The Economic and Social Impacts of the University of Portsmouth on Its Local Economy

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This paper measures the economic impact of the University of Portsmouth and its consultancy company (the University of Portsmouth Enterprise Ltd. - UPEL) on the local economy, using a 107 by 107 sector local input-output (IO) table. (The IOtable is specifically constructed for this purpose). Thus, a more detailed (and hopefully accurate) means of measuring the total (i.e. direct, indirect and induced) effects of direct University spending is available than for other comparable studies. In addition to considering this economic effect through University (and UPEL) expenditure in the local economy, the study also considers the type and scope of the research work carried out by the University and whether it benefits the local economy. Finally, as a result of a recent survey of employers' use of graduates, a more detailed examination of the University's direct impact on the local labour market is undertaken.

INTRODUCTION

Universities play an important role in local economic growth and development, in particular through the network links that exist between them and other organisations. That is, the economic impact of universities goes far beyond local expenditure by the university, its staff and students, which generates regional income and employment. Production and service sector activities in the local economy are increasingly knowledge dependent, and universities are in a unique position to diffuse the knowledge gained from basic and applied research back into the local business community. Put another way, economic growth is not only dependent on current levels of efficiency and cost effectiveness in production; rather, quality-increasing activities are becoming more important, as well as an ability to keep abreast of the latest technological developments affecting industry, and it is here that a local university can influence growth in the region.

Smilor *et al.* (1993) argue that universities have begun to pay far more attention to their part in establishing and improving network links in the local economy. This is leading to the emergence of the "entrepreneurial university" which has a direct involvement in the commercialisation of research together with a more proactive approach to local economic development. Figure 1 sets out their model of what is driving this new paradigm, how the university responds, and thus the outcomes for the (local) economy. Firstly, the hypercompetitive nature of the economy has led to external and internal forces that are altering the university's research, teaching and service missions. This is facilitated through new and innovative linkages between the university and local organisations, with the outcome being various benefits both to the external community and internally. The external benefits are often apparent through increasing technology transfers (Dill, 1995), e.g.,





- the licensing and patenting of commercial applications of basic and applied research;
- providing technical and managerial assistance to entrepreneurs, especially in the small business sector;
- developing new technology in collaboration with business partners, through research and technology centres;
- managing facilities in support of new technology-based businesses; and
- making available the university's financial resources for equity in start-up businesses.

Notwithstanding this wider role, which suggests that the economic benefits to the local community are likely to be large, it is very difficult to measure such knowledge impacts and the extent to which technology-based firms rely on universities to provide R&D support or the strength of university-industry technology transfer links (Robson *et al.* 1995, Anselin *et al.*, 1997)). It is likely that for all but a small group of 'ivy-league' universities, the links are fairly specialised and cover only a small number of businesses in any local economy (Henderson *et al.*, 1998). Thus, in terms of the economic impacts on the local economy, it is easier to only measure the expenditure impacts of the university and consider such questions as to how many local jobs are directly and indirectly dependent on the university.

In addition to considering the expenditure impact on the local economy, two other specific areas are explored here in the context of the major activities of the University of Portsmouth: (i) the extent to which funded research impacts directly on organisations located in Portsmouth and south Hampshire; and (ii) the impact of the University on the local graduate labour market.

The paper proceeds as follows: the next section is concerned with measuring the economic impacts of a University on its local economy, and concentrates on methodology and data requirements.¹ Section 3 then looks at the external funding of research covering the academic years 1995/96 to 1998/99 and considers to what extent the research undertaken at the University of Portsmouth is likely to directly benefit local organisations. Section 4 presents an overview of some results from a recent survey of local employers that shows the extent to which these organisations use graduates, and the extent to which there are barriers to graduate employment.² Finally, there is a summary and conclusion that brings together some of the major themes covered.

Measuring the economic impact of the University of Portsmouth

With some 1,900 employees, the University of Portsmouth is one of the largest employers in the Portsmouth Travel-to-Work Area (TTWA). In addition to direct employment, there were 17,779 students registered with the University in the 1994/95 academic year, although not all were located in Portsmouth.³ Consequently, the University has a major role in generating expenditure, and thus jobs, in the local economy.

^{1.} Full details are contained in Harris (1997). More information on the input-output model used is provided in Harris and Liu (1998).

^{2.} The full results of this survey are available from: http://www.pbs.port.ac.uk.ac.uk/~harrisr/upcs.pdf.

^{3.} The student population in 1998/1999 was 17,606. Staff numbers are comparable to the figure quoted above, since university funding in the UK has continued to incorporate efficiency gains (i.e. increases in funding are usually at or below inflation so employment growth is severely constrained).

In order to calculate the impact of the University and its staff and students on the local economy, a 87×87 sector I-O table is used to measure the direct, indirect and induced impacts of University related expenditure. A brief outline of the methods used to construct the local I-O table is provided first, before setting-out how the various multipliers are calculated.⁴

Constructing the local Input-Output Table

The construction of a regional I-O table ideally requires survey-based information on sales and expenditure by industry that identifies inter-industry linkages, both between local industries and in terms of exports and imports of goods and services. While it is generally agreed that information on inter-industry linkages is generally too expensive to collect, Harris and Liu (1998) show there is still a need to survey local organisations to provide benchmark data on total sales/turnover, exports, total purchases of materials and supplies, imports of materials and supplies, and total labour costs. They argue that this is the minimum requirement to be able to construct a reasonably accurate regional I-O model, and they illustrate their arguments by comparing the survey-based 1989 Scottish table with two alternatives: a hybrid table using a mixture of survey and non-survey information, and the more common LQ-based non-survey approach. They find that the hybrid approach is reasonably accurate *vis a vis* a complete survey table, and thus it is this same methodology that is reported on here.

A survey of local organisations in the Portsmouth TTWA was undertaken in 1994 which obtained total sales/turnover, the percentage of sales exported, the percentage of materials and fuels imported, and total labour costs. This provided sufficient information to obtain I-O row figures relating to total inputs, intermediate purchases and imports (although these needed to be adjusted for sales by final demand, and taxes minus subsidies, using UK estimates), and income from employment for the intermediate sector of the IO table, as well as column figures for exports and total sales. As to final demand, the I-O column total for consumer expenditure was obtained by taking the local area pro rata share (using population figures) of the published Regional Accounts data relating to consumer expenditure for Hampshire county. Regional information on the total amount spent by Central Government and Local Authorities on final consumption goods is harder to obtain. Thus, it was necessary to assume that there is a strict one-to-one relationship between government purchases of final consumption goods and the numbers employed locally in various public sector industries. Information on local Gross Domestic Fixed Capital Formation and stocks and work in progress was also incomplete or non-existent, and again national estimates were broken-down using local employment shares available from the 1991 Census of Employment.

^{4.} See Harris and Liu (1998) for full details of the construction of the local I-O model.

Thus, reasonably reliable non-survey estimates for total final demand were constructed (export data already having been obtained from the local survey). What was missing were data on imports related to final demand for goods and services, as well as information on how the total figures are distributed across the 87 industries in the local I-O table. (Information on sales by final demand and taxes minus subsidies is also needed, and this was obtained from applying the ratios implicit in the UK I-O table —see Harris and Liu, *op. cit.*, for details). Missing information was filled-in using known row and column totals which needed to be allocated across the I-O table using initial guesses (from the UK I-O table) and a special computer programme which ensures that computer allocated row and column amounts equal these known totals. Details of the procedures used are provided in Harris and Liu *op. cit.* Table 1 provides an aggregated version of the Portsmouth TTWA input-output table, including the University sector.

	Extraction	Manufacturing	Construction	Distribution	Transport & Communication	Business Services	University ^a	Other Services	Total Intermediate	Consumers demand	Government	Fixed investment	Stocks	Exports	Total Final Demand	Total Output
Extraction	47	10	5	5	1	1	1	2	73	76	27	0	0	137	240	313
Manufacturing	15	115	31	26	8	22	0	10	227	136	170	145	18	1692	2160	2388
Construction	0	1	84	2	0	1	1	0	89	18	43	420	5	92	577	666
Distribution	4	9	8	15	5	2	1	2	45	522	26	17	0	15	580	625
Transport & Communication	5	9	5	35	29	13	1	5	101	119	37	5	0	209	370	471
Business Services	11	44	55	53	16	131	0	13	324	131	80	101	0	285	596	919
University	0	0	0	0	0	0	2	1	4	7	35	0	0	28	70	73
Other Services	7	24	6	10	6	17	2	54	127	515	793	0	0	184	1492	1619
Total Intermediate	89	213	194	146	65	187	8	87	989	1523	1211	686	23	2641	6085	7074
Imports	104	1199	220	111	94	270	16	165	2177	840	270	198	0	0	1308	3486
Income from Employment	67	582	147	212	249	273	43	1112	2684	0	0	0	0	0	0	2684
Balance	54	394	106	156	62	190	6	254	1223	199	-12	-2	0	12	197	1420
Total Inputs	313	2388	666	625	471	919	73	1619	7074	2562	1469	882	23	2653	7590	14664

TABLE 1. Portsmouth TTWA Input-Output Table, 1994 (f. million)

Based on a 87×87 sector table.

^a UPEL and the University combined.

The I-O table can be represented algebraically as: F = (I-A)X, where F is the column-vector of total final demand; I is the identity matrix; A is the direct (or technical) coefficient matrix; and X is the column-vector of total output. Consequently,

$$X = (I - A)^{-1} F$$
 (1)

which shows the total output generated for each sector by any final demand vector F. The matrix $(I-A)^{-1}$ is the usual Leontief inverse and each cell, r_{ij} , gives the amount of output needed from industry *i* in order to satisfy a £1 increase in the final demand for industry *j*.

Based on this approach, it is possible to examine the overall effect on output in the economy (and hence jobs, if we assume that for each industry the employmentto-output ratio is constant) of different final demand vectors (e.g., the consumer expenditure generated by staff and students), and the demand for goods and services emanating from the University. That is, the impact on output of staff and/or student consumer demand is obtained from:

$$X_{k} = (I-A)^{-1} F_{k}$$
 (2)

where F_k is a (1 × 87) column-vector of consumer spending on local goods and services by group k, and X_k is the consequential impact on local output. The impact on local income and employment can be measured by using the results obtained from equation (2), and then multiplying these by either W (the row vector of labour income coefficients)⁵ or L (the row vector of labour-output ratios).⁶

The impact of University non-wage expenditure in the local economy is measured by:

$$X = (I-B)^{-1} S$$
 (3)

where X is output in the economy dependent on S, the column vector of direct purchases by the University from local industry. The matrix B is equivalent to A but with the University inter-industry column and row removed. Again income and employment effects are obtained by multiplying through by W and L.

The difference between the direct expenditure (F_k or S) of University activities and the total impact (X_k or X) provides estimates of the multiplier effect, i.e., the proportional increase in local activity due to indirect and induced effects which are over and above the direct spending impact of the University sector. There are two types of calculations that can be used: if the Leontief inverse (I-A)⁻¹ is based on the inter-industry transactions matrix then a Type 1 multiplier effect is measured. However, this assumes that while spending by the University increases local sales through higher purchasing linkages throughout the economy, these extra sales do not generate additional employment. If more staff are employed, then total income

^{5.} That is, the ratio of income from employment to total inputs for each industry.

^{6.} That is, the ratio of total employment to total output for each industry.

levels will increase and some proportion of this extra income will be spent on goods and services, generating additional, higher multiplier effects. To include the induced effect of additional consumer spending, the consumer expenditure column vector in the I-O table can be added to the technical coefficient matrix A, thus allowing consumption to expand as part of the multiplier process when equations (2) and (3) are used to measure the impact of the University. This Type 2 multiplier effect is likely to be an over-estimate since it assumes that all additional income is spent. However, the Type 1 estimates are clearly an under-estimate since no allowance is made for additional consumer spending in the local economy.

Three basic sets of information are needed in order to measure the expenditure impact of the university: (i) the value of the University's local expenditure on materials and equipment (i.e., its non-wage expenditure); (ii) student expenditure within the local economy; and (iii) household expenditure by staff who live in the local area. In every case, it is necessary to include only local expenditures, and not expenditure which takes place outside the Portsmouth TTWA. It is to obtaining these data that we now turn.

University income and expenditure

It is crucial to be able to separate out that expenditure that takes place within the Portsmouth TTWA from that which occurs outside. Once the information on non-wage University expenditure is available, it can be used to calculate the extent of (backward) linkages between the University and the industries from which it buys. However, to make the I-O table operational, it is also necessary to have information on which local industries buy goods and services from the University, and thus detailed figures are required on both the income and expenditure side for the University, in terms of what is purchased and which industries buy educational services, *and* in terms of the location of these buyers and sellers.

The estimates of income and expenditure for the year ending 31 July 1995 used in this paper are mostly based on the official figures presented in the University's *Report to the Board of Governors.* In order to be able to allocate amounts to specific industries and geographic areas, it was necessary to make use of the expenditure and sales ledgers since these contain information on names and addresses. However these ledgers are not wholly appropriate for the present purposes,⁷ and it was only

^{7.} In particular, the expenditure ledger is used for every type of purchase (e.g., income tax, national insurance and pension payments are recorded, as are unpaid cheques) and in many instances the information given on particular items was insufficient to make out who the payee is and where they are located. Given that this ledger contained 74,199 items, it was only possible to identify \pm 70.117 million of the \pm 73.694 million recorded in the University official accounts. The missing 4.8 % relates to the "other services rendered" and "other income" categories recorded in "Other Operating Income" in the Report to the Board of Governors for 1995.

possible to identify 95.2 % cent of the official income and expenditure arising from activities in 1994/95. Table 2 summaries the basic data on income and expenditure. With regard to the former, $\pounds 2.8$ million was from sales to Portsmouth TTWA customers (of which $\pounds 1.4$ million was generated by the short course and consultancy activities of the University of Portsmouth Enterprise Limited - UPEL) and $\pounds 6.5$ million resulted from sales to the rest of the UK and overseas.⁸ The major source of this income is from short courses and research grants and contracts, and the University was able to generate some $\pounds 1.3$ million from the use of its residences, catering and conference facilities.

Income	£m	Expenditure	£m
Government (mostly HEFCE)	35.0	Income from Employment	42.7
Student fees:		Purchases	
local (i.e. PO1-PO11)	3.7 <i>local (i.e.</i> PO1-PO11)		7.0
rest of UK	15.1	rest of Hampshire	3.0
overseas	4.1	rest of England	14.2
Hall fees & leasing	2.8	rest of UK	0.2
Sales (short courses, contracts, etc.)		overseas	0.0
local (i.e. PO1-PO11)	2.8	Balance (depreciation, etc.)	3.0
rest of Hampshire	0.7		
rest of England	5.3		
rest of UK	0.0		
overseas	0.5		
Total	70.1	Total	70.1

TABLE 2. Portsmouth University Income and Expenditure, 1994/95

The most important source of income was the £35 million received from the HEFCE in the form of grants to fund the continuing educational operations of the University. Student fees amounted to £23 million. Finally, the letting of halls and leasing arrangements with students provided some £2.8 million. Thus, the University generated £25.7 million in terms of exports (comprising fees from students coming from outside the Portsmouth region and sales to individuals and industries located outside PO1-PO11).

^{8.} The information on sales was drawn from over 4,700 entries in the University's sales ledger, since this provided names and addresses of those individuals or organisations who purchased services. This allowed each transaction to be mapped to a location (and industry if the payment originated from within the Portsmouth TTWA area).

On the expenditure side, around £7 million was directly spent in the local economy while £17.4 million comprised imports of goods and services from the rest of the UK and overseas. Local expenditure (which included internally some £0.83 million in transfers to UPEL and the Students Union) was allocated to 87 industry groups, with the major items comprising £0.75 million to the electricity industry; £0.95 to construction; £0.5 million to hotels and catering; £0.28 million to the telecommunications sector; £0.48 million to public administration; £0.63 million to other education providers; £0.76 million to health services; and £0.3 million to recreation and welfare services. Purchases from outside the region were not grouped by industry, because of the time it would have taken to code the 58,813 entries which were identified as imports.

The single most important item of expenditure in Table 2 is the £42.7 million spent on labour costs,⁹ which includes employers' contributions to social security and pension costs. The remaining item of expenditure is a balancing item of £3.1 million to cover depreciation and other non-identified costs.

Student fees (amounting to $\pounds 23$ million in 1994/95) can also be classified according to where they originated.¹⁰ Overseas students, as a subgroup, accounted for 18% of fee income, while 16.3 % (or $\pounds 3.74$ million) was generated from students whose address prior to entry was given as the Portsmouth TTWA. The rest of Hampshire was the next major catchment area (11.2%), followed by counties to the east and north east of Portsmouth, rather than to the west, where it might be expected competition for students is lower. The University is clearly dependent on the South of England for its UK student population (since at least 52.7% of nonoverseas income comes from only seven counties in the South East),¹¹ although every county in the UK (except for the Hebrides and Shetland Isles) sent some students to Portsmouth during 1994/95.

Separate detailed information on the income and expenditure of the University's business company was also collected. It also spends in the local economy, and receives income from selling its services to local businesses. Table 3 shows that most of UPEL's income came from outside the Portsmouth TTWA (£2.37 million, or 74%),¹² while in terms of expenditure the company mainly purchased from the local economy

^{9.} An additional ± 2 million was spent on enhancing pensions, but this has been omitted from the current expenditure figures on labour costs, since it comprises an extraordinary payment.

^{10.} These figures are compiled from the postcode variable in the 1994/95 HESA return which covered all 17,779 students listed with the University, together with information on course fees which had to be merged into the HESA file. Note some 6.5 % of fee income was from students with no known postcode address.

^{11.} The figure could be nearer 60.7 % if all the students with no known postcode are allocated to these counties.

^{12.} The sectors which provided most of the \pounds 0.31 million local (non-University) demand for consultancy and short courses were: pharmaceuticals, the office machinery sector, health and personal services.

0 0	1		
Income	£m	Expenditure	£m
University	0.4	Income from Employment	0.6
Sales		Purchases	
local (i.e. PO1-PO11)	0.4	University	1.5
rest of UK and overseas	2.4	local (i.e. PO1-PO11)	0.3
		rest of UK and overseas	0.5
		Balance (depreciation, etc.)	0.3
Total	3.2	Total	3.2

TABLE 3. University of Portsmouth Enterprise Ltd. Income and Expenditure, 1994/95

(£1.83 million) with most of the local expenditure (82%) going to the University, partly in payment to staff for consultancy services (£0.75 million) and partly for fuel, light, power and accommodation (which were purchased through the University). Other than expenditure that went through the University, the only *major* items of local expenditure amounted to £0.11 million to the hotels and catering sector and £0.15 million to other educational establishments. The cost of UPEL employees amounted to £0.57 million, while the balancing item (covering depreciation and profits) amounted to £0.34 million.

Student and staff local expenditure

The student population can be disaggregated into those that live in the Portsmouth TTWA and those that live outside, with the latter also contributing to local expenditure since this group spends a significant proportion of their time at the University.¹³ The basic data available was the 1994/95 HESA accounts, which lists all 17,779 students that were at some time registered with the University during the academic year. Of this total, 2,224 students were immediately excluded as belonging to an external category which covers distance learning students, those taught by other institutions on a franchise basis, and sandwich and language students and others who took a year out.

^{13.} Note, information was collected directly from students on where they lived and the proportion of expenditure incurred in the Portsmouth TTWA. No information is available separately on expenditure by staff or other consumers relating to spending outside the region, or spending by in-commuters living outside the TTWA. It is assumed that the I-O figures for consumer expenditure accurately take into account these injections and leakages.

The remaining 15,555 were allocated to the Portsmouth TTWA or elsewhere on the basis of the term-time accommodation and home address markers in the HESA database. This approach is not straightforward and involved certain assumptions, as detailed below. The 1,770 students recorded as living in halls were clearly located in Portsmouth. Those students classified as living in their parents' home in the PO1-PO11 area were assumed to have Portsmouth-based term-time accommodation. It was also assumed that foreign students listed as living in their parental home during term-time were living in Portsmouth. Of the 637 students from the rest of the UK who were classified as living in their parents home, 94.3 % lived in adjacent counties (Dorset, Hampshire, London, Isle of Wight, Surrey, and East & West Sussex), and thus it is assumed that this category lived outside the Portsmouth TTWA.

Students whose home address before coming to University falls within the postcodes PO1-PO11 and who were registered as living in their own home during term-time were assumed to be located in the Portsmouth TTWA. Overseas students living in their own home were likewise allocated to a Portsmouth term-time address. Of the 2,055 students from the rest of the UK who stated they lived in their own home during term-time, 78.7 % lived in adjacent counties (see above list), and were consequently assumed to live outside the Portsmouth TTWA. Assuming this to be correct, it indicates that a sizeable number of students were prepared to travel quite a long way to attend lectures at the University.

Lastly, all students listed as having "other accommodation" term-time addresses were assumed to rent in the Portsmouth TTWA. This is a necessary assumption based on incomplete data, and while it inevitably overestimates the true figure, it is not likely to be incorrect by very much.

Having obtained "raw" numbers of students allocated to Portsmouth or elsewhere, it is necessary to convert the figures into Full-Time-Equivalent. This was done using two further sets of information contained in the HESA database:

- 1. The month when the course was started and the month when the student left the course, during the 1994/95 academic year, were used to calculate the proportion of the 10 month academic year that the student was with the University. This takes account of those students who leave early and do not complete, whose course is less than a full year, and those whose course ends before July.¹⁴
- 2. The HESA database also contained a variable STULOAD which is a FTE measure used to calculate the proportion of the year a student spent in Portsmouth on the course (e.g., any sandwich students not picked up earlier would be covered by this variable).

^{14.} Postgraduates were treated in a similar way, but using a longer academic year.

The outcome of applying these two corrections is the number of FTE students attached to the University, by geographic location (Table 4).

Category	Living in PO1-PO1	1	Living outside PO1-PO11		
	raw numbers	FTE	raw numbers	FTE	
Undergraduate (full-time)	9,190	8,693	1,320	1,246	
Undergraduate (part-time)	671	271	664	293	
Postgraduate (full-time)	541	495	75	70	
Postgraduates (part-time)	487	232	438	206	
Further Education (full-time)	432	364	154	115	
Further Education (part-time)	1,542	847	41	21	
Total	12,863	10,902	2,692	1,951	

TABLE 4. University of Portsmouth Student Population, 1994/95 (excluding 'external' students)

A survey of student weekly expenditure was undertaken¹⁵ to obtain information on average weekly expenditure by type of student (e.g., undergraduate and postgraduate) together with where they lived and how much they spent in the Portsmouth TTWA and elsewhere. The average amount spent on various items was then multiplied by 30 (weeks) for undergraduates and FE students, and by 45 (weeks) for postgraduates. The resulting amounts were then multiplied by the number of "FTE" students in each relevant category to give total annual expenditure in the Portsmouth TTWA.

FIGURE 2. Student Expenditure in the Portsmouth Travel-to-Work Area, 1994-1995



^{15.} This survey of some 400 students was undertaken in late 1994 by staff from the Centre for Local and Regional Economic Analysis in the Department of Economics, University of Portsmouth, prior to undertaking the current study. My thanks to Jeff Grainger and the *CLREA* team for permission to use their survey results.

Figure 2 shows that annual expenditure in the local economy amounted to £33.4 million, most of this from students living in the Portsmouth TTWA. The various items of expenditure identified in the diagram are treated as consumers' expenditure in the local economy (and this is how it is presumed they enter the I-O table). Certain assumptions have to made about which industries are affected and how much of the £33.4 million is spent on locally-produced goods as opposed to goods which are imported into the region, with the result that student spending on goods and services produced locally is judged to amount to £23.8 million with the remaining £9.6 million being spent on goods and services bought locally but imported into the area (Table 5 in Harris, 1997, provides details).

1774/77			
Category	Number	Net Annual Salary ¹	Annual Expenditure ¹
Living in PO1-PO11		£m	£m
Academic	471	8.4	6.6
Manuals	185	1.1	1.0
Support & Research	712	6.5	5.5
Living outside PO1-PO11			
Academic	330	5.8	4.6
Manuals	14	0.1	0.1
Support & Research	266	2.8	2.4

TABLE 5. Income and Expenditure by Portsmouth University Staff by Type and Location, 1994/95

1. For academic staff, amounts include net payments from UPEL for consultancy.

 1.978^{2}

Total

2. This figure is larger than the 'official' University total of 1,885 since all employees (including temporary workers) who received a wage in 1994/95 are included in Table 5.

24.7

20.1

As to staff expenditure, information was made available by the University on every individual who received a wage payment in the 1994/95 period, comprising a breakdown of the annual amount paid, the status of the individual (in terms of whether they were academic staff, manual, or support/research staff) and their home postcode address. Table 5 summarises University employees by type and location, showing in particular that a sizeable proportion of the academic staff (17% of all employees) lived outside the Portsmouth TTWA area.

Since consumption expenditure is based on disposable incomes, it is necessary to calculate net salaries for staff, and then relate these to expenditure. Tax, National Insurance payments and pension liabilities were subtracted from gross incomes, using Inland Revenue information on an individual's allowances against tax, plus the rate at which individual's are liable for contracted-out NI contributions and for the two main occupational pensions schemes in use. It was assumed that 50% of staff could claim the higher married persons' allowances, although changing this percentage alters the final results by very little. Note, information was not available on other income earned from other sources, and thus tax liabilities must be considered here as a lower limit.

UPEL paid £750,000 to staff for consultancy, and after deducting an estimate for tax, NI/pensions and assuming that payments went only to academics (of who 57.1 % live in the Portsmouth TTWA), the UPEL addition to disposable income for staff living in Portsmouth was nearly £289,000. Thus, total net disposable income available for spending in the Portsmouth TTWA was £16 million in 1994/95. This estimate of disposable income has to be adjusted in three ways in order to arrive at the direct impact of staff expenditure in the local economy. Firstly, savings must be subtracted from income to obtain expenditure. Then only the spending of those staff who it is presumed would leave the area (if there was no University) should be counted in terms of their impact; those staff who would remain in Portsmouth and who would claim unemployment benefit should be omitted. Lastly, some of the expenditure by staff is on imported goods and services which, because they are not produced locally, do not affected local output and employment levels.

Savings were calculated by applying estimates for different groups of the marginal propensity to consume (*mpc*) out of disposable incomes. The *mpc* for academics was obtained from regressing (the natural logarithm of) individual household expenditures on (the natural logarithm of) household disposable income, using individual household data from the 1993/94 Family Expenditure Survey.¹⁶ Only households where the head-of-household (HOH) was employed full-time and belonged to the "professional workers (employees)" occupation group were used in the analysis. The resulting estimate of the *mpc* was 0.78.¹⁷ The data for manual workers was based on households were the HOH was a semi-skilled manual (*mpc* = 0.9),¹⁸ while the results for support and research staff were based on households where the HOH belonged to the junior non-manual occupation group (*mpc* = 0.84).¹⁹ Multiplying staff disposable incomes by their respective estimates of the *mpc* gave estimates of expenditure (Table 5), and thus savings.

It is assumed that all manual employees and 52 % of support and research staff²⁰ would stay in the Portsmouth TTWA if the University did not exist. If it is

^{16.} The variables used from the FES comprised P550 (total household spending) and P344 (gross normal weekly household income).

^{17.} The model's R^2 (goodness-of-fit) was 0.53, based on 236 households. The *t*-value attached to the *mpc* was 16.2. Diagnostic tests for the residuals indicated that there were no problems with regard to non-normal residuals. Some experimentation was undertaken with regard to 2SLS estimates to account for potential simultaneity bias (instruments included age of the HOH and other aspects of human capital), with the results obtained being fairly close to those obtained using simple OLS.

^{18.} The model's R^2 was 0.70, based on 252 households. The *t*-value attached to the *mpc* was 24.2.

^{19.} The model's \mathbb{R}^2 was 0.71, based on 264 households. The *t*-value attached to the *mpc* was 25.2.

^{20.} Individual information separating out support from research staff was not available. However, separate figures on the proportion of the total which comprises research staff and senior support staff suggested that a figure of 48 % comprising migrants was not unreasonable.

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further assumed that 50% of non-migrants are married, and thus could claim the married persons' additional allowance, then the total sum amounting to unemployment benefit for those who would remain in the Portsmouth TTWA equals approximately \pounds 1.7 million. Subtracting savings and unemployment benefits from disposable income gives a sum of \pounds 11.4 million in terms of spending by local staff. This is presumed to be distributed across consumer expenditure categories in the I-O table in the same way as expenditure undertaken by all Portsmouth households. Thus, 40.6 % (or \pounds 4.6 million) is spent on imports (or is taken up in VAT and other taxes), giving \pounds 6.75 million net expenditure in the Portsmouth TTWA which would be lost if the University did not exist or were to close.

The expenditure impact of the University

To measure the impact of the University sector, Equations (2) and (3), based on Type 1 and Type 2 Leontief inverse matrices, can be used along with the estimates previously obtained of direct University non-wage expenditure (\pounds 6.2 million), spending by UPEL (\pounds 1.7 million), consumer spending by students (\pounds 2.8 million), and consumer spending by staff (\pounds 6.8 million).²¹ Table 6 summarises the results, showing that direct expenditure of \pounds 38.5 million results in additional local output of between \pounds 9.3 - \pounds 27.9 million. This is equivalent to an output multiplier effect of 1.24 (Type 1) or 1.73 (Type 2). Thus, every increase in expenditure by the University sector of \pounds 1 results in an additional 24 - 73p of indirect and induced spending in the Portsmouth TTWA economy, with the higher figure likely to be a much better indicator of the full impact.

		Type 1			Type 2		
	Direct spending	Output	Employ- ment ¹	Income	Output	Employ- ment ¹	Income
University	6.2	7.3	205	2.8	10.0	272	4.1
UPEL	1.7	1.9	40	1.1	2.7	59	1.4
Students	23.8	30.9	721	11.3	42.6	1010	16.3
Staff	6.8	7.7	196	3.4	11.1	282	4.8
Total	38.5	47.8	1,162	18.6	66.4	1,623	26.6

TABLE 6: The Total Impact of the University Sector (£, million) in the Portsmouth Travel-to-Work Area, 1994/95

1. Employment figures are converted to full-time equivalents.

^{21.} Note, all the figures used here are net of sales by final demand and taxes (minus subsidies). Thus, the University and UPEL figures are lower than previously reported.

In terms of employment in the local economy, Figure 3 shows that between 1,029 and 1,490 full-time equivalent jobs are dependent on the University sector,²² in addition to the 1,885 directly employed by the University. Thus, in the absence of the University it is estimated that the local economy would employ something like 3,375 fewer people (which is equivalent to around 2.1 % of the employed workforce). The major sectors where jobs would be lost include Distributive Services (698 jobs), Other Services (371 jobs), and Transport & Communications (157 jobs). These figures indicate that the employment multiplier effect of the University sector is between 1.55 and 1.79.²³





EXTERNAL RESEARCH FUNDING AND ITS LOCAL IMPACT

This section looks at the external funding of research covering the academic years 1995/96 to 1998/99 and considers to what extent is the research undertaken at the University of Portsmouth likely to be directly benefiting local organisations.²⁴

^{22.} The difference between these figures and the totals reported in Table 6 is that Figure 3 excludes intra-University jobs dependent on University expenditures.

^{23.} These multipliers are larger than the output multipliers, indicating that the University has a greater impact in terms of jobs on employment intensive service sector industries.

^{24.} The figures considered here would have been allocated to "sales" in Table 2, although we are dealing here with the post 1994/95 period.

Not all research is funded by outside agencies; indeed a substantial proportion of government (i.e. mostly HEFCE) funding that is used to pay academic salaries can be said to cross-subsidise generic research (the consequences of this are currently being debated in the University sector). But research supported from outside funding will incorporate specific industry and regional links directly benefiting from this research, since universities generally "charge" for research outputs that are tailored to specific needs. The only other major source of funding not included here is the operations of the University's consultancy company (UPEL), but in recent years this has fallen substantially as any research that is deemed to have a public element to it (i.e., external benefits to more than just the client) has been classified to the research accounts of the University and not UPEL.²⁵

There were 487 externally-funded research projects undertaken by the University of Portsmouth between 1995/96 and 1998/99, totalling to \pounds 13.9 millions. These have been classified by source (using a classification derived by government) and by allocating projects on a spatial basis. The latter comprises projects deemed to have no specific local impact (where local refers to the approximately the Portsmouth TTWA); those commissioned by companies that have a presence in the local economy but the projects resulted in outcomes that would benefit the company more widely (e.g., in the UK or international operations); and projects commissioned by local organisations to study specifically local issues (note, the majority of these projects were undertaken for local authorities or similar bodies in the public sector).

Figure 4 shows that research directly related to UK industries only accounted for some 14% of income during the period, with the largest benefactor being UK government (including local and health authorities), followed by the EU and UK charities. In terms of local content, income during the 4-year period amounted to only 13% of the total, most of it benefiting government agencies (specifically local authorities). Only 21% of research undertaken for UK-based industry is deemed to have a local orientation. This suggests that either the University of Portsmouth has missed opportunities to exploit local entrepreneurial content, or is it simply that research (as opposed to consultancy) is more general and likely to have external economies that local organisations would find difficult to appropriate and therefore internalise?

The impact of the University on the local graduate labour market

The present author recently undertook a survey of local employers in order to understand more fully the workings of the graduate labour market in South Hampshire. While information is more readily available on the supply-side of the graduate mar-

^{25.} UPEL income in recent years has fallen to probably only £300k.







UK Based Industry

14%

ket (e.g., information as to who are more likely to be graduates, their characteristics, and occupations; and information on graduate employment profiles after entering the labour market – e.g. DfEE, 1999), there is little data with which to build-up a picture of the demand for graduates by organisations of different size and sub-sectors. Thus, a postal and telephone survey was undertaken in November/December 1999 to collect information relevant to understanding more clearly such factors as which types of organisation employ graduates, what type of jobs are "graduate jobs", why graduates are not recruited, and various other factors associated with the graduate labour market. Details with regard to the conduct of the survey, the population covered and response rates are provided in Harris (2000).

The Extent of Market Penetration by Graduates

The information provided by the postal/telephone survey on the percentage of organisations in South Hampshire that employ indicates that across all sub-sectors 58.5% of organisations employ at least some graduates, particularly large organisations and those in the Banking & Insurance sector and organisations located in the semi-urbanised hinterlands surrounding Portsmouth and Southampton. This is mostly as would be expected given supply-side information that is available from the UK Labour Force Survey.

While some 58% of organisations employ graduates; this does not take account of the proportion of staff with a degree. Figure 5 therefore presents information on the percentage of graduate staff in each sub-group, and which of last year's recruits were graduates. Some 17 % of employees in the area were graduates (with just over





6 % of 1999 recruits holding degrees).²⁶ The depth of graduate employment is clearly lower than the number of organisations with graduates which is to be expected given the proportion of graduates in the labour force. However, graduate employment in medium-sized organisations (defined here as those with 25-99 employees) is significantly lower than the proportion of such organisations that employ at least some graduates. This might imply that there is something different about the nature of graduate jobs in these organisations (something to which we return to below).

A large proportion of the workforce in the production sector has university degrees, even more than those employed in banking, insurance and finance. In contrast, a much smaller percentage of employees in other services (which includes education and health) are graduates, and only some 3% of employees in the distribution, transport and communications sectors have degrees. While this spread across the different industrial sectors is similar to the broad pattern of graduate employment across the same sectors in the UK, the production sector does seem to have a particularly high level of graduate coverage while other services seem to be rather underrepresented. Again graduate employment is high in semi-rural areas of Fareham and Eastleigh when the actual numbers of graduates is considered, rather than just the number of organisations that employ graduates.

The proportion of the workforce recruited in (mostly) 1999 with university degrees was just over 6%, with the pattern of recruitment similar to the pattern of graduate concentration, although on a smaller scale. There is insufficient information available to say whether this lower level of graduate recruitment, if repeated yearby-year, would result in a declining level of graduate penetration into the labour market, since we would need to know more about the turnover of graduates and non-graduates in the labour market before being able to reach conclusions about what was happening to the net stock of graduates.

Thus, these data suggest that graduate employment opportunities are concentrated in specific sub-sectors of the labour market, such as the smallest and largest organisations, those operating in the production and banking and finance sectors, and establishments located on the outskirts of the major cities in South Hampshire.

Defining graduate jobs

After graduating from Universities and other Higher Education institutions, many graduates do not immediately obtain what may be termed a graduate job – that is, a job typically filled by graduates or one where use is made of the degree either directly or indirectly. A recent study (DfEE, 1999) defines a graduate job as whether a degree is used in performing a job (i.e., where the employee uses their subject/discipline knowledge or skills when performing the functions of the job). However, while a

^{26.} Data from the 1996 Quarterly Labour Force Survey provides a figure of 15.4% of the workforce being graduates in the South East (excluding London).

FIGURE 6. The Changing Composition of Employment in Graduate Jobs: subjective measure



Source: Moving On: Graduate Careers Three Years After Graduation, a report to the DfEE, 1999.

degree may or may not be required to gain a job, the degree skills and knowledge may or may not be used in the work environment. Thus, there are a number of permutations when measuring graduate jobs. Figure 6 reports the profile of jobs obtained by graduates after leaving the HE sector in 1995, for the 3¹/₂ years following graduation. Initially, less than 33% of graduates entered jobs where the job required a degree that was then used in performing the job. Upon graduation, the highest proportion of graduates took jobs that required no degree and where they did not use the skills/knowledge gained as part of their degree programme. As with the objective definition of a graduate job, as time elapses graduates filter into graduate jobs where they use their skills and knowledge, although after 42 months only some 55% of graduates filled graduate-entry jobs where they use their degrees.

This information on defining a graduate job helps to explain the information collected in the survey covering employers in South Hampshire. Organisations were asked to state, with respect to graduates recruited in the previous year, what percentage were to jobs:

- Where a degree was not a minimum requirement.
- Which specified a degree as a minimum requirement.
- Which specified a degree and relevant experience as a minimum requirement.

Figure 7 presents the results (based on data relating to the number of graduates recruited, rather than the average percentage of organisations responding to each category). Small and large organisations recruited mainly graduates who required a degree or a degree with relevant work experience (the latter is especially important to the smallest enterprises), while medium-sized organisations (where graduate employment is low – Figure 5) were willing to accept graduates for non-graduate jobs. In terms of different industrial sectors, the small proportion of graduates recruited to the distribution, transport and communications sectors generally did not take up graduate jobs, while many of the jobs in the other services sector were also, by definition, non-graduate employment. In contrast, the production sector and banking, insurance and finance recruited a significant proportion of their graduates to jobs where a degree was needed and often required relevant experience as well.

In total, over 15% of the graduates recruited (mostly) in 1999 went to nongraduate jobs; some 44 % were recruited to jobs that required a degree as a minimum requirement; and over 40% of graduates needed both a degree and relevant experience to secure employment.





Reasons Why Graduates are Not Employed

Over 41% of the organisations operating in South Hampshire (and covered by the survey) did not employ any graduates. These were therefore asked to rank the reasons why they had no graduates, covering *inter alia*:

- The company is too small to employ graduates;
- Graduates are too expensive and cannot be afforded;
- Past graduates did not stay;

- The organisation has not considered employing graduates.
- The work undertaken is not suited to graduates.
- The organisation prefers staff with more experience.

Figure 8 presents the major barriers to graduate employment, by size of the organisation, industry sector, and location. Overall, nearly 58% of organisations without graduates stated that the most important reason was that the work they undertook was not suited to graduates, while 15.4% stated that they could not afford graduates and another 15.4% thought that graduates lacked the necessary experience required to work in the enterprise. Interestingly, only a small percentage (less than 4%) had not considered employing graduates while past failures to retain graduates did not feature as a main reason for having no graduate employees. Clearly, there is a strong perception that graduates are not likely to "fit" into the organisation.

The smallest organisations were more likely to believe that graduates are not suited to their line of work, and (importantly) this far outweighed (by a ratio of nearly 3:1) any belief that they were too small to employ graduates. Some 50% of the medium-sized organisations were also of the view that graduates were not suited, although experience also plays an important factor for over 37% of the respondents. None of the larger organisations (employing over 100) stated that they do not currently recruit graduates or that they did not expect to (which accounts for why not all organisations in this size-band employ graduates but none of the organisations suggested their were any barriers to graduate recruitment now or in the future).

The reasons for not employing graduates are more polarised when looked at by industrial sector. In the production industries, the major barrier to further graduate entry (where market penetration is relatively high) relates mostly to the perception that the work undertaken in the organisation is not suited to graduate employees. This may suggest that plants of this type produce low technology goods and services that involve few innovations and the use of older technology (certainly the plants covered are relatively small, with an average size of just 14 workers). Previous analysis of small manufacturing plants in the Portsmouth area (Harris, 1995) suggested that many did not use best-practice technology, and continue with products that have been in existence for a considerable length of time. It is likely that this type of plant would not see the potential benefits from employing graduates, but this would need to be substantiated in further work.

In the distribution, transport and communications sector the major reason for not employing graduates is the perception that the business is too small. This suggests that these firms believe that they would under-utilise graduates, and not obtain a sufficient return. Again, this might suggest that this type of potential barrier is more perceived than real, and more information is needed to understand the nature of the concerns being expressed.

Banking, insurance and finance companies without graduates state the overwhelming reason for this is a lack of experience, and this suggests that these organisations



FIGURE 8. Major Reason for Not Employing Graduates, South Hampshire 1999

require more specialised knowledge (certainly, they tend to be larger organisations with an average size of 60 employees). Organisations in the other services sector think that graduates are too expensive, which may reflect the type of skills expected of them or an expectation that graduates want too high a return on their human capital.

Lastly, Figure 8 shows that Fareham and Eastleigh organisations that do not employ graduates are mainly concerned about the suitability of graduates. This mostly reflects that fact that over 82% of this sub-group are in the production sector (see the discussion above). A similar situation holds for Southampton, while Portsmouth and Gosport have a greater spread across different industry sectors.

Graduate occupations and whether graduates are preferred/not preferred

Graduates are much more likely to be found in certain occupations: for example, natural science occupations, as engineers/technologists, as business/finance professionals, as architects/planners/ surveyors, etc. Thus, organisations were asked to state whether they currently employed graduates in certain occupations, whether they were recruiting to these occupations in the following 12 months and, if they were, whether they preferred to recruit graduates. Figure 9 shows the percentage of respondents who said that they employed graduates in the 18 occupations that were listed. Managers are well represented (partly because they are a major proportion of the workforce and have a relatively high graduate penetration), as are engineers/technologists, business/finance professionals, and other professionals. Sales staff and clerical/secretarial are



FIGURE 9. Occupations Where Graduates Currently Employed, South Hampshire 1999

also well-represented, partly because of the relative importance of these occupations but also because these occupations are often the easiest points of entry into many organisations for graduates. As expected, manual occupations (other than sales and clerical) are much less likely to have graduate employees.

Figure 10 shows (for those occupations where graduates are more likely to be present) whether organisations were planning to recruit staff and whether they preferred graduates. Clearly, organisations do not think that graduate status is necessary, let alone sufficient, when recruiting staff to what would normally be termed graduate occupations (e.g., engineers/technologists; business/finance professionals). This in part suggests that they do not regard the skills and knowledge gained as being essential to providing the human capital services required by the organisation.

FIGURE 10. Whether Planning to Recruit in Next 12 Months and Whether Prefer to Recruit Graduates



Difficulties in recruiting graduates

Nearly 19% of respondents stated that they have had difficulties when trying to recruit graduates in the past. Those organisations were then asked to rank the most important reasons for the difficulties experienced. The options to choose from included:

- Because graduates did not apply.
- Pay expectations were unrealistic.

- There was no clear career path for graduates;
- The graduates had inappropriate qualifications and/or skills; or
- Their training expectations were unrealistic.
 - (The respondent could also provide their own specific difficulty if necessary.)

Figure 11 indicates the most important recruiting difficulties experienced at any time in the past. In nearly 45% of organisations that had had difficulties, unrealistic pay expectations was the most important reason; the next most important category is inappropriate qualifications and/or skills (21.6%); while difficulties in attracting graduate applications also features significantly (nearly 20% of relevant organisations experiencing this problem). Given previous work on how graduates adapt in the labour market following entry (cf. *Moving On: Graduate Careers Three Years After Graduation*, a report to the DfEE, 1999), it might be expected that the initial valuation of their human capital by graduates often exceeds employers valuations, since the latter can be recruiting to non-graduate jobs and/or to graduate jobs that require more specific experience (that can usually only be achieved through job-related experience in the work-place). This suggests that many graduates lack both a clear perception of what employers expect, and a sufficient range of skills that will make them sufficiently productive at the beginning of their career.



FIGURE 11. Most Important Difficulty in Recruiting Graduates

Implications of University impact on graduate labour market

The recent survey undertaken by Harris (2000) on behalf of the University of Portsmouth Careers Service provides important information on the demand-side of the graduate labour market. However, it also raises many questions that require a more in-depth study to be undertaken that can obtain from employers the reasons why they employ graduates, for what type of jobs, and with what benefits (and costs).

The major topics covered have included the extent to which graduates are able to obtain employment across a range of organisations, industry sectors, and locations. A major conclusion is that graduate employment opportunities are concentrated in specific sub-sectors of the labour market, such as the smallest and largest organisations, those operating in the production and banking and finance sectors, and establishments located on the outskirts of the major cities. Moreover, graduates are often not recruited to graduate jobs, or the jobs they obtain also require relevant experience over and above the skills and information obtained through acquiring a degree.

In terms of the barriers to graduate employment in those organisations that do not employ graduates, the results show that there seems to be a strong perception that graduates are not likely to 'fit' into the organisation, either because the work is not suited to them, or they lack necessary experience, or that the organisation would not utilise them sufficiently to make it worthwhile employing workers with a degree. Even in those organisations where graduates are employed, there is strong evidence that organisations do not think that being a graduate is necessary, let alone sufficient, when recruiting staff to what would normally be termed graduate occupations.

As to those organisations that have experienced difficulties in recruiting graduates, the evidence suggests that they find graduates cost too much (presumably in relation to the return they offer), and often lack the necessary skills and/or appropriate qualifications for the job. That is, graduates may overvalue their human capital when seeking work because they lack a clear perception of what employers expect, and a sufficient range of skills that will make them sufficiently productive at the beginning of their career.

In conclusion, there seems to be strong evidence to suggest that employers require graduates that have a more general understanding of the labour market together with generic business skills, as well as the specific skills associated with the degree-course studied. This might then extend graduate penetration into a wider section of the labour market, and reduce some of the real or perceived barriers to graduate employment. In response, the higher education sector needs to include more training of these generic skills into degree programmes, which also include strong elements of experiencing employment as part of studying. The results also suggest that universities would benefit from greater attempts to involve employers in what goes on in the HE sector, so that misperceptions of what graduates have to offer can be minimised.

Summary and conclusions

Universities have the potential to play a major role in stimulating local economic development, both through their own activities (which generate and maintain local demand and thus local jobs), and through the transfer of knowledge to local organisations. This study has concentrated narrowly on only a small number of areas related to the local impact of the University of Portsmouth.

Specifically, a detailed account has been given of how to measure the expenditure impact of a University, in terms of data requirements and an appropriate methodology. Secondly, we looked at the local-content of externally funded University of Portsmouth research in the last 4 years, showing that this local content is fairly small (only 13%). Thirdly, the local graduate labour market was examined in some detail, based on a recent survey, and several important findings emerge that suggest that universities need to be more proactive in terms of equipping their graduates to exploit future local and national) employment opportunities.

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