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

BY

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The Expenditure Impacts of Individual Higher Education Institutions (HEIs) and their Students on the Welsh Economy: Homogeneity or Heterogeneity?

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Abstract

This paper replicates the analysis of Scottish HEIs in Hermannsson *et al* (2010a) for the case of Wales in order to provide a self-contained analysis that is readily accessible by those whose primary concern is with the regional impacts of Welsh HEIs. When we treat each of the twelve Higher Education Institutions (HEIs) that existed in Wales in 2006 as separate sectors in conventional input-output analysis, their expenditure impacts per unit of final demand appear rather homogenous, with the apparent heterogeneity of their overall impacts being primarily driven by scale. However, a disaggregation of their income by source reveals considerable variation in their dependence upon funding from the devolved Welsh Assembly Government and their ability to draw in income/funding from external sources. Acknowledging the binding budget constraint of the Welsh Assembly Government and deriving balanced expenditure multipliers reveals large differences in the net-expenditure impact of HEIs upon the Welsh 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. On balance this suggests that the impacts of impending budget cut-backs will be quite different by institution depending on their sensitivity to public funding. However, predicting the outcome of budget cutbacks at the margin is problematic for reasons that we identify.

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

JEL classifications: R51, R15, H75, I23.

1 Introduction

In this paper we analyse the expenditure impacts of Welsh Higher Education Institutions (HEIs) on the Welsh economy. The primary focus is on the expenditure impacts of individual HEIs and of their students, and the treatment of HEIs as a distinct sector of the economy. The paper, in effect, replicates the analysis of Hermannsson *et al* (2010a) for the case of Wales. The main differences are in the tables, graphs and discussion of results. The rationale for this approach is to provide a convenient, readily accessible, self-contained analysis of the expenditure impacts of HEIs in Wales for user groups whose primary interest is in Wales. Since we are also committed to producing similar analyses for Northern Ireland and for England, this is also an efficient way for us to generate a range of the regional-specific outputs of our research project on *The Overall Regional Impacts of HEIs* quickly.[1] Subsequent contributions will provide a fuller comparative regional analysis of HEI impacts.

There have been a number of studies of expenditure impacts of Scottish HEIs. These include Blake and McDowell (1967), Brownrigg (1973), Battu, *et al* (1998), Kelly *et al* (2004), Hermannsson *et al* (2010a). There have been rather fewer studies for Wales (e.g. Hill, 1997). The best of these studies have been input-output (IO) based (e.g. Kelly *et al*, 2004). We adopt such an IO approach but our analysis is distinctive in two important ways. First, we provide a comprehensive, systematic and consistent IO attribution analysis of the impact of each individual HEI, as well as the impact of the Welsh HEI sector as whole.

This analysis highlights the heterogeneity of impacts across Welsh HEIs. Second, the source of this diversity is not variation in the pattern of expenditure for individual HEIs, which would be the conventional argument. Rather it stems from the difference in the sources of funding across Welsh HEIs.

In order to provide these close impact comparisons, we augment the officially produced IO table for Wales so that each individual Welsh HEI is separately identified as a sector, with its own row and column. We then adopt an IO accounting approach and undertake various attribution analyses. While the results can be interpreted in terms of a conventional IO impact model, the approach does not require this and is not subject to the restrictive assumptions of IO modelling *per se*, though it continues to reflect the key distinction between exogenous and endogenous components of expenditures.

In comparing the impacts across Welsh HEIs, we introduce a number of innovations. The importance of variation in the sources of revenues to HEIs reflects the crucial role of the regional public sector expenditure constraint that is binding in Wales through the operation of the Barnett formula. The devolution settlement in Wales gives the Welsh Government discretion over its use of funds, but the total amount of funding is effectively governed by the settlement from Westminster.

In measuring the student expenditure impacts we draw on Hermannsson *et al* (2010b) in adopting a novel approach that emphasises the importance of the degree of exogeneity of student expenditure. We recognise that the regional

government budget constraint also impacts on student funding. Again considerable heterogeneity is revealed across HEIs.

The rest of the paper is structured as follows. In Section 2 we provide a brief overview of the Welsh higher education system and present key characteristics of individual Welsh HEIs – including their funding sources and the level of funding relative to the number of staff and students. In Section 3 we outline the HEI-disaggregated IO accounting approach, and present the results of applying it to HEIs' own expenditures. While total institutional expenditure impacts vary considerably across HEIs, we show that this largely reflects differences in the scale of HEIs. Once we control for scale, by focussing on the value of individual HEI multipliers, the results exhibit a striking degree of homogeneity. We then show the impact of recognising the budget constraint implied by the Barnett formula in Section 4. The resultant *balanced expenditure* HEI multipliers exhibit considerable heterogeneity.

We discuss the overall impacts of HEIs by incorporating the effects of student expenditures in Section 5. One key finding is that a focus on overall expenditure impacts gives a misleading impression of a homogenous HEI sector in Wales, which is in fact characterised by considerable heterogeneity once differences in funding sources are recognised. Against this background a simple descriptive analysis suggests a number of "clusters" of less heterogeneous groups of HEIs within the sector as a whole, based upon alternative indicators of their impact on their host region. However, our results emphasise the critical dependence of any such clustering on the criteria on which any taxonomy is

predicated and, in particular, on the precise definition of "impact". Of course, the analysis of this paper is confined to the *expenditure* effects of HEIs, whereas general taxonomies would naturally focus on a more comprehensive set of criteria (though these do not typically include estimated expenditure impacts).[2]

We present brief conclusions in Section 5, where we also consider the implications of our analysis for assessing the likely impact of the significant cut in public funding that HEIs are currently anticipating in the light of the recent emergency budget of the Liberal Democrat – Conservative coalition Government.

2. Key characteristics of Welsh HEIs

There were 12 Welsh Higher Education Institutions in 2006 and these are listed alphabetically in the first column of Table 1. Also included in the table is a sample of their more important characteristics, from the perspective of this impact study.

Column two shows the total income for the Higher Education sector in Wales in 2006 and how this was distributed amongst the individual institutions. Of the total income of £890 million, nearly 37% goes to the largest university, Cardiff, and 50% to the biggest two, Cardiff and Swansea. (In Scotland funding is less

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[2] 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).

concentrated, with the largest university, Edinburgh, accounting for just over 20% of the sector's income, and the top three, Edinburgh, Glasgow and Strathclyde, absorb 45% of the total.) On this criterion, the largest institution is over 40 times the size of the smallest, which is the Royal Welsh College of Music and Drama (RWCMD). This large variation in the size of individual institutions, which is also a characteristic of the Scottish sector, 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 the institution's income, number of staff or student population.

Table 1. Key characteristics of Welsh HEIs

Institutions	Income		Employment		Students	
	Total	% Welsh Assembly Government	Income per staff	Share of wages in expenditure	Income per student £	Share non-Welsh
UW, Aberystwyth	77	53%	48,091	58%	9,764	71%
UW, Bangor	96	55%	63,897	59%	12,586	55%
Cardiff	329	50%	71,085	58%	14,604	61%
UWI Cardiff	59	65%	57,294	62%	7,624	43%
Glamorgan	92	71%	58,400	60%	6,744	33%
UW, Lampeter	13	61%	58,735	60%	5,384	74%
UW, Newport	36	78%	54,002	63%	6,946	29%
NEWIHE	27	78%	62,025	57%	6,692	42%
RWCMD	8	80%	54,475	65%	13,417	59%
SIHE	25	79%	52,896	60%	5,635	30%
UW, Swansea	117	53%	61,770	63%	10,784	47%
Trinity UC	12	68%	44,716	59%	7,103	15%
Total/average	**890**	**58%**	**61,786**	**60%**	**10,058**	**49%**

Column three gives the proportion of the total funding for each Welsh HEI that comes from the Welsh Government. Note that while HEIs are heavily funded by the Welsh Government, they are non-profit organisations and are not formally part of the public sector. In total, 58% of their income comes from the Welsh Government but the remaining 42% does not, so that the Welsh HEI sector is

slightly more dependent on funding from the devolved government than its Scottish counterpart (for which the percentages are 54% and 46% respectively). However, as important for the present paper is the variation around the 58% figure. There is a considerable range: RWCMD is the institution most reliant on Welsh Government funding, at 80%, with Cardiff the least at 50% (a significantly smaller range than for Scotland, which varied between 88% for Bell College and 37% for St Andrews).

Column four presents the income per member of staff. In 2006 the total employment in Welsh HEIs was 24.9 thousand, so that the income per member of staff averages at £61.8 thousand (very close to the £62.5 figure for Scotland). The ranking of Welsh 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. The institutions have values that range between the high of £71.1 thousand for Cardiff and a value of £44.8 thousand for Trinity College (a very similar range to that found in Scotland if the outlier, University of Highlands and Islands, is ignored).

However, variation in the share of wages in total income presented in column five is much more limited. The average figure for the sector as a whole is 60% (59% in Scotland), and this only varies between a low of 57% (North East Wales Institute of Higher Education, NEWIHE) and a high of 65% (RWCMD). It is clear that the across all institutions wage payments make up a significant and relatively similar share of total HEI expenditure, as in Scotland.

University income per student is given in column six of Table 1. It is important to note that this is the total income of the institution divided by the total number of students, measured in FTEs. For the Welsh sector as a whole, the figure was £10.1 thousand (below the Scottish figure of £12.8k, but this includes a significant outlier, Scottish Agricultural College, that pushes up the average). However, again there is a high degree of variation across institutions. In the Welsh (Scottish) case the figure varies between £14.6 (£21.3) thousand for Cardiff (Edinburgh) and £5.4 (£6.3) thousand for UW, Lampeter (Bell College).

Finally, column seven presents figures for the proportion of students that are non-Welsh. In aggregate 49% of all students in Welsh HEIs come from outwith Wales, a much bigger percentage than in Scotland, where only 29% come from beyond the national boundaries. But again there are large differences across institutions. Trinity UC recruits 85% of its students from Wales, whilst the majority of students going to University of Wales (UW), Lampeter (74%), UW, Aberystwyth (71%), Cardiff (61%) and RWCMD (59%) are non-Welsh.

The information given in Table 1 reflects the fact that HEIs actually perform a range of activities, covering teaching, research and knowledge exchange that can be funded in a variety of ways. There are systematic differences in the way in which different Welsh 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 Welsh universities. We would expect this variation in activities to affect the demand impact of

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individual HEIs on the Welsh economy. It is this proposition that we test in the remainder of the paper.

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

Florax (1992) identified over 40 studies of the regional economic impact of HEI expenditure and much has been published since. McGregor *et al* (2006) summarise the methods and findings of the main UK studies. Most of these 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 IO modelling (Blake and McDowell, 1967; Harris, 1997; Kelly *et al*, 2004). Our view is that the IO method does indeed provide a valuable framework for investigating the expenditure impacts of HEIs, and we pursue that approach here. However, we use IO as an accounting framework that we modify to acknowledge the presence of binding expenditure constraints in regions with devolved public sector budgets.

Here we use IO to attribute economic activity in Wales to Welsh HEIs, both individually and as a sector (Miller and Blair, 2009; Hermannsson *et al,* 2010a). The analysis is based upon the IO tables for the Welsh economy for the year 2004 constructed by the Welsh Economic Research Unit (WERU, 2007). However, extensive augmentation of the basic table is required to generate an updated Welsh analytical table for 2006 that identifies each individual HEI in

Wales as a separate sector. We provide details of this process in Hermannsson *et al* (2010b).[3]

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 their students.[4] 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 multiplier, or "knock-on", impacts of any expenditure injection, obtained by summing up subsequent internal feedbacks within the economy (for a review see Loveridge, 2004). This section briefly outlines the methods adopted by impact studies[5].

Regional demand-driven models, including IO, distinguish between two types of expenditures: exogenous and endogenous. Exogenous expenditures are

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[3] Much of the supplementary data required are sourced from the Higher Education Statistics Agency (HESA). The chosen year of reference is 2005/2006 as this is the last year for which the necessary data were available. The procedure used to derive the HEI-disaggregated IO table can be broadly divided into two steps. First we "roll forward" the Welsh IO table to reflect changes in Gross Value Added (GVA) from 2004-2006. Then we create a row and column for each institution.

[4] Some studies have included an additional category, namely HEI-generated tourism activity, but this is typically much less important. In any case there is no consistent database for tourism-induced activities across HEIs, otherwise it would be straightforward to extend our analysis to include them.

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

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[6] 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 identifies a clear causal pathway from exogenous to endogenous expenditures.

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 runs this requires 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)[7].

The derivation of the demand-driven multipliers draws on this notion that exogenous expenditure determines endogenous 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:

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[6] 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.
[7] The legitimacy of either set of conditions is ultimately an empirical issue. For example, there may be some cases, such as that of the the island economy of Jersey, where the institutional framework restricts migration so that the supply side could not legitimately be regarded as passive over any time interval. See Learmonth *et al* (2007).

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

where $(1-A)^{-1}$ is the Leontief inverse. This is identifying the additional demand for intermediate inputs and consumption goods that accompany the final demand.

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 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)
$$q^i = m_i f_i$$

where m_i is the output multiplier for sector i.

Multipliers can be derived for a variety of activity outcomes, including employment, income, output or 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. For further details see 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 its final demand. This impact effect 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 sum of the impacts attributable to each sector's final demands equals the economy-wide total[8].

Table 2 and Figure 1 summarise conventional Type II IO-based impact estimates for Welsh HEIs. These are obtained by applying equation 2 to each HEI treated as a separate sector in our HEI-disaggregated IO table.[9] This is to treat HEIs simply as a conventional business. The first column shows the income of each HEI in Wales in 2006, as in Table 1. Columns two, three and four give the total direct, indirect and induced (Type-II) impact of HEI spending on total Welsh output, GDP and FTE employment respectively.

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[8] Moreover, the validity of this attribution method does not rest on the same strict assumptions as identified for IO modelling in Section 3.1. For example, CO_2 attribution analyses of the type associated with the carbon footprint is most rigorously calculated using IO tables.
[9] For each institution, the direct, indirect and induced effects are calculated using the final demand for their 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).
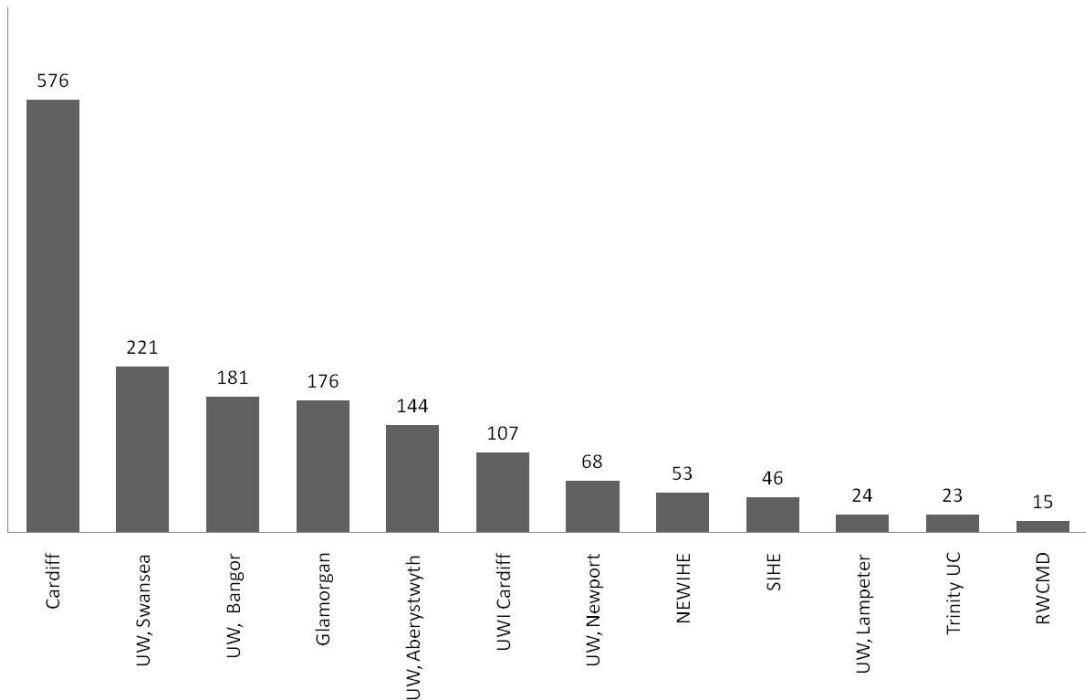
The first point to note is that the expenditures of Welsh HEIs, considered as a single production sector, have a major impact on Welsh gross output (£1,635 million, or 1.84% of the total, compared to £4,060 million in Scotland or 2.28% of the total), GDP (£944 million or 2.33% as against £2,315 million or 2.63% for Scotland) and employment (24,900 full-time-equivalents or 2.12% as against 55,100 full-time-equivalents or 2.76% for Scotland).

Table 1. Conventional Type-II impacts of Welsh HEIs in 2006

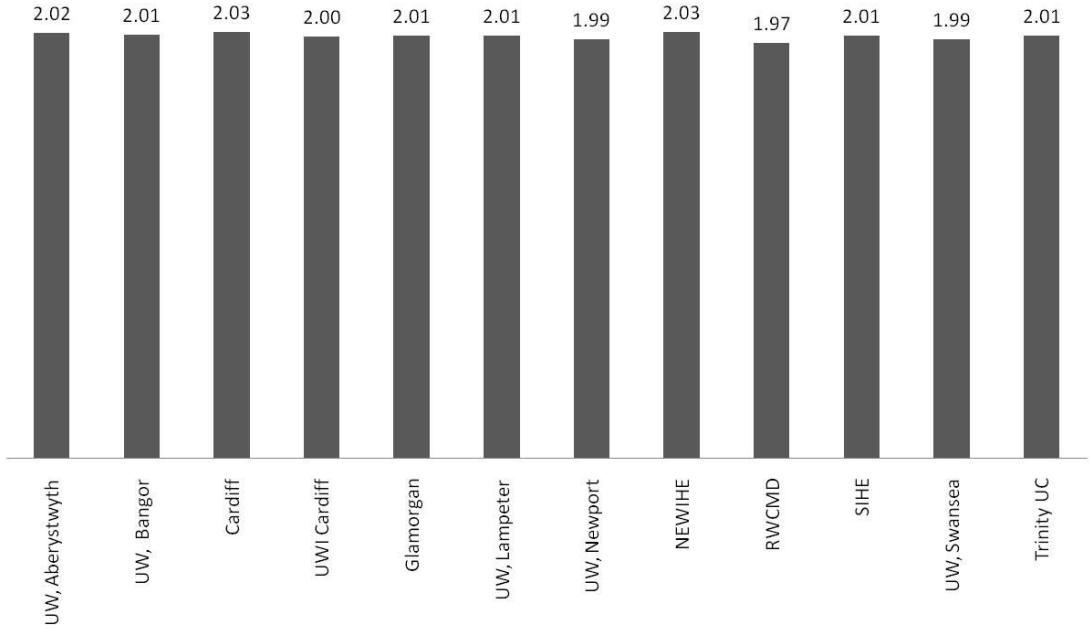|	Income	Output £m	GDP £m	Employment FTEs (000's)
UW, Aberystwyth	77	144	82	2.5
UW, Bangor	96	181	105	2.8
Cardiff	329	576	325	8.1
UWI Cardiff	59	107	63	1.7
Glamorgan	92	176	103	2.7
UW, Lampeter	13	24	14	0.4
UW, Newport	36	68	41	1.1
NEWIHE	27	53	30	0.8
RWCMD	8	15	9	0.2
SIHE	25	46	27	0.8
UW, Swansea	117	221	132	3.4
Trinity UC	12	23	13	0.4
Total	**890**	**1,635**	**944**	**24.9**
% of WAL total output/GDP/employment		**1.84%**	**2.33%**	**2.12%**

The second point is that there is considerable variation in the impacts of individual HEIs, as simple inspection of Figure 1 makes clear. However, these 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 m_is in equation 2, in this case relating to each of the 12 HEI sectors of the HEI-disaggregated IO table. Their values are shown in Figure 2.

Figure 1 Output impact (Type-II) of Welsh HEIs expenditures, £m

The most striking thing about the multiplier values in Figure 2 is their uniformity. The lowest conventional Type-II output multiplier in the Welsh (Scottish) cases, associated with RWCMD (Bell College) is 1.97 (2.05), is 97% (95%) of the highest, 2.03 (2.16), associated with Cardiff and NEWIHE (Edinburgh) and the coefficient of variation is only 0.007 (0.012). This appears to suggest that Welsh HEIs are remarkably homogeneous in terms of the intensity of the impact of their expenditures on the Welsh economy. In essence this reflects the similarity of the cost structure of different Welsh institutions, which was indicated in Table 1 by the close similarity in the share of wages in total income across Welsh institutions.

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Figure 2 Conventional Type-II output multipliers for Welsh HEIs

4. The binding Welsh public expenditure constraint

We show in Hermannsson *et al* (2010c) that recognition of the public sector expenditure constraint imposed by the Barnett formula on UK devolved administrations has an important impact on estimates of the expenditure effects of the HEI sector as a whole. The issue is that in so far as the Welsh Government operates with a fixed budget allocated from Westminster, Welsh Government expenditure on HEIs displaces other public expenditure. 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. Attention is now focussed on the impact that they exert beyond that of general government expenditure.

The Input-Output framework, combined with detailed information about the income sources of each HEI, enables a disaggregation of HEIs' impacts in terms of the origin of the exogenous final demands. This allows an analysis of the extent to which the impacts attributed to HEIs under a traditional IO approach would instead be attributed to the expenditure of the Welsh Assembly Government.

In order explicitly to acknowledge the Welsh public sector budget constraint, and therefore to take account of the possibility of public expenditure switching effects, we deduct the impacts of the Welsh Government funding from the overall expenditure impact of each Welsh HEI. We identify this as Barnett funding, in that it comes from the block grant that Westminster transfers to the Welsh Government using the Barnett formula (Christie and Swales, 2009). This is the proportion of the HEI's income identified in Table 1 as coming from the Welsh Government. The direct expenditure on the output of each Welsh HEI, i, is therefore divided into Barnett funding (bf_i), which comes through the Welsh 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. The conventional attribution to an individual HEI is simply:

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

where $bf_i + of_i = f_i$. For Type-II output attribution, these are the values reported in column 2 of Table 2 and plotted in Figure 1.

The adjusted, or "balanced expenditure", attribution subtracts the Barnett-funded element of each HEI's funds and the associated own-multiplier effects. This is calculated as bf_im^P, where m^p is the Type-II multiplier for the aggregated public sector (and so is invariant across HEIs).[10] The balanced expenditure aattribution, q^{iB} is therefore given by equation 4.

(4)
$$q^{iB} = (bf_i + of_i)m_i - bf_im^P = of_im_i + bf_i(m_i - m^P)$$

To summarise, the output impact of an individual HEI *net* of its Welsh Government funding equals the sum of the output impact attributable to other funding sources of_im_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 ith HEI, $bf_i + of_i$, yields a "balanced expenditure" multiplier, m^B_i, given by:

(5)
$$m^B_i = (1 - \alpha_i)m_i + \alpha_i(m_i - m^P) = m_i - \alpha_im^P$$

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

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[10] m^P is the weighted sum of the sectoral multiplier values, where the weights are the shares of total public sector expenditure in that sector. Therefore $m^P = \sum \alpha^P_im_i$ where $\alpha^P_i = f^P_i / \sum f^P_i$.

The balanced expenditure multiplier shows the impact of a £1 increase in final demand (with a constant composition) for HEI i. This multiplier value takes into account he fact that a portion of final demand will be switched from general public expenditure. The balanced expenditure multiplier is a weighted average of the individual HEI's multiplier and the switching multiplier ($m_i -$ m^p). The weights are the proportions of Welsh Government and other funding in 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 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.
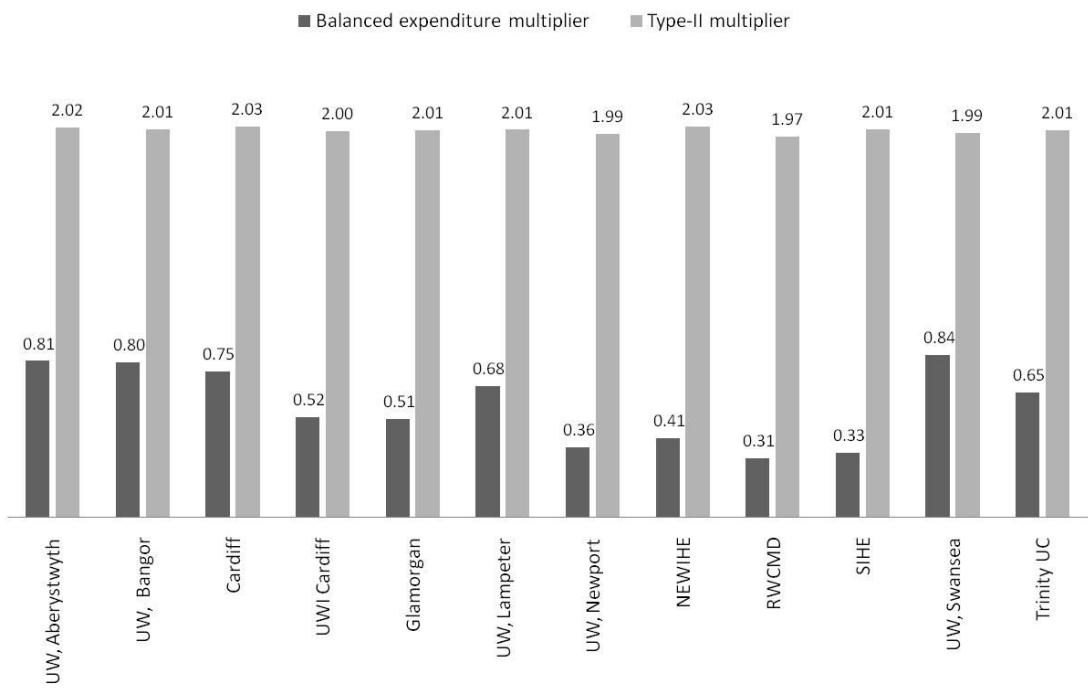
This discussion suggests that an extreme "policy scepticism" perspective implicitly assumes that $\alpha_i = 1$ and ($m_i - m^p$) = 0. However, no Welsh HEI is funded 100% by the Welsh Government, so that for all institutions $\alpha_i < 1$. Moreover the switching multiplier for Welsh HEI's is positive, so that $m_i - m^p > 0$. The balanced expenditure multipliers for all Welsh HEIs are therefore positive.

Nevertheless, accounting for the possibility of alternative uses of public funding is potentially very important. Firstly, m^B_i must be less than m_i if the

HEI receives any public funding at all. Traditional impact studies neglect the possible alternative use of public expenditure and so might be regarded as exaggerating the net impact of HEIs on their host regional economies where both public funding and a regional public sector budget constraint operate. Secondly, in principle, even the sign of m^B_i 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 might be negative.
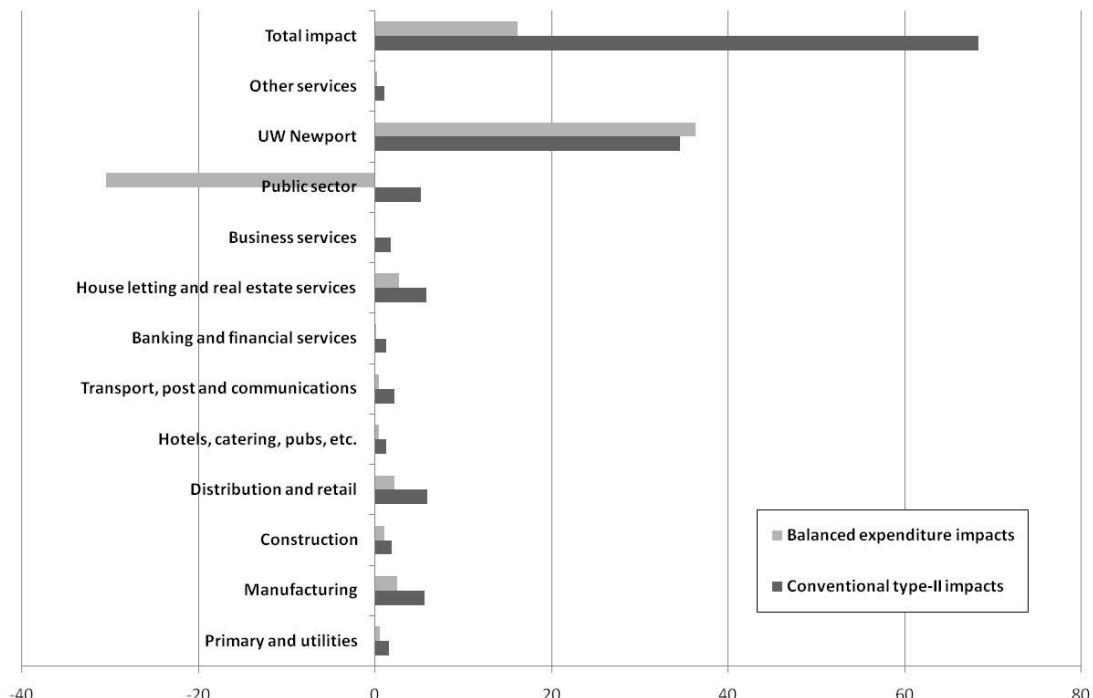
The balanced expenditure multipliers for all Welsh HEIs are shown in Figure 3, together with their conventional IO counterparts. All of the balanced expenditure Type-II multipliers are positive but lower than their corresponding conventional values. All Welsh HEIs receive significant levels of government 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 Wales. Also, HEIs' expenditures are, on average, less import-intensive than those of the public sector. Accordingly, Welsh HEIs exert positive expenditure effects relative to the public sector. The presence of a public expenditure constraint certainly does not imply negligible (or in the limit zero) expenditure impacts as is often implied by the "policy scepticism" perspective, though it does imply lower expenditure impacts attributable to HEIs *per se* than conventional IO impact studies imply.

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Figure 3 Balanced expenditure multipliers for Welsh HEIs

The detailed operation of the balanced expenditure multiplier, as against the conventional multiplier, can be seen in Figure 4 for the case of University of Wales, Newport. The conventional Type-II impact output attribution to UW, Newport is £68 million (as indicated in the top horizontal dark bar in Figure 4). The sectoral impacts are graphed in the lower part of figure and all are positive since these are conventional IO results. However, the lighter bars illustrate the (Type-II) balanced expenditure output effects. Figure 4 shows the balanced expenditure impacts as the net outcome of an expansion due to the stimulus to total final demand together with a contraction due to the notional reduction in government expenditure that is required to reflect the government expenditure switching. There is a big negative impact on the public sector and small negative impact on the Business Services sector. Overall, the total output attributed to UW, Newport under the balanced expenditure scenario is only £15.0 million.

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Figure 4. Traditional and balanced budget output impacts of University of Wales, Newport, disaggregated by sector (£m)

A key feature of the results presented in Figure 3 is that there is considerable variation in the balanced budget multipliers across HEIs in Wales. The minimum value of this multiplier is 0.31 for RWCMD (which is only 15.7% of its conventional IO multiplier value) and the maximum value is 0.84 for UW Swansea (42% of its conventional multiplier value). The range is rather less than for Scotland, for which Bell College has the lowest balanced expenditure multiplier (0.28, 14% of the type II multiplier value), and St Andrews the highest (1.35, 64% of the conventional multiplier value). Recall that, for conventional Type II multipliers, the smallest value was 97% of the largest: for the balanced budget multipliers the comparable figure is 37%. The range of multiplier values has increased significantly, as has the coefficient of variation,

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which for Wales (Scotland) is some 44 (28) times as great, 0.33 as against 0.007 (0.32 as against 0.012), relative to the conventional IO multipliers.
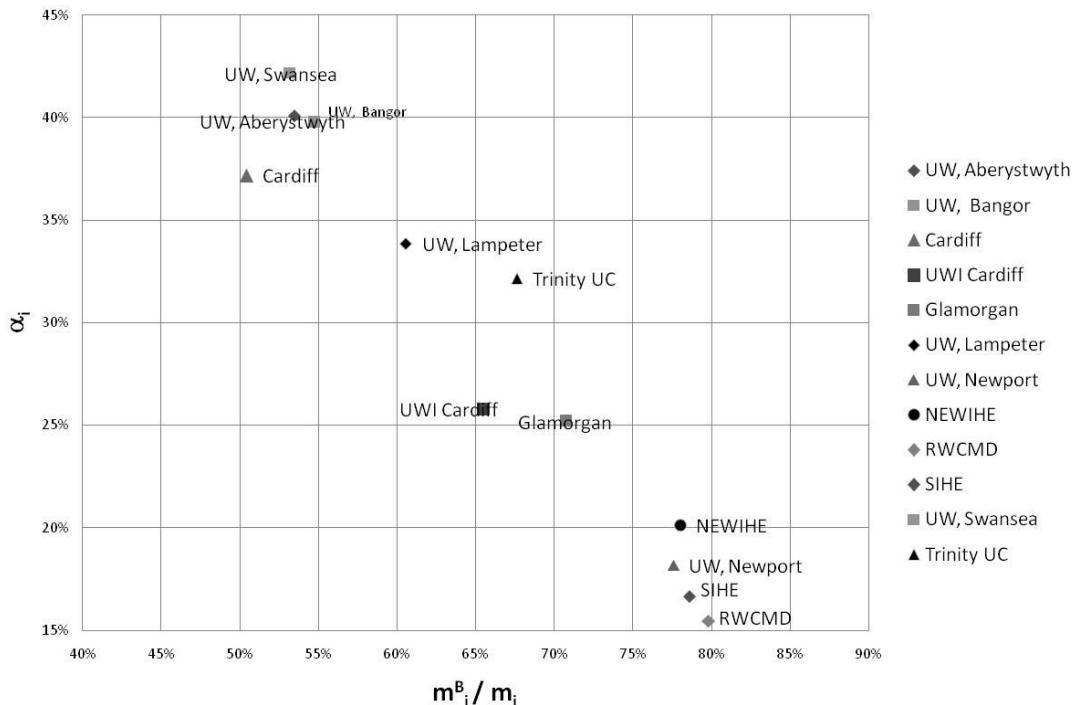
It is apparent from equation (4) that the proportion of HEIs' funding coming from the public sector is going to have a major impact on an HEI's balanced expenditure multiplier. We already know that there is limited variation in HEIs own expenditure multiplier (m_i), and the aggregate public expenditure multiplier (m^p) is invariant across HEIs, so the main source of variation is in the size of the term $-\alpha_i m^p$ which is directly related to the share of Welsh Government funding in total final demand for the HEI (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 Welsh Government. Not surprisingly there is a strong negative relationship between the two series (correlation coefficient of -0.965 though this is lower than the correlation coefficient of -0.998 for Scotland).

Inspection of Figure 5 suggests at least three, probably four, clear HEI groupings in Wales on this criterion. One group of HEIs retains between 42% (UW Swansea) and 37% (Cardiff) of their corresponding IO multiplier. This group also includes UW, Aberystwyth and UW, Bangor (both 40%). A second cluster of two HEIs, UW, Lampeter and Trinity UC, retain between 34% and 32% of their conventional IO impact in the balanced expenditure scenario. Then come UWI Cardiff and Glamorgan with 26% and 24% respectively. There are then a group of four HEIs with the lowest relative balanced expenditure multipliers, NEWIHE (20%), UW Newport (18%), SIHE (17%) and RWCMD

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(15%). 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.

On average Welsh HEIs' balanced expenditure multipliers are around 29% of their conventional multiplier, whereas that for Scotland is significantly higher at just under 40% (with an average value of 0.84). Nine of the 20 HEIs in Scotland at the same period retain at least as much of their type II multiplier as Swansea (42%). Furthermore, the negative relationship between the percentage of public funding and the balanced expenditure multiplier as a percentage of the conventional IO multiplier is even clearer in Scotland, especially within each group of HEIs.

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, 1996) or only consider the expenditures of students who move into the region to study as additional (Kelly *et al*, 2004). Our view is that these alternative 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. Hermannsson *et al* (2010d) implement this approach for Scotland using the survey by

Warhurst *et al* (2009), combined with the database employed in our preceding analysis. By analogy with the discussion in Section 4 above, we can distinguish between the Welsh government funding of students and other student funding and engage in a similar attribution analysis that identifies balanced expenditure multipliers for students' expenditures.

Here we wish 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. This implies that for each £1 million of HEI final demand expenditure we calculate the associated student numbers and the impact on the local economy that occurs from those students' exogenous consumption.[11] The exogenous expenditure per student does vary between students of different types. To accommodate this we use an equation of the following form:

(6) $$m_i^s = \frac{m^C s_i}{f_i} \sum_n \gamma_{i,n} c_n x_n$$

where m_i^S is the student consumption multiplier, m^C is the standard consumption multiplier, s_i is the number of students in HEI i and there are n student types. $\gamma_{i,n}$ is the proportion of the students in HEI i in type n, c_n is the average consumption from student group n and x_n is the proportion of the income of group n that is exogenous. In the present application we have three

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[11] In order to determine exogenous consumption we subtract student consumption financed from wages and intra-family transfers. Also, where appropriate, we adjust for maintenance grants from the Welsh Assembly Government.

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groups: Welsh students, students from the rest of the UK and students from the rest of the world.

Figure 6 Aggregate multipliers of Welsh 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)
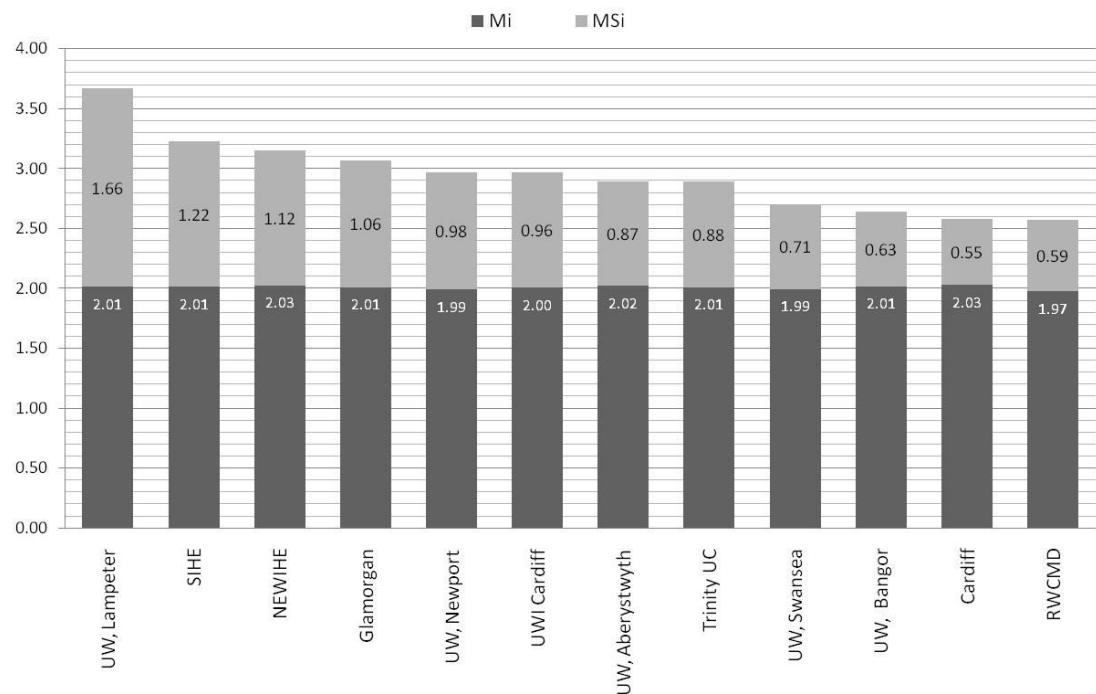

Figure 6 gives the conventional Type II student consumption multiplier value where the associated output is expressed as a proportion of HEI expenditure. These are conventional multiplier values in that they do not include any adjustment for public sector expenditure switching. For each HEI, this figure has been added to the conventional Type II HEI output multiplier value shown in Figure 2. Note that the associated student consumption multipliers vary widely across HEIs, from 1.66 (83% of the institutional expenditure multiplier), for UW Lampeter to 0.55 for Cardiff (27% of the institutional expenditure multiplier). In contrast in Scotland the range of values is much lower, from 0.07 for SAC to 0.92 for Queen Margaret University College (QMUC). At a

maximum, the conventional student multipliers only make up 30% of the conventional total Type II impact in Scotland, these multiplier values are always dwarfed by the conventional multipliers for HEIs own expenditure. However, the same is clearly not true in Wales. This reflects the much higher proportion of non-home students attending Welsh HEIs, a point we noted in our discussion of Table 1.

Figure 7 Aggregate balanced expenditure multipliers of Welsh 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).]
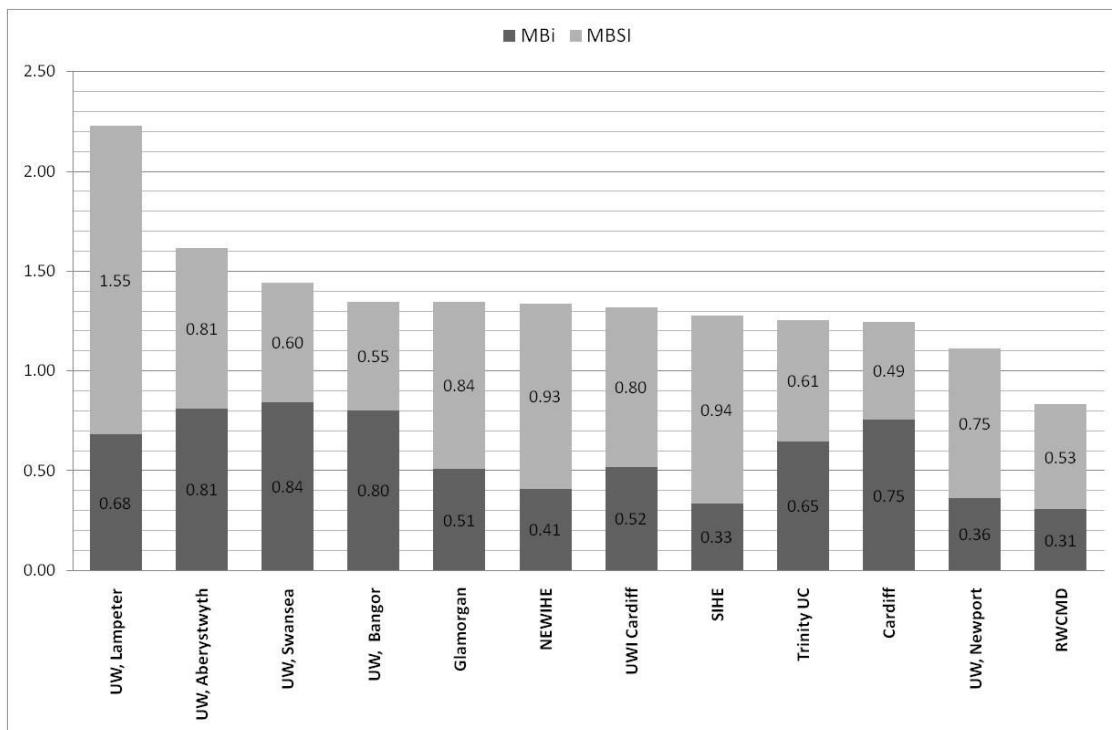

Figure 7 shows the total balanced expenditure multiplier values for each Welsh HEI. That is to say, the student multiplier value is adjusted to take into account the reduction in public expenditure elsewhere as a result of maintenance grants from the Welsh Government. This multiplier is then added to the HEI balanced

expenditure values given in Figure 3. Taking into account public sector expenditure switching implies a downward adjustment to the student consumption multiplier. However this downward adjustment is in general small relative to the adjustment to the HEI expenditure multiplier. This has two implications. First, for some institutions, student consumption makes up a large share of their total balanced expenditure multiplier. Indeed 74% of SIHE's balanced expenditure multiplier is attributable to student expenditure, whereas the maximum value in Scotland is 60% (Bell College), and for only four Welsh HEIs is the contribution less than 50% (Trinity UC, 48%; UW, Swansea, 42%; UW, Bangor, 40%; and Cardiff 39%). In the Scottish case, the contribution of students is typically significantly lower (on average, 38%, though this is significantly higher than the corresponding share of Type II multipliers, 23%). Second, the combined impact of HEI and student expenditure means that for all but one institution the multiplier value is greater than unity (and for one is in excess of two). Third, the addition of student spending leads to a marked change in the ordering of HEI's by their balanced expenditure multiplier values. Also there are no longer clear groupings amongst institutions, although high and low outliers still remain. Finally, the multiplier values reflect the wide range of activities undertaken by different HEIs. For example, SIHE and Trinity UC have very similar 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 Welsh HEIs and their students on their host regional economy by applying an IO attribution analysis to a purpose-built, HEI-disaggregated IO table for Wales. Using a conventional IO analysis the level of HEIs' own expenditure impacts on GDP vary considerably from the £325 million contributed by Cardiff to the £9 million impact of RWCMD. However, when impacts are corrected for scale and expressed in terms of conventional multipliers, HEI impacts appear remarkably invariant across HEIs.

These results contrast with a growing "policy scepticism" that regards HEI expenditure impacts as negligible or even zero, on the grounds 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. We investigate this hypothesis by conducting simulations in which we subtract from the overall HEI impact the effect that its public funding would have if it was used instead to expand the public sector. The resultant *balanced expenditure* multipliers are all positive, denying the policy scepticism hypothesis, but are considerably smaller than conventional IO impacts. 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 Welsh Government. If these impacts are used in a simple descriptive way to categorise HEIs, there appear to be probably four groups of HEIs in Wales.

We adopt a new method of attributing impacts to the expenditure of HEIs' students, a method which accommodates earlier treatments as special cases. In fact, these impacts vary very substantially across HEIs, reflecting the student intensity of the institution and the geographical source of the student body. Incorporation of these effects within aggregate/ composite (institutional and student) conventional IO and balanced expenditure multipliers, tends to reduce slightly the degree of heterogeneity among HEIs, at least in terms of their aggregate expenditure impacts (and has the impact of improving the estimated impacts of the post 1992 universities). For Wales the student expenditure impacts are significantly more important than for Scotland, reflecting the greater preponderance of non-home students in Wales.

Overall, our analysis implies a more complex and subtle view of the expenditure impacts of HEIs than is traditionally associated with impact studies of the sector. Crude IO estimates of impact suggest a homogeneity that we think is misleading, and our formal modelling of HEI impacts is more in accord with the sector's intuition about the nature of Welsh HEIs. It is important to note that our analysis overwhelmingly rejects the "policy scepticism" perspective, at least in its limiting form: HEI expenditure impacts are important, but their measurement should acknowledge the presence of the public expenditure constraint in devolved regions.

Our approach is capable of extension in a number of directions. Most obviously we can apply our analysis to the other devolved regions of the UK, which are

also subject to a public expenditure constraint through Barnett.[12] Such an extension allows us to make systematic comparisons across both regions and HEIs. Secondly, the lessons of the analysis are not restricted to HEIs, but are applicable to any impact analysis relating to devolved regions where final demands are at least partially publicly funded. Thirdly, our approach may also be applied to regions that are not devolved: even in the absence of a binding public expenditure constraint at the regional level, there is likely to be interest in the impacts of HEIs, for example, net of those attributable to general government expenditure.[13]

A fourth extension to a Social Accounting Matrix (SAM) approach holds the promise of further enriching the analysis of the expenditure impacts of HEIs, through the more explicit treatment of financing issues that this would facilitate.[14] Fifthly, HEI impact studies have focussed to date exclusively on impacts that occur within the boundaries of the host region. It may appear understandable that these impacts would attract most attention from the devolved administrations. However, HEIs in the UK are part of an integrated higher education system. Furthermore, the regions in which HEIs are located are part of an inextricably intertwined system of interdependent regions linked by migration, trade flows and wage bargaining mechanisms. It is therefore inevitable that HEIs will exert impacts that extend well beyond the geographic

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[12] See e.g. Hermannsson *et al* (2010a), (2010e) for analyses of Scottish and Northern Irish HEI impacts.

[13] See e.g. Hermannsson *et al* (2010f) for an analysis of London-based HEIs.

[14] Allan *et al* (2010) show how a SAM-based analysis of the impact of a renewable energy project yields allows an appropriate and much fuller analysis of the impact of community benefits and community ownership than conventional IO can capture.

boundaries of their host regions. These effects should at the very least be of interest to UK government. Furthermore, some of these impacts are likely to be positive, as is probably the case, for example, for the movement of graduates to London and the South East. Certainly, interregional extensions of our analysis should enhance our understanding of the regional impacts of HEIs, and this knowledge may be of wider interest than is immediately apparent. More generally, greater understanding of the impacts of HEIs is likely to provide a more convincing evidence base assessing the likely impacts of any contractions in public expenditure, a point we return to shortly.

Furthermore, this study is concerned exclusively with the expenditure, or demand-side, impacts of HEIs. But these are not the only, and are probably not the most important, impacts that HEIs may have on their host regional economies. For example, one of the most important contributions 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. However, recall that in expenditure impact analyses, including our own, in-coming students' expenditures typically have the biggest impact, yet these may be the very students who are least likely to stay and stimulate the host region through their enhanced productivity. 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. Our view is that regional Computable General Equilibrium (CGE) models can be usefully applied to explore the supply-side impacts of HEIs. For example, in Hermannsson *et al* (2010g) we simulate the impact of maintaining current higher education policies on student

recruitment. The productivity-enhancing impact of the resultant increase in the proportion of graduates in the Scottish labour force is significant and dominates any expenditure impact.

There are other potentially beneficial supply side impacts occurring through channels such as innovation and knowledge exchange (e.g. Harris and Moffat, 2010a,b), and through externalities, for example through health (both generally through exposure to higher education and through the research of HEI medical schools) (e.g. McMahon, 2004, 2009), and again CGE analyses rooted in micro-econometric evidence are likely to be revealing. However, while much certainly remains to be done in terms of enhancing our understanding of the supply-side impacts of HEIs, it would, in our view, be a mistake to assume that the more subtle aspects of the demand-side impacts of HEIs are already well-understood.

We end on a cautionary note, which reflects the absence of a detailed model of individual HEI behaviour in our present analysis (or indeed in our CGE analyses, which tend to focus on the HEI sector as a whole). While our approach does of course, *inter alia*, identify those HEIs whose activity is currently most dependent on public funding, we would caution against its mechanical use to project the likely impacts of impending government expenditure cuts, since this is going to be critically dependent on the reactions of individual HEIs. These reactions are themselves likely to be characterised by heterogeneity, reflecting varying objectives and differing opportunities and constraints. Naturally, given the recent (July 2010) emergency budget of the Liberal Democrat – Conservative coalition Government, there is considerable

interest in what is likely to be a major cut in the public sector budget of HEIs. The crucial issue is not the conventional HEI expenditure multiplier, which we know is virtually uniform across HEIs from our analysis. While balanced expenditure multipliers provide a better idea of sensitivity to government funding, application to marginal changes is problematic. What is critical here is the reactions of individual HEIs to significant and probably unprecedented public funding cuts and attempting to capture this would require us to go beyond the present accounting/ attribution exercise to consider the impact of major changes in government expenditure at the margin. An HEI-disaggregated regional CGE approach would certainly provide a preferable starting point for analysing changes at the margin (since it is not predicated upon an entirely passive supply side), but no matter how sophisticated the model of the host regional economy, what is likely to be crucial here is characterising the behaviour of individual HEIs.

HEIs who are in a position to do so may seek to compensate for the loss of public funds through expansion of overseas students or research income, though presumably the latter will have to be sought from sources other than research councils (though this is likely to vary by subject area and could presumably only be secured at some additional cost). Here other funding sources may be able to *substitute* for a contraction in public funding. Presumably any such substitution is likely to be partial unless the process of contracting public funds stimulates an entrepreneurial spirit that would otherwise have remained dormant. In these circumstances our analysis based on a snapshot of average relationships, would prove overly pessimistic. However, there may be some

HEIs who are severely restricted in their ability to secure other sources of funding, and for whom public funds may even be *complementary* to their other funding sources. In this case a contraction in public funding may so constrain activity that other sources of funding diminish too, perhaps ultimately threatening the continued separate existence of the HEI. For such HEIs the impact of reductions in their public funding would be much more extensive than our multiplier analysis suggests. While our formal analysis reveals a considerable degree of heterogeneity among HEIs, we suspect even greater heterogeneity will be apparent in their reactions to the impending cuts in public funding.

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