SHORT-RUN ECONOMIC IMPACT OF STATE UNIVERSITIES IN PARANÁ

Cássio Rolim[*]

Ricardo Kureski[**]

Abstract

Analyses of economic impact of universities on their regions are not quite common in developing countries. This is a pioneering study in Brazil and takes the case of some universities in the State of Paraná. Brazil is a federation and its public Higher Education System is basically an attribution of the Federal level. However some states have their own universities. Paraná is one of the Brazilian states which have a substantial number of state universities. It is a middle-income state (6.5 % of national GDP) and settles 4.5 of the Brazilian population. The analysis use a Social Accounting Matrix for Parana State and an adaptation of a CGE model developed at Monash University using this matrix. The first exercise consider the impact of the universities spending on income and employment at Parana State (using classical SAM's multiplier approach).The subsequent exercises are made considering typical input-output closure for the CGE model.

INTRODUCTION

This paper presents an analysis of the impact of public, state-run universities (known as HEIs, or Higher Education Institutions[1]) on the Paraná state economy. The state of Paraná has close to 9 million inhabitants, thus representing 5% of Brazil´s total population, and covers a territory that is two-thirds the size of Italy. The state capital, Curitiba, has close to three million inhabitants and is home to the public, federally supported university, UFPR, or Federal University of Paraná. Yet the state government has always maintained a commitment to the creation of public, state-government supported universities within other regions of the state. At present, there are five of these universities in existence, in five other major cities within the state, as well as 10 state government-run colleges

In fact, in Brazil most public universities are run by the federal government. Nonetheless, as in the case in point, many state governments also maintain their own public university system. For the most part, these universities are not only public but also offer free tuition to the entire student body. In spite of the fact that public universities are extremely costly for the Brazilian government, few studies have been made evaluating their costs on the regional

[*] Federal University of Parana (UFPR-PPGDE); cassio.rolim@pobox.com

[**] Catholic University of Parana (PUC-PR); kureski@pr.gov.br

[1] This is a broad term (in Portuguese "instituições de ensino superior") bringing under its wing both universities and independent colleges. Throughout our text, we will use the terms of Higher Education Institutions (HEIs) and University interchangeably, unless otherwise designated..

economy within which they operate. The present paper is one of the first attempts that uses an input-output model to analyze the impact of universities on specific regions of the country.

The analysis of the short-run economic impact of a university has been well-studied, following the consecrated procedures in the literature for the study of the economic impact of any particular sphere of economic activity within a regional economy. For the most part, it becomes a matter of considering the sphere's impact on regional aggregate demand -

The literature on this topic has consecrated a series of procedures that can be summarized as follows:

- Specification of the region.
- Determination of direct impact.
- Determination of indirect impact.

The specification of the region is an important procedure because the magnitude of the impact is contingent upon it. The multiplying effect of the expenses carried out in one region is attenuated by the leakeges of income.(the amount of income that flows outside the region). Thus, the smaller the region, the larger the portion of expenditures carried on out outside it, and conversely, the larger the region, the greater the probability that more expenditures will be made internally. The hypothesis that is implicit in this reasoning is that larger regions will have a more diversified economy and that they will therefore experience less need to import goods and services from other regions.

The determination of direct impacts, albeit simple, often presents complex operational difficulties. The volume of expenditures carried out by four large groups of actors who are connected to the university must be measured: expenses regarding current consumption and investments made by the institution; expenses related to faculty and staff members' consumption; out-of-state students' consumption expenditures and expenditures linked to visitors residing outside the region. In fact, the first two really represent a breakdown of current expenses and university investments. Since our objective is to compare real economic activity with that which would occur if the university were not present, local students are not taken into account, under the assumption that they do not represent an additional demand that is being made on the region. On the other hand, professors and staff are considered as additional expenditures, to the extent that they are paid from resources coming in from outside the region. Such procedures, beyond the implicit hypotheses, also take the existence of a regional labor market for university members into account, under the assumption that they would otherwise be working in other regions. In some instances this is considered to be the case only in regard to faculty and not for staff members; in other cases, it is considered to be relevant for both groups. The latter case

would be primarily applicable to the case of university towns (cities or towns that originate exclusively from university life, as in the case of Cambridge, England); it seems less relevant for cases in which the universities belong to regions in which greater diversity prevails. Furthermore, it is a hypothesis that is difficult to prove, especially because testing of this sort of conjecture is often based on the subjective response of actors who are questioned as to what they would do under idealized circumstances. Thus, the only truly effective way to test it would be to see what actually happens when such a university closes down.

Once direct impacts have been determined, indirect impacts on the economy caused by such expenditures should be examined. This means taking the multiplying effect of initial expenditures into account. For this purpose, there are a series of techniques with greater or lesser degrees of sophistication that can be applied. When it is possible to employ an input-output or a social accounting matrix, qualitatively superior results are obtained. Furthermore, the existence of the matrix is also a basic condition for the use of more powerful tools such as models of computable general equilibrium.

With the input-output or social accounting matrix it thus becomes possible to calculate the indirect impact of expenditures of university actors within the region as well as to determine the increase in the volume of regional employment that can be associated with them. It also becomes possible to calculate the impact of expenditures that these indirect effects induce on regional income and employment. The sum total of all these impacts allows us, finally, to determine the total impact of the university on a regional economy.

Nonetheless, it should be taken into account that in a strict sense, the short-run economic impact that a university has over a regional economy is always that which we are able to evaluate within the hypotheses that we set up, and is marked by the limitations of the data that we have and the methodologies that we put into practices in order to carry out our study. The study that we present here has the merit of being one of the first of its kind in Brazil. Although it has made use of international work on the topic, it still suffers from limitations pertaining to its pioneering status.

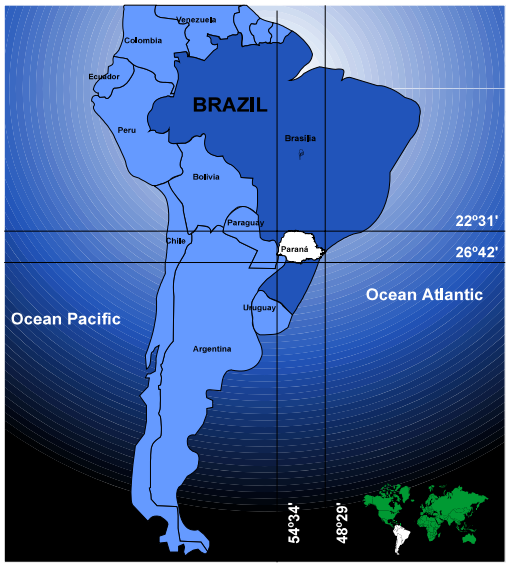
Beyond this introduction, this paper is divided into five sections. It begins with a short characterization of the state of Paraná, followed by a brief review of the literature on the regional economic impact of universities. This in turn is followed by a discussion of methodological procedures. Finally, in the last two sections, the main results of the study are presented and some conclusions are drawn.

1. THE STATE OF PARANÁ

The territory that will be studied here, the state of Paraná (map 1), is a member of the federative union, possessing 199.554 square kilometers, 2/3 the size of Italy. Its GNP is around 6% of the Brazilian one. It has a population of close to 9 million inhabitants, and its capital city is Curitiba, with a greater metropolitan area of close to 3 million which is rapidly becoming site of new investments in the Brazilian automobile industry.

The state of Paraná has a history of recent settlement. The state was populated along three different fronts of occupation, coming from different parts of Brazil, each in its own historical moment. In the early days of Brazilian colonization, in the 16th century, only the coast and the area which is today Curitiba were inhabited by colonizers. The intensive occupation of the north of the State began in the 1940s, as a spin-off of the São Paulo state coffee growing industry. Until recently, it was one of the richest areas of the state. The occupation of the southeast was initiated only in the 1950s, as a result of migration from Rio Grande do Sul, where family-based subsistence agriculture still prevailed.

Map 1



Paraná has also been characterized as an agricultural state, and one that for the last 15 years boasts one of the most modern agricultural systems in the country. On the other hand, the state's capital, Curitiba, underwent an industrialization process beginning in the 70s in which traditional industries linked to wood and food production gave way to more modern branches of Brazilian industry, whose products belong to the electrical and electronic and metal and

mechanical groups. These new industries, to a large extent branches of multi-nationals and industries from the state of São Paulo, result from the expansion of firms located in the Greater São Paulo metropolitan region, or, in other cases such as that of the Volvo company in the seventies and other automobile industries in the nineties (Renault, Audi. Chrysler, etc.) represent new investments in Brazilian territory. Some locational advantages notwithstanding, the major factor that attracted these firms to the Greater Curitiba is linked to the extremely generous policy of fiscal incentives that has been offered.

2. BRIEF REVIEW OF THE LITERATURE

In this section we will privilege those studies that in some way take the input-output matrix into consideration for the results that they obtain.

2.1 McNicoll's study of Scottish universities.

This study was elaborated by McNicoll for a commission of chancellors of Scottish universities[2], covering the 1993/4 academic year. It was one of the most important studies of its type and set the basis for a series of similar studies that were carried out in different parts of the United Kingdom..

Twenty two Scottish institutions of higher education were taken into consideration. Aggregation of basic data were based on several sources and some cases used studies that had been especially prepared for the research. The input-output research matrix that was used consisted of the most recent material that existed at that time (July, 1995) for the Scottish economy. The version that was implemented considered 28 sectors of the economy, 17 household income levels and 10 types of employment.

Revenues of Scottish institutions of higher learning:: £1,41 bn

Employees : 30.500 FTE

2% of the Scottish GDP

Direct impact = current expenditures and university investment + student expenditures = £1.197,31 m

Indirect impact = £940,26 bn

Total multiplier = £1.197,31 m + £940,26 m / £1.197,31 m= 1,79

Direct employment = 30.500

Indirect employment = 37.700

[2] Committee of Scottish Higher Education Principals

Employment multiplier = 30.500 + 37.700 = 68.200/30.500= 2,24

2.2 Study of Universities in Greater Manchester.

Robson et al (1995) analyzed the impact of the expenditures made by four universities in Greater Manchester. The methodology employed follows the general guidelines of Keynesian multipliers..

These four universities spent, in conjunction, the equivalent of 450 million pounds during the 1992/3 period, employed 12,500 people and received close to 46,000 regular students and 100,000 students for short term study programs. The authors of the study analyzed the impact of these expenditures over three regions: the city of Manchester, the greater metropolitan area (greater Manchester) and the northeastern region of England.

Table 2.1 Total impact of Manchester Universities

	Production multipliers	Income multipliers	Additional Jobs
Manchester	1,182	1,321	2.000
Great Manchester	1,306	1,283	3.200
Northeastern of England	1,495	1,404	4.800

2.3 The Harris Study of the University of Portsmouth.

Harris' (1997) study of Portsmouth University's impact on the local economy is frequently cited in the literature. The author employs an input-output matrix and considers the direct, indirect and induced impact of university expenditures. Part of his data were obtained through specific research to evaluate the amounts of sales, imports, income leakages etc.

He estimates an income multiplier of around 1,66 and an employment multiplier of around 1.8/ He also estimates that close to two thirds of the University expenditures are made within the region. [3]

2.4 Study of Southeast England.

Allen & Taylor's (2002) study elaborated for educational authorities in Southeastern England [4] also implement an input-output matrix. It is a broad study which covers 12 Higher Education Institutions. Of these, the largest four (which are responsible for almost 70% of total expenditures) are the universities of Bristol, West England, Plymouth and Bath.

The study uses an indirect methodology to calculate the impact of universities in the cities that they are located in, which the author refers to as impact on the local economy and general impact for southeastern England, which is denominated as regional impact. Through a

[3] According to Allen & Taylor (2002) p.25.
[4] HERDA-SW. Higher Education Regional Development Association – South West

series of specific and direct researches on income, expenditure patterns and student and faculty patterns of consumption, the flows that provoke direct economic impact are gleaned. The following flows are considered::

(1) Salaries paid to university faculty and staff.

(2) University consumption and investment expenditures

(3) Expenditures related to staff and faculty food costs.

(4) Student food and housing expenditures.

(5) Total spending by students in the local economy.

(6) Student income from temporary or part-time employment in the local economy.

Direct economic impact is thus defined as:

DI =(1) + (2) - (3) – (4) + (5) – (6)

Flows 3 and 4, since they occur within the confines of the university, are not considered to have an impact on local purchases..

Once direct impact has been calculated, a 1.2 Keynesian multiplier is applied in order to calculate the total impact (and, as a consequence, the indirect impact) on local economies. This value, 1.2, has been applied only after a review of the literature on similar cases has been completed, indicating a value between 1.24 and 1.73 for local university impact. For regional impact, the value of this multiplier, usually obtained through input-output matrixes, is between 1.56 and 1.91. Thus, a multiplier of 1.5 is applied for the aggregate impact of 12 institutions of higher learning, in an attempt to capture total regional effects

3. METHODOLOGY.

Before proceeding with our discussion of methodology per se, it is wise to present the concepts we use and specify our variables and how we have restricted them. In response to the availability of data, we have limited ourselves to considering only the effects of Paraná state government expenditures on higher education and the effects of expenditures made by out-of-state students of the HEIs. Government expenditures, in turn, have been sub-divided into two groups: expenditures on personnel and current consumption and investment. This is due to the fact that the highest government expenditures in higher education pertain to personnel costs (wages and salaries). Information referring to government expenditures on higher education for the year of 2004 were consolidated, and expenditures on students were estimated.

Once this information had been obtained, it was easier to evaluate the impact that these universities had over the Paraná state economy using the social accounting matrix for the state from the year 2000. Data on each HEI was obtained and then aggregated to the set of state HEIs. The evaluation of their impact that has been made refers to the state economy as a whole. The evaluation of their impact on the local economies to which they belong, although certainly very important, lies beyond the scope of this work.

It is initially important to discuss the concept of *government spending* in social accounting. As has been stated, the impact of income and employment generation is determined by the increase of final demand. What then constitutes final demand, or final aggregate demand? Final aggregate demand is the sum total of the final demands (final goods and services) of large consumption groups. These groups are: family consumption, government expenditures, investment and export. Since the components of aggregate demand are presented separately, it is possible to examine the independent impact on each one of them on the economy

Within economic literature, *government spending* corresponds to the production of goods and services carried out by the government (federal + municipal + federal) that is destined to the population without any need for citizens to pay for the consumption of such public goods and services[5]. Thus, since they have no market price, the production value of state-produced goods and services is obtained by adding personnel expenditures plus expenses with production inputs.

Thus, in order to obtain the value involved in supplying a higher education through the HEIs (state universities and colleges), we need to add staff and faculty salaries plus expenses with materials and services that are necessary for supplying educational services. Expenditures on material and services may include water, electricity, security and food services, money spent on laboratories, paper and photocopies, and so forth. These are all considered current consumption.[6] These expenditures are in turn sub-divided into two categories, personnel expenditures and current consumption. Those of the first type refer exclusively to payment of faculty and staff, while the second type pertain to the daily expenses of running the institution. Universities also produce economic impact when making investments. Investments can be the result of expanding the physical area, through the building of new classrooms and laboratories or other works linked to the construction industry. Investment also includes purchase of books, personal computers and laboratory equipment, insofar as this material has a work life of over 360 days. These are all considered *investment expenditures*..

[5] These goods and services are public rather than privately consumed and are paid through tax collection. .
[6] Financial expenditures such as those related to debt payment are not included here. .

Growth in household consumption also has an economic impact, given that with the salaries that the university pays to its faculty and staff, the latter turn their wages into final goods and services that also propel the state's economic activity. Students from other states transfer income to Paraná through the spending that they engage in order to stay in school. Spending on rent and food are the most significant.

3.1 The Social Accounting Matrix for the State of Paraná

Most Brazilian regional matrixes have been put together through indirect research, using published data and then applying adjustment techniques to the latter. In the case of Paraná, Kureski and Caballero Nuñez (2005) adopted the Location Quotient method - whose main advantage is its lower cost - in order to obtain the input-output matrix for Paraná for the year 2000. The method is based on the transformation of national coefficients into regional ones (Soares, 1993, p.32).

In order to put together the Paraná state matrix, per product Location Quotient had to be obtained. The latter were calculated by employing data on gross product values supplied by the IBGE table on Resources and Uses for Brazil, and Brazilian Regional Accounts for the State of Paraná. Here we should keep in mind that gross product values are disseminated by the IBGE, in its publications on Brazilian regional accounts, which were thus compatible Brazilian gross product values. However, since regional accounts for the industrial sector are not disaggregated in the Table of Uses and Resources as they are at the national level, the authors had to resort to use of a proxy. For disaggregating the gross value of Parana state industrial production, the value of sales plus changes in inventories was employed. These values were obtained from the Paraná State Department of the Treasury, as specially tabulated, without including tax values, since the latter would produce a distortion in results.

Through the input-output matrix Kureski and Caballero Nunes (2004) were able to put together a Social Accounting Matrix (SAM) for the state. The resulting matrix is presented in table 3.1, in which aggregate data on the state of Paraná are presented. The Labor account was subdivided as follows: a) registered workers b) workers kept "off the books" c) employers d) self-employed workers. On this basis, the impact of state universities was evaluated:

TABLE 3.1 MATRIX OF AGGREGATE SOCIAL ACCOUNTING FOR THE STATE OF PARANA -2000

ORIGIN		DESTINY (in millions of R$) Activities	Documented Worker	Undocumented worker	Self-employed	Employer	Capital	Households	Government	Investment	Exports to other parts of Brazil	Exports to other parts of world	Total demand
		1-41	42	43	44	45	46	47	48	49	50	51	52
Ativities	1-41	RMPGR						FC	GC	I	ERB	ERW	DT
		51.387						41.133	9.955	3.131	11.689	29.028	146.323
Documented Worker	42	IDW											IDW
		14.154											14.154
Undocumented Worker	43	IUW											IUW
		6.214											6.532
Employer	44	IEW											IEW
		2.937											2.937
Self-employed	45	ICSE											ISE
		3568											3.568
Capital (EOB)	46	CI											CI
		47.244											47.244
Households	47		IWAFDW	IWAFUN	IWAFSE	IWAE	CIAF		GTF				TFI
			13.100	6.532	2.871	3.482	32.351		4.538				62.875
Taxes and Tarifs	48	IT	SCLDW	SCLUN	SCLSE	SCLE	SCC	DT					TGR
		6.214	1.054	0	66	86	1.875	1.265					10.560
Savings	49						DEP	FS	GS		ESRB	ESRW	S
							13.017	20.477	-3.933		-10.308	-16.122	3.131
Imports from other parts of Brazil	50	IRB											RRBSI
		1.380											1.380
Imports from other parts of the world	51	IRW											RRWSI
		12.907											12.907
Total supply	52	TS	TEDW	TEUW	TEEL	TESE	TEC	TEF	TGE	I	ERBSE	ERWSE	
		146.323	14.154	6.532	2.937	3.568	47.244	62.875	10.560	3.131	1.380	12.907	

LEGEND:

RMPGR	- Raw material purchases;	CI	- Capital income.	FS	- Family savings	TEUW	- Total expenses undocumented work.
FC	- Family consumption;	IWAF	- Income from work allocated to families;	GS	- Government savings;	TEEL	- Total expenses employers' labor.
GC	- Government consumption.;	CIAF	- Capital income allocated to families.;	ESRB	- External savings rest of Brazil.	TESE	- Total expenses self-employment.
I	- Investment;	GTF	- Government transfer to families;	ESRW	-External savings rest of world.;	TEC	- Total expenses capital.
ERB	- Exports to rest of Brazil ;	TFI	- Total family income;	S	- Savings	TEF	- Total expenses families.
ERW	- Exports to rest of world;	IT	- Indirect taxation;	IRB	- Imports from rest of Brazil.;	TGE	- Total government expenses.
DT	- Total demand;	SCL	- Social contribution from labor;	RRBSI	- Revenues from rest of Brazil from State imports.	I	- Investment
IDW	- Income from documented work;	SCC	- Social contribution from capital;	IRW	- Imports rest of world..	ERBSE	- Expenses rest of Brazil with State exports.
IUW	- Income from undocumented work;	DT	- Direct taxation;	RRWSI	- Revenues from rest of World from State imports ;	ERWSE	- Expenses rest of world with State exports.
IEW	- Income from Employers' Work;	TGR	- Total government revenue.	TS	- Total supply. ;		
ICSE	-Income from self-employment;	DEP	- Depreciation;	TEDW	- Total expenses documented work		

3.2 Consolidation of information.

Once the variables that compose aggregate demand related to state universities have been defined, we need to explain how they were obtained.

In order to obtain government spending on state universities and colleges, it was necessary to put together the budgetary and financial operations for all state institutions of higher learning during the year 2004. This was done in conjunction with the State Department of Science, Technology and Higher Education. Data were available in a very disaggregated format, per HEI and according to units of public accounting. If on the one hand this dissagregation facilitated the researchers' tasks, it also generated quite a problem, since the state data base does not permit easy migration to typical electronic spreadsheets. Thus, the researchers were obliged to put together a special list which were later transcribed into Excel forms, and subsequently prepared as study data.

a) Investment and Current public consumption Expenditures.

Spending on Current consumption were aggregated, and spending on Building and Installations were added on, together with Equipment and Permanent Material, all of which represent investment in HEIs.

b) Personnel Expenditures.

Personnel expenses were obtained by adding the following variables: short - term contracts, wages and benefits, employers responsibilities and other variable employment costs.

c) Spending on out –of- state students.

An estimate of expenses with out of state students was carried out according to the following procedures:

c1) Based on socio-economic data of HEIs students, average family income was estimated..

Income information was classified according to the wage levels, based on , the current Brazilian minimum wage

- Less than the minimum wage.
- From 1 to 2 times the minimum wage.
- From 3 to 4 times the minimum wage.

- From 5 to 10 times the minimum wage.
- From 11 to 15 times the minimum wage.
- From 16 to 20 times the minimum wage.
- Over 20 times the minimum wage.

Thus, the value of total income for each wage level was the result of multiplying the average wage for each level by the number of students within each wage level category.

c2) Since the specific wage level for out –of- state students was not obtained, their family income was considered to correspond to the general average of family wages for HEIs students. Once family income has been calculated, an estimate of the total family income for out-of-state students is obtained: the result of multiplying the number of out-of-state students by the estimated average family income.

c3) The following step was to estimate the volume of family income that was transferred to the state of Paraná through out-of -state students. As a hypothesis, this value was taken to represent 20% of total family income.

3.3 Calculations for Impact Multipliers through the Social Accounting matrix.

Once the amount of current consumption and investment in the HEIs, expenditures on personnel and out-of-state student spending are consolidated, it becomes possible to estimate state HEI impact on income and employment generation within the state of Paraná.

Calculations were made through multipliers obtained from the Paraná State Social Accounting matrix for the year 2000 (Kureski e Caballero-Nuñez, 2004).The equations below demonstrate how total income and employment generated were calculated.

a) Impact of investment and current consumption expenditures on HEIs.

The total impact of HEIs expenditures on current consumption and investment on employment and income was obtained by applying sectoral multipliers over

the amounts of these expenses: the general multiplier for Public Administration for spending on materials and services, the Construction Industry multiplier for building expenses, the multiplier for Electronic Equipment for spending on machines and equipment. The values were obtained through the application of the following formulae:

$$TIG = IMPA * SMS + IMCI*SCI + IMEE*SME \quad (1)$$

$$TEG = EMPA * SMS + EMCI*SCI + EMEE*SME \quad (2)$$

TEG= Total of employment generated.
TIG=Total of income generated.
EMPA= Employment multiplier in Public Administration.
IMPA=Income multiplier in Public Administration.
SMS=Spending on materials and services.
EMCI= Employment multiplier in Construction Industry.
IMCI= Income multiplier in Construction Industry
SCI=Spendings on the Construction Industry
IMEE= Income multiplier in Electronic Equipment activities
EMEE= Employment multiplier in Electronic Equipment activities.
.SME= Spending on Machines and Equipment.

The results obtained were for each HEI. In order to break down the values of the total impact on income and employment, direct, indirect and induced, calculation procedures are the same; only the specific multiplier values –obtained through the social accounting matrix - have to be inserted.

b).Impact of spending on personnel and out-of-state students.

In order to measure the impact on employment and income, per HEI, coming from staff and faculty salaries, a consumption structure must be available. This makes it possible to identify the sectors in which these salaries will be spent and their subsequent

impact on the regional economy. The consumption structure from the social accounting matrix was used in order to disaggregate faculty and staff consumption.

Total impact on income and employment is obtained through the application of the following formulae: :

IGFSC=FSSF*IM (3)

EGFSC=FSSC*EM (4)

Where:

EGFSC= Employment generated through faculty and staff consumption.

IGFSC= Income generated through faculty and staff consumption.

FSSC=Faculty and Staff Spending on Consumption.

EM= Employment multiplier.

. IM=Income Multiplier.

In the case of the total impact of income generated by out –of- state students, the procedures are the same as those that have been adopted for faculty and staff. The value of students' income was also break down through the structure of the social accounting matrix. Nonetheless, in this case it was not possible to disaggregate the impact per HEI, as was the case for other segments.

For the results obtained regarding income, it was necessary to adjust the value of direct, indirect and induced income. Since income multipliers for public administration as a whole, covering all categories of civil servants was used, the multiplier is heavily influenced by those categories of civil servants that have lower wage levels, who in fact constitute the majority. The values resulting from the application of sectoral multipliers were lower than those pertaining to real direct spending. One solution would be to disaggregate from administrative activities that part that corresponds to state-run higher education. In this case it would be necessary to obtain an intermediate consumption structure for the new activity. This would make it necessary to carry out research within each university on its cost structure, which would be time-consuming and make it take longer to conclude the project. The alternative that was adopted was the use of general public administration multipliers, making the necessary corrections on the results end. Thus the values estimated for direct faculty income were substituted by the real values found for

the budgetary and financial operations carried out by the universities. For indirect and induced income, the same elasticity that was used for direct income was presumed here. Through this procedure the values originally obtained through income multipliers were altered.

c) Impact on tax revenues.

The impact of income expansion over taxes collected can also be evaluated. The formulae for this are, as follows:

TTG = TMPA*SMS=TMCI*SBI +TMEE*EME (5)

TTG = Total Taxes Generated

TMPA=Tax Multiplier in Public Administration.

SMS= Spending on materials and services.

TMCI= Tax Multiplier in Construction Industry.

SBI=Spendings on Building Industry.

TMEE= Tax Multiplier in Electronic Equipment

.EME= Expenses on Machines and Equipment.

In order to evaluate the impact of taxes collected from faculty and staff salaries, the formula is as follows :

RGFST =FSC*TM (6) where:

RGFST = Revenues Generated by Faculty and Staff Consumption

FSC=Faculty and Staff Consumption

TM=Tax Multipliers.

3.4 The Iguaçu Model.

This is a general computable equilibrium model elaborated by the Centre of Policy Studies at Monash University in Australia.[7]. It is a static model developed for use with Social Accounting Matrixes (SAM). This basic model was taken and adapted with data from the Paraná state social accounting matrix. The resulting model has 41 industrial sectors that produce 41 products, that is, each sector produces only one product. The model

[7] The model may be seen on the following website: http://www.monash.edu.au/policy/archivep.htm

follows traditional neo-classical hypotheses of economic rationality, which means that each sector minimizes its production costs subject to constant returns of scale and input prices are given. Families use their incomes according to traditional functions of utility maximizing..

Two regions for world trade are considered: Brazil and the rest of the world. Furthermore, imports are a compound good used in different proportions throughout all sectors..

The matrix makes no distinction between activities and products, but is interpreted in the following manner. The entrance of commodities, presented in the lines of matrix, signify purchases of a compound good formed by local (Paraná state) and imported commodities (from the rest of Brazil and the rest of the world) . Imported products are only used directly by firms. Thus, sectors acquire a dual role: to produce and to combine compound goods that use their own product plus the equivalent in imported goods. Using an example from agriculture, we can say that imports will consist of: any imported good used directly by the agricultural sector, and any import of an agricultural product used directly by final demand.

Furthermore, the model also considers that all payments for production factors are received by local families.

4 ANALYSIS OF RESULTS.

4.1 Results obtained through the Social Accounting Matrix.

In the year 2004, spending on the three components of Final Demand that had an impact on the Paraná state HEIs added up to R$ 460.543.924,00. This spending led to a total expansion of state income of R$ 1.075.854.466,00, corresponding to an income multiplier[8] of 2.34. This is the same as saying that for each “real” (current unit of Brazilian currency) spent as a result of HEIs existence, an additional income of R$ 1.34 is generated.

Considering the multipliers for each component of expenditures, we can say that those that result from faculty and staff income and from out-of-state students have a

[8] The multiplier that has been calculated considers direct, indirect and induced expenditures. It is known in the literature as Type II Multiplier.

greater impact as multiplier (2.43) than do HEIs final demand expenditures on investment and current consumption (2.07) This means that for each "*real*" paid in HEIs faculty and staff salaries, an additional R$1.43 is generated in the Paraná state economy (see table 4.1 and 4.2),

Table 4.1 Income generated by total Final Demand (HEIs + Faculty and Staff + Out-of-State Students)

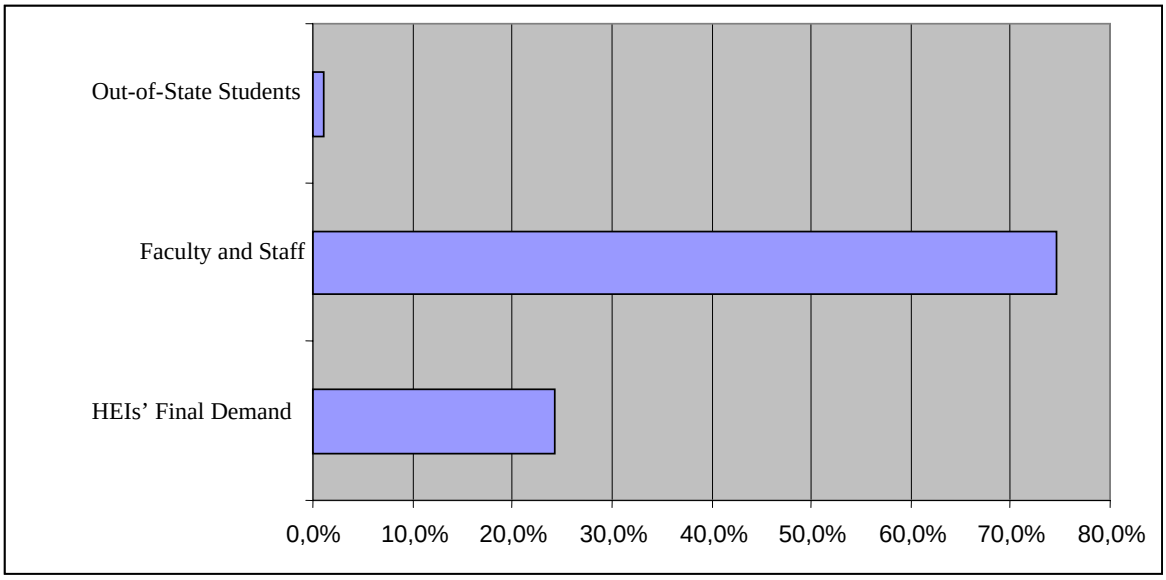
	2004			
Source	Direct	Indirect	Induced	Total
HEIs' Final Demand Consumption and Investment	125.647.765	23.257.138	111.664.802	260.569.706
Faculty and Staff's Income	329.863.783	166.939.970	306.229.987	803.033.739
Out-of-State Students' Spending	5.032.376	2.546.823	4.671.821	12.251.021
TOTAL	460.543.924	192.743.931	422.566.610	1.075.854.466
Income Multiplier	**2,34**			

The source that generates greatest impact on income is spending of faculty and staff. It constitutes more than 70% of the total income generated in 2004, followed by HEIs final demand in current consumption and investment.

Table 4.2 Income Multipliers

Source	**Partial Multipliers**
HEIs' Final Demand Consumption and Investment	2,07
Faculty and Staff's Income	2,43
Out-of-State Students' Spending	2,43
Total income multiplier	**2,34**

Graph 4.1- Source's Contribution to Generated Income



As could be expected, the largest universities are most responsible for impact on state income. The Universities of Londrina and Maringá together make up close to 60% of this impact, followed by Unioeste, Unicentro and the State University of Ponta Grossa. Table 4.3 and Graph 4.2 below represent the total results for each HEI.

Graph 4.2 HEIs' Share in Generated Income -2004

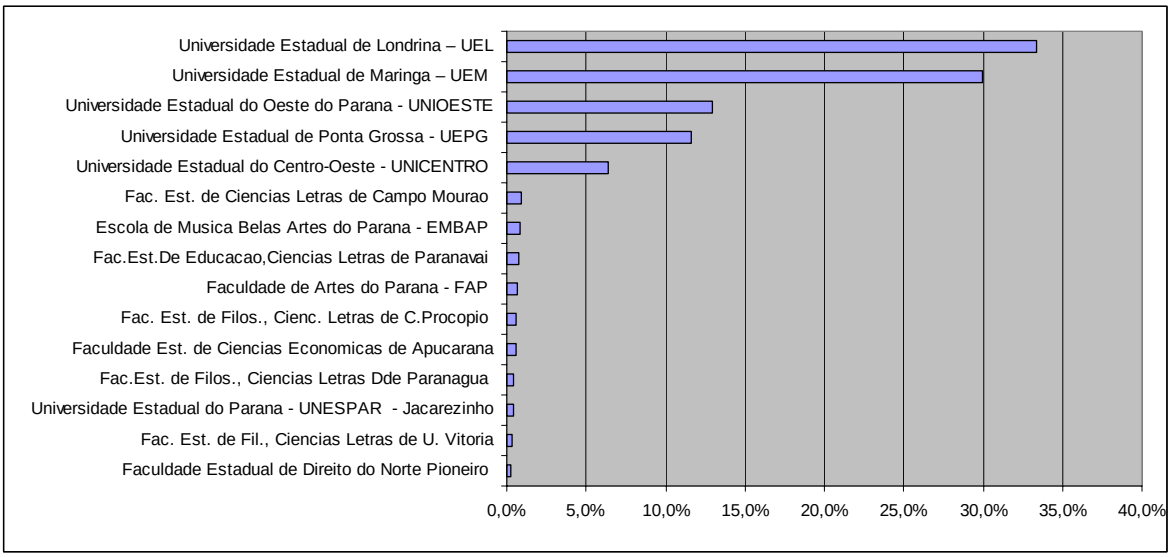


Table 4.3 Income generated by Total Final Demand (HEIs + Faculty and Staff + Out-of-State Students) - R$ of 2004

	2004			
	Direct	Indirect	Induced	Total
Universidade Estadual de Londrina - UEL	152.773.504	61.742.718	140.057.482	354.573.704
Universidade Estadual de Maringá - UEM	136.194.660	57.422.507	124.988.131	318.605.297
Universidade Estadual do Centro-Oeste - UNICENTRO	28.966.339	12.070.210	26.624.493	67.661.042
Universidade Estadual do Oeste do Paraná - UNIOESTE	58.510.678	25.646.641	53.801.738	137.959.056
Universidade Estadual de Ponta Grossa - UEPG	52.771.755	22.849.643	48.365.346	123.986.743
Faculdade Est. de Ciências Econômicas de Apucarana	2.611.427	1.060.750	2.387.725	6.059.902
Fac. Est. de Filos., Ciências e Letras de C.Procópio	2.728.274	1.086.020	2.499.909	6.314.202
Universidade Estadual do Paraná - UNESPAR - Jacarezinho	2.059.091	757.045	1.874.168	4.690.305
Faculdade Estadual de Direito do Norte Pioneiro	1.028.019	340.926	936.765	2.305.710
Fac.Est. de Filos., Ciências e Letras de Paranaguá	2.106.085	805.659	1.923.947	4.835.691
Fac. Est. de Ciências e Letras de Campo Mourão	4.143.458	1.644.689	3.767.444	9.555.590
Escola de Musica E Belas Artes do Paraná - EMBAP	3.724.866	1.671.189	3.433.866	8.829.920
Faculdade de Artes do Paraná - FAP	2.861.145	1.182.289	2.630.127	6.673.562
Fac.Est.De Educação,Ciências e Letras de Paranavaí	3.463.769	1.343.974	3.172.994	7.980.736
Fac. Est. de Fil., Ciências e Letras de U. Vitória	1.568.479	572.849	1.430.657	3.571.985
SUBTOTAL (*)	455.511.548	190.197.108	417.894.789	1.063.603.445
TOTAL (**)	**460.543.924**	**192.743.931**	**422.566.610**	**1.075.854.466**
Income Multiplier		**2,34**		

(*) But out-of-state students (**) Included the total of out-of-state students

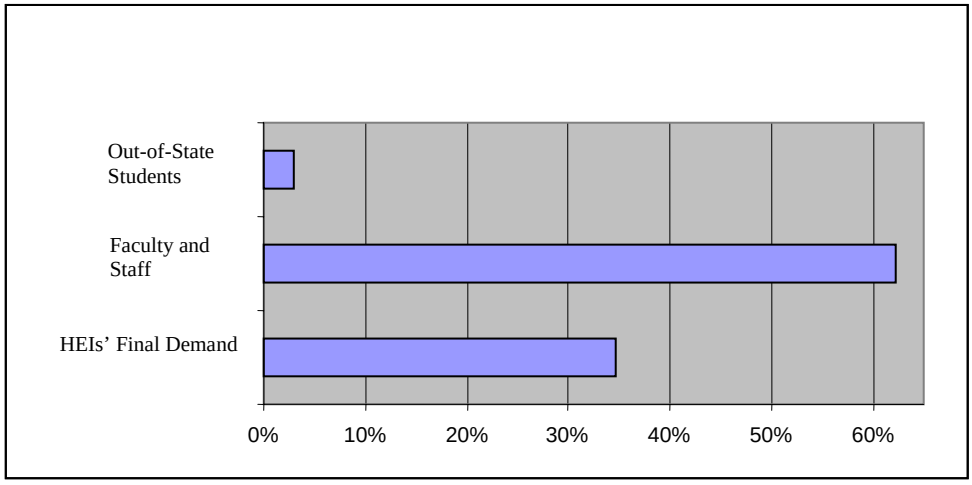
Employment

The employment generated in 2004 in the state of Paraná through expenditures on the three component parts of the demands associated with state HEIs came to a total of 21.073, the equivalent to a 2.53 employment multiplier. This means that for each employment created directly by the state HEIs, another 1.53 employments are created in the state as a whole. (See table 4.4).

Table 4.4 Employment generated by Total Final Demand (HEIs + Faculty and Staff + Out-of-State Students)

	2004			
Source	Direct	Indirect	Induced	Total
HEIs' Final Demand Consumption and Investment	**2.886**	**1.037**	**3.398**	**7.320**
Faculty and Staff's Income	**5.178**	**2.949**	**5.005**	**13.127**
Out-of-State Students' Spending	**247**	**141**	**239**	**626**
TOTAL	**8.311**	**4.126**	**10.249**	**21.073**
Employment Multiplier		**2,53**		

Graph 4.3- Source's Contribution to Generated Employment - 2004



The history repeats itself with little variation in relation to tendencies detected in income analysis. Major responsibility for income creation are expenditures flowing from staff and faculty employment, followed in second place by expenditures related to HEIS final demand in investment and current consumption.

The universities of Londrina and Maringa also have the majority of the responsibility for the total volume of employment generated in the state as a whole. Together they generate more than 70% of this employment, followed by Unioeste, Unicentro and the State Univerity of Ponta Grossa. (See Graph 4.4 and Table 4.5)

Graph 4.4 HEIs' Share in Generated Employment -2004

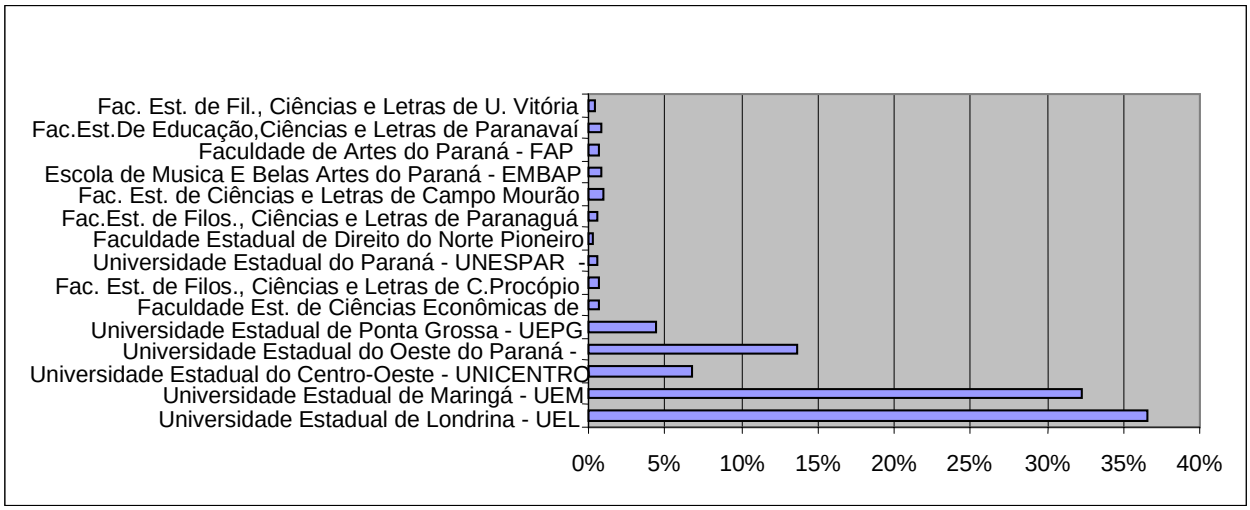


Table 4.5 Employment generated by Total Final Demand (HEIs + Faculty and Staff + Out-of-State Students)

	2004			
	Direto	Indireto	Induzido	Total
Universidade Estadual de Londrina - UEL	2946	1443	3071	7460
Universidade Estadual de Maringá - UEM	2595	1306	2686	6588
Universidade Estadual do Centro-Oeste - UNICENTRO	551	275	568	1394
Universidade Estadual do Oeste do Paraná - UNIOESTE	1102	568	1128	2797
Universidade Estadual de Ponta Grossa - UEPG	352	145	413	910
Faculdade Est. de Ciências Econômicas de Apucarana	51	25	53	129
Fac. Est. de Filos., Ciências e Letras de C.Procópio	54	26	56	136
Universidade Estadual do Paraná - UNESPAR - Jacarezinho	41	19	44	104
Faculdade Estadual de Direito do Norte Pioneiro	27	9	22	52
Fac.Est. de Filos., Ciências e Letras de Paranaguá	41	20	44	105
Fac. Est. de Ciências e Letras de Campo Mourão	82	40	88	210
Escola de Musica E Belas Artes do Paraná - EMBAP	69	36	70	175
Faculdade de Artes do Paraná - FAP	54	27	56	138
Fac.Est.De Educação,Ciências e Letras de Paranavaí	67	32	71	170
Fac. Est. de Fil., Ciências e Letras de U. Vitória	31	14	33	79
SUBTOTAL (*)	**8064**	**3985**	**8403**	**20447**
TOTAL((**)	**8311**	**4126**	**10249**	**21073**

(*) But out-of-state students (**) Included the total of out-of-state students

4.2 Results obtained through the Computable General Equilibrium Model: Iguaçu Model

Given the still experimental nature of the Iguaçu Model, its results should be interpreted with caution. Thus, only a simple simulation was made, on the basis of an 18.6% raise that university faculty received in the second semester of 2005.

This simulation considered a closure of the model in classic input-output terms. All factors and all imports have flexible supply and fixed nominal prices. Thus, there are no changes in relative prices and the model functions according to typical input-output patterns. Furthermore, household consumption, since it is related to regional income, has a high multiplier effect. In other words, the resulting multiplier is a type II. It is important to emphasize again that the implications of the input-output hypothesis tend to inflate expansion since the assumption of elastic supply causes any impact of demand, such as that provided by the case of the raise in faculty salaries, to be covered by supply..

The shock applied to the model was a nominal increase of 18.6% on the salaries of registered employees in the public sector. The results that followed from the

irradiation of the effects of this raise throughout the entire state economy are described below. This increase in the cost of a specific parcel of the state labor force led to a 0.014% increase of the real state GDP and a 0.044% nominal increase. It shows only a small effect over total employment, yet it provided a 0.044% increase in real household consumption. With all effects making themselves felt, tax revenues increased by 0.035% (see table 4.6).

Table 4.6 CGE Iguaçu Model Simulation

Change in selected variables due 18,6% increase in faculty's nominal wages	%
Paraná State Economy	
Real GDP	0,014
Nominal GDP	0,043
Real household consumption	0,044
Total employment	0,00
Total change in tax revenues	0,035
Change in income after taxes	0,046
Change in workers' income	
Documented worker	0,122
Undocumented worker	0,073
Self-employed	0,018
Employer	0,021
Rent of Capital	0,021

5. Final Considerations.

This paper represents an effort to evaluate the short-run economic impact of Higher Education Institutions on the economy of the state of Paraná.

The results obtained show a type II income multiplier of 2.34 and a 2.53 employment multiplier. This is equivalent to affirming that for each income unit generated due to HEIs existence, another 1.34 income units are generated throughout the state economy. A 2.53 employment multiplier means that for each job that springs from HEIs expenditures, another 1.53 jobs are generated in the state economy as a whole.

The values obtained, and with particular salience the employment multiplier, are quite close to the values found in similar studies in other parts of the world.[9]. We could cite here Harris'(1997) study of the impact of Portsmouth university on the local economy, in which an input-output matrix that considered the direct, indirect and induced outcomes of university expenditures was used. It resulted in an income multiplier if approximately

1.66 and an employment multiplier of 1.8. Although the values found for the state of Paraná were greater than those of other studies, it should be taken into account that, in addition to methodological differences and structural differences in the economies studied, the multipliers calculated for Paraná are type II. This means that they include induced expenditures, and therefore tend toward larger values.

In addition to this evaluation, a simulation was also carried out, considering the impact of an average salary readjustment of 18.6% for university faculty. In this case the analytic tool used was the computable general equilibrium model- the Iguaçu Model.

As emphasized initially, the results of studies of this sort have to be seen in relation to the hypotheses that are under consideration and the methodological and data limitations that are a part of the elaboration process. Regardless of the limitations that do exist, the research does demonstrate that Paraná Higher Education Institutions have a considerable short-run impact on the state economy. To go into greater depth in these calculations and extend analysis to the dimension of long term impact which would include supply side elements is a remaining challenge.

References

Allen, G. & Taylor,P. (2002) **The Economic Impact of Higher Education in the South West Region.** Exeter. Herda-SW

Harris, R.I.D. (1997) **The Impact of the University of Portsmouth on the Local Economy**. Urban Studies, v.34 n.4,605-626.

Kureski, R.; Caballero Nuñez, B.E. **Metodologia de obtenção da matriz de contabilidade e social do estado do Paraná 2000.** In: III Encontro de Economia Paranaense, 2004, Londrina. III ECOPAR, 2004.

McNicoll, I.H., Kelly, U., Marsh, R. (2002) **The Impact of Higher Education Institutions on the UK Economy.** London: Universities UK.

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

Robson, B. et all (1995) **The Economic and Social Impact of Greater Manchester's Universities.** Manchester: Salford University Business Services Ltd.

Rolim,C. & Kureski,R. (2006) **Impacto Econômico de Curto Prazo das Universidades Estaduais Paranaenses**. Curitiba. Relatório de Pesquisa realizada para a Secretaria de Ciência, Tecnologia e Ensino Superior do Estado do Paraná.

[9] A wider-ranging comparison with similar studies can be found in Rolim and Kureski (2006))