland only have two main HEIs that receive research capital funding, the Department's funding is also subject to accountability regulations that do not apply to any other agency. These regulations, which are strictly enforced by the National Audit Office in Northern Ireland mean that DEL cannot, neither in principle nor in practice, pre-allocate funding to its two HEIs. Instead the HEIs need to show proof of actual expenditure and then apply for a refund. This can create issues as regards to budgeting and matching funds for investment.

Another difference between the UK funding councils is that the Scottish and Welsh Funding Councils have since the 2007 CSR, allowed for HEIs to use their capital allocations, consisting of both teaching and research capital, for whichever purpose

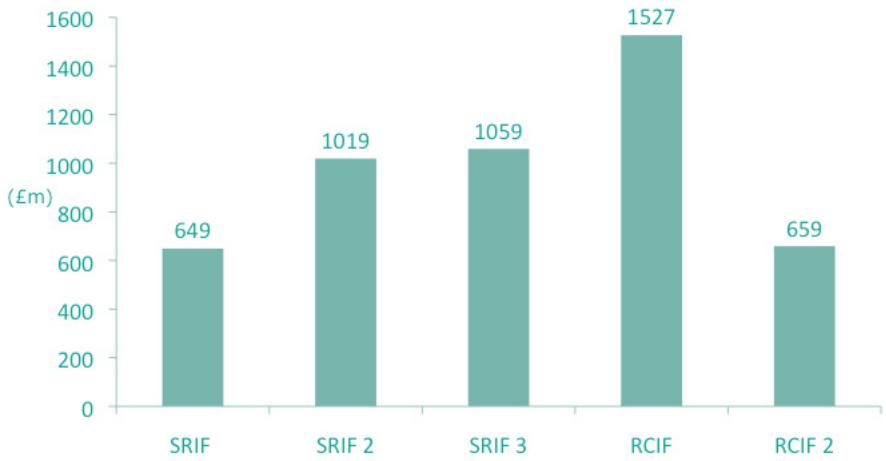
[32] JISC is a registered charity that works on behalf of UK higher education, further education and skills to champion the use of digital technologies.

they like. In fact, the SFC has invested more than £254 million in a Formula Capital Investment Funding scheme between 2008 and 2013, which Scottish HEIs can use either for teaching or research capital investments. The funding is allocated on the same percentage basis as the main teaching grants, which makes it more comparable to teaching than research capital funding in for instance England. The total learning and teaching capital funding allocated to English HEIs by HEFCE over the same period amounted to just over £1.1 billion.

Discretionary research capital funding: overall available funds

In Scotland, Wales and Northern Ireland, UK Central Government FRC funding should, at least in theory, be matched and combined with national funds before being allocated on a formula-basis to HEIs in the respective nations. The following figure (see below) shows that an estimated total of £4.9 billion has been made available to UK HEIs in formula-based research capital funding between 2002-2015. It shows a steady increase of funding over the first four schemes before a sharp drop under the current scheme (see **Table 8** in the Data Annex for more details).

Figure 5: Total research capital formula funding (£m)



Sources: DELNI, HEFCW, HEFCE, SFC, and BIS (2010).

Notes: Figures in cash terms, not adjusted for inflation.

How and when Central Government funding is matched varies between the devolved administrations (see **Table 8** in the Data Annex for funding levels). For instance, as already explained, the SFC has in parallel to RCIF provided funding that can be used for either teaching or research capital. As regards Wales, HEFCW has to apply for matched funds from the Welsh government every year and does not have capacity therefore to plan for capital funding from this source for, say, a 4-year period. As already stated, funding from BIS has to be matched as a condition of its disbursement, but the annual cycle reduces certainty.

As indicated above, overall funding levels are very much a function of the strategies and frameworks set as part of the Spending Reviews. Looking at funding levels across

the nations the average drop in formula research capital funding between CSR 2004 and 2007 was 10 percent (see **Table 9** in the data annex for details). If matched funding by the SFC is assumed, Scottish HEIs were the only ones to see funding increase with 25 percent. England retained 95 percent of the funding levels whilst the biggest drop was seen in Northern Ireland (40 percent less) followed by Wales (19 percent less). Some of the drop in Northern Ireland can be explained by the fact that a substantial amount of funding had been allocated under SRIF3 to deal with a legacy of underinvestment in estates and research equipment.

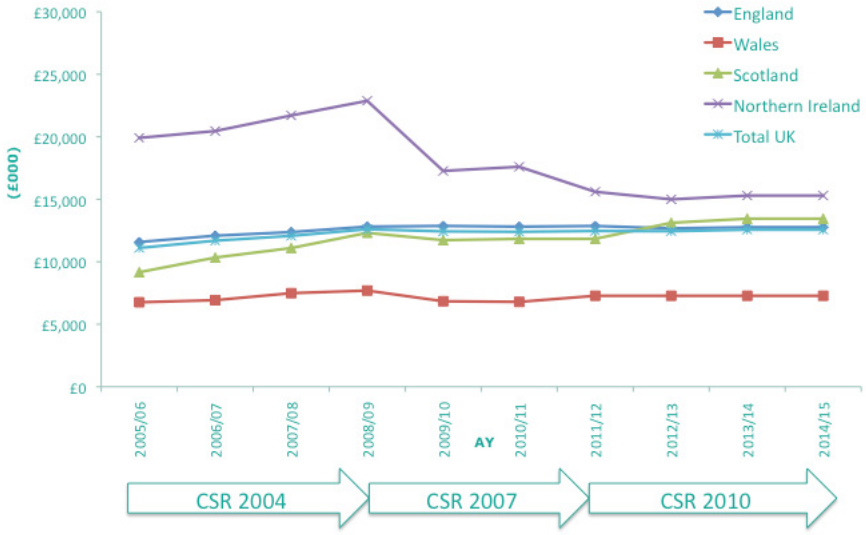
A much bigger drop in funding levels can be seen in the latest CSR. The average drop in available funds for formula-based research capital was 58 percent across all Funding Councils with Wales experiencing the biggest drop in percentage terms (64 percent less) and Scotland the smallest (49 percent) between CSR 2007 and 2010 levels. This assumes that HEFCW and the SFC largely match Central Government funding for the last two years of the CSR cycle and that the SFC matched RCIF funding under CSR 2007.[33]

5.2 Funding allocations and strategies across HEIs

Discretionary research capital funding: funding allocations across HEIs

The following two figures show the average mainstream Quality Related (QR) funding and Formula Research Capital (FRC) allocations made by BIS partners to HEIs in the different nations based on data from the funding councils. The first figure shows that overall, average QR allocations have remained stable over a 10-year period (2005-2015), except in Northern Ireland where it has seen a decrease.

Figure 6: UK HEIs - Mean mainstream QR funding over time by nation



[33] Both HEFCW and SFC have indicated to the research team that they are budgeting for matched funds in 2013-14 and 2014-15. Given the requirement for matched funding, SFC confirmed that this could be assumed under RCIF.

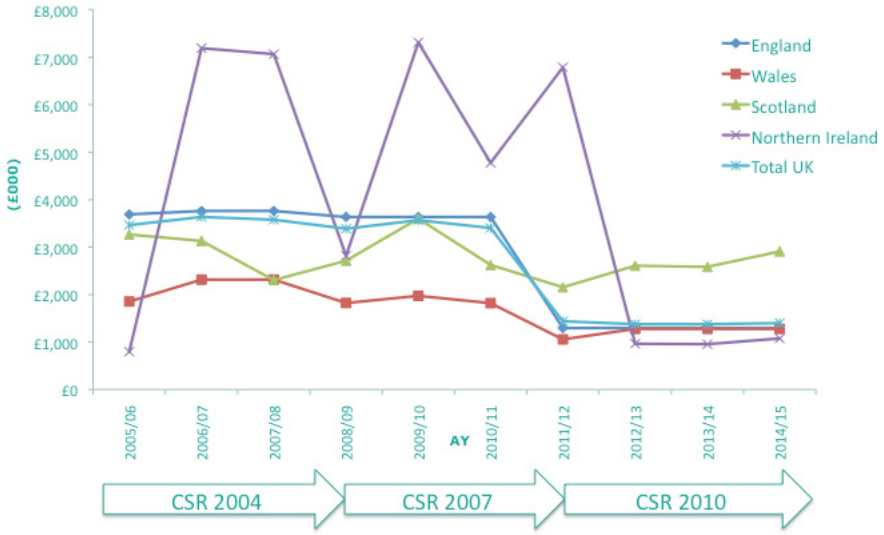
Sources: HEFCW, HEFCE, SFC, and DELNI.

Notes: Values for Welsh, Scottish and English allocations for AY 2013-14 and 2014-15 calculated on the basis of overall budget estimates and average proportions of funding received in the preceding two years. This approach was validated by the respective funding councils. See **Table 10** in the Data annex for full mean allocations and

Table 12 for numbers of HEIs. The "Total UK" figures in the figure relate to the average for the UK as a whole.

The situation as regards Formula Research Capital allocations, the average UK trend is one of reduced levels of funding following the latest spending review in 2010 (see figure below) although average allocations varied considerably between years and nations, particularly in Northern Ireland and Scotland. Although overall funding increased between SRIF and RCIF (see **Figure 5**), because RCIF was spread over more years (see **Figure 4**), the mean allocation per annum has remained stable.

Figure 7: UK HEIs - Mean Formula Research Capital funding over time by nation



Sources: DELNI, HEFCW, HEFCE, SFC, and DELNI.

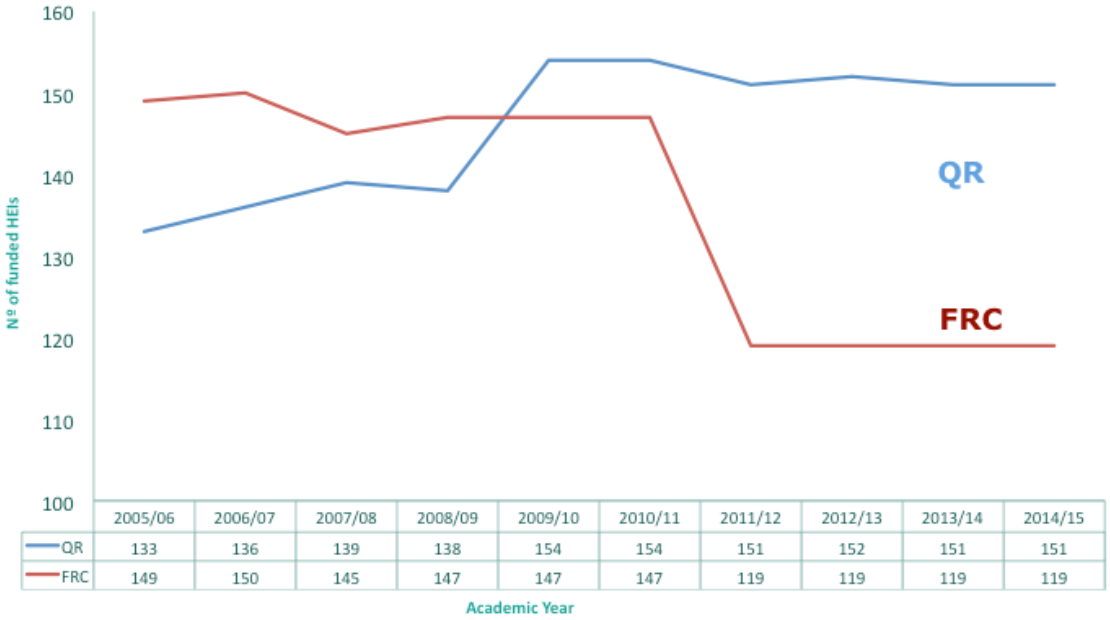
Notes: Values for Welsh and Scottish allocations for AY 2013-14 and 2014-15 calculated on the basis of overall budget estimates and average proportions of funding received in the preceding two years. This approach was validated by the respective funding councils. See **Table 11** in the Data annex for full details. The "Total UK" figures in the figure relate to the average for the UK as a whole.

Of the 166 higher education institutions based in the UK[34], 131 of these (79 percent) are found in England, 19 in Scotland (11 percent), 12 in Wales (7 percent) and 4 in Northern Ireland (2 percent). Looking at the numbers of HEIs receiving Formula Research Capital versus QR funding over time, they seem to be following rather opposite trajectories (see **Figure 8** below). Whereas more institutions have been receiving QR funding, the numbers getting FRC funding have dropped over time. The new institutions gaining QR funding are all smaller/specialist teaching institutions (TRAC peer groups F and G) with the biggest increase seen in England. Whereas the increase in institutions receiving QR funding has been gradual, the drop in institutions gaining FRC funding has been sudden and a direct result of the funding councils' response to overall cuts as part of the latest CSR. The HEIs loosing out on FRC after 2010 are principally either institutions with the smallest research income (between 5-8 percent of total income) or pure teaching institutions (TRAC peer groups D to G). However, there are differentials across nations prompted by the different strategies

[34] This is on the basis of HESA data.

adopted by funding councils. For instance, in Scotland and Wales no institutions outside out peer groups A-C are funded whereas in England, the reduction has been subtler. There, the smallest institutions (peer group D) are still receiving something and the biggest drop in the number of institutions funded has been among the smaller teaching institutions (notably peer group F).

Figure 8: UK HEIs - Numbers funded, by type of funding and academic year



	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
QR	133	136	139	138	154	154	151	152	151	151
FRC	149	150	145	147	147	147	119	119	119	119

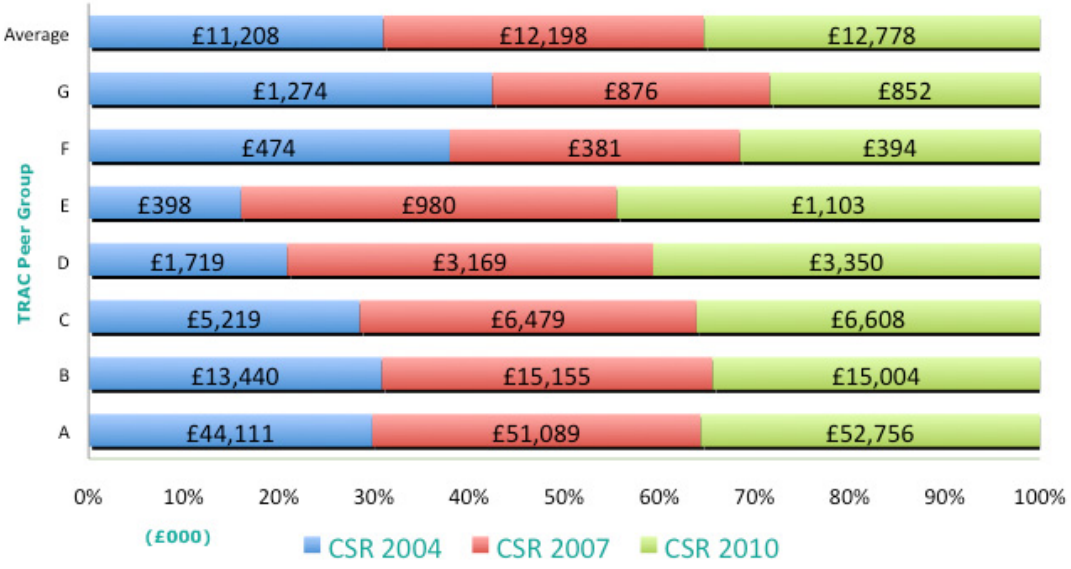
Sources: DELNI, HEFCW, HEFCE and SFC.

Notes: The fall in the number of recipient HEIs varies between devolved administrations. Between 2010/11 and 2011/12 the drop in England was 10%, in Scotland 56%, in Wales 60% and no change in NI. See

Table 12 in the Data Annex for a break down.

These findings are in line with a recent report showing that the concentration of mainstream QR fell between 2002 and 2010 pointing to a moderating influence on the concentration of this income stream.[35] This is due to the change in the operation of the RAE in 2008 compared to its predecessors: in 2008, subject areas were given a profile of performance ratings and not one simple grade. This allowed for "pockets" or "islands" of excellence to receive QR funding, meaning that excellent small teams or individuals in teaching-focussed institutions got access to QR. Hence overall, looking at available QR funding across CSRs and peer groups, average QR funding has either increased or been maintained over the period with the exception of the smallest specialist teaching institutions (see **Figure 9** below). However as would be expected, given the policy emphasis on research excellence, peer group A (representing all Russell Group institutions) has seen the largest rise in average available funding over time securing QR funding many times that of the smaller research institutions (with research income of up to 8 percent of total income i.e. peer groups D-G). This shows how the formula can generate greater disparity between the top research performers and the rest when funding levels are larger, which would be expected.

Figure 9: UK HEIs – Mean QR Funding Available per year by CSR and TRAC peer groups



Source: HEFCE, HEFCW, DELNI and SFC.

Notes: The allocations for AY 2013-14 and 2014-15 were calculated on the basis of overall budget estimates and average proportions of funding received in the preceding two years. Details can be found in **Table 13** in the Data Annex.

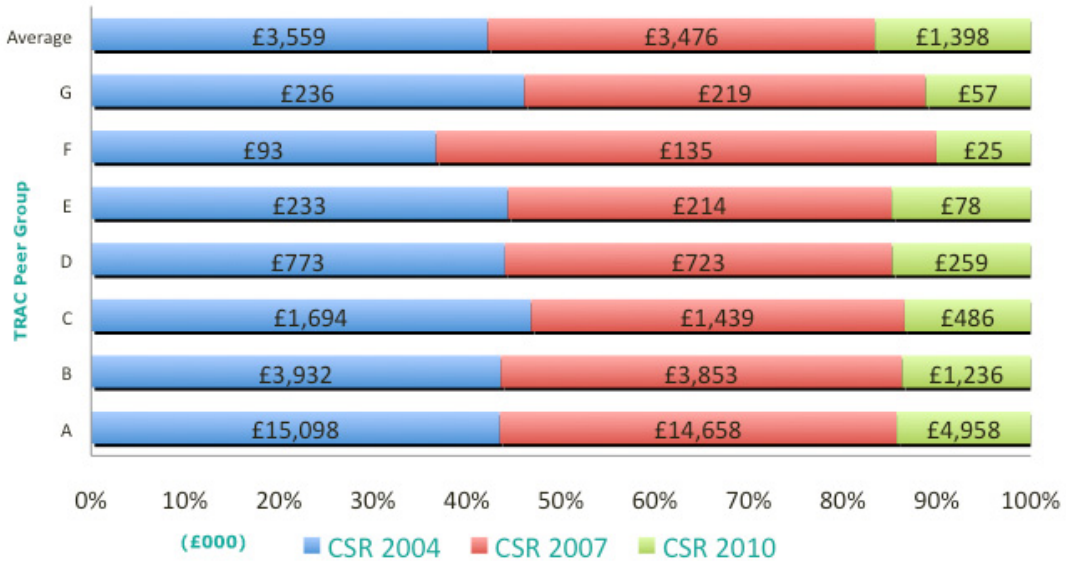
Looking again at the FRC allocations, the following figure shows the total annual FRC funding available by Spending Review and by TRAC peer group.[36] It shows that the

[35] Hughes, A. et al (2013).

[36] The annual breakdown provides a more comparable picture than looking at the total mean allocations across peer groups since CSRs have different durations.

funding allocations dropped by 69 percent across the board after the 2010 CSR. As already pointed out, the fact that the lower TRAC groups lost out in terms of Formula Research Capital funding is both due to the overall drop in available funding after 2010 and a deliberate strategy to focus on the highest research performers but could also partly have been exacerbated by a tougher overall climate for competitive, project-based funding. As a consequence of the latter, these institutions would not have qualified for research capital funding to the same extent as before, despite gaining more QR in many cases. In addition to the actual cuts, it is also worth bearing in mind that over time, because of inflation, purchasing power will have eroded meaning that not only will HEIs, on average, be facing lower budgets than years ago; they will also be less able to purchase equipment for the same amount of funding.

Figure 10: UK HEIs – Mean FRC funding available per year by CSR and TRAC peer groups

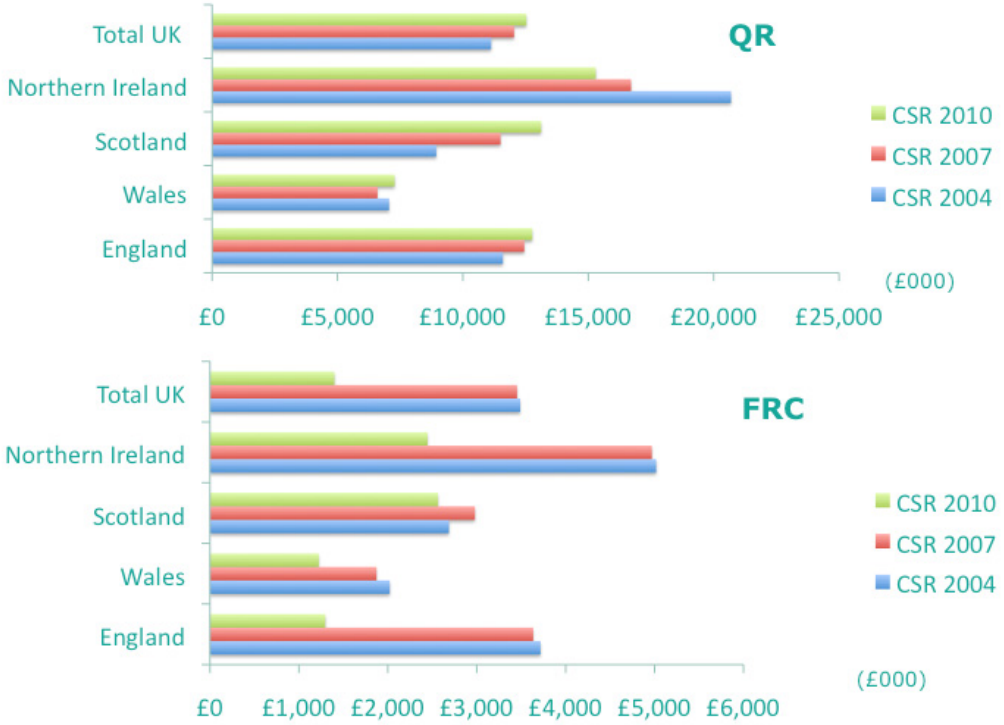


Source: HEFCE, HEFCW, DELNI and SFC.

Notes: The allocations for AY 2013-14 and 2014-15 were calculated on the basis of overall budget estimates and average proportions of funding received in the preceding two years. Details can be found in **Table 13** in the Data Annex.

In terms of distribution of average available amounts of funding across the UK nations over time, Scotland has overall faired well both in terms of mainstream QR as well as Formula Research Capital funding. The following tables compare means by country and type of funding.

Figure 11: UK HEIs – Mean QR and FRC funding available per year, CSR and country



Source: HEFCE, HEFCW, DELNI and SFC.

Notes: Details can be found in **Table 13** in the Data Annex. The "Total UK" figures in the figure relate to the average for the UK as a whole.

These figures suggest that Scotland and Northern Ireland, in particular, have done well over time to retain, on average, higher levels of FRC funding per HEI than England and Wales. The low average funding available in England can largely be explained by the fact that HEFCE has kept a low threshold, maintaining funding for as many HEIs as possible despite the overall cuts, which is bringing the average down.

Given the high number of HEIs receiving funding in England, it is worth looking briefly at the regional distribution of funding there particularly since it varies considerably over time. The South West increased its share if FRC funding four times over the last three CSR periods (see **Table 2** below). The East of England and the North West almost doubled their capacity to attract funding between the 2004 CSR and the 2010 CSR whereas London's share on the contrary was halved as part of the latest spending review. Regardless of the sharp cuts that the London area has experienced, increases in FRC funding observed is mostly spread across the south of England, whilst Northern regions, with the exception of the North West, are either losing out or remaining stable.

Table 2: Formula research capital by English regions – percentage secured by CSR

Region	CSR 2004	CSR 2007	CSR 2010
East of England	11%	11%	24%
West Midlands	5%	4%	4%
South West	3%	8%	12%
London	14%	14%	7%

Region	CSR 2004	CSR 2007	CSR 2010
North West	5%	7%	10%
Yorkshire & Humber	23%	20%	13%
South East	18%	16%	16%
East Midlands	12%	10%	9%
North East	9%	10%	5%

Source: HEFCE.

6.0 Research capital spending in UK HEIs

This chapter describes findings in relation to research capital expenditure patterns across HEIs including variations in spending models and other explanatory variables and drawing upon evidence from the interviews, online survey and secondary data analyses with emphasis on survey results. Overall, 25 completed survey responses were obtained of which the majority were HEIs in either TRAC peer group A (16 responses) or TRAC peer group B (7 responses), see **Table 7** in the Data Annex for a break down of the respondents demography. Responding HEIs were mostly either large with incomes per annum exceeding £600m (N=12) or medium-income HEIs with incomes of £300-600m (N=8). A much smaller proportion of responding HEIs had incomes under £300m per annum (N=5). The survey respondents covered a large proportion of formula-based research capital funding under last spending period[37] in all nations except Wales and covering 68 percent of all funding in England, 72 percent in Northern Ireland and 43 percent in Scotland.

6.1 Research Capital Expenditure

Evolution of capital expenditure

The survey asked HEI to provide numbers on actual small and large research capital expenditure at various points in the recent past (2005/06, 2008/09 and 2010/12) as well as projected expenditure going forward (2015/16). These comparison years were chosen specifically to coincide with changes in funding levels and policies associated with successive Spending Reviews (CSR 2004, CSR 2007, CSR 2010 and CSR 2014) in order to see how changes in policy affect expenditure.

Because of the high threshold used for small research capital expenditure in the survey (up to £25 million/year), most HEI expenditure fell within the small expenditure category. Looking at the average annual small research capital expenditure over time (see figure below), it seems that it is the medium to large-income institutions that have been mostly affected by immediate cuts after the 2010 CSR (AY 2011/12) whereas they remain optimistic about future expenditure over the medium term (2015/16). The reverse seems to be the case for the smallest institutions. The trend over time also differs between the medium and large-income institutions in the sense that larger institutions have seen a much larger drop in levels of expenditure. Even taking into account the expected recovery by 2015/16, larger institutions do not expect to recover expenditure to 2005/06 levels whereas medium-income institutions do.

[37] The percentages were derived by adding up the percentage of funding each respondent received from the total pot in the individual nation since the 2010 CSR. In the case of HEFCE and DELNI this covered actual allocations from 2011/12 through to projected allocations in 2014/15. For Scotland this reflected the 2011-12 allocation of the total budget available.

Figure 12: Small (under £25m/y) research capital expenditures by size of income and academic year

Note: See **Table 15** in the data Annex for more details.

Looking at the small research capital expenditure by TRAC peer groups, expenditure dipped among peer group A members after the 2010 CSR from £23 million on average in 2008/09 to £20 million in 2011/12 whilst remaining steady among peer group B members in both years with just over £6 million in average expenditure. Looking forward, peer group A members expect average levels of funding to reach pre-CSR 2010 levels by 2015/16, whereas B group members expect a drop down to the £5 million on average (see **Table 16** in the Data Annex for more details). The above may be consistent with the analysis by size of income, as members of peer group A tend to be larger and have medical schools.

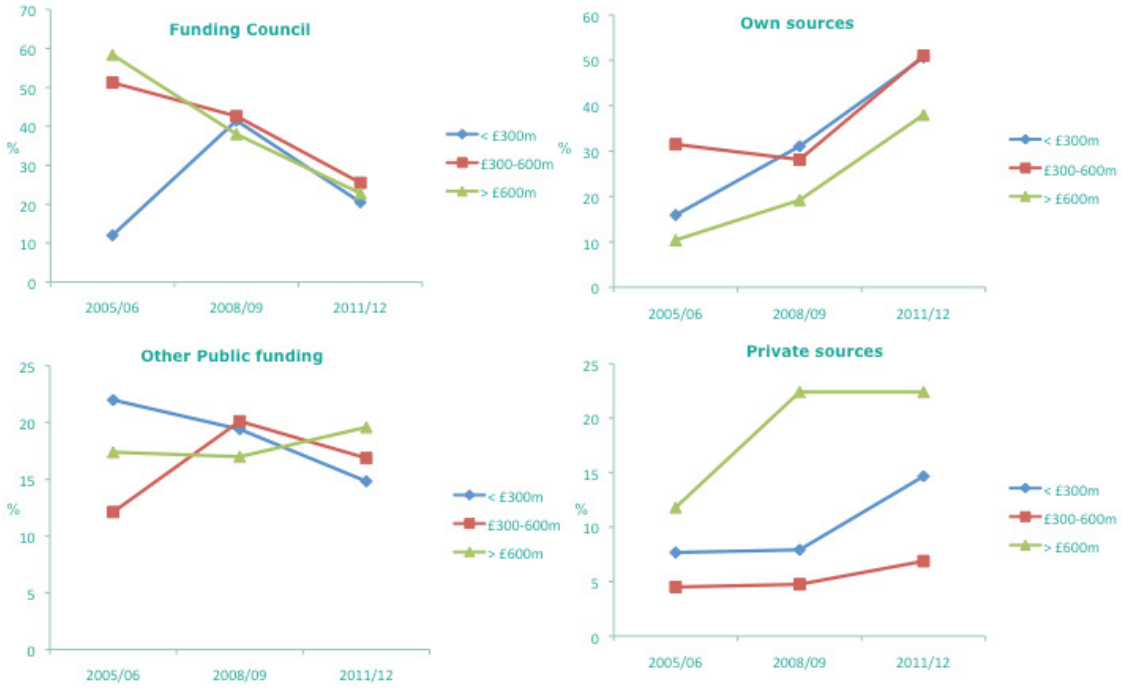
With regards to large research capital investments, only a very small number of HEIs responded to this indicating that very few make investments that exceed £25 million in value. Of the handful of HEIs (5 in total) that reported making these kinds of investments, all were affiliated to the Russell group of universities. Looking at trends according to different income brackets, it seems that middle-income institutions (£300-600 million/annum) have scaled back its large-scale investments over time whilst larger institutions (>£600 million) have increased its proportion of large investments and expect to be making larger investments from 2015/16 (see **Table 17** in the Data Annex). However given the low number of data points, it would seem pertinent not to read too much into these results. In addition, it may be that planned investments over this high threshold are for mixed teaching and research purposes (but this is a speculative point).

Spending models

In order to understand how important different funding sources are, and have been, to funding research capital expenditure over time, HEIs participating in the survey were asked to estimate the proportions of actual research capital expenditure that originated from different funding sources including the higher education funding councils, other public sources, private sources and own sources of funding[38]. What the analysis shows is that, on average, the proportions of funding council income and own sources have more or less reversed in importance over time. Between 2005/06 and 2011/12, the proportion of funding council income used to fund research capital expenditure dropped by 58 percent from 54 to 23 percent whereas own sources more than doubled as a source of income from just under 20 percent to just over 48 percent on average (see **Table 18** in Annex).

Breaking down responses by size of income (small, medium, large), there is a common trend towards relying less on funding council income and more on own sources for funding research capital investments (see figure below). However, larger institutions have on average increased their proportion of other public funds used between the 2007 and the 2010 CSRs whereas its proportion of private source funds has remained the same. The reverse trend is visible among small to medium-income HEIs. There, other sources of funding have been substituted by private sources for financing research capital expenditure.

Figure 13: Sources of actual research capital expenditure over time by size of income



[38] There was also an "other" category but because responses were below 1%, they have not been reported.

Source: Policy Impact Ltd (2013).

Notes: Scales vary given that very different sources of funding with varying levels of intensity are compared. After intensity is compared, these categories plus a (negligible) "other" category sum up to 100% in each size of income category. Further details can be found in **Table 19** in the Data Annex.

In order to understand whether differences in research intensity could help to explain these differences, the data was analysed according to TRAC peer groups. Here, some interesting differences emerge between peer groups A and B (see figure below). Whereas peer group A members are increasingly using private funds for their research capital investments, peer group B members have had to rely on own sources of funding to a much greater extent since the 2010 CSR than the others, although it appears to be a trend that started earlier (as part of the 2007 CSR). Possibly the group B institutions are not able to attract private sources as successfully as group A due to their lower overall focus on research (and thus lower reputation) while group A have access to both private funding and other public funding for a greater proportion of their research capital spend. Group A members also have medical schools which can attract charity and NHS funding.

Figure 14: Sources of actual research capital expenditure over time and by peer group

Source: Policy Impact Ltd (2013).

Notes: The charts show the proportion of actual research capital expenditure originating from different funding sources over time and the dynamics between TRAC groups A and B. Results for other TRAC groups have been omitted here due to insufficient data see **Table 20** in the Data Annex for details.

Having looked at the relative importance of various funding sources that underpin actual research capital investments in UK HEIs, it is important to try and understand how important the formula-based block funding for research capital emanating from the

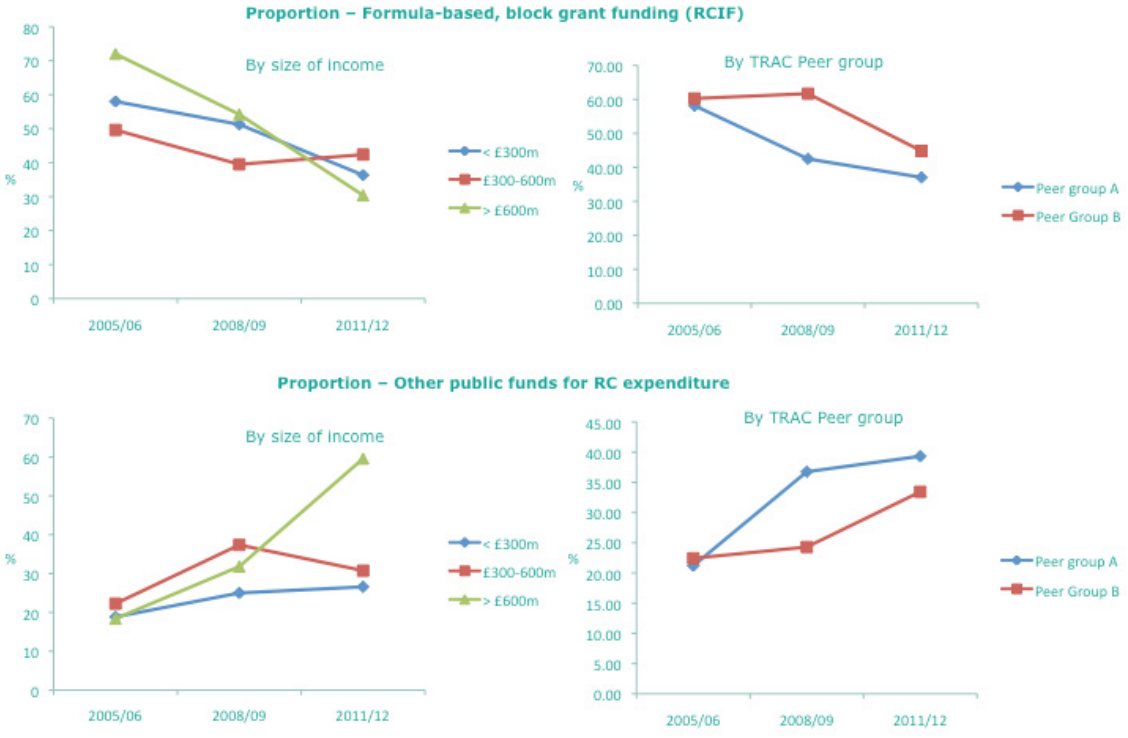
funding councils are for making these investments relative to other public funding, whether its is ear-marked for research capital funding or not. The following figure summarises trends according to HEI size of income and TRAC peer group. The survey results point to the research capital block funding decreasing in importance as a source of funding for supporting investment needs over time particularly for the biggest institutions, many of whom are also members of peer group A, and substituted by other sources of public money. However, for medium-income HEIs the formula-based block funding is still an important element sustaining research capital investment which may explain why this group, in particular, has had to dig deep into its own pockets since the 2010 CSR to ensure continuous expenditure, albeit at lower levels. This is not without its challenges as expressed by various HEIs:

> *"One important issue is the level of internal funds now required for essential investment in research infrastructure compared with prior years" (small HEI).*

> *"The funding of university research in the UK is such that grant funded activity must be subsidised from other funds and so this constrains the level of surplus own-funds available for capital investment and means that external sources of capital funding are very important to [the institution]" (small HEI).*

Two small HEIs taking part in the survey also specifically, and independently, indicated that they historically had been using the formula-based block funding to finance large capital projects.

Figure 15: Importance of public funding for small research capital investments



Source: Policy Impact Ltd (2013).

Results for other TRAC groups have been omitted here due to insufficient data see

Table 21 and **Table 22** in the Data Annex for details.

In order to validate these findings, the self-reported small research capital expenditure figures were compared with the actual formula-based funding received from the funding councils (see **Table 23** in the Data Annex). It is apparent that the FRC has gone from covering a substantial part of smaller research capital expenditure to only covering a small proportion. Among the higher research performers, the reduction is particularly visible among English HEIs in peer group B who on average have seen their FRC funding cover about 97 percent of expenditure in 2005/06 to just 22 percent in 2011/12. On average among English HEIs in peer group A, FRC funding covered just over three quarters of small capital expenditure in 2005/06 and 2008/09 before dropping down to just under a third in 2011/12. Within the income groups (small, medium, large), the picture is similar in which, on the whole, the largest institutions have been able to retain a higher proportion of funding to expenditure (on average) than the smaller institutions. It is hence perhaps not surprising that it is mainly the high intensity research institutions outside of the Russell group such as those in peer group B that have been most affected by the cuts. As indicated above, these institutions are tapping into their own pockets and using non-capital sources of funding to fund ongoing expenditure. However, considering that expenditure levels have remained fairly stable over time and are likely to remain so going forward, the drop in funding raises questions about the feasibility of compensating for the shortfall in formula funding through internal efficiencies at the level of individual HEIs in the medium to long-term or whether changes in the structure of the funding is needed in order to seek even greater efficiencies between institutions. As one small HEI put it:

> *"To maintain the UK as the most research intensive and productive nation on the globe it is essential to maintain capital research equipment to the highest standard and currency. A key element of the support mechanism is central BIS funding. Another vital strategy for the UK is the sharing of facilities between universities where this can be done efficiently. This requires incentives to collaborate rather than compete in everything".*

This remark shows that HEIs, which may have hitherto been reluctant to arrange sharing at all, see that it may be able to offer the chance to retain access to up-to-date research equipment. While the voices against sharing may be loud from the large research intensive HEIs, sharing to allow research excellence to be maintained within smaller HEIs warrants full exploration and experimentation. Scotland shows interesting examples where small to medium HEIs collaborate in equipment purchasing and maintenance in research pools in order to maintain and improve the research base in Scotland.

Decision-process and criteria for expenditure

Although the decision-making processes and criteria for allocating capital expenditure vary considerably across HEIs, it is possible to discern some patterns. Among the survey responses, smaller institutions (total annual income under £300 million per year according to HESA 2010/11 figures) seem to emphasise affordability and quality of

research as key criteria underpinning research capital expenditure. Their responses also point to highly centralised processes for capital expenditure with low thresholds for departmental discretionary spending. As regards the largest institutions (here defined as annual income in excess of £600 million), the survey points towards strong devolved decision-making powers for departmental heads, particularly as regards equipment, combined with a central process for decision-making around larger-scale investments (e.g. buildings) for which expenditure is prioritised according to overall strategic fit. Institutions in-between these (with incomes between £300-600 million per annum) seem to largely combine a central capital expenditure programme with tiered decision-making processes involving sign-off at varying levels of management depending on the size of expenditure. Frequently mentioned decision criteria among HEIs in this category include: Value for Money, strength of business case, sustainability and strategic need.

The following figure summarises the most prevalent decision-processes and criteria for research capital expenditure according to size of the institution. Generally, small and medium-sized HEIs emphasise financial viability and potential legacy costs more than larger institutions as part of their overall criteria. The larger the institution, the more central priorities seem to be set through a bottom-up process of prioritisation involving the departments/schools. The qualitative survey feedback also suggests that the smaller the institution, the more decision-making is concentrated to the centre. Having said that, looking at the thresholds reported by HEIs under which a Department or School would be able to make research capital investments without central approval or sign-off, the average overall threshold reported was £145k. Looking at it from a TRAC peer group perspective, it would seem that HEIs in peer group B allow for higher levels of autonomy (average threshold £153k) than those in peer group A (average threshold £135k) (see **Table 24** in the data Annex).

Figure 16: HEI decision-making processes and criteria by size of income

Again, to try and understand the variability through which research capital expenditure is capitalised across different HEIs, the survey asked HEIs to specifically report their capitalisation thresholds for scientific equipment reported in their annual financial statements. Here HEIs with the largest incomes were found to have the highest capitalisation thresholds; £31k on average for HEIs with an annual income of £600

million or above, £21k for middle-income HEIs (between £300 and £600 million) and £15k for HEIs on incomes smaller than £300 million (see **Table 25** in the data Annex).

Allocation mechanisms and link to expenditure decision-making

Whereas overall decision-processes and criteria for expenditure provide us with an idea of how and when decisions are made, it does not necessarily provide a clear picture of what areas receive the largest investments and what the underlying drivers for investment are. However, before looking at this it would be important to understand how the structure and conditionality of different sources of funding may affect decision-making around research capital expenditure in UK HEIs. As outlined in the table below, different sources of public funding are assessed differently and crucially can be "earned" at different levels of the organisation without necessarily benefiting these levels directly. For instance, project-based competitive funding from the RCUK is based on proposed activities (forward-looking) in which awards reflect reputation and quality of past work. Such competitive funding "earned" at departmental level is likely to stay there although central overheads can be charged. Mainstream QR funding is based on backward looking assessment of research performance over a set period (the latest of which was the 2008 RAE and the next is the 2014 REF) as well as incremental (allocated according to an ascending scale of excellence). Although individual departments "earn" credits in the REF, the funding is allocated at the level of the overall institution and there is no requirement that HEIs allocate the funding back to those departments that earned it in the first place. The formula research capital grant funding incorporates elements of both these other sources of funding and although the award is partly based on levels of competitive funding achieved as well as research standing, it is essentially backward-looking.

Table 3: Public funding – comparison of award criteria, time frames and level of award

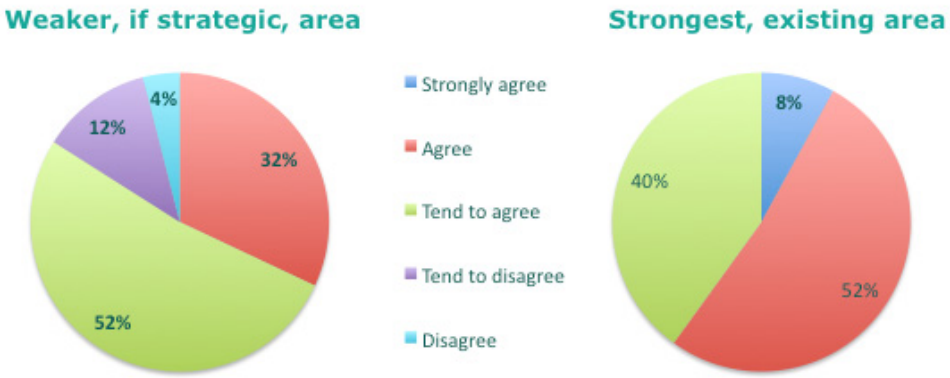
Type of public funding	Award	Time-frame	Level of award
Research block grant i.e. mainstream QR (Funding councils in England, Scotland, Wales and N. Ireland)	Assessment of research performance over a set period	Backward-looking	Earned by department, paid out centrally to overall institution
Project-based, competitive research grants (RCUK)	Reputation, quality of past work, peer reviewed	Forward-looking	Earned by department and paid to department (for a named academic)
Formula Research Capital block grant e.g. RCIF (Funding councils in England, Scotland, Wales and N. Ireland)	Combination of research performance over set period and successful competitive tenders in the preceding year	Backward-looking	Earned by department, paid out centrally to overall institution

Inception interviews and survey feedback indicate that very few, if any, institutions redistribute the research capital block funding back to those departments who “earned” it. Overwhelmingly it seems instead that the funding is used as a central source for sustaining and cross-subsiding investments overall.

In order to understand in what areas UK HEI tend to make research capital investments and how this has evolved over time, survey respondents were asked to choose the top three areas in which they made investments over a period of time. The results show that Biological, Mathematical and Physical Sciences have remained the top two priority areas for smaller HEIs over time whereas Engineering and Technology have become the number one top priority for both the medium and large-income HEIs since the last spending review. Medicine, Dentistry and Health was the top priority area for investment for the largest HEIs earlier on (in both 2005/06 and 2008/09) but has lost ground to Engineering and Technology as well as to Biological, Mathematical and Physical Sciences (see

Table 26 in the Data Annex for more details). Overall, these findings suggest that HEIs regularly retain block funding to invest in particular areas. What is not clear is whether the top three areas funded represent the most resource-intense and/or strategic disciplines. Looking at the HEIs levels of agreement with the statements that they "tend to invest more research capital in areas with the strongest existing research standing" versus "in areas with weaker research standing if deemed as strategic", there is overall agreement with the former and some disagreement with the latter. Having said that, HEIs did not seem to agree particularly strongly with the notion that they invest more research capital in the already strongest areas, which may be evidence that other issues such as resource-intensity prevails. This would be more in line with interview feedback suggesting that HEIs regularly retain block funding to invest in the most resource-intense disciplines.

Figure 17: Areas in which the institution tends to invest more research capital



Source: Policy Impact Ltd (2013).

Strategic responses

The cuts to central formula-based research capital funding in the last SR has spurred surveyed institutions into finding alternative strategies for funding capital expenditure, at least in the short term and some more successfully than others (see Figure 13 and Figure 14). The survey feedback points to various short-term approaches including "generating surpluses" such as internal efficiencies to fund expenditure (small HEI); "promoting matched funding opportunities, encouraging collaboration and maximising impact" (small HEI); and "competing for research investment that supports our research agenda wherever we can find it" (small HEI).

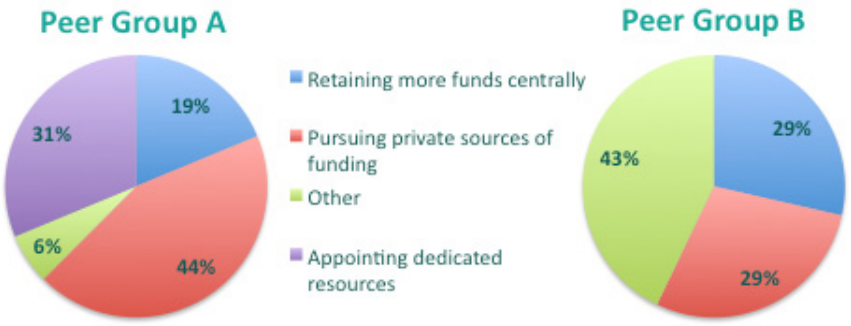
Longer lead times for larger investments means that their research capability is not necessarily affected in the short-term but it remains a source of grave concern to many HEIs over the medium to long tem.

> "*Despite the efficiencies achieved, our operating surplus remains considerably below the target level required to generate enough funds to maintain our estate at a level that we feel is required in order to remain a world class institution" (large HEI).*

> *"Raising large sums (for example, for replacement research buildings or new research buildings to adopt new approaches) is difficult, particularly in the current economic climate, and so the large decrease in research capital allocations in CIF2, compared to CIF1, is a significant matter for [the institution]"* (small HEI).

Comparing what HEIs rated as the main strategy for maintaining or increasing levels of research capital expenditure going forward, it seems that all institutions independently of size see pursuing private sources of funding as a main priority followed by retaining more funds centrally and appointing a dedicated resource. Large institutions in particular emphasise retaining more funds centrally, whereas small to medium-income institutions' emphasise getting more private funding. Interestingly, medium-income institutions are the most prone to saying that appointing a dedicated resource is their top strategy (see **Table 27** in Data Annex). Looking at the responses according to TRAC peer group, it is mainly members of peer group A that is looking to appoint a dedicated resource (see figure below). Peer group B members are much more likely to list "other" strategies than those provided as options in the survey as their main strategy. This heterogeneity of responses indicates a need to share best practice.

Figure 18: Main strategy to secure future research capital expenditure by peer group



Source: Policy Impact Ltd (2013).

Note: TRAC peer group A calculations based on N=16 versus N=7 for TRAC peer group B.

6.2 Research capital and link to research standing

Link to research standing

In order to try and gauge what really drives research capital investment in HEIs, the survey respondents were asked to rate what they see as the most important areas or abilities that they are hoping to achieve or maintain at the input/output level by making research capital investments. Across the board, HEIs rated research capital expenditure as more important for maintaining or improving outputs - expressed as retaining or improving research standing (see table below). However, the difference was least pronounced for the largest institutions (income >£600m/year), which also

rated research capital expenditure as very important to enabling the recruitment of the top researchers to a higher degree than others. The smallest institutions rated retention of top researchers as a much more important factor for making research capital investments than the other institutions. Given the small sample population, no statistical testing was possible to test whether these ratings could predict patterns in funding or expenditure but it provides as indication that HEIs, independently of size, see the need for research capital investment firstly as a means to maintain or improve its research standing and secondly to recruit or retain the best talents.

Table 4: Importance of research capital expenditure at the level of inputs and outputs

Input/Output		Rating	Institutional income		
			< £300m[a]	£300-600m[a]	> £600m[a]
Output	Retain research standing	Very important	100%	63%	60%
		Important	0%	25%	20%
		Not applicable/Don't know	0%	13%	0%
	Improve research standing	Very important	83%	63%	80%
		Important	8%	25%	0%
		Moderately important	8%	0%	0%
		Not applicable/Don't know	0%	13%	0%
Input	Recruit top researchers	Very important	67%	50%	80%
		Important	25%	38%	20%
		Not applicable/Don't know	0%	13%	0%
	Retain top researchers	Very important	83%	50%	40%
		Important	8%	38%	40%
		Moderately important	8%	0%	20%
		Not applicable/Don't know	0%	13%	0%

Source: Policy Impact Ltd (2013), HESA 2010/11 income data.

Notes: The original Likert scale included five options on a scale between 1 and 5 where 5 was "very important". However, where no respondent chose a particular rating this has been omitted from the above table.

[a] The numbers of HEIs varied per category (for < £300m N=5, for £300-600m N=8 and for £600m N=12). In terms of total coverage of overall annual funding, the figures for the large income category of HEIs are hence to be considered as stronger than those for the small income category.

Whether the emphasis and balance between inputs and outputs have changed over time is not clear from the survey data. However, the impact of cuts to the formula research capital funding associated with the latest CSR was identified as a threat to research capability, particularly in the long-run, as evidenced by the following quotes:

> *"The current reduction in research capital funding is sustainable for a short period, but over the long-run runs a risk of depleting university capability significantly"* (large HEI).

> *"It is becoming an increasingly significant challenge to find sources of income to support the ongoing level of capital investment required to maintain the quality*

of our research infrastructure at the level required in order to meet our strategic objectives and for us to stay competitive globally" (large HEI).

7.0 Conclusions

This chapter presents conclusions drawn from the evidence provided in the report.

Conclusions relating to the funding of research capital

- BIS and its UK funding council partners have allocated just under £5 billion in research capital block funding to UK HEIs between 2002 and 2015. With the exception of England, funding councils are obliged to match overall BIS funding as a condition of its disbursement. Differences in the funding arrangements between nations tend to reduce certainty and hence the ability of funding councils to plan ahead due to the uncertainty of the annual allocations.

- We have documented around ten years of a relatively stable funding environment for HEIs since the first SRIF. There is ample evidence of achieving objectives and benefits to UK research and industry from the formula funding stream from independent evaluations. There is strong evidence that the formula funding performed its job very well.

- The post 2010 CSR funding constitutes a dramatic reduction. Across the funding councils the average drop in available funds for formula-based research capital was 58 percent between the latest CSR (2010) and the previous one.

- From an international perspective, UK is the only country found in the comparison group (DE, DK, SE, NO, IS, US) that has reduced research capital funding. At the same time, it is the only country that earmarks funding for capital expenditure. All others provide overall block funding for research that can be used for capital investment. The majority of those countries have either maintained or substantially increased public funding for research in recent years some by as much as a quarter.

- The UK funding councils have adopted different funding strategies in response to overall cuts in research capital funding after 2010. Whereas Scotland and Wales are actively focussing on the higher research performers, England has adopted an approach aimed at ensuring stability and minimising perturbation by keeping a lower threshold that allows most institutions some level of funding. The consequences of each strategy are not yet known.

- The large reduction in formula funding and move to competitive funding with short time scales for HEIs to bid (RPIF) can be viewed as a change in the funding environment, which HEIs have reacted to with varying strategies. The immediate impact is that all HEIs have seen their FRC

funding heavily cut or even extinguished. In response, HEIs have relied more heavily on their own sources to fund ongoing capital expenditure. The Funding Councils have played a role here by implementing (differing) cut-off thresholds for HEIs to qualify for formula funding, resulting in some 28 getting none at all (of which 12 are in England, 10 in Scotland and 6 in Wales).

- The short-term effect has been particularly dramatic for HEIs with a research income of 22 percent or more of total income (TRAC peer group B), excluding the Russell Group. There is evidence in our study for a longer-term trend in which the larger-income, top research performers seem more able to generate alternative funds both public and private to sustain capital expenditure. The top research performers (TRAC peer group A) are also deliberately pursuing private sources of funding and appointing dedicated resources as part of their main strategies to secure expenditure compared to group B members whose response is more varied and also involves retaining central funds to a greater extent than HEIs in peer group A.

- A tougher climate for competitive, project-based public funding possibly underlies the further concentration of formula-based block funding into the hands of the largest, most research-intensive institutions simply because the funding is conditional on winning research funding from other sources.

Conclusions relating to expenditure and investment decisions in HEIs

- There are differences between the HEIs relating to scale and research intensity including planning processes and motivations for research capital investments. Our evidence suggests that the small HEIs (limited however by few responses from this category) may devote more effort to internal planning and allocation of smaller capital investments in order to retain top researchers, while the larger ones have central planning but stronger devolved powers for larger sums, and report recruitment and improving research standing as more important than retention and maintaining standing.

- The top areas for research capital investment have tended to include the most resource-intensive ones including Medicine, Dentistry and Health, Engineering and Technology, and Biological, Mathematical and Physical Sciences. Although HEIs see strategic alignment as important for investing they are more likely to invest in already strong areas than weaker, but potentially strategic, areas. The international comparison points to an area of potential rising tension between maintaining a tradition of investing in resource-intensive disciplines against growing demands for investment from hitherto equipment-light disciplines (e.g. social science and humanities), particularly around high-end computer

equipment. The likelihood of increased funds in the equipment pots is low; hence prioritisation may become a larger issue over time than it is now.

- There is evidence that HEIs can fund research capital from sources other than formula-based, public funding as funding from private and other sources has partly taken the place of the FRC. Although a source of optimism, there is the growing discrepancy between those institutions whose alternative strategies are paying off and those that have to dig deep into own sources of funding to sustain investment. Medium-income HEIs appear to be particularly dependent on the formula-based block grants. This is a worrying trend in the medium to long-term for these medium-income HEIs and may require consolidation, particularly if funding levels remain at similar levels as those seen in the last CSR.

- With limited discretionary capital available, it remains clear that an increase in the extent of sharing of research equipment is required and needs to be facilitated. However, examples of this occurring are few and far between (except in Scotland). Some of the main obstacles are the lack of incentives for HEIs to share facilities that lead to reputation building (and future funding streams) when the system sets up HEIs to be in competition with each other. There are also costs in sharing (such as user support, allocating time on equipment and travel costs). Also, no funding scheme incentivises equipment sharing between HEIs at present outside Scotland.

- Our overall findings suggest that, in the bigger picture, capital is a follow factor in research excellence in the sense that the highest research performers not only manage to win a bigger proportion of public funding but also better able to access substantial sources of private funding on the basis of reputation.

Conclusions relating to future developments

- There is currently no requirement for HEIs to report to HESA on their actual or planned research capital expenditure. This hinders effective and on-going monitoring of the health of the research capital base in UK HEIs.

- The funding councils have adopted varying strategies in relation to funding allocations. In Scotland and Wales funding is directed to the highest research performers. In England, the approach has been to provide at least some funding to a wider set of institutions. The consequences of each strategy are not yet known.

- Evidence on the link between research capital investment and capacity for excellent research is only just emerging; our research highlights a

vacuum in terms of the data available to monitor long-term outcomes associated with different funding approaches. More systematic monitoring would allow Funding Council to assess differential impacts of their funding strategies on HEIs of different sizes and research intensities. This is particularly pertinent if some categories of HEIs are unable to manage their research capital very effectively. Although changes may generate a greater consolidation of the sector it may also be that capacity for excellent research is lost due to poor decision-making at the level of individual HEIs. It is only by monitoring such developments over time that varying impacts of changes in the funding landscape can be understood.

- Evidence uncovered in this report points to a recurring issue of under-funding in the sector. This is not likely to change unless pressures on budgets ease. Although greater equipment and resource sharing across HEIs could start to address this issue, it is unlikely to occur on the basis of present competitive funding schemes and the REF without strong counter-incentives.

Annex 1: Bibliography and references

BIS (2010): " The allocation of Science and Research Funding 2011/12 to 2014/15. Investing in World-class Science and Research", Department for Business, Innovation & Skills, December 2010.

Georghiou, L. on behalf of the N8 Research Partnership (2012): "Synthesis Report - Sharing for Excellence and Growth", www.n8research.org.uk.

Georghiou, L. and Halfpenny, P. (1997): "Assessing the Stock, Condition and Needs for Research Equipment in British Universities. In Equipping Science for the 21st Century". Irvine, J.M. et al. (eds.) Cheltenham: Edward Elgar Publishing Ltd.

Hughes, A., Kitson, M., Bullock, A. and Milner, I. (2013): "The Dual Funding Structure for Research in the UK: Research Council and Funding Council Allocation Methods and the Pathways to Impact of UK Academics: A Report from the Centre for Business Research (CBR) and the UK Innovation Research Centre (UK~IRC) to the Department for Business, Innovation and Skills", February 2013.

JM Consulting (2002): Investment in Infrastructure for Teaching and Learning in Higher Education, June 2002/31, HEFCE Issues paper.

JM Consulting (2006): "Future needs for capital funding in higher education: A review of the future of SRIF and Learning & Teaching Capital", HEFCE, July 2006.

Moore et al. (2012): "Evaluation of Research Capital Funding (SRIF2006-08) to Higher Education Institutions 2006-2008", Report by PACEC to the four UK higher education funding bodies and the Department for Business Innovation and Skills, HEFCE, 2012.

PREST and CASR (2000): "Research Equipment Needs in UK Universities: a Snapshot Study CVCP".

RCUK/UUK Task Group Report ("Wakeham Report") (2010): "Financial Sustainability and Efficiency in Full Economic Costing of Research in UK Higher Education Institutions".

RCUK (2011): "Efficiency 2011-2015: Ensuring Excellence with Impact RCUK".

Technopolis (2009) Science Research Investment Fund: a review of Round 2 and wider benefits report to HEFCE.

Annex 2: Data collection tools

The Annex contains the following data collection tools:

- Inception interview schedules 1 and 2
- Online survey questionnaire.

Interview schedule 1 – Guide for inception interview with Research Capital funders and policy-makers

Guide for interviews with GES and GSR Heads of Profession	
Interview ID – background on the person	1.1 What is your title? What is your role and what are your key responsibilities?
Funding – sources and trends over time	1.2 What public funding schemes are open to HEIs for making smaller investments in research capital? What is roughly the balance between directed and discretionary funding schemes and how has this evolved over time? How do longer-term trends differ from recent changes, particularly those associated with the CSR? /What private funding schemes are open to HEIs for making smaller investments in research capital? What is roughly the balance between directed and discretionary funding schemes and how has this evolved over time? How do longer term trends differ from recent changes, in particular, have you noticed higher levels of demand for this sort of funding after the CSR 2010? 1.3 What do you as a funder see as the most important funding criteria (e.g. competitiveness of research, wider impact, leveraging of other funds)? Have priorities evolved over time and if so, why? 1.4 What feedback do HEIs provide on your current funding schemes compared to previous ones or schemes operated by other funders? 1.5 What changes have brought about the biggest changes in funding allocations between individual, or groups of, HEIs over the past 10-15 years other than those already discussed? How did HEIs react to these changes? 1.6 What future changes to your organisations funding of research capital in HEIs do you envisage and over what time scales? How important will tuition fees be to these changes?
Decision-making among beneficiaries	1.7 Have you got a sense of what factors affect research capital decision-making in the HEIs that receive funds from your organisation? 1.8 Is there any way of telling whether the funding you provide is invested in existing researchers in the HEIs or whether it leads to recruitment of new researchers? If yes, has this evolved over time and how does it vary (e.g. according to how close the HEIs are to the RAE or other factors)?
Conclusion of	

Guide for interviews with GES and GSR Heads of Profession	
interview	1.9 Are there any other issues that you feel could be important but have not been discussed?
Practicalities/ sign-posting	1.10 We are keen to interact with HEIs that have received funding from you. Would you be able to signpost us to relevant contacts? Who within the HEI structures would you regard as being most knowledgeable about actual research capital decision-making? 1.11 Would you be able to provide us with any published or unpublished data that you think could be relevant to our research? 1.12 Would you like to receive an invite to the stakeholder workshop next spring?

Thank you for your time, if you have any questions or queries, please do not hesitate to contact me at a later date.

Interview schedule 2 – Guide for inception interviews with HEI decision-makers

Guide for interviews with high level users/policy-makers	
Interview ID	1.1 What is your title? What is your role and what are your key responsibilities?
Institution	1.2 How is your HEI organised? What is the level of autonomy over funding and expenditure at different levels of the organisation? Is there a central sign-off process?
Funding sources	1.3 Overall, how has the type and level of funding of your institution evolved over time, in particular the balance between public and private funds? Has research capital funding evolved along the same lines or differently? 1.4 What is the balance between directed and discretionary research capital funds that you receive and has it changed over time? 1.5 What events have had the most impact on research capital funding in the last 5 to 10 years? 1.6 How has the Spending Review affected your research capital funding levels? What actions, if any, have you taken to mitigate against this? 1.7 What kind of funding streams do you regard as the most desirable for research capital funding and why?
Level of expenditure	1.8 What is the level of your annual research capital expenditure? What proportion of this is invested in facilities, equipment or buildings? How much does it vary year on year? 1.9 What proportion of the research capital expenditure emanates from directed versus discretionary funding sources? 1.10 What is roughly the proportion between capital and non-capital expenditure and how has it evolved over time and in relation to

Guide for interviews with high level users/policy-makers	
	recent changes (the CSR)? 1.11 How does capital expenditure vary across disciplines within your institution? 1.12 Do you perceive your institution's research capital expenditure levels to be different from other HEIs? Why, why not?
Expenditure decision criteria and processes	1.13 What are the decision processes for deciding upon research capital expenditure priorities year on year within your institution? Who is involved and at what stages of the decision processes? How formal versus informal are these processes? What is the level of autonomy of schools/departments within the organisation for setting their own priorities? How does this affect research capital spending? 1.14 What are the main factors affecting the level and contents of small research capital expenditure (up to 25 million pounds per year) in your institution? Is this different from large capital investment? Do these vary according to discipline? 1.15 What proportions of your institutions' annual small research capital investment (up to 25 million pounds/pa) would you say adhere to any of the following (please give an approximate percentage): ○ Strategic research-driven (top down boosting/maintaining of existing strengths or expanding into new promising/weaker areas) %? ○ Demand research-driven (responding to requests from scientists) %? ○ Strategic funding supply-led (local government funds or facilities that could over time become self-sustainable e.g. via shared use by industry) %? ○ Opportunistic supply-led (funds were available, we can always identify a use) %? ○ Other, % ? If so, please specify… 1.16 Are there any big differences in proportions between disciplines? 1.17 What factors have over time shifted, or could shift the emphasis between different investment decision criteria in the future? 1.18 If your institution has had to make cuts in its research capital investment, what has been the process and criteria for prioritising the remaining expenditure? How, if at all, has this differed from the processes and criteria discussed above? 1.19 Do you perceive your institution's research capital investment decision criteria to be different from other HEIs? Why, why not? 1.20 How do you account for maintenance versus upgrading of facilities or equipment, particularly if there is a high degree of autonomy between departments/schools?

Guide for interviews with high level users/policy-makers	
Outcomes	1.21 Can you point to particular examples in which research capital investment has been made on direct demand from scientists? How successful was this seen to be and why? 1.22 Can you point to a particular example in which research capital investment has been made to attract or recruit researchers? How successful was this seen to be and why? 1.23 Can you point to a particular example in which research capital investment has been forged greater linkages with industry? How successful was this seen to be and why? 1.24 Overall, to what extent is your perception that research capital investment follows the research or the research follows the capital?
Context and other issues	1.25 What would your feedback be to funders such as HEFCE or BIS be in terms of how well existing or previous funding for research capital investment has worked? What changes would you propose, if any? 1.26 What skills, experience or personal characteristics, if any, do you think enable or hinder scientists to influence research capital expenditure decisions?
Conclusion of interview	1.27 Are there any issues that you feel are important but have not been discussed? 1.28 Is there anything else you would like to add?
Practicalities/ sign-posting	1.29 Is there anybody else in your institution or elsewhere that you think we should contact with regard to this work? 1.30 Who within the HEIs do you think will have the best overview of research capital funding and expenditure at a practical and strategic level that we should direct our survey to? Are you for instance aware of any networks of individuals with similar responsibilities to yours, which we could approach? 1.31 Would you like to receive and invite to the stakeholder workshop in spring of next year?

Thank you for your time, if you have any questions or queries, please do not hesitate to contact me at a later date.

Survey tool

General Background

1) Please indicate to which Higher Education Institution you belong by picking from the below list:*

[Scroll-down list of 165 HEIs]

2) Please indicate the physical location of your Higher Education Institution from the below list:*

[Scroll-down list of UK Regions]

3) What is your current role?*
( ) Director of Finance
( ) Director of Estates
( ) Director of Research Services
( ) Vice-Chancellor
( ) Chief Information Officer
( ) Other. Please, specify:: _____

Research Capital expenditure and funding
This section asks questions about your HEIs' research capital expenditure and funding over the last few Spending Review Periods. By research capital expenditure we mean investments in buildings, renewal, upgrading of HEIs estates and research equipment, as defined in the Evaluation of Research Capital Funding (SRIF2006-2008).

4) What is the value of **actual research capital expenditure** made or forecasted in the following academic years (i.e. ended 31 July)*? Please provide your best estimates in pounds (GBP) by type/size of investment (this refers to investments actually made rather than committed). [*Note: These years were chosen as the first years in which the Spending Reviews of 2004, 2007, 2010 and 2013 would be effective from.]*
Your responses must be numeric values in pounds (GBP).

Small research capital investments, defined as: capital items up to 25 million per annum that are wholly owned by the institution and that are wholly or partly used for research. If only partly used for research, please include an estimate of the value of that share.	Academic year 2005/06 (actually made) in GBP	Academic year 2008/09 (actually made) in GBP	Academic year 2011/12 (actually made) in GBP	Academic year 2015/16 (forecasted) in GBP
Large scale research capital investments, defined as: capital items above 25 million per annum which may or may not be wholly owned by the institution and that are wholly or partly used for research. If only partly used for research, please include an estimate of the value of that share.				

5) For the purposes of your annual financial statements, what are your capitalisation thresholds for scientific equipment?*
Your response must be a numeric value in pounds (GBP).
( ) The threshold amounts to the following, in pounds (GBP):: _____
( ) Not applicable/No threshold.

6) What proportion of actual research capital expenditure originated from what funding sources* in the academic year 2011/12? We understand that this will be a mix of specific capital grants and non-capital income (i.e. income not ear-marked for capital expenditure). Please provide

your best estimates of the proportions. [*Note: Taking into account all funds used for research capital including those diverted from non-capital sources or shared with teaching.]*

- HEFCE/ Department for Employment and Learning/ Scottish Funding Council/ Higher Education Funding Council for Wales (research capital or non-capital funding for research e.g. QR, teaching) (%): _____
- Other public funding sources (capital or non-capital funding e.g. Research Councils, Overseas, UK central government, hospitals and health authorities) (%): _____
- Private sources (e.g. UK and international industry or charity sector funding) (%): _____
- Own resources (e.g. institution's own endowment, investment income), retained surpluses, and borrowings and leases) (%): _____
- Other (%): _____

7) What proportion of research capital investments tend to be funded from the formula based research capital grant funding versus other public funding for research capital expenditure in the academic year 2011/12? We understand that this will be a mix of specific capital grants and non-capital income (i.e. income not ear-marked for capital expenditure). Please provide your best estimates of the proportions.*

	Proportion funded via public formula based research capital grant funding (RCIF) (%)	Proportion funded via other public research capital funding (%)
Small research capital investments, defined as: capital items up to 25 million per annum that are wholly owned by the institution and that are wholly or partly used for research.	___	___
Large scale research capital investments, defined as: capital items above 25 million per annum which may or may not be wholly owned by the institution and that are wholly or partly used for research.	___	___

8) What proportion of actual research capital expenditure originated from what funding sources* in the academic year 2008/09? We understand that this will be a mix of specific capital grants and non-capital income (i.e. income not ear-marked for capital expenditure). Please provide your best estimates of the proportions. [*Note: Taking into account all funds used for research capital including those diverted from non-capital sources or shared with teaching.]*

- HEFCE/ Department for Employment and Learning/ Scottish Funding Council/ Higher Education Funding Council for Wales (research capital or non-capital funding for research e.g. QR, teaching) (%): _____
- Other public funding sources (capital or non-capital funding e.g. Research Councils, Overseas, UK central government, hospitals and health authorities) (%): _____

- Private sources (e.g. UK and international industry or charity sector funding) (%): _____
- Own resources (e.g. institution's own endowment, investment income), retained surpluses, and borrowings and leases) (%): _____
- Other (%): _____

9) What proportion of research capital investments tend to be funded from the formula based research capital grant funding versus other public funding for research capital expenditure in the academic year 2008/09? We understand that this will be a mix of specific capital grants and non-capital income (i.e. income not ear-marked for capital expenditure). Please provide your best estimates of the proportions.*

Small research capital investments, defined as: capital items up to 25 million per annum that are wholly owned by the institution and that are wholly or partly used for research.	Proportion funded via public formula based research capital grant funding (RCIF) (%)	Proportion funded via other public research capital funding (%)
Large scale research capital investments, defined as: capital items above 25 million per annum which may or may not be wholly owned by the institution and that are wholly or partly used for research.		

10) What proportion of actual research capital expenditure originated from what funding sources* in the academic year 2005/06? We understand that this will be a mix of specific capital grants and non-capital income (i.e. income not ear-marked for capital expenditure). Please provide your best estimates of the proportions. [*Note: Taking into account all funds used for research capital including those diverted from non-capital sources or shared with teaching.]*

- HEFCE/ Department for Employment and Learning/ Scottish Funding Council/ Higher Education Funding Council for Wales (research capital or non-capital funding for research e.g. QR, teaching) (%): _____
- Other public funding sources (capital or non-capital funding e.g. Research Councils, Overseas, UK central government, hospitals and health authorities) (%): _____
- Private sources (e.g. UK and international industry or charity sector funding) (%): _____
- Own resources (e.g. institution's own endowment, investment income), retained surpluses, and borrowings and leases) (%): _____
- Other (%): _____

11) What proportion of research capital investments tend to be funded from the formula based research capital grant funding versus other public funding for research capital expenditure in the academic year 2005/06? We understand that this will be a mix of specific capital grants and

non-capital income (i.e. income not ear-marked for capital expenditure). Please provide your best estimates of the proportions.*

Small research capital investments, defined as: capital items up to 25 million per annum that are wholly owned by the institution and that are wholly or partly used for research.	Proportion funded via public formula based research capital grant funding (RCIF) (%)	Proportion funded via other public research capital funding (%)
Large scale research capital investments, defined as: capital items above 25 million per annum which may or may not be wholly owned by the institution and that are wholly or partly used for research.		

12) In what areas* did the institution make the most research capital investments in the financial year 2005/06? [*Note: Please see sub-categories falling under each main area at the bottom of the page.]*

Top 1 area in which the most research capital investments were made
Top 2 area in which the second most research capital investments were made
Top 3 area in which the third most research capital investments were made

- Medicine, dentistry and health
- Agriculture, forestry and veterinary science
- Biological, mathematical and physical sciences
- Engineering and technology
- Architecture and planning
- Administrative, business and social studies
- Humanities and language based studies and archaeology
- Design, creative and performing arts
- Education

13) In what areas* did the institution make the most research capital investments in the financial year 2008/09? [*Note: Please see sub-categories falling under each main area at the bottom of the page.]*

Top 1 area in which the most research capital investments were made
Top 2 area in which the second most research capital investments were made
Top 3 area in which the third most research capital investments were made

- Medicine, dentistry and health
- Agriculture, forestry and veterinary science
- Biological, mathematical and physical sciences
- Engineering and technology
- Architecture and planning
- Administrative, business and social studies
- Humanities and language based studies and archaeology
- Design, creative and performing arts

- Education

14) In what areas* did the institution make the most research capital investments in the financial year 2011/12? [*Note: Please see sub-categories falling under each main area at the bottom of the page.]*

Top 1 area in which the most research capital investments were made
Top 2 area in which the second most research capital investments were made
Top 3 area in which the third most research capital investments were made

- Medicine, dentistry and health
- Agriculture, forestry and veterinary science
- Biological, mathematical and physical sciences
- Engineering and technology
- Architecture and planning
- Administrative, business and social studies
- Humanities and language based studies and archaeology
- Design, creative and performing arts
- Education

Decision-making processes and links between research capital expenditure and research standing

This section focuses on your HEIs' criteria and processes for making research capital investment decisions.

15) Under what level of research capital expenditure would a Department or School be able to invest without central approval or sign-off (e.g. involvement of Vice-chancellor, university council, etc.)?*

Your response must be a numeric value in pounds (GBP).

( ) The approximate value, in pounds (GBP):: _____

( ) Not applicable.

16) What are the typical decision criteria and decision-making processes involved in allocating research capital expenditure across your institution? Please elaborate.

17) How important is different research capital expenditure for your institution's ability to:*

Please rate on a scale from 1 to 5, where 5 is very important, the importance of research capital investments made below the level of expenditure referred to in question 15 and above, mostly at Departmental/School level	Recruit the best researchers?	Retain the best researchers?	Retain its research standing?	Improve its research standing?
Please rate on a scale from 1 to 5, where 5 is very important, the importance of research capital investments made above the level of expenditure referred to in question 15 and above, mostly requiring involvement from Central Services				

18) To what extent do you agree (or disagree) with the following statement: "The institution tends to invest more research capital in areas with the strongest existing research standing"*
( ) Agree Strongly
( ) Agree
( ) Tend to Agree
( ) Tend to Disagree
( ) Disagree
( ) Disagree Strongly

19) To what extent do you agree (or disagree) with the following statement: "The institution invests research capital in areas with weaker research standing if deemed as strategic"*
( ) Agree Strongly
( ) Agree
( ) Tend to Agree
( ) Tend to Disagree
( ) Disagree
( ) Disagree Strongly

Looking forward
20) What is the main strategy that your institution is pursuing to maintaining or increasing levels of research capital expenditure going forward?*
( ) It is mainly about appointing a dedicated resource
( ) It is mainly about retaining more funds centrally
( ) It is mainly about actively pursuing private sources of funding
( ) It is mainly about selling off assets
( ) It is mainly about something else. Please, provide details:: _____

21) What other issues do you consider to be important for this research that you would like to share?

Participating in further research
If you would not mind being interviewed at a later stage as part of the case studies, please state your name, email address and telephone number and a member of our team will be in contact.
( ) No, thanks
( ) Yes, I would not mind to be contacted and I am providing my details below to that effect

---

Many thanks for your help!

Annex 3: Stakeholder interviewees

The following stakeholders were interviewed as part of the study. Contact was also made with the League of European Research Universities (LERU) and the European University Association (EUA) although no one was formally interviewed.[39]

Table 5: Interviewed stakeholder by organisation and date of interview

N°	Name	Organisation	Date of interview
1	Carolyn Reeve	BIS	12/11/2012
2	Nolan Smith	HEFCE	20/11/2012
3	Gavin Campbell	Department for Employment and Learning	20/11/2012
4	Michelle Coupland	Imperial College London	29/11/2012
5	John Neilson	Imperial College London	29/11/2012
6	Klas Malmqvist	Lund University	16/11/2012
7	Thomas Trøst Hansen	Danish Agency for Science, Technology and Innovation	29/11/2012
8	Mogens Klostergaard Jensen	Danish National Research Foundation	29/11/2012
9	Rahim Tafazolli	University of Surrey's Centre for Communication Systems Research	27/11/2012
10	Keith Robson	Research and Enterprise Support, University of Surrey	29/11/2012
11	Jonathan Waller	HESA	27/11/2012
12	Camilla Jakobsson	Vetenskapsrådet	04/12/2012
13	Guri Drottning Aarnes	University of Oslo	06/12/2012
14	Bjarke Lind	Agency for universities and internationalisation	06/12/2012
15	Halldor Jonsson	The Division of Science, the University of Iceland	07/12/2012
16	Eva Lindencrona	VINNOVA	07/12/2012
17	Asbjørn Mo	The Research Council of Norway	12/12/2012
18	Steve Beaumont	University of Glasgow	17/12/2012
19	Sally McGill	The University of Manchester	18/12/2012
20	Susanne Ladefoged Pedersen	Agency for universities and internationalisation	30/11/2012
21	Albert Rodger	University of Aberdeen, Research and Knowledge Exchange Committee	10/01/2013
22	Johannes Janssen	German Research Foundation (DFG)	29/01/2013
23	Chris Cowburn	Higher Education Funding Council for Wales	05/02/2013
24	Linda Tiller	Higher Education Funding Council for	05/02/2013

[39] LERU reported not to have a working group on research capital whilst the EUA had some materials on their website.

Nº	Name	Organisation	Date of interview
		Wales	
25	Bethan Owen	Higher Education Funding Council for Wales	05/02/2013
26	Judith Brown	Planning Division, University of Cardiff	26/02/2013
27	Dr Stuart Fancey	Research & Innovation at the Scottish Funding Council (SFC)	14/03/2013

Annex 4: International country-by-country summaries

The following country-by-country summaries collate the main findings for each country that formed part of the international comparison. Each country summary is subdivided into three sections of which the first provides an overview of the funding levels and schemes with particular emphasis on funding for research capital investments. The second section focuses on the actual expenditure and any structural issues in the way that Universities are governed that may affect its spending. The last section highlights any recent trends in policy-making in the area or any issues arising from within the HEI community with respect to research capital funding or investment.

Denmark

Funders and funding instruments

There are eight universities in Denmark and three research institutions. Prior to a voluntary merger in 2007 led by the Danish Government there were 25 institutions - more than double the current number. Institutions are located all over Denmark and are of varying sizes.

The Danish state provides direct block funding for education and research to the Universities which the HEIs can use as they see fit. In 2010, Denmark introduced a new output-based model for distributing research funding which, for the first time, included a measure of research competitiveness. In order to phase in this competitive element, it was decided that the percentage linked to bibliometrics would gradually increase from 10% of the funding in the first year, 15% in the second and 25% in the third. The current research funding model thus distributes funds according to the universities' education funding (45%), the universities' external competitive research funding (20%), the universities' research publishing (25%), and the number of students having completed their PhD thesis (10%).

In 2010, "Styrelsen for Forskning og Innovation" undertook a wide consultation to identify priority areas and projects for research infrastructure investment in the short to medium term (3-5 years). After receiving 150 contributions a short-list of 19 priorities were combined into a roadmap for research infrastructure investment.[40]

Structural variations and investments

Similarly to the Swedish system, 6 out of 8 Danish Universities do not own their own premises whereas the remaining two do. Under the current scheme, Statens Ejendoms Administration (SEA), roughly translated as the "Government Property Administration", universities have to pay rent for the premises that they occupy either to the "Danish University and Property Agency" (Bygningsstyrelsen), who owns the Danish state's education and research buildings and sublets them to the universities, or other

[40] DANSK ROADMAP FOR FORSKNINGSINFRASTRUKTUR 2011, Forsknings- og Innovationsstyrelsen, April 2011.

providers. When universities want to construct a new building they can either negotiate with Bygningsstyrelsen for them to build it or they can engage with a private real estate developer. According to the principle of "Free supply choice," universities are thus not forced to use the governments building agency when they need a new building.

Prior to the SEA reform, the Danish state made buildings available to the universities free of charge, which meant that buildings were always in high demand. The objective of this scheme was to force universities to take more strategic responsibility for how many buildings they actually need. Since the introduction back in 2000/01, there has been a significant decline in requests for new buildings as building expenses now form part of the universities' overall expenses.

The SEA scheme was launched to be cost-neutral which meant that Universities initially received higher overall funding as part of the overall block funding to cover the extra expense. Hence funding under the scheme would not change irrespective of whether an institution terminated or entered into a new lease for a building. In effect, universities are able to terminate the lease of a building with half a years warning. This provides them with huge flexibility as opposed to entering into a lease with a private property owner.

Through the SEA scheme, universities pay rent as a percentage of the value of the building. According to the Danish Ministry[41], the cost-base is similar for those HEIs that are part of the scheme compared to the two that own their properties. Although the latter have to take into account mortgages and capital depreciation, their rents roughly equal the rents paid by the six other universities to government. However, a 2009 report by Bygninsstyrelsen[42] showed that many HEI laboratories were totally outdated which pointed to a lack of continuous capital investment associated with the SEA scheme. Although government and HEIs are jointly responsible for maintain properties there just had not been enough capital coming into the system to do so. In response to the findings, the government set aside six million Danish Kroner for renovation of laboratories in 2010 with a view to get all of them up to standard by 2017-2018. Bygninsstyrelsen and HEIs are also trying to reform SEA to prevent this from happening again.

Recent trends

Funding levels for research been maintained in Denmark in the past few years which is in contrast with some other European countries. A relatively large element of research competitiveness has been introduced in the basic funding allocations to individual HEIs in a short space of time.

Despite the SEA university sector property reform, there is a growing debate among HEIs about the rents that they are paying to the state. The recent findings that the SEA

[41] Interviews with stakeholders.
[42] COWI A/S, RH Arkitekter AS, NNE Pharmaplan, Dalux ApS (2009): "Tilstandsvurdering af laboratorier ved universiteterne under SEA-ordningen", December 2008, Rev. januar 2009, Universitets- og Bygningsstyrelsen.

scheme consistently underfunded ongoing investments points to the difficulties in matching funding levels to needs, even where funding levels are relatively high like in Denmark.

Germany

Funders and funding instruments

Germany has 409 officially-recognized institutions of higher education: 104 universities, 6 colleges of education, 16 colleges of theology, 51 colleges of art, 203 universities of applied sciences, and 29 colleges of public administration. German universities and colleges offer more than 13,500 degree programs to approximately two million students.

Germany currently invests around 1.1% of its Gross Domestic Product in tertiary education. The majority of the funds stem from public sources. In 2010, the total volume of public funds for higher education institutions (HEIs) amounted to 23.3 billion euro. Of this, 19.9 billion euro (85.4 per cent) was provided by the regional states (Länder), which are responsible for the HEIs. The German Federal Government provided 3.4 billion euro (14.6 per cent).

The Federal Government and the regional Länder work together in providing government research funding. Cooperation involves the Federal Ministries and Land Ministries as well as the ministries responsible for research and science at Federal and Länder level. Other departments are also actively involved, including the ministries for economics, agriculture, consumer affairs, environment, and health.

Structural variations and investments

The DFG (German Research Foundation) is a self-governing organisation for science and research in Germany and is funded jointly by The Ministry for Education and Research (58%) and the Länder (42%). DFG is the main funder of research and research equipment funding in German HEIs. There are some instances of third party charitable project funding, which may include funds for equipment, e.g. from the Volkswagen Foundation and funding from industry, but DFG remains the main funder of research equipment in HEIs.

Scientific instrumentation and equipment can be applied for in several of the DFG's funding programmes. Equipment can be funded through research project funding. This implies 100% funding and ownership by the DFG until the end of the project, when ownership is transferred to the HEI in question, who is then allowed to use it for training and education purposes. In addition, major instrumentation (worth €50K or higher) for research at universities can be co-financed by the DFG (50%), whereby the ownership rests with the HEI. In the case of major research equipment funding, considered of national importance, it can be funded directly by the federal government (100%) and these applications are then reviewed by the DFG. All applications for funding are reviewed on scientific merit.

Core funding for HEIs comes from the regional Länder through which HEIs co-finance equipment purchases with DFG. DFG only funds purchase of equipment, all

maintenance and upkeep is the responsibility of the HEI. Any equipment with a purchase price under €10K should be funded by HEIs themselves.

Recent trends

During the economic crises of the past few years, Germany has not cut the budget for research or investment in research and has even managed to slightly increase their annual budget in these two fields.

A recent trend in HEI equipment funding in Germany is that HEIs are increasingly taking advantage of the option of creating core facilities, where they share equipment. This has also been encouraged by the DFG, which are seeing increasing demands for state of the art equipment. This is due to rapid advancement in technology where equipment can easily be out of date within a few years of purchase. The drive for HEIs to be competitive and at the forefront of technology, in terms of research equipment, is proving increasingly problematic for equipment funding.
Consequently, applications now increasingly have to have, in addition to a clear scientific argument, a statement that outlines their competency of housing and operating the equipment. In fact, an infrastructure justification is becoming a necessary part of each proposal to the DFG.

Iceland

Funders and funding instruments

Iceland has four public HEIs and two privately operated Universities. Public funding accounted for 81.9% of total R&D expenditure in the higher education sector in 2009. Private funding (from business enterprises and private non-profit organisations) accounted for 9.5% and funding from foreign sources 8.6%.[43]

The Icelandic Centre for Research (RANNIS), funded by the Icelandic Government, supports domestic research, research studies, technical development and innovation. This involves: administering competitive funds and strategic research programmes, coordinating and promoting Icelandic participation in collaborative international projects in science and technology, monitoring resources and performance in R&D, as well as promoting public awareness of research and innovation in Iceland. Moreover, RANNIS cooperates closely with the Icelandic Science and Technology Policy Council and provides professional assistance to the preparation and implementation of science and technology policy in Iceland. It coordinates funding from a variety of funds, the largest being The Icelandic Research Fund, £4 million (825 million ISK)[44], The Equipment Fund £565k (115 million ISK) and The Technology Development Fund £3.5 million (720 million ISK). The Equipment fund provides research institutions with funding to buy expensive equipment for the purpose of research. The Equipment Fund's grant only covers a part of the expenses concerning the investment, i.e. 75% of the costs before VAT.

[43] Source: Rannis, 2011
[44] Annual budgets for 2010 according to http://rannis.is/rannisenglish/

Structural variations and investments

The University of Iceland is by far the largest university in Iceland and owns most of the country's HEI research infrastructures, either solely or in collaboration with governmental organisations or industry. The University owns its own buildings and infrastructure, however uniquely funds most of it via its own lottery fund. The University has its own small equipment fund, which comprises some basic funding from the government as well as the University's own Lottery income. The equipment fund is divided into two funds, one of which is used for co-funding research equipment (contributing the 25% to funding from RANNIS) and another that is meant for purchases of small-scale equipment £5-25k (1-5 million ISK) and is a competitive application based fund, where individuals/labs/departments from within the University compete for funding. The RANNIS Equipment Fund is mostly used for purchase of small to medium sized research equipment value ranging from £25-250k (5-50 million ISK). When it comes to larger items, other sources of financing are used, such as government financing (in the case of research having a clear public health and safety goal such as health research or being associated with weather/earthquake/volcanic monitoring and research) or EU funds or collaborative funding with national or international institutions.

The University Hospital, which is the largest hospital in Iceland, also forms part of the University of Iceland, although its research equipment is mostly funded directly by the Ministry of Health.

Recent Trends

Despite the economic downturn, which was very steep in Iceland, funding for equipment is now on the up again, after a few years slump. Stakeholders' consulted praised the RANNIS equipment fund, which was revamped about 5 years ago to become a much stronger and larger fund. They, like many of contacts in the other countries, expressed the constant push to remain at the leading edge and having state of the art equipment but this is not something that seemed to overly concern them. Iceland seems to have various options when it comes to financing equipment and in many instances equipment is co-funded with industry. The University of Iceland also has reciprocal equipment sharing contracts with various countries, where they offer access to their unique state of the art equipment in geological research (volcanic and earthquake) in exchange for access to equipment in other fields, within which their equipment ownership is less strong.

Norway

Funders and funding instruments

In Norway there are in total eight universities, twenty-one university colleges, and nine specialised university colleges. All universities are publicly owned. Most institutions of higher education are state-run and are responsible for the quality of their own instruction, research and dissemination of knowledge. The eight universities perform

the largest part (about 80%) of research in the HEI sector. A large part of the funding for HEI research is the core funding channelled directly from the Ministry of Education and Research, but funds are also provided for projects funding through The Research Council of Norway (RCN). Since its reorganisation in 2003 the RCN acts as the only operational research policy agency in Norway. Majority of research funding goes through the RCN but some Government ministries also initiate and fund research projects, within their respective fields, for their own purposes, e.g. The Ministry of Health. According to the RCN National Strategy on Research Infrastructure for 2012-201745 large-scale investments are currently being allocated to research infrastructure to address the estimated investment needs of about £1.2 billion (NOK11 billion) for the period 2008-2017.

RCN is responsible for making decisions regarding investment in nationally oriented research infrastructure, i.e. development of research areas of national or regional priority and industries of national importance with a significant need for research infrastructure. RCN is responsible for coordinating investments when a number of research groups need a certain type of infrastructure but the costs are so high that cooperation is the best solution. The Research Council assesses applications involving investment costs starting at £220k- £22 million (2-200 million NOK) million in project funding. Allocations of over £22 million must be submitted by RCN to the relevant ministry for special consideration and final allocation of funding. To be eligible for funding, smaller-scale infrastructure with low investment costs must comprise a component of a larger-scale, nationally oriented research infrastructure or a nationally coordinated initiative, or be closely affiliated with one of the programme initiatives administered by RCN. Funding for smaller research equipment (under 2m NOK) is funded by RCN, but through project funding rather than infrastructure specific measures.

Structural variations and investments

Unlike Sweden and Denmark, Norwegian HEIs own their property and infrastructure and are responsible for all maintenance costs and repair of equipment. Most of small to medium sized equipment funding comes from the Universities' own basic budget, which is allocated from the Government. This Basic budget can be allocated at the Universities discretion. Universities usually earmark a part of their basic budget for Research Infrastructure and equipment. It then differs between universities how this is allocated to faculties and departments. Some of this funding may be channelled to high priority areas, defined as such by University or Faculty strategy and some may be allocated on a competitive basis.

Recent trends

Currently, there is an on-going national, regional and institutional debate in Norwegian HEI sector about how to prioritise equipment funding due to ever increasing demands for state-of-the-art equipment.

[45] http://www.forskningsradet.no/prognett-infrastruktur/Norwegian_Roadmap_for_Research_Infrastructure/1253976312605

The Norwegian government has prioritised and steadily increased contributions to education and research and continues to do so in 2013, with overall funding rising 2.2 per cent in real terms. In total, £3 billion (27.4 billion NOK) will be spent on research and development in 2013. In real terms, funding in 2013 will be 32%, higher than in 2005, which represents a very substantial increase. Higher education continues to be priority area, and in 2013 the government aims to invest in improving quality. The amount of funding provided through the Ministry of Education and Research's budget for higher education will go up by 1.45 billion NOK from 2012 to 2013, which in real terms is an increase of two per cent.[46] According to HEI contacts in Norway, there is also a recent trend of increasing number of applications from the social sciences and humanities e.g. for high-end computer equipment. This has further fuelled the debate of prioritisation as traditionally the majority of research infrastructure funding has gone to the natural sciences and medical sciences. There is little to signal a dramatic increase in capital funding to meet the new demand for equipment so it is clear that prioritisation warrants a discussion on future strategy of capital funding.

Sweden

Funders and funding instruments

There are 13 state-owned universities and 23 state-owned university colleges in Sweden and 3 private institutions.[47] Universities are the main research performers and receive three quarters of their funding from the public sector.[48] The main basic funding is allocated directly by central government for teaching and research and does not separate out research capital. Hence each university decides what proportion of the block funding that is channelled into research capital versus other expenditure as well as what level of overhead is retained at the central level to help cross-subsidise investments across departments. In recent years a competitive element was introduced in the allocation of this central block funding in which 10% of the research funding is linked to bibliometrics (see Government proposition 2012/13:30).[49] In addition to the block funding, Swedish HEIs can seek competitive funding from various Research Councils. In terms of research capital, the Swedish Research Council (Vetenskapsrådet) provides a dedicated funding initiative for research infrastructures of national importance, which HEIs apply for through a peer-reviewed, competitive process. The kinds of infrastructures that are supported by this funding are wide and ranges from subscriptions to international research infrastructures to supporting depositories or purchasing of equipment. To guide strategy in this area, the research councils jointly set up a Council for Research Infrastructures (RFI) in 2005, which

[46] Research Council of Norway. http://www.regjeringen.no/en/dep/kd/press-contacts/Press-releases/2012/education-given-high-priority-nok-19-bil.html?id=701282

[47] http://www.euraxess.se/en/Research-in-Sweden/Major-actors-in-RD/Higher-education/

[48] http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/se/country?section=ResearchPerformers&subsection=HigherEducationInstitutions

[49] http://www.riksdagen.se/sv/Dokument-Lagar/Forslag/Propositioner-och-skrivelser/prop-201213-30-_H00330/?html=true

publishes a long-term road map for investments in research infrastructure of national and international importance. The latest such roadmap was published this year.[50]

Structural variations and investments

State HEIs in Sweden are considered to be authorities and cannot for that reason own property in their own right. A reform in 1993 meant that the state HEIs would rent facilities and property from a state-owned, profit-making entity called Akademiska Hus AB. Akademiska hus rents out 62 percent of properties used by Swedish HEIs and has a property portfolio worth approximately 2.4 billion pounds (26 billion Swedish Krona).[51] The idea behind the reform was that it would bring more flexibility into the system and give the HEI leadership the ability to negotiate space requirements according to their needs. The idea was also that it would allow HEIs to better control property costs. The advantage of this system is that expenditure on property for research is easy to foresee since agreements span over longer time frames (10-20 years). Investments are also not so dependent on the economic cycle and new facilities can easily be up and running 2-3 years from conception. A disadvantage is that scientists do not always understand the model and can be tempted to move to other premises although this then does not work for the University who is tied into long-term rental agreements with Akademiska hus. Also, private foundation are not necessarily interested in investing in buildings or equipment that the state can then make a profit on via Akademiska hus.

According to the Swedish Research Council[52], the cost of facilities including rents paid to Akademiska Hus amounted to about a seventh of the total costs within the sector and remained stable between the middle of the 1990s and 2005 with few exceptions. This suggests that although this system enables HEIs to have a good grasp of long-term property costs, it can be inflexible and keep costs constant. Also, rent charges can be linked to the local market situation. This means that there can be large discrepancies in the rent levels paid by HEIs pay in different parts of the country.

With regards to investments in equipment, despite a rise in overall HEI expenditure by 40% between 1997 and 2007, this did not translate into larger investments in research equipment. In fact, investments in research equipment shrank from 6-7% of total research expenditure (1997-2001) to 4% (2003-2007) over the period. This was due to HEIs generally prioritising investment in more staff over equipment.[53]

Recent trends

In stark contrast to some other European countries, Sweden has consistently increased funding to Higher Education and Research over the past few years. Alongside larger amounts of funding to HEIs, an element of competitiveness has been introduced in the basic funding allocations to individual HEIs in which 10% of the funding is linked to

[50] Vetenskapsrådet (2012): "The Swedish Research Council's Guide to Infrastructures 2012, Recommendations on long-term research infrastructures by the research councils and VINNOVA", Vetenskapsrådet Rapport serie 3:2012.
[51] http://www.akademiskahus.se/index.php?id=511
[52] Hällsten, M. and Hyenstrand, P.: "Lokalkostnader vid universitet och högskolor", Vetenskapsrådet, Analysenheten, 2005-06-22, Dnr 2004-440.
[53] Friberg, M. and Hyenstrand, P.: "En studie av investeringar i utrustning för forskning vid svenska universitet och högskolor, 1997–2007", Vetenskapsrådets lilla rapportserie, 9:2010.

bibliometrics. Many in the sector predict that this percentage will rise to at least 20% after 2016 following the next government proposition. This would then see Sweden following a similar path to Denmark.

Many state-owned HEIs are becoming increasingly vocal about a system in which they cannot own property, and hence cannot take advantage of private-sector funding for new or shared facilities with industry, as well as a system in which the state makes a profit on rents of facilities paid for by the state through its own HEI research funding.

USA

Funders and funding instruments

The US R&D funding system is large, with expenditures in the public and private sectors standing at more than £217 billion ($349 billon). The main sources of funding of US R&D are government and private industry and the main producers of research are industry and universities. 67% of R&D funding in 2008 came from private industry and 27% from the federal government. Private industry performed just over 70% of all research in 2008. Universities performed 14% of R&D in 2009. Nearly 60% of all university research was funded by the federal government in 2009. The federal government funds more extramural research than it conducts in-house. Nearly 40% of federal funding goes to federal R&D performers.[54]

In 2009, about £1.25 billion ($2.0 billion) in current funds was spent for academic research equipment (i.e., movable items such as computers or microscopes), a 2% increase over 2008. Equipment spending as a share of total R&D expenditures fell from 4.8% in the financial year 1999 to a three decade low of 3.6% in 2009. Three science and engineering fields accounted for 82% of equipment expenditures in 2009: the life sciences (41%), engineering (24%), and the physical sciences (17%). In the financial year 2009, the federal share of support for all academic research equipment funding was 55%. This share has fluctuated between 55% and 63% over the last 20 years.[55]

Structural variations and investments

US HEIs fund their capital investments through a combination of sources: the Federal government, state and local governments, and institutional funds, which include endowments, private donations, and facilities and administration (F&A) costs recovered from the Federal government. The Federal share of these capital investments is generally about 5%, with the state/local governments accounting for 22%, and the institutions themselves contributing 72%. As just noted, the institutional share does include F&A costs reimbursed by the Federal government as part of Federal contracts and grants, primarily research grants. The reimbursed funds are used for such activities as operation and maintenance of research facilities, library expenses,

[54] ERA WATCH http://erawatch.jrc.ec.europa.eu/

[55] US Science and Engineering Indicators 2012. National Center for Science and Engineering Statistics. http://www.nsf.gov/statistics/seind12/c5/c5h.htm#s1

department administration, including secretaries, academic deans, and grant compliance officers.[56] However, according to a 2000 RAND study[57], the true F&A costs incurred by an institution are higher than the rate for which they are reimbursed and analyses indicate that universities are recouping between 70 to 90% of the amount they are actually spending on facilities and administration.

Recent trends

The US President's 2012 Budget proposes a substantial Federal investment of £1.5 billion ($2.4 billion) in research infrastructure. The budget announcement included funds to support major research instrumentation acquisitions in the extramural research community through the programs listed below, totalling £124 million ($199 million) in the 2012 Budget:

National Science Foundation, Major Research Instrumentation, £56 million ($90 million)
NSF's Major Research Instrumentation (MRI) program is an NSF-wide, crosscutting program that strengthens the U.S. scientific enterprise by investing in state-of-the-art research instrumentation at HEIs, research museums, and non-profit research organizations. The MRI program promotes acquisition and development of instrumentation for shared use. MRI funds are awarded through a competitive, merit review process based on proposals. The 2012 Budget proposes $90 million for the MRI program, the same as the 2010 enacted funding level.

Department of Health and Human Services, National Institutes of Health, National Center for Research Resources, Shared Instrumentation Grants, £38 million ($61 million)
The National Center for Research Resources (NCRR) within the National Institutes of Health (NIH) supports Shared Instrumentation/High-End Instrumentation Grants programs. Although these programs are not typically included in the annual R&D budget survey of major capital equipment for R&D funding, these one-year awards help NIH-supported investigators acquire commercially available equipment, typically too costly to obtain through a research project grant. Instrumentation purchased with an award must be shared by at least three NIH supported scientists. The Shared Instrumentation program funds equipment in the ($100-$600k) range and the High-End Instrumentation program funds instrumentation in the $750k - $2 million range. These funds are awarded through a competitive, merit review process based on proposals. The 2012 Budget proposes $61 million for the Shared Instrumentation/High-End Instrumentation Grants programs, a decrease of $5 million from the 2010 enacted funding level.

Department of Defence, Defence University Research Instrumentation Program, £30 million ($48 million)
The Department of Defence's (DOD) Defence University Research Instrumentation Program (DURIP) funds competitive grants for research instrumentation to enhance

[56] The State of Research Infrastructure at U.S. Universities. http://science.house.gov/sites/republicans.science.house.gov/files/documents/hearings/022310_charter.pdf
[57] http://www.rand.org/pubs/monograph_reports/MR1135-1/

universities' capabilities to conduct world-class research critical to DOD needs. DURIP generally funds equipment in the $50k to $1 million range. DURIP is funded by the three services (Army, Navy, and Air Force) in each service's University Research Initiatives (URI) program.

In addition to these dedicated programs, other Federal programs offer support for research instrumentation as part of general infrastructure support. *The National Science Foundation's (NSF) Experimental Program to Stimulate Competitive Research (EPSCoR) program*, for example, proposes £72 million ($116 million) in the 2012 Budget for its Research Infrastructure Improvement (RII) program of awards to strengthen academic research infrastructure to institutions in EPSCoR-eligible states. While the program does not generally fund research instrumentation exclusively, the program does support awards for instrumentation as part of complex, multifaceted state-wide awards to develop research infrastructure.[58]

The bulk of academic R&D funding from non-federal sources is provided by the universities themselves. The share of support provided by institutional funds increased steadily between 1972 (12%) and 1991 (19%) but since then has remained fairly stable at roughly one-fifth of total academic R&D funding. Industry's percentage of funding for academic R&D declined steeply after the 1990s, from above 7% in 1999 down to about 5% by 2004, but has seen a 5-year increase to about 6% in 2009.Support from other governmental agencies, chiefly state funds, declined from 10% in the late 1970s to about 8% through the 1990s and stood at less than 7% in 2009.[59]

[58] See: Research Infrastructure in the President's 2012 Budget. A Report to Congress on Federal Investment in Research Facilities Construction and Major Research Instrumentation. http://www.whitehouse.gov/sites/default/files/microsites/ostp/facilities-report-12.pdf

[59] US Science and Engineering Indicators 2012. National Center for Science and Engineering Statistics. http://www.nsf.gov/statistics/seind12/c5/c5h.htm#s1

Annex 5: Detailed data

The following data reflects analyses of survey and secondary source data on research capital funding and expenditure not already included in the main chapters of the report or which appears here in a more detailed format.

Table 6: Definition of TRAC peer groups

TRAC Peer Group	Type of Institutions
Group A	Russell Group (all have medical schools) excluding LSE, plus specialist medical schools
Group B	All other institutions with Research income of 22% or more of total income
Group C	Institutions with a Research income of 8%-21% of total income
Group D	Institutions with a Research income of between 5% and 8% of total income and those with a total income > £120m
Group E	Teaching institutions with a turnover of between £40m and £119m
Group F	Smaller teaching institutions
Group G	Specialist music/arts teaching institutions

Source: www.jcpsg.ac.uk/guidance/revisions/PeerGroups09.pdf

Table 7: Survey respondent demography by TRAC peer group, affiliation and income

TRAC peer group	Affiliation	Size (Income)	N	%
Peer Group A	Russell Group	£300-600m	7	28%
		> £600m	5	20%
		Total	12	48%
	1994 Group	< £300m	1	4%
	MillionPlus	< £300m	1	4%
	University Alliance	£300-600m	1	4%
	No affiliation	< £300m	1	4%
	Total	< £300m	3	12%
		£300-600m	8	32%
		> £600m	5	20%
		Total	16	64%
Peer Group B	Russell Group	< £300m	1	4%
	1994 Group	< £300m	3	12%
		Total	3	12%
	No affiliation	< £300m	3	12%
		Total	3	12%

TRAC peer group	Affiliation	Size (Income)	N	%
	Total	< £300m	7	28%
		Total	7	28%
Peer Group C	Russell Group	< £300m	1	4%
	Total	< £300m	1	4%
Peer Group G	No affiliation	< £300m	1	4%
	Total	< £300m	1	4%
Total	Russell Group	< £300m	2	8%
		£300-600m	7	28%
		> £600m	5	20%
		Total	14	56%
	1994 Group	< £300m	4	16%
		Total	4	16%
	MillionPlus	< £300m	1	4%
	University Alliance	£300-600m	1	4%
	No affiliation	< £300m	5	20%
		Total	5	20%
	Total	< £300m	12	48%
		£300-600m	8	32%
		> £600m	5	20%
		Total	25	100%

Source: Policy Impact (2013).

Table 8: Research capital formula funding by instrument and partners (£m)

In £m/Country	Instruments Academic Years	SRIF 2002-2004	SRIF 2 2004-2006	SRIF 3 2006-2008	RCIF 2008-2011	RCIF 2 2011-2015	Total 2002-2012
England	Central Government	300	465	487	539	253	2,044
	HEFCE	300	406	416	737	296	2,155
	Total England	600	871	903	1,276	549	4,199
Scotland	Central Government	0	35	61	80	41	217
	SFC	42	47	25	80[a]	41*	236
	Total Scotland	42	82	86	80	73	364
Wales	Central Government	0	25	25	24	10	84
	HEFCW	0	22	22	32	10*	85
	Total Wales	0	47	46	56	20	170
N. Ireland	Central Government	7	12	15	11	4	49
	DEL	0	8	8	23	4	42
	Total N. Ireland	7	19	24	34	8	91
Total Central Government (A)		307	537	588	655	308	2,395
Total HE Funding Councils (B)		342	483	471	872	351	2,519
Total Research Capital Formula Funding to HEIs (A + B)		649	1,019	1,059	1,527	659	4,914

Sources: DELNI, HEFCW, HEFCE, SFC, and BIS (2010).

Notes: *Values for SFC and HEFCW contributions for AY 2013-14 and 2014-15 estimated to match BIS funding. [a]Estimated values for SFC contributions under RCIF estimated to match BIS funding.

Table 9: Research capital formula funding by partners and CSRs (£m)

Country	Funder	CSR 2004 2005-2008	CSR 2007 2008-2011	CSR 2010 2011-2015	Total 2005-2015
England	Central Government	720	539	253	1,511
	HEFCE	629	737	296	1,662
	Total England	1,348	1,276	549	3,174
Scotland	Central Government	90	80	41	212

		CSR 2004	CSR 2007	CSR 2010	Total
	SFC	38	80[a]	41*	48
	Total Scotland	129	161	82	282
Wales	Central Government	38	24	10	72
	HEFCW	32	32	10*	75
	Total Wales	70	56	20	146
N. Ireland	Central Government	21	11	4	36
	DEL	12	8	4	25
	Total N. Ireland	33	20	8	61
Total Central Government (A)		869	655	308	1,831
Total HE Funding Councils (B)		712	858	351	1,840
Total Research Capital Formula Funding to HEIs (A + B)		1,580	1,513	659	3,671

Sources: DELNI, HEFCW, HEFCE, SFC, and BIS (2010).

Notes: *Values for SFC and HEFCW contributions for AY 2013-14 and 2014-15 estimated to match BIS funding. [a]Estimated values for SFC contributions under RCIF estimated to match BIS funding.

Table 10: UK HEIs – Mean QR funding over time by country (£000)

Country	England	Wales	Scotland	N. Ireland	Total UK
AY 2005-2006	£11,580	£6,761	£9,165	£19,912	£11,107
AY 2006-2007	£12,087	£6,928	£10,338	£20,460	£11,688
AY 2007-2008	£12,377	£7,489	£11,099	£21,705	£12,073
AY 2008-2009	£12,813	£7,696	£12,313	£22,876	£12,604
AY 2009-2010	£12,870	£6,842	£11,729	£17,270	£12,431
AY 2010-2011	£12,810	£6,791	£11,835	£17,602	£12,398
AY 2011-2012	£12,866	£7,279	£11,835	£15,599	£12,464
AY 2012-2013	£12,670	£7,279	£13,119	£14,995	£12,447
AY 2013-2014	£12,767	£7,279	£13,447	£15,297	£12,567
AY 2014-2015	£12,767	£7,279	£13,447	£15,297	£12,567

Sources: DELNI, HEFCW, HEFCE, SFC, and BIS (2010).

Notes: Values for English, Welsh and Scottish allocations for AY 2013-14 and 2014-15 calculated on the basis of overall budget estimates and average proportions of funding received in the preceding two years.

Table 11: UK HEIs – Mean Formula Research Capital funding over time by country (£000)

FRC Instrument	Country	England	Wales	Scotland	N. Ireland	Total UK
SRIF 2	AY 2005-2006	£3,690	£1,854	£3,267	£798	£3,464
SRIF 3	AY 2006-2007	£3,762	£2,316	£3,131	£7,191	£3,636
	AY 2007-2008	£3,763	£2,316	£2,306	£7,066	£3,578
RCIF 1	AY 2008-2009	£3,635	£1,823	£2,714	£2,818	£3,388
	AY 2009-2010	£3,635	£1,974	£3,601	£7,311	£3,568
	AY 2010-2011	£3,635	£1,820	£2,625	£4,777	£3,403
RCIF 2	AY 2011-2012	£1,296	£1,057	£2,155	£6,786	£1,438
	AY 2012-2013	£1,296	£1,279	£2,608	£965	£1,378
	AY 2013-2014	£1,296	£1,279	£2,585	£957	£1,377
	AY 2014-2015	£1,296	£1,279	£2,910	£1,077	£1,400

Sources: DELNI, HEFCW, HEFCE, SFC, and BIS (2010).

Notes: Values for Welsh and Scottish allocations for AY 2013-14 and 2014-15 calculated on the basis of overall budget estimates and average proportions of funding received in the preceding two years.

Table 12: UK HEIs – Total number of QR & FRC recipients by country over time

Country	England QR	England FRC	Wales QR	Wales FRC	Scotland QR	Scotland FRC	Northern Ireland QR	Northern Ireland FRC
AY 2005-2006	106	118	8	11	17	18	2	2
AY 2006-2007	109	120	8	10	17	18	2	2
AY 2007-2008	112	120	8	10	17	13	2	2
AY 2008-2009	112	117	8	10	16	18	2	2
AY 2009-2010	123	117	10	10	18	18	3	2
AY 2010-2011	123	117	10	10	18	18	3	2
AY 2011-2012	121	105	9	4	18	8	3	2
AY 2012-2013	123	105	9	4	17	8	3	2
AY 2013-2014	122	105	9	4	17	8	3	2
AY 2014-2015	122	105	9	4	17	8	3	2

Sources: DELNI, HEFCW, HEFCE, and SFC.

Notes: Where actual allocations are pending, numbers of recipients are estimated to remain the same as the average between 2011-12 and 2012-13.

Table 13: UK HEIs – Mean FRC and QR funding available per year by CSR and by TRAC peer groups

Mean FRC available per year			
TRAC Peer Group	CSR 2004	CSR 2007	CSR 2010
Peer Group A	£15,098	£14,658	£4,958
Peer Group B	£3,932	£3,853	£1,236
Peer Group C	£1,694	£1,439	£486
Peer Group D	£773	£723	£259
Peer Group E	£233	£214	£78
Peer Group F	£93	£135	£25
Peer Group G	£236	£219	£57

Mean FRC available per year			
Total	£3,559	£3,476	£1,398
Mean QR available per year			
TRAC Peer Group	**CSR 2004**	**CSR 2007**	**CSR 2010**
Peer Group A	£44,111	£51,089	£52,756
Peer Group B	£13,440	£15,155	£15,004
Peer Group C	£5,219	£6,479	£6,608
Peer Group D	£1,719	£3,169	£3,350
Peer Group E	£398	£980	£1,103
Peer Group F	£474	£381	£394
Peer Group G	£1,274	£876	£852
Total	£11,208	£12,198	£12,778

Sources: DELNI, HEFCW, HEFCE, and SFC.

Table 14: UK HEIs – Mean FRC and QR funding available per year by CSR and country

Mean FRC available per year			
Country	**CSR 2004**	**CSR 2007**	**CSR 2010**
England	£3,718	£3,635	£1,296
Wales	£2,022	£1,873	£1,223
Scotland	£2,688	£2,980	£2,564
Northern Ireland	£5,018	£4,969	£2,446
Total UK	£3,489	£3,453	£1,398
Mean QR available per year			

Country	CSR 2004	CSR 2007	CSR 2010
England	£11,596	£12,449	£12,767
Wales	£7,059	£6,596	£7,279
Scotland	£8,940	£11,503	£13,121
Northern Ireland	£20,692	£16,708	£15,297
Total UK	£11,129	£12,041	£12,530

Sources: DELNI, HEFCW, HEFCE, and SFC.

Table 15: Mean small research capital expenditure by academic year and income (£000)

Size*		AY 2005/06	AY 2008/09	AY 2011/12	AY 2015/15
Below £300 Million	N	12	12	12	10
	Mean	£7,224	£7,078	£7,032	£4,036
Between £300-600 Million	N	8	8	8	7
	Mean	£15,938	£19,777	£16,595	£19,761
Above £600 Million	N	5	5	5	5
	Mean	£46,429	£34,873	£30,660	£35,361
Total	N	25	25	25	22
	Mean	£17,853	£16,701	£14,818	£16,159

Source: Policy Impact (2013) and HESA HEI income data for AY 2010/11.

Table 16: Mean small research capital expenditure by academic year & peer group (£000)

TRAC Peer Group		AY 2005/06	AY 2008/09	AY 2011/12	AY 2015/15
Peer Group A	N	16	16	16	14
	Mean	£24,756	£23,327	£20,208	£23,045
Peer Group B	N	7	7	7	6
	Mean	£6,824	£6,133	£6,360	£5,293
Peer Group C	N	1	1	1	1
	Mean	£2,372	£771	£1,796	£1,000
Peer Group G	N	1	1	1	1
	Mean	£100	£575	£800	£100
Total	N	25	25	25	22
	Mean	£17,853	£16,701	£14,818	£16,159

Source: Policy Impact (2013).

Table 17: Mean large research capital expenditure by academic year and income (£000)

Size*		AY 2005/06	AY 2008/09	AY 2011/12	AY 2015/15
Below £300 Million	N	1	1	1	1
	Mean	£2,726	£1,257	£2,368	£10,000
Between £300-600 Million	N	2	2	2	1
	Mean	£26,610	£39,645	£6,952	£6,000
Above £600 Million	N	2	2	2	1
	Mean	£7,192	£12,082	£16,543	£41,700
Total	N	5	5	5	3
	Mean	£14,066	£20,942	£9,872	£19,233

Source: Policy Impact (2013) and HESA HEI income data for AY 2010/11.

Table 18: Mean proportions of actual research capital expenditure by source (%)

Source/Year	2005/06 %	2008/09 %	2011/12 %
Funding Councils	54.24	41.16	22.56
Other Public Funding	17.92	19.16	16.44
Private Sources	7.48	9.80	13.72

	2005/06	2008/09	2011/12
Own Sources	19.80	27.76	48.24
Other	.68	.88	.08

Source: Policy Impact (2013).

Table 19: Sources of research capital expenditure by size of income & academic year

AY 2005/06		Funding Councils	Other Public Funding	Private Sources	Own Sources	Other
Below £300 Million	N	12	12	12	12	12
	Mean	54.50	22.00	7.67	15.92	0.00
Between £300-600 Million	N	8	8	8	8	8
	Mean	51.25	12.13	4.50	31.50	.75
Above £600 Million	N	5	5	5	5	5
	Mean	58.40	17.40	11.80	10.40	2.20
Total	N	25	25	25	25	25
	Mean	54.24	17.92	7.48	19.80	.68
AY 2008/09		**Funding Councils**	**Other Public Funding**	**Private Sources**	**Own Sources**	**Other**
Below £300 Million	N	12	12	12	12	12
	Mean	41.50	19.42	7.92	31.08	.08
Between £300-600 Million	N	8	8	8	8	8
	Mean	42.63	20.13	4.75	28.13	.38
Above £600 Million	N	5	5	5	5	5
	Mean	38.00	17.00	22.40	19.20	3.60
Total	N	25	25	25	25	25
	Mean	41.16	19.16	9.80	27.76	.88
AY 2011/12		**Funding Councils**	**Other Public Funding**	**Private Sources**	**Own Sources**	**Other**
Below £300 Million	N	12	12	12	12	12
	Mean	20.50	14.83	14.67	50.67	0.00
Between £300-600 Million	N	8	8	8	8	8
	Mean	25.50	16.88	6.88	51.00	.13
Above £600 Million	N	5	5	5	5	5
	Mean	22.80	19.60	22.40	38.00	.20
Total	N	25	25	25	25	25
	Mean	22.56	16.44	13.72	48.24	.08

Source: Policy Impact (2013) and HESA HEI income data for AY 2010/11.

Table 20: Sources of research capital expenditure by TRAC peer group & academic year

AY 2005/06		Funding Councils	Other Public Funding	Private Sources	Own Sources	Other
Peer Group A	N	16	16	16	16	16
	Mean	49.56	18.44	10.06	21.00	1.06

AY 2005/06		Funding Councils	Other Public Funding	Private Sources	Own Sources	Other
Peer Group B	N	7	7	7	7	7
	Mean	64.71	21.86	3.00	10.43	0.00
Peer Group C	N	1	1	1	1	1
	Mean	10.00	0.00	5.00	86.00	0.00
Peer Group G	N	1	1	1	1	1
	Mean	100.00	0.00	0.00	0.00	0.00
Total	N	25	25	25	25	25
	Mean	54.24	17.92	7.48	19.80	0.68
AY 2008/09		**Funding Councils**	**Other Public Funding**	**Private Sources**	**Own Sources**	**Other**
Peer Group A	N	16	16	16	16	16
	Mean	38.44	23.25	12.31	22.75	1.31
Peer Group B	N	7	7	7	7	7
	Mean	42.14	12.14	6.86	38.71	.14
Peer Group C	N	1	1	1	1	1
	Mean	29.00	22.00	0.00	49.00	0.00
Peer Group G	N	1	1	1	1	1
	Mean	90.00	0.00	0.00	10.00	0.00
Total	N	25	25	25	25	25
	Mean	41.16	19.16	9.80	27.76	.88
AY 2011/12		**Funding Councils**	**Other Public Funding**	**Private Sources**	**Own Sources**	**Other**
Peer Group A	N	16	16	16	16	16
	Mean	22.63	19.81	16.63	41.88	.13
Peer Group B	N	7	7	7	7	7
	Mean	25.29	13.43	6.71	54.71	0.00
Peer Group C	N	1	1	1	1	1
	Mean	5.00	0.00	5.00	88.00	0.00
Peer Group G	N	1	1	1	1	1
	Mean	20.00	0.00	25.00	65.00	0.00
Total	N	25	25	25	25	25
	Mean	22.56	16.44	13.72	48.24	.08

Source: Policy Impact (2013) and HESA HEI income data for AY 2010/11.

Table 21: Proportion of RCIF and other public funding for small Investments by income size & academic year

Size by Income (HESA data 2010-2011)		RCIF Funding			Other Funding		
		2005/06	2008/09	2011/12	2005/06	2008/09	2011/12
Below £300 Million	N	12	12	12	12	12	12
	Mean	58.00	51.25	36.33	18.83	25.00	26.58
Between £300-600 Million	N	8	8	8	8	8	8
	Mean	49.63	39.50	42.38	22.25	37.38	30.75
Above £600 Million	N	5	5	5	5	5	5
	Mean	72.00	54.20	30.40	18.40	31.80	59.60
Total	N	25	25	25	25	25	25
	Mean	58.12	48.08	37.08	19.84	30.32	34.52

Source: Policy Impact (2013) and HESA HEI income data for AY 2010/11.

Table 22: Proportion of RCIF and other public funding for small Investments by TRAC group & academic year

Proportion of RCIF Funding - Small Investments				
TRAC Peer Group		AY 2005-2006	AY 2008-2009	AY 2011-2012
Peer Group A	N	16	16	16
	Mean	58.19	42.50	37.06
Peer Group B	N	7	7	7
	Mean	60.29	61.71	44.86
Peer Group C	N	1	1	1
	Mean	0.00	0.00	0.00
Peer Group G	N	1	1	1
	Mean	100.00	90.00	20.00
Total	N	25	25	25
	Mean	58.12	48.08	37.08
Proportion of Other Funding - Small Investments				
TRAC Peer Group		AY 2005-2006	AY 2008-2009	AY 2011-2012
Peer Group A	N	16	16	16
	Mean	21.19	36.75	39.31
Peer Group B	N	7	7	7
	Mean	22.43	24.29	33.43
Peer Group C	N	1	1	1
	Mean	0.00	0.00	0.00
Peer Group G	N	1	1	1
	Mean	0.00	0.00	0.00
Total	N	25	25	25
	Mean	19.84	30.32	34.52

Source: Policy Impact (2013) and HESA HEI income data for AY 2010/11.

Table 23: Comparison of expenditure and actual FRC funding allocations – Mean values

Comparison of mean values by country and TRAC peer group and income size							
Country	TRAC Peer Group	Mean self-reported expenditure	Mean actual FRC allocation	Mean self-reported expenditure	Mean actual FRC allocation	Mean self-reported expenditure	Mean actual FRC allocation
		2005/06	2005/06	2008/09	2008/09	2011/12	2011/12
England	Peer Group A	£23,565	£18,328	£22,993	£17,879	£19,780	£5,916
	Peer Group B	£4,708	£4,576	£5,303	£4,398	£6,266	£1,362
	Peer Group C	£2,372	£4,586	£771	£3,680	£1,796	£939
	Peer Group G	£100	£315	£575	£504	£800	£121
	Total	£16,393	£13,134	£16,139	£12,767	£14,414	£4,184
Scotland	Peer Group A	£29,122	£17,528	£32,374	£14,417	£24,123	£6,245
	Peer Group B	£19,519	£7,671	£11,114	£4,870	£6,925	£1,205
	Total	£24,320	£12,600	£21,744	£9,644	£15,524	£3,725
N_Ireland	Peer Group A	£37,054	£1,155	£18,966	£2,304	£22,292	£10,415
	Total	£37,054	£1,155	£18,966	£2,304	£22,292	£10,415
Total	Peer Group A	£24,756	£17,204	£23,327	£16,689	£20,208	£6,217
	Peer Group B	£6,824	£5,018	£6,133	£4,465	£6,360	£1,340
	Peer Group C	£2,372	£4,586	£771	£3,680	£1,796	£939
	Peer Group G	£100	£315	£575	£504	£800	£121
	Total	£17,853	£12,612	£16,701	£12,099	£14,818	£4,397

Comparison of mean values by country and income size							
Country	Income-size	Mean self-reported expenditure	Mean actual FRC allocation	Mean self-reported expenditure	Mean actual FRC allocation	Mean self-reported expenditure	Mean actual FRC allocation
		2005/06	2005/06	2008/09	2008/09	2011/12	2011/12
England	Below £300 Million	£3,804	£4,354	£4,145	£4,254	£5,334	£1,270
	Between £300-600 Million	£12,921	£12,208	£19,893	£12,315	£15,781	£3,882
	Above £600 Million	£46,429	£31,991	£34,873	£30,427	£30,660	£10,435
	Total	£16,393	£13,134	£16,139	£12,767	£14,414	£4,184

Scotland	Below £300 Million	£24,320	£12,600	£21,744	£9,644	£15,524	£3,725
	Total	£24,320	£12,600	£21,744	£9,644	£15,524	£3,725
N_Ireland	Between £300-600 Million	£37,054	£1,155	£18,966	£2,304	£22,292	£10,415
	Total	£37,054	£1,155	£18,966	£2,304	£22,292	£10,415
Total	Below £300 Million	£7,224	£5,728	£7,078	£5,152	£7,032	£1,679
	Between £300-600 Million	£15,938	£10,826	£19,777	£11,063	£16,595	£4,698
	Above £600 Million	£46,429	£31,991	£34,873	£30,427	£30,660	£10,435
	Total	£17,853	£12,612	£16,701	£12,099	£14,818	£4,397

Source: Policy Impact (2013), HESA HEI income data for AY 2010/11, SFC, HEFCE and DELNI funding data.

Table 24: Autonomous capital investment threshold by TRAC peer group and income

Size by Income (HESA data 2010-2011)	N	Mean	Std. Deviation	Minimum	Maximum
Below £300 Million	7	133.6	180.7	10	500
Between £300-600 Million	6	164.2	185.2	10	500
Above £600 Million	5	140.0	102.5	50	250
Total	18	145.6	155.8	10	500
TRAC Peer Group	N	Mean	Std. Deviation	Minimum	Maximum
Peer Group A	13	135.4	140.9	10	500
Peer Group B	4	152.5	232.4	10	500
Peer Group C	1	250.0		250	250
Total	18	145.6	155.8	10	500

Source: Policy Impact (2013) and HESA HEI income data for AY 2010/11.

Table 25: Equipment capitalisation threshold by TRAC peer group and income

Size by Income (HESA data 2010-2011)	N	Mean	Std. Deviation	Minimum	Maximum
Below £300 Million	12	15.4	8.4	5	30
Between £300-600 Million	8	21.3	6.9	5	25
Above £600 Million	5	31.0	10.8	25	50
Total	25	20.4	10.1	5	50
TRAC Peer Group	N	Mean	Std. Deviation	Minimum	Maximum
Peer Group A	16	25.0	8.6	5	50
Peer Group B	7	10.0	2.9	5	15
Peer Group C	1	30.0	N/A	30	30
Peer Group G	1	10.0	N/A	10	10
Total	25	20.4	10.1	5	50

Source: Policy Impact (2013) and HESA HEI income data for AY 2010/11.

Table 26: Top three areas for research capital investments by financial year

Area	Financial year		
	2005/06	2008/09	2011/12
	Top 1 Areas (% expenditure in area)		
< £300m	Biological, Mathematical and Physical Sciences (42%)	Biological, Mathematical and Physical Sciences (33%)	Biological, Mathematical and Physical Sciences (33%)
£300-600m	Biological, Mathematical and Physical Sciences (50%)	Biological, Mathematical and Physical Sciences (38%)	Engineering and Technology (75%)
> £600m	Medicine, Dentistry and Health (60%)	Medicine, Dentistry and Health (60%)	Engineering and Technology (60%)
	Top 2 Areas (% expenditure in area)		
	2005/06	2008/09	2011/12
< £300m	Biological, Mathematical and Physical Sciences (33%)	Biological, Mathematical and Physical Sciences (50%)	Biological, Mathematical and Physical Sciences (33%)
£300-600m	Engineering and Technology (75%)	Engineering and Technology (38%)	Biological, Mathematical and Physical Sciences (50%)
> £600m	Biological, Mathematical and Physical Sciences and Medicine, Dentistry and Health (both 40%)	Biological, Mathematical and Physical Sciences and Engineering and Technology (both 40%)	Biological, Mathematical and Physical Sciences (80%)
	Top 3 Areas (% expenditure in area)		
	2005/06	2008/09	2011/12
< £300m	Agriculture, Forestry, Vet Science, Engineering and Technology, Administrative, Business and Social Studies, Humanities, Language and Archaeological Studies, Education (just under 17% for all 5 areas)	Humanities, Language and Archaeological Studies (33%)	Engineering and Technology (25%)
£300-600m	Medicine, Dentistry and Health (38%)	Medicine, Dentistry and Health (50%)	Medicine, Dentistry and Health (38%)
> £600m	Engineering and Technology (60%)	Engineering and Technology (60%)	Medicine, Dentistry and Health (40%)

Source: Policy Impact (2013).

Table 27: Main strategy to secure future research capital expenditure by income size

Main strategy	Income		
	> £300m	£300-600m	< £600m
Appointing dedicated resources	8%	38%	20%
Retaining more funds centrally	17%	13%	40%
Pursuing private sources of funding	42%	50%	40%
Selling off assets	0%	0%	0%
Other	33%	0%	0%
Total	100%	100%	100%

Source: Policy Impact (2013) and HESA HEI income data for AY 2010/11.