Assessing the Impacts of Academic Social Science Research

Modelling the economic impact on the UK economy of UK-based academic social science research

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Executive Summary

- We distinguish two kinds of 'economic impact' of academic social science research spending:
  - the value added and jobs sustained by the spending
  - the value of the benefits to users of the research
- We follow the conventional methodology for estimating the value added and jobs sustained by the spending of social science departments and find that the £3.35bn spent in 2010/11 generated £2.7bn of value added within the departments themselves and a further £0.5bn of value added in other (supplying) sectors. If Keynesian multiplier ('induced') effects are included, a further £1.6bn was generated, giving a total of £4.8bn.
- We develop estimates of the value of the benefits to users of the research based on the following argument. In the case of the social sciences, the most important outputs tend not to be embodied in products or codified knowledge that can readily be used or accessed by those with no training in the relevant discipline.

Table 1: Summary of economic impacts of social science research spending

Economic impacts of the spending of UK social science departments, 2010/11	£bn
Value added in social science departments	2.7
Value added elsewhere in the economy ('indirect')	0.5
Value added stimulated by spending from wages ('induced')	1.6
Total UK value added	4.8
Estimates of spending on research-mediation (as a measure of the benefits of social science research)	£bn
Government (including education and health)	
In-house staff	6.2
Overheads (40%)	2.5
Bought-in consultancy	0.5
Finance	
In-house staff	7.0
Overheads (40%)	2.8
Sectors outside of government	
Bought-in consultancy	0.5
Total	19.4

Rather, the benefits of research activity must typically be mediated by experienced researchers, whether employed directly by the final user of the research or by specialist consultancies and think tanks. We therefore seek to construct estimates of what the users of research mediation activities currently pay for the outputs of those activities (which could not be sustained in the long term in the absence of UK-based academic SSR), which we interpret as a minimum estimate of the value of those outputs.

- We have drawn on the Labour Force Survey to estimate the number and wages of workers who have a social science degree and are employment in occupations and sectors in which it is plausible to argue that their work involves research mediation. We have used the turnover of consultancy companies likely to be involved in research mediation to estimate bought-in consultancy inputs. We have also reviewed partial data on central government employment by profession, which supports a much narrower definition of research-mediation professionals, but are unable to extend this approach outside of central government to construct comparable narrowly-defined estimates for the rest of the economy. Use of the narrower definition would imply that a large number of social science graduates working in government are not involved in research mediation at all, which seems unlikely (depending on how narrowly we choose to define 'research mediation'.
- We estimate that some £13.2bn was spent employing relevant staff in government (including education, but excluding teaching staff, and health) and in the finance sector. If we add an estimate for overhead costs of employing these staff, the value of spending on in-house research mediation rises to £18.4bn. We estimate that a further £1bn was spent on consultancy relevant to research mediation.

1 Introduction

This report presents an analysis of the economic impact of academic social science research on the UK economy.

It begins with a methodological discussion of how economic impact should be defined in this context, highlighting the distinction between an approach that measures the economic activity sustained by *spending* on research and one that seeks to measure the *benefits* of research to its users. The two subsequent chapters present estimates for each of these approaches. The methods for estimating the value of activity sustained by research spending are well-established and have been applied in previous studies of the economic impact of universities. The methods for estimating the value of the benefits of research have been developed here and rely on the assumption that users of the research must employ staff or consultants to mediate the research results, so that the amount paid for the employment of those staff or consultants provides a minimum estimate of the value of the research to the users. Various sources are then used in an attempt to estimate this expenditure, the main difficulty being determining whether workers or consultancies are engaged in research mediation based on the description of their role, qualification or business.

2 Methodological Issues

2.1 The meaning of the 'economic impact' of academic research

The value added and employment sustained by expenditure

As commonly applied in other contexts, *economic impact* is typically taken to mean the value added and jobs sustained by the spending associated with the industry or initiative whose impact is being assessed. So, the economic impact of the car industry is measured by the value added and jobs associated with the sale, production and maintenance of cars and of its supply-chain (and their suppliers). It might also include the economic activity stimulated by the investment spending of the car industry. In some cases, the concept of economic impact is extended to include the (Keynesian) multiplier effects of the spending of those employed in these jobs, although this is more relevant for analysis of local (rather than overall) impact since it includes some element of double-counting (if the same treatment were applied to every sector of the economy, the total value added and jobs would exceed the total for the whole economy).

This kind of analysis does not attempt to place a value on the spending that supports the impact. If households and firms choose to buy cars, it is assumed that the value of the benefit to the purchaser is at least as great as the spending[1]. The focus of interest is on the scale and location (geographical and sectoral) of the economic activity stimulated by the spending.

Application to estimating the impact of social science research

In the context of social science research (SSR), this kind of analysis

- draws a boundary to determine which subject areas will be deemed to count as 'social science'
- draws together information about different types of funding to estimate the overall scale of funding of SSR
- uses the supplier-purchaser relationships that are measured in input-output tables to determine the scale of the associated value added that is captured in the UK (rather than leaking out to imports), and the sectors that are most affected
- distinguishes the wage bill within the associated value added and uses the relationship between household incomes and spending to estimate Keynesian multiplier effects (which flow to the producers of consumer products and their suppliers)

Type I and Type II multipliers

The two stages of analysis which make use of input-output relationships are sometimes referred to as 'Type I' and 'Type II' multipliers.

A 'Type I' multiplier takes the total value added (or employment), excluding Keynesian multiplier effects, across all sectors and expresses this as a ratio to the value added (or employment) in the sector whose impact is being examined. It supports conclusions such as 'for every job created in the sector, a further 2.6 jobs are supported in supplying sectors'. This is sometimes of interest when attention needs to be drawn to the fact that the size of the overall impact may be underestimated if attention is focused only on the sector that receives the spending. For example, as car manufacturers became more specialised in assembly of vehicles and bought in an increasing proportion of their

[1] Similarly the externalities in production and use are often ignored in this kind of calculation, although in principle they could be calculated and they sometimes are, whether negative (for example, the carbon content of production and use) or positive (for example, clustering economies).

components, its Type I multiplier increased (a higher proportion of the total value added or employment associated with car production was located outside of the car manufacturers). But from the point of view of the impact on the economy as a whole, it does not matter whether the value added and jobs are primarily captured in the sector where the spending first occurs or in supplying sectors. The total value added sustained by the spending is simply the difference between the value of the spending and the value of leakages from the economy (principally imports, but also any taxes on production). There is no 'multiplier' to be applied to the initial spending whose impact is being examined.

A 'Type II' multiplier adds the Keynesian expenditure multiplier effects to the supplier impacts calculated in the Type I multiplier. It is, again, expressed as the ratio of the total value added (or employment) across all sectors to the value added (or employment) of the sector whose impact is being examined, but the total now includes the Keynesian effects. It supports conclusions such as 'for every job created in the sector, a further 2.6 jobs are supported in supplying sectors; and a further 1.3 jobs are supported by the spending of the wages of the workers directly and indirectly employed'. These additional Keynesian effects are not particularly distinctive to the sector whose impact is being examined, except insofar as the value added has a larger share of wages relative to operating surplus (because the calculation usually ignores the distribution of income to households out of operating surplus).

Limitations of the method when considering the impact of research

This kind of economic impact is relatively straightforward to define and measure, and it is the calculation carried out in studies undertaken for Universities UK (2002, 2006 and 2009) of the economic impact of higher education institutions (HEIs). These studies analysed the expenditure effects of HEIs in terms of the effects outlined above, but also the economic effects of off-campus expenditure by international students studying at UK universities and other international visitors to UK HEIs (eg for business tourism).

However, such analysis is of limited relevance when it comes to justifying the spending of public money on academic research. Ignoring the Keynesian multiplier effects (which are not distinctive to academic research), this kind of analysis decomposes the total value of spending into the value added generated in the UK and abroad. There is no 'return on investment' in this analysis; rather it presents a breakdown of the *costs* associated with undertaking the research.

The difference with research arises because, for the most part, academic social science research is publicly funded (where the term 'public' here can be extended to include charitable foundations). When we examine the impact of spending on cars, we do not evaluate the benefit received by the purchasers because they make the decision for themselves. But when we examine the impact of the spending of public funds, we want to know whether the benefits justify the spending. Of course, it is of some interest to know the scale of activity associated with the spending, and in other applications these may be reported when the benefits are difficult to assess (for example, we seldom try to put a value on the benefit of defence spending, and we typically report the value added and jobs sustained by that spending). But it has to be remembered that an alternative way of spending the funds would also sustain value added and jobs.

2.2 Identifying the benefits of research

There is some tradition in the literature for identifying the benefits of research and we have drawn on this to prepare Figure 2.1 which seeks to summarise the different kinds

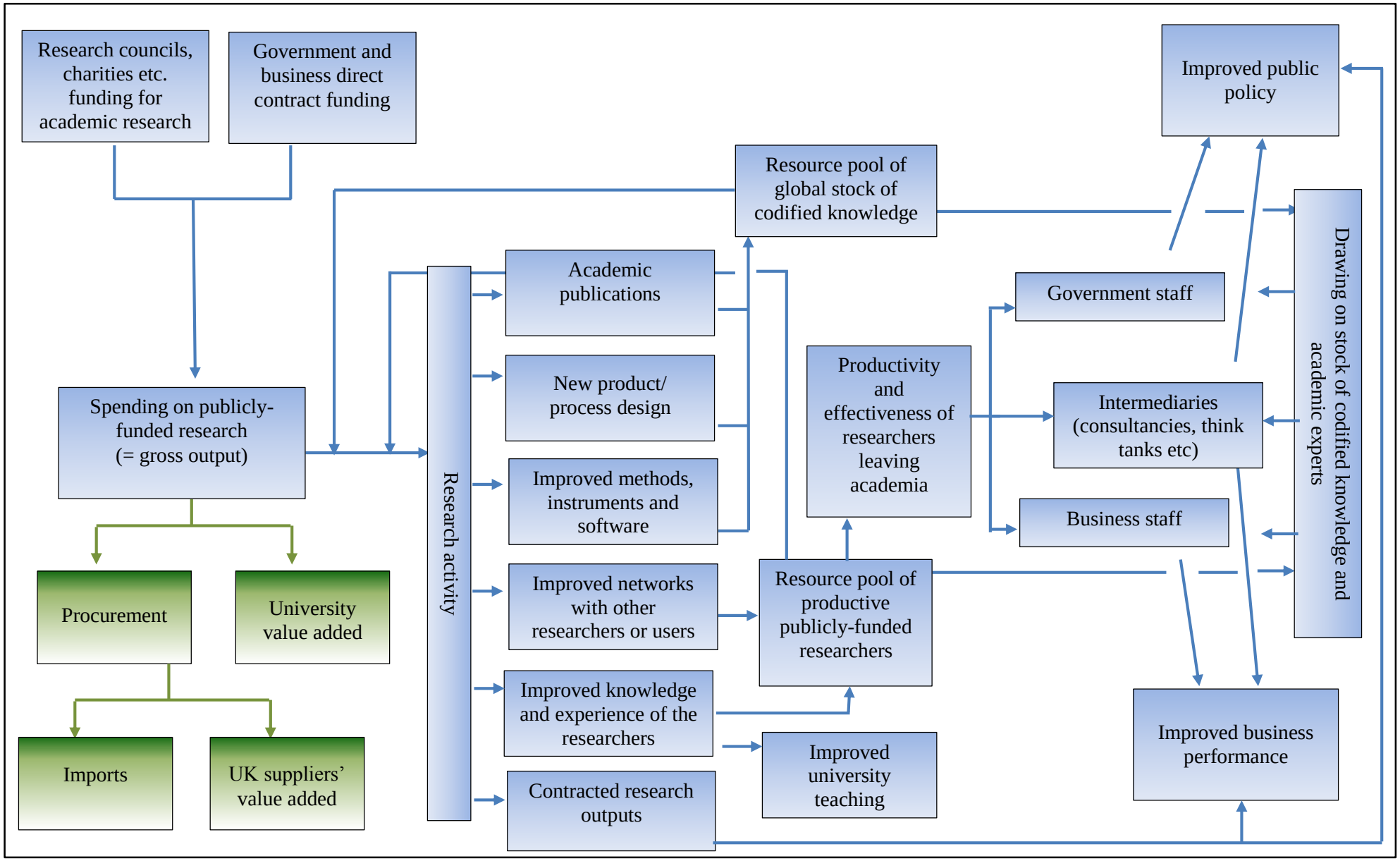
of impacts. The figure shows the value added and jobs sustained by spending on research in a different colour to distinguish them; it is not generally meaningful to add these together with the benefits of research.

Access to social science research is mediated by experienced staff

The figure shows six direct outputs of research activity, of which only one (publications) is conventionally measured when evaluating the quality of research. A second, new product or process design, is much more relevant to some aspects of research in the natural sciences or engineering (on which the literature on research benefits has mainly focused). In the case of the social sciences, the most important outputs tend not to be embodied in products or codified knowledge that can readily be used or accessed by those with no training in the relevant discipline. Rather, the benefits of research activity must typically be mediated by experienced researchers, whether employed directly by the final user of the research or by specialist consultancies and think tanks. The availability of a pool of such experienced researchers in turn depends to some extent on the opportunities that they have had to conduct research in academia (whether as part of a post-graduate qualification or in a research post). Directly contracted research (the sixth output identified in Figure 2.1) is more likely to be tailored to the needs of the user than research funded by research councils and so Figure 2.1 represents it as contributing directly to public policy and business performance, but even here the research typically has to be commissioned and managed by an in-house specialist or entrusted to a consultancy with the required expertise.

The consequence is that the benefits of academic SSR cannot be valued by examining the value of expenditure on *products* that embody that research or the contribution to productivity of such products, in the way that one might attempt to assess the benefits of the research that underpinned the development of products such as smart phones or tablet computers. If, ultimately, a major impact of academic SSR lies in the contribution that research-based advice makes to decision-makers and practitioners in public policy and business, that advice must be seen as requiring the joint inputs of (1) the academic SSR and (2) the work of the in-house or contracted researcher who mediates the research. The value to the 'user' in government or business of the advice must then be at least as much as the cost of accessing it, which includes (and may be dominated by) the cost of the mediator. Of course, the value may be much more. To the extent that advice based on academic SSR contributed to the decision of the British government not to join the euro, the economic benefit of having a separate currency during the recent recession was presumably much larger than the salaries of those who gave the advice. Similarly, the cost of mistakes in the Department for Transport's procurement process for the InterCity West Coast rail franchise has proved to be much larger than the salaries of the staff involved in undertaking the assessment of bids.

Figure 2.1: Logic Map for Identifying the Economic Impact on the UK economy of UK-based Social Science Research



We can draw an analogy with any distribution chain: the final user pays the cost of all the value added stages required to make the product available (including, for example, the retailer's value added); if we did not know the price paid by the final user, we could make an estimate by adding up the costs of each stage. We might subsequently use market prices to place a value on each stage and thereby distinguish the contribution of the raw material from the contribution of subsequent processors and distributors. However, in the case of academic SSR, there is no market to put a value on the research outputs that represent the 'raw material' of the advisory process, and the capability of the mediator to undertake the final advice stage depends in part on the human capital they have built up through their experience of undertaking research in the past.

Research mediators draw on the global stock of knowledge

A further difference in the case of academic SSR is that the research outputs, once produced, represent an addition to the *stock* of knowledge, some of which may be repeatedly drawn upon for many decades after they were produced. Consequently, when we estimate the annual cost to the final user of accessing research, this represents a minimum estimate of the value of a given year's use of the stock of research rather than the value of, say, this year's academic SSR activity. And the stock of research represents the result of past *global* investment in academic SSR, rather than simply the research carried out in the UK, although it may be argued that UK-based research would on average have a higher rating in terms of relevance.

What might happen if UK academic SSR ceased

These features of research mediation can be highlighted if we conduct the thought experiment of what might happen if all academic SSR in the UK ceased. There would be no academic research outputs for studies commissioned by clients, but this gap might be filled by private consultants who could initially draw on past research experience and methods. There would be a brain drain of researchers from UK academia to universities abroad or other occupations. Post-graduate teaching would no longer be sustained and so UK students seeking to undertake post-graduate social science degrees would have to study abroad. In time, the quality of undergraduate teaching would be affected by the absence of research opportunities for university staff. The mediators of social science research would no longer have access to a UK research base and their methods and experience would become outdated. The flow of new staff with recent research experience, one of the principal ways in which methods and experience outside of academia are refreshed, would be reduced.

What this thought experiment suggests is that the economic impact of academic SSR comes less through the immediate application of the results of research, whether undertaken in the spirit of academic enquiry or commissioned directly by the final user, and more through the diffusion of experience and new methods among the research mediators working in government and business or in consultancy.

2.3 Implications for the method of estimating the economic impact of academic SSR

We divide our analysis of economic impact into two parts. In Chapter 3, we apply the established method of assessing the value added and jobs associated with academic research spending. In Chapter 4 we seek to construct estimates of what the users of research mediation activities currently pay for the outputs of those activities (which, on the argument set out above, could not be sustained in the long term in the absence of UK-based academic SSR), which we interpret as a minimum estimate of the value of

those outputs. In this way we seek to place quantified estimates on some of the key effects identified in Figure 2.1.

3 UK Social Science as an Economic Industry

3.1 Introduction

Impact analysis of UK social science in production terms

In this chapter we present our analysis of UK social science as an economic industry ie in terms of the economic activity it generates from its purchases of supplies such as stationery and computer services; and the incomes it provides to employees, who then spend this money in the economy, generating further activity (the Keynesian multiplier effect).

The analysis is similar in approach to previous work carried out for Universities UK (2002, 2006, 2009) to estimate the economic impact of UK HEIs in terms of these institutions' expenditure and the incomes they generate. This earlier analysis also assessed the off-campus expenditure of international students and other visitors that come to the UK as a result of UK HEIs, which we do not pursue here. However, whereas that analysis covered the entire work of UK HEIs, our focus here is on the activity generated by departments that we classify as 'social science' (which covers both teaching and research).

In the next section we present our analysis to identify social science departments among the 'department groups' identified in the HESA data. We then present the multiplier analysis, which quantifies the total amount of economic activity generated in the UK from expenditure by UK social science departments. For more details on the derivation of the multipliers, we refer the reader to Appendix A.

3.2 Identification of social science departments in HEI financial data

UK social science departments' expenditure in 2010/11

From the HESA finance data, total HEI expenditure amounted to £26.2bn in 2010/11, (up from £25.8bn in 2009/10)[2]. Of that £26.2bn, almost 40% was accounted for by academic departments (rather than centralised expenditure such as premises, accommodation, catering etc).

The HESA data on academic departments' expenditure is available with a further breakdown, by 'department group'. This is a relatively broad categorisation that identifies nine types of academic department (for example, Engineering and technology is one department group). The department groups, in turn, consist of a number of 'cost centres'. At the level of cost centres, the categorisation begins to resemble more closely the various academic subjects catered for by universities (for example, Civil engineering, and Electrical, electronic and computer engineering are each identified as cost centres within the Engineering and technology department group).

The departmental finance data are only available at the department-group level, and we have classified the groups into 'social science' and 'not social science', as shown in Table 3. The table shows that, of the £10.4bn of expenditure by academic departments in 2010/11, around one-third was by departments we consider to be predominantly social science.

Classification approach

Appendix Table A.4 lists the department groups along with the breakdowns by cost centre, and this shows that a small number of cost centres are arguably misclassified. For example, we consider the department group Medicine, dentistry and health to be

[2] HESA Finance Data Table 1. Note that these figures are in current prices and are thus not adjusted for inflation.

'not social science', although this department group includes as cost centres two subjects that should be classified to social science:

– Health and community studies
- Psychology and behavioural sciences

In the absence of data at the level of these cost centres, we have not attempted to split out the figures any further than those we report in Table 3.

We show the breakdown of social science and non-social science departmental expenditure in Table 2. This table shows broad similarities in the shares of different types of departmental expenditure. Academic staff costs account for similar proportions in social science and non-social science, at around 60%. Differences in the other components of expenditure are likely to reflect, *inter alia*, differences in the extent to which departments purchase and maintain equipment for teaching and research. For example, depreciation in non-social science accounts for a greater share of total expenditure, which reflects the greater importance of fixed assets such as laboratory equipment (the share is particularly high for the science and engineering department groups).

Table 3: Classification of HESA Department Groups

Social science	STEM	Humanities
Architecture and planning Administrative, business and social studies Education **Total expenditure 2010/11: £3.35bn**	Medicine, dentistry and health Agriculture, forestry and veterinary science Biological, mathematical and physical sciences Engineering and technology **Total expenditure 2010/11: £5.53bn**	Humanities and language based studies and archaeology Design, creative arts and performing arts. **Total expenditure 2010/11: £1.53bn**

Source(s): HESA Finance Statistics, Table K.

Table 2: Breakdown of Social Science and Not Social Science Departmental Expenditure, 2010/11

	Social science	STEM	Humanities
Academic staff costs	60.9%	57.1%	63.9%
Other staff costs	15.3%	19.1%	16.9%
Other operating expenses	23.0%	21.1%	18.3%
Depreciation	0.7%	2.7%	0.9%

Source(s): HESA Finance Statistics, Table K.

In summary, the HESA show that departmental social science expenditure accounted for around one-third of total expenditure by academic departments in 2010/11, with a large proportion of this expenditure allocated to staff (and most of that is on academic staff).

3.3 Sector-level analysis of UK HEIs

Multiplier analysis of UK HEIs

In this section we present the multiplier analysis of UK HEIs, to answer questions such as:

- how much activity is generated in the UK economy for every £1 of output generated by UK HEIs?
- how many jobs are supported in the UK economy by one job in the UK HEIs sector?

In order to answer such questions, we carry out analysis similar in approach to that undertaken previously for Universities UK (2002, 2006, 2009). This analysis takes, as its starting point, official UK statistics on the productive structure of the UK economy, as represented by the national accounts.

Breakdown of industry output

Among other things, the national accounts record transactions between firms and final consumers (households, government etc) and transactions between firms and other firms ie purchases of inputs to production. From this information, it is possible to break down the value of a sector's output into:

- purchases of inputs from other UK-based firms
- imported inputs
- taxes less subsidies
- the value of labour inputs i.e. payments to employees
- gross operating surplus; effectively the remainder, which includes profits but also certain costs such as interest

All the above are recorded in an *input-output table*, in which the columns correspond to the different sectors identified within the economy and the rows correspond to the various components above.

Breakdown of UK HEI output

We provide an excerpt of the most recent input-output table for the UK (for 2005) in Table 4. Rather than estimate a more recent table (which is the approach followed in the Universities UK analysis), we have chosen to use the most recent official input-output table, which was published in 2011. Our assumption is that the structure of the UK economy (but not necessarily its size/performance) in the 2010/11 academic year is similar to how it was in 2005.

The table shows that the value of the total output (which can be thought of, loosely, as turnover) from Education Non-Profit Institutions Serving Households (NPISHs)[3] was £18.7bn, which is similar to the expenditure figures from HESA for that year[4].

Of that total output, 16.8% was accounted for by purchases from other firms (intermediate demand) and in the table we distinguish a few key sources of inputs to university production, such as Computer services and Telecommunications.

Table 4 also shows that the direct import content of UK HEIs is low, amounting to around 1% of total output in 2005.

Table 4: Breakdown of Output in Education NPISHs

	Value (£m)	Share of total output (%)
Intermediate demand	3,137.6	16.8
including:		
Computer services	431.0	2.3
Printing and publishing	89.4	0.5
Postal and courier services	89.1	0.5
Telecommunications	77.2	0.4
Electricity production & distribution	63.8	0.3
Imported goods and services	190.5	1.0
Taxes less subsidies on products	159.5	0.9
GVA	15,180.5	81.3
of which:		
Taxes less subsidies on production	0.0	0.0
Compensation of employees	14669.5	78.6
Gross Operating Surplus	511.0	2.7
Total output	18668.0	100.0

Source(s): ONS (2011), Cambridge Econometrics calculations.

[3] The sector to which the UK Office for National Statistics classifies universities.

[4] The relevant UK economic statistics are for calendar years while the HESA figures are for academic years.

The majority of the value of university output is found in Gross Value Added (GVA), specifically, Compensation of employees (wages and salaries), which accounted for almost 80% of total output. This is broadly consistent with the analysis in the previous section (although there we focused only on departmental expenditure): the majority of university expenditure is on staff. With regard to the size of the multipliers that we calculate, the key points are that university activity is a relatively labour-intensive activity with small direct import content.

Multiplier calculation

The full input-output table provides a breakdown such as the one in Table 4 (with a complete breakdown of intermediate demand) for every sector identified in the statistics. This table is the basis for the multiplier analysis and it shows the interdependencies between sectors of the economy:

- firms must purchase inputs from other firms in order to produce their own output
- in order to produce, firms must pay wages and salaries to workers and workers may then spend this income on other goods and services

The first of the above points captures the *indirect* effects of HEI output that arise from universities' requirements for computer services etc: £1 of university (gross) output supports more than £1 of total-economy (gross) output through these *backward linkages*. In this case we call the ratio of the total-economy output effect to the value of the university output itself (the *direct* effect) the *Type I multiplier*. Different sectors have different compositions of output so multipliers differ by sector. Given UK HEIs' low dependence on inputs from other sectors, we expect this multiplier to be small relative to those in other sectors, such as manufacturing (as we show later on). This does not mean that £1 spent on university activity has a low impact; it simply means that most of the impact is captured within the university sector itself. Type 1 multipliers are highest for sectors whose output is mostly made up of bought-in inputs with relatively little value added within the sector itself.

By including the wages and salaries effects (the Keynesian multiplier effects), we can capture the *induced* effects of HEI output. The *Type II multiplier* is thus the ratio of the total direct, indirect and induced effect to the direct effect. Because wages and salaries represent such a large proportion of university output, and the direct import content is low, we expect this multiplier to be relatively large for universities when compared to other sectors of the economy.

Comparison of Type I and Type II output multipliers

In Table 5 and Table 6 we report the Type I and Type II output multipliers, respectively. In each case, we report the multiplier for Education NPISHs alongside those for a few sectors with similarly-sized multipliers, to give some sense of the kinds of sectors that generate similar wider impacts.

We estimate the Type I multiplier for Education NPISHs to be 1.28: every £1 of UK HEI output triggers £1.28 of output in the UK economy as a whole (including the initial £1 of UK HEI output). The size of this multiplier, relative to those for other sectors, is small (as we expect). In fact, the multiplier is ranked 122 out of 123 in terms of its size. This indicates that UK universities make relatively little use of inputs from other sectors of the economy (as we saw when we examined the intermediate demand figures in Table 4): a high proportion of its inputs are direct labour costs.

Table 5: Type I Output Multipliers

	Multiplier	Rank (out of 123 sectors)
Banking and finance	1.53	102
Computer services	1.48	106
Health and veterinary services	1.39	116
Accountancy services	1.37	118
Education NPISHs*	1.28	122

Note(s) : * contains UK HEIs (and thus encompasses social science departments).
Source(s) : Cambridge Econometrics calculations.

Table 6: Type II Output Multipliers

	Multiplier	Rank (out of 123 sectors)
Public administration & defence	3.34	14
Education NPISHs*	3.34	15
Construction	3.24	23
Hotels, catering, pubs etc	2.91	64
Retail distribution	2.88	68

Note(s) : * contains UK HEIs (and thus encompasses social science departments).
Source(s): Cambridge Econometrics calculations.

In contrast, the Type II multiplier is relatively high, at 3.34, making it the 15th-largest multiplier of all sectors in the UK economy. This multiplier is large owing to UK HEIs' heavier reliance on labour, rather than intermediate inputs, and low import intensity. These wages and salaries thus generate large Keynesian expenditure effects because the income is then spent on other goods and services in the economy (requiring further inputs to production and generating further income elsewhere in the economy).

The calculations that underpin the derivation of the output multipliers also form the basis of the GVA and employment multipliers, which we report (in the Type II case only) in Table 7 and Table 8.

We estimate the Type II GVA multiplier for UK HEIs, reported in Table 7, to be 1.77: an additional £1 of GVA in UK universities generates a further £0.77 in the rest of the economy (for a total GVA impact of £1.77). Such a multiplier is comparable to that in legal activities and lower than that in sectors such as telecommunications or computer services. Overall, the GVA multiplier on universities is comparatively small, because the sector itself is labour-intensive: most of the value added generated by spending on the sector is captured within the sector itself, so £1 of GVA within the university sector is associated with a relatively small increase in value added in other sectors of the economy.

We estimate the employment multiplier on universities, shown in Table 8, to be 1.85. As with the GVA multiplier, the employment multiplier is near the bottom end of the ranking, for similar reasons to the GVA estimates. The labour intensity of universities is such that an increase in one job is not associated with a large number of jobs in other sectors.

Table 7: Type II GVA Multipliers

	Multiplier	Rank (out of 123 sectors)
Retail distribution	2.04	101
Telecommunications	1.97	103
Computer services	1.94	108
Education NPISHs*	1.77	113
Legal activities	1.76	114

Note(s) : * contains UK HEIs (and thus encompasses social science departments).
Source(s): Cambridge Econometrics calculations.

Table 8: Type II Employment Multipliers

	Multiplier	Rank (out of 123 sectors)
Market research, management consultancy	2.01	88
Leather goods, Footwear	1.96	94
Education NPISHs*	1.85	99
Railway transport	1.79	103
Hotels, catering, pubs etc	1.76	106

Note(s) : * contains UK HEIs (and thus encompasses social science departments).
Source(s): Cambridge Econometrics calculations.

Table 9: Comparison of Type II Multipliers

	Output	Employment
Universities UK (2002)	2.56	1.89
Universities UK (2006)	2.52	1.99
Universities UK (2009)	2.38	2.03
Cambridge Econometrics (2012)	3.34	1.85

Source(s): Universities UK (2002, 2006, 2009), Cambridge Econometrics.

In Table 9 we present a comparison of the multipliers estimated from the three Universities UK studies against the multipliers from this study. The table shows that the Type II output multiplier estimated in this study is higher than that previously estimated: we estimate the economic impacts of UK HEI activity, per unit of output, to be higher than previously calculated. In contrast, we estimate a somewhat lower employment multiplier for UK HEIs compared to the earlier Universities UK estimates. An important difference compared with the earlier studies is that we had access to a later version of the input-output tables for the British economy.

3.4 Macroeconomic impacts of social science departments

By combining the social science-department expenditure figures from Section 3.2 with the multipliers from Section 3.3, we can estimate the impacts of social science departments at universities in the UK in terms of the output, GVA and employment supported across the UK economy. We report these figures in Table 10.

From our analysis in Section 3.2, social science departments at UK universities in 2010/11 accounted for £3.4bn of output, generating a further £7.8bn of output around the UK economy. In total, social science departments generated £11.1bn of economy-wide output in 2010/11.

In GVA terms, we estimate social science departments to have accounted for £2.7bn, generating a further £2.1bn across the economy. In total, they support £4.8bn of GVA, economy-wide.

We estimate there to be 54,000 FTE jobs in UK social science departments (based on the employment and output data for UK universities as a whole), which support a further 46,000 FTE jobs in the rest of the economy. In total, social-science departments supported around 100,000 FTE jobs in the economy in 2010/11.

Table 10: Economic Impacts of UK Social Science Departments

	Direct impact	Type I impact	Type II impact
Output (£m)	3,353.0	4,292.3	11,192.7
GVA (£m)	2,726.6	3,204.2	4,816.0
Employment ('000s FTE jobs)	54.0	65.2	100.0

Source(s): Cambridge Econometrics calculations

4 Valuing Benefits of Academic Social Science Research

In Chapter 2 we discussed the issues involved in identifying the benefits of academic SSR and presented a logic map (Figure 2.1) to represent the process that we believe is at work. In this chapter we present data to populate elements of that logic map.

4.1 Workers mediating academic social science research

Estimating the value of SSR from the cost of research mediation activity

In Chapter 2 it was argued that the principal way in which academic SSR is made available to government and business is through the mediation of staff with a social science background, either in house or through the services of a consultancy, think tank or similar organisation. We assume that the value of the SSR to the final user in government or business is at least equal to the cost of the mediation activity.

Substantial research mediation activity goes on in-house

If research mediation services were entirely bought in from specialist providers, it would be straightforward to represent the (minimum) value to the client as the amount charged for the services provided. In a subsequent section we consider the value of the output of consultancy firms whose work is likely at least partly to involve research mediation. However, it is clear that a substantial part of the mediation activity takes place by staff based in the client organisation, and so we need to take account of the value of their activity.

The challenge of identifying the relevant workers

In this section we present data for the number of workers with relevant qualifications and their wages. Not all workers with a social science degree do jobs whose principal activity is mediating social science research. In principle, one can imagine conducting a survey to determine the proportion of working time that is spent in this activity, but this would probably understate the value of the research-based advice to the final user. The value of, say, economic consulting services purchased by a client includes the cost of the supporting services and management time required to make the economic advice available. We therefore face a double difficulty:

- people who have a social science degree may work in a field that has nothing to do with mediating social science academic research
- the work of people who do not have a social science degree may be required to make research-based advice available

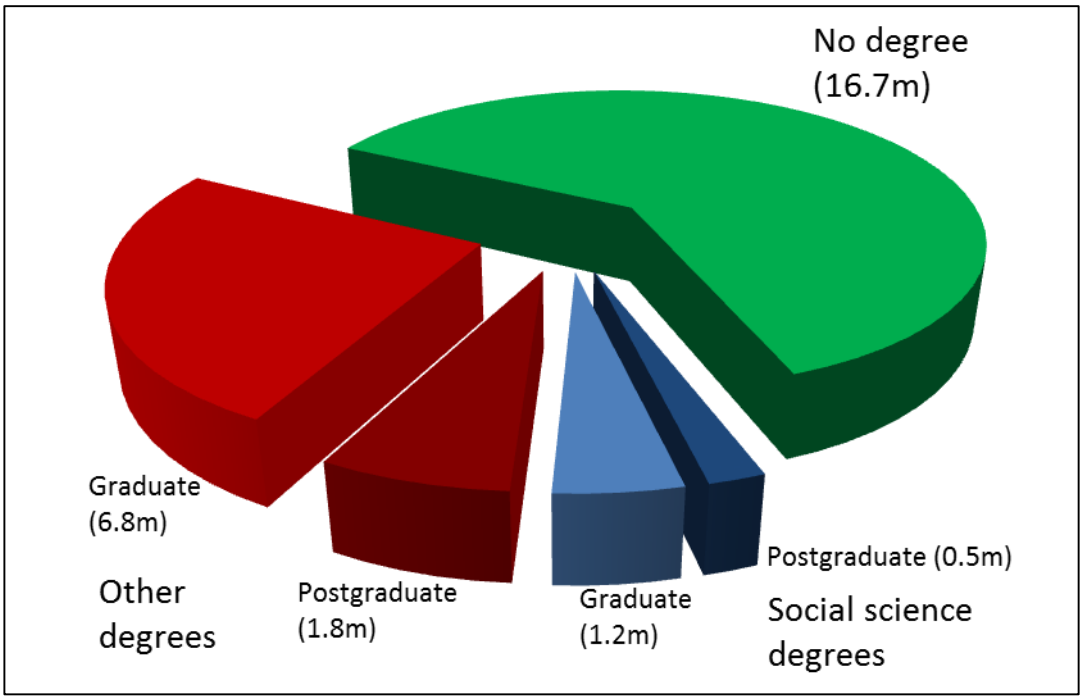
While there is no simple way to identify the workers relevant to research mediation, we can make use of data on the occupation and industry of workers to construct a range of estimates with increasingly strict criteria.

Analysis of the LFS to identify workers with social science degrees

Figure 4.1 shows estimates of the numbers of workers (whether employees or self-employed) in the UK in 2011 by degree subject. Of the 27m workers, 32% (10.3m) had a degree (whether a first degree or, in addition, a postgraduate degree). Of these, 1.7m (or 6.4% of all workers) had a degree in a 'social science' subject[5]

[5] Defined here, using the LFS classification, as one of Social studies, Business & Administrative studies or Historical & Philosophical studies.

Figure 4.1: Workers aged 16-64 in the UK by degree level and subject, 2011



Source: Labour Force Survey.

Analysis by occupation

Table 11 shows the analysis by occupation. Obviously workers with degrees tend to work in higher-level occupations and the shading in the table highlights this. Workers with social science degrees are over-represented among managers, certain science and technology professionals and associate professionals, teaching and research professionals, business and public service professionals and associate professionals, health & social welfare assoc. professionals, and administrative occupations. Surprisingly, they are also over-represented in two occupations which are generally filled by people with no degree: protective service occupations and customer service occupations.

Table 11: UK workers aged 16-64 by occupation and degree subject and level, 2011

	'000				
	Social sciences		Other subjects		
	Postgraduate degree	Degree	Postgraduate degree	Degree	No degree
Corporate managers	101.6	183.1	118.0	567.2	874.8
Managers/proprietors in agriculture/services	19.8	47.9	33.9	205.7	499.2
Science and technology professionals	26.2	49.6	262.5	672.7	360.2
of which					
Social and humanities scientists	4.4	1.8	2.5	3.0	2.1
Natural and social science professionals nec	3.2	0.4	17.9	13.2	1.5
Other science and technology professionals	18.6	47.4	242.1	656.5	356.6
Health professionals	15.3	23.0	203.7	798.3	87.0
Teaching and research professionals	95.5	58.1	582.6	523.4	95.7
Business and public service professionals	105.5	202.1	188.3	609.6	305.0
Science & technology associate professionals	3.5	12.5	33.5	187.0	259.8
Health & social welfare assoc. professionals	10.3	29.0	23.0	157.9	183.9
Protective service occupations	4.3	23.1	5.9	89.4	242.9
Culture, media and sports occupations	5.2	17.3	62.4	244.3	211.7
Business & public service assoc. professionals	79.0	217.5	103.9	597.5	903.1
Administrative occupations	29.1	139.4	46.2	462.4	1639.5
Secretarial and related occupations	5.4	21.9	8.8	108.8	537.7
Skilled agricultural trades	2.5	2.1	6.5	45.3	230.5
Skilled metal and electronic trades	0.4	3.2	11.5	145.3	912.7
Skilled construction and building trades	1.5	5.5	2.9	80.7	912.3
Textiles, printing and other skilled trades	2.0	7.4	6.8	68.3	489.3
Caring personal service occupations	4.8	39.4	23.1	403.2	1425.9
Leisure and other personal service occs	1.5	10.4	4.7	82.6	469.4
Sales occupations	11.1	32.7	15.5	228.7	1409.0
Customer service occupations	4.3	28.8	8.1	96.0	373.1
Process, plant and machines operatives	0.5	4.1	3.2	58.2	668.5
Transport & mobile machine drivers/operatives	0.0	6.3	5.8	73.7	901.9
Elementary trades, plant and storage related	0.5	2.1	1.6	36.8	419.1
Elementary administration & service occs	6.4	26.6	15.0	250.5	2216.0
Not applicable/no answer	0.3	1.3	1.8	10.8	76.7
Total	536.4	1194.2	1779.2	6804.2	16704.8

Note: Shaded cells indicate over-representation of the qualification (column) for the given occupation (row) compared with the average across all occupations (the shares of each qualification in the 'Total' row). Darker shading indicates that the share is more than one standard deviation (unweighted, across occupations) higher than the all-occupation average.

Source: Labour Force Survey.

We adopt the following assumptions to screen out workers whose degree level and occupation is unlikely to be relevant to research mediation:

- choose only workers with a 'social science' degree (as identifiable in the LFS data)
- choose higher-level occupations whose job title includes the word 'professional'
- exclude teaching and research professionals (on the grounds that their activity mainly focuses on adding to the human and knowledge capital stock, rather than mediating research to final users[6])
- include intermediate-level occupations whose job title includes the word 'professional', but only include those with a postgraduate degree

When this selection is made from Table 11, we arrive at the figures shown in Table 13, giving a total of just over half a million workers out of the 1.7m who have a social science degree. About 60% of these workers are in the occupation Business and public service professionals.

Table 12: UK workers in occupations considered relevant to the mediation of academic social science research, 2011

	'000		
	Social sciences		
	Postgraduate degree	Degree	All degrees
Science and technology professionals	26.2	49.6	75.8
Health professionals	15.3	23.0	38.3
Business and public service professionals	105.5	202.1	307.6
Science & technology associate professionals	3.5		3.5
Health & social welfare assoc. professionals	10.3		10.3
Business & public service assoc. professionals	79.0		79.0
Total			514.5

Analysis by industry

Table 13 presents a similar analysis to that of Table 11, but distinguishing the industry in which people work instead of their occupation.

The table shows that banking, public administration, education and health and 'other' (notably business) services are more graduate-intensive than the other sectors. Social science graduates are particularly over-represented in banking and (for those with postgraduate degrees) the public sector group.

The industry analysis provides some information that can help to identify research-relevant workers: we might, for example, be willing to exclude all the sectors except for the last three (banking and finance, public administration education and health, and 'other' services) on the grounds that it is is difficult to envisage how academic SSR would be drawn upon to support work in the other sectors (unless we regard general

[6] However, this filter will also exclude the research work undertaken by academics.

management activities as being informed by academic SSR). However, the three remaining service sectors still account for more than 70% of social science graduates which is much larger than the earlier occupational analysis suggested. The figure includes those working in education whom, on the basis of our earlier argument, we wish to exclude.

Table 13: UK workers aged 16-64 by industry and degree subject and level, 2011

	'000				
	Social sciences		Other subjects		
	Postgraduate degree	Degree	Postgraduate degree	Degree	No degree
Agriculture, forestry and fishing	1.8	4.1	5.1	45.9	229.3
Energy and water	6.4	17.0	27.6	113.7	319.4
Manufacturing	27.0	66.9	84.5	579.0	1896.2
Construction	14.6	33.6	37.2	330.7	1615.1
Distribution, hotels and restaurants	33.0	136.6	81.2	755.0	4048.0
Transport and communication	35.1	103.0	117.0	600.4	1468.9
Banking and finance	131.7	363.2	300.4	1254.6	2286.3
Public admin, education and health	252.6	389.5	1042.4	2746.8	3748.8
Other services	32.4	74.6	76.2	346.2	968.8
Not applicable/no answer	1.9	5.7	7.4	31.8	124.0
Total	536.4	1194.2	1779.2	6804.2	16704.8

Note: Shaded cells indicate over-representation of the qualification (column) for the given industry sector (row) compared with the average across all industries (the shares of each qualification in the 'Total' row). Darker shading indicates that the share is more than one standard deviation ((unweighted, across industries) higher than the all-industry average.

Source: Labour Force Survey.

Analysis by occupation and industry

We can combine the criteria discussed so far to include only those workers with a social science degree who work in selected occupations deemed relevant to research mediation *and* in industries in which we expect academic SSR research mediation to be a significant activity.

The result, shown in Table 14, reduces the number of workers considered relevant to research mediation to 384,000.

Table 14: UK workers aged 16-64 with a social science degree in selected occupations and industries considered relevant to social science research, by degree level, 2011

	'000		
	Social sciences		
	Postgraduate degree	Degree	All degrees
Science and technology professionals			
Banking and finance	6.4	10.8	17.2
Public admin, education and health	8.4	8.3	16.7
Other services	0.5	1.4	1.9
Health professionals			
Banking and finance	0.0	0.7	0.7
Public admin, education and health	14.2	22.3	36.6
Other services	0.0	0.0	0.0
Business and public service professionals			
Banking and finance	41.9	83.4	125.3
Public admin, education and health	33.0	55.4	88.3
Other services	10.6	20.8	31.4
Science & technology associate professionals			
Banking and finance	0.7		0.7
Public admin, education and health	1.6		1.6
Other services	0.0		0.0
Health & social welfare assoc. professionals			
Banking and finance	0.5		0.5
Public admin, education and health	3.8		3.8
Other services	0.0		0.0
Business & public service assoc. professionals			
Banking and finance	32.3		32.3
Public admin, education and health	21.7		21.7
Other services	4.9		4.9
All the above occupations			
Banking and finance	81.8	94.8	176.6
Public admin, education and health	82.7	86.0	168.7
Other services	15.9	22.3	38.2
Total			383.5

Source: Labour Force Survey.

Analysis of employment in the Civil Service

An alternative source of data, but focused solely on workers in the UK Civil Service (a subset, amounting to about a third, of workers in the industry 'public administration and defence'), provides information on workers according to their profession. Table 15 presents the data, with a suggested, narrow classification of professions most relevant to SSR mediation. The numbers here are much smaller, just 4,081 workers, or 0.8% of the total number of civil servants. The difficulty here is knowing the extent to which the professions with more general descriptions, among whom there are evidently many workers with social science degrees (judging from the LFS data), are engaged at least for part of their time in research mediation.

Table 15: UK Civil Service Employment by Profession, March 2012

Social science		Not social science	
Economics	747	Communications and Marketing	3,470
Operational Research	385	Engineering	1,540
Psychology	1,061	Finance	11,592
Social and Market Research	445	Human Resources	7,278
Statistics	1,443	Information technology	7,472
		Internal Audit	706
		Law	6,995
		Knowledge and Information Management	1,330
		Medicine	1,122
		Operational Delivery	271,116
		Planning	450
		Policy delivery	18,930
		Procurement and Contract Management	2,483
		Programme and Project Management	3,888
		Inspector of Education and Training	472
		Science	6,436
		Tax Professionals	20,874
		Veterinarian	443
		Property Asset Management	2,256
		Other	68,205
		Non-response	22,673
Total	**4,081**	**Total**	**459,731**

Source(s): Office for National Statistics (2012b).

Analysis of the LFS to estimate the wages and salaries of 'research-mediation' workers

We can also use the Labour Force Survey to obtain an estimate of the wages and salaries of the workers selected through the exercise described above.

We begin by presenting data on the wages of all employees[7], distinguishing those with different types of degree, in Table 16. The first column of the table shows the average annual wage of full-time employees. As expected, employees with a degree in business & administrative studies tend to earn higher salaries. The table also shows the large differential between the average wage of people with degrees and those without a degree, and the smaller differential between people with a postgraduate degree and those with a first degree only.

Table 16: Average earnings and wage bill for UK employees aged 16-64 by degree subject and level, 2011

	Annual average (full-time)	Wage bill (full and part-time)
	£	£m
Social studies		
Postgraduate degree	43000	5873
Degree	37000	12451
Business & Administrative studies		
Postgraduate degree	50000	11864
Degree	38000	20861
Historical & Philosophical studies		
Postgraduate degree	38000	2987
Degree	33000	6023
All the above subjects		
Postgraduate degree	46000	20724
Degree	37000	39335
Other		
Postgraduate degree	42000	61615
Degree	34000	182086
All degrees and postgraduate degrees	40000	303761
Employees without any degree	23000	271467
All employees	25000	575228

Source: Labour Force Survey.

[7] Wage information in the LFS is only available for employees, and not for the self-employed.

Table 17: Pay of employees in the UK with social science degrees in selected occupations and industries, 2011

	Annual average (full-time)[8]	Wage bill (full and part-time)[9]
	£	£m
Science and technology professionals		
Banking and finance	49000	685
Public admin, education and health	37000	446
Other services	39000	83
Health professionals		
Banking and finance	53000	22
Public admin, education and health	32000	1118
Other services	na	0
Business and public service professionals		
Banking and finance	52000	5053
Public admin, education and health	37000	3419
Other services	31000	866
Science & technology associate professionals		
Banking and finance	36000	28
Public admin, education and health	33000	35
Other services	na	0
Health & social welfare assoc. professionals		
Banking and finance	35000	0
Public admin, education and health	27000	253
Other services	na	0
Business & public service assoc. professionals		
Banking and finance	44000	1203
Public admin, education and health	36000	946
Other services	36000	136
All the above occupations		
Banking and finance	47000	6991
Public admin, education and health	35000	6218
Other services	33000	1084
Total		14293

[8] To allow comparison across occupations, the average annual wage figures for each occupation are for all full-time employees holding a social science degree.

[9] The wage bill for associate professionals includes only workers with a postgraduate social science degree, consistent with the treatment in Table 14.

Source: Labour Force Survey.

The second column of Table 16 shows an estimate of the wage bill, formed by multiplying the estimated number of workers at each wage level in the LFS data[10] by that wage level. The method is only approximate and the total for all employees (£575bn) is only 85% of the National Accounts 2011 estimate for wages and salaries of employees (£673bn[11]), partly because there are some wage earners aged above 64.

Table 17 presents the equivalent information focusing on the mediation-relevant workers selected in Table 14. The average wage column has the expected result that workers in banking and finance earn more than those in the other sectors. Workers in 'professional' occupations generally earn more than those in 'associate professional' occupations[12].

The result of the analysis shown in Table 17 is that some £14bn was paid in 2011 to employees in occupations and sectors that we have deemed relevant to the mediation of academic SSR. If we accept the argument for the selection of these workers, the conclusion is that their employers in government and business were willing to pay £14bn (in wages and salaries alone, ignoring the other costs associated with employment such as National Insurance contributions, pension contributions and support costs) to gain access to advice which draws on academic SSR. This total is made up of some £7bn in banking and finance, £6bn in government and £1bn in 'other services' which includes the consultancy sector and whose activities therefore may therefore predominantly comprise the supply of bought-in services to other sectors rather than in-house services to final clients.

4.2 The sales of the 'research mediation' consultancy sector

Consultancy sales as a measure of the value of mediated research to the final client

Ideally we want to measure the sales of consultants whose work is primarily mediating the results of academic research to the final client. The value of these sales includes profit margins, the wages of staff who are not social science professionals and other costs (for example utilities, rent) that may not appear to be research mediation: if the consultancy output is research mediation, the sales represent a minimum estimate of the value of the mediated research to the final client. In this respect the coverage is therefore wider than the analysis in Section 4.1. In terms of sector of activity the coverage is much more narrow: we are focusing here on firms operating within the sector described in Section 4.1 as 'other services': whereas Section 4.1 focused on sectors that are regarded as *users* of social science research services (measured by the employment of staff with the skills to undertake research mediation in-house), in this section we examine the activity of the *suppliers* of those services, without knowing the sector of activity of their clients. In principle, if we are focusing on the impact on the UK economy we should include only the value of sales purchased by UK clients, but in practice the data source we have used does not make this distinction.

There is, of course, no simple way to classify consultants according to the extent of their research-mediation activity. We rely here on the classification into 'industries' made by Plimsoll Publishing[13] in its analysis of company accounts. It distinguishing one quite

[10] More precisely, the LFS income weights are used when calculating wage incomes. These differ somewhat from the employment weights used to calculate the number of workers.

[11] ONS (2012) *United Kingdom National Accounts – the Blue Book*, series NQBI.

[12] This is not the case for business & public service associate professionals working in 'Other services', but the sample size is small for this group and so the unexpected outcome may be due to sampling error.

[13] www.plimsoll.co.uk.

Identifying 'research mediation' consultants

narrowly-defined industry 'Economic Consultancy' and a much broader group of 'Management Consultants'. While economic consultancy is too narrow a grouping to cover the whole range of social science disciplines, the fact that Plimsoll distinguishes economic consultancy suggests that the number of firms with this specialisation is larger than for any other social science discipline. Firms based on the other disciplines are aggregated in with the much larger and heterogeneous category of management consultants that includes many services that have nothing to do with research mediation.

Consultancy sales

For most of the companies in the Plimsoll reports accessed in October 2012, the latest accounts are for a company year ending in 2011, and so we refer to the year of latest data as '2010/11'.

Economic Consultancy

For Economic Consultancy, Plimsoll gather the accounts of 142 companies. The total value of sales in 2010/11 was £2.8bn (similar in magnitude to the values in 2008/09 and 2009/10).

However, examination of the activities largest companies in the list suggests that research-mediation activities are not associated with economies of scale: the largest companies include a wide range of activities many of which are unlikely predominantly to involve the mediation of social science research. The company with the largest sales (just under £1bn), Arup Group Ltd, includes economics and planning services in its portfolio, but its main specialism continues to be in engineering services. The second-ranked company (with sales of £720m) is Savills plc, a global real estate services provider whose services include research-based advice to investors on trends in property markets, but much of whose activity involves property management and transactions. The third-ranked company (with sales of £175m), Capita Symonds Ltd, covers a wide range of services including design of the built environment and infrastructure.

Outside of the top five, there are 27 companies with sales in the range £10m-£60m. The next 50 have sales in the range £1m-£10m leaving 60 with below £1m in sales. While it seems more likely that research-mediation accounts for a larger part of these companies' activities, we have not attempted to review what they do in more detail to make an assessment (and it is unlikely that anything more than a website description would be available to guide this assessment for smaller firms).

If the judgement that research-based activities account for a larger share of the activities of smaller firms is correct, we should apply a sliding scale on the share of sales that we count as research-mediation. In order to construct a quantitative estimate, we apply the following assumptions for the share of research-mediation services:

- 5% for companies with total sales of more than £60m
- 50% for companies with total sales in the range £10m-£60m
- 75% for companies with total sales of less than £10m

On this basis, the research-mediation sales of firms in Plimsoll's Economic Consultancy industry amounted to some £540m in 2010/11.

Management consultancy

For Management Consultancy, Plimsoll gather the accounts of 980 companies with a total sales value in 2010/11 of some £45bn. Given the heterogeneous nature of the sector, and the presence of the very large management consultants whose services span a wide range of activities within which SSR-based mediation is likely to represent quite a small part, we make the judgement that only a small proportion of the total sales should be counted as relevant to our study. There is no firm basis for determining that

proportion, but if 1% of the activity were relevant, that would amount to sales revenue of some £450m.

4.3 The purchase of 'research mediation' consultancy services by central government

The published details of consultancy purchases by central government departments[14] provide another source of data by which some of the benefits of academic SSR might be quantified.

We reviewed the websites of the following departments (selected as likely to cover the most important purchases of research-mediation services):

Cabinet Office
Department for Business, Innovation and Skills
Department for Communities and Local Government
Department for Culture, Olympics, Media and Sport
Department for Education
Department for Environment, Food and Rural Affairs
Department for International Development
Department for Transport
Department for Work and Pensions
Department of Energy and Climate Change
Department of Health
Foreign and Commonwealth Office
HM Treasury
Home Office
Ministry of Defence
Ministry of Justice

The data are published for payments made each month. The classification system varies by department (and sometimes by division within departments). There is usually a field that records the 'expense type' and the entries in this field provide some information to filter out payments that are more likely to be for consultancy research. In some cases the field value is clearly relevant (e.g. the BIS data have a field for 'Economic consultancy and research') but in other cases much broader values such as 'Consultancy' are used. In most cases the data do not refer to an academic discipline.

Having reviewed the payments filtered in this way, it was clear that the majority of consultancy payments for Defra, DoH and MoD were unlikely to be social science-based, while those for the Cabinet Office, FCO, Treasury, Home Office and Ministry of Justice were much smaller in total value.

Table 18: Estimated expenditure on research-related consultancy services by selected central government departments

[14] Accessed via the links at http://www.number10.gov.uk/transparency/how-your-money-is-spent/.

Table 18 shows that consultancy payments to value of some £51m were made in 2011 by the central government departments shown for the categories of services that we have included as 'research-based consultancy'.

4.4 Bringing together the estimates of expenditure on SSR mediation

	2011
	£m
Department for Business, Innovation and Skills	5.74
Department for Communities and Local Government	7.36
Department for Culture, Olympics, Media and Sport	2.85
Department for Education	11.62
Department of Energy and Climate Change	3.90
Department for International Development	9.61
Department for Transport	3.57
Department for Work and Pensions	6.08
Total	50.73

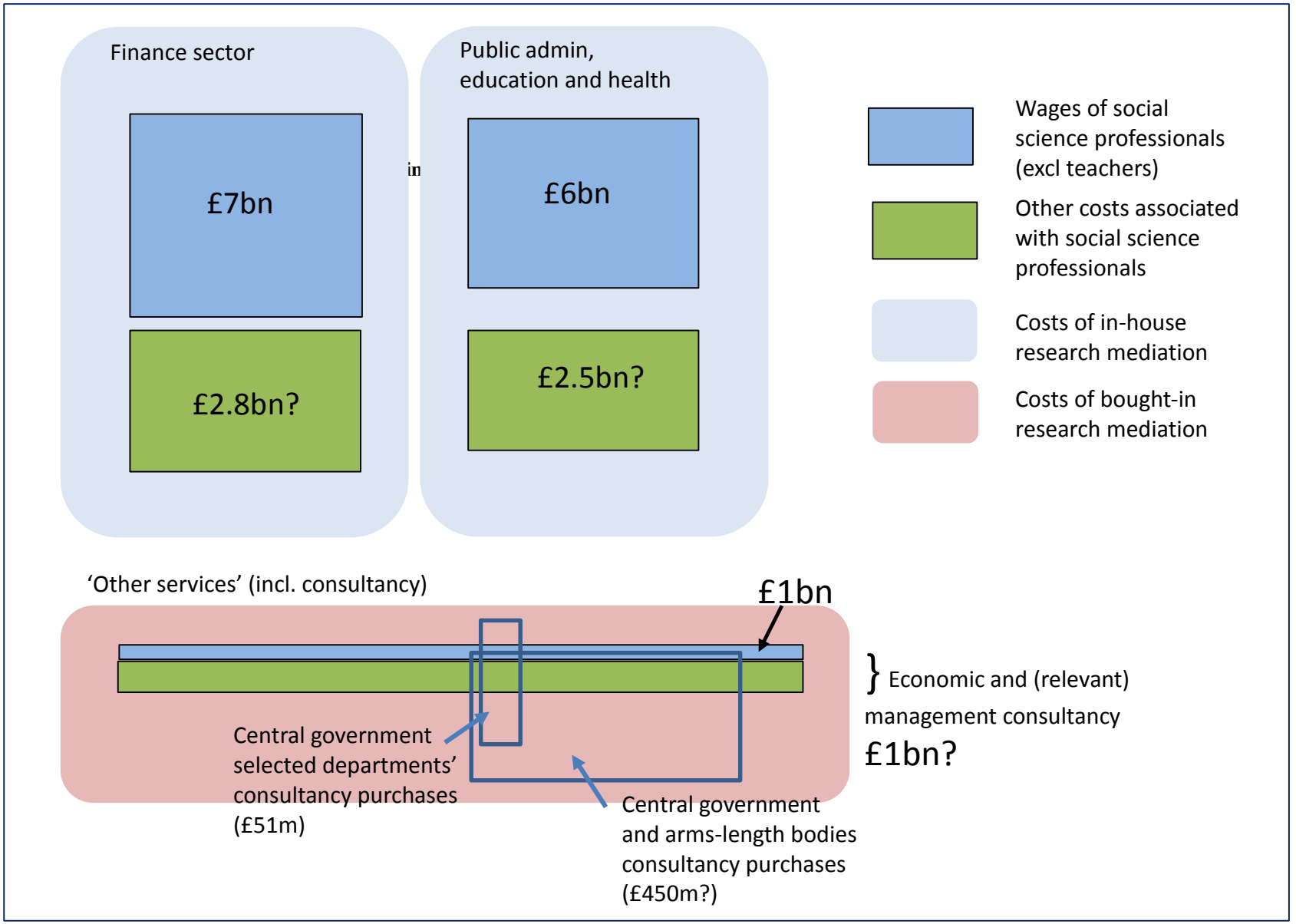
Figure 4.2 brings together the ballpark estimates made for spending on in-house and bought-in mediated social science research from the above sections. The salaries of the selected professional staff in the finance (£7bn) and government sectors (£6bn) dominate the figure, and if we assume an additional overhead at the cautious estimate of 40% that the sectors have to pay in order to employ these staff (office accommodation, employers' national insurance, pension contirbutions etc), this dominance extends still further. But if we apply the much narrower definition of relevant staff provided by the Civil Service employment statistics, the government salary bill would be much smaller: if we restrict the number of relevant staff in the whole of public administration, education and health to the 4,081civil servants in the selected professions shown in Table 15 and apply the average wage suggested by the LFS data, the salary bill would be in the order of £150m.

The salaries of selected professional staff in 'Other services', which we treat here as entirely bought-in consultancy, amount to £1bn. Our crude estimate of research mediation consultancy sales is also about £1bn, but this is subject to a wide margin of error: the figure illustrates that we would expect the total sales to be higher, to take account of the sector's other costs and profits. But it is also true that 'Other services' is a broader sector than consultancy, and so some of the wages and salaries of the sector may be for firms outside of the consultancy sector.

However, the estimate of spending by central government departments seems small by comparison with these figures, at only 5% of the market for the relevant consultancy services. National Audit Office (2010) reported that spending on *all* kinds of consultants by the departments shown in Table 18 was £327m in 2009/10 out of a total of £789m for 17 central government departments and an estimated £1.5bn for all central government spending including 'arms-length bodies'[15]. Spending on consultancy has been cut back sharply since 2009/10, and so the estimate of £51m in 2011 for research

[15] See pp 11-12 of NAO (2010).

mediation services for the selected departments does not seem unreasonably low, but the NAO figures may suggest that the omission of other central government departments and arms-length bodies may exclude some consultancy purchases relevant to this study. If we assume that a 'normal' level of reseach mediation consultancy spending by the selected departments is, say, £100m (out of the £327m spending on *all* kinds of consultants in 2009/10), and that the same proportion (30%) of consultancy spending by all central government departments including 'arms-length bodies' is on research mediation, that gives a figure of £450m. This amount is also shown in Figure 4.2, although on the assumptions made here that amount is associated with a more 'normal' year (2009/10) than 2011.


Finance sector
£7bn
£2.8bn?
Public admin, education and health
£6bn
£2.5bn?
Wages of social science professionals (excl teachers)
Other costs associated with social science professionals
Costs of in-house research mediation
Costs of bought-in research mediation
'Other services' (incl. consultancy)
£1bn
Central government selected departments' consultancy purchases (£51m)
Central government and arms-length bodies consultancy purchases (£450m?)
} Economic and (relevant) management consultancy
£1bn?

5 Summary of Results

In this chapter we briefly summarise the estimates made in earlier chapters.

Impact of spending of UK social science departments

The top half of Table 19 shows the estimated value added generated in the UK as a result of the spending of UK social science departments, drawn from Chapter 3. The first two rows show the value added that is generated directly within the departments themselves and indirectly among UK-based suppliers. The import content of university department spending is relatively low and so a high proportion of the total spending of £3.35bn is captured as value added in the UK (£3.2bn). A further £1.6bn of value added is estimated to be generated by spending out of the wages of those employed directly and indirectly.

Estimating spending on research mediation as a measure of the benefits of social science research

The bottom half of Table 19 shows estimates of spending on research-mediation, drawn from Chapter 4. These combine estimates of the wages of in-house staff working in relevant professions and sectors and having social science degrees with an allowance for the non-wage costs of employing those staff, and estimates of the size of the consultancy sector. The sector 'Other services' for which data are reported in Chapter 4 is excluded here, because it partly double-counts the consultancy sector.

Table 19: Summary of economic impacts

Economic impacts of the spending of UK social science departments, 2010/11	£bn
Value added in social science departments	2.7
Value added elsewhere in the economy ('indirect')	0.5
Value added stimulated by spending from wages ('induced')	1.6
Total UK value added	4.8
Estimates of spending on research-mediation (as a measure of the benefits of social science research)	£bn
Government (including education and health)	
In-house staff	6.2
Overheads (40%)	2.5
Bought-in consultancy	0.5
Finance	
In-house staff	7.0
Overheads (40%)	2.8
Sectors outside of government	
Bought-in consultancy	0.5
Total	19.4

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Appendices

Appendix A: Modelling UK Social Science as an Economic Industry

Economic effects of departmental social science expenditure

In this appendix we explain in more detail the modelling approach to analyse UK social science departments as an economic industry. The method is similar to that applied in previous studies to analyse the economic impact of UK higher education institutions (see Universities UK, 2002, 2006 and 2009), but with a focus on social science departments, rather than the sector as a whole.

The approach analyses social science departments as if they were a conventional economic sector that stimulates economic activity in the UK through their demand for goods and services (as inputs to production). This demand, in turn, generates a requirement for production in the sectors that supply these goods and services, and who must in turn source more inputs themselves. We also consider the expenditure effects that arise from workers' wage income.

In the sections that follow we briefly explain the structure of an input-output table, which depicts flows of goods and services in an economy. We then explain how this information can be used to analyse the wider economic impacts of changes in demand for particular goods and services (eg from expenditure by university social science departments). Finally, we present the data and assumptions for the analysis of UK departmental social science as a conventional economic industry. We report the results of the analysis itself in Chapter 3.

A.1 Input-output tables and the national accounts

Accounting for transactions in the economy

National accounts provide a framework with which to analyse the structure of an economy. The accounts classify entities in the economy to institutional sectors with broadly similar characteristics and behaviour, such as households, government and corporations. The accounts record, in a double-entry bookkeeping manner, the transactions (flows) between these sectors and how this affects the items on their balance sheets (stocks). For example, a firm might invest in a new factory (the flow of expenditure), which is then recorded as an asset on its balance sheet (the stock).

The UK produces its national accounts in line with the standards set out in the European System of Accounts (Eurostat, 1996) and these are, in turn, fully consistent with the worldwide guidelines: the UN System of National Accounts (Commission of the European Communities et al 1993).

Breakdown of output

An *input-output table* focuses on flows between actors in the economy and can be used to decompose the monetary value of output of a set of products into its constituent components. The value of output consists of:

- purchases of inputs produced by firms in the UK (domestic *intermediate demand*)
- purchases of inputs produced by firms abroad (*imports*)
- *taxes* (which are added) and *subsidies* (which are subtracted), differentiated into:
  - those levied on products ie on a per-unit basis
  - those levied on production ie unrelated to the quantity or value of output produced, such as taxes on buildings
- the value of the labour input: wages and salaries (*compensation of employees*)
- *gross operating surplus*: this is the remainder on output after accounting for the above and includes profits as well as items such as interest and rent

Of the above, the following comprise Gross Value Added (GVA), the resources required to transform inputs purchased from other firms into final output:

- taxes less subsidies on production (but not on products)
- compensation of employees
- gross operating surplus

Appendix Figure A.1 illustrates how *total output* (sales), at the very bottom of the figure, is the sum of the various components above it, by reading 'down' from intermediate demand. Each of these components consists of a series of columns; one to denote each of the different types of product produced in the UK economy, at a relatively broad level[16].

[16] The most recent UK input-output table distinguishes 123 types of product, obviously far less detail than the actual number of distinct items available for purchase in the UK.

We provide a summary of the breakdown of output in the Education NPISHs sector in 2005 in Appendix Table A.1.

The table shows that intermediate demand in that year was £3,137.6m, accounting for 16.8% of total output. We also show intermediate demand for selected inputs such as Computer services (2.3% of total output) and Printing and publishing (around 0.5%).

Imports and taxes less subsidies on products account for a further 1.9% of total output, leaving the majority of total output, the remaining 81.3%, as GVA. Much of the GVA in this sector is accounted for by labour costs (Compensation of employees). These features are in line with what we would expect for a service industry such as UK universities:

- low domestic intermediate demand and low import content, as a share of total output
- high value added, concentrated principally in wages and salaries paid to employees (and limited gross operating surplus, owing to HEIs generally being non-profit-making)

Breakdown of demand

By reading 'across' from intermediate demand in Appendix Figure A.1, the input-output table also shows how production is allocated to purchasers. The rows of the intermediate demand portion of the table decompose the intermediate demand for a product into those that make use of it as an input. The block to the right of intermediate demand is *final demand*, representing the purchase of finished goods by consumers, government etc as well as overseas (exports). The sum of intermediate and final demand by product gives *total demand* (purchases).

Appendix Table A.1: Breakdown of Output in Education NPISHs

	Value (£m)	Share of total output (%)
Intermediate demand	3,137.6	16.8
including:		
Computer services	431.0	2.3
Printing and publishing	89.4	0.5
Postal and courier services	89.1	0.5
Telecommunications	77.2	0.4
Electricity production & distribution	63.8	0.3
Imported goods and services	190.5	1.0
Taxes less subsidies on products	159.5	0.9
GVA	15,180.5	81.3
of which:		
Taxes less subsidies on production	0.0	0.0
Compensation of employees	14669.5	78.6
Gross Operating Surplus	511.0	2.7
Total output	18668.0	100.0
Source(s): ONS (2011), Cambridge Econometrics calculations.		

Input-output tables distinguish the same product inputs (rows) and outputs (columns) and are thus square. Because they relate product inputs to product outputs (rather than, say, product inputs to industry outputs), the tables are termed *symmetric*.

Derivation of GDP

For each individual product, demand (the row sum of intermediate and final demand) equals output (the column sum of intermediate demand, imports, taxes on products and GVA). This equality is denoted by the dotted line between the two totals boxes, in the bottom-right corner of the figure.

Because total output and total demand must be equal, and because both sides have intermediate demand in common, the implication is that the sum of the items 'below' intermediate demand in Appendix Figure A.1 must equal the sum of the items to the 'right':

GVA + Taxes less subsidies + Imports = Final demand

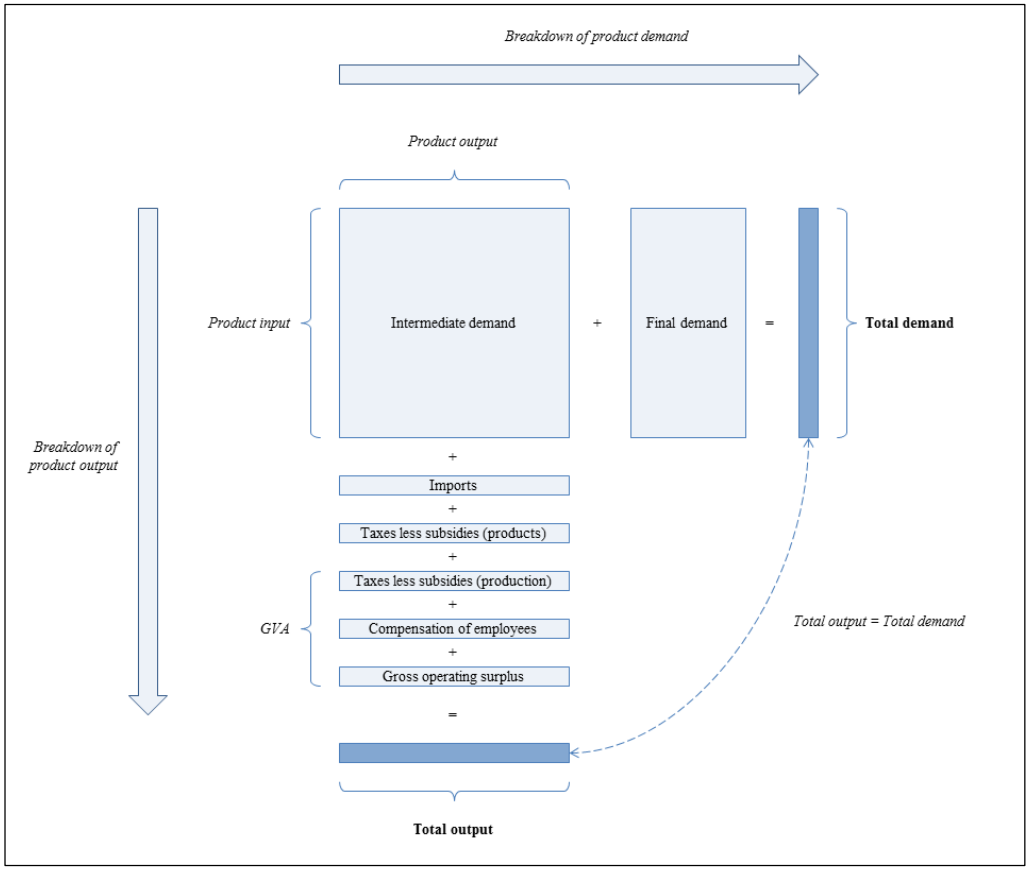
This can be rearranged to:

GVA + Taxes less subsidies = Final demand + Imports

Which gives GDP by the production approach on the left-hand side (GVA + Taxes less subsidies) and by the expenditure approach on the right (Final demand + Imports).

Owing to the data required for their construction, the UK Office for National Statistics (ONS) produces input-output tables approximately every five years. The most recent table was published in 2011, for the year 2005.

Appendix Figure A.1: Structure of an Input-Output Table



A.2 Multiplier analysis

Economic impacts of changes in final demand

Input-output tables allow for the calculation of *multipliers*, which provide estimates of the economy-wide impacts of changes in a particular sector. An *output multiplier*, for example, would indicate how much economy-wide output was required to meet an initial increase in output in a single sector (to meet additional final demand). The initial increase in output is termed the *direct* effect and there are two types of multiplier that we consider in this study, to capture the wider impacts:

- *Type I* multipliers, which, in addition to the direct effect, capture the *indirect* effects that arise from the requirement for additional intermediate demand to produce new output (and which in turn requires its own intermediate demand)
- *Type II*, which, like the Type I multiplier, captures the direct and indirect effects, but also the *induced* effect that arises from the additional output generating additional employment income, some of which is spent in the economy, generating further final demand and, in turn, further production. This induced effect represents the Keynesian multiplier effect

A multiplier is usually expressed as a ratio of the wider effects to the direct effect such that a multiplier of 2 for a particular sector indicates that a one-unit increase in final demand (which creates a one-unit increase in the requirement for total output) requires in total two units of economy-wide output (of which one unit is the original direct effect). Multipliers are calculated for each sector, and their values differ depending on the size and composition of their demand for intermediate goods and services; as well

as their labour intensity. We thus talk about multipliers for particular sectors, such as food or construction.

Double counting in measures of total output

Output multipliers should be treated with caution because of the double counting inherent in measures of total output. This double counting arises because the total output of a particular product accounts for the value of the inputs of other products and total output of these products is also recorded in the table. As such, when the multipliers are combined with the estimates of social science output, while it will produce a measure of the value of all output in the economy, this is not the same as the value generated in the economy from the production process.

Other multipliers

Consequently, it is often more instructive to consider two other forms of multiplier, which we also calculate in this study:

- the GVA multiplier: the amount of economy-wide GVA associated with a one-unit increase in GVA in a particular sector
- the employment multiplier: the number of jobs supported by a one-job increase in a particular sector

Multipliers and effects

Multipliers are expressed as the ratio of the total change (direct, indirect and, in the case of Type II multipliers, induced) in a particular variable (output/GVA/employment) to the direct change in that same variable[17]. However, the multiplier does not retain the information on how much GVA, or how many jobs, are actually created as a result of higher output.

For example, a sector may have a high employment multiplier, indicating that one additional direct job creates a relatively large number of economy-wide jobs. However, if that sector is capital intensive, the amount of output required to generate a direct job will be high. This information is lost in the multiplier. Instead, we might consider the Type I and Type II *effects*, which express the amount of GVA/number of jobs created across the economy for a change in direct output. We also calculate these effects as part of this study, in order to assess the amount of GVA and employment associated with departmental social science expenditure.

A.3 Calculating multipliers

Converting flows to coefficients

The first step in the multiplier analysis is to convert the monetary flows in the table into *coefficients*, by dividing intermediate demand and the other inputs to production by total output, to give the share of each input in total output[18]. The standard notation for the matrix of intermediate demand coefficients is the letter A, and q is used to denote the column vector of total output/demand, such that the original matrix of intermediate demand flows can be recovered as the element-by-element multiplication of A by q.

With final demand denoted as the column vector f, the demand identity can be expressed as:

$$q = Aq + f$$

And q can be made the subject of the equation, such that:

$$q = (I - A)^{-1} f$$

[17] The values in the numerator and denominator must be of the same variable, be it output, GVA or employment.

[18] These shares are average shares, thus imposing the assumption of constant returns to scale.

The Leontief Inverse

Where *I* is an identity matrix and the term $(I - A)^{-1}$ is called the *Type I Leontief Inverse* matrix (*L*). The Type I Leontief Inverse gives, by sector, the amount of economy-wide (final/direct and intermediate/indirect) output required to satisfy a one-unit (eg £1) increase in demand for output. The column sums of the matrix give, for each sector, the total amount of economy-wide output required to satisfy a one-unit increase in demand for output. This multiplier, in combination with an estimate of output from social science departments, would give us an indication as to the amount of UK economy-wide output sustained by university social science departments' expenditure.

Accounting for induced (Keynesian) effects

In order to calculate the *Type II Leontief Inverse*, which captures the additional effects of employment income on consumption, the *A* matrix must be extended to include (to *endogenise*) households. This is achieved by the addition of:

- the compensation of employees coefficients (the share of compensation in output) to the bottom of the *A* matrix
- household expenditure coefficients to the right

These additional elements capture how households allocate their income to expenditure[19]. The bottom-right element of this new matrix is set to zero.

The vector of household expenditure coefficients is formed from the vector of household final consumption (a component of final demand) divided by some measure of *total* household income. This is to account for households as a whole having additional sources of income to that obtained from employment. The calculation of the Type II multipliers then follows that for the Type I matrix, but using the extended *A* matrix.

GVA and employment multipliers

The Leontief Inverse matrices show the amount of product output required, economy-wide, to support a one-unit increase in output to meet final demand. These matrices also form the basis of the two other forms of multiplier calculated for this study: GVA and employment multipliers. In each case, the multipliers are calculated from the Leontief Inverse by taking into account the output ratio:

$$wL / w$$

Where the division operator denotes element-by-element division and *w* is the ratio to output, differentiated by sector, as a row vector:

- for the GVA multiplier, it is the ratio of GVA to output
- for employment, it is ratio of full-time equivalent (FTE) employment to output

The calculation of alternative multipliers can be interpreted as the amount of economy-wide output required to support additional output equivalent to one job (or £1 of GVA), and then converted from output to employment (or GVA).

The GVA and employment effects calculation is as above, but excluding the division by *w* at the end:

$$wL$$

This gives the amount of GVA/employment generated economy wide from a £1 increase in output (as opposed to a £1 increase in GVA, or a one-job increase in employment, respectively).

[19] The assumption that underpins this approach is that households' expenditure patterns (ie their expenditure shares) do not change with changes in income.

A.4 Data

The input-output analysis draws on a number of different data sources to estimate the economy-wide impacts of expenditure by social-science departments. We list these sources (and the data we use) in Appendix Table A.2.

We use data for 2005 to calculate the multipliers, as this is the most recent year for which all the necessary data are available. We then use, as the key input, data from HESA for the 2010/11 academic year. The results thus presume that the structure of the UK economy in 2010/11 is the same as that in 2005 in terms of flows of goods and services for the purposes of production.

Type I output and GVA multipliers

We use the most recent available input-output table for the UK, for 2005, published by the ONS (2011). This provides sufficient information to calculate the Type I output and GVA multipliers, using the data on intermediate demand, GVA and total output. We retain the same sectoral disaggregation (123 sectors) as in the input-output tables throughout this analysis.

Type II output and GVA multipliers

In order to calculate the Type II multipliers, it is necessary to include the expenditure effects of higher output generating additional employment income. Compensation of employees is available from the input-output table and can be converted to coefficients using total output, which is also available from the input-output table.

Household expenditure figures are also available from the input-output table but, in order to convert these figures to coefficients, we require a measure of total household income. This figure must be sourced from elsewhere and in this case we use the 2005 figure for Total Resources from the secondary distribution of income account from the

Appendix Table A.2: Data Sources for the Economic Impact Analysis

Data	Description	Source
Input-output table	Data for intermediate demand, GVA, household consumption and total output in 2005	Office for National Statistics (2011)
Household income	Estimate for total household income from all sources in 2005, for Type II multiplier calculation	Total Resources, Series QWMP, Office for National Statistics (2012a)
Employment	FTE employment figures in 2005, for employment multiplier analysis	Cambridge Econometrics database combined with input-output table data; Higher Education Statistics Agency
Social-science department expenditure by UK HEIs	Input figure to estimate economic impacts of expenditure in 2010/11	Higher Education Statistics Agency

most recent ONS Blue Book (2012): £1,189.4bn. This figure covers a number of sources of income, including wages, property and benefits.

The above data are sufficient for the calculation of the Type II output and GVA multipliers.

Employment multipliers

The calculation of employment multipliers requires both the Leontief Inverse matrices and FTE employment for each sector identified in the input-output analysis. Such employment data are not readily available from official sources; they must be derived.

FTE employment data

Our approach to creating the FTE employment data (for 2005) is to share out the employment data in CE's own databases (which we use for our own economic analysis), which are disaggregated to 42 sectors, to the 123 sectors identified in the input-output table.

We assume that part-time jobs count as half a full-time job and we split out the 42-sector data to 123 sectors according to the sectors' shares of compensation of employees. We thus also assume a common wage rate across subsectors. For example, CE's employment data identify agriculture, forestry and fishing as a single sector, but the input-output table identifies these as three separate sectors. We share out the employment figures to the three sectors based on the value of compensation of employees (taken from the input-output table). We apply the same procedure to the other sectors.

In the case of Education NPISHs, which consists predominantly of universities, we can draw on the additional data from HESA to inform the employment figures for this particular sector in the input-output table. Annual economic statistics are typically by calendar year, whereas the HESA data are by academic year. Consequently, the employment figure we use is the mean of the 2004/05 and 2005/06 academic years. HESA provides employment information in FTE and the final figure that enters the multiplier calculation is 300,532 jobs. This figure is smaller than our initial estimate for FTE employment in Education NPISHs and we allocate the excess to the other non-university education sectors on the basis of compensation of employees.

A.5 Classification of university departments

Input to the impact calculation

Having calculated the multipliers, the economic impact can be estimated using estimates of the direct impact: the value of departmental social science expenditure. The multipliers then yield the wider effects. In this section we detail our approach to identifying expenditure by UK university social-science departments.

HESA data

The source for the direct impact figures is the Higher Education Statistics Agency (HESA). HESA publishes a range of statistics on UK higher education institutions (HEIs), including a breakdown of expenditure by UK academic department[20]. The breakdown is by 'department group', of which there are nine. These department groups in turn consist of a number of constituent 'cost centres' and we use these cost centres to inform the decision as to which departments should be considered social science-related or not (more detailed data at the level of individual cost centres are not available).

[20] From Table K of the HESA finance statistics.

Appendix Table A.3 lists the nine department groups identified in the HESA data and our classification of them into 'social science' and 'not social science'. The table also lists the value of expenditure by the two sets of groups in 2010/11, indicating that the groups we identify as social science spent £3.35bn in that academic year. That figure is around one-third of total expenditure by UK university academic departments.

Classification of departments into social science and not social science

Some of the groups in the HESA data are a mix of social-science and non-social science cost centres and in these cases we have classified the groups according to whether the majority of the constituent cost centres should be considered social science or not. We list the department groups and their cost centres in Appendix Table A.4 and mark cost centres that are arguably misclassified with an asterisk.

The figure of £3.35bn feeds into the input-output analysis through the sector grouping 'Education Non-Profit Institutions Serving Households (NPISHs)'[21]. The output in this sector generates wider economic impacts through supply-chain effects (in both the Type I and Type II cases) and through employment income driving further consumption (Type II only).

Appendix Table A.3: Classification of HESA Department Groups

Social science	Not social science
Architecture and planning	Medicine, dentistry and health
Administrative, business and social studies	Agriculture, forestry and veterinary science
Education	Biological, mathematical and physical sciences
	Engineering and technology
	Humanities and language based studies and archaeology
	Design, creative and performing arts
Total expenditure: £3.35bn	Total expenditure: £7.06bn
Source(s): HESA	

[21] NPISHs are non-profit institutions that 'provide goods or services to households for free or at prices that are not economically significant […] Their main resources […] are derived from voluntary contributions in cash or in kind from households in their capacity as consumers, from payments made by general governments, and from property income'. Eurostat, *Statistics Explained* website: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Non-profit_institutions_serving_households

Appendix Table A.4: Classification of HESA Department Groups and Cost Centres

Social science	Not social science
Architecture and planning *23 Architecture, built environment and planning*	Medicine, dentistry and health *01 Clinical medicine* *02 Clinical dentistry* *04 Anatomy and physiology* *05 Nursing and paramedical studies* *06 Health and community studies** *07 Psychology and behavioural sciences** *08 Pharmacy and pharmacology*
Administrative, business and social studies *26 Catering and hospitality management* *27 Business and management studies* *28 Geography* *29 Social studies* *30 Media studies*	Agriculture, forestry and veterinary science *03 Veterinary science* *13 Agriculture and forestry*
Education *34 Education* *38 Sports science and leisure studies** *41 Continuing education*	Biological, mathematical and physical sciences *10 Biosciences* *11 Chemistry* *12 Physics* *14 Earth, marine and environmental sciences* *24 Mathematics*
	Engineering and technology *16 General engineering* *17 Chemical engineering* *18 Mineral, metallurgy and materials engineering* *19 Civil engineering* *20 Electrical, electronic and computer engineering* *21 Mechanical, aero and production engineering* *25 IT & systems sciences, computer software engineering*
	Humanities and language based studies and archaeology *31 Humanities and language based studies* *35 Modern languages* *37 Archaeology*
	Design, creative and performing arts *33 Design and creative arts*

Note(s) : * indicates cost centres that should probably be allocated to the other column.
Source(s) : HESA.