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BY

**THE EXPENDITURE IMPACTS OF INDIVIDUAL HIGHER
EDUCATION INSTITUTIONS (HEIs) AND THEIR
STUDENTS ON THE SCOTTISH ECONOMY UNDER
DEVOLUTION: HOMOGENEITY OR HETEROGENEITY?**

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**DEPARTMENT OF ECONOMICS
UNIVERSITY OF STRATHCLYDE
GLASGOW**

The Expenditure Impacts of Individual Higher Education Institutions (HEIs) and their Students on the Scottish Economy under a Regional Government Budget Constraint: Homogeneity or Heterogeneity?

Kristinn Hermannsson,
Katerina Lisenkova,
Peter G McGregor,
and
J Kim Swales

Fraser of Allander Institute, Department of Economics,
University of Strathclyde

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Abstract

Comparing each of the Higher Education Institutions (HEIs) in Scotland as a separate sector in an Input-Output table suggests their expenditure patterns are homogenous and that any apparent heterogeneity of their impacts is primarily driven by scale. However, a disaggregation of their income by source reveals a disparity in their dependence upon funding from the devolved Scottish Government and their ability to draw in income/funding from external sources. Acknowledging the binding budget constraint of the Scottish Government and deriving balanced expenditure multipliers reveals large differences in the net-expenditure impact of HEIs upon the Scottish economy, with the source of variation being the origin of income. Applying a novel treatment of student expenditure impacts, identifying the amount of exogenous spending per student, modifies the heterogeneity of the overall expenditure impacts. These issues have particular importance for many governments facing increasing pressure to reduce their overall budgets.

Keywords: Higher Education Institutions, Input-Output, Scotland, Impact Study, Multipliers

JEL classifications: R51, R15, H75, I23.

1 Introduction

The regional, and national, impact of the expenditure by Higher Education Institutions (HEIs) and their students is a topic of international interest and has been the subject of an extensive academic literature. For example, Florax (1992) lists over 40 HEI expenditure studies, Giesecke and Madden (2006) provides a partial up-date and McGregor *et al.* (2006) summarises the methods and findings of the UK literature. This paper uses Scottish data as a case study to investigate two important issues. First, whether the expenditure impacts across HEIs located in the same region are homogeneous or heterogeneous. Second, if regional public spending is subject to a binding budget constraint, how does that affect the measured expenditure impacts of HEIs?

A wide range of indicators suggest that HEIs are heterogeneous establishments. This is evident, for example, from the variation in their scale, the spatial origin of their student population and the degree to which they are dependent on the state for funding. However, we do not know whether this heterogeneity translates into a similar variation in the intensity of their expenditure impacts. One significant limitation of the existing literature is that it has typically been applied to individual HEIs on a piecemeal basis, making systematic comparisons of impacts across HEIs in a given region (and between regions, in general) difficult or impossible. There has therefore never been a previous attempt systematically to address the issue of the degree of heterogeneity of the expenditure impacts across HEIs. In this paper, for the first time, we conduct a

systematic comparison of the expenditure impacts of all individual HEIs within a particular higher education system, that of Scotland. We are attempting to test the hypothesis that these expenditure impacts are homogeneous.

Furthermore, we examine how the estimates of these impacts are affected once we diverge from a conventional approach and incorporate a binding public sector budget constraint. This analysis is partly motivated as an investigation of the “policy scepticism” view. This holds that much of the expenditure impacts conventionally attributed to HEIs should be attributed to the public funding that finances their expenditures. In the limit this argument implies that the expenditure impacts of HEIs *per se* are negligible. In order to investigate the validity of the policy sceptics’ claims, in addition to conventional impact multipliers we calculate balanced expenditure multipliers that treat Scottish Government funding of HEIs and students’ consumption as expenditure switching rather than wholly new expenditure.

The work tests the hypothesis that heterogeneity amongst key characteristics of HEIs activities and funding translates into a similar heterogeneity in their expenditure impacts. Whilst the present study focuses on data for Scotland the results should be regarded as illustrative and as having more general applicability. These issues raised have particular importance in the situation facing many governments who are under pressure to reduce their overall budget.

In Section 2 of the paper we provide a brief overview of our database of the Scottish higher education system and present key characteristics of individual Scottish HEIs. In Section 3 we outline a conventional HEI-disaggregated Input-Output (IO) accounting approach. While total expenditure impacts vary considerably across HEIs, we show that if we control for scale, by focussing on the value of individual HEI multipliers, there is a striking degree of homogeneity across institutions. In Section 4 we augment this standard IO analysis by explicitly recognising the Scottish Government's budget constraint imposed by its funding formula. This implies that Scottish Government financing of HEIs involves switching expenditure from alternative public sector uses. The resultant balanced expenditure multiplier values exhibit considerable heterogeneity across individual HEIs. In Section 5 we incorporate the effects of student expenditures, again recognising the importance of the Scottish budget constraint for the attribution of student expenditure impacts. Once more, while conventional expenditure impacts appear relatively homogeneous, heterogeneity across Scottish HEIs becomes apparent once differences in funding sources are recognised. Brief conclusions are presented in Section 6.

2 Key characteristics of Scottish HEIs

In the year 2006, which is the period for which our database applies, there were 20 Scottish Higher Education Institutions. In this study we exclude the UHI Millennium Institute as data on its expenditures are not comparable with those

of other institutions in the Higher Education Statistics Agency (HESA) dataset.¹ The remaining 19 institutions are listed alphabetically by their official names in the column one of Table 1.² The second column lists convenient abbreviations of these names, which are used for the remainder of the paper. Also included in the table is a selection of the HEIS' more important characteristics, from the point of view of this impact study. Before analysing the data, a brief description of how the dataset was constructed is in order. A more detailed account is given in Hermannsson *et al.* (2010a).

The official Scottish Input-Output tables are the starting point (Scottish Government, n.d.). An IO table is a matrix that identifies the sales and expenditures of each production sector in a given economy in a consistent and complete manner. We begin by augmenting this table by disaggregating the education sector. We first separately identify the non-HEI elements and then use data on the income and expenditures of Scottish HEIs to create a separate sector for each institution. The table therefore details the expenditure pattern and composition of income for each Scottish HEI in a consistent way.

HESA (2007) provides details of the incomes of each HEI. Most HEIs draw the majority of their income from research and teaching grants from the Scottish Funding Council, funded by the Scottish Government. Other important income

¹ Due to its network structure, the UHI employs relatively few staff directly but it funds positions at member institutions for which the expenditure structure is not revealed in HESA data. The UHI is relatively small, accounting for 1.7% of the expenditures of the Scottish HEIs sector.

² Since 2006 the University of Paisley and Bell College have merged to form the University of the West of Scotland and the RSAMD has changed its name to the Royal Conservatoire of Scotland.

sources are: the tuition of fee-paying students; research grants funded by the private sector or non-profit organisations: public sector research grants obtained through competitive bidding at the UK-level or overseas, which are classified as exports in the Scottish accounts; and other income sources such as payments for residence and catering services and various services rendered to local production sectors.

Column three of Table 1 shows the total income for the Higher Education sector in Scotland in 2006 and how this was distributed amongst the individual institutions. Of the total income of £2.029 billion, 21% goes to the largest university, Edinburgh, and 46% to the top three, Edinburgh, Glasgow and Strathclyde. On this criterion, the biggest institution is over 40 times the size of the smallest, which is the RSAMD. This large variation in the size of individual institutions suggests that there is likely to be heterogeneity in other aspects of their operation. The rest of the information in the table is standardised against some measure of the institution's scale.

Column four gives the proportion of the total funding for individual Scottish HEIs that comes from the Scottish Government. Note that HEIs are non-profit organisations: whilst they are heavily funded by the Scottish Government, they are not formally part of the public sector. In total, 55% of their income comes from the Scottish Government, but the remaining 45% does not. In the context of the present paper, the considerable variation around this 55% figure is of central importance. Bell College is the most reliant on Scottish Government funding, at 88%, with St Andrews as the least, at only 37%.

Table 1 Key characteristics of Scottish HEIs (Source: Higher Education Statistics Agency (HESA, 2007) and own calculations)

| Institutions | | Income | | Employment | | Students | |
|---|---|----------------------|---|--|-------------------------------------|---|---------------------------|
| Formal name | Abbreviated name (used in the remainder of this paper) | Total (£ million) | Percentage from Scottish Government | Total income per FTE employee (£) | Share of wages in expenditure | Total final demand per FTE student (£) | Share non- Scottish |
| The University of Aberdeen | Aberdeen | 157.0 | 54% | 55,820 | 62% | 13,458 | 30% |
| University of Abertay Dundee | Abertay | 32.5 | 70% | 57,616 | 59% | 8,521 | 28% |
| Bell College | Bell College | 19.9 | 88% | 44,167 | 69% | 6,368 | 1% |
| The University of Dundee | Dundee | 164.0 | 51% | 55,386 | 61% | 11,757 | 28% |
| Edinburgh College of Art | ECA | 14.7 | 70% | 56,111 | 65% | 8,917 | 51% |
| The University of Edinburgh | Edinburgh | 435.6 | 43% | 68,924 | 55% | 20,036 | 54% |
| Glasgow Caledonian University | Caledonian | 97.6 | 76% | 59,322 | 64% | 6,732 | 12% |
| Glasgow School of Art | GSA | 15.8 | 71% | 54,806 | 65% | 10,331 | 47% |
| The University of Glasgow | Glasgow | 312.4 | 51% | 67,251 | 62% | 15,565 | 24% |
| Heriot-Watt University | Heriot-Watt | 99.5 | 47% | 67,021 | 57% | 13,443 | 45% |
| Napier University | Napier | 81.4 | 72% | 61,043 | 60% | 8,251 | 30% |
| The University of Paisley | Paisley | 58.5 | 80% | 57,905 | 60% | 7,378 | 10% |
| Queen Margaret University College, Edinburgh | QMUC | 27.6 | 70% | 61,562 | 63% | 6,667 | 34% |
| The Robert Gordon University | Robert Gordon | 75.1 | 67% | 57,737 | 60% | 7,572 | 24% |
| The Royal Scottish Academy of Music and Drama | RSAMD | 10.4 | 66% | 71,646 | 61% | 14,614 | 35% |
| The University of St Andrews | St Andrews | 108.8 | 37% | 58,881 | 60% | 14,735 | 67% |
| Scottish Agricultural College | SAC | 43.7 | 51% | 53,616 | 58% | 60,768 | 11% |
| The University of Stirling | Stirling | 83.7 | 56% | 53,577 | 60% | 11,149 | 25% |
| The University of Strathclyde | Strathclyde | 191.1 | 58% | 63,046 | 59% | 11,092 | 14% |
| Total/average | | 2,029 | 55% | 61,629 | 60% | 12,832 | 29% |

Column five presents the total income per member of staff, that is to say, the total income of the institution divided by its total (all categories) FTE staff. This is the conventional labour productivity measure. In 2006 the total employment in Scottish HEIs was 32,922, so that the income per member of staff averages at £61.6 thousand. The ranking of Scottish HEIs by employment is very close to that by income, but there is some variation and this is reflected in variation in income per staff member across institutions, ranging between the high of £71.6 thousand for RSMAD and a value of £44.2 thousand for Bell College.

However, variation in the share of wages in total income, presented in column six of Table 1 is much more limited. The average figure for the sector as a whole is 60%, and this only varies between a low of 57% (Heriot-Watt) and a high of 69% (Bell College). It is clear that across all institutions, wage payments make up a significant and relatively stable share of total HEI expenditure.

University income per student is reported in column seven. This is the total income of the institution divided by the total number of students, measured in FTEs. For the Scottish sector as a whole, the figure is £12.8 thousand. However again there is a high degree of variation across institutions. In this case the Scottish Agricultural College, which is primarily a research institution, is a high valued outlier. Amongst the other institutions the figure varies between £21.3 thousand for Edinburgh and £6.4 thousand for Bell College.

Finally column eight presents figures for the proportion of students that are non-Scottish. In aggregate 29% of all students in Scottish HEIs come from outwith Scotland. But again there are large differences across institutions. Bell College recruits almost wholly from Scottish students whilst the majority of students going to St Andrews, Edinburgh College of Art (ECA) and Edinburgh University are non-Scottish.

The information given in Table 1 reflects the fact that HEIs perform a range of activities, covering teaching, research and knowledge exchange, which all can be funded in a variety of ways. There are systematic differences in the manner in which different Scottish HEIs operate and the weighting of the activities that they undertake. This is especially the case for the smaller and more specialised HEIs, but is also apparent amongst the more conventional Scottish universities. There is clearly a high level of heterogeneity across Scottish HEIs. We would expect this heterogeneity to affect the expenditure impact of individual HEIs on the Scottish economy. We test this proposition in Sections 3 and 4 where we calculate and compare conventional and balanced expenditure multipliers across the range of Scottish HEIs.

3 The impact of Scottish HEIs' own expenditures: conventional IO impact analysis

As already noted, there are numerous studies of the regional economic impact of HEI expenditures: the existing Scottish studies are listed in Hermannsson *et al.* (forthcoming). Most of the UK studies, especially earlier ones, are based on Keynesian income-expenditure models (Brownrigg, 1973; Bleaney *et al.*, 1992; Armstrong, 1993; Battu *et al.*, 1998) whilst a smaller number use straightforward or extended Input-Output (IO) modelling (Blake and McDowell, 1967; Harris, 1997; Kelly *et al.*, 2004). We believe that the IO approach is the most comprehensive and in this section we present a standard IO analysis. In Section 4 this is modified to accommodate a binding expenditure constraint imposed by a devolved regional public sector budget.

We use IO to attribute economic activity in Scotland to Scottish HEIs, both individually and as a sector (Miller and Blair, 2009; Hermannsson *et al.*, forthcoming). The direct spending impact of universities is separated into two categories: the impacts of HEIs' own expenditures on intermediate inputs (including the wages of their own staff) and the consumption expenditures of the HEIs' students. We begin with a brief account of conventional IO impact analysis. We then apply this analysis to these two expenditure streams.

3.1 Conventional IO analysis

Regional IO impact analyses are frequently used to capture the total spending effects of institutions, projects or events. These analyses include the multiplier, or “knock-on”, impacts of any expenditure injection, obtained by summing the

subsequent internal feedbacks within the economy. This section briefly outlines the methods adopted by impact studies³.

Regional demand-driven models, including IO, distinguish between two types of expenditures: exogenous and endogenous. Exogenous expenditures are independent of the level of economic activity within the host economy. In IO studies exports, government expenditure and investment are typically taken to be exogenous. On the other hand, endogenous expenditures are driven by the overall level of economic activity within the host economy. Specifically, demand for intermediate inputs and often household consumption demands are taken to be endogenous. Input Output analysis thus identifies a clear causal pathway from exogenous expenditure to endogenous economic activity.

These demand-driven models assume that the supply side of the regional economy is entirely passive. This can be motivated in two alternative ways. In the short and medium run such a model applies where there is general excess productive capacity and significant regional unemployment. In the long run, supply-side passivity holds where the supply of the primary inputs of labour and capital eventually becomes infinitely elastic, as migration and capital accumulation ultimately eliminate any short-run capacity constraints (McGregor *et al.*, 1996)⁴.

³ For a more detailed account of the methods used in impact studies and regional multipliers see Armstrong & Taylor (2000), Loveridge (2004) and Miller & Blair (2009).

⁴ The legitimacy of either set of conditions is ultimately an empirical issue. For example, Learmonth *et al.*, (2007) models the island economy of Jersey. Here the labour market is tight and the institutional framework restricts migration so that the supply side cannot be treated as passive over any time interval.

The derivation of the demand-driven multipliers draws on the notion that exogenous expenditure determines endogenous economic activity. In the standard Leontief Input-Output approach the endogenous vector of final outputs, q is determined by the vector of final demands, f , through the operation of the Leontief inverse multiplier matrix. This can be summarised as:

$$(1) \quad q = (\mathbf{1} - A)^{-1}f$$

where $(\mathbf{1}-A)^{-1}$ is the Leontief inverse (Miller & Blair, 2009, Ch. 2). The Leontief inverse identifies the indirect and induced effects of any exogenous demand stimulus. Indirect effects arise through increased demands for intermediate goods and with Type-II multipliers induced effects are generated through the impact of increased household income on consumption demand.

The output multiplier for each sector i , m_i , is derived from equation (1). It is the change in total output for the economy as a whole resulting from a unit change in the final demand for that sector. It can be found as the sum of the entries in the relevant column of the Leontief inverse. This allows a convenient expression for the gross output q^i attributable to the final demands f_i for the output of sector i :

$$(2) \quad q^i = m_i f_i$$

As noted earlier, in this analysis each HEI is treated as a separate sector so each will have its own multiplier value.

Multipliers can also be derived for any variable that is linked to industry output. Multiplier values are commonly given for employment, income and GDP. The Type-II multipliers used here are those conventionally reported in demand-driven IO impact studies. Type-II multipliers incorporate not only the increase in demand for intermediate inputs but also induced household consumption effects, generated by changes in wage income, as endogenous elements in the multiplier process. More detailed explanation is given in Miller and Blair (2009, Ch. 6) and Hermannsson *et al.* (2010a).

3.2 Results of the conventional IO analysis applied to HEIs' own expenditures

Our IO table provides a useful accounting framework in which each HEI can be attributed with the total regional economic activity driven by the final demand for its output⁵. This total impact is composed of both the final demand for the HEI's output and also the knock-on impacts on other sectors, generated through directly and indirectly linked intermediate demand and household consumption. One key strength of IO as an accounting framework is that it is consistent. When such an attribution exercise is carried out on a sector-by-sector basis, the

⁵ For each institution, the direct, indirect and induced effects are calculated using the final demand for the output of the particular institution. This is not the total income of the institution, which will incorporate some sales to local intermediate and household consumption demands. For a more detailed discussion of the distinction between final demand and gross output, and its implications for impact studies, see Oosterhaven & Stelder (2002).

sum of the impacts attributable to each sector's final demands equals the economy-wide total.

Table 2 summarises conventional Type II IO-based impact estimates for individual Scottish HEIs. These are obtained by applying equation 2 to each HEI entered as a separate sector in our HEI-disaggregated IO table. This approach essentially treats each HEI as a conventional business, which buys some of its intermediate inputs in Scotland and employs workers who in turn demand Scottish produced goods and services. The three columns in Table 2 give the sum of the direct, indirect and induced (Type-II) impacts of HEI spending on total Scottish output, GDP and FTE employment respectively. Figure 1 is a diagrammatic representation of the output effects presented in Table 2, where the HEIs are ranked by the scale of the effect.

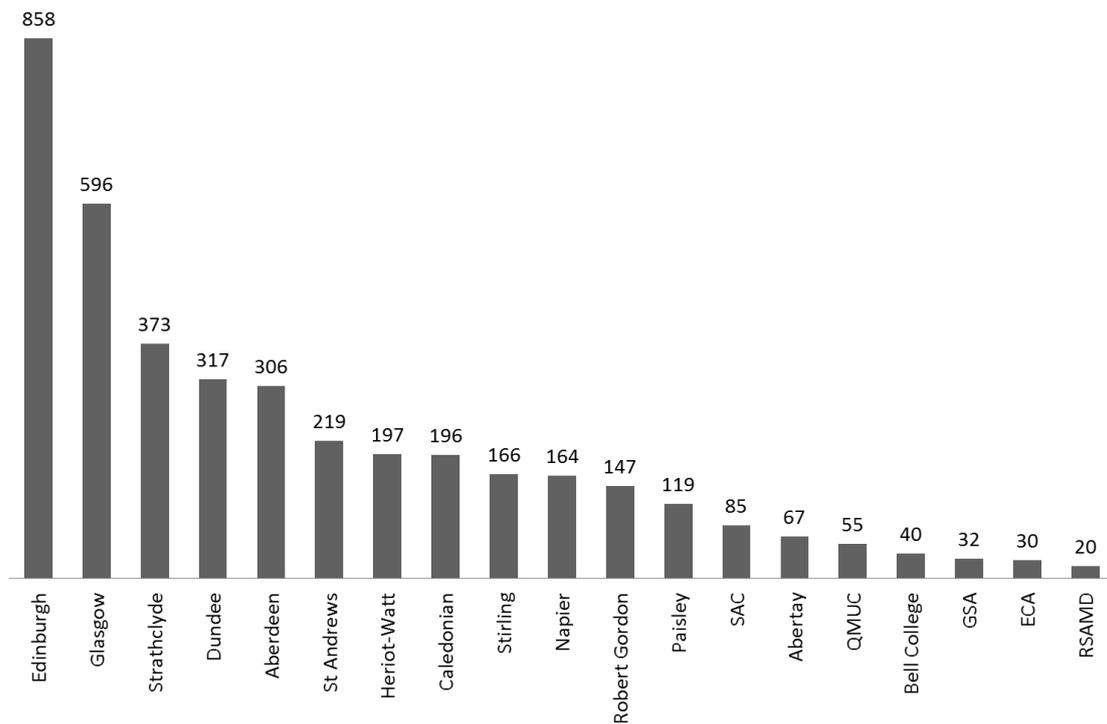
The first point to note is that the expenditures of Scottish HEIs, considered as a single production sector, have a major impact on Scottish gross output (£3,387 million, or 2.24% of the total), GDP (£2,274 million, 2.58%) and employment (54,200 full-time-equivalents, 2.71%).

The second point is that there is considerable variation in the impacts across Scottish HEIs. However, these results are clearly strongly affected by the initial scale of the individual institutions. A natural way of eliminating scale effects in an IO impact analysis is to focus on the *multiplier* values associated with a unit change in the final demands for each HEI's output. These are the appropriate m_i values for each HEI, as identified in equation 2, and are shown in Figure 2.

Table 2 Conventional total IO Type-II impacts of Scottish HEIs in 2006
(final demand plus multiplier effects)

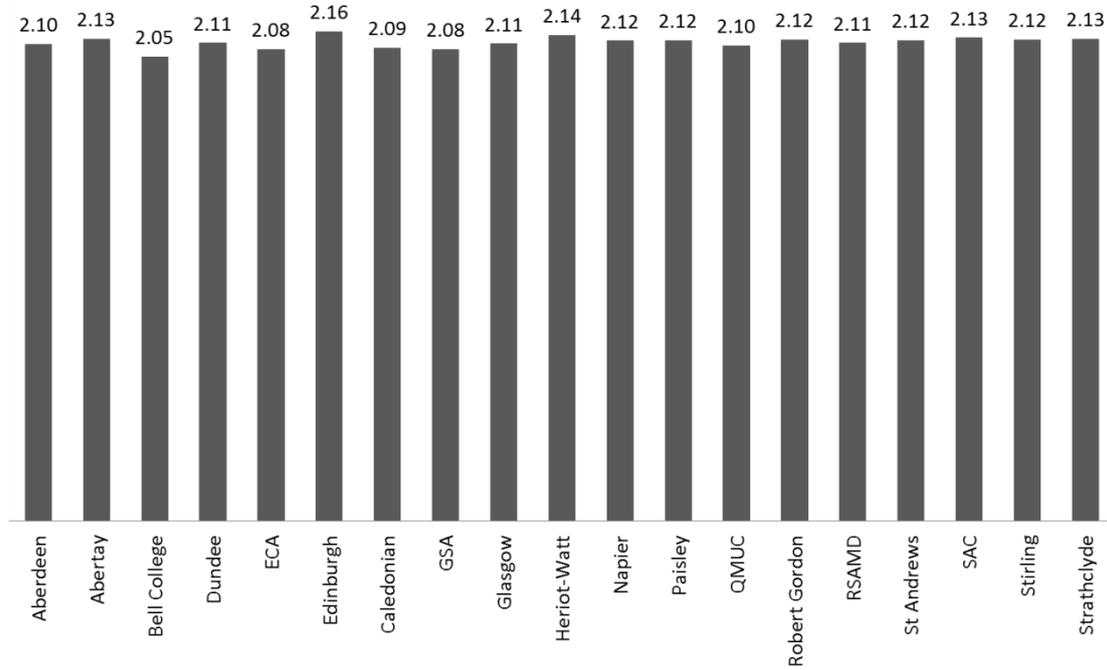
| | Final demand plus multiplier effects | | |
|--|--------------------------------------|--------------|--------------------------|
| | Output, £m | GDP, £m | Employment, FTE 000's |
| Aberdeen | 306 | 179 | 4.4 |
| Abertay | 67 | 38 | 1.0 |
| Bell College | 40 | 25 | 0.7 |
| Dundee | 317 | 184 | 4.6 |
| ECA | 30 | 18 | 0.4 |
| Edinburgh | 858 | 468 | 10.8 |
| Caledonian | 196 | 117 | 2.8 |
| GSA | 32 | 19 | 0.5 |
| Glasgow | 596 | 347 | 7.7 |
| Heriot-Watt | 197 | 110 | 2.5 |
| Napier | 164 | 94 | 2.2 |
| Paisley | 119 | 68 | 1.7 |
| QMUC | 55 | 33 | 0.8 |
| Robert Gordon | 147 | 84 | 2.1 |
| RSAMD | 20 | 12 | 0.3 |
| St Andrews | 219 | 125 | 3.0 |
| SAC | 85 | 48 | 1.2 |
| Stirling | 166 | 95 | 2.4 |
| Strathclyde | 373 | 212 | 5.0 |
| Total | 3,987 | 2,274 | 54.2 |
| % of SCO total output/ GDP/employment | 2.24% | 2.58% | 2.71% |

Figure 1 Total output impact (Type-II) of Scottish HEIs expenditures, £m



The most striking characteristic of these multiplier values is their comparative uniformity. However, they are not identical since they reflect the HEI-specific data drawn from the Higher Education Statistics Agency (HESA). The highest conventional Type-II output multiplier, associated with Edinburgh (2.16), is only 5% greater than the lowest, which is for Bell College (2.05), and the coefficient of variation is only 0.012. This indicates that when conventional multiplier measures are used, the Scottish HEIs are remarkably homogeneous in terms of the intensity of the impact of their expenditures on the Scottish economy. This result reflects the fact that although Scottish HEIs vary on many criteria, there is a similarity in their cost structures. This is identified in Table 1 by the similarity in the share of wages in total income across Scottish institutions.

Figure 2 Conventional Type-II output multipliers for Scottish HEIs



4 The binding Scottish Government budget constraint

The devolved Scottish Government is financed through a block grant from the UK Government using the population-based Barnett formula (Christie and Swales, 2009).⁶ The Scottish Government has no borrowing powers and only a limited ability to shift expenditure between accounting periods. Essentially it has a binding budget constraint, so that the Scottish Government's expenditure on HEIs displaces other public expenditure in Scotland. Hermansson *et al.*

⁶ The Scottish Parliament does have the power to vary the standard rate of income tax by up to 3p in the pound. We abstract from this possibility here since all of the Scottish political parties are committed to not using this power. Lecca *et al.* (2010) give an analysis of the consequences of this tax-raising power being exercised by the Scottish Parliament.

(forthcoming) shows that the Scottish Government's budget constraint has an important impact on estimates of the expenditure effects of the HEI sector as a whole. Here we extend this analysis to individual institutions and show that the effect of this constraint varies significantly among HEIs. This means that HEIs that appear to have similar conventional expenditure impacts have rather more distinctive impacts once the budget constraint is imposed.

We can use detailed information about the income sources of individual HEIs to disaggregate their expenditure impacts in terms of the origin of their exogenous final demands. This allows an analysis of the extent to which the impacts attributed to HEIs (under a traditional IO approach) should instead be attributed to the expenditure of the Scottish Government. In order explicitly to acknowledge this constraint, and therefore to take account of the possibility of public expenditure switching effects, the direct expenditure on the output of the i th Scottish HEI is divided into Barnett funding (bf_i), which comes through the Scottish Government, and other funding (of_i), which includes all other sources of funds such as exports to the rest of the UK and the rest of the World. This breakdown is shown in column 4 of Table 1. Using equation (1) the conventional Type II attribution of direct, indirect and induced output to an individual HEI is simply:

$$(3) \quad q^i = (bf_i + of_i)m_i$$

where $bf_i + of_i = f_i$. These q^i values are the figures reported in column 1 of Table 2 and plotted in Figure 1.

The "balanced expenditure" multiplier takes into account the activity that would have been generated if the Scottish Government had used the funds in alternative ways. We therefore subtract the Barnett-funded element of each HEI's funds and the associated public sector expenditure multiplier effects. This is calculated as $bf_i m^p$, where m^p is the Type-II multiplier for the aggregated public sector expenditure (and so is invariant across HEIs).⁷ The balanced expenditure attribution, q^{iB} , is therefore given by equation 4.

(4)

$$q^{iB} = (bf_i + of_i)m_i - bf_i m^p = of_i m_i + bf_i(m_i - m^p)$$

In the RHS of equation (4), the output impact of an individual HEI *net* of its Scottish Government funding comprises two elements. It is the sum of the output impact attributable to other funding sources $of_i m_i$ and the impact of switching from general public expenditure to HEIs, $bf_i(m_i - m^p)$. This latter term is positive if the individual HEI multiplier, m_i , is greater than the aggregate public sector multiplier, m^p , and negative if it is not. Dividing equation (4) through by total final demand for the output of the *i*th HEI, $(bf_i + of_i)$, yields a "balanced expenditure" multiplier, m^B_i , given by:

⁷ m^p is the weighted sum of the multiplier values in those production and service sectors which receive public expenditure. The weights are the shares of total public sector expenditure in that sector. Therefore $m^p = \sum \alpha^p_i m_i$ where $\alpha^p_i = f^p_i / \sum f^p_i$.

$$(5) \quad m_i^B = m_i - \alpha_i m^P = (1 - \alpha_i)m_i + \alpha_i(m_i - m^P)$$

where α_i is the share of government funding in HEI i 's total final demand.

The balanced expenditure multiplier for HEI i shows the impact of a £1 increase in final demand with the base-year composition between Scottish Government and non-Scottish Government funding. This multiplier value takes into account the fact that a portion of final demand will be switched from general public expenditure. The balanced expenditure multiplier is therefore the weighted sum of the individual HEI's multiplier and the switching multiplier ($m_i - m^P$). The weights are the proportions of Scottish Government and other funding for the HEI's total final demand.

The intuition is clear: switching public expenditure to the HEI has no effect on the impact attributed to the HEI's other funding sources, which continue to exert the expected multiplier impact (m_i), weighted by the share of other funds ($1-\alpha_i$). The public expenditure that is switched has a multiplier value whose sign and scale is determined by the difference between the HEI's own multiplier and the aggregate public sector multiplier ($m_i - m^P$) and this is weighted by the share of public expenditure in total final demand for this HEI's output, α_i .

Hermannsson *et al.* (forthcoming) discusses in some detail the notion that there is a degree of policy scepticism surrounding the validity of expenditure studies of the impact of HEIs. This scepticism has a number of strands but takes its

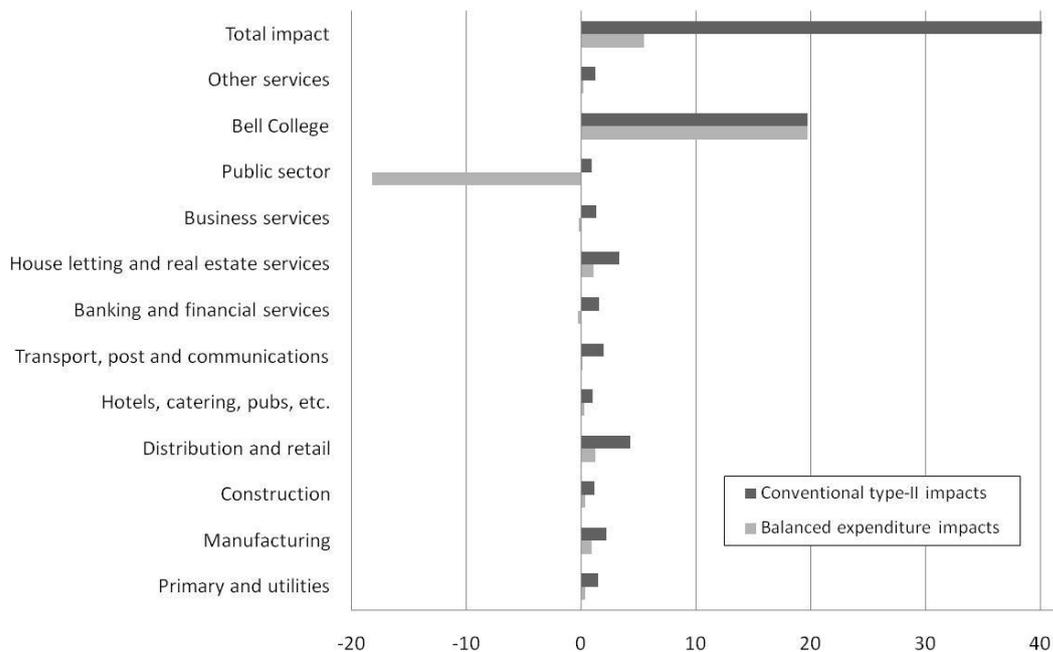
most rigorous form in the critique that all types of public spending have an associated expenditure multiplier, so that any expansion of expenditure in one form, such as HEIs, would be met with an equal and opposite negative impact from reduced spending on other forms. Equation (5) suggests that an extreme “policy scepticism” perspective implicitly assumes that $\alpha_i = 1$ and $(m_i - m^p) = 0$. However, no Scottish HEI is funded 100% by the Scottish Government, so that for all institutions $\alpha_i < 1$. Moreover the switching multiplier for Scottish HEI’s is positive, so that $m_i - m^p > 0$. The balanced expenditure multipliers for all Scottish HEIs are therefore positive.

Nevertheless, accounting for the possibility of alternative uses of public funding is potentially very important. Firstly, m_i^B must be less than m_i if the HEI receives any public funding at all. Traditional impact studies neglect this possible alternative use of public expenditure. Therefore these studies might be thought to exaggerate the net impact of HEIs on their host regional economies where HEIs are publically funded and a regional public sector budget constraint operate. Secondly, in principle, even the sign of m_i^B cannot be determined *a priori*. If an HEI is heavily dependent on constrained public funding and the HEI’s own multiplier is smaller than the general public expenditure multiplier, its balanced expenditure multiplier could be negative.

As an illustration, Figure 3 compares the operation of the balanced expenditure and conventional (Type II) multipliers for the case of Bell College. The analysis is disaggregated to 12 production sectors. The darker horizontal bars are the conventional total direct, indirect and induced output (Type II) impacts

attributed to Bell College. The total is £40 million, as identified earlier in Table 1, and represented by the top bar in Figure 3. The largest sectoral impact is the direct stimulus to the Bell College sector itself, which is just under £20 million, but the darker bars show smaller positive indirect and induced effects in all sectors.

Figure 3 Traditional and balanced expenditure output impacts of Bell College disaggregated by sector

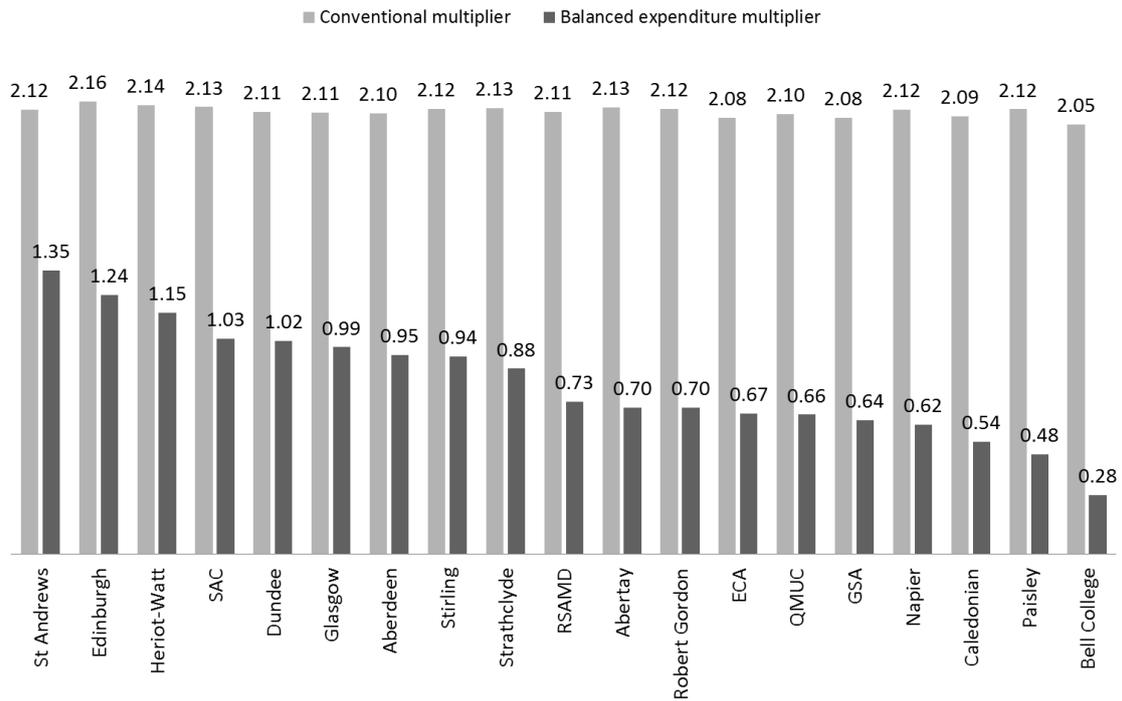


The lighter bars show the (Type-II) balanced expenditure output effects. These show the balanced expenditure impacts as the net outcome of two counteracting impacts. These are the expansion due to the stimulus to total Bell College final demand and the contraction due to the notional reduction in other public expenditure that follows the government expenditure switched required to fund this HEI. Overall, the total output attributed to Bell College under the balanced

expenditure scenario, shown as the top lighter bar, is only £5.5 million. There is still the large direct impact on the Bell College sector itself. However, there is now a big negative impact on the public sector and small negative impacts on the Business and the Banking and Financial Service sectors. The positive impacts on other sectors are also lower than in the conventional Type II case.

Figure 4 ranks all the Scottish HEIs by the value of their balanced expenditure multiplier. It also shows each HEI's conventional IO counterpart. All of the balanced expenditure Type-II multipliers are positive but lower than their corresponding conventional values. All Scottish HEIs receive significant levels of Scottish Government funding, and netting out the impact of this funding inevitably reduces the measured impact of HEIs' expenditures. However, HEIs as a whole are relatively export-intensive, and draw a significant portion of their funds from sources of final demand outwith Scotland. Also, HEIs' expenditures are, on average, less import-intensive than those of the public sector. Accordingly, Scottish HEIs exert positive expenditure effects relative to public sector expenditure as a whole. The presence of a public expenditure constraint certainly does not imply negligible (or in the limit zero) expenditure impacts as is often implied by policy sceptics, though it does imply lower expenditure impacts attributable to HEIs *per se* than conventional IO impact studies do.

Figure 4 Conventional and balanced expenditure Type-II multipliers for Scottish HEIs



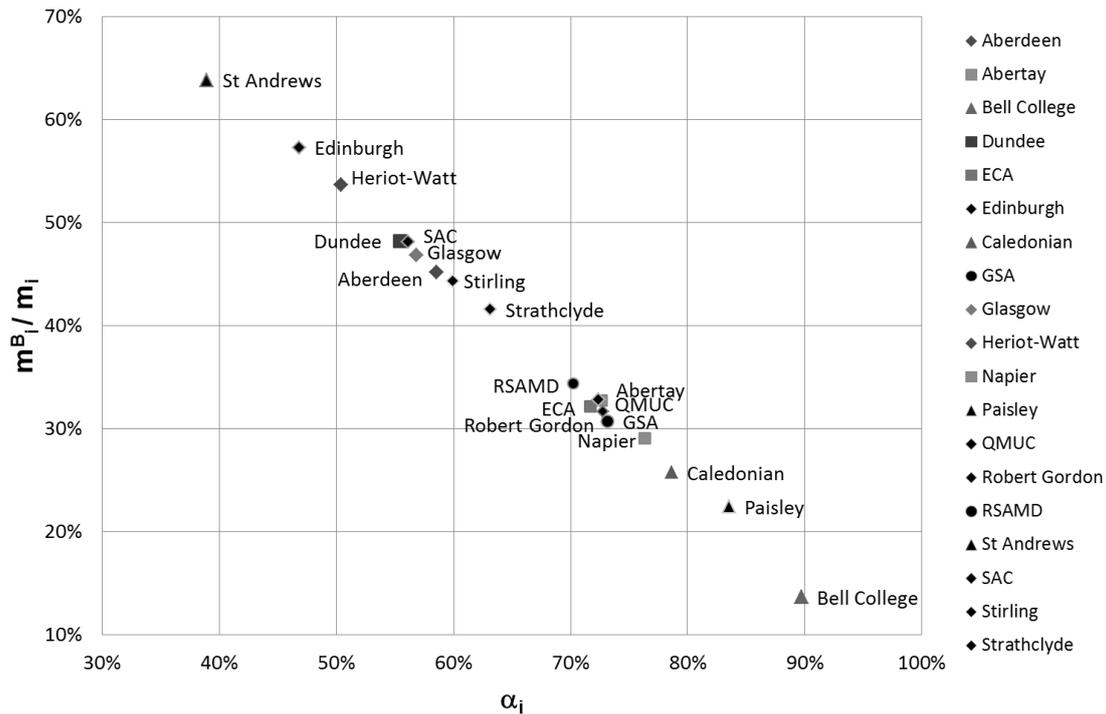
A key feature of the results presented in Figure 4 is that there is considerable variation in the balanced expenditure multipliers across HEIs in Scotland. The maximum and minimum values of this multiplier are 1.35, for St Andrews and 0.28 for Bell College. These figures represent 64% and 14%, respectively, of their conventional multiplier values. Recall that for conventional Type II multipliers, the largest Scottish HEI value was only 5% higher than the smallest: for the balanced expenditure multipliers the largest value is 430% higher than the smallest. The range of multiplier values has increased significantly, as has the coefficient of variation, which is some 27 times as great (0.32 as against 0.012), relative to the value for conventional IO multipliers.

It is apparent from equation (4) that the proportion of HEIs' funding coming from the public sector has a major impact on an HEI's balanced expenditure multiplier. We already know that there is limited variation in the Scottish HEIs own expenditure multiplier values (m_i) so that the main source of variation is in the size of the term $-\alpha_i m^p$. However, the aggregate public expenditure multiplier (m^p) is constant across HEIs. Therefore the key determinant of any variation in the balanced expenditure multiplier values is variation in the share of Scottish Government funding for the HEI's total final demand, α_i . Figure 5 plots each HEI's balanced expenditure multiplier (expressed as a percentage of its type II IO output multiplier) against the percentage of its funds that comes from the Scottish Government. Not surprisingly there is a strong negative relationship between the two series (-0.998).

Inspection of Figure 5 suggests two clear HEI groupings in Scotland on this criterion, with more loosely linked higher and lower outlying groups. One group of HEIs retains between 48% (Dundee) and 42% (Strathclyde) of their corresponding conventional IO multiplier. This group also includes SAC, Glasgow, Aberdeen, and Stirling. A second cluster, led by RSAMD retains between 34% and 29% (Napier) of their conventional IO impact in the balanced expenditure scenario. The outlying group of high balanced expenditure multiplier values includes St Andrews, Edinburgh and Heriot-Watt, which have values of 1.34, 1.24 and 1.15, retaining 64%, 57% and 54% respectively, of their corresponding conventional IO multipliers. Again, for the lower balanced expenditure multiplier values, there appears to be three outliers, Glasgow Caledonian (26%), Paisley (22%) and then again Bell College (14%). Of course,

there may be some dispute about the precise composition of each group, and recall that we are here solely focussing on expenditure impacts.⁸

Figure 5 Balanced expenditure multipliers (as % of type II output multiplier) against public funding as a percentage of total final demand for the HEI.



5 The overall impact of HEIs' and their students' expenditures

Conventional IO impact analyses of student expenditures typically adopt one of two quite different approaches. They either treat all HEI students' expenditures as additional expenditure within the host region (Harris, 1997) or only consider

⁸ See e.g. King (1970), Dolton and Makepeace (1982), Tight (1996) and Howells *et al.* (2008) for typologies based on a wide range of HEI characteristics (some of which could be interpreted as proxies for expenditure effects).

the expenditures of students who move into the region to study as additional (Kelly *et al.*, 2004). Our view is that these different perspectives are effectively approximations to, and special cases of, an IO accounting approach in which the key distinction is between those expenditures (or parts of expenditures) that are exogenous and those that are endogenous. From this viewpoint, all the consumption expenditure of students from outwith Scotland and some of the expenditure from domestic students should be treated as exogenous.

We implement this alternative approach using information from the survey of Scottish student income and expenditure by Warhurst *et al.* (2009) combined with the database employed in the construction of Table 1. These data allow us to distinguish between those expenditures that are treated as exogenous and those that are treated as endogenous in a conventional IO analysis. An outline of this procedure is given in the Appendix but for more details see Hermansson *et al.* (forthcoming). Furthermore, following the discussion in Section 4, we distinguish between the Scottish Government funding of students consumption and other funding sources and engage in a similar attribution analysis that identifies balanced expenditure multipliers for students' expenditures.

In this section the primary aim is to provide an overall analysis of HEI impacts by adding student expenditure impacts to those of the HEIs' own expenditures as discussed in Sections 3 and 4. For each £1 million of HEI final demand expenditure, we calculate the associated student numbers and the multiplier

multiplier impact on the local economy that occurs from those students' exogenous consumption. This is represented as m_i^S .

We assume that the additional consumption expenditure made by students has a consumption multiplier that is the same as that for general household consumption, m^C . However, the exogenous per capita expenditure varies between students of different types: for students of type n , this is the product of the average consumption expenditure of students of that type, c_n , and the proportion which is exogenous, x_n .

We use the sum $\sum_n \gamma_{i,n} c_n x_n$ to calculate the average per capita exogenous student consumption expenditure at each HEI, where $\gamma_{i,n}$ is the proportion of the students of type n in HEI i . The additional output generated per £1 million of HEI final demand expenditure, m_i^S , is therefore determined by multiplying the per capita figure by the number of students at the HEI, s_i , dividing by the HEI's total final demand, f_i , and multiplying by the consumption multiplier, m^C . This produces:

$$(6) \quad m_i^S = m^C \left[\frac{s_i}{f_i} \right] \sum_n \gamma_{i,n} c_n x_n$$

In the present application, we have three groups of students identified by initial domicile. These are students from Scotland, the rest of the UK and the rest of the world. In these calculations, the values of the per capita consumption of a student of a particular type, c_n , the proportion of that expenditure that is

exogenous, x_n , and the value of the household consumption multiplier, m^C , do not vary across HEIs. However, the student intensity, $\frac{s_i}{f_i}$, and the distribution of students between different types (the values of $\gamma_{i,n}$) do.

Some indication of the variation across HEIs for these variables is given in Table 1. The value of the student intensity is inversely related to the HEI income per student shown in column 7 of Table 1.⁹ As noted in the discussion in Section 2, the highest income per student (Edinburgh) is over three times the value for the lowest (Bell College). Concerning the student distribution, incoming students (non-Scottish) have a significantly higher per capita expenditure impact than local (Scottish) students. Column 8 in Table 1 shows the proportion of incoming students at different Scottish HEIs. Again there is very wide dispersion: 1% of students at Bell College come from outwith Scotland, whilst 71% at St Andrews do.

⁹ The student intensity can be represented as: $\frac{s_i}{f_i} = \frac{s_i q_i}{q_i f_i} = \left[\frac{q_i}{s_i} \right]^{-1} \left[\frac{q_i}{f_i} \right]$. The first term on the RHS of this final expression is the inverse of the HEIs income per student, which is the figure given in Table 1. The second term is the ratio of the HEIs income to the final demand for its output. This second term must be greater than unity but as almost all HEI output goes to final demand, for HEIs its value is typically just above one.

Figure 6 Aggregate standard multipliers of Scottish HEIs (m^A_i). The darker area shows the institutional component (the standard IO multiplier m_i) while the lighter shaded area shows the student consumption component (m^S_i).

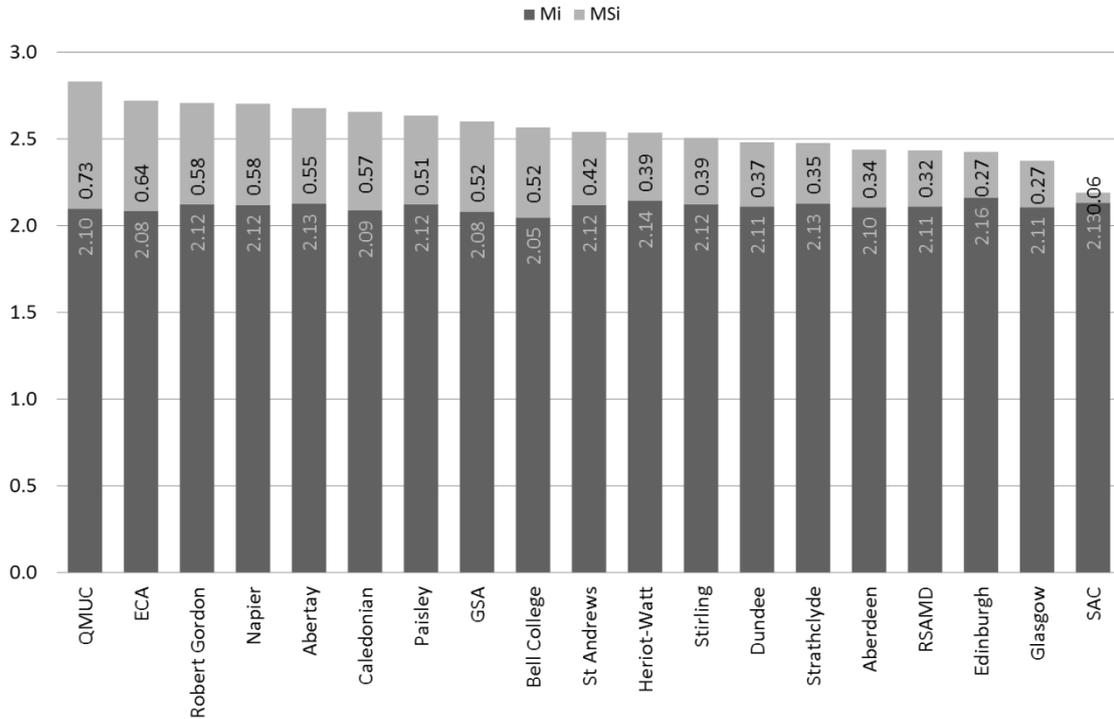


Figure 6 shows the conventional Type II student consumption multiplier value, m^S_i , as expressed in equation (6). These are conventional multiplier values in that they do not include any adjustment for public sector expenditure switching. For each HEI, this student multiplier figure has been added to the conventional Type II HEI output multiplier value shown in Figure 2 to generate an aggregate multiplier, m^A_i . Figure 6 also ranks the Scottish HEIs by the value of this aggregate multiplier value. Note that the associated student consumption multipliers vary widely across HEIs, from 0.06 for SAC to 0.73 for Queen Margaret University College (QMUC). However, these student consumption multiplier values are always dominated by the conventional multipliers for the

HEIs own expenditure. At a maximum, the conventional student multipliers only make up 35% of the conventional total Type II impact.

Figure 7 Aggregate balanced expenditure multipliers of Scottish HEIs (m^{AB}_i). The darker area shows the institutional component (m^B_i) while the lighter shaded area shows the student consumption component (m^{BS}_i).

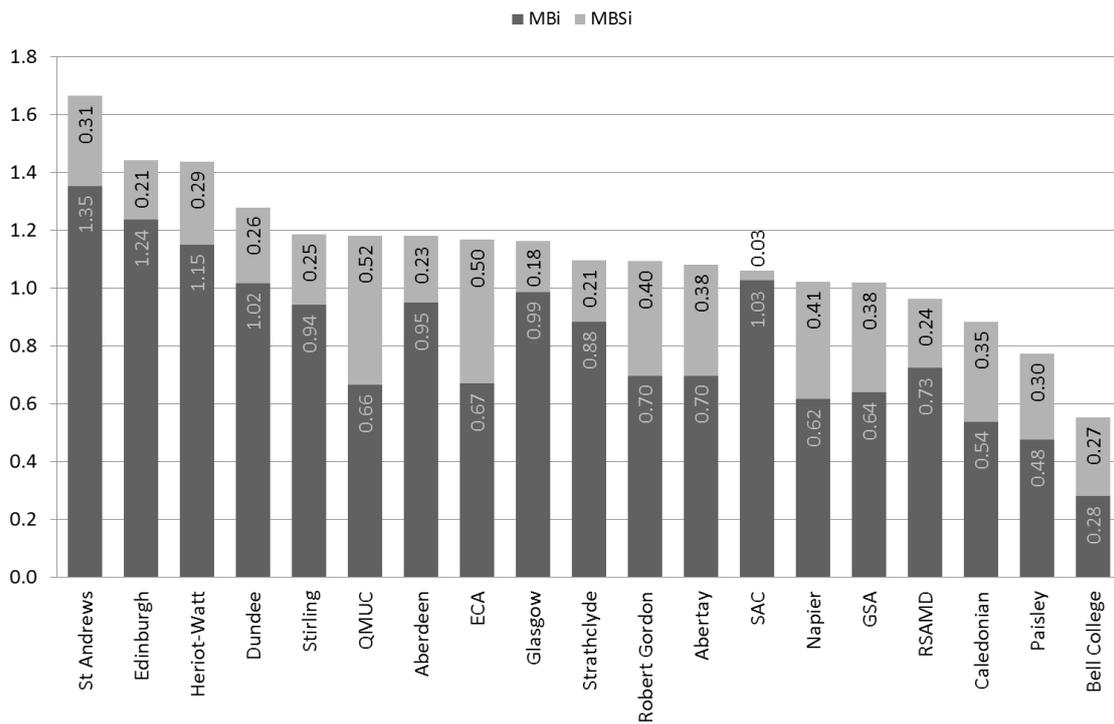


Figure 7 shows the aggregate balanced expenditure multiplier values for each Scottish HEI, m^{AB}_i . That is to say, the student multiplier value is adjusted to take into account the reduction in public expenditure elsewhere as a result of maintenance grants from the Scottish Government. This generates the balanced expenditure student consumption multiplier, m^{BS}_i . This multiplier is then added to the HEI balanced expenditure values given in Figure 3. Taking into account public sector expenditure switching produces a downward adjustment to each HEI's student consumption multiplier. However this downward adjustment is, in

general, small relative to the adjustment to the HEI expenditure multiplier. This has a number of implications.

First, student consumption makes up a large share of the total balanced expenditure multiplier for a number of Scottish HEIs. For Bell College, QMUC and Edinburgh College of Art (ECA), 49%, 44% and 43% respectively of the total balanced expenditure multiplier is contributed by student expenditures, and for Napier, GSA, Caledonian and Paisley the figure is just less than 40%. Second, the combined impact of HEI and student expenditure means that for over two thirds of the institutions the balanced expenditure multiplier value is greater than unity. Third, the addition of student spending leads to a marked change in the ordering of HEI's by their balanced expenditure multiplier values. Fourth, there are no longer clear groupings amongst institutions, although those institutions identified in Figure 5 as being either high or low outliers retain that status. Finally, the multiplier values reflect the wide range of activities undertaken by different HEIs. For example, QMUC and Aberdeen have almost identical balanced expenditure multiplier values but their decomposition into university and student expenditure effects are quite different.

6 Conclusions

In this paper we explore the expenditure impacts of Scottish HEIs and their students on their host regional economy by applying an IO attribution analysis to a purpose-built, individual-HEI-disaggregated IO table for Scotland. Our

database and modelling framework allow us to provide the first systematic comparison of expenditure impacts among Scottish HEIs, and to address the issue of whether these are heterogeneous or homogeneous in nature. Our answer varies with the precise definition of impact. Using a conventional IO analysis the *level* of HEIs' own expenditure impacts on Scottish GDP vary considerably from the £468 million contributed by Edinburgh to the £12 million impact of RSAMD: estimated impacts in this sense are very heterogeneous. However, when these impacts are corrected for scale and expressed in terms of conventional IO multipliers (measures of “bang per buck”), the expenditure impacts appear remarkably homogeneous across HEIs.

However, these conventional results are challenged by a growing “policy scepticism” that argues that public funds allocated to HEIs could, in principle at least, be reallocated to other uses which would also have “knock on” effects of a comparable scale. The resulting balanced expenditure multipliers for individual HEIs are all positive, but are considerably smaller than conventional IO impacts. While these results allow us to reject the extreme form of policy scepticism, a non-trivial part of the expenditure impacts that are attributed to Scottish HEIs in conventional impact studies should instead be attributed to the Scottish Government funding that they receive. The balanced expenditure multipliers also exhibit considerable heterogeneity, reflecting to a large degree the different extents to which individual HEIs obtain their funding from the Scottish Government. If these impacts are used in a simple descriptive way to categorise HEIs, there appear to be two groups of HEIs and three outliers at each of the lowest and highest end of the impact scale. However, incorporating

student consumption expenditure generates greater heterogeneity so that no clear groupings emerge.

Our main response to the question posed in the title of this paper is that using conventional IO multiplier impact measures, Scottish HEIs appear remarkably homogenous; but if the focus is shifted to the impact net of their Scottish Government funding, very considerable heterogeneity is apparent. This is potentially very important for the impact of policy in the context of the current pressure on the public funding of HEIs in Scotland (and elsewhere). If the reduction in government expenditure on HEIs is targeted to produce the closure of individual institutions, the balanced expenditure approach is the most appropriate. However, judging the impact of marginal changes in government expenditure at the level of individual HEIs is complicated by the fact that we do not know whether public funding may prove to be complementary to, or a substitute for, other sources of funds.

Our main general conclusion is that future HEI impact studies should routinely report balanced expenditure as well as conventional IO multipliers, so as to reveal the impacts that are attributable to the institutions *per se*, net of the impacts attributable to their public funding. Individual HEIs (many of whom sponsor impact studies) may resist, since adopting this approach can only reduce reported impacts relative to conventional IO results. However, using this method is the only way to address the more serious concerns of policy sceptics. Of course, the argument applies with equal force to any regional impact study involving the use of public funds, most obviously where there exists a binding

regional government budget constraint. But even where there is no regional budget constraint, as long as there is interest in the expenditure opportunity cost of public funding, balanced expenditure multipliers become relevant.

We end on a cautionary note: this study is concerned exclusively with the expenditure, or demand-side, impacts of HEIs. These are not the only, and are probably not the most important, impacts that HEIs have on their host regional economies. For example, one key contribution that HEIs can make to their host regions, at least in principle, is their supply of skilled graduates whose (private) benefits are apparent through graduate wage premia. In our analysis of expenditure impacts, in-coming students' expenditures typically have the biggest impact. However, these might be the very students who are least likely to stay and stimulate the host region in the longer term, through their enhanced productivity. For example, St Andrews has the highest share of incoming students (67%), but the lowest graduate retention rate in Scotland (69%).

Any overall assessment of the contribution of HEIs to their host region must attempt to measure supply-side, as well as demand-side or expenditure impacts (Hermannsson *et al.*, 2010b). This cannot be accomplished through further modification of the IO approach, but necessitates adoption of a modelling framework that explicitly incorporates a detailed specification of the supply side of the regional economy.

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Appendix

To determine exogenous student consumption we subtract that proportion of student consumption expenditure that is financed from student wages and local intra-family transfers. Also, where appropriate, we adjust for maintenance grants from the Scottish Government. A more detailed exposition of this procedure is given in the Appendix of Hermansson *et al.* (forthcoming). Furthermore, to avoid double counting¹⁰ we subtract student expenditures on university provided residence and catering services. More specifically, for housing expenditures this is done by drawing on data from HESA on the number of students by institution which stay in university provided accommodation and survey data on the housing expenditures of those students. Equivalent data are not available for students' expenditures on food and drink. Therefore, we adopt the assumption that 10% of students' living costs are spent on food and drink sold by university residence and catering departments.

¹⁰ We are grateful to a referee for suggesting this adjustment.