

**“Policy Scepticism” and the Impact of Scottish Higher Education Institutions (HEIs) on
their Host Region: Accounting for Regional Budget Constraints under Devolution**

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Abstract

A “policy scepticism” has emerged that challenges the results of conventional regional HEI impact analyses. Its denial of the importance of the expenditure impacts of HEIs appears to be based on a belief in either a binding regional resource constraint or a regional public sector budget constraint. In this paper we provide a systematic critique of this policy scepticism. However, while rejecting the extreme form of policy scepticism, we argue that it is crucial to recognise the importance of the public-sector expenditure constraints that are binding under devolution. We show how conventional impact analyses can be augmented to accommodate regional public sector budget constraints. While our results suggest that conventional impact studies overestimate the expenditure impacts of HEIs, they also demonstrate that the policy scepticism that treats these expenditure effects as irrelevant neglects some key aspects of HEIs, in particular their export intensity.

Keywords: Higher Education Institutions, Input-Output, Scotland, Impact study, Multipliers, Devolution.

JEL classifications: R51, R15, H75, I23 .

1. Introduction

There have been numerous studies of the impact of higher education institutions (HEIs) on their host regional economies, which focus solely on their effect on the local demand for goods and services. (See e.g. Florax, 1992 and McGregor *et al*, 2006, for reviews.) These demand side studies treat a university like any other business, which demands goods and factor services within the region¹. The best of these studies employ regional input-output analysis. However, a “policy scepticism” has emerged that challenges the value of such analyses. This scepticism asserts that either demand-side binding budget constraints or supply-side binding resource constraints generate “crowding out” of HEI expenditure effects on the host regional economy, to the point where the regional impact of HEIs expenditures is regarded as negligible. In this paper we provide a systematic critique of this perspective. While we reject the extreme form of policy scepticism we acknowledge the importance of binding public sector budget constraints under UK devolution, and argue that future regional impact studies should be modified to accommodate these constraints.

The case is illustrated through an application to Scotland, which is a UK region with a large higher education sector and partially devolved fiscal responsibilities. The study of HEIs in Scotland is particularly appropriate for three reasons: Scotland’s devolved status imposes a binding public sector expenditure constraint at the regional level; the variety of spatial origins of HEIs’ income motivates a fresh look at the composition of their impact; and the availability of relevant data for the Scottish economy and Scottish HEIs allows a degree of confidence in the results that is more difficult to replicate for other regions in the UK. However, it should be emphasised that this approach is generally applicable to all impact studies of regions with a devolved budget.

¹ HEIs may also have important impacts on the supply-side of regional economies through, for example, their impact on skills in the host region’s labour market, knowledge effects and wider external benefits. These are discussed in Hermansson *et al* (2010b).

Our analysis of HEI impacts is based upon a purpose-built, HEI-disaggregated Input-Output (IO) table for Scotland, in which the higher education sector is separately identified². We derive the expenditure impacts of HEIs using standard IO assumptions. However, we also consider how the standard IO assumptions, and current practice, have to be modified to accommodate the binding budget constraint of the Scottish Parliament. We also implement a novel treatment of student expenditure impacts in which, in line with standard IO assumptions, we seek to identify the degree to which student's consumption expenditures can be treated as exogenous. Two quite different treatments of student expenditures are apparent in the literature, focussing either on the expenditures of all students in the host region (Harris, 1996) or only those who move into the region to study (Kelly et al, 2004). We argue that both are, in general, approximations to an appropriate distinction between those parts of student expenditures that can legitimately be regarded as exogenous, and those that should be treated as endogenous.

The remainder of the paper is structured as follows. In Section 2 we outline the approach adopted by conventional (input-output-based) regional HEI impact studies, and summarise the results that the implementation of this approach yields when applied to our purpose-built, Scottish, HEI-disaggregated input-output database. We explore the basis of "policy scepticism" in Section 3, attributing this to two broad possible sources: an acknowledgement of a resource constraint on the supply-side and a public sector budget constraint on the demand-side. We argue that the traditional "Green Book perspective" of complete supply-side crowding out of regional expenditures is not applicable to the context of a single devolved region. Indeed, at the regional level the passive supply-side assumptions required to motivate the use of input-output analysis may apply in the longer term. However, we also argue that the presence of a binding constraint on government expenditure, which operates through the Barnett formula in Scotland,

² For details of the construction of the Input-Output table, the derivation of the income and expenditure structure of the HEIs sector and the data sources used see Hermannsson et al (2010a).

is significant for the appropriate conduct of regional impact studies. In particular, in the context of incremental increases (or decreases) in public expenditure on HEIs, the application of conventional impact analysis effectively assumes that these expenditures are externally-financed (through the central government). If, instead, they are financed by switching/reallocation of the Scottish Government's expenditure, then the impact of this should be explicitly identified. We show how this constraint can be accommodated within conventional impact analyses. Inevitably, our results suggest that the aggregate impact on the host region of such switching is significantly less than conventional impact analyses imply, though in the Scottish case the net impact remains positive.

In Section 4 we show that it would be wrong to infer from the small net "balanced expenditure multiplier", which (we establish in Section 3) applies to Scottish general government expenditure being switched to HEIs, that HEIs have a negligible overall impact on their host region that is additional to the impact of public expenditure *per se*. We illustrate this through an IO-based attribution analysis, which highlights the fact that HEIs are emphatically not part of the public sector. Some 54% of Scottish HEIs' funds come from devolved public sources, but 46% do not. Scottish HEIs are in fact relatively export-intensive. We show that of the "total impact" of HEIs on Scottish output that would be attributed to HEIs in a conventional analysis, just under one half is attributable to public funding *per se*.

We present brief conclusions in Section 5. Overall, our results suggest that conventional impact studies do overestimate the impact of HEIs expenditures on their host region. However, our findings also demonstrate that the policy scepticism that treats the expenditure effects of HEIs as irrelevant neglects some important characteristics of these institutions, notably their export

intensity. Although this analysis is illustrated in terms of the impact of Scottish HEIs, it is relevant to any impact analysis conducted in regions where budgets are devolved.³

2. Conventional regional impact analyses

Conventional impact analyses of HEIs on their host regions identify the total effects of HEIs as the sum of the impact of institutional expenditures and of (typically part of) the expenditures of their students. We begin with a brief account of regional input-output-based impact analyses. We first consider the application of this approach to institutional and then subsequently to student expenditures

2.1 Theoretical basis of conventional regional impact analyses

Regional impact analyses are frequently employed to capture the total spending effects of institutions, projects or events. In addition to simply identifying the direct spending injection of the studied phenomenon, multiplier, or “knock-on”, impacts are estimated by summing up subsequent internal feedbacks within the economy (see Loveridge (2004) for a review). In this section we briefly outline the methods adopted by impact studies⁴. Based on the typical assumptions made in the literature we derive the expenditure, or demand-side, impacts of the HEI sector on the Scottish economy for 2006.

Most regional demand-driven models (e.g. Export base, Keynesian multiplier, Input-Output) make a crucial distinction between exogenous and endogenous expenditures. Exogenous expenditures in these models are taken to be independent of the level of activity of the relevant

³ Indeed the analysis may be of rather more general applicability, since even where budgets are not devolved there may be interest in identifying the opportunity cost of public funding.

⁴ For a more detailed account of the methodology of impact studies and regional multipliers see e.g.: Miller & Blair (2009), Armstrong & Taylor (2000).

economy; endogenous variables are primarily driven by the overall level of income or activity within the economy. Specifically demand for intermediate inputs and often consumption demand are taken to be endogenous. Other elements of final demand (exports, government expenditure, investment) are taken to be exogenous⁵. There is then a clear causal pathway from exogenous to endogenous expenditure.

In addition, interpreting the results of these demand driven models rests on the assumption that the supply-side of the economy operates in a passive way. At the regional level, conventional multiplier analyses can be validated by either of two sets of conditions. In the short and medium runs this would be where there is general excess capacity and regional unemployment. In the long-run, it is where factor supplies effectively become infinitely elastic, as migration and capital accumulation ultimately eliminate any short-run capacity constraints (McGregor *et al*, 1996)⁶.

The derivation of the multipliers draws on the notion of exogenous expenditure driving endogenous activity. In the standard Leontief Input-Output approach total activity within the economy can be described in terms of an equation where the total output of each industry equals final demand, which is exogenous, times multipliers as represented by the Leontief inverse. This can be summarised as:

$$q = (I - A)^{-1}f \quad \text{Equation 1}$$

⁵ The distinction between endogenous and exogenous activity depends on the model and the application. In particular, what is exogenous and what is endogenous to the model does not have to correspond with what is 'inside' and what is 'outside' the region in spatial terms.

⁶ The nature of the regional economy naturally governs the realism of such an assumption. One limiting case is the example of the island economy of Jersey where the institutional framework restricts migration so that supply-side crowding out can be expected even in the long run. See Learmonth *et al* (2007).

where q is a vector of gross outputs, f is a vector of final demands and $(\mathbf{1}-\mathbf{A})^{-1}$ is the Leontief inverse. The output multiplier for each sector 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 columns 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 :

$$q_i = l_i f_i \quad \text{Equation 2}$$

Where l_i is the output multiplier for sector i .

Multipliers can be derived to relate a variety of activity outcomes, such as employment, income, output or GDP, to exogenous changes in demand. Although a number of variants can be applied the Type-I and Type-II demand-driven multipliers used here are typical for Input-Output based impact studies. Type-I multipliers incorporate the increase in demand for intermediate inputs, and treat household consumption as exogenous. Type-II multipliers also include induced consumption effects as endogenous For further details see: Hermannsson *et al* (2010a), Miller & Blair (2009, Ch. 6).

We base this study on an augmented Scottish Input Output table (Hermannsson *et al* (2010a). Income and expenditure data for Scottish HEIs are used to identify a separate HEIs sector. That is to say the aggregate education sector that is identified in official IO tables is split into two elements, HEI and non-HEI education. This disaggregation reveals the income and expenditure structure of Scottish HEIs and makes it possible to derive appropriate (sector-specific) multipliers. The table, and associated model, treat the HE sector on the same basis as any other sector: as a demander of goods and services and factor inputs, and as a supplier of services to meet intermediate and final demand. Applying these principles to derive the demand-side

impacts of HEIs entails estimating the economic activity contingent upon the economy's final demand for the HEIs' services and the linked exogenous expenditure of their students.

2.2 The regional impact of HEIs' own expenditures

An extensive literature estimates the impact of HEI spending on their host regional economies solely through these demand side (expenditure-related) effects. For example Florax (1992) identified over 40 studies of the regional economic impact of HEI expenditure and much has been published since. Table 1 below presents a summary of the major Scottish HEI impacts studies. Most, especially the earlier analyses, are based on Keynesian income-expenditure models e.g. Brownrigg (1973), Bleaney *et al* (1992), Armstrong (1993) and Battu *et al* (1998), whilst a smaller number use some variant of IO modelling e.g. Blake and McDowell (1967), Kelly *et al* (2004) and most recently Hermannsson *et al* (2010b)⁷. These studies differ in the type of multiplier they report, the approach used to derive the multiplier values and the geographical definitions of the studies. Unsurprisingly therefore, the multiplier values generated differ somewhat and are in most cases not directly comparable⁸. McGregor *et al* (2006) summarise the methods and findings of the main UK studies.

⁷ McGregor *et al* (2006) argue that, although less frequently applied, the IO analysis is methodologically superior to Keynesian income-expenditure models. However the latter might be used in circumstances where indicative results are considered sufficient or IO accounts are not available and cannot be constructed with the resources available.

⁸ Except perhaps in the most recent studies based on the Scottish Input-Output tables.

Table 1 Overview of main Scottish HEI impact studies⁹

Subject of study	Multiplier value	Geographic boundary	Source of multiplier value
St. Andrews University (Blake & McDowall, 1967)	1.45 (Household income)	St. Andrews (pop. 10,000)	Input Output table
Stirling University (Brownrigg, 1973)	1.24 - 1.54 (Income)	Parts of Stirling and Perth (pop. 96,000)	Brown et al (1967), Greig (1971)
Strathclyde, Stirling and St. Andrews Universities (Love & McNicholl, 1988)	1.34, 1.43, 1.36 (student spending)	Scotland	Brownrigg & Greig (1975), McNicholl (1981)
Aberdeen, Dundee and Stirling Universities (Love & McNicol, 1990)	2.18 (output), 1.75 (GDP), 1.95 (employment)	Scotland	Scottish Input Output Tables (1979)
Aberdeen University (Battu et al, 1998)	1.46 (spending), 1.61 (employment)	North East of Scotland	Greig (1971), Brownrigg (1971), McGuire (1983), Harris et al (1987)
Strathclyde University (Kelly et al, 2004)	1.63 (output), 1.38 (employment)	Scotland	Input Output table
Strathclyde University (McNicholl, 1993)	2.15 (output), 1.66 (Income)	Scotland	Scottish Input Output Tables (1989), Survey
Scottish HEIs (1) 1995	1.76 (output), 1.7 (employment)	Scotland	Scottish Input Output Tables (Hybrid, 1994-5)
Scottish HEIs (2) 1999	1.73 (output), 1.42 (employment)	Scotland	Scottish Input Output Tables (SLMI, 1997)
Scottish HEIs (3) 2004	1.6 (output), 1.4 (employment)	Scotland	Scottish Input Output Tables (2000)
HEI impacts projects 2009	1.3 (output type I), 2.1 (output type II)	Scotland	Scottish Input Output Table (2004)

A variety of multipliers can be derived to link a particular exogenous change to changes in a number of economic outcome metrics. The output multipliers relate changes in final demand to the change in gross output. Therefore, an output multiplier of 2.15 as found in McNicol (1993) implies that a unit increase in the final demand for the outputs of Strathclyde University leads to a Scotland-wide change in output of £2.15. The stated employment multipliers show the economy-wide change in employment caused by a unit (£1) increase in direct employment. The household income multiplier used by Blake and McDowell (1967) is slightly unusual, but appropriate for their small borough application, where they relate changes in the total output of the University of St. Andrews to changes in local household income. The income multipliers used by Brownrigg (1973) relate exogenous changes in regional income to the overall change in regional income¹⁰.

When we apply conventional input-output analysis to our HEI-disaggregated Input-Output table for Scotland, we find that in 2006 the Type-I output multiplier for the HEIs sector is 1.33 and the Type-II multiplier is 2.12. That is, each £1 of final demand for the output of HEIs should

⁹ The multipliers presented are in most cases not directly comparable among studies as their exact definition varies. Furthermore, they differ in terms of what spending is treated as exogenous.

¹⁰ Where regional income is equivalent to GDP as derived by the expenditure method. For further details on Keynesian multiplier models see Chapter 1 in Armstrong & Taylor (2000).

generate a Scotland-wide output amounting to £1.33 if indirect knock-on effects are included and £2.12 if induced impacts are counted as well. As is summarised below, based on these assumptions the HEI sector drives a significant amount of economic activity within Scotland: approximately 2.28% of total output and 2.76% of overall employment.

Table 2 Summary of expenditure impacts of HEIs, based on traditional IO-assumptions, £m and FTE's

	Final demand		indirect and induced impacts		Total impact	
Output, £m	1,912	1.07%	2,148	1.20%	4,060	2.28%
Employment, FTE's	31,507	1.58%	23,606	1.18%	55,112	2.76%

2.3 The treatment of students' consumption expenditures

In addition to the impact of the institutions' own expenditures a further impact we need to account for is the implicitly linked (exogenous) students' consumption expenditure that occurs within the local economy. In practice this involves: determining the level of student spending; judging the extent to which this is additional to the Scottish economy, and identifying how student expenditures are distributed among sectors. Perhaps the most difficult part of this process is the disaggregation of students' consumption expenditures into its exogenous and endogenous components.

There have been two alternative treatments of student expenditures in past impact studies: one incorporates only the expenditures of in-coming students (e.g. Kelly *et al*, 2004), the other includes all student expenditures, irrespective of their origin (e.g. Harris, 1996). Here we argue that each of these past treatments of student expenditure impacts represents an approximation to an input-output accounting approach in which the crucial distinction is that between the exogenous and endogenous components of student expenditures. While it is true that the whole

of external students' expenditures can be regarded as exogenous to the host region, home students' expenditures cannot legitimately be treated as either wholly endogenous, which is what would be required to validate the first approach, nor wholly exogenous, which would be required to validate the second.

The case of external students is straightforward: their expenditures are unambiguously exogenous, as their incomes are derived from an external location. The treatment of their expenditure is similar to that of tourists. For local students, the distinction between their endogenous and exogenous consumption is less clear cut. To a large extent their income, and hence consumption, is endogenous to the local economy in that it comes from wages earned from local industries and transfers from within local households. For local students simplifying assumptions are adopted in line with the typical IO-notion of exogeneity. The exogenous components of local students' consumption expenditures are assumed to be expenditures financed from commercial credit taken out during their years of study, student loans and education-related grants and bursaries.

For details of Scottish students' income and expenditures we draw on a comprehensive survey by Warhurst *et al* (2009). The full details of our treatment of student expenditures are reported in an Appendix. This reveals that *per student* the net contribution to final demand is greater for incoming students than local ones as there are fewer deductions of incomes that should be treated as endogenous.

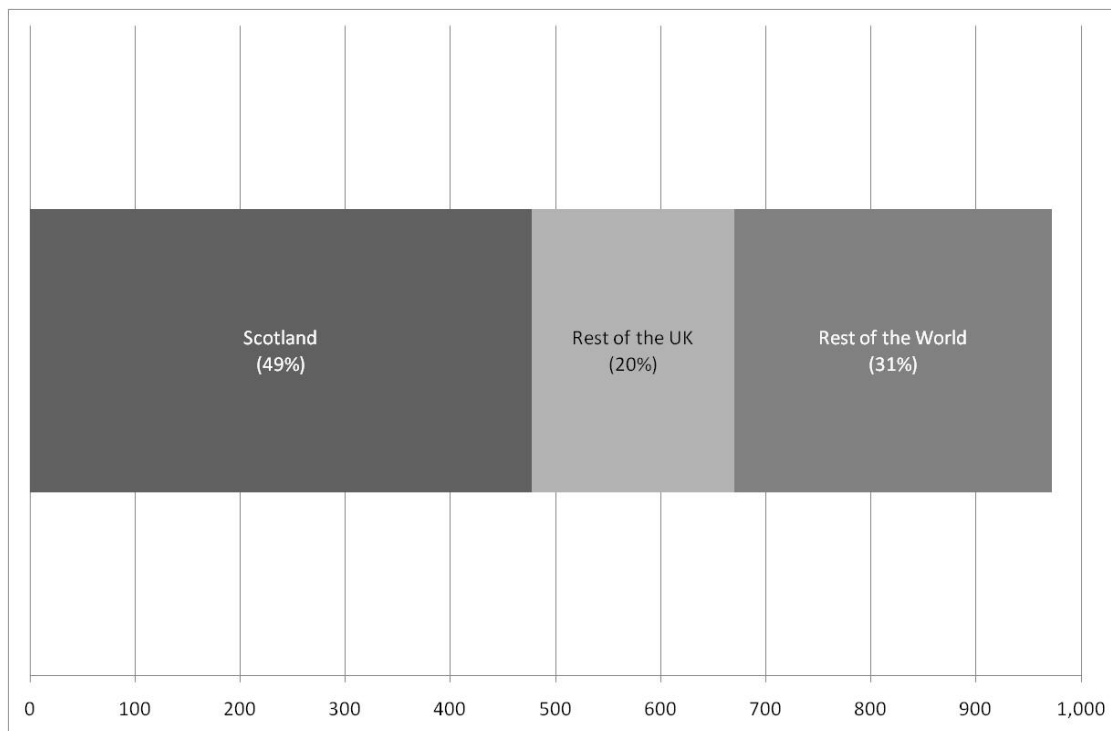
Table 3 Derivation of per student spending disaggregated by place of domicile

Location of domicile		Scotland	Rest of the UK	Rest of the World
Gross average student spending £	+	6,230	7,187	7,187
Income from employment £	-	1,945	1,945	
Within household transfers £	-	453		
Other income £	-	570		
Dissaving £	-	1,073		
Spending attributable to new commercial credit £	+	346		
Exogenous average per student spending	=	2,535	5,242	7,187
Direct imports £ (32%)	-	816	1,688	2,315
Net change in final demand per student £	=	1,719	3,554	4,872
Number of students FTE's	x	115,398	22,630	25,737
Estimated net contribution to final demand by student population £ m	=	198.3	80.4	125.4

Once students' net contribution to final demand has been determined the next step is to estimate the knock on impacts of their consumption spending. A student expenditure vector estimated by Kelly *et al* (2004) is used to derive the spending impact of the different student groups in Scotland. The output multiplier for student spending derived from the IO tables is 2.4. Hence, a direct injection of £404.2 million (the horizontal sum of the final row of Table 3), drives £ 972 million of output in the Scottish economy, as is summarised in Figure 1 below, or approximately 0.54% of economy wide output. As the preceding discussion indicates the consumption multiplier cannot be applied directly to students' gross term-time spending as reported in income and expenditure surveys. Gross expenditures have to be adjusted for spending financed by income sources endogenous to the Scottish economy. When these adjustments are applied to multipliers we find that for each £1 of local students' gross term time expenditures the Scotland-wide economic impact is only 66 pence. This is because these expenditures represent, to a significant extent, a redistribution of spending within the Scottish economy and so only partially constitute an additional injection. The impact of per unit gross spending of incoming students is stronger as more of it represents an additional injection into the regional economy.

Despite the relatively modest per student impact, Scottish students make up 70% of the student population and therefore drive approximately 49% of the total student consumption impact. The significance of the consumption spending of students from the rest of the world is little less at approximately 31% of the total consumption impact, whereas the remaining 20% is made up by the expenditure of students from the rest of the UK.

Figure 1 Output impact of student spending in Scotland disaggregated by student origin, £m



Students' consumption impact is a significant complement to institutional expenditures when measured in terms of total Scottish output. Whereas institutional expenditures support 2.28% of overall output in the economy an additional 0.54% is provided for by students' consumption. In output terms these represent 19% of the total impact of HEIs. The employment impact of student's consumption is more subdued, however. Whereas HEIs support 2.76% of overall employment, student's consumption expenditures provide an additional impact of only 0.18%, or approximately 6% of the overall employment supported by HEIs and related expenditures in Scotland.

This section has summarised typical practice for estimating the regional expenditure impact of HEIs and their associated student population. The next section examines criticisms of this approach and considers appropriate responses to these.

3. Policy scepticism and the impact of HEIs

There appear to be two main ways of motivating an assumption of complete “crowding out” of HEIs expenditures within their host region: a tight resource constraint; a binding regional public sector budget constraint. We consider each in turn.

3.1 Resource Constraint

One potentially important source of scepticism within the UK about regional demand-driven impact multipliers is the 100% crowding-out argument that characterised the HM Treasury Green Book’s analysis of regional impacts. Here a pure demand disturbance that stimulates employment in one region has an equal and offsetting impact on employment in other regions of the UK, given that the UK economy is taken typically to operate at “full employment” (or the natural rate of unemployment or NAIRU). However, even if there was a 100% crowding out at the level of the UK as a whole, this would not apply at the level of the host regional economy¹¹. It is quite legitimate for Scottish and Welsh governments, for example, to be concerned about the demand-side impact of particular institutions/expenditures for their own economies. In this context, aggregate host-region employment multipliers are clearly not constrained to be zero.

¹¹ Though it could under limiting conditions of a completely inelastic labour supply curve or infinitely elastic labour demand curve, but these are extreme and empirically unlikely parameter values (McGregor and Swales, 2005).

Of course, none of this implies that the supply side is unimportant. Rather it simply emphasises that the demand side cannot be dismissed as irrelevant at the level of the individual devolved region. There undoubtedly is, and certainly ought to be, policy interest in the demand side impact of public expenditure decisions in a regional context. Furthermore, the issue of supply-side crowding out must depend on supply-side conditions in national and regional economies and on institutional arrangements: there certainly is no “law” of 100% supply-side crowding out of regional demand changes. For the remainder of this paper we therefore concentrate on the other possible motivation for policy scepticism: a binding regional public sector budget constraint.

3.2 Expenditure impacts under a budget constraint

The idea here is that an increase in public expenditure on HEIs will induce offsetting changes in demand through the operation of a binding regional public sector expenditure constraint. In a Scottish context, this operates through the Barnett formula, which determines the allocation of Scottish Government funding from the central government in Westminster¹². The conventional regional multiplier analysis, which we presented in Section 2 above, implicitly assumes that the financing of the HEI expenditures in Scotland comes from outwith the country – from the Westminster Government – with no ramifications for other elements of government expenditure.

Does taking account of the Scottish public sector budget constraint imply that host-region employment multipliers are zero? To address this question it is helpful to begin by focussing simply on changes in the public funding of HEIs in Scotland, and note that increased public spending on HEIs may have to be financed by contractions in other government expenditures. Although the Scottish Government has wide-ranging devolved powers in making spending

¹² For further details see e.g. Ferguson *et al* (2003, 2007).

decisions, its income is constrained each year by the block grant it receives from Her Majesty's Treasury¹³. Therefore, if the Scottish Government allocates additional funds to HEIs, less funds are available for other public expenditures. Given this context it can be misleading for an impact study to treat the Scottish Government's funding of HEIs as an exogenous stimulus to the regional economy, although that is standard IO practice.

To illustrate the significance of the difference between the cases we conduct two simulations of the introduction of a hypothetical additional £100m of expenditure on HEIs in Scotland. In the first case we adopt the traditional impact study assumption that the exogenous increase in expenditure is entirely externally funded, for example from UK-level funding or foreign students' fees, and does not have any ramifications for other public spending in Scotland. The second case examines how the impacts change when there is a corresponding reduction of other public spending in Scotland. In the latter case the offsetting £100m reduction in public spending is applied to an aggregation of those sectors that receive 93%¹⁴ of central and local government final demand in the Scottish IO tables.

The Type-II multiplier for the HEIs sector is 2.12. Without any offsetting cutbacks in public spending the additional spending on HEIs has an output impact of £212m. Approximately half of that impact is realised as a direct consequence of increased activity in the HEIs themselves, whereas the other half is generated via "knock on" effects in other sectors, particularly the retail and service sectors. The total change in output and employment, and the distribution across sectors is summarised in Table 4. These impacts are shown graphically in the darker shaded bars in Figures 3 and 4.

¹³ The Scottish Government does have limited powers to vary its expenditure through adjusting the standard income tax rate up or down by 3 pence in the pound. This is the Scottish Variable Rate. For details see e.g. McGregor and Swales (2005), and Lecca *et al* (2010).

¹⁴ The public sector is aggregated from 5 sectors in the HEI-disaggregated IO table (IO115, IO116, IO117, IO118 and IO119). Approximately 10% of the sector's final demand is from other sources than government.

A more complex picture emerges with expenditure switching. The Type-II multiplier for other public expenditure in Scotland is 1.97. If an increase in HEIs funding is met by cutbacks in other Scottish public expenditure the ‘multiplier’ for switching is equal to $2.12 - 1.97 = 0.15$ ¹⁵. That is to say, for every £100 m directed from the public sector to HEIs the output impact of switching is £15 m. In particular the estimated import propensity of HEIs (13%) is lower than the public sectors’ import propensity (17%). Therefore for every £1 spent on HEIs more is retained within the regional economy than for government spending in general. A qualitatively similar result emerges in results for employment impacts.

The recognition of the regional budget constraint implies that multiplier effects on individual sectors are no longer universally positive, as in the conventional case. The net changes are again shown in Table 4 and in the lighter shaded bars in Figures 2 and 3. In particular, there is a significant contraction in the public sector and a net contraction in other sectors that are more sensitive to changes in general public expenditure rather than the expenditure on output in the HEI sector. “Banking and financial services” and the “Transport, post and communications” sector show small net reductions in activity. In a UK devolved context, changes in public expenditure, determined by the regional government and therefore financed through Barnett, typically involve expenditure switching (and certainly have an opportunity cost in terms of alternative uses within the region), and the multiplier effects are accordingly more subdued. Indeed, even the direction of the net impact cannot be known *a priori*. This is a crucial result that appears not to be widely appreciated in existing impact studies.

¹⁵ For further discussion of analysing the impact of expenditure switching within an IO context, see Allan et al (2007).

Table 4 Impact of £100m increase in final demand for Scottish HEIs

Sector	Without Spending Substitution			With Spending Substitution		
	Change in Final Demand (£m)	Output Impact (£m)	Employment Impact (FTE)	Change in Final Demand (£m)	Output Impact (£m)	Employment Impact (FTE)
Primary and utilities	0	8	37	0	2	9
Manufacturing	0	14	99	0	7	50
Construction	0	8	78	0	3	31
Distribution and retail	0	21	364	0	3	61
Hotels, catering, pubs, etc.	0	5	140	0	1	16
Transport, post and communications	0	10	90	0	0	-4
Banking and financial services	0	8	48	0	-2	-12
House letting and real estate services	0	17	44	0	4	11
Business services	0	8	134	0	0	-6
Public sector	0	6	95	-100	-103	-1,735
HEIs	100	101	1,666	100	101	1,662
Other services	0	6	88	0	0	2
	100	212	2,882	0	15	86

Figure 2 Output impact of £100m increase in final demand for Scottish HEIs

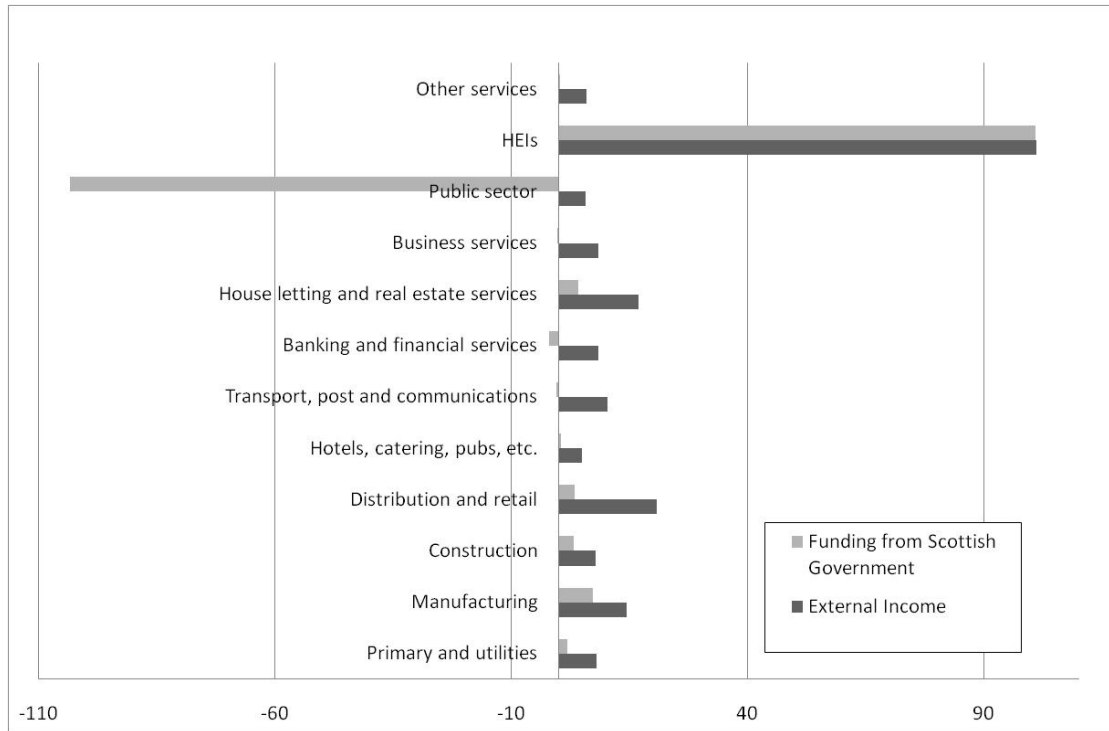
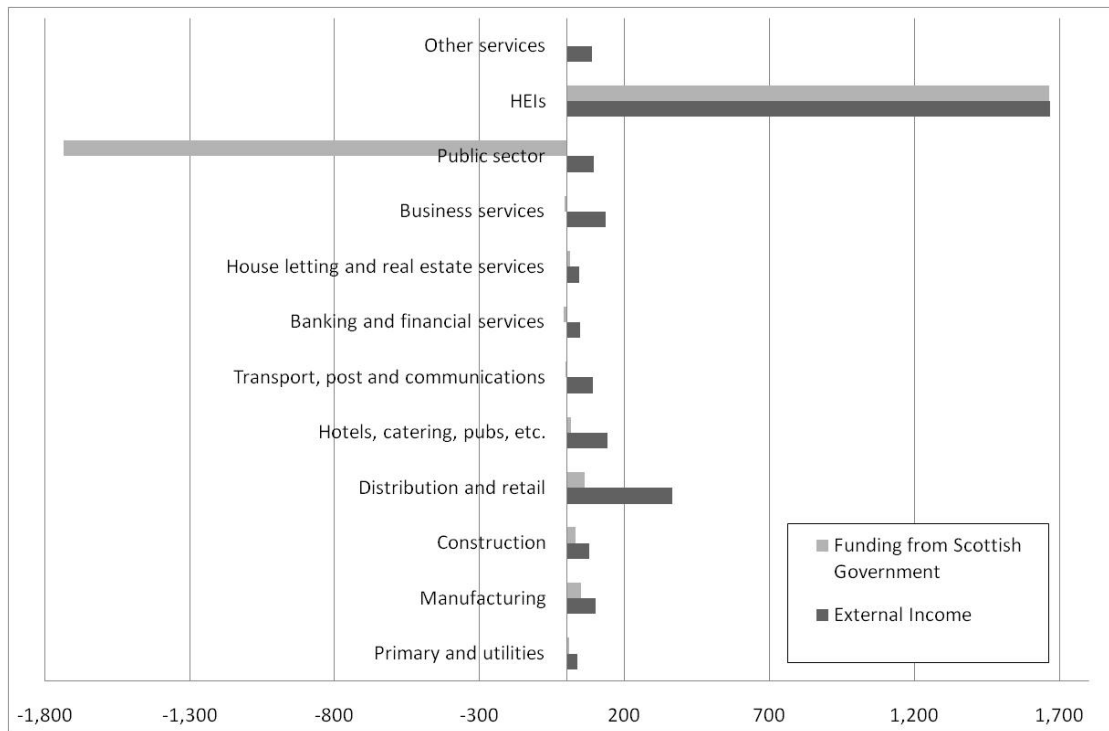


Figure 3 Employment impact of £100m increase in final demand for Scottish HEIs



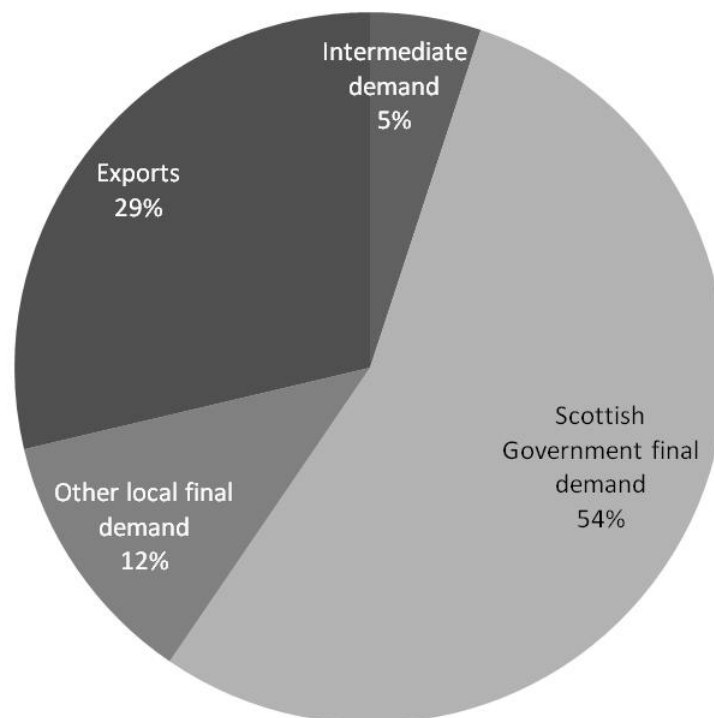
As can be seen from the analysis above, care must be taken in determining the source of financing for any impact study applied to a region with a devolved budget. While the example of HEIs is used here, the principle is, of course, quite general. Devolution matters a great deal for the appropriate conduct of regional impact analyses.

These results might be interpreted as implying that the impact of HEIs' spending is very limited at the Scottish level, because of expenditure switching within Scotland, since in the absence of HEIs the funding would simply be allocated to public services. However, while HEIs are often perceived to be part of the public sector they are in fact non-profit organisations¹⁶. An analysis of their income based on data from HESA (Hermannsson *et al*, 2010a) reveals that just 54% of their income can be traced back to the Scottish Government. Some 29% comes from sources outside Scotland and approximately 17% originates from households, businesses, charities and

¹⁶ In the Scottish Input-Output tables HEIs are classified as part of the NPISH category, i.e. Non-Profit Institutions Serving Households.

other institutions whose funding is independent of the block grant. The external income is unambiguously additional to the Scottish economy and it is reasonable to assume the latter part is as well. Even if the regional public sector budget constraint implies complete crowding out of public spending on HEIs within the region, only a part of HEIs activities is publicly funded. In fact, HEIs are characterised by significant exports (to the rest of the UK and the rest of the world), and changes in export demand do not trigger any offsetting expenditure switching among final demands. The sources of income of Scottish HEIs are summarised in Figure 4. In the next section we explore the significance of this pattern of funding for the attribution of HEI impacts on the host region.

Figure 4 Income structure of the HEIs sector in the HEI-disaggregated Input-Output tables



4. Accounting for the regional budget constraint within the Input-Output framework

The Input-Output tables provide a useful accounting framework. Based on the dichotomy of exogenous (final demand) and endogenous ('knock-on' effects) activity, each sector can be attributed with the total activity driven by its final demand within the regional economy. While this activity can be measured in terms of output, employment or GDP we illustrate our approach using output. The total impact of HEIs on output is composed of both the final demand for the output of the sector and also the knock-on impacts on other sectors, through directly and indirectly linked intermediate demand and household consumption. One key strength of Input-Output as an accounting framework is that it is consistent. When such an attribution exercise is carried out on a sector by sector basis, the sum of the impacts attributable to each sector equals the economy-wide total¹⁷.

As discussed in the previous section, one of the criticisms levelled against deriving the economy-wide expenditure impact of HEIs in such a way is that, given their funding arrangements in Scotland, attributing HEIs with the impact of spending public funds is disingenuous. Such an impact is not so much caused by the HEIs *per se* as it is by the availability of public funds and potentially similar results could be obtained if the funds were to be switched to be spent on other public services.

The Input-Output framework, combined with detailed information about the income sources of HEIs, enables a disaggregation of the sector's impacts in terms of the origin of the exogenous final demands. This allows an analysis of the extent to which the impacts attributed to the HEIs

¹⁷ Moreover, the validity of this attribution method does not rest on the same strict assumptions as identified for IO modelling in Sections 2 and 3. For example, CO₂ attribution analyses of the type associated with the carbon footprint is most rigorously calculated using IO tables.

sector under a traditional IO approach should in fact be attributed to the expenditure of the Scottish Government.

Based on conventional assumptions, HEIs account for 2.28% of Gross Output, 2.63% of GDP and 2.76% of employment in Scotland. Adding the impact of student's consumption spending as derived in Section 2, Scottish HEIs support 2.82% of Gross Output, 3.08% of GDP and 2.94% of employment in the region. Taken at face value it is clear that the sector is important as a supporter of employment and output within the regional economy. The controversy concerns whether the traditional IO-accounting approach may be providing a misleading estimate of the sector's contribution.

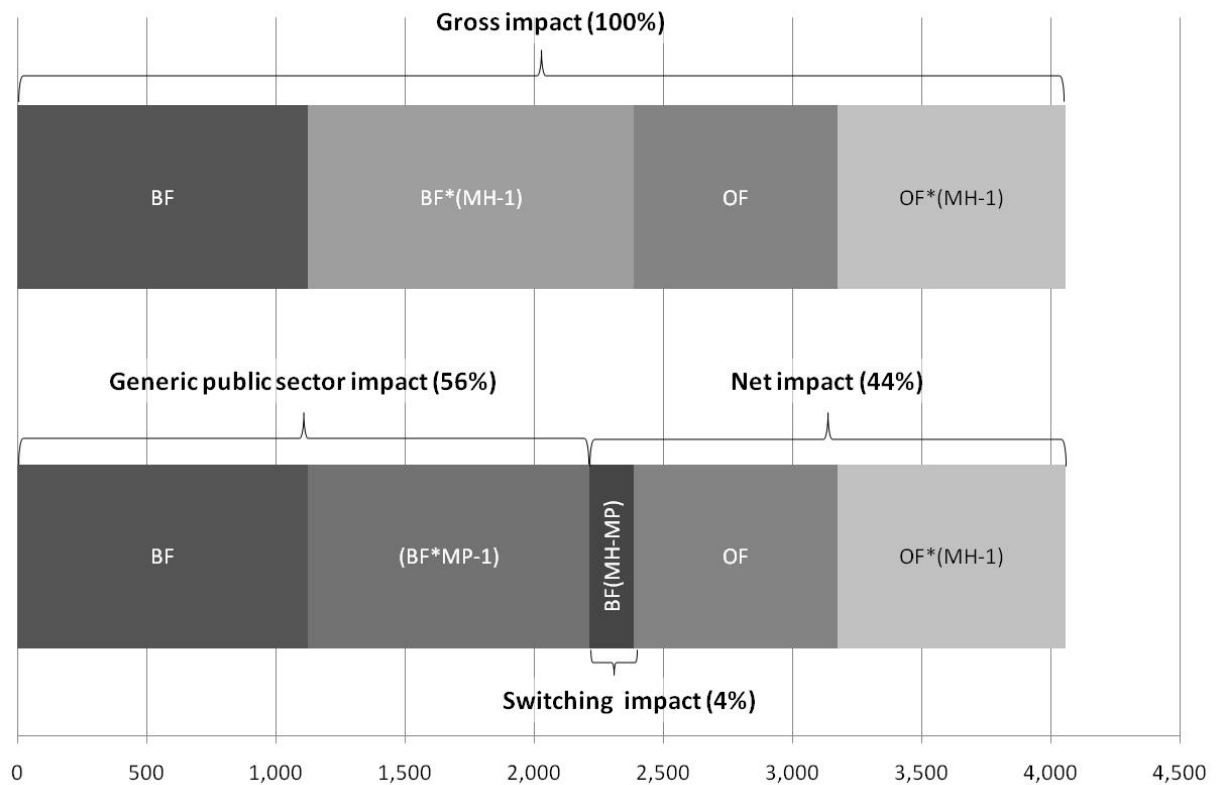
In order explicitly to take account of the public expenditure switching effects, as discussed in Section 3, we deduct the impacts of the Scottish Government ('Barnett') funding from the overall expenditure impact. The direct expenditure on the output of Scottish HEIs is divided into Barnett funding (BF), which comes through the Scottish Government, and other funding (OF) which includes all other sources, including exports to the rest of the UK and the rest of the World. The conventional attribution to HEIs is simply $(BF+OF)M_H$, where M_H is the multiplier value for the HEIs sector. The results of this attribution are summarised in Figure 6. The adjusted attribution subtracts the Barnett funded element and its own multiplier effects, which equals $BF*M_p$ where M_p is the multiplier for the aggregated public sector. The adjusted attribution is therefore given by equation 3.

$$(BF+OF)M_H - BF*M_p = OF*M_H + BF(M_H - M_p) \quad \text{Equation 3}$$

To summarise, the output impact of HEIs net of Scottish Government funding equals the output impact attributable to other funding sources OF^*M_H in addition to the switching impact $BF(M_H-M_P)$.

To clarify, the impact of Scottish Government funding upon HEIs can be re-arranged into a 'generic' public expenditure impact and a 'net' impact. The output impacts of the HEIs sector are illustrated in these terms in the lower bar of Figure 5 below. As the diagram reveals, when the expenditure impact of HEIs is disaggregated according to the source of income, just under half of it can be classified as a generic public sector, leaving just over half of it as a net impact, that is not subject to the budget constraint of the Barnett funding received by the Scottish Parliament.

Figure 5: Output impact of HEIs disaggregated by origin of final demand. Upper bar shows the components of the gross impact while the lower bar breaks the impact into a generic public sector impact and net impact by implementing expenditure switching, £m



An exactly analogous argument can be made in respect of the appropriate attribution of student expenditure impacts. In this case we have:

$$(BF_S + OF_S)M_S - BF_S * M_P = OF_S * M_S + BF_S(M_S - M_P) \quad \text{Equation 4}$$

Where, BF_S is student's consumption final demand attributable to Scottish Government student support¹⁸, OF_S is students' exogenous final demand for consumption from other sources, M_S is the output multiplier for students' consumption expenditures and M_P is the output multiplier for the public sector.

¹⁸ A part of Scottish students' expenditures is funded by student support grants provided by the Scottish Government. For details see Appendix.

When students' consumption expenditures are analysed in this way the results are qualitatively different from those for the HEIs' institutional expenditures. Primarily due to the strong direct import component of students' consumption expenditures the output multiplier is smaller than for public sector expenditure *per se*. In this case the Scottish Government gets a smaller demand stimulus for expenditures on student support than on other public expenditures on average. In this case the switching impact is negative, whereas it is positive for HEIs' institutional expenditures. The impact of students' consumption expenditures has been combined with the impacts of HEIs institutional expenditures in Table 5 below.

Table 5 Summary of overall spending impacts attributable to HEIs, by origin of final demand and type of impact (output, £m).

	Generic public sector impact	Net impact	Gross impact
Institutional spending	1,125	788	1,913
Knock on impacts	1,091	885	1,976
Switching impact		172	172
Institutional impact total	2,216	1,846	4,062
<i>– % of total impact</i>	<i>55%</i>	<i>45%</i>	<i>100%</i>
Exogenous student spending	88	509	596
Knock on impacts of student's consumption	55	321	376
Switching impact		-30	-30
Student's consumption impact total	143	799	942
<i>– % of total impact</i>	<i>15%</i>	<i>85%</i>	<i>100%</i>
Total impact attributable to HEIs	2,358	2,645	5,004
<i>– % of total impact</i>	<i>47%</i>	<i>53%</i>	<i>100%</i>

In this section of the paper we examine the impact attributable to the HEI sector in Scotland in more detail than is true of typical impact studies. In addition to the traditional approach of attributing the sector its impact (as the final demand for institutional expenditures times the HEI multiplier plus the direct impact of exogenous student's consumption expenditure times the student consumption multiplier) the origin of the final demands is examined and knock-on

impacts attributed to each of these. In an accounting sense the total impact of the HEIs' sector is the same in each of these exercises. However, instead of simply revealing an aggregate impact, we have disaggregated this into components that reflect the origin of the exogenous demand.

Although overall the impact of HEIs is unchanged by this attribution, the analysis reveals that there is some justification for a degree of policy scepticism based on the binding regional public budget constraint. Slightly less than half of the impact of the HEI sector in Scotland is a 'generic' public spending impact that would have materialised anyway had the public funds been used to expand the host region's public sector. Although, there is a small positive 'switching impact' of public funding for HEIs' own expenditures, and a small negative switching impact for students' consumption expenditures.

However, the analysis also reveals that the extreme form of policy scepticism, which argues that once the public budget constraint has been accounted for the impact of the HEIs' expenditures on the host region is negligible, is not supported by the evidence. These impacts are attributable to funding from sources independent of the Scottish block grant and the consumption expenditures of students that are not supported by the Scottish Government.

4. Conclusions

A "policy scepticism" appears to have developed that constitutes a major challenge to studies of the regional impacts of HEIs. In the limit this policy scepticism suggests that the expenditure impacts of HEIs on their host regions are negligible, and can therefore be ignored. We reject the binding resource constraint rationale for policy scepticism on *a priori* grounds, but do acknowledge the significance of the binding regional public sector budget constraint under devolution. We build this constraint into an augmented IO analysis using our purpose-built HEI-

disaggregated IO table for Scotland. Our results offer some support for policy scepticism in that we estimate that just under half of the regional expenditure impacts of Scottish HEIs is attributable to public funding that could generate similar (though not identical) effects if put to alternative uses such as expansion of the public sector within the host region. Conventional multiplier/ impact analyses therefore do overstate the expenditure impacts attributable to HEIs *per se*. However, the remaining impact is nonetheless substantial in the Scottish case, and certainly not negligible, as the extreme form of policy scepticism implies. In fact, it transpires that if funds used directly to finance the Scottish public sector were instead used to finance HEIs, there would be a small net positive multiplier effect reflecting the lower import propensity of HEIs. But for similar reasons the switching of public funds to students and away from the public sector would have a net negative multiplier impact.

Our analysis is capable of extension in a number of directions. Firstly, the analysis can be applied to individual HEIs, as well as to the HEI sector as a whole. In Hermansson *et al* (2010b) we show that there is considerable heterogeneity among Scottish HEIs in terms of their dependence on public funding, and identify the significance of this for the scale of “balanced expenditure” multipliers. Secondly, although we focus here on the expenditure impacts of HEIs, the principles, of course, apply equally to any sector of interest which is at least partly publicly-funded. Naturally, our judgement about policy scepticism does not necessarily generalise: this will depend on the characteristics of both the sector under consideration and the region. Thirdly, the analysis can clearly be applied, and indeed should be applied, to *all* impact analyses that involve any element of local public funding conducted for any region that is subject to a binding public expenditure constraint, most obviously Wales and Northern Ireland in the UK context. In these circumstances, researchers seeking to identify the economic activity attributable to a particular sector should acknowledge the devolved budget constraint explicitly and identify the fraction of activity attributable to the public funds. In general this will reveal

that a significant part of HEIs impact is in fact a 'generic' public expenditure impact and in the limit this may reveal the demand side impact of particular regional institutions to be effectively zero once the regional public budget constraint has been taken into account. However, in the case of Scottish HEIs considered in this paper, substantial impacts can be attributed to HEIs activity, in addition to those driven entirely by local public expenditures. Fourthly, the analysis may also be usefully applied to regions that are not subject to a binding expenditure constraint, such as the English regions in the UK context. Even where there is no binding constraint on public expenditure at the (relevant) regional level, it may still be of interest to assess the opportunity cost of the public funding involved by exploring the impact of their alternative use within the region.

Finally, it should be noted that our analysis in this paper is, in common with conventional regional impact analyses, focussed solely on the expenditure or *demand-side* effects of HEIs. This is a rather restrictive context in which to consider policy impacts. So we would not, for example, advocate the use of estimated net "balanced expenditure" multipliers to decide on the distribution of projected cuts in public expenditures. In the case of HEIs the message would in any case be mixed: HEIs' own institutional expenditures have a rather higher multiplier than public expenditure *per se*, but the reverse is true of students' expenditures funded by government grant. However, much more importantly in the case of HEIs, at least, is that we would expect many of their impacts on regional economies to come through the direct stimulation of the supply side, for example, through their impact on the skills of the host region's labour force and through knowledge exchange activities. These impacts can only be explored in a framework that explicitly accommodates these supply side effects, so that input-output analyses are inadequate to the task, even if, as here, they are augmented to accommodate regional public expenditure constraints. This may be particularly important for policy given that

there is some evidence that the supply-side impacts of Scottish HEIs may be large relative to their expenditure impacts (see e.g. Hermannsson *et al*, 2010c).

References

Allan, G., Dunlop, S. & Swales, K. (2007). The economic impact of regular season sporting competitions: the Glasgow Old Firm football spectators as sports tourists. *Journal of Sport and Tourism*, Vol. 12, No. 2, pp. 63-97.

Armstrong, H. (1993). The local income and employment impact of Lancaster University. *Urban Studies*, Vol. 30, No. 10, pp. 1653-1668.

Armstrong, H. & Taylor, J. (2000), *Regional Economics and Policy*, 3rd edition., Oxford: Blackwell Publishers.

Battu, H., Finch, J.H. & Newlands, D. (1998). Integrating knowledge effects into university impact studies: A case study of Aberdeen University. Department of Economics, University of Aberdeen.

Blake, C. & McDowell, S. (1967). A Local Input Output Table. *Scottish Journal of Political Economy*. Vol. 14, pp. 227-242.

Bleaney, M.F., Binks, M.R., Greenaway, D., Reed, G.V. & Whynes, D.K. (1992), What Does a University Add to Its Local Economy, *Applied Economics*, vol. 24, pp. 305-311.

Brownrigg, M. (1973). The Economic Impact of a New University. *Scottish Journal of Political Economy*, vol. 10, no. 2, pp. 123-139.

Callander, C., Wilkinson, D., MacKinnon, K. & Vegeris, S. (2005). Higher and further education students' income, expenditure and debt in Scotland 2004-2005: A report to the Scottish Executive. London, London South Bank University & Policy Studies Institute.

Ferguson, L, Learmonth, D, McGregor, P G, Swales, JK and K Turner (2003). The Regional Distribution of Public Expenditure in the UK: An Exposition and Critique of the Barnett Formula. In Mønnesland, J. (ed.) Regional Public Finance, European Research in Regional Science 13. London: Pion.

Ferguson, L., Learmonth, D., McGregor, P.G., Swales, J.K., and Turner, K. (2007). The Impact of the Barnett Formula on the Scottish Economy: Endogenous Population and Variable Population Proportions. *Environment and Planning A*, vol. 39, No. 12, pp 3008-3027.

Florax, R. (1992). *The University: A Regional Booster?* Aldershot, Avebury.

Harrigan, F. and P. G. McGregor. (1987). Interregional Arbitrage and the Supply of Loanable Funds: A Model of Intermediate Financial Capital Mobility. *Journal of Regional Science*. Vol. 7, No 3, pp. 357-367.

Harris, R. (1997), The Impact of the University of Portsmouth on the Local Economy. *Urban Studies*, vol. 34, pp. 605-626.

Hermannsson, K., Lisenkova, K., McGregor, P. G & Swales, K. (2010a). An HEI-Disaggregated Input-Output Table for Scotland. *Strathclyde Discussion Papers in Economics*, 10-14

Hermannsson, K., Lisenkova, K., McGregor, P. G and Swales, K. (2010b). The Expenditure Impacts of Individual Higher Education Institutions (HEIs) and their Students on the Scottish Economy under Devolution: Homogeneity or Heterogeneity? Strathclyde Discussion Papers in Economics, 10-16.

Hermannsson, K., Lisenkova, K., McGregor, P. & Swales, K. (2010c). The Importance of Graduates to the Scottish Economy: A “Micro-to-Macro” Approach, Strathclyde Discussion Papers in Economics, forthcoming.

Higher Education Statistics Agency – HESA (2007). Resources of Higher Education Institutions 2005/06. Cheltenham: HESA.

Kelly, U., McNicoll, I & McLellan, D. (2004). The Impact of the University of Strathclyde on the economy of Scotland and the City of Glasgow. Glasgow, University of Strathclyde.

Kelly, U., McNicoll, I & McLellan, D. (2003). The economic impact of Scottish higher education. Edinburgh: Universities Scotland.

Kelly, U., McNicoll, I & McLellan, D. (1999). Economic aspects of Scottish higher education institutions. Report to the Committee of Scottish Higher Education Principals. Edinburgh : COSHEP.

Kelly, U., McNicoll, I. & McCluskey, K. (1997). The Economic Impact of Universities and Colleges on the UK Economy. London, CVCP.

Lecca, P., McGregor, P. & Swales, K. (2010). Balanced Budget Government Spending

in a Small Open Regional Economy. Strathclyde Papers in Economics. Forthcoming.

Learmonth, D., McGregor, P., Swales, K., Turner, K. & Yin, Y.P. (2007). The importance of the regional/local dimension of sustainable development: an illustrative computable general equilibrium analysis of the Jersey economy. *Economic Modelling*, Vol.24, pp. 15-41.

Love, J. & McNicoll, I. (1988). The Regional Economic Impact of Overseas Students in the UK: A Case Study of Three Scottish Universities. *Regional Studies*. Vol. 22.1, pp. 11-18.

Love, J. & McNicoll, I. (1990). The economic impact of university funding cuts. *Higher Education*. Vol. 19, No. 4, pp. 481-495.

Loveridge, S. (2004). A Typology and Assessment of Multi-sector Regional Economic Impact Models. *Regional Studies* Vol. 38. No. 3, pp. 305-317.

McGregor, P. and Swales, K. (2005). Economics of devolution/decentralization in the UK: Some questions and answers. *Regional Studies*, Vol. 39, No. 4, pp.477-494.

McGregor, P., Swales, K & McLellan, D. (2006). The Overall Impact of Higher Education Institutions on Regions: A Critical Review, in *Final Report of the HERE Network*. Retrieved from the World Wide Web: <http://ewds.strath.ac.uk/impact/Background/StageOneNetworks.aspx>.

McGregor, P., Swales, K. & Yin, Y.P. (1996). A long-run interpretation of regional input – output analysis. *Journal of Regional Science*, vol. 36, pp. 479-501.

McGregor, P., Swales, K. & Yin, Y.P. (1999). Spillover and feedback effects in general equilibrium interregional models of the national economy: a requiem for interregional input-output? In Hewings, G., Sonis, M., Madden & Kimura, Y. (eds.) Understanding and interpreting economic structure. Berlin: Springer Verlag.

McNicoll, I. (1993). The impact of Strathclyde University on the economy of Scotland. University of Strathclyde, Glasgow, United Kingdom.

McNicoll, I. (1995). The impact of the Scottish higher education sector on the economy of Scotland . Committee of Scottish Higher Education Principals. Glasgow : COSHEP.

Miller, R.E. & Blair, P.D. (2009), Input-Output Analysis: Foundations and Extensions, second edition. Cambridge: Cambridge University Press.

National Assembly for Wales (2009). The Economic Contribution of Higher Education in Wales. National Assembly for Wales, Enterprise and Learning Committee, October 2009. Retrieved from the World Wide Web: <http://www.assemblywales.org/cr-ld7730>

Oosterhaven, J. and D. Stelder (2002). "Net multipliers avoid exaggerating impacts: With a bi-regional illustration for the Dutch transportation sector." Journal of Regional Science 42(3): 533-543.

Scottish Government – Riaghaltas na h-Alba (2007) Input-Output Tables and Multipliers for Scotland

Siegfried, J. J., A. R. Sanderson & McHenry, P. (2007). The economic impact of colleges and universities. *Economics of Education Review*, Vol. 26, pp. 546-558.

Warhurst, C., Commander, J., Nickson, D., Symeonides, A. Furlong, A., Findlay, J., Wilson, F. & Hurrell, S. (2009). Higher and Further Education Students' Income, Expenditure and Debt in Scotland 2007-08. Edinburgh: Scottish Government Social Research. Retrieved from the World Wide Web: <http://www.scotland.gov.uk/Publications/2009/06/24115743/02>

Appendix: Derivation of student's consumption expenditure

In this appendix we present the details of our derivation of the impact of students' consumption expenditures. We draw on a comprehensive survey by Warhurst *et al* (2009)¹⁹, who conducted a large scale survey complemented with face to face interviews. They interviewed 1,000 Scottish domiciled undergraduate students at Scottish institutions and estimated their average term time expenditure at £6,404 in the academic year 2007/2008. However, these results only refer to a part of students at Scottish HEIs as a third come from outwith Scotland²⁰ and 19%²¹ are postgraduate. Surveys have not been carried out relating to the expenditure of students of RUK and ROW origin nor for Scottish domiciled postgraduate students. These students' expenditures are expected to be greater as expenditures generally increase with age and the year of study, and these students are staying away from home and so must pay for accommodation in full.

According to Warhurst *et al* (2009) Scottish domiciled undergraduates living independently spent on average £7,187 in 2007/2008 while those living with parents spent £5,317. The expenditure level of Scottish students who are living independently is used as a proxy for expenditures of incoming students. However it is reasonable to expect incoming students to have to incur more costs than locals if only due to unfamiliarity with local conditions and an inability to draw on a social network, in contrast to local students. A higher estimate for living costs is, for example, suggested by the Icelandic Student Loan fund, which estimates student expenditures (apart from tuition fees) for an academic year in Scotland at £8,520²². Here the rather conservative approach is adopted that the average for Scottish domiciled undergraduates

¹⁹ Warhurst *et al* (2009) build on and expand work by Callander *et al* (2005).

²⁰ See Hermannsson *et al* (2010c). Table 5.

²¹ See HESA (2007) Students in Higher Education, Table 0b

²² For the academic year 2008/2009 the Icelandic Student Loan Fund (LÍN) estimates the cost of subsistence for obtaining a single ECTS credit in Scotland is £142, where a full academic year will consist of 60 credits, amounting to anticipated costs of £8,520. See: <http://www.lin.is/Namslan/utlan/framfaerslutafla.html>

is applied to all Scottish domiciled HE students and the average expenditures of Scottish domiciled undergraduates living independently is applied to all incoming students.

A number of adjustments have to be applied to the 'gross' student spending as reported by Warhurst *et al* (2009) to conform with IO assumption (their main findings on student spending in Scotland are outlined in Table A2 below). In particular care must be taken to deduct non-additional ('endogenous') spending components to avoid double counting. For Scottish domiciled students this means that the components of consumption that are treated as additional (exogenous) are those that are attributable to student loans, commercial credit students take out to support themselves and student support & grants as reported by Warhurst *et al* (2009). This changes slightly when the budget constraint of public expenditures in Scotland is acknowledged as student support and grants are to a significant extent²³ funded by the Scottish block grant and therefore represent a re-allocation of Scottish Government spending within Scotland (see general discussion in Section 3). The student loans received by Scottish students are, however, treated as additional as they are provided by the Student Loans Company, a UK-level non-departmental public body. Informal transfers within the family do not constitute additional spending in Scotland as they are a re-allocation of total household spending²⁴. Term-time labour market earnings are equally not-additional to the Scottish economy as, under the IO assumption of a passive supply-side, if the student was not earning that wage income some other Scotland resident would be. That leaves other income, which is assumed to be endogenous to the Scottish economy²⁵ and the student's income shortfall (expenditure in excess of income). Precise information is not available on the composition of this income shortfall, but it is expected to constitute some combination of informal

²³ The category also includes support from private charities. Here the conservative stance is adopted that the charities are funded from Scottish contributions and therefore represent a re-distribution within the Scottish economy rather than an additional injection.

²⁴ In principle parents could be funding these transfers by drawing on savings or taking out new credit, but we assume they are met with consumption switching from parents to student.

²⁵ Information on the composition of other income is not available in Warhurst (2009). Therefore we adopt the conservative stance that it is non-additional to the Scottish economy.

income/credit not previously accounted for and commercial credit. New commercial credit taken out by Scottish domiciled students represents an exogenous impact on the local economy, while informal credits are assumed to be obtained locally and therefore represent a transfer within the economy rather than an additional impact.

Warhurst *et al* (2009) provide information on the amount of commercial credit taken out by Scottish students during their time of study, which is used to estimate the magnitude of this impact. Care must be taken to count only the net commercial credits obtained as students run up commercial debts during term time but typically repay these to some extent between years. Table 4.15 in Warhurst *et al* (2009, p. 100) reports the amount of commercial credit owed by students at the end of each of their year of study. They find a wide range of commercial debt incurred by year of study. Of course it must be born in mind that their survey is a cross section but interpreted literally it suggests that students rely less on commercial credit as they progress through their studies (and a net repayment occurs between years 3 and 4). This is in line with their findings that students' earning power increases with year of study. Here the assumption is adopted that commercial debt levels at the end of year 4 are representative for their overall net-incurrence for the entire duration of undergraduate study.

Table A1 Commercial credit at the end of term by year, £. Source: Warhurst et al (2009, Table 4.15, p. 100).

	Year 1	Year 2	Year 3	Year 4
Commercial credit owed at the end of term time	968	1,240	1,699	1,384
Net change in commercial debt between years of study	968	272	459	-315
Implied average per year of study	968	620	566	346

Based on these assumptions the average additional ('exogenous') component of Scottish students' term time spending is £346 (1,384/4). The assumption suffers from a potential downward bias in that 4th year students are fewer than one quarter of the student population. However, it could be counter-argued that students will use income earned in the following

summer to make additional payments to their commercial debt. Available evidence unfortunately does not allow a precise estimate but on balance the assumption adopted here should be seen as rather conservative. Available evidence (see Table A2 below) suggests that the average income shortfall of Scottish undergraduates is significantly larger each year, amounting to £ 1,073. Unfortunately Warhurst *et al* (2009) do not elaborate on how the income shortfall might be explained but here it is expected to be met by some combination of underreported informal contributions (within household transfers), earnings outwith term-time (drawing on savings) and commercial credit.

Table A2 Average term time income and expenditures of Scottish undergraduates, £. Source: Warhurst et al (2009, Table 2.4 & 3.4, pp. 24, 56).

	£	% of income	% of expenditure
Average total income	5,157	100%	83%
Student loan	1,430	28%	23%
Informal housing contribution	163	3%	3%
Informal living contribution	290	6%	5%
Term-time earnings	1,945	38%	31%
Education related grants and bursaries	759	15%	12%
Other	570	11%	9%
Average total expenditure	6,230	121%	100%
Housing costs	1,116	22%	18%
Living costs	3,954	77%	63%
Participation costs	957	19%	15%
Child specific costs	203	4%	3%
Other costs	110	2%	2%
Dissaving	1,073	21%	17%

Warhurst *et al* (2009) estimate the average term time employment income of Scottish undergraduates at £ 1,945. Here it is assumed that this average holds for incoming students from other parts of the UK, while foreign students are assumed not to participate in the labour market. Finally we deduct the direct import content of student's expenditure, which is assumed to equal that of Scottish households in general (32%) as reported in the Scottish Input-Output tables.

Table A3 Derivation of per student spending

Location of domicile		Scotland	Rest of the UK	Rest of the World
Gross average student spending £	+	6,230	7187	7,187
Income from employment £	-	1,945	1,945	
Within household transfers £	-	453		
Other income £	-	570		
Dissaving £	-	1,073		
Spending attributable to new commercial credit £	+	346		
Exogenous average per student spending	=	2,535	5,242	7,187
Direct imports £ (32%)	-	816	1,688	2,315
Net change in final demand per student £	=	1,719	3,554	4,872
Number of students FTE's	x	115,398	22,630	25,737
Estimated net contribution to final demand by student population £ m	=	198.3	80.4	125.4

Having estimated the students' net contribution to final demand it is possible to estimate the "knock on" impacts of their consumption spending. A student expenditure vector estimated by Kelly *et al* (2004) is used to derive the spending impact of the different student groups in Scotland. In total they support approximately 0.54% of output.

Table A4 Impact of student spending in Scotland

	Scotland	Student origin		Total
		Rest of the UK	Rest of the World	
Output impact of student spending £m	477	193	302	972
<i>% of Gross Output</i>	<i>0.27%</i>	<i>0.11%</i>	<i>0.17%</i>	<i>0.54%</i>
GDP impact of student spending £m	197	80	124	401
<i>% of GDP</i>	<i>0.22%</i>	<i>0.09%</i>	<i>0.14%</i>	<i>0.45%</i>
Employment impact of student spending FTEs	1,738	705	1,099	3,541
<i>% of Scotland employment</i>	<i>0.09%</i>	<i>0.04%</i>	<i>0.06%</i>	<i>0.18%</i>