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## Expenditure and Displacement effects of Students in the Periphery: Impact on the Scottish Highlands and Islands

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# Expenditure and Displacement effects of Students in the Periphery: Impact on the Scottish Highlands and Islands

Kristinn Hermannsson \*

## Abstract

A ubiquitous feature of life in peripheral communities is that school leavers have to move away to attend further and higher education. From the point of view of an individual student and his family significant amounts have to be spent to pay for term time costs. These are at least partially funded through saving incomes earned locally. These term time expenditures are then spent at the place of study, typically a central city. This gives rise to a spatial demand-shift effect, where students increase consumption where they study and reduce consumption where they are from. Because of this, the location of HEIs can have an important impact not only upon their host economies but also on the localities where students originate from. This paper analysis the flow of students within Scotland and the resulting spatial shift of consumption expenditures. The focus is on the peripheral region of the Highlands and Islands (HI) and its interaction with the Rest of Scotland (ROS). Student records data are used to determine the origin and destination of HE students in Scotland. This reveals a significant net-outflow of students from the HI to the ROS. Using survey-based expenditure profiles and a custom built 2-region Input-Output table the economic impact of these student flows are estimated for both sending and receiving regions.

JEL Codes: I23, I25, R12, R15

Keywords: Input-Output, Peripheral, Impact, Higher Education, Students, Expenditures, Displacement

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# 1 Introduction

Students attending higher education institutions (HEIs) transfer income from their place of origin to their place of study. This movement can displace consumption at the origin. As students are mobile, the location of the expenditures and the income sources are not necessarily the same. This gives rise to a spatial demand-shift effect, where students increase consumption where they study and reduce consumption where they are from. Because of this, the location of HEIs can have an important impact not only upon their host economies but also on the localities where students originate from. Therefore students are an economic 'benefit' to the region that attracts them. Conversely, students who leave to study elsewhere are a 'cost' to the region that they left.

Unsurprisingly therefore, local governments have in place policies to attract students. For example, London and Partners, the official promotional organisation for London, maintains a website promoting London to students, in an analogous manner to its promotion of the city for tourism. Similarly, the websites promoting tourism in Scotland and Wales, both have specific sections targeting students. Furthermore, there is political pressure to decentralise the provision of education to areas which exhibit negative net-migration of students. For example, one of the arguments for founding the University of the Highlands and Islands was to keep students in Northern Scotland. However, despite policy interest, this issue has received little formal analysis. It is not clear what the economic impacts of these student flows are upon the regions where students originate from. A priori, it seems potential displacement impacts could be particularly onerous for peripheral regions where a large share of school-leavers out-migrates for further study and there is no counter migration to attend local institutions of learning.

With high rates of HEI participation in most high-income countries, these

questions are particularly important. HE students are now a significant share of such populations. Students have for a long time been an important group of consumers in specific locations. For example Blake & McDowall (1967) illustrate their relative importance for the university town of St Andrews in Scotland. However, participation rates in the UK increased sharply in the 1990's (Blanden & Machin 2004), as they did elsewhere in Europe (Gallice 2009). In 2007 the OECD average of HE entrants as share of the corresponding age group was 56%, with the UK slightly under this average at 55% OECD (n.d.). Therefore, university students play a significant role in the economy and their pattern of expenditures and displacements has important implications.

Research has mostly focussed on the positive aspects of students' consumption expenditures (e.g. Love & McNicoll 1988, Steinacker 2005) or used simple assumptions to correct for endogeneity of income sources (see Hermansson et al. 2012, for a discussion of this point). Recent work suggests a broader range of transmission channels to the local economy, such as through labour supply and the housing market (Allinson 2006, Munro et al. 2009, Munro & Livingston 2012, Sage et al. 2012). Furthermore, that the impacts are not necessarily all positive (Munro et al. 2009). An approach is needed that accounts for both the role of income and expenditure in shaping the impact of students' consumption, as well as students' mobility and heterogeneity.

This paper specifies an interregional student consumption expenditure impact model to address these issues. The model is used to examine the spatial expenditure and displacement patterns of different student types. The location of the institution of study is combined with post code level data on place of domicile and term time residence, to determine movers and stayers. Then the expenditure and displacement pattern of each group of students is quantified. A two region interregional Input-Output model of the Highlands and Islands and

the wider economy of Scotland is applied to examine spill-over impacts over space.

The paper is structured as follows. The next section presents a brief overview of previous work on the impacts of students. The third section sets out the model. This draws on Hermannsson et al. (2012) who introduce a novel treatment of student expenditures, whereby survey information is used to identify students' exogenous expenditures. This approach is extended to an explicitly interregional setting. The fourth section applies the model to conduct an interregional analysis of the consumption and displacement impacts of students in Scotland. The focus is on the Highlands and Islands. Final section concludes.

## 2 Previous Research

A number of studies have examined the role of students as consumers, effectively treating them like tourists (e.g. Cook 1970, Florax 1992, Love & McNicoll 1988, Steinacker 2005). Often this is carried out as part of an analysis of the host institution's expenditure impacts (e.g. Armstrong 1993, Bleaney et al. 1992, Brownrigg 1973, Harris 1997, Hermannsson et al. 2012, Love & McNicoll 1990). Typically these studies determine the direct expenditures of students and then apply a demand-driven model, such as Keynesian multiplier or Input-Output to trace multiplier impacts. Typically the geographical scale is regional or local.

In principle such impact studies are straightforward and follow well established procedures (Armstrong & Taylor 2000, Miller & Blair 2009). In practice, however, it can be difficult to determine to what extent student's consumption is additional to the host economy. This has resulted in simplifying assumptions, of which are two main conventions. 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 1997). This issue is re-examined

by Hermansson et al. (2012), who draw on student income and expenditures surveys to determine empirically to what extent their consumption expenditures are additional to the host economy. They find that for Scotland about half of indigenous students' expenditure is not additional as these are funded through household transfers and local wage income. This reveals a significant positive impact for local students, albeit muted vis-à-vis external students. Much of this represents a re-allocation of demand within the local economy, rather than an addition to it.

More recently work in urban and planning studies has examined the variety of influence students exert on their local economy using surveys and case studies (Allinson 2006, Munro et al. 2009, Munro & Livingston 2012, Sage et al. 2012). This work has contributed an important qualitative point: namely that the local impacts of students are not necessarily uniformly positive (Munro et al. 2009, Munro & Livingston 2012).

Most work on students acknowledges in principle that they are mobile and indeed often the main point of the impact studies is to provide evidence for the export stimulus driven by incoming students. However, it remains to be analysed how students impact upon their origin as well as the destination. Hitherto the spatial dimension of students' consumption impacts has received limited attention. Usually the focus is on what happens in the student centres, but what is the impact upon those regions that experience a net out-migration of students? Such a story is not just a purely positive one about expenditure injection, but might also highlight negative aspects, i.e. the displacement of consumption in the region of origin.

### 3 Model

An Input-Output model is modified to accommodate an interregional analysis of consumption expenditures and displacements of heterogeneous students. The model is augmented to allow for the displacement of expenditures and different types of students and extended to two regions.

#### 3.1 Input-Output impact analysis and students' consumption expenditures

Demand driven models are frequently used to capture the total spending effects of institutions, projects or events. These analyses incorporate the multiplier, or knock-on, impacts of any expenditure injection, obtained by summing the subsequent internal demand feedbacks within the economy. For a detailed account of IO-based impact studies see Armstrong & Taylor (2000), Loveridge (2004), Miller & Blair (2009).

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

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

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

It is straightforward on principle to apply the standard Leontief model, presented in equation 1, to determine the output impact of students' consumption expenditures. All that is needed is to determine the final demand expenditures on the output of local sectors attributable to students ( $\mathbf{f}^s$ ). Then the Leontief inverse can be used to determine indirect (and, where appropriate, induced) impacts.

Using the gross consumption expenditures of students as the starting point, three adjustments have to be made in order to arrive at the vector of final demands for the output of local sectors attributable to students.

Therefore, the final demand attributable to students of type n ( $\mathbf{f}_n^s$ ) can be identified as:

$$\mathbf{f}_n^s = \mathbf{v}_c^s c_n^s x_n (1 - \delta) \quad (2)$$

where  $\mathbf{v}_c^s$  is a vector that reveals the sectoral breakdown of students' consumption

Only exogenous expenditures influence final demand, but endogenous expenditures are also a component of gross output. Hence, even if endogenous expenditures are not additional to the economy these can represent a switching of expenditures within the economy. In this case to student expenditures from something else. In order to explicitly identify this expenditure switching exogenous expenditures can be represented as

$$c_n^s x_n = c_n^s - d_n^s \quad (3)$$

where  $d_n^s$  is the average displaced expenditures of student type n. This is important for testing if this switching of expenditures occurs over space. Substituting 3 into 2 final demand of students can be represented as:



$$\mathbf{f}_n^s = \mathbf{v}_c^s(c_n^s - d_n^s)(1 - \delta) \quad (4)$$

To further clarify this distinction the vector of student's final consumption demand can be disaggregated into two vectors of expenditures ( $\mathbf{e}_n^s$ ) and displacements ( $\mathbf{d}_n^s$ ):

$$f_n^s = e_n^s - d_n^s \quad (5)$$

These can be represented as:

$$\mathbf{e}_n^s = \mathbf{v}_c^s c_n^s (1 - \delta) \quad (6)$$

$$\mathbf{d}_n^s = \mathbf{v}_c^s d_n^s (1 - \delta) \quad (7)$$

### 3.2 Interregional impact of expenditures and displacements

Following standard approach (Leontief 1986, Miller & Blair 2009, Turner et al. 2007) the model can easily be extended to two regions. Equation 1 identifies the key equation determining the  $N \times 1$  vector of output  $\mathbf{q}$  in the single region inputoutput framework. This becomes region 1 in a 2-region world and the element  $\mathbf{f}$  (final demand) is separated into local final demand in region 1 for commodities produced in region 1 ( $\mathbf{f11}$ ) and export demand in region 2 for region 1 commodities ( $\mathbf{f12}$ ). Similarly for region 2, final demand for region 2 commodities is split into export demand in region 1 ( $\mathbf{f21}$ ) and local demand in region 2 ( $\mathbf{f22}$ ). This can be presented as:

$$\begin{bmatrix} q_{11} & q_{12} \\ q_{21} & q_{22} \end{bmatrix} = \begin{bmatrix} 1 - A_{11} & -A_{12} \\ -A_{21} & 1 - A_{22} \end{bmatrix} \begin{bmatrix} f_{11} & f_{12} \\ f_{21} & f_{22} \end{bmatrix} \quad (8)$$

where elements  $a_{ij}^r$  of the  $N \times J$  sub-matrices  $A^{RS}$  show the transactions between sector  $i$  in producing region  $r$  and using sector  $j$  in consuming region  $s$ .

$$\mathbf{F}^S = \begin{bmatrix} F_1 \\ F_2 \end{bmatrix} = \begin{bmatrix} e_{11}^s - d_{11}^s & e_{12}^s - d_{12}^s \\ e_{21}^s - d_{21}^s & e_{22}^s - d_{22}^s \end{bmatrix} \quad (9)$$

Equation 5 shows the vector of final demand expenditures attributable to students in a two region setting as composed of two matrices  $F_1$  and  $F_2$ , where  $F_1$  shows the final demand expenditures destined for Region 1 and  $F_2$  shows the final demand expenditures that will impact Region 2. Looking more closely at  $F_1$  reveals that it is composed of the elements  $e_{11}^s - d_{11}^s$  and  $e_{12}^s - d_{12}^s$ , where the former captures the final demand expenditures and displacements that both originate and are incurred within region 1, whereas the latter describes the final demand expenditures and displacements that originate in region 2 but are incurred in region 1. Similarly,  $F_2$  shows expenditures and displacements that originate in region 2 but impact region 1 and region 2, respectively.

For analysing the impact of students consumption expenditures two spatial definitions are relevant: the student's region of domicile, or home region, denoted by the subscript  $H$  and the term time address where the student studies at university, denoted by the subscript  $U$ .

Table 1 identifies three types of students. For locals the region of study and the region of domicile is the same and hence both the expenditure injection and displacement occur within the same region. Movers exert a positive direct net-impact upon their region of study whilst they result in a net displacement of expenditures in their region of domicile. For external students a positive direct impact is felt in the region of study. For those external students that seek employment in their region of study a corresponding displacement is allowed for. It should be noted that external students do trigger other displacements of

Table 1: Final demand impact of different student groups upon region of study and region of domicile.

Student origin	Region of study	Region of domicile
Local (studies in home region)	$e^s - d^s$	
Mover (moves between regions for study)	$e_{ij}^s - d_{ij}^s$	$-d_{ii}^s$
External	$e_{ij}^s - d_{ij}^s$	

expenditures in their region of domicile, but this is not modelled here as they are by definition external to the locations being examined and hence the model.

The case of locals is straightforward. Their region of study and region of domicile is the same, so that expenditures directly impact upon the local economy (region 1) and displaces expenditures within the local economy as well.

$$\mathbf{F}_L^S = \begin{bmatrix} F_1 \\ F_2 \end{bmatrix} = \begin{bmatrix} e_{11}^s - d_{11}^s & 0 \\ 0 & 0 \end{bmatrix} \quad (10)$$

The interregional mover leaves his region of domicile to attend university in another region. In this case all the expenditures are incurred in the region of study, along with some displacements. Whereas additional displacements are incurred in the region of domicile but no expenditures.

$$\mathbf{F}_M^S = \begin{bmatrix} F_1 \\ F_2 \end{bmatrix} = \begin{bmatrix} 0 & e_{12}^s - d_{12}^s \\ 0 & -d_{22}^s \end{bmatrix} \quad (11)$$

External students bring in an expenditure stimulus from exports, which is exogenous to the host economy. However, some external students are expected to participate in the labour market. Expenditures supported by this income are

Table 2: FTE students at Scottish Higher Education Institutions (HEIs) in the academic year 2007/08 by origin.

Domicile	FTE students	% of total
Scottish	130,838	75%
Other UK	17,574	10%
Non-UK	25,051	14%
Total	173,463	100%

endogenous to the economy under analysis. The extent to which this labour market participation funds consumption expenditures is an empirical matter

$$\mathbf{F}_E^S = \begin{bmatrix} F_1 \\ F_2 \end{bmatrix} = \begin{bmatrix} e_{11}^s - d_{11}^s & 0 \\ 0 & 0 \end{bmatrix} \quad (12)$$

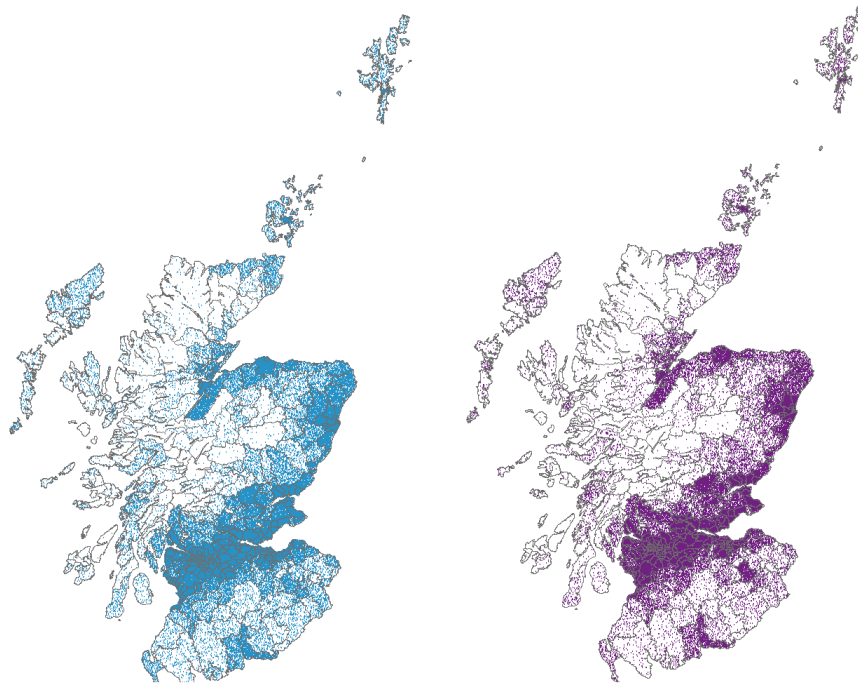
## 4 Students in Scotland

There were 173,463 FTE students registered at Higher Education Institutions (HEIs) in Scotland in the academic year 2007/08. As is clear from Table 2 three quarters come from Scotland, while 15% originate from other parts of the UK and 10% from the rest of the World.

Of the 19 HEIs in Scotland, most activity is concentrated in the urban centres of the Central Belt (Glasgow, Edinburgh, Stirling) and on the East Coast (Aberdeen, Dundee). Measured in terms of registered students about a third are associated with institutions in each of Glasgow and Edinburgh, with most of the remaining third associated with HEIs in Aberdeen, Dundee and Stirling. 5% of students are at the University of St Andrews, which is located in rural Fife outside the main population corridor on the East Coast. Then there are well known distributed elements of the higher education system, notably the University of the Highlands and Islands (UHI) and the Scottish Agricultural College (SAC), both of which operate out of multiple locations. However, they

only account for 3% and 0.5% of the total student population, respectively. Similarly, there are outreach campuses run by the conventional HEIs, but these are relatively small.

Figure 1: Domiciles (left) and term time addresses (right) of Scottish HE students plotted at postcode district level (1 dot = 1 student).



Based on this simple overview of the nature of the Scottish HEI system it seems likely that given its centralised structure there is significant migration from peripheral to central regions, where students seek access to HEIs. Using the Students in Higher Education dataset (maintained by the Higher Education Statistics Agency (HESA)) it is possible to examine student's domicile and term time address at post code level. Focussing solely on Scottish students, Figure 1 maps the domiciles and term time whereabouts. From this it is difficult to discern a distinct pattern based on visual comparison alone. The large urban centres dominate in terms of the domiciles and term-time addresses of students.

Therefore, due to differences in scale a direct comparison is difficult.

Figure 2: Difference between Scottish students place of domicile and term time at postcode district level, normalised with the number of students domiciled in the postcode of origin. View of Scotland as a whole.

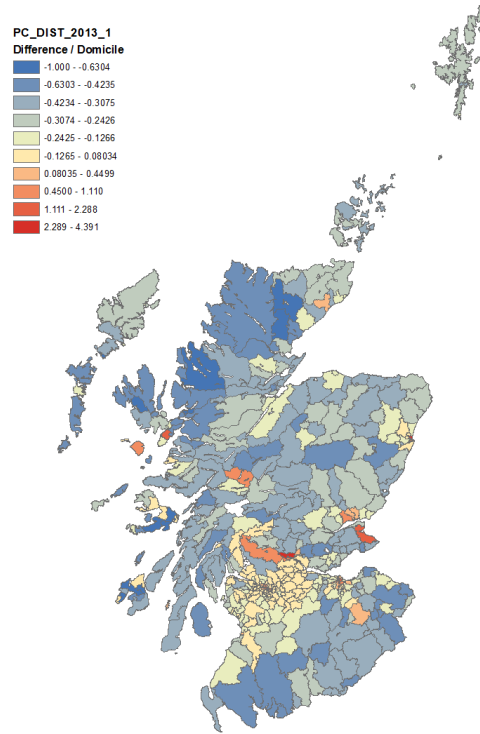
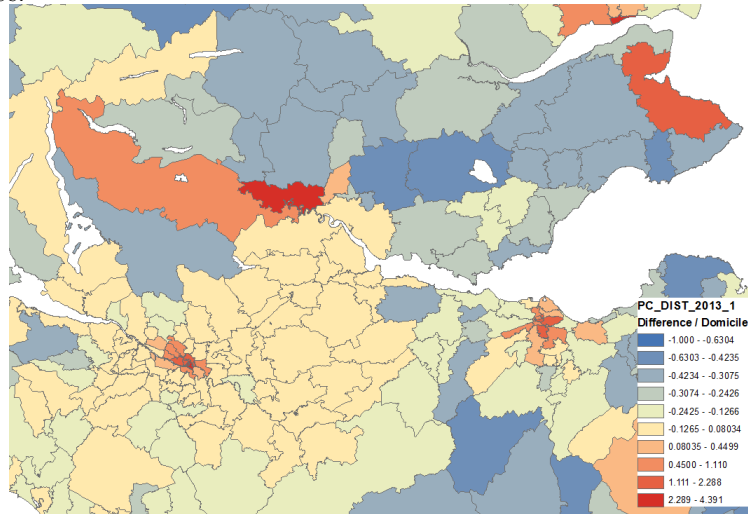


Figure 2 shows a "heat map" for "winning" and "loosing" regions in terms of student migration. This shows the difference between the number of students domiciled in a region and the number of students staying in the region over term-time. This is normalised by dividing through the number of students domiciled in a region. This metric can be interpreted as an index of the loss or gain of student population in a region. A region with a value of 0 experiences no net migration of students. Region with a value of 1 has its student population double through positive net migration and region with a value of -1 has lost its

Figure 3: Difference between Scottish students place of domicile and term time at postcode district level, normalised with the number of students domiciled in the postcode of origin. Close up view of the Central belt, St Andrews and Dundee.



entire student population due to negative net migration. Of the 440 postcode districts analysed, 5 experience a 100% out-migration of its student population (1 in the Highlands, 4 in the Western Isles). The absolute numbers are not large (ranging from 1 to 3 students) but it shows that there are areas (even if at small scale) where there is no uptake of HE through distance learning nor commuting to a local institutions and all the HE students migrate to study. The median postcode district has a value of -0.25, suggesting a net migration equivalent to a quarter of its student population. On the opposite end of the spectrum the most gain in student population was observed in G1, Glasgow's Merchant City, where the student population grew fivefold through migration. In this case we are looking at an inner city area with a relatively small indigenous student population and hence the multiple is quite high. However, the area with the largest overall student population is AB24 in Aberdeen, with 4,097 students as term time residents, but just over 1,000 domiciled.

The same map is reproduced at a different scale in Figure 3, giving a closer look at the Central Belt student centres (Glasgow, Stirling and Edinburgh) in addition to St Andrews and Dundee.

From this analysis it is clear that at a postcode level, most areas in Scotland lose students to the major university centres. This analysis has only looked at the role of Scottish students, but the pre-eminence of the urban centres is only exacerbated when external students are taken into account, as these tend to cluster even more closely to the location of the HEI.

Looking at the cross-sectional data clearly reveals a strong gravity effect, where students migrate from all over Scotland to congregate in a few student centres. This is likely to have a number of social and economic effects. In terms of the economics, this inflow of students can stimulate both the supply side (productive capacity) and of the host economy and the demand side (expenditures). As an example of the former, it has been argued that students are valuable to student centres as source of relatively high-skill, inexpensive and flexible labour, in particular for retail and entertainment sectors. Furthermore, graduates are more likely to be retained where they study, thereby subsequently stimulating the host economy. In terms of demand-side impacts we know that students consumption impacts are significant, but the money that funds these has to come from somewhere. Hence it is highly likely not only that student centres experience a positive stimulus, but that donor regions are negatively affected in terms of expenditure effects.



## 5 Expenditures and displacements of students in Scotland

To apply the model it is necessary to determine the spatial expenditure profiles of different student types and then determine the number of each student type by region. Once this has been determined it is possible to derive the expenditure and displacement impacts of different types of students over space.

### 5.1 HE students in Scotland

Table 3 below presents an overview of the student population in Scotland broken down by two dimensions, the student's origin and their term time residence. As the table reveals there were 173,463 full time equivalent HE students in the academic year 2007/08, thereof 3.4% had their term time residence in Highlands and Islands. Tracing through the rows in the table, we can see that of the students from the Highlands and Islands (H&I), about 60% stayed in the region, whereas 40% migrated to the ROS. However, there is little return migration of students to the Highlands and Islands, whether from within Scotland, the UK or further afield. However, the rest of Scotland benefits from significant in migration from the H&I the RUK and ROW.

Table 3: The HE student population in Scotland in 2007/08 (FTEs) disaggregated by term time residence (rows) and student origin (columns).

Term time residence / Domicile	HI	ROS	Total
H&I	5,689	3,831	9,520
ROS	168	121,150	121,318
Other UK	60	17,514	17,574
Non-UK	59	24,992	25,051
Total	5,976	167,487	173,463

A priori, the interregional student flow suggests a potentially large transfer

of demand from the H&I to ROS as consumption in the former is withheld in order to fund term-time expenditures in ROS. However, the magnitude of this interregional demand spill-over depends on a range of factors, such as how much the students spend during term time and how those expenditures are funded. Furthermore, the final outcome will hinge on economic structure, i.e. how knock-on impacts spill over regional boundaries.

## 5.2 Spatial distribution of students' consumption expenditures and displacements

The consumption attribution of Hermannsson et al. (2012, Table A3) is used as a starting point to determine the expenditure and displacement pattern of individual student types. Hermannsson et al. (2012) utilise the comprehensive survey by Warhurst (2009) for details of Scottish students' incomes and expenditures. They examine student's income in order to adjust gross expenditures for endogenous funding sources. They identify as endogenous 'Income from employment', 'within household transfers' 'other income' and 'income shortfall'. However, they add back an estimate for the new commercial credit taken out by students. This reveals that per student the impact of external students is larger than for local students. This is both because of the higher expenditure level expected for external students, but more importantly due to the fact that a greater share of their expenditures are exogenous than of local students. The simplifying assumption is adopted that external students from the RUK participate in the labour market, but ROW students do not.

Table 4 reveals how the consumption expenditures and displacements of individual students by type are divided across the region of study ( $U$ ) and the region of domicile ( $H$ ). The first case is that of 'local' students, as presented in the 2nd column of the table. As the two regions coincide ( $U = H$ ) expen-

ditures and displacements occur within the same region. For Scottish movers 'gross expenditures', 'income from employment' and 'spending attributable to new commercial credit' all occur within the region of study, while the 'Within household transfers', 'Other income' and 'Income shortfall' all displace expenditures within the region of domicile. As the table reveals, for movers the impacts in the two regions add up to the single region impact of Scottish students.

Table 4: Derivation of per student spending of different student types separately identifying direct impacts for region of study (U) and region of domicile (H), £.

Student type and sub-region of impact / Expenditure and income category	SCO 'Stayer'	SCO 'mover'		External
	U	U	H	U
Gross average student spending £	5,317	5,317		7,187
Income from employment £	-1,945	-1,945		-1,945
Within household transfers £	-453		-453	
Other income £	-570		-570	
Income shortfall	-1,073		-1,073	
Spending attributable to new commercial credit £	346	346		
<b>Exogenous average per student spending</b>	<b>1,622</b>	<b>3,718</b>	<b>-2,096</b>	<b>5,242</b>
Direct imports £ (32%)	-522	-1,197	675	-1,688
<b>Net change in final demand per student £</b>	<b>1,100</b>	<b>2,521</b>	<b>-1,421</b>	<b>3,554</b>

No survey evidence is available for the expenditures of non-Scottish students. Therefore, following Hermannsson et al. (2012) their expenditure level is proxied with that of Scottish students living independently as identified by Warhurst (2009). Similarly in the absence of more detailed information, the simplifying assumption is adopted that external students participate in the labour market to the half the extent as Scottish students (and hence  $d = 1,945/2 = 972.5$ ). Furthermore,  $\delta$  is the direct import share, which is equal across all student groups and fixed at 32.2% (equal to that of households in the Scottish IO-

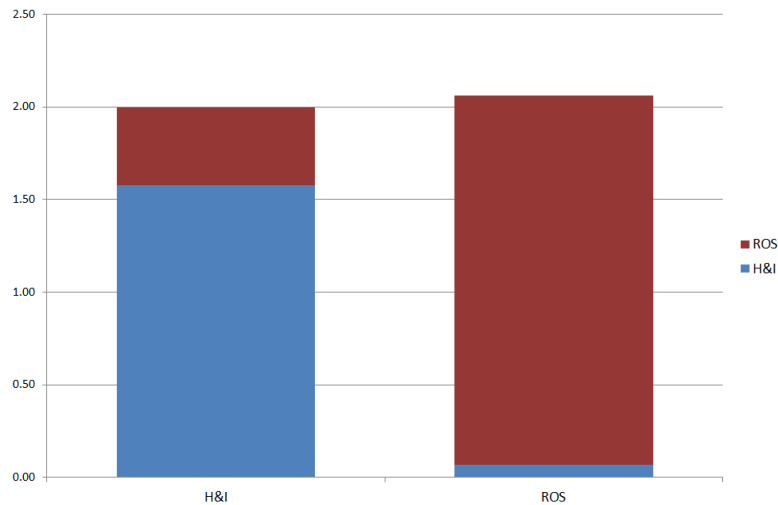
tables).

This attribution exercise shows that movers drive a significant impact in their region of study, but displace expenditures in their region of domicile. This suggests that regions that send away more students than they receive from elsewhere would suffer a negative demand impact.

## 6 Final demand and multiplier impacts of students

Given the spatial expenditure and displacement patterns of students' consumption expenditures, it is possible to determine the expenditures and displacements driven by a representative student of each type within a 2-region setting. Then it is straightforward to multiply the interregional expenditure and displacement matrices with a scalar for the FTE number of each student type to determine the aggregate final demand impact.

Figure 4: Interregional Type-II output multipliers of students' consumption expenditures.



The interregional Leontief inverse determines how final demand drives knock-on impacts both within the region directly impacted and across other regions. This is obtained by disaggregating the official Scottish input-output table for 2008 using employment based location quotients. The student expenditure vector is from (Kelly et al. 2004). The structure of these effects can be summarised as interregional multipliers. As Figure 4 reveals the largest share of knock-on impacts are realised inside the region where the expenditures occur, this is particularly the case for the ROS, which is a much larger region and hence more self-contained. However, for H&I a significant share of the knock-on impacts spill over into ROS. That is, for every 1 of final demand for the output in the H&I an additional 58p of output is supported within H&I and a further 42p in ROS.

Table 5 reveals the expenditure impact of each student type upon the H&I and how this impact is composed. For example, looking at the top row, we can see that there are 5,699 FTE students from Scotland that reside in the H&I. Each of these has a gross expenditure of £5,317, which multiplied by the population adds up to £30,248,000. However, not all of these expenditures are additional to the local economy as each student displaces consumption activities elsewhere in the economy to the tune of £3,718. Therefore, on balance, the final demand injection of the population of Scottish 'stayers' in the H&I amounts to £9,228,000. This drives a further knock-on impact (allowing for direct imports) of £3,619,000. In contrast, students from the H&I that move elsewhere to study drive an overall negative impact of £3,149,000 as can be seen in the third line of the table. On balance, therefore, we can see that the impacts of individual groups are significant but the overall impacts are muted as the positive and negative impacts largely cancel out.

For the ROS of Scotland, as depicted in Table 6, the impacts of individual

student groups are qualitatively similar. However, their composition is significantly different, which much more in-migrants, which alters the overall outcome.

Table 5: Expenditure and displacement impacts of students' consumption expenditures upon the Highlands and Islands, (£000's)

Student type	Number of students FTEs	Gross expenditure	Gross expenditure	Expenditure displacement per student	Displacement of student population	Final demand impact	Knock-on impacts incurred locally	Final demand + local knock on impacts	% of regional output
		s per student (£000's)	s of student population						
	A	B	C=AxB	D	E=AxD	F=C+E	G=FxM	H=F+G	
Stayers	5,689	5.32	30,248	-3.70	-21,021	9,228	3,619	12,847	0.09%
Movers in	168	5.32	893	-1.95	-327	566	222	789	0.01%
Movers out	3,831			-2.10	-8,030	-8,030	-3,149	-11,179	-0.07%
Externals	119	7.19	855	-0.97	-116	740	290	1,030	0.01%
<b>Total</b>			<b>31,997</b>		<b>-29,493</b>	<b>2,504</b>	<b>982</b>	<b>3,486</b>	<b>0.02%</b>

Table 6: Expenditure and displacement impacts of students' consumption expenditures upon the rest of Scotland, (£000's)

Student type	Number of students FTEs	Gross expenditure	Gross expenditure	Expenditure displacement per student	Expenditure displacement of student population	Final demand impact	Knock-on impacts incurred locally	Final demand + local knock on impacts	% of regional output
		s per student	s of student population						
	A	B	C=AxB	D	E=AxD	F=C+E	G=FxM	H=F+G	
Stayers	121,150	5.32	644,155	-3.70	-447,649	196,505	-124,168	72,338	0.04%
Movers in	3,831	5.32	20,369	-1.95	-7,451	12,918	5,067	17,985	0.01%
Movers out	42,506			-2.10	-89,093	-89,093	-34,943	-124,036	-0.06%
Externals	167,487	7.19	1,203,729	-0.97	-162,881	1,040,848	408,232	1,449,080	0.72%
<b>Total</b>			<b>1,868,253</b>		<b>-707,074</b>	<b>1,161,179</b>	<b>254,188</b>	<b>1,415,366</b>	<b>0.70%</b>

Tables 7 and 8 combine the results from tables 5 and 6 with the additional impacts of interregional spillover effects. This suggests spill over impacts are potentially very important for the H&I. However, this is very sensitive to the extent of spillover in the multiplier, for which estimates should be regarded as tentative. Not surprisingly, the reverse impact is negligible, that is the spillover impact of students attending HEIs in the H&I is small. This is purely the result of the relative scale of the two regions, i.e. few students in the H&I and large economy in ROS.

Table 7: Final demand, knock-on and spillover effects of students' consumption expenditures upon the Highlands and Islands, (& 000's)

Student type	Final demand	Local knock-on effects	Interregional spillover effects	Total impact of HE students upon	% of regional output
Stayers	9,228	3,619	9,055	21,901	0.15%
Movers in	566	222	595	1,384	0.01%
Movers out	-8,030	-3,149	-4,105	-15,284	-0.10%
Externals	740	290	47,961	48,991	0.32%
<b>Total</b>	<b>2,504</b>	<b>982</b>	<b>53,506</b>	<b>56,992</b>	<b>0.38%</b>

Table 8: Final demand, knock-on and spillover effects of students' consumption expenditures upon the rest of Scotland, (& 000's)

Student type	Final demand	Local knock-on effects	Interregional spillover effects	Total impact of HE students upon region	% of regional output
Stayers	196,505	-124,168	2,604	74,942	0.04%
Movers in	12,918	5,067	160	18,145	0.01%
Movers out	-89,093	-34,943	-2,266	-126,301	-0.06%
Externals	1,040,848	408,232	209	1,449,288	0.72%
<b>Total</b>	<b>1,161,179</b>	<b>254,188</b>	<b>707</b>	<b>1,416,073</b>	<b>0.70%</b>

## 7 Conclusions

This paper has analysed the expenditure and displacement impacts of students at HEIs in the peripheral region of the Highlands and Islands and compares this with the impacts of students in the rest of Scotland, as well as analysing spillover impacts. The results show that retained and incoming students support a modest share of output in the local economy (0.1%). However, this impact is undermined by the spatial demand-shift that occurs as students move to the ROS for study and displace expenditures in the H&I.

In contrast, students play a much more significant role in the ROS, where their consumption expenditures support 0.7% of total output. This difference is caused both by a relatively larger student population hosted in the ROS and

its composition, with a bigger share of external students, which bring in more additional spending.

Once interregional multiplier effects have been taken into account it seems likely that the H&I enjoy significant spillover impacts from the consumption expenditures of the student population in ROS. This should be interpreted with some caution as the exact degree of demand spillovers is sensitive to specification. None the less, it is clear that the H&I have some economic interest in the success of the ROS as an export focussed student centre. However, at the margin, the H&I have much more to gain from each additional student in the H&I rather than ROS. In fact, looking at the multiplier per student is about 23 ( $1.58/0.07$ ) times more valuable for the region if based in that H&I than if based in the ROS.

The fact that the local economic impact of students in the H&I is not negative is due to the significant degree of retention of local students in the area (approximately 3 out of every 5). However, the inflow of students from outside the region is very limited. Attracting students in return could provide a significant boost for the regions economy.

It should be noted that this study analyses solely the impact of students as consumers providing a demand side-stimulus. However, students interact with their host economy through a wider range of channels, such as through labour supply (Munro et al. 2009). Furthermore, students typically become graduates and there is some evidence that the location of study can influence their choice of future residence (e.g. Montgomery & Beeson 1993, Bound et al. 2004). In this role they further stimulate their host economy such as through labour productivity (Bradley & Taylor 1996, Harmon et al. 2003), knowledge exchange (Faggian & McCann 2006), externalities (Moretti 2004*a,b*) and potential socioeconomic feedback, such as on crime (Machin et al. 2011). Therefore, for future research it



would be desirable to examine students, not only as mobile consumers, but also in their many other roles that influence the economy, such as a flexible labour force. This would require an approach that explicitly identifies the supply-side of the economy, such as a through an applied general equilibrium model. Furthermore, it would be useful to consider the entire 'supply-chain' from students to graduates.

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