A Distance Learning University and its Economic Impact in a country's peripheries: the case of Hellenic Open University

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Abstract

Higher education institutions can contribute into regional growth via the services of teaching they provide, the research activity they develop and the administration spillover effects on the local markets they operate. This paper attempts to quantify the impact of University expenditures on the regionally produced product (GDP). More specifically, we focus on the expenditure effects of the Hellenic Open University on the GDP of the thirteen Greek regions. In our analysis we distinguish between direct and indirect effects by identifying as direct effects all initial expenditures incurred by the HOU while we identify and subsequently calculate as indirect effects the increases in local output caused by the interactions of different sectors of the regional economy. For the calculation of indirect effects we use the input-output methodology. An input-output system shows the intermediate transactions between sectors and the primary inputs, as well as, the final demand of each sector. This is a general equilibrium system that records all the inter-sector transactions presenting a complete picture of the economy under examination and being the appropriate system to be used for calculating the total effect of University expenditure on regional GDP. Our results suggest that the economic impact of HOU is (a) significant to the Greek peripheries and its size varies across regions; (b) indirect regional effects boost the direct regional effects by 60% creating an overall size of the HOU expenses GDP multiplier by 1.6 on average. Moreover, our findings may have two straightforward policy implications that could be useful to those exercising policy making: First, the quantification of HOU economic impact on all Greek peripheries is not only useful for assessing the economic role of HOU at regional level but it could also been seen as a benchmark in assessing the impact of other similar regional educational activities. Secondly, the economic impact of HOU in each periphery can be a useful tool in assessing alternative non-educational, regional projects, aiming to fight the high unemployment arisen due to economic crisis that bedevils Greece and its peripheries in the last five years.

JEL codes: I230, R110, R150

Key words: Regional development, higher education policy, Hellenic Open University

1. Introduction

Higher Education Institutions (HE) have always contributed in social, cultural and economic growth of regions in which they are located. The main role of these Institutions is the provision of services of teaching and research that are usually provided without taking into consideration the needs of the region where the Institution is located (Del Rey 2001).

Moreover, the framework of operation of institutions that has been adopted by UNESCO for the development of HE (1998) declares that the HE institutions should: `develop innovative plans of collaboration with other higher education institutions and different sectors of society in order to ensure that higher education and research programs contribute effectively in *local, regional* and national growth'.

The consideration of the regional dimension in the national system of HE is likely to require a powerful framework of regional planning that assembles various regional collaborators in order to manage, coordinate and regulate jointly the management and financing of teaching and research that will place priorities of regional growth (Chatterton and Goddard 2000).

Although universities are usually assessed and evaluated on academic merit and their contribution to human capital and social needs, relative less attention has been given to the economic impact that Universities have in the local economies of their operation despite the fact that the recent expansion in the number of universities worldwide has been attributed to many factors among which a prominent role is attributed to the economic development of the peripheries within a country[1]. Few exemptions are Swenson (2015), Swenson et al (2007), De la Fuente and Vives (2002), Hedin[2] (2009), De Meulmester and Rochet (1995).

The basic operation of HE institutions is to offer services of education via the diffusion of knowledge. While this operation of teaching historically was offered initially to a national elite of politicians, industrialists, clergy and public servants, with the arrival of the 20th century it has been extended to much larger social groups. Despite this increase in access, the growth of teaching in the established frameworks of operation of HE has not been influenced by the regional needs and it produces graduates which will cover needs of the national and international markets (see Tsounis and Kagaroz 2008).

The HE institutions located in the periphery can contribute in the regional growth of their regions via the services of teaching they provide, the research activities that they undertake and the expenditures occurring in the region from their operation.

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[1] On the overall economic effects but not in regional effects, see Oketch; McCowan and Schendel (2014) for an excellent review of the impact of Tertiary Education on the overall development of a country. Another interesting analysis on the effects of UK Universities is the Kelly et.al. (2014) as well as the Fray (2013) on economic growth through Education in Finland.

[2] Hedin (2009) analyses Higher Education institutions as drivers of regional development especially in innovation and enterprises

Research in the higher education institutions promotes, traditionally, the production of knowledge for the national academic community and has neglected the application of applied knowledge for the local/regional community. Moreover, a lot of national regimes of financing do not encourage collaborations of regional character from the point of view of research activity and financing. Nevertheless, there are various tendencies that encourage universities in order to develop the mechanisms for their research base that more closely connect the research and their experience with the exterior environment.

Therefore, HE institutions can contribute in social, cultural and economic growth of the region in which they are located. The immediate effect, of course, for the local society is the income for the various sectors of economic activity produced by the operation of the University.

Without forgetting the contribution of regional institutions in the growth of local human capital, the regional reserve of knowledge and their contribution in the social and cultural growth, this work will be focused on the examination of the effect of university expenditure on the regionally produced product and more specifically will examine the effect of the Hellenic Open University (HOU) on the GDP of the thirteen Greek regions. HOU is different from traditional universities because its students do not attend classes and they live not in university campuses but in their place of domicile. Further, most of the tutors are adjunct faculty and they also do not live in the region were HOU has its administrative base.

The structure of the article is the following: in section 2 the methodology that was followed for the measurement of the effect of HOU expenses in the regional GDP is described, in section 3 the description and consolidation of data used is made, in section 4 the results of the direct and total (direct and indirect) effect of the HOU on the regionally produced product is analyzed and in section 5 the conclusions of this work are presented.

2. Methodology

An input-output (I-O) system shows the economic relations between the sectors of economic activity of an economy. Specifically, it shows the intermediate transactions between sectors and the primary inputs as well as the final demand of each sector. It is a general equilibrium system that records all the inter-sector transactions presenting a complete picture of the economy under examination (Leontief 1986, Miller and Blair 1985, Mattas *et. al.* 1984, 2005, Tsounis 1996, 2000, 2003). The basic I-O system consists of three matrices. The matrix of inter-sector transactions, where the intermediate transactions are recorded is the basic matrix of an I-O system from which, the other two matrices can be calculated: the matrix of the technology coefficients (or direct requirement matrix) and the matrix of total requirement (or Leontief matrix).

An I-O system can be used in the same way, for the examination of an economy irrespectively of its size, *i.e.* it can be used for both the national and the regional

economies. In the case where a regional economy is examined some adjustments can be made and the system can be written as:

$$[\underline{I} - \underline{A}]\,\underline{x} - \underline{b}y + \underline{c}z = \underline{r}, \qquad (1)$$

where underlined capital letters symbolise matrixes, underlined small letters vectors while, the variables are symbolized with small letters.

$A = \begin{bmatrix} a_{1,1} & a_{1,2} & \dots & a_{1,n-1} & a_{1,n} \\ a_{2,1} & & \dots & & a_{2,n} \\ \vdots & & \ddots & & \vdots \\ & & & & \\ a_{n,1} & & \dots & & a_{n,n} \end{bmatrix}$ is a square matrix with the input coefficients, $\underline{x}' = [x_1 \cdots x_n]$ is the vector of gross outputs of the *n* sectors of the region, $\underline{b}' = [b_1 \cdots b_n]$ is the vector of shares of the *n* sectors in the total exports *y* of the region, $\underline{c}' = [c_1 \cdots c_n]$ is the vector of shares of the *n* sectors in the total imports *z* of the region, $\underline{r}' = [r_1 \cdots r_n]$ is the vector of the final uses, the elements of which represent the part from the total product of each sector that is allocated to the final consumption. If (1) is solved for $\underline{x}$ we have:

$$\underline{x} = [\underline{I} - \underline{A}]^{-1}[\underline{b}y - \underline{c}z + \underline{r}], \qquad (2)$$

If $\underline{e}$ is the vector, the elements of which show the contribution of HOU in the increase of the product of the particular sector, then multiplying (2) with $\underline{e}'$ it is found that:

$$\underline{e}'\underline{x} = \underline{e}'[\underline{I} - \underline{A}]^{-1}[\underline{b}y - \underline{c}z + \underline{r}], \qquad (3)$$

The product $\underline{e}'[\underline{I} - \underline{A}]^{-1}$ is a vector that shows the *direct* and *indirect* contribution of the University expenditure in the increase of the total product of the region. The **total contribution** is the increase caused in the regional product from the relations between the sectors of the regional economy, e.g. an increase in the sector of furniture, effects the sectors of wood, chemicals, metal, financial services etc. (more on the method of calculation of the direct and indirect University contribution in regional GDP in Tsounis and Karagoz 2008). Relationship (3) implicitly assumes that all HOU expenditures in a region are part of the consumption component of the final demand in that region and therefore, increase the regional gross output. This is not an unrealistic assumption as most of the University services are not used by any other sector in the regions as intermediate inputs.

3. Data Description and consolidation

In order to calculate the total contribution of the Hellenic Open University in the increase of the regional product of each of the thirteen Greek regions the following data is needed:

(a) According to (3) above, the matrix $\underline{A}$ of the input coefficients for each Greek region is needed. However, the I-O table data for its calculation for each region is not available. National input-output tables are available for a series of years by Eurostat with the latest available being the one for 2010 (Eurostat 2010). This table has been used under the following assumptions which are the usual assumptions adopted by the input-output methodology:

1. the input coefficients have not changed within the three-year period (the expenditure data from HOU is for 2013). This assumption may appear restrictive but it is not unrealistic because existing relations between the sectors do not change fast.
2. A structural change has not taken place due to the change in the institutional framework that influences the structure of production, or a change of technology, or a change in relative prices of the factors of production and/or of the intermediate inputs which will create a substitution of inputs in the productive process and consequently, change in the input coefficients. For the rest of the analysis the assumption that in three-year period 2010-2013 the above have not happened is adopted.
3. A further, assumption is made for the use of the input coefficients from national input-output table instead of the input coefficients of the regional input-output tables. Regional input-output tables are not constructed for Greece. The use of the input coefficients from national input-output table instead of the input coefficients of the regional input-output tables was made under the assumption that the structure of production does not differ very much across Greek regions. This assumption was adopted because it is not possible to construct the regional input-output tables at this point. The 2010 input-output table has 56 sectors of economic activity. The sectors are classified according to NACE rev.2 classification scheme (this is in direct correspondence to the STAKOD 08 system of the Hellenic Statistical Authority (Hellenic Statistical Authority 2008).

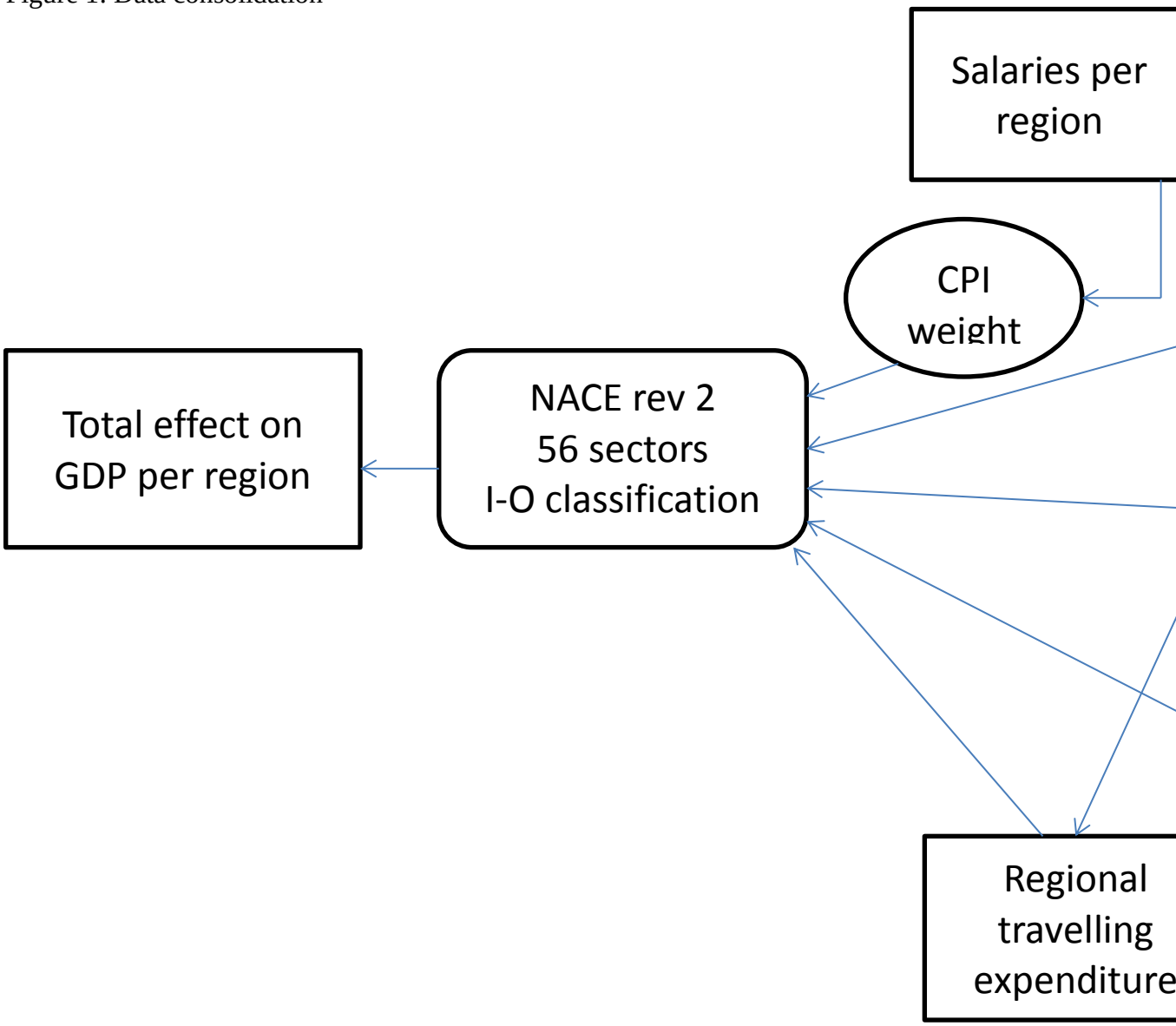
(b) Expenditure data per category of expenditure and region of the Hellenic Open University has been used to calculate the total contribution of the Hellenic Open University in the increase of the regional product of each of the thirteen Greek regions. It was provided by the accounting office of HOU. In each Greek University there are two kinds of budgets: one for covering the operating costs of the University and one for managing funds for research projects. The former is heavily subsidised by the government and it is mostly for the teaching activities of the University; it has also government funds from the public investments account for building maintenance and construction of new buildings and infrastructure while the latter, is for research funded by competitive projects.

HOU expenditure data was corresponded to the 56 NACE Rev.2 sectors. There were two problems concerning the correspondence of HOU expenditure data to the 56 sectors of the input-output table data: the first had to do with the salaries of the HOU employees (including members of staff with tenure) and the salaries of the adjunct faculty staff. These salaries had to be corresponded to the sectors of the input-output table. For this reason the weights of the different product categories used for the

construction of the consumer price index (CPI) have been used under the assumption that each HOU employee spend all his/her salary (savings from the salary are zero) according to the representative Greek consumer used by the Hellenic Statistical Authority to construct the consumer price index (Hellenic Statistical Authority 2012). Then, the amount spent for salaries was broken down to the 56 NACE Rev.2 sectors using the CPI weights.

The second problem that had to be dealt with is the travelling expenditures of the faculty members of staff (this concerns mostly the adjunct faculty members). HOU has classes in seven out of thirteen regions (in the cities of Patras, Athens, Piraeus, Heraclion, Larisa, Ioannina, Thessaloniki and Xanthi). This means that some tutors have to travel from the place of domicile to the place of teaching seven to eight times per year plus three to four times per year for members of staff meetings. The amount that was presented in the account for travelling had to be distributed to the thirteen regions and then corresponded to the three sectors of the input-output classification scheme relating to transport. The former was done by identifying the number of tutors travelling from their place of domicile for tutoring. Then the total amount of travelling expenses was divided by the total number of tutors travelling and finally, the amount spent in each region for travelling was found by multiplying the number of tutors travelling per region by the average amount for travelling expenses per tutor travelling. Then this amount found per region had to be corresponded to the three sectors of the input-output classification scheme relating to transport. These sectors are *Land transport services and transport services via pipelines* (CPA_H49), *Water transport services* (CPA_H50) and *Air transport services* (CPA_H51). It was assumed that the services of travel agents were not used and the booking of tickers (where a ticket is used for transport) is made by the tutors without the mediation of a travel agent (so the sector Travel agency, tour operator and other reservation services and related services -CPA_N79- of the input-output table was not used). It was assumed that all tutors living on islands are using airplane transport to the place of tutoring. It was assumed further, that 20% of the tutors living in Athens, Piraeus and Thessaloniki are using airplane transport to their place of tutoring. Tutors living in all other regions were assumed to use land transport services.

Figure 1: Data consolidation



Source: Authors' calculations

Taking into account (a) and (b) above, final demand expenditure across the thirteen regions was decomposed using the following steps:

1. Expenditure data, excluding teaching salaries and travelling costs, per region and category of expenditure has been provided by the accounting office of HOU. This data has been compiled by the financial services of the University and then the University accounting system codes have been corresponded to the 56 NACE Rev.2 sectors.
2. The amount spend for teaching salaries first, was broken down to the 56 NACE Rev.2 sectors using the CPI weights (see (b) above) and then it was decomposed to the thirteen Greek regions according to the region of domicile of the teaching staff.
3. Travelling expenditures of the faculty members of staff were first corresponded to the 56 NACE Rev.2 sectors (see (b) above) and then the

travelling expenditure data was regionally decomposed by using as a citerion the region of domicile of the teaching staff .

HOU total expenditure and the percentage in total expenditure, for 2013, by sector of economic activity, are presented in Table 1, below:

Table 1: HOU total expenditure by sector of economic activity (euros)

Sector no	NACE Rev.2 (STAKOD 08)	Sector description	HOU expenditure 2013	% in total
1	CPA_A01	Products of agriculture, hunting and related services	20783	0.1
2	CPA_A02	Products of forestry, logging and related services	207057	0.8
3	CPA_A03	Fish and other fishing products; aquaculture products	267096	1.0
4	CPA_C10-C12	Food products, beverages and tobacco products	3748574	13.9
5	CPA_C13-C15	Textiles, wearing apparel and leather products	1662612	6.2
6	CPA_C16	Wood and of products of wood and cork, except furniture	39449	0.1
7	CPA_C17	Paper and paper products	92175	0.3
8	CPA_C18	Printing and recording services	77743	0.3
9	CPA_C20	Chemicals and chemical products	230918	0.9
10	CPA_C22	Rubber and plastics products	173381	0.6
13	CPA_C25	Fabricated metal products, except machinery	49647	0.2
14	CPA_C26	Computer, electronic and optical products	196088	0.7
15	CPA_C27	Electrical equipment	196088	0.7
16	CPA_C28	Machinery and equipment n.e.c.	37717	0.1
17	CPA_C30	Other transport equipment	855360	3.2
18	CPA_C31_C32	Furniture; other manufactured goods	236306	0.9
19	CPA_D35	Electricity, gas, steam and air-conditioning	1019521	3.8
20	CPA_E36	Natural water; water treatment and supply services	408824	1.5
21	CPA_E37-E39	Sewerage; waste collection and treatment	34830	0.1
22	CPA_F	Constructions and construction works	732375	2.7
23	CPA_G45	Wholesale and retail trade	170532	0.6
25	CPA_G47	Retail trade services, except of motor vehicles and motorcycles	2866684	10.6
26	CPA_H49	Land transport services and transport services via pipelines	2518299	9.3
27	CPA_H50	Water transport services	41565	0.2
28	CPA_H51	Air transport services	843261	3.1
30	CPA_H53	Postal and courier services	163061	0.6
31	CPA_I	Accommodation and food services	3099694	11.5
32	CPA_J58	Publishing services	263640	1.0
33	CPA_J59_J60	Motion picture, video and television programme production services	48878	0.2
34	CPA_J61	Telecommunications services	1013098	3.8
35	CPA_J62_J63	Computer programming, consultancy and information services	144818	0.5
36	CPA_K64	Financial services, except insurance and pension funding	9776	0.0
37	CPA_K65	Insurance, reinsurance and pension funding services	709938	2.6
38	CPA_K66	Services auxiliary to financial services and insurance services	25401	0.1
39	CPA_L68	Real estate services	1567922	5.8
40	CPA_M69_M70	Legal and accounting services; management consulting services	205878	0.8
41	CPA_M71	Architectural and engineering services	203978	0.8
42	CPA_M72	Scientific research and development services	62335	0.2
43	CPA_M73	Advertising and market research services	43755	0.2
44	CPA_M74_M75	Other professional, scientific and technical services; veterinary services	206672	0.8
45	CPA_N77	Rental and leasing services	9044	0.0
46	CPA_N79	Travel agency, tour operator and other reservation services	289204	1.1
47	CPA_N80-N82	Security and investigation services; services to buildings and landscape	320218	1.2
48	CPA_O84	Public administration and defence services; compulsory social security services	65526	0.2
49	CPA_P85	Education services	585186	2.2
50	CPA_Q86	Human health services	333100	1.2
51	CPA_Q87_Q88	Social work services	21552	0.1
52	CPA_R90-R92	Creative, arts and entertainment services	218603	0.8
53	CPA_R93	Sporting services and amusement and recreation services	89866	0.3
54	CPA_S94	Services furnished by membership organisations	19508	0.1
55	CPA_S95	Repair services of computers and personal and household goods	36992	0.1
56	CPA_S96+97+97+99	Other services	450479	1.7
		Total	**26935007**	**100.0**

Source: Authors' calculations

Last column of Table 1 above reports the sectoral shares of HOU expenditure in total expenditure. It is observed that the sector with the highest share is Food products, beverages and tobacco products (13.9), followed by Accommodation and food services (11.5), Retail trade services (10.6), Land transport services (9.3), Textiles, wearing apparel and leather products (6.2) and Real estate services (5.8). Telecommunications services (3.8), Air transport services (3.1), Education services (2.2) and Insurance, reinsurance and pension funding services (2.6) have also, high shares in total HOU's expenditure.

4. The results: the total (direct and indirect) contribution of the Hellenic Open University in Regional GDP

4.1. The direct regional contribution

In Table 2 bellow, the direct[3] contribution HOU in the produced product of the thirteen Greek regions is presented, per sector and as a regional total. The method of calculation and the assumptions used are reported in section 3, above. The description of sectors is given in Table 1, above. The last raw of Table 2 presents the distribution of the direct contribution of HOU across regions.

[3] Swenson (2015) distinguishes between direct, indirect and induced effects the latter associated with the effects materialized within the Iowa state where University of Iowa operates, which clearly is not our case here.

Table 2: Direct Contribution of the Hellenic Open University in the Regional GDP per sector (in Euros)

Sector no	Attiki	Kentriki Makedonia	Dytiki Makedonia	Anatoliki Makedonia, Thraki	Ipeiros	Thessalia	Ionia Nisia	Dytiki Ellada	Sterea Ellada	Peloponnisos	Voreio Aigaio	Notio Aigaio	Kriti
1	6986	2233	147	431	567	336	188	8079	110	426	503	83	694
2	69599	22252	1463	4291	5651	3349	1874	80491	1097	4246	5009	823	6912
3	89780	28704	1887	5535	7290	4320	2417	103831	1415	5477	6462	1062	8916
4	1260025	402848	26489	77677	102313	60627	33924	1457222	19861	76866	90685	14906	125130
5	558861	178676	11748	34452	45379	26890	15046	646324	8809	34093	40222	6611	55499
6	13260	4239	279	817	1077	638	357	15335	209	809	954	157	1317
7	30983	9906	651	1910	2516	1491	834	35832	488	1890	2230	367	3077
8	26132	8355	549	1611	2122	1257	704	30222	412	1594	1881	309	2595
9	77620	24816	1632	4785	6303	3735	2090	89767	1223	4735	5586	918	7708
10	58279	18633	1225	3593	4732	2804	1569	67400	919	3555	4194	689	5788
11	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0
13	16688	5335	351	1029	1355	803	449	19300	263	1018	1201	197	1657
14	65912	21073	1386	4063	5352	3171	1775	76227	1039	4021	4744	780	6546
15	65912	21073	1386	4063	5352	3171	1775	76227	1039	4021	4744	780	6546
16	12678	4053	267	782	1029	610	341	14662	200	773	912	150	1259
17	287516	91923	6044	17725	23346	13834	7741	332513	4532	17540	20693	3401	28553
18	79431	25395	1670	4897	6450	3822	2139	91862	1252	4846	5717	940	7888
19	483870	86712	5702	16720	22023	13050	7302	313662	4275	16545	19520	3208	26934
20	136869	43759	2877	8438	11114	6586	3685	159928	2157	8350	9851	1619	13592
21	11708	3743	246	722	951	563	315	13540	185	714	843	138	1163
22	120634	38568	2536	7437	9795	5804	3248	513002	1901	7359	8682	1427	11980
23	57244	18302	1433	3529	4648	2754	1541	66203	902	3492	4120	677	5685
24	0	0	0	0	0	0	0	0	0	0	0	0	0
25	1712334	210725	7808	22897	33045	17871	10000	714228	5854	44475	26731	4394	56323
26	798233	245304	97822	100146	250148	116766	80	620247	83349	205660	214	35	295
27	13972	4467	294	861	1134	672	376	16158	220	852	1006	165	1387
28	215697	66486	355	101003	1371	812	111524	19524	266	1030	90071	44627	190495
29	0	0	0	0	0	0	0	0	0	0	0	0	0
30	159100	641	42	124	163	96	54	2319	32	122	144	24	199
31	1041914	333115	21903	64231	84603	50132	28052	1204976	16423	63561	74988	12325	103470

Sector no	Attiki	Kentriki Makedonia	Dytiki Makedonia	Anatoliki Makedonia, Thraki	Ipeiros	Thessalia	Ionia Nisia	Dytiki Ellada	Sterea Ellada	Peloponnisos	Voreio Aigaio	Notio Aigaio	Kriti
32	87387	27939	1837	5387	7096	4205	2353	104728	1377	5331	6289	1034	8678
33	16429	5253	345	1013	1334	791	442	19001	259	1002	1182	194	1632
34	435034	93577	6153	18044	23766	14083	7880	338497	4613	17855	21065	3462	29066
35	85461	6287	413	1212	1597	946	529	43262	310	1200	1415	233	1953
36	3093	972	64	187	247	146	82	4194	48	185	219	36	302
37	236416	75586	4970	14574	19197	11375	6365	280016	3726	14422	17015	2797	23478
38	8538	2730	179	526	693	411	230	9874	135	521	615	101	848
39	680387	235009	4641	26011	41087	33426	5944	484047	3480	13467	15889	2612	21923
40	68564	21921	1441	4227	5567	3299	1846	81195	1081	4183	4935	811	6809
41	68564	21921	1441	4227	5567	3299	1846	79294	1081	4183	4935	811	6809
42	62335	0	0	0	0	0	0	0	0	0	0	0	0
43	3040	972	64	187	247	146	82	38227	48	185	219	36	302
44	69470	22210	1460	4283	5641	3343	1870	80342	1095	4238	5000	822	6899
45	3040	972	64	187	247	146	82	3516	48	185	219	36	302
46	18047	5770	379	1113	1465	868	486	256386	284	1101	1299	213	1792
47	88228	28208	1855	5439	7164	4245	2375	159777	1391	5382	6350	1044	8762
48	51218	2316	152	447	588	349	195	8378	114	442	521	86	719
49	196701	62888	4135	12126	15972	9464	5296	227485	3100	11999	14157	2327	19534
50	111966	35797	2354	6902	9092	5387	3015	129489	1765	6830	8058	1325	11119
51	7244	2316	152	447	588	349	195	8378	114	442	521	86	719
52	73480	23493	1545	4530	5967	3536	1978	84980	1158	4483	5288	869	7297
53	30207	9658	635	1862	2453	1453	813	34934	476	1843	2174	357	3000
54	1682	538	35	104	137	81	45	16450	27	103	121	20	167
55	3856	367	18	52	68	40	23	32350	13	51	61	10	84
56	70993	21921	1441	4227	5567	3299	1846	323367	1081	4183	4935	811	6809
total	9952620	2629956	233967	611081	801175	450654	285218	9637251	185257	621886	554387	120945	850609
Regional share in total	36.95	9.76	0.87	2.27	2.97	1.67	1.06	35.78	0.69	2.31	2.06	0.45	3.16
Total, all regions			**26935007**										

Table 3: Total Contribution (Direct plus Indirect) of HOU in the Regional GDP (in Euros)

Sector no	Attiki	Kentriki Makedonia	Dytiki Makedonia	Anatoliki Makedonia, Thraki	Ipeiros	Thessalia	Ionia Nisia	Dytiki Ellada	Sterea Ellada	Peloponnisos	Voreio Aigaio	Notio Aigaio	Kriti
1	152302	36423	2421	6498	9167	5356	2623	126704	1856	7373	6866	1150	10146
2	165859	43588	2818	7942	10842	6387	3336	153959	2137	8530	8813	1463	12696
3	184952	52742	3656	10004	13766	8061	4157	186599	2790	10606	10946	1823	15496
4	1421268	440840	28808	84285	111430	66057	36665	1588682	21630	84107	97660	16103	135560
5	641018	200088	13033	38231	50537	30015	16616	718992	9785	37978	44253	7297	61347
6	137237	28402	1569	4529	6390	3853	1822	93267	1200	5238	4578	794	7219
7	136932	33271	1926	5696	7834	4769	2343	111626	1465	5965	5952	1024	8811
8	156621	38195	2133	6425	8874	5484	2610	125188	1626	6581	6518	1137	9697
9	128267	35887	2286	6667	8903	5293	2874	127870	1725	6820	7475	1258	10641
10	181632	44938	2732	7942	10799	6455	3347	154839	2072	8439	8613	1463	12637
11	110373	22988	1282	3777	5277	3231	1526	74483	983	4086	3726	663	5755
12	123437	23794	1330	3823	5389	3244	1542	78389	1020	4417	3831	671	6058
13	172910	38012	2142	6269	8759	5337	2538	123835	1642	6841	6244	1103	9627
14	72917	22764	1497	4361	5784	3432	1889	81566	1126	4342	5007	829	6950
15	131727	34587	2155	6256	8457	5045	2655	120380	1632	6528	6867	1162	9923
16	55622	13575	795	2333	3224	1967	953	44661	608	2433	2362	415	3525
17	292259	93113	6125	17955	23653	14015	7842	336554	4595	17778	20923	3445	28899
18	140953	39279	2444	7156	9655	5797	3026	136178	1848	7281	7881	1325	11231
19	702914	133969	8056	24321	32630	19918	10232	458724	6058	23599	27061	4489	37769
20	228392	64676	3976	11948	15931	9673	5092	230061	2995	11581	13260	2230	18552
21	91666	21863	1259	3705	5196	3209	1462	72175	963	3785	3742	638	5469
22	279771	74135	5018	13764	19085	11250	5653	651463	3839	14668	14675	2475	21051
23	179822	50871	3313	8667	12677	7927	3158	158104	2396	8643	7901	1376	11409
24	166354	46862	3496	8601	13248	8035	2923	145179	2791	9077	6710	1261	9855
25	1857331	253022	10688	30337	44471	24988	12488	839961	8145	51953	32507	5469	64718
26	921999	276492	100921	106760	260490	122542	2400	741844	85841	213615	5460	1034	8124
27	97982	26652	2039	5306	7447	4342	2174	93757	1593	5602	5105	940	7442
28	374622	96976	3070	108231	10671	6064	115007	120019	2436	8215	96176	46090	200273
29	56725	15753	2141	4319	6534	3471	1700	49978	1760	5067	2860	712	4543
30	292177	24531	1337	8543	5439	3383	6721	72876	1041	3731	7667	2737	13999
31	1221550	382616	24943	73179	96653	57363	31844	1378241	18716	72723	84959	13988	117694

Sector no	Attiki	Kentriki Makedonia	Dytiki Makedonia	Anatoliki Makedonia, Thraki	Ipeiros	Thessalia	Ionia Nisia	Dytiki Ellada	Sterea Ellada	Peloponnisos	Voreio Aigaio	Notio Aigaio	Kriti
32	167188	48463	2892	8662	11778	7229	3580	168132	2191	8466	9236	1566	13086
33	117583	31682	2015	5936	7953	4813	2545	113527	1542	5806	6118	1104	8849
34	579048	126569	8306	24226	32127	19083	10503	457442	6257	24102	27598	4604	38452
35	166809	27069	1775	5329	6926	4182	2406	112380	1370	5011	5268	1033	7788
36	77694	21679	1025	3459	4823	3209	1317	73414	780	2958	3229	573	4620
37	291932	90872	5784	17210	22753	13653	7450	330260	4345	16771	19623	3267	27222
38	81707	23120	1216	3916	5378	3476	1557	75924	928	3468	3787	676	5403
39	715762	244364	5272	27713	43523	34890	6605	540727	3970	15253	17532	2900	24310
40	153544	44655	2722	8471	10976	6713	3783	155999	2067	7851	8947	1637	12854
41	333533	83023	5363	15591	20930	12532	6657	298413	4074	15583	16921	2906	24025
42	203799	34891	2922	7179	10343	5950	2852	125144	2308	7788	6521	1230	9559
43	257335	70001	5325	13782	19729	11697	5433	266604	4192	14197	12400	2342	18075
44	196497	54004	3761	10318	14166	8325	4318	196559	2887	10815	10878	1884	15612
45	103422	28265	1935	5119	7547	4622	1879	90835	1523	5200	4377	812	6408
46	285564	80659	7884	18061	26502	14859	7106	517454	6312	20084	15168	3041	22461
47	239348	66774	4359	12950	16991	10222	5752	291454	3341	12437	13317	2484	19365
48	185465	29574	2790	5613	9311	5137	1769	95346	2259	7701	4166	766	6748
49	222766	69601	4662	13397	17893	10589	5752	253123	3516	13423	15294	2526	21181
50	254624	64810	4037	11606	15734	9308	4925	229866	3053	12476	12935	2159	18811
51	139690	35992	2462	6668	9297	5452	2725	127365	1886	7234	7096	1194	10228
52	137381	42466	2628	7597	10642	6560	2979	147070	2007	7399	7819	1306	10892
53	189616	51583	3480	10357	13376	8008	4741	182493	2688	9797	10261	2032	15220
54	400789	116791	10385	26140	35792	20219	11366	450727	8192	27380	24455	4870	36018
55	98855	27753	2548	5102	9037	5359	1237	105473	2092	6139	2807	533	4193
56	155546	47763	3526	9246	13097	7679	3660	410257	2715	9743	9723	1607	13493
total	16633091	4273325	348486	921474	1235841	709730	412115	15212144	274812	944685	842074	175617	1281989
Regional share in total	38.44	9.88	0.81	2.13	2.86	1.64	0.95	35.16	0.64	2.18	1.95	0.41	2.96
Total, all regions			**43265385**										

The highest contribution in the regional GDP is observed in the region of Attiki (where the capital of the country is located) followed by the region of Dytiki Ellada (Western Greece) where HOU has its administrative base and the region of Kentriki Makedonia (Central Macedonia) where Thessaloniki, the second largest city in Greece is located. The smallest direct contribution in the regional GDP is observed for the region of Notio Aigaio (South Aegean), Sterea Ellada and Ionia Nisia (Ionian Islands). In these regions HOU does not have classes.

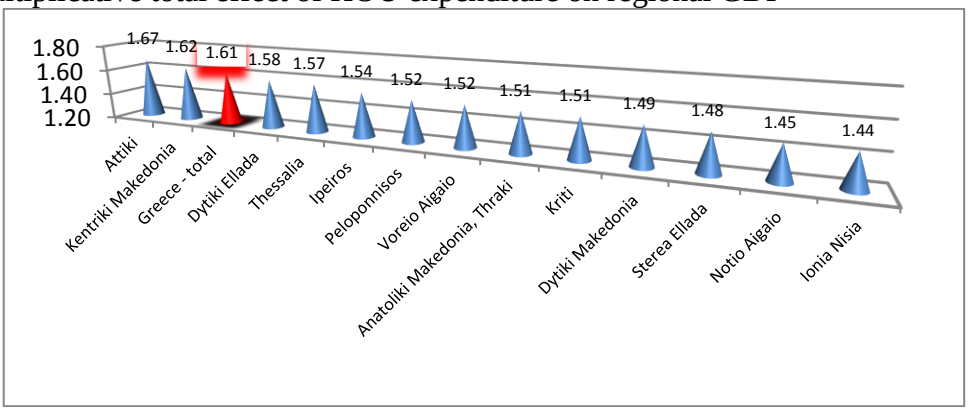
4.2. The total (direct and indirect) regional contribution

In Table 3, the total contribution (direct and indirect) of HOU in the produced product of the thirteen regions and for the country in total is presented. The methodology of calculating the total contribution is reported in section 2, above.

The highest total contribution (direct and indirect) in the GDP (see also the last raw of Table 3 for a clearer presentation of the distribution of the total impact of HOU across regions) is in the region of Attiki (where the capital of the country is located) followed by the region of Dytiki Ellada (Western Greece) where HOU has its administrative base and the region of Kentriki Makedonia (Central Macedonia) where Thessaloniki, the second largest city in Greece is located. The smallest contribution in the regional GDP is observed for the region of Notio Aigaio (South Aegean), Sterea Ellada and Ionia Nisia (Ionian Islands). In these regions HOU does not have classes.

Table 3 shows that the total contribution of HOU in the GDP of the Greek regions is on average about 60% higher than that of the direct contribution (43.3 mil. Euros the former and 26.9 mil. Euros the latter). The inter-relations of sectors boost the impact effect of HOU expenses on the regional GDP. Equally said, **the total increase of regional GDP from HOU expenditures is 60% higher than the direct contribution** i.e. the GDP multiplier is 1.6, on average. The indirect increase of the GDP is due to the economic dependences of the economic activity between sectors; e.g. an expenditure made in the sector of restaurants is not limited in the increase of the produced product in this sector but influences also all the sectors from which this sector has economic dependence (it uses inputs). A graphical presentation of regional multipliers in the thirteen regions is shown in Graph 1.

Graph 1: Multiplicative total effect of HOU expenditure on regional GDP

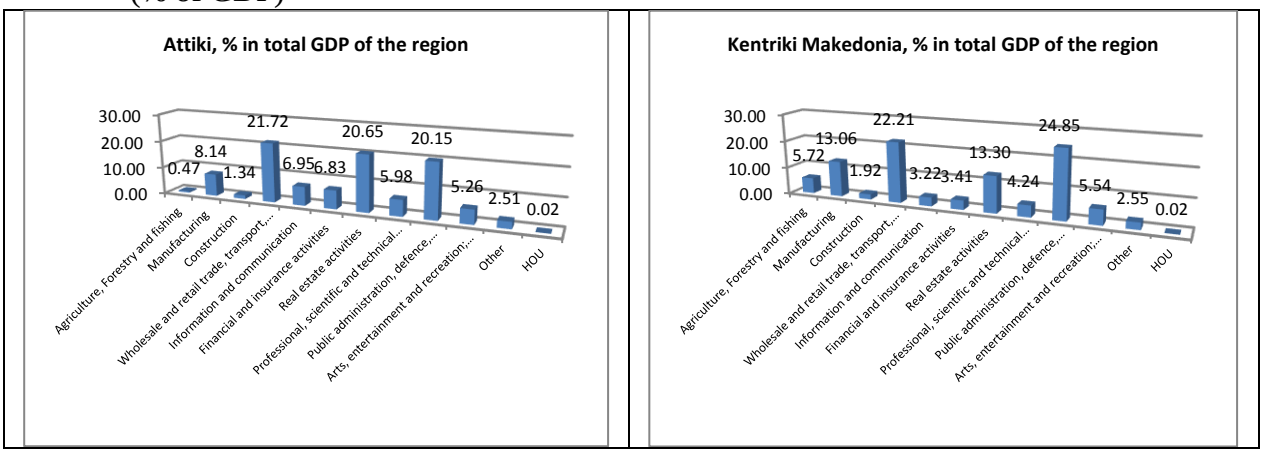


Source: Table 2 and 3, authors' calculations

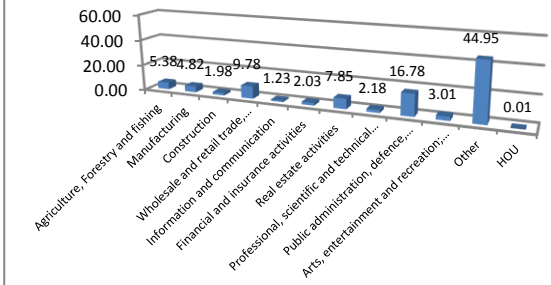
Graph 1 shows the multiplicative effect (GDP multipliers) of HOU expenditure per region and for the country in total, i.e. it shows the number by which the HOU expenditure for each region has to be multiplied in order to give us the total effect. The multiplicative effect ranges from 1,4 for the region of Ionian Islands (Ionia Nisia), South Aegean (Notio Aigaio), Sterea Ellada and Western Macedonia (Dytiki Makedonia) to 1.67 for the region of Attica. The difference in the GDP multipliers across regions is caused by the difference distribution of HOU expenditure among the various sectors across regions and the differences in inter-sector dependences for the production of output of each sector[4].

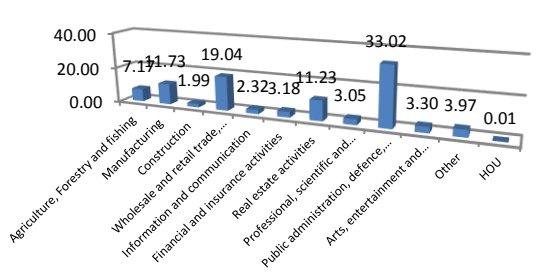
In Graph 2 bellow, we illustrate a comparison of total contribution of the Hellenic Open University in the produced GDP of each region is made with the contribution of the various sectors of economic activity in the total regional GDP (in percentages). This Graph shows the relative importance of HOU in the production of regional GDP across regions.

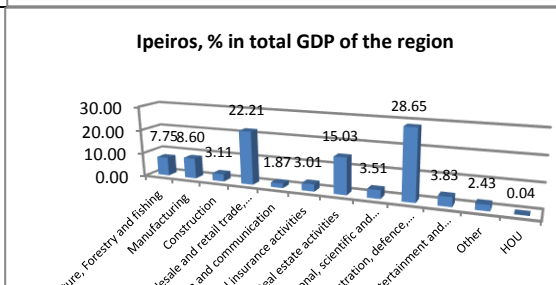
Graph 2: Contribution of various sectors and of the Hellenic Open University in the Regional GDP (% of GDP)

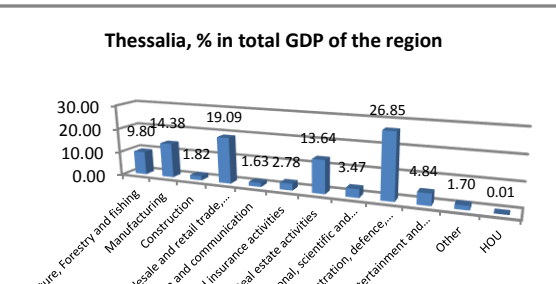


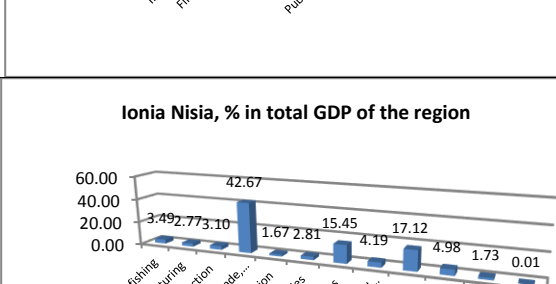
4 If the distribution of expenditure were exactly the same among the sectors for each region the multipliers would have the same value.

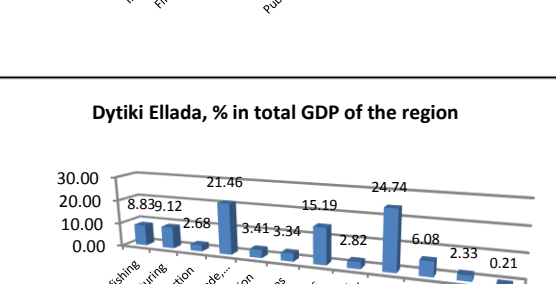

Dytiki Makedonia, % in total GDP of the region
60.00
40.00
20.00
0.00
5.38
1.82
1.98
9.78
1.23
2.03
7.85
2.18
16.78
3.01
44.95
0.01
Agriculture, Forestry and fishing
Manufacturing
Construction
Wholesale and retail trade,...
Information and communication
Financial and insurance activities
Real estate activities
Professional, scientific and technical...
Public administration, defence,...
Arts, entertainment and recreation;...
Other
HOU

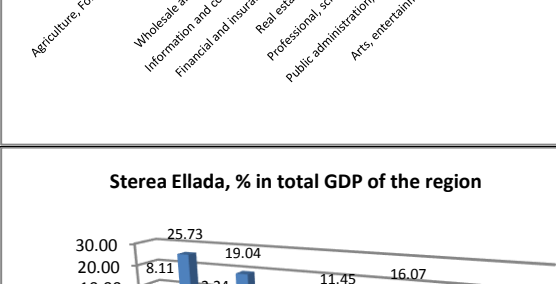

Anatoliki Makedonia, Thraki, % in total GDP of the region
40.00
20.00
0.00
7.17
11.73
1.99
19.04
2.32
3.18
11.23
3.05
33.02
3.30
3.97
0.01
Agriculture, Forestry and fishing
Manufacturing
Construction
Wholesale and retail trade,...
Information and communication
Financial and insurance activities
Real estate activities
Professional, scientific and...
Public administration, defence,...
Arts, entertainment and...
Other
HOU

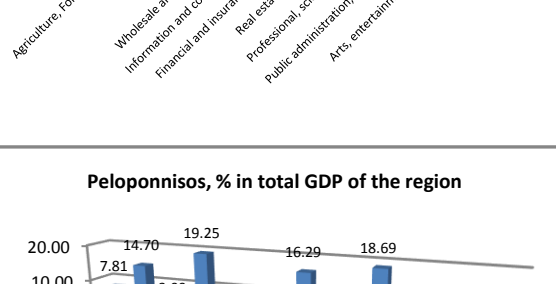

Ipeiros, % in total GDP of the region
30.00
20.00
10.00
0.00
7.75
8.60
3.11
22.21
1.87
3.01
15.03
3.51
28.65
3.83
2.43
0.04
Agriculture, Forestry and fishing
Manufacturing
Construction
Wholesale and retail trade,...
Information and communication
Financial and insurance activities
Real estate activities
Professional, scientific and...
Public administration, defence,...
Arts, entertainment and...
Other
HOU

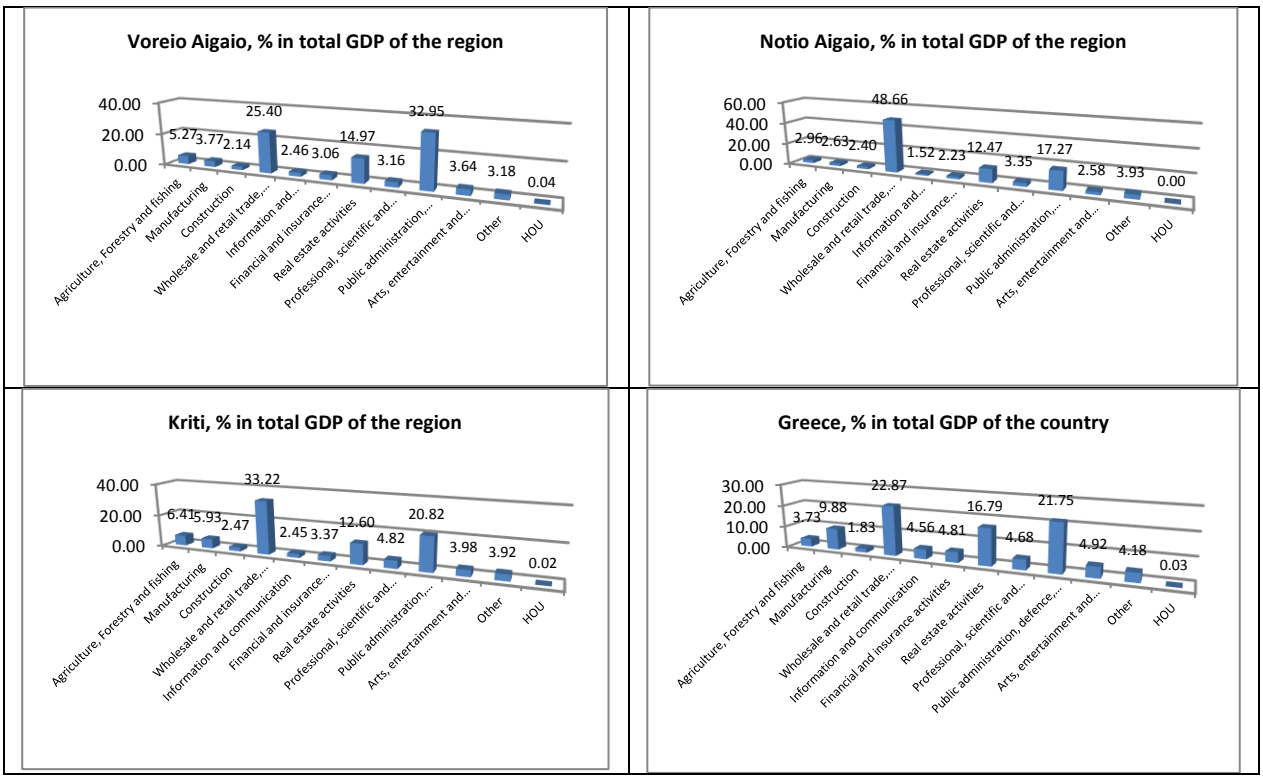

Thessalia, % in total GDP of the region
30.00
20.00
10.00
0.00
9.80
14.38
1.82
19.09
1.63
2.78
13.64
3.47
26.85
4.84
1.70
0.01
Agriculture, Forestry and fishing
Manufacturing
Construction
Wholesale and retail trade,...
Information and communication
Financial and insurance activities
Real estate activities
Professional, scientific and...
Public administration, defence,...
Arts, entertainment and...
Other
HOU


Ionia Nisia, % in total GDP of the region
60.00
40.00
20.00
0.00
3.49
2.77
3.10
42.67
1.67
2.81
15.45
4.19
17.12
4.98
1.73
0.01
Agriculture, Forestry and fishing
Manufacturing
Construction
Wholesale and retail trade,...
Information and communication
Financial and insurance activities
Real estate activities
Professional, scientific and...
Public administration, defence,...
Arts, entertainment and...
Other
HOU


Dytiki Ellada, % in total GDP of the region
30.00
20.00
10.00
0.00
8.83
9.12
2.68
21.46
3.41
3.34
15.19
2.82
24.74
6.08
2.33
0.21
Agriculture, Forestry and fishing
Manufacturing
Construction
Wholesale and retail trade,...
Information and communication
Financial and insurance activities
Real estate activities
Professional, scientific and...
Public administration, defence,...
Arts, entertainment and...
Other
HOU


Sterea Ellada, % in total GDP of the region
30.00
20.00
10.00
0.00
8.11
25.73
2.24
19.04
1.41
2.13
11.45
2.03
16.07
3.40
8.39
0.00
Agriculture, Forestry and fishing
Manufacturing
Construction
Wholesale and retail trade,...
Information and communication
Financial and insurance activities
Real estate activities
Professional, scientific and...
Public administration, defence,...
Arts, entertainment and...
Other
HOU

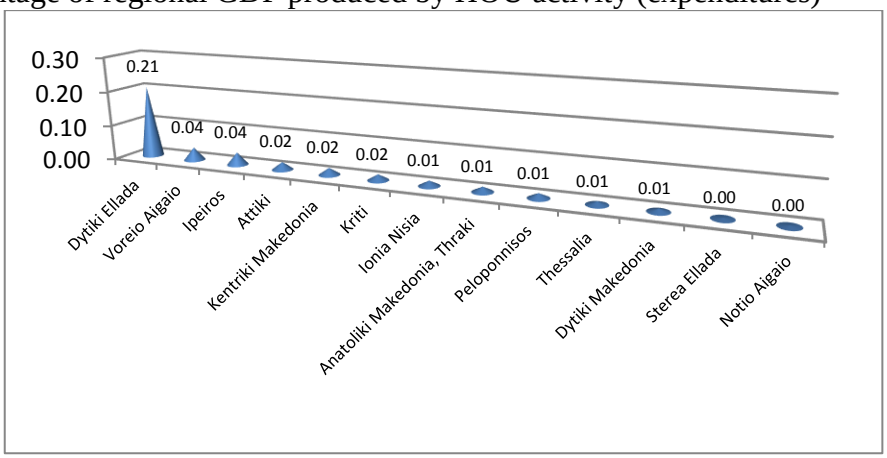

Peloponnisos, % in total GDP of the region
20.00
10.00
0.00
7.81
14.70
3.09
19.25
2.10
2.54
16.29
3.00
18.69
6.13
6.40
0.01
Agriculture, Forestry and...
Manufacturing
Construction
Wholesale and retail trade,...
Information and...
Financial and insurance...
Real estate activities
Professional, scientific and...
Public administration,...
Arts, entertainment and...
Other
HOU



Source: Eurostat (2014) and Table 3; authors' calculations

The impact effect on regional GDP of HOU expenses for all the 13 regions is summarised in Graph 3. It shows the percentage of regional GDP produced by HOU activity (expenditures). The largest effect- contribution to the regional GDP - is found for the region of Dytiki Ellada (Western Greece) where HOU has its administrative base; 0.21% of the regional GDP is owed to HOU expenditure. HOU appears that it does not play an important role in the economy of the regions of Notio Aigaio, Sterea Ellada, Dytiki Makedonia, Thessalia, Peloponnisos, Anatoliki Makedonia, Thraki and Ionia Nisia. It is observed further, that although, in the Attica region, HOU has its highest effect in absolute terms, the relative effect is small; only 0.02% of the regional GDP is due to HOU expenditure. This result is caused because Attica's GDP is the highest in the country and the relative importance of HOU is thus, small.

Graph 3: Percentage of regional GDP produced by HOU activity (expenditures)



Source: Table 3; authors' calculations

From Table 3 that shows the total contribution of HOU in the GDP of the Greek regions Graph 6 bellow, is produced. It depicts the effect of HOU on each sector of economic activity on the region of Western Greece (Dytiki Ellada), the region that HOU has its largest effect. The highest total effect is found for the sector of Food products, beverages and tobacco products, while the sectors of Accommodation and food services, Retail trade services and Land transport services follow, while

the sectors that are influenced the least by the existence of the Hellenic Open University are Machinery and equipment, Warehousing and Sewerage; waste collection, treatment and disposal activities.

5. Conclusions

Although universities are usually assessed and evaluated on academic merit and their contribution to human capital and social needs, relative less attention has been given to the economic impact that Universities have in the local economies of their operation despite the fact that the recent expansion in the number of universities worldwide has been attributed to many factors among which a prominent role is attributed to the economic development of the peripheries within a country.

Our paper tries to quantify the economic impact arising from the HOU expenditure to the regionally produced product in all thirteen peripheries of Greece. It should be noted that HOU is not constrained to operate within its headquarters or within the same administrative region[5]. Indeed, HOU in the last 5 years operates in about eight Greek towns and employs staff from all over Greece.

Our findings suggest that the economic impact of HOU is (a) significant to the Greek peripheries and its size varies across regions depending upon the distribution of HOU expenditure among the various sectors across regions and the differences in inter-sector dependences for the production of output of each sector; (b) indirect regional effects boost the direct regional effects by 60% creating an overall size of the HOU expenses GDP multiplier of 1.6 on average.

The indirect increase of the GDP is due to the economic dependences of the economic activity between sectors. The largest effect is found for the region of Dytiki Ellada (Western Greece) where HOU has its administrative base; 0.21% of the regional GDP is produced by HOU expenditure. HOU does not play an important role in the economy of the regions of Notio Aigaio, Sterea Ellada, Dytiki Makedonia, Thessalia, Peloponnisos, Anatoliki Makedonia, Thraki and Ionia Nisia. It is observed further, that although, in the Attica region, HOU has its higher effect in absolute terms, the relative effect is small; only 0.02% of the regional GDP is due to HOU expenditure. This result is caused because Attica's GDP is the highest in the country and the relative importance of HOU is small. The highest total effect in the region of Western Greece (Dytiki Ellada), the region that HOU has its largest effect, is found for the sector of Food products, beverages and tobacco products, while the sectors of Accommodation and food services, Retail trade services and Land transport services follow. Sectors that are influenced the least by the existence of the Hellenic Open University are Machinery and equipment, Warehousing and Sewerage; waste collection, treatment and disposal activities.

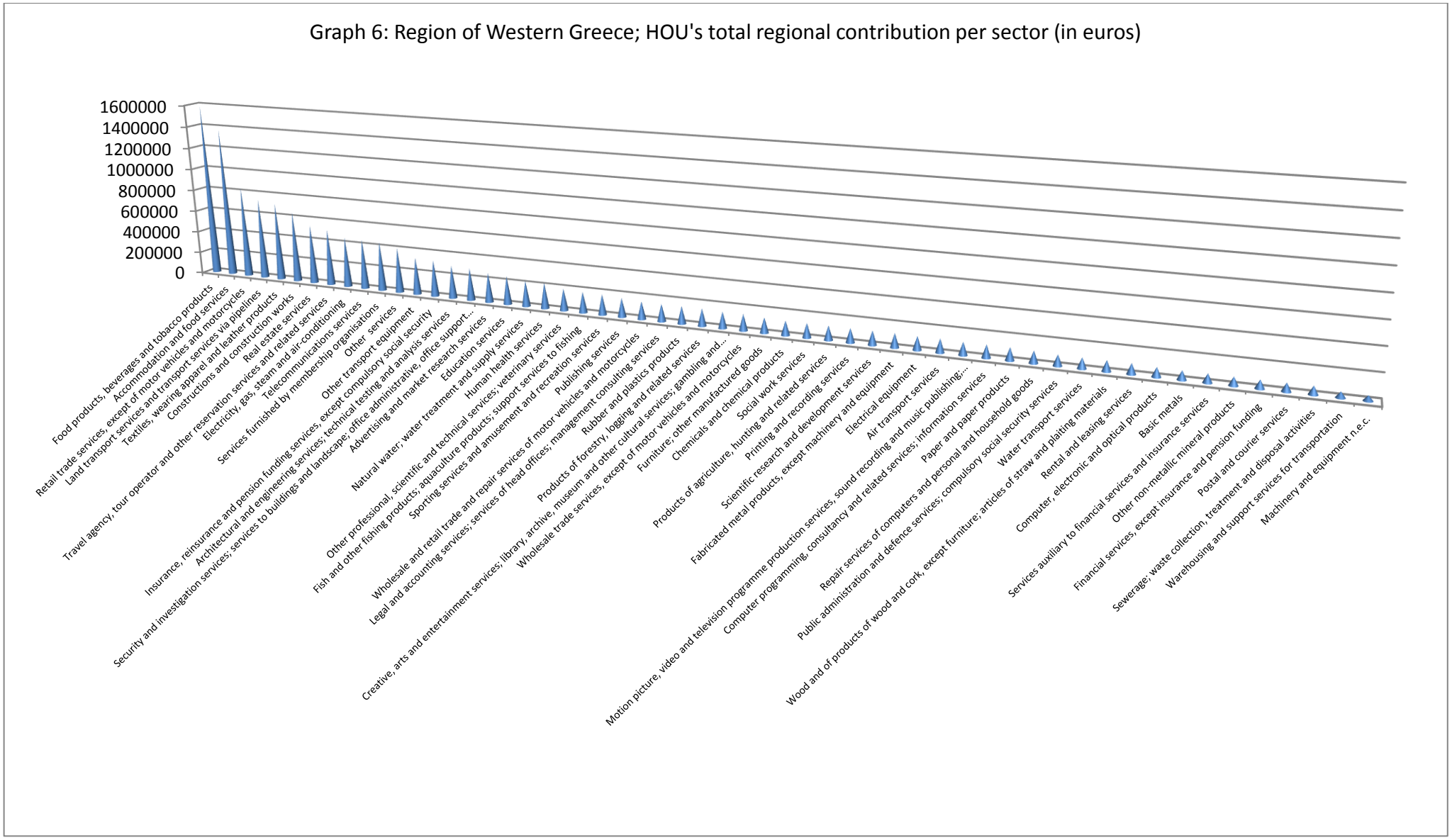
Moreover, our findings have two straightforward policy implications that could be useful to those exercising policy making:

1) The quantification of HOU economic impact on all Greek peripheries is not only useful for assessing the economic role of HOU at regional level but it could also been seen as a useful benchmark in assessing the impact of other similar educational activities undertaken either by central authorities or by local governments within the region6. For example, out quantification could help in assessing the economic impact expansion/contraction of existing or the establishment of new universities.

5 No other university operated in places other that the regions where its headquarters is.

6 These activities could be financed either by the European Regional projects, central government funds or local authorities such as municipality funds.

2) The economic impact of HOU in each periphery can be a useful tool in assessing alternative regional projects other than in education aiming to fight high unemployment arisen due to economic crisis that bedevils Greece and its peripheries in the last five years.



Source: Table 3

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