Integration of a Regional Input-output Model With a Spatial Interaction Model For Localities. An Application to the Azores

Integração de um modelo regional de input-output com um modelo de interação espacial para as localidades. Uma aplicação aos Açores

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Abstract/Resumo

The aim of this paper is to analyze the economic interdependencies between the regional and the local scale through the use of an economic model that integrates an Input-Output Model for the regional scale with a spatial interaction model for the local scale. Furthermore it is possible to show that multiplier effects vary considerably between areas if we consider the spatial disaggregation of income and the spatial distribution of consumption.

O objetivo deste artigo é analisar as interdependências económicas entre a escala regional e a escala local através de um modelo económico que liga um Modelo Input-Output à escala regional com modelos de interação espacial à escala local. É assim possível explicitar que os efeitos multiplicadores variam consideravelmente entre zonas, caso se desagregue o rendimento e o consumo por várias zonas.

Keywords: Input-Output; Spatial Interaction; Island; Azores

Palavras-Chave: Input-Output; Interação Espacial; Ilha; Açores

JEL Codes: R15, R58, R42

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1. INTRODUCTION

Applicable modelling techniques for small regions can vary from the effective simplicity of the base models (Hoyt, 1939; North, 1955; and Tiebout, 1956); passing through the generally diffused Input Output Models (Isard, 1951; Moses, 1955; Leontief and Strout, 1963) to the illustrative possibilities of the Spatial Interaction Models (Reed,1967; Chisholm and O'Sullivan, 1973; Ashtakala and Murthy, 1988); continuing through the interesting and challenging implementation of more complex, actual and still operational tools like the Multiregional Economic Models (Haddad, 1999; Brocker, 2002; Kim et al., 2004).

The interest of the application of these operational tools to small localities result not only from the empowering of regional actors through the highlighting of locally controllable policy tools, but also to the creative exercise of most adaptations, quite often allowing interconnections with technological, social, regulatory and environmental issues. The challenge we like to address in this essay is the integration of a regional input-output model with a spatial interaction model for localities.

This creates one problem and one opportunity: the problem is that tradable activities are not easily reproducible both for large and small places and being so it does not make sense to try to adopt the same type of economic structure for the region and for the localities; the opportunity is that non tradable activities like shopping, commuting and residence, although not sufficiently considered in regional economic models but can be easily dealt with spatial interaction models. Being so, it makes sense to integrate an Input-Output Model suitable to represent all economic activities of a region, with a spatial interaction model adapted to the scale of smaller localities for which environmental and regulatory issues can be better characterized and where non tradable activities are better analyzed.

The aim of this essay is to formulate a Regional Input-Output model with a Spatial Interaction models for Localities (RIOSIL). Beyond the introduction (Point 1), the essay is divided into four parts. Point 2 explains the traditional input-output model. Point 3 presents a spatial interaction in a input-output format. And, Point 4 shows the regional input-output model with a spatial interaction model for localities. There is also some concluding remarks in point 5.

2. REGIONAL INPUT-OUTPUT MODEL

The construction and application of Input-Output models is generalized all over the world. Input-Output models are very important to analyze the structure of the economy and to evaluate how the different sectors interact with each other. The integration of Input-Output models into the national accounts system allows the detection of information inconsistencies, the validation of different forms of economic information and a good basis to design statistical enquiries. Nevertheless it is on economic analysis that these models perform best. They quantify direct, indirect and induced impacts due to changes in final demand, assuming there are no changes on relative prices and also that production functions are linear. Therefore they are used to simulate the effects of economic scenarios and policies. They can also serve to support Computable General Equilibrium Models that add to the Input-Output models the assumption of equilibrated markets through the adaptation of product and factor prices. Finally, it is also common to find Input-Output models connected to areas like the environment and used to estimate the effects of the economy on CO2 emissions, or on the consumption of water or energy resources (Hewings et al. 2003).

Input-Output analysis is based on the organization of the economic information of a particular region during a certain period of time (Leontief, 1951; Leontief et al., 1953). Input-Output models assume a causal link between the exogenous variables of the Final Demand to the endogenous variables that includes the total production per sector and the primary inputs also per sector. The assumptions of input-output models are: i) constant returns on scale; ii) the existence of one product by sector; iii) no substitution between production factors; iv) constant technical coefficients; v) unlimited supply of resources; and vi) efficient resource utilization.

The input output model assumes that sales x_{ij} of each sector (i) to other sector (j) are constant percentages a_{ij} of the total production X_j of sector (j); similarly, sales F_{kj} of primary products of type (k) to sector (j) are constant

percentages f_{kj} of the total production X_j; finally, sales from the external economy (m) to sector (j) M_j are also a constant percentage m_j of production X_j of sector (j). Being so it is possible to formulate the linear production function of input-output models for each sector (j):

$X_j = \sum_i a_{ij} X_j + \sum_k f_{kj} X_j + m_j X_j$ for all sectors (j), where $\sum_i a_{ij} + \sum_k f_{kj} + m_j = 1$ **(1)**

Furthermore, it is also possible to formulate the linear consumption function (C) that combines the consumption of all the sectors and equals to the total income applied to consumption Yc

$C = \sum_i c_i Y_c$, where $\sum_i c_i = 1$ **(2)**

Then, for each sector (i), one can add up the sales $\sum_j a_{ij} X_j$ of sector (i) to all the other sectors (j), plus the sales to final demand, being it consumption $C_i = c_i Y_c$, exports E_i, public expenditure G_i or private investment H_i.

$X_i = \sum_j a_{ij} X_j + c_i Y_c + E_i + G_i + H_i$ for all sectors (i), **(3)**

Also for the primary products (F_{kj}) of sector (j) applied to consumption (k=c) it is possible to define an equilibrium equation so that the total sum of the incomes applied to consumption ($f_{ic} X_j$) for each sector (j) is equal to the total income applied to consumption.

$Y_c = \sum_j f_{cj} X_j$, **(4)**

If we assume that Matrix A' is defined as follows:

$$A' = \begin{bmatrix} a_{ij} & c_i \\ f_{cj} & 0 \end{bmatrix} \quad \textbf{(5)}$$

And vector X' is defined to include X and Yc.

$$X' = \begin{bmatrix} x \\ y_c \end{bmatrix} \quad \textbf{(6)}$$

Then equations (3) and (4) can be written

$X' = A' X' + (E+G+H)$ **(7)**

And, so, the total output vector X' can be explained by the final demand vector (E+G+H) provided (I-A') is a regular matrix that can thus be inverted.

$X' = (I-A')^{-1}(E+G+H)$ **(8)**

Table 1: Input Output Model Coefficients with Endogenized Consumption

	I	J	N	C	Ex	H	G	T
I	a_{11}	a_{1j}	a_{1n}	c_1	Ex_1	H_1	G_1	X_1
J	a_{1j}	a_{ij}	a_{jn}	c_j	Ex_j	H	G_j	X_j
N	a_{n1}	a_{nj}	a_{nn}	c_n	Ex_n	H_n	G_n	X_n
W_c	fc_1	fc_j	fc_n	0				Yc
W_o	fo_1	fo_j	fo_n					Wo
M	m_1	m_j	m_n	cm				M
T	X_1	X_j	X_n	Yc	Ex	F	G	Tot

Being so, the total output vector X', and all the other vectors of endogenous variables ($\sum_i a_{ij} X_j$; $\sum_k f_{kj} X_j$ and $m_j X_j$) can be explained by the final demand vector (E+G+H) provided (I-A') is a regular matrix.

Table 1 presents the traditional input-output model with endogenized consumption. In the present paper we assume that the technological structure at the regional scale stay the same. In other words the technological coefficients a_{ij} are similar for the whole region no matter the locality where each sector is located.

3. SPATIAL INTERACTION MODEL FOR LOCALITIES.

There are three major modeling approaches that focus spatial interaction: interregional input-output, interregional linear programming and spatial interaction models (Isard, 1960). Nevertheless, input-output models and their interregional and interregional linear programming design, tend to be more applicable to a regional scale or larger, where technological coefficients are more stable, where as

spatial interaction models, in their spatial interaction models, usually deals with town areas where work, shopping, residence and commuting are the main activities (Hewings et al., 2003). Spatial interaction models are built to describe and predict the flows of people, goods and information across space. The adoption of spatial interaction models to analysis flows between regions exists for a long time (Carrothers, 1956). They are analytical tools, with challenging theoretical interpretations (Coelho, 1983; Sen e Smith, 1995; Roy, 2003), very much used in planning, geography and regional science [(Wilson, 1970, 1974; McFadden (1978); Haynes and Fotheringhan (1984], in demography [Plane and Rogerson (1994)], in commerce and marketing [Bergstrand (1985)].

A spatial interaction model uses the structure of a basic model according to which exports, or basic activities, are the propulsive factors of the economy, demarcating not only its dimension but also the pattern of local production. The spatial interaction model distributes employment (or income) and residents (or consumption) by different zones of the region taking into account the distances between those zones and their attractiveness. A Spatial Interaction Model can be represented by Equations (9) to (12).

The endogenous variables, Residents (P_k) per zone (k) and Employment (E_{kj}) per zone and sector (j) is obtained from the exogenous variable, basic employment (Eb_{ik}) through the use of flow matrices [q] – Employment-Residence and [c] – Residence – Non Basic Employment

$$[P_k] = [q]\ \{I- [c]\ [q]\ \}^{-1}[Eb_{kj}] \quad \textbf{(9)}$$

$$[E_{kj}] = \{I- [c]\ [q]\ \}^{-1}[Eb_{kj}] \quad \textbf{(10)}$$

Where:

$$[q_{(kl)j}] = \{r.\exp(-\mu_k - \alpha_j d_{kl}) / / \Sigma_l[r.\exp(-\mu_k - \alpha_j d_{kl})]\} \quad \textbf{(11)}$$

$$[c_{(kl)j}] = \{s_j.\exp(-\mu_k - \beta_j d_{kl}) / / \Sigma_{lj}[s_j.\exp(-\mu_k - \beta_j d_{kl})]\} \quad \textbf{(12)}$$

$[E_{kj}]$ is employment of sector j of zone k;

$[Eb_{kj}]$ is the basic employment of sector j of zone k;

$[P_k]$ are the residents in zone k.

r is the inverse of the employment rate, thus the ratio of population over employment;

μ_k is the bid rent for zone k;

α_j is the distance friction parameter for commuters of sector (j);

β_j is the distance friction parameter for shoppers of sector (j);

d_{kl} is the distance between zone k and zone l

s_i is the ratio of non-basic employment of activity i over the total population;

Table 2: Spatial Interaction Model in Input-Output format

	I	J	N	C_1	C_2	C_3	C_e	Ex	T
I	0	0	0	$C_{(11)1}$	$C_{(12)1}$	$C_{(13)1}$	$C_{(1e)1}$	Eb_I	E_I
J	0	0	0	$C_{(11)j}$	$C_{(12)j}$	$C_{(13)j}$	$C_{(1e)j}$	Eb_j	E_j
N	0	0	0	$C_{(11)n}$	$C_{(12)n}$	$C_{(13)n}$	$C_{(1e)n}$	Eb_n	E_n
Q_1	$Q_{(11)I}$	$Q_{(11)J}$	$Q_{(11)N}$	0	0	0	0		P_1
Q_2	$Q_{(21)I}$	$Q_{(21)J}$	$Q_{(21)N}$	0	0	0	0		P_2
Q_3	$Q_{(31)I}$	$Q_{(31)J}$	$Q_{(31)N}$	0	0	0	0		P_3
Q_e	$Q_{(e1)I}$	$Q_{(e1)J}$	$Q_{(e1)N}$						
T	E_i	E_j	E_n	P_1	P_2	P_3		Eb	

There are two integrated calibration processes involved in the Economic Spatial Interaction Model. First, the calibration of the attrition parameters α_i and β_i estimated so that the average transportation cost of the model, from work to residence and from residence to ser-

vices, are close to the real transportation costs. Second, the calibration of bid-rents (μ_k) estimated to fulfill spatial constraints. All these calibrations must be done iteratively until the estimated parameters converge to stable values.

Table 2 highlights matrices [Q] [C] in an input-output framework where the basic employment per sector [Eb] is the exogenous vector and the total employment [E] is the endogenous vector. Notice that it is possible to include one extra row for commuters coming from outside the region [Q_e] and one extra column for non-residents that shop inside the region [C_e]. This procedure is one way to solve the overestimation of the induced effects when there is no perfect mobility of labour (Oosterhaven and Dewhurst, 1990).

4. REGIONAL INPUT-OUTPUT INTEGRATED WITH A SPATIAL INTERACTION MODEL FOR LOCALITIES

The interest of linking regional economic input output model with town spatial interaction models comes not only from the need to integrate physical and economic flows but also from the requirement to attend the demand for economic models for small places like islands where most of the perceivable economic activity is associated with the physical flows: travel to work, travel to shopping, location of jobs and locations of residences.

Table 3: Regional input-output integrated with spatial interaction model for localities

	I	J	N	C_1	C_2	C_3	C_e	Ex	H	G	T
I	A_{11}	A_{1j}	A_{1n}	$C_{(11)1}$	$C_{(12)1}$	$C_{(13)1}$	$C_{(1e)1}$	Ex_i	H_i	G_i	X_i
J	A_{1j}	A_{ij}	A_{jn}	$C_{(11)j}$	$C_{(12)j}$	$C_{(13)j}$	$C_{(1e)j}$	Ex_j	H_j	G_j	X_j
N	A_{n1}	A_{nj}	A_{nn}	$C_{(11)n}$	$C_{(12)n}$	$C_{(13)n}$	$C_{(1e)n}$	Ex_n	H_n	G_n	X_n
Q_1	$Q_{(11)I}$	$Q_{(11)J}$	$Q_{(11)N}$	0	0	0	0				*Yc1*
Q_2	$Q_{(21)I}$	$Q_{(21)J}$	$Q_{(21)N}$	0	0	0	0				*Yc2*
Q_3	$Q_{(31)I}$	$Q_{(31)J}$	$Q_{(31)N}$	0	0	0	0				*Yc3*
Q_e	$Q_{(e1)I}$	$Q_{(e1)J}$	$Q_{(e1)N}$	0	0	0	0				
W_o	FO_1	FO_j	FO_n								
M	M_1	M_j	M_n	CM_1	CM_2	CM_3					
T	X_i	X_j	X_n	*Yc1*	*Yc2*	*Yc3*		*Ex*	*F*	*G*	*Tot*

Besides input-output technological coefficients are not stable at small scales and, therefore it is not advisable to rescale regional input-output models to local input-output models but, as we propose, to integrate regional input-output models with spatial interaction models for localities.

The construction of regional input-output models with spatial interaction models for localities results from the combination of the matrix of technological coefficients with endogenized consumption [A'] presented in Table 1 with the combined matrices [Q] [C] of the Spatial Interaction Model presented in Table 2

From Table 3 is then possible to derive the formulation of the Regional input - output model integrated with a spatial interaction model for localities.

The linear production and demand functions of regional input-output models with spatial interaction models for localities model are:

$$X_j = \sum_i a_{ij} X_j + \sum_k q_{(k)j} X_j + fo_j X_j + m_j X_j$$

for all sectors (j) **(13)**

$X_i = \sum_j a_{ij} X_j + \sum_k c_{(k)i} Yc_k + E_{il} + G_{il} + H_{il}$ for all sectors (i) , **(14)**

Where $\sum_i a_{ij} + \sum_k q_{(k)j} + fo_j + m_j = 1$, and $Yc_k = \sum_j f_{ckj} X_j$, implying that technological coefficients $[a_{ij}]$ are the same for all the localities (k), commuter coefficients $[q_{(kl)j}]$ must be calibrated so that $\Sigma_k Q_{(kl)j} = F_{jl}$ for all l and j, and consumption coefficients $[c_{(kl)j}]$ must also be calibrated so that $\Sigma_{li} C_{(kl)i} = Yc_k$ for all k.

If we assume that Matrix B is defined as follows:

$$B = \begin{bmatrix} A & C \\ Q & 0 \end{bmatrix} \quad \textbf{(15)}$$

And vector X' is defined to include X and Yc.

$$X' = \begin{bmatrix} X \\ Yc \end{bmatrix} \quad \textbf{(16)}$$

Then equations (7) and (8) can be written

$X' = B X' + (E+G+H)$ **(7')**

And, so, the total output vector X' can be explained by the final demand vector (E+G+H) provided (I-B) is a regular matrix that can thus be inverted.

$X' = (I-B')^{-1}(E+G+H)$ **(8')**

Being so the total output vector X', and all the other vectors of endogenous variables can be explained by the final demand vector (E+G+H) provided (I-B') is a regular matrix.

5. DATA AND RESULTS

The input output Tables for the Azores Economy with 16 sectors and with disaggregation of the Consumption and the Income for Consumption by Municipality (Annex 1) and the respective coefficients matrix (Annex 2) was obtained from the work of Pedro Ferreira (2006) that produced a matrix with 45 sectors based on the Input-Output matrix for Portugal and on the employment and production per sector for the Azores, using cross entropy methods to generate the Employment and Production Tables for 45 sectors and the Method of Almond [2000] to generate the Input-Output matrix for the Azores. The multiplier effects that result from the Input-Output for the Azores Economy with 16 sectors and with disaggregation of the Consumption and the Income for Consumption by Municipality are presented in Annex 3, without endogenized expenditure, and in Annex 4 with endogenized consumption expenditure.

The commuter coefficients $[Q_{(kl)j}]$ and consumption coefficients $[C_{(kl)j}]$ were calibrated so that, respectively, $\sum_{li} C_{(kl)i} = Y_{ck}$ for all k and $\sum_k Q_{(kl)j} = F_{ji}$; and also taking into account that the average travel cost per commuter and consumer and sector is equal to the average travel cost actually verified in the travel to work journeys and in the consumption journeys. To assess the actual average commuters travel cost per sector we used journey to work data of the 2001 census data and the distances between the municipalities (Annex 5). To estimate the average consumers travel cost per sector we undertook a small survey on Terceira population and also the distances between the municipalities.

Table 4: Travel to Work and to Shopping Average Distances and Calibrated Attrition Parameters

Km	Average Travel to Work	Attrition Parameters Travel to Work	Average Travel to Shop	Attrition Parameters Travel to Shop
A – Agriculture and Animals Farming	4,1	0,544	7,1	0,140
B – Fishing	7,5	0,143	6,9	0,168
C- Mining and Quarrying	4,6	0,338	6,9	0,159
DA – Processed Food, Beverages and Tobacco	5,4	0,290	5,1	0,287
D-DA – Other Manufacturing Activities	5,1	0,315	6,8	0,163
E- Electicity, Gas and Water	5,8	0,222	5,4	0,246
F – Construction	5,7	0,229	9,1	0,096
G – Trade and Commerce	5,0	0,360	11,2	0,066
H – Hotels and Restaurants	4,8	0,374	8,3	0,114
I – Transport and Communications	5,9	0,208	25,2	0,025
J – Banks & Insurance	5,4	0,308	6,6	0,172
K – Real Estate and Business Services	5,6	0,277	6,0	0,207
L – Public Administration	5,4	0,247	13,5	0,045
M – Education	5,8	0,222	7,0	0,158
N – Health and Social Work	5,3	0,289	6,5	0,184
O,P – Social and Personal Services; Domestic Staff	5,4	0,251	6,5	0,200

Table 5: Cross Income Multiplier per Municipality

	GRA	CAL	VEL	ANG	PRA	COR	HOR	LPF	SCF	LAP	MAD	SRP	VPO	LAG	NOR	PDL	POV	RGR	VFR	TOTAL
GRA	1,006	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,006	0,005	0,005	0,005	0,006	0,005	0,004	0,005	0,004	0,005	0,005	1,096
CAL	0,004	1,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,003	0,004	0,004	0,004	0,004	1,076
VEL	0,007	0,006	1,006	0,007	0,006	0,006	0,007	0,007	0,007	0,006	0,006	0,006	0,007	0,006	0,006	0,006	0,006	0,006	0,006	1,119
ANG	0,051	0,045	0,044	1,049	0,048	0,044	0,049	0,050	0,051	0,046	0,045	0,043	0,051	0,048	0,041	0,049	0,041	0,047	0,044	1,885
PRA	0,042	0,035	0,034	0,039	1,038	0,033	0,039	0,040	0,041	0,035	0,035	0,032	0,042	0,038	0,030	0,039	0,030	0,036	0,033	1,693
COR	0,000	0,000	0,000	0,000	0,000	1,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	1,006
HOR	0,022	0,019	0,019	0,021	0,021	0,019	1,021	0,021	0,022	0,020	0,020	0,019	0,022	0,021	0,018	0,021	0,018	0,020	0,019	1,382
LFL	0,002	0,002	0,002	0,002	0,002	0,002	0,002	1,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	1,036
SCF	0,003	0,003	0,002	0,003	0,003	0,002	0,003	0,003	1,003	0,003	0,003	0,002	0,003	0,003	0,002	0,003	0,002	0,003	0,002	1,049
LAF	0,006	0,005	0,005	0,006	0,006	0,005	0,006	0,006	0,006	1,005	0,005	0,005	0,006	0,006	0,005	0,006	0,005	0,006	0,005	1,106
MAD	0,010	0,009	0,009	0,009	0,009	0,009	0,010	0,010	0,010	0,009	1,009	0,008	0,010	0,009	0,008	0,009	0,008	0,009	0,008	1,173
SRP	0,004	0,003	0,003	0,004	0,004	0,003	0,004	0,004	0,004	0,003	0,003	1,003	0,004	0,004	0,003	0,004	0,003	0,003	0,003	1,065
VPO	0,008	0,007	0,007	0,007	0,007	0,007	0,007	0,008	0,008	0,007	0,007	0,007	1,008	0,007	0,007	0,007	0,007	0,007	0,007	1,139
LAG	0,046	0,040	0,040	0,044	0,043	0,040	0,044	0,045	0,046	0,041	0,041	0,039	0,046	1,043	0,037	0,044	0,038	0,042	0,039	1,798
NOR	0,004	0,003	0,003	0,004	0,004	0,003	0,004	0,004	0,004	0,003	0,003	0,003	0,004	0,004	1,003	0,004	0,003	0,004	0,003	1,068
PDL	0,084	0,075	0,074	0,081	0,079	0,073	0,081	0,082	0,084	0,076	0,076	0,072	0,085	0,080	0,069	1,081	0,070	0,078	0,074	2,473
POV	0,008	0,007	0,007	0,007	0,007	0,007	0,007	0,008	0,008	0,007	0,007	0,007	0,008	0,007	0,006	0,007	1,006	0,007	0,007	1,134
RGR	0,025	0,022	0,021	0,024	0,023	0,021	0,024	0,024	0,025	0,022	0,022	0,021	0,025	0,023	0,020	0,024	0,020	1,022	0,021	1,428
VFR	0,010	0,009	0,009	0,010	0,009	0,009	0,010	0,010	0,010	0,009	0,009	0,009	0,010	0,010	0,008	0,010	0,008	0,009	1,009	1,175
TOTAL	1,343	1,299	1,295	1,326	1,318	1,292	1,327	1,332	1,338	1,304	1,301	1,286	1,344	1,322	1,273	1,324	1,276	1,310	1,292	

Table 6: Income Multiplier Effects of Final Demand of Sectors on Municipalities

	GRA	CAL	VEL	ANG	PRA	COR	HOR	LPI	SCF	LAF	MAD	SRP	VPO	LAG	NOR	PDL	POV	RGR	VFR	TOTAL
A - Agriculture	0,141	0,117	0,112	0,131	0,126	0,112	0,131	0,136	0,138	0,119	0,117	0,108	0,141	0,129	0,100	0,130	0,100	0,122	0,110	2,322
B - Extraction	0,005	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,005	0,004	0,004	0,003	0,005	0,004	0,003	0,004	0,003	0,004	0,003	0,075
C- Manufacturing	0,259	0,222	0,212	0,240	0,232	0,215	0,241	0,250	0,253	0,224	0,217	0,204	0,259	0,236	0,194	0,238	0,191	0,223	0,204	4,314
DA – Electricity	0,144	0,101	0,095	0,112	0,108	0,102	0,120	0,125	0,134	0,104	0,091	0,085	0,145	0,106	0,083	0,110	0,080	0,097	0,082	2,022
F – Construction	0,009	0,008	0,008	0,009	0,009	0,008	0,009	0,009	0,009	0,008	0,009	0,008	0,009	0,009	0,008	0,009	0,008	0,009	0,009	0,167
E- Water & Santiation	0,032	0,030	0,030	0,031	0,031	0,029	0,031	0,031	0,031	0,030	0,030	0,029	0,032	0,030	0,029	0,031	0,029	0,030	0,029	0,574
G – Trade and Comme	0,378	0,419	0,444	0,430	0,440	0,427	0,417	0,402	0,396	0,424	0,457	0,457	0,380	0,439	0,446	0,434	0,469	0,456	0,480	8,194
I – Tourism	0,158	0,227	0,215	0,138	0,151	0,266	0,151	0,159	0,148	0,207	0,182	0,223	0,151	0,139	0,262	0,139	0,235	0,157	0,185	3,492
H – Transport	0,157	0,144	0,145	0,162	0,159	0,141	0,158	0,159	0,159	0,147	0,155	0,145	0,157	0,163	0,132	0,162	0,139	0,159	0,154	2,896
J – Communications	0,093	0,071	0,068	0,086	0,081	0,066	0,086	0,089	0,091	0,074	0,072	0,064	0,094	0,083	0,058	0,085	0,058	0,077	0,067	1,462
K – Banks & Insurance	0,025	0,019	0,018	0,022	0,021	0,017	0,022	0,023	0,024	0,019	0,018	0,016	0,026	0,021	0,015	0,022	0,015	0,019	0,016	0,378
L – State	0,166	0,218	0,228	0,193	0,202	0,214	0,192	0,178	0,174	0,215	0,220	0,237	0,166	0,198	0,256	0,196	0,255	0,213	0,235	3,956
M – Consultancy	0,073	0,065	0,065	0,072	0,070	0,064	0,071	0,072	0,073	0,067	0,067	0,064	0,074	0,071	0,060	0,072	0,061	0,069	0,065	1,296
N – Administration	0,011	0,008	0,007	0,010	0,009	0,007	0,010	0,010	0,010	0,008	0,008	0,007	0,011	0,009	0,006	0,009	0,006	0,008	0,007	0,161
O,P – Education, Healt	0,272	0,198	0,187	0,242	0,227	0,179	0,244	0,254	0,263	0,206	0,198	0,173	0,274	0,235	0,153	0,239	0,153	0,212	0,178	4,088
TOTAL	1,923	1,850	1,838	1,882	1,871	1,849	1,887	1,902	1,910	1,855	1,844	1,823	1,923	1,874	1,805	1,878	1,804	1,855	1,824	

The estimation of the distances were done assuming that the real distance (d_{ij}) is transformed into a distance associated with travel cost (c_{ij}) considering loading and unloading costs (δ) and the transportation between the island as a proportion (σ) of the same cost by road [$c_{ij} = \delta + \sigma\ d_{ij}$]. In a recent study Dentinho (2008) estimated that, for air transportation between the islands, (δ = 125) and (σ=0,12). The distances inside each municipality are taken as half of the average radium [$d_{ii} = (Area/\pi)^{0,5}$]. The estimated distances are presented in Annex 5. The actual average distances per sector and for commuters and consumers are presented in Table 4.

As expected, with the understandable exception of the extraction activities, the travel to work distances are much more stable across sectors than the travel to shop distances, where the Christaller/Losch hierarchy of places, and implicit scale economies of the different sectors, influences the "travel to shop" average distances.

Table 5 presents the Cross Income Multiplier Effects per Municipality that shows the impact of an increase in income for consumption in one municipality on the income for consumption in the others. Such impact can be associated, for instance, with an external transference to the families of each municipality. As expected the direct effect stays in the municipality but the induced effect tends to occur also outside the municipality and attracted to the major cities of the region namely Ponta Delgada. On the other hand, the effect of an extra income allocation in major cities would have a much bigger impact than a similar extra income allocation in any other municipalities. Summing up the technological and distributional distances seems to be more important than the physical distances.

Table 6 presents the income multiplier effects of the Final Demand per Sector on the income for consumption in each municipality. The sectors that have major effects are Commerce, Real State and Education. The impact of Final Demand per Sector in the various Municipalities is quite similar being slightly bigger in smaller islands and central municipalities of bigger islands than in less central municipalities of bigger islands. This shows the effect of some level of economic protection created by remoteness.

6. CONCLUSION

Model implementation results from the interaction between, on the one hand, the demand for models pushed by the existence of policy makers or researchers and, on the other hand, the modelling capacity that can be assessed by the computing power, by the available data, and by the existing knowledge of modelling techniques.

The Integration of a regional input-output model with a spatial interaction model developed in the present exercise have a great potential for policy makers:

a) First, the disaggregation of existing Input-Output models for smaller spatial units is quite easy to implement, based on existing data on commuting employment and shopping behaviours that, jointly with the distance matrices and the attraction factors, feeds the spatial interaction model that is then used to spatialize consumption in the Final Demand of the pre-existent Input-Output Model and to spatialize income for consumption, in the Primary Inputs of the same pre-existent Input-Output Model;

b) Second, policy makers can test the impact of changes in localized changes on the Final Demand by disaggregating the absolute values of the changes between, on the one hand, the share of income for consumption by locality and, on the other hand, the share of change in final demand by sector net of the share of income for consumption by locality.

c) Finally, policy makers can test the impact of changes in the Spatial Interaction Model, namely changes in accessibility and attraction factors that influence commuting employment and shopping behaviours.

In the present model applied to the Azores Region and its municipalities it was possible to establish the connections between regional economic models spatial interaction models. Furthermore, it was possible to show that multiplier effects vary considerably between areas if we consider the spatial disaggregation of income and the spatial distribution of consumption.

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ANNEXES

Annex 1: Input-Output Table with Disaggregated Consumption and Income for Consumption by Municipality (Azores - 2001)

	A	B	C	DA	F	E	G	I	H	J	K	L	M	N	O,P
A - Agriculture	7116	1	121097	0	18	0	851	5337	4	6	0	36	300	244	2843
B - Extraction	32	476	5162	1155	1	2380	35	39	27	0	0	6	7	239	13
C- Manufacturing	66151	93	43595	191	290	51059	6345	23845	769	220	262	119	1785	3552	13842
DA – Electricity	4768	932	7370	34894	294	1157	4673	2441	2123	264	1026	474	432	6494	5567
F – Construction	250	9	1898	45	905	24	648	164	377	17	111	95	132	781	1127
E- Water & Santiation	724	132	4284	1791	440	92770	3726	326	4014	891	636	6383	517	1665	2428
G – Trade and Commerce	3014	268	42752	1217	160	15404	9888	11107	5847	3607	98	1138	1216	2610	7073
I – Tourism	747	94	2015	268	103	354	6758	613	5079	111	1578	397	2064	3443	5661
H – Transport	6490	1187	17445	887	537	3431	28622	2101	78347	713	201	549	3302	10384	5280
J – Communications	534	64	1645	569	96	397	5206	372	1852	10324	2128	278	2292	864	8570
K – Banks & Insurance	342	51	1457	196	17	971	1255	165	600	110	229	115	516	178	808
L – State	2749	114	3947	513	265	2321	27360	2588	6567	1314	6210	3175	1224	3092	10658
M – Consultancy	1527	257	10255	1976	171	2686	16401	2029	3972	734	6876	1710	16821	6536	13077
N – Administration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	2036	30	1569	177	48	312	2424	878	660	1205	476	53	3152	2665	26618
STA CRUZ GRACIOSA	610	8	1470	273	98	1852	1014	165	698	291	311	117	246	2355	3752
CALHETA	763	9	548	453	56	1906	907	89	184	303	677	80	235	1867	2424
VELAS	727	22	1397	676	91	1598	1217	258	1185	398	623	107	298	4120	3684
ANGRA DO HEROISMO	2132	632	4718	3854	526	8704	11666	1186	8652	2577	4691	1149	2188	46583	35448
PRAIA VITORIA	1211	198	3471	501	332	5983	5185	1141	5454	928	2287	639	1091	9279	55671
CORVO	71	8	115	9	3	14	53	19	79	12	19	29	16	250	147
HORTA	963	160	2908	2387	168	3796	5090	733	4606	950	1952	523	835	17929	11159
LAJES DAS FLORES	239	8	298	64	36	137	361	73	339	72	110	83	72	877	1794
STA CRUZ FLORES	253	9	424	120	41	260	555	108	667	132	109	100	108	1699	1931
LAJES DO PICO	675	65	4049	581	63	2529	883	82	363	321	184	130	290	2812	2229
MADALENA	702	189	1807	2310	94	1163	1694	320	1923	482	463	173	330	4331	3360
SAO ROQUE DO PICO	345	327	239	422	50	1974	659	88	445	242	221	123	259	2430	2170
VILA DO PORTO	330	8	1289	80	81	1985	1441	876	1783	226	531	218	360	3156	5228
LAGOA	1584	272	6109	3964	538	10411	9770	1596	7170	2804	4832	754	2214	22047	29406
NORDESTE	920	85	184	251	60	512	790	107	303	280	300	170	315	3343	2176
PONTA DELGADA	2838	228	4736	7176	750	16855	20936	2705	15613	6454	9684	1318	3425	45116	49186
POVOACAO	713	94	2197	296	107	2532	1229	135	3209	271	414	134	306	3377	4228
RIBEIRA GRANDE	2241	346	8493	2227	357	4573	4590	551	2663	949	1695	319	1195	9640	15150
VILA FRANCA CAMPO	1369	147	2733	749	242	1504	1787	234	2976	361	437	140	596	5121	4783
Other Income	154210	4135	89642	19692	2147	83157	151125	23495	135808	24568	56091	181371	57428	147906	169517
Imports	49800	2702	167862	11842	1147	80121	52858	45218	57025	6816	13302	2695	24793	21992	64056
Taxes on Products	3334	354	17042	260	116	7382	2369	1067	3103	117	2212	1382	1113	5004	10371
Subsidies on Products	-735	-3	-11513	-1	-12	-11	-145	-1806	-537	-2	-2	-10	-61	-442	-1589
Taxes on Production	74	12	1366	104	4	308	483	133	220	89	279	8517	198	0	335
Subsidies on Production	-22307	-893	-4061	-183	-79	-766	-1045	-216	-21716	-128	-182	-11555	-192	-1770	-986
TOTAL	299538	12830	572013	101987	10361	411746	389663	130363	342454	69031	121072	203235	131418	401770	579194

	GRA	CAL	VEL	ANG	PRA	COR	HOR	LPI	SCF	LAF	MAD	SRP	VPO	LAG	NOR	PDL	POV	RGR	VFR
A - Agriculture	748	433	642	7177	4655	31	2829	248	363	660	848	367	1001	5405	297	9835	609	2600	924
B - Extraction	3	2	3	30	19	0	12	1	2	3	3	1	4	22	1	41	2	11	4
C- Manufacturing	1642	926	1357	15325	9887	65	6096	537	791	1411	1771	765	2198	11460	625	20961	1260	5456	1898
DA – Electricity	829	375	533	5726	3736	30	2562	230	364	574	569	259	1110	4004	249	7653	450	1819	564
F – Construction	52	38	63	595	407	3	225	19	27	58	83	39	69	465	32	826	71	244	101
E- Water & Santiation	59	28	40	446	286	2	192	17	27	43	45	20	79	316	18	600	34	144	45
G – Trade and Commerce	2920	2859	4929	37736	27207	236	14375	1131	1569	4221	6042	3154	3908	30072	3007	53148	6379	17059	7859
I – Tourism	1408	1893	2754	11709	9468	185	5466	490	630	2424	2593	1772	1738	9193	2134	16574	3666	5933	3190
H – Transport	700	465	729	7516	5029	35	2875	246	353	704	983	440	936	5806	355	10383	770	2943	1149
J – Communications	673	367	532	6054	3884	26	2439	216	320	560	681	294	901	4485	244	8260	481	2110	715
K – Banks & Insurance	228	116	165	1878	1198	8	782	70	106	177	199	87	305	1359	76	2545	143	626	202
L – State	1039	1401	2339	14141	10686	109	5644	412	560	1981	2572	1523	1379	11394	1695	20232	3292	6899	3447
M – Consultancy	257	147	216	2432	1574	10	963	85	124	224	285	123	343	1826	100	3330	203	874	308
N – Administration	112	60	87	990	634	4	401	36	53	92	110	48	150	730	40	1349	78	342	115
Other	2592	1393	2013	22954	14700	97	9299	825	1228	2127	2552	1102	3470	16934	922	31282	1805	7930	2659
STA CRUZ GRACIOSA																			
CALHETA																			
VELAS																			
ANGRA DO HEROISMO																			
PRAIA VITORIA																			
CORVO																			
HORTA																			
LAJES DAS FLORES																			
STA CRUZ FLORES																			
LAJES DO PICO																			
MADALENA																			
SAO ROQUE DO PICO																			
VILA DO PORTO																			
LAGOA																			
NORDESTE																			
PONTA DELGADA																			
POVOACAO																			
RIBEIRA GRANDE																			
VILA FRANCA CAMPO																			
Other Income																			
Imports																			
Taxes on Products																			
Subsidies on Products																			
Taxes on Production																			
Subsidies on Production																			
TOTAL	13261	10501	16401	134708	93370	842	54160	4563	6517	15258	19339	9995	17593	103471	9795	187019	19244	54990	23179

	SINFIM	CORR	ipsfl	ADM	FBCF	VE	EXP	TOTAL
A - Agriculture	0	- 1 953	0	0	4 684	3 338	115 941	299 538
B - Extraction	0	- 9	0	0	0	896	2 208	12 830
C- Manufacturing	0	-4553	14	240	26092	7410	246263	572 013
DA – Electricity	0	-2559	0	0	0	0	0	101 987
F – Construction	0	- 30	0	391	0	0	0	10 361
E- Water & Santiation	0	- 189	0	0	288 764	0	0	411 746
G – Trade and Commerce	0	7 061	28	2 645	41 669	180	4 870	389 663
I – Tourism	0	8 463	0	85	0	0	9 308	130 363
H – Transport	0	- 1 089	0	0	0	0	141 650	342 454
J – Communications	0	- 1 979	0	0	0	0	2 577	69 031
K – Banks & Insurance	101 000	- 723	0	0	0	0	3 517	121 072
L – State	0	6 360	0	0	34 032	0	0	203 235
M – Consultancy	0	- 690	0	0	25 342	722	7 593	131 418
N – Administration	0	- 335	6 226	390 450	0	0	0	401 770
Other	0	- 7 776	76 820	337 328	2 270	0	2 366	579 194
STA CRUZ GRACIOSA								13261
CALHETA								10501
VELAS								16401
ANGRA DO HEROISMO								134708
PRAIA VITORIA								93370
CORVO								842
HORTA								54160
LAJES DAS FLORES								4563
STA CRUZ FLORES								6517
LAJES DO PICO								15258
MADALENA								19339
SAO ROQUE DO PICO								9995
VILA DO PORTO								17593
LAGOA								103471
NORDESTE								9795
PONTA DELGADA								187019
POVOACAO								19244
RIBEIRA GRANDE								54990
VILA FRANCA CAMPO								23179
Other Income								1300291
Imports			2 444	6 462	308 671	22 359	5 069	1 423 693
Taxes on Products			3 264	1 647	30 504	0	0	227 449
Subsidies on Products			- 977	- 121	- 58	0	0	- 44 534
Taxes on Production			0	0	0	0	0	12 121
Subsidies on Production			0	0	0	0	0	- 66 080
TOTAL	101000	0	87817	739127	761970	34905	541362	7423820

Annex 2: Technical Coefficients of the Input-Output Table with Disaggregated Consumption and Income for Consumption by Municipality (Azores 2001)

	A	B	C	DA	F	E	G	I	H	J	K	L	M	N	O,P	GRA	CAL	VEL	ANG	PRA	COR	HOR	LPI	SCF	LAF	MAD	SRP	VPO	LAG	NOR	PDL	POV	RGR	VFR
A - Agriculture	0,024	0,000	0,212	0,000	0,002	0,000	0,002	0,041	0,000	0,000	0,000	0,000	0,002	0,001	0,005	0,056	0,041	0,039	0,053	0,050	0,036	0,052	0,054	0,056	0,043	0,044	0,037	0,057	0,052	0,030	0,053	0,032	0,047	0,040
B - Extraction	0,000	0,037	0,009	0,011	0,000	0,006	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
C- Manufacturing	0,221	0,007	0,076	0,002	0,028	0,124	0,016	0,183	0,002	0,003	0,002	0,001	0,014	0,009	0,024	0,124	0,088	0,083	0,114	0,106	0,077	0,113	0,118	0,121	0,092	0,092	0,077	0,125	0,111	0,064	0,112	0,065	0,099	0,082
DA – Electricity	0,016	0,073	0,013	0,342	0,028	0,003	0,012	0,019	0,006	0,004	0,008	0,002	0,003	0,016	0,010	0,063	0,036	0,032	0,043	0,040	0,036	0,047	0,050	0,056	0,038	0,029	0,026	0,063	0,039	0,025	0,041	0,023	0,033	0,024
F – Construction	0,001	0,001	0,003	0,000	0,087	0,000	0,002	0,001	0,001	0,000	0,001	0,000	0,001	0,002	0,002	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,003	0,004	0,004	0,004	0,004
E- Water & Santiation	0,002	0,010	0,007	0,018	0,042	0,225	0,010	0,003	0,012	0,013	0,005	0,031	0,004	0,004	0,004	0,004	0,003	0,002	0,003	0,003	0,002	0,004	0,004	0,004	0,003	0,002	0,002	0,004	0,003	0,002	0,003	0,002	0,003	0,002
G – Trade and Comm.	0,010	0,021	0,075	0,012	0,015	0,037	0,025	0,085	0,017	0,052	0,001	0,006	0,009	0,006	0,012	0,220	0,272	0,301	0,280	0,291	0,280	0,265	0,248	0,241	0,277	0,312	0,316	0,222	0,291	0,307	0,284	0,331	0,310	0,339
I – Tourism	0,002	0,007	0,004	0,003	0,010	0,001	0,017	0,005	0,015	0,002	0,013	0,002	0,016	0,009	0,010	0,106	0,180	0,168	0,087	0,101	0,219	0,101	0,107	0,097	0,159	0,134	0,177	0,099	0,089	0,218	0,089	0,190	0,108	0,138
H – Transport	0,022	0,093	0,030	0,009	0,052	0,008	0,073	0,016	0,229	0,010	0,002	0,003	0,025	0,026	0,009	0,053	0,044	0,044	0,056	0,054	0,042	0,053	0,054	0,054	0,046	0,051	0,044	0,053	0,056	0,036	0,056	0,040	0,054	0,050
J – Communications	0,002	0,005	0,003	0,006	0,009	0,001	0,013	0,003	0,005	0,150	0,018	0,001	0,017	0,002	0,015	0,051	0,035	0,032	0,045	0,042	0,030	0,045	0,047	0,049	0,037	0,035	0,029	0,051	0,043	0,025	0,044	0,025	0,038	0,031
K – Banks & Insurance	0,001	0,004	0,003	0,002	0,002	0,002	0,003	0,001	0,002	0,002	0,002	0,001	0,004	0,000	0,001	0,017	0,011	0,010	0,014	0,013	0,010	0,014	0,015	0,016	0,012	0,010	0,009	0,017	0,013	0,008	0,014	0,007	0,011	0,009
L – State	0,009	0,009	0,007	0,005	0,026	0,006	0,070	0,020	0,019	0,019	0,051	0,016	0,009	0,008	0,018	0,078	0,133	0,143	0,105	0,114	0,130	0,104	0,090	0,086	0,130	0,133	0,152	0,078	0,110	0,173	0,108	0,171	0,125	0,149
M – Consultancy	0,005	0,020	0,018	0,019	0,017	0,007	0,042	0,016	0,012	0,011	0,057	0,008	0,128	0,016	0,023	0,019	0,014	0,013	0,018	0,017	0,012	0,018	0,019	0,019	0,015	0,015	0,012	0,020	0,018	0,010	0,018	0,011	0,016	0,013
N – Administration	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,008	0,006	0,005	0,007	0,007	0,005	0,007	0,008	0,008	0,006	0,006	0,005	0,009	0,007	0,004	0,007	0,004	0,006	0,005
O,P – Educ., Health and Other	0,007	0,002	0,003	0,002	0,005	0,001	0,006	0,007	0,002	0,017	0,004	0,000	0,024	0,007	0,046	0,195	0,133	0,123	0,170	0,157	0,115	0,172	0,181	0,188	0,139	0,132	0,110	0,197	0,164	0,094	0,167	0,094	0,144	0,115
STA CRUZ GRACIOSA	0,002	0,001	0,003	0,003	0,009	0,004	0,003	0,001	0,002	0,004	0,003	0,001	0,002	0,006	0,006	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
CALHETA	0,003	0,001	0,001	0,004	0,005	0,005	0,002	0,001	0,001	0,004	0,006	0,000	0,002	0,005	0,004	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
VELAS	0,002	0,002	0,002	0,007	0,009	0,004	0,003	0,002	0,003	0,006	0,005	0,001	0,002	0,010	0,006	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
ANGRA DO HEROISMO	0,007	0,049	0,008	0,038	0,051	0,021	0,030	0,009	0,025	0,037	0,039	0,006	0,017	0,116	0,061	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
PRAIA VITORIA	0,004	0,015	0,006	0,005	0,032	0,015	0,013	0,009	0,016	0,013	0,019	0,003	0,008	0,023	0,096	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
CORVO	0,000	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
HORTA	0,003	0,013	0,005	0,023	0,016	0,009	0,013	0,006	0,013	0,014	0,016	0,003	0,006	0,045	0,019	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
LAJES DAS FLORES	0,001	0,001	0,001	0,001	0,003	0,000	0,001	0,001	0,001	0,001	0,001	0,000	0,001	0,002	0,003	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
STA CRUZ FLORES	0,001	0,001	0,001	0,001	0,004	0,001	0,001	0,001	0,002	0,002	0,001	0,000	0,001	0,004	0,003	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
LAJES DO PICO	0,002	0,005	0,007	0,006	0,006	0,006	0,002	0,001	0,001	0,005	0,002	0,001	0,002	0,007	0,004	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
MADALENA	0,002	0,015	0,003	0,023	0,009	0,003	0,004	0,002	0,006	0,007	0,004	0,001	0,003	0,011	0,006	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
SAO ROQUE DO PICO	0,001	0,026	0,000	0,004	0,005	0,005	0,002	0,001	0,001	0,004	0,002	0,001	0,002	0,006	0,004	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
VILA DO PORTO	0,001	0,001	0,002	0,001	0,008	0,005	0,004	0,007	0,005	0,003	0,004	0,001	0,003	0,008	0,009	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
LAGOA	0,005	0,021	0,011	0,039	0,052	0,025	0,025	0,012	0,021	0,041	0,040	0,004	0,017	0,055	0,051	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
NORDESTE	0,003	0,007	0,000	0,002	0,006	0,001	0,002	0,001	0,001	0,004	0,002	0,001	0,002	0,008	0,004	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
PONTA DELGADA	0,009	0,018	0,008	0,070	0,072	0,041	0,054	0,021	0,046	0,093	0,080	0,006	0,026	0,112	0,085	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
POVOACAO	0,002	0,007	0,004	0,003	0,010	0,006	0,003	0,001	0,009	0,004	0,003	0,001	0,002	0,008	0,007	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
RIBEIRA GRANDE	0,007	0,027	0,015	0,022	0,034	0,011	0,012	0,004	0,008	0,014	0,014	0,002	0,009	0,024	0,026	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
VILA FRANCA CAMPO	0,005	0,011	0,005	0,007	0,023	0,004	0,005	0,002	0,009	0,005	0,004	0,001	0,005	0,013	0,008	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Other Income	0,515	0,322	0,157	0,193	0,207	0,202	0,388	0,180	0,397	0,356	0,463	0,892	0,437	0,368	0,293	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Imports	0,166	0,211	0,293	0,116	0,111	0,195	0,136	0,347	0,167	0,099	0,110	0,013	0,189	0,055	0,111	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Taxes on Products	0,011	0,028	0,030	0,003	0,011	0,018	0,006	0,008	0,009	0,002	0,018	0,007	0,008	0,012	0,018	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Subsidieson Products	-0,002	0,000	-0,020	0,000	-0,001	0,000	0,000	-0,014	-0,002	0,000	0,000	0,000	0,000	-0,001	-0,003	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Taxes on Production	0,000	0,001	0,002	0,001	0,000	0,001	0,001	0,001	0,001	0,001	0,002	0,042	0,002	0,000	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Subsidies on Production	-0,074	-0,070	-0,007	-0,002	-0,008	-0,002	-0,003	-0,002	-0,063	-0,002	-0,002	-0,057	-0,001	-0,004	-0,002	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
TOTAL	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

Annex 3: Multipliers Without Endogenized Expenditure

Production Multipliers	A	B	C	DA	F	E	G	I	H	J	K	L	M	N	O,P	TOTAL
A - Agriculture	1,082	0,004	0,250	0,003	0,013	0,041	0,010	0,092	0,004	0,003	0,003	0,002	0,009	0,004	0,013	1,532
B - Extraction	0,003	1,040	0,011	0,018	0,002	0,010	0,001	0,003	0,001	0,000	0,000	0,000	0,000	0,001	0,001	1,092
C- Manufacturing	0,262	0,016	1,149	0,011	0,049	0,186	0,029	0,226	0,012	0,011	0,009	0,008	0,026	0,015	0,035	2,043
DA – Electricity	0,033	0,118	0,033	1,524	0,051	0,013	0,022	0,039	0,014	0,009	0,015	0,004	0,009	0,026	0,018	1,929
F – Construction	0,002	0,001	0,005	0,001	1,096	0,001	0,002	0,003	0,002	0,001	0,001	0,001	0,002	0,002	0,003	1,122
E- Water & Santiation	0,009	0,020	0,016	0,037	0,065	1,295	0,019	0,011	0,022	0,023	0,010	0,042	0,009	0,008	0,009	1,594
G – Trade and Commerce	0,034	0,030	0,095	0,023	0,028	0,066	1,035	0,109	0,028	0,066	0,006	0,009	0,018	0,011	0,019	1,577
I – Tourism	0,005	0,011	0,008	0,006	0,014	0,004	0,021	1,009	0,020	0,004	0,015	0,003	0,020	0,010	0,012	1,162
H – Transport	0,046	0,131	0,065	0,024	0,082	0,031	0,104	0,045	1,302	0,024	0,007	0,006	0,042	0,037	0,018	1,964
J – Communications	0,005	0,009	0,008	0,012	0,014	0,004	0,019	0,008	0,010	1,178	0,023	0,002	0,025	0,004	0,020	1,339
K – Banks & Insurance	0,002	0,005	0,004	0,003	0,003	0,004	0,004	0,003	0,003	0,002	1,002	0,001	0,005	0,001	0,002	1,044
L – State	0,016	0,016	0,020	0,011	0,034	0,015	0,078	0,033	0,029	0,029	0,055	1,017	0,015	0,010	0,023	1,402
M – Consultancy	0,016	0,031	0,033	0,037	0,027	0,019	0,055	0,031	0,020	0,020	0,068	0,011	1,151	0,021	0,030	1,569
N – Administration	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	1,000	0,000	1,000
O,P – Education, Health and Other	0,009	0,004	0,007	0,004	0,007	0,003	0,009	0,010	0,004	0,023	0,006	0,001	0,030	0,008	1,050	1,176
TOTAL	1,525	1,438	1,704	1,714	1,486	1,692	1,407	1,621	1,469	1,393	1,219	1,106	1,359	1,158	1,252	

Annex 4: Multipliers with Endogenized Expenditure

	A	B	C	DA	F	E	G	I	H	J	K	L	M	N	O,P
A - Agriculture	1,097	0,041	0,270	0,056	0,070	0,074	0,040	0,112	0,035	0,047	0,038	0,008	0,030	0,067	0,071
B - Extraction	0,004	1,041	0,012	0,020	0,003	0,011	0,002	0,004	0,002	0,002	0,001	0,001	0,001	0,003	0,002
C- Manufacturing	0,290	0,084	1,187	0,110	0,154	0,247	0,084	0,263	0,069	0,091	0,073	0,018	0,064	0,129	0,140
DA – Electricity	0,046	0,149	0,050	1,569	0,099	0,041	0,048	0,056	0,041	0,047	0,044	0,009	0,026	0,079	0,067
F – Construction	0,003	0,004	0,006	0,005	1,100	0,003	0,004	0,004	0,004	0,004	0,004	0,001	0,003	0,007	0,007
E- Water & Santiation	0,013	0,029	0,021	0,049	0,079	1,303	0,026	0,015	0,030	0,033	0,019	0,043	0,014	0,023	0,022
G – Trade and Commerce	0,088	0,163	0,167	0,209	0,226	0,180	1,138	0,178	0,135	0,216	0,124	0,029	0,090	0,224	0,216
I – Tourism	0,026	0,061	0,035	0,072	0,085	0,045	0,057	1,034	0,059	0,057	0,056	0,010	0,045	0,085	0,081
H – Transport	0,065	0,179	0,091	0,091	0,153	0,072	0,141	0,070	1,341	0,079	0,050	0,013	0,068	0,115	0,090
J – Communications	0,015	0,033	0,021	0,046	0,051	0,025	0,038	0,020	0,029	1,206	0,045	0,006	0,038	0,044	0,057
K – Banks & Insurance	0,005	0,011	0,007	0,012	0,012	0,009	0,009	0,006	0,008	0,010	1,008	0,002	0,008	0,011	0,011
L – State	0,042	0,079	0,054	0,098	0,126	0,068	0,126	0,064	0,078	0,098	0,109	1,026	0,049	0,109	0,114
M – Consultancy	0,024	0,052	0,044	0,067	0,059	0,037	0,071	0,042	0,038	0,044	0,087	0,014	1,163	0,056	0,062
N – Administration	0,001	0,003	0,001	0,004	0,004	0,002	0,002	0,001	0,002	0,003	0,002	0,000	0,001	1,004	0,004
O,P – Education, Health and Othe	0,037	0,070	0,044	0,100	0,109	0,062	0,063	0,046	0,060	0,102	0,069	0,011	0,067	0,121	1,154
STA CRUZ GRACIOSA	0,004	0,003	0,005	0,007	0,014	0,008	0,005	0,004	0,004	0,007	0,004	0,001	0,004	0,009	0,010
CALHETA	0,004	0,003	0,003	0,009	0,009	0,008	0,004	0,002	0,002	0,007	0,007	0,001	0,003	0,007	0,007
VELAS	0,005	0,005	0,006	0,013	0,014	0,008	0,006	0,005	0,007	0,010	0,008	0,001	0,004	0,014	0,010
ANGRA DO HEROISMO	0,021	0,076	0,028	0,083	0,086	0,046	0,050	0,027	0,048	0,066	0,056	0,010	0,033	0,143	0,090
PRAIA VITORIA	0,013	0,032	0,018	0,026	0,057	0,032	0,027	0,021	0,032	0,033	0,032	0,006	0,021	0,044	0,120
CORVO	0,000	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,000
HORTA	0,010	0,025	0,014	0,046	0,031	0,020	0,022	0,014	0,024	0,026	0,024	0,004	0,013	0,057	0,031
LAJES DAS FLORES	0,001	0,002	0,001	0,002	0,005	0,001	0,002	0,001	0,002	0,002	0,002	0,001	0,001	0,003	0,004
STA CRUZ FLORES	0,002	0,002	0,002	0,003	0,006	0,002	0,003	0,002	0,003	0,003	0,002	0,001	0,002	0,006	0,005
LAJES DO PICO	0,005	0,008	0,010	0,012	0,011	0,011	0,005	0,004	0,003	0,008	0,004	0,001	0,004	0,010	0,007
MADALENA	0,006	0,022	0,008	0,039	0,017	0,008	0,008	0,007	0,010	0,012	0,007	0,002	0,005	0,016	0,011
SAO ROQUE DO PICO	0,002	0,029	0,002	0,009	0,008	0,008	0,003	0,002	0,003	0,006	0,003	0,001	0,003	0,008	0,006
VILA DO PORTO	0,003	0,004	0,005	0,005	0,013	0,009	0,007	0,010	0,009	0,007	0,007	0,002	0,005	0,012	0,013
LAGOA	0,018	0,045	0,028	0,082	0,085	0,050	0,043	0,029	0,041	0,068	0,056	0,008	0,032	0,080	0,077
NORDESTE	0,004	0,009	0,002	0,006	0,009	0,003	0,004	0,002	0,002	0,006	0,004	0,001	0,004	0,010	0,006
PONTA DELGADA	0,031	0,062	0,039	0,148	0,130	0,083	0,087	0,050	0,085	0,147	0,109	0,014	0,053	0,158	0,132
POVOACAO	0,005	0,012	0,008	0,008	0,016	0,011	0,007	0,004	0,014	0,008	0,006	0,001	0,005	0,013	0,012
RIBEIRA GRANDE	0,017	0,040	0,026	0,045	0,053	0,025	0,021	0,015	0,018	0,027	0,022	0,004	0,017	0,037	0,040
VILA FRANCA CAMPO	0,008	0,017	0,010	0,016	0,032	0,009	0,009	0,006	0,014	0,010	0,007	0,002	0,008	0,018	0,014
TOTAL	1,915	2,397	2,227	3,067	2,924	2,527	2,160	2,123	2,251	2,494	2,089	1,252	1,886	2,723	2,694

	GRA	CAL	VEL	ANG	PRA	COR	HOR	LPI	SCF	LAF	MAD	SRP	VPO	LAG	NOR	PDL	POV	RGR	VFR	TOTAL
A - Agriculture	0,141	0,117	0,112	0,131	0,126	0,112	0,131	0,136	0,138	0,119	0,117	0,108	0,141	0,129	0,100	0,130	0,100	0,122	0,110	4,377
B - Extraction	0,005	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,005	0,004	0,004	0,003	0,005	0,004	0,003	0,004	0,003	0,004	0,003	1,184
C- Manufacturing	0,259	0,222	0,212	0,240	0,232	0,215	0,241	0,250	0,253	0,224	0,217	0,204	0,259	0,236	0,194	0,238	0,191	0,223	0,204	7,317
DA – Electricity	0,144	0,101	0,095	0,112	0,108	0,102	0,120	0,125	0,134	0,104	0,091	0,085	0,145	0,106	0,083	0,110	0,080	0,097	0,082	4,392
F – Construction	0,009	0,008	0,008	0,009	0,009	0,008	0,009	0,009	0,009	0,008	0,009	0,008	0,009	0,009	0,008	0,009	0,008	0,009	0,009	1,327
E- Water & Santiation	0,032	0,030	0,030	0,031	0,031	0,029	0,031	0,031	0,031	0,030	0,030	0,029	0,032	0,030	0,029	0,031	0,029	0,030	0,029	2,294
G – Trade and Commerce	0,378	0,419	0,444	0,430	0,440	0,427	0,417	0,402	0,396	0,424	0,457	0,457	0,380	0,439	0,446	0,434	0,469	0,456	0,480	11,576
I – Tourism	0,158	0,227	0,215	0,138	0,151	0,266	0,151	0,159	0,148	0,207	0,182	0,223	0,151	0,139	0,262	0,139	0,235	0,157	0,185	5,298
H – Transport	0,157	0,144	0,145	0,162	0,159	0,141	0,158	0,159	0,159	0,147	0,155	0,145	0,157	0,163	0,132	0,162	0,139	0,159	0,154	5,515
J – Communications	0,093	0,071	0,068	0,086	0,081	0,066	0,086	0,089	0,091	0,074	0,072	0,064	0,094	0,083	0,058	0,085	0,058	0,077	0,067	3,136
K – Banks & Insurance	0,025	0,019	0,018	0,022	0,021	0,017	0,022	0,023	0,024	0,019	0,018	0,016	0,026	0,021	0,015	0,022	0,015	0,019	0,016	1,508
L – State	0,166	0,218	0,228	0,193	0,202	0,214	0,192	0,178	0,174	0,215	0,220	0,237	0,166	0,198	0,256	0,196	0,255	0,213	0,235	6,196
M – Consultancy	0,073	0,065	0,065	0,072	0,070	0,064	0,071	0,072	0,073	0,067	0,067	0,064	0,074	0,071	0,060	0,072	0,061	0,069	0,065	3,154
N – Administration	0,011	0,008	0,007	0,010	0,009	0,007	0,010	0,010	0,010	0,008	0,008	0,007	0,011	0,009	0,006	0,009	0,006	0,008	0,007	1,198
O,P – Education, Health and Othe	0,272	0,198	0,187	0,242	0,227	0,179	0,244	0,254	0,263	0,206	0,198	0,173	0,274	0,235	0,153	0,239	0,153	0,212	0,178	6,203
STA CRUZ GRACIOSA	1,006	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,006	0,005	0,005	0,005	0,006	0,005	0,004	0,005	0,004	0,005	0,005	1,185
CALHETA	0,004	1,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,003	0,004	0,004	0,004	0,004	1,152
VELAS	0,007	0,006	1,006	0,007	0,006	0,006	0,007	0,007	0,007	0,006	0,006	0,006	0,007	0,006	0,006	0,006	0,006	0,006	0,006	1,234
ANGRA DO HEROISMO	0,051	0,045	0,044	1,049	0,048	0,044	0,049	0,050	0,051	0,046	0,045	0,043	0,051	0,048	0,041	0,049	0,041	0,047	0,044	2,747
PRAIA VITORIA	0,042	0,035	0,034	0,039	1,038	0,033	0,039	0,040	0,041	0,035	0,035	0,032	0,042	0,038	0,030	0,039	0,030	0,036	0,033	2,206
CORVO	0,000	0,000	0,000	0,000	0,000	1,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	1,012
HORTA	0,022	0,019	0,019	0,021	0,021	0,019	1,021	0,021	0,022	0,020	0,020	0,019	0,022	0,021	0,018	0,021	0,018	0,020	0,019	1,743
LAJES DAS FLORES	0,002	0,002	0,002	0,002	0,002	0,002	0,002	1,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	1,066
STA CRUZ FLORES	0,003	0,003	0,002	0,003	0,003	0,002	0,003	0,003	1,003	0,003	0,003	0,002	0,003	0,003	0,002	0,003	0,002	0,003	0,002	1,092
LAJES DO PICO	0,006	0,005	0,005	0,006	0,006	0,005	0,006	0,006	0,006	1,005	0,005	0,005	0,006	0,006	0,005	0,006	0,005	0,006	0,005	1,210
MADALENA	0,010	0,009	0,009	0,009	0,009	0,009	0,010	0,010	0,010	0,009	1,009	0,008	0,010	0,009	0,008	0,009	0,008	0,009	0,008	1,353
SAO ROQUE DO PICO	0,004	0,003	0,003	0,004	0,004	0,003	0,004	0,004	0,004	0,003	0,003	1,003	0,004	0,004	0,003	0,004	0,003	0,003	0,003	1,158
VILA DO PORTO	0,008	0,007	0,007	0,007	0,007	0,007	0,007	0,008	0,008	0,007	0,007	0,007	1,008	0,007	0,007	0,007	0,007	0,007	0,007	1,252
LAGOA	0,046	0,040	0,040	0,044	0,043	0,040	0,044	0,045	0,046	0,041	0,041	0,039	0,046	1,043	0,037	0,044	0,038	0,042	0,039	2,539
NORDESTE	0,004	0,003	0,003	0,004	0,004	0,003	0,004	0,004	0,004	0,003	0,003	0,003	0,004	0,004	1,003	0,004	0,003	0,004	0,003	1,140
PONTA DELGADA	0,084	0,075	0,074	0,081	0,079	0,073	0,081	0,082	0,084	0,076	0,076	0,072	0,085	0,080	0,069	1,081	0,070	0,078	0,074	3,803
POVOACAO	0,008	0,007	0,007	0,007	0,007	0,007	0,007	0,008	0,008	0,007	0,007	0,007	0,008	0,007	0,006	0,007	1,006	0,007	0,007	1,266
RIBEIRA GRANDE	0,025	0,022	0,021	0,024	0,023	0,021	0,024	0,024	0,025	0,022	0,022	0,021	0,025	0,023	0,020	0,024	0,020	1,022	0,021	1,836
VILA FRANCA CAMPO	0,010	0,009	0,009	0,010	0,009	0,009	0,010	0,010	0,010	0,009	0,009	0,009	0,010	0,010	0,008	0,010	0,008	0,009	1,009	1,358
TOTAL	3,265	3,149	3,132	3,208	3,189	3,141	3,214	3,234	3,248	3,159	3,146	3,110	3,267	3,196	3,079	3,202	3,080	3,164	3,116	

Annex 5: Code of Municipalities

Code	Municipalities	Island
GRA	Santa Cruz da Graciosa	Graciosa
CAL	Calheta	São Jorge
VEL	Velas	São Jorge
ANG	Angra do Heroísmo	Terceira
PRA	Praia da Vitória	Terceira
COR	Corvo	Corvo
HOR	Horta	Faial
LPF	Lajes das Flores	Flores
SCF	Santa Cruz das Flores	Flores
LAP	Lajes do Pico	Pico
MAD	Madalena	Pico
SRP	São Roque do Pico	Pico
VPO	Vila do Porto	Santa Maria
LAG	Lagoa	São Miguel
NOR	Nordeste	São Miguel
PDL	Ponta Delgada	São Miguel
POV	Povoação	São Miguel
RGR	Ribeira Grande	São Miguel
VFR	Vila Franca do Campo	São Miguel

Annex 6: Distances Between Municipalities of the Azores in Equivalent Terrestrial Kilometers

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	STA CRUZ GRACIOSA	3	153	137	154	143	160	142	161	164	166	141	154	172	167	209	163	199	174	181
2	CALHETA	153	4	19	168	158	178	53	179	182	65	48	52	184	180	223	176	213	188	194
3	VELAS	137	19	4	155	145	161	30	161	165	50	25	32	171	167	210	163	199	174	181
4	ANGRA DO HEROISMO	154	168	155	5	16	183	160	184	187	181	159	171	176	171	213	167	203	178	184
5	VILA PRAIA VITORIA	143	158	145	16	4	172	150	173	177	171	149	161	163	158	200	154	190	165	172
6	CORVO	160	178	161	183	172	1	159	26	19	187	159	175	200	196	238	192	228	203	210
7	HORTA	142	53	30	160	150	159	4	159	162	53	13	37	175	171	214	167	204	179	185
8	LAJES DAS FLORES	165	182	165	187	177	26	162	3	6	191	163	179	203	200	242	196	232	207	214
9	STA CRUZ FLORES	161	169	144	184	173	19	129	6	3	174	133	156	200	196	239	192	229	204	210
10	LAJES DO PICO	166	65	50	181	171	187	53	187	191	4	29	16	195	191	234	187	224	199	205
11	MADALENA	141	48	25	159	149	159	13	159	163	29	4	18	174	170	213	166	203	178	184
12	SAO ROQUE DO PICO	154	52	32	171	161	175	37	175	179	16	18	4	186	182	225	178	214	189	196
13	VILA DO PORTO	172	185	171	176	164	200	175	200	203	195	174	186	3	148	187	145	176	156	159
14	LAGOA	167	180	167	171	158	196	171	196	200	191	170	182	148	2	39	8	29	9	13
15	NORDESTE	209	223	210	213	200	238	214	239	242	234	213	225	187	39	3	47	13	33	29
16	PONTA DELGADA	163	176	163	167	154	192	167	192	196	187	166	178	145	8	47	5	37	16	21
17	POVOACAO	199	213	199	203	190	228	204	229	232	224	203	214	176	29	13	37	3	26	17
18	RIBEIRA GRANDE	174	188	174	178	165	203	179	204	207	199	178	189	156	9	33	16	26	4	14
19	VILA FRANCA CAMPO	181	194	181	184	172	210	185	210	214	205	184	196	159	13	29	21	17	14	3

Annex 7: Movements Residence Employment between municipalities by sector (Azores, 2001)

A Agriculture and Animals Farming (1)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	455	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	455
2	CALHETA	0	569	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	570
3	VELAS	0	0	541	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	541
4	ANGRA DO HEROISMO	0	0	0	1555	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1572
5	VILA PRAIA VITORIA	0	0	0	38	884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	922
6	CORVO	0	0	0	0	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	53
7	HORTA	0	0	0	0	0	0	720	0	0	1	0	1	0	0	0	0	0	0	0	722
8	LAJES DAS FLORES	0	0	0	0	0	0	0	176	4	0	0	0	0	0	0	0	0	0	0	180
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	187	0	0	0	0	0	0	0	0	0	0	187
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	502	2	0	0	0	0	0	0	0	0	504
11	MADALENA	0	0	0	0	0	0	0	0	0	0	517	20	0	0	0	0	0	0	0	537
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	1	3	236	0	0	0	0	0	0	0	240
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	246	0	0	0	0	0	0	246
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	703	1	44	0	3	3	754
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	683	0	0	1	0	684
16	PONTA DELGADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2406	3	10	2	2422
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	513	0	1	514
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	49	13	1750	0	1814
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	3	1013	1021
20	AZORES	455	569	542	1593	901	53	720	176	191	504	522	257	246	703	687	2502	531	1767	1019	13938

B Fishing (2)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	CALHETA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	VELAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	ANGRA DO HEROISMO	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
5	VILA PRAIA VITORIA	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
6	CORVO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	HORTA	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
8	LAJES DAS FLORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	MADALENA	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	3
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
16	PONTA DELGADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	3
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	5	0	7
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	AZORES	0	0	0	9	1	0	2	0	0	0	2	5	0	0	1	4	1	7	1	33

C Mining and Quarrying (3)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65
2	CALHETA	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
3	VELAS	0	0	62	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	65
4	ANGRA DO HEROISMO	0	0	0	211	16	0	1	0	0	0	0	0	0	0	0	0	0	0	0	228
5	VILA PRAIA VITORIA	0	0	0	0	135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135
6	CORVO	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
7	HORTA	0	0	0	0	0	0	124	0	0	0	1	0	0	0	0	0	0	0	0	125
8	LAJES DAS FLORES	0	0	0	0	0	0	0	10	1	0	0	0	0	0	0	0	0	0	0	11
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	21
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	182	2	0	0	0	0	0	0	0	0	184
11	MADALENA	0	0	0	0	0	0	2	0	0	0	72	0	0	0	0	0	0	0	0	74
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	0	3	7	0	0	0	0	0	0	0	10
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	57	0	0	0	0	0	0	57
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	167	0	35	0	0	3	205
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5
16	PONTA DELGADA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	185	0	0	0	186
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	100	0	0	105
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	440	0	459
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	111	125
20	AZORES	65	24	62	211	151	5	131	10	22	182	78	7	57	167	5	258	100	440	114	2089

DA Processed Food, Beverages and Tobacco (4)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
2	CALHETA	0	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54
3	VELAS	0	2	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86
4	ANGRA DO HEROISMO	0	0	0	462	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	465
5	VILA PRAIA VITORIA	0	0	0	36	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76
6	CORVO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7	HORTA	0	0	0	0	0	0	298	0	0	0	0	0	0	0	0	0	0	0	0	298
8	LAJES DAS FLORES	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	20
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	72	34	2	0	0	0	0	0	0	0	108
11	MADALENA	0	0	0	0	1	0	0	0	0	1	247	0	0	0	0	0	0	0	0	249
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	0	10	46	0	0	0	0	0	0	0	56
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	10
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	95	0	108	0	2	5	210
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	0	0	31
16	PONTA DELGADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1092	0	11	2	1105
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	0	34
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	2	290	0	364
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	70	81
20	AZORES	34	56	84	498	44	1	298	3	20	73	291	48	10	95	31	1283	36	303	77	3285

D-DA Other Manufacturing Activities (5)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
2	CALHETA	0	51	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
3	VELAS	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60
4	ANGRA DO HEROISMO	0	0	0	478	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	490
5	VILA PRAIA VITORIA	0	0	0	33	283	0	0	0	0	0	0	0	0	0	0	0	0	0	0	316
6	CORVO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7	HORTA	0	0	0	1	0	0	186	0	0	0	0	0	0	0	0	0	0	0	0	187
8	LAJES DAS FLORES	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	7
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	28	0	1	0	0	0	0	0	0	0	29
11	MADALENA	0	0	0	0	0	0	0	0	0	0	75	2	0	0	0	0	0	0	0	77
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	0	8	55	0	0	0	0	0	0	0	63
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	0	0	48
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	227	0	65	0	13	0	305
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	1	0	30
16	PONTA DELGADA	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1012	0	48	1	1064
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0	60
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	71	0	382	0	456
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	3	1	118	139
20	AZORES	28	51	61	512	295	1	186	5	7	28	83	58	48	231	31	1165	63	445	119	3417

E Electricity, Gas and Water (6)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
2	CALHETA	0	26	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
3	VELAS	0	3	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
4	ANGRA DO HEROISMO	0	0	0	131	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151
5	VILA PRAIA VITORIA	0	0	0	6	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71
6	CORVO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	HORTA	0	0	0	0	0	0	64	0	0	0	0	0	0	0	0	0	0	0	0	64
8	LAJES DAS FLORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	6
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	37	0	3	0	0	0	0	0	0	0	40
11	MADALENA	0	0	0	0	0	0	0	0	0	2	10	1	0	0	0	0	0	0	0	13
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	0	0	26	0	0	0	0	0	0	0	26
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	30
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0	0	1	0	24
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4
16	PONTA DELGADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	349	0	13	0	362
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	41	0	0	43
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	1	51	0	91
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	1	1	10	26
20	AZORES	28	29	24	137	85	0	64	0	6	39	10	30	30	23	4	404	43	66	10	1032

F Construction (7)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	298
2	CALHETA	0	163	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165
3	VELAS	0	5	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	281
4	ANGRA DO HEROISMO	0	0	0	1521	76	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1598
5	VILA PRAIA VITORIA	0	0	0	143	863	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1006
6	CORVO	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
7	HORTA	0	0	0	0	0	0	544	0	0	1	1	1	0	0	0	0	0	0	0	547
8	LAJES DAS FLORES	0	0	0	0	0	0	0	89	6	0	0	0	0	0	0	0	0	0	0	95
9	STA CRUZ FLORES	0	0	0	0	0	0	0	4	137	0	0	0	0	0	0	0	0	0	0	141
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	180	3	0	0	0	0	0	0	0	0	183
11	MADALENA	0	0	0	0	0	0	1	0	0	4	236	0	0	0	0	0	0	0	0	241
12	SAO ROQUE DO PICO	0	0	1	0	0	0	0	0	0	10	16	142	0	0	0	0	0	0	0	169
13	VILA DO PORTO	0	0	0	1	0	0	0	0	0	0	0	0	245	0	0	0	0	0	0	246
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	353	0	230	5	13	5	606
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	161	10	0	7	2	180
16	PONTA DELGADA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2527	1	57	14	2600
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	9	303	2	7	322
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	457	2	1126	6	1595
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	242	10	11	668	931
20	AZORES	298	168	279	1665	939	5	546	93	143	195	256	143	245	353	166	3476	321	1216	702	11209

G Trade and commerce (8)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	159
2	CALHETA	0	142	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144
3	VELAS	0	0	189	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	189
4	ANGRA DO HEROISMO	0	0	0	1784	57	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1842
5	VILA PRAIA VITORIA	0	0	0	70	732	0	0	0	0	0	0	0	0	0	0	0	0	0	0	802
6	CORVO	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	8
7	HORTA	0	0	0	0	0	0	818	0	0	0	0	0	0	0	0	0	0	0	0	818
8	LAJES DAS FLORES	0	0	0	0	0	0	0	40	4	0	0	0	0	0	0	0	0	0	0	44
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	99	0	0	0	0	0	0	0	0	0	0	99
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	133	2	0	0	0	0	0	0	0	0	135
11	MADALENA	0	0	0	0	0	0	1	0	0	1	240	0	0	0	0	0	0	0	0	242
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	5	3	102	0	0	0	0	0	0	0	110
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	226	0	0	0	0	0	0	226
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	392	0	253	1	9	3	658
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	116	2	0	1	0	119
16	PONTA DELGADA	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3891	0	30	1	3923
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	192	7	0	207
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	230	0	709	0	940
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	29	1	1	255	287
20	AZORES	159	142	191	1854	789	8	820	41	103	139	245	102	226	393	122	4408	194	757	259	10952

H Hotels and Restaurants (9)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
2	CALHETA	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
3	VELAS	0	0	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46
4	ANGRA DO HEROISMO	0	0	0	330	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	339
5	VILA PRAIA VITORIA	0	0	0	8	199	0	0	0	0	0	0	0	0	0	0	0	0	0	0	207
6	CORVO	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
7	HORTA	0	0	0	0	0	0	182	0	0	0	0	0	0	0	0	0	0	0	0	182
8	LAJES DAS FLORES	0	0	0	0	0	0	0	7	1	0	0	0	0	0	0	0	0	0	0	8
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0	0	31
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	14	1	0	0	0	0	0	0	0	0	15
11	MADALENA	0	0	0	0	0	0	0	0	0	0	68	0	0	0	0	0	0	0	0	68
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	0	2	17	0	0	0	0	0	0	0	19
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	69	0	0	0	0	0	0	69
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	41	0	4	12	138
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	9
16	PONTA DELGADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	724	0	1	9	734
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	127	0	3	132
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	98	1	128
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	90	95
20	AZORES	27	7	46	338	208	3	182	7	32	14	71	17	69	81	9	801	127	103	115	2257

I Transport and Communications (10)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75
2	CALHETA	0	37	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
3	VELAS	0	0	116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	116
4	ANGRA DO HEROISMO	0	0	0	480	145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	625
5	VILA PRAIA VITORIA	0	0	0	71	360	0	0	0	0	0	0	0	0	0	0	0	0	0	0	431
6	CORVO	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
7	HORTA	0	0	0	0	0	0	366	0	0	0	0	0	0	0	0	0	0	0	0	366
8	LAJES DAS FLORES	0	0	0	0	0	0	0	14	10	0	0	0	0	0	0	0	0	0	0	24
9	STA CRUZ FLORES	0	0	0	0	0	0	0	1	59	0	0	0	0	0	0	0	0	0	0	60
10	LAJES DO PICO	0	0	0	0	0	0	1	0	0	36	16	0	0	0	0	0	0	0	0	53
11	MADALENA	0	0	0	0	0	0	1	0	0	0	86	1	0	0	0	0	0	0	0	88
12	SAO ROQUE DO PICO	0	0	0	0	0	0	1	0	0	1	12	35	0	0	0	1	0	0	0	50
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	397	0	0	0	0	0	0	397
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	48	0	130	0	0	0	178
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	4	0	4	0	53
16	PONTA DELGADA	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1689	0	5	0	1697
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	60	0	0	61
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	144	1	171	0	318
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	2	55	115
20	AZORES	75	37	120	551	506	7	369	15	69	37	114	36	398	49	47	2027	61	182	55	4755

J Banks & Insurance (11)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
2	CALHETA	0	28	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
3	VELAS	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
4	ANGRA DO HEROISMO	0	0	0	237	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	247
5	VILA PRAIA VITORIA	0	0	0	8	70	0	0	0	0	0	0	0	0	0	0	1	0	0	0	79
6	CORVO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7	HORTA	0	0	0	0	0	0	91	0	0	0	0	0	0	0	0	0	0	0	0	91
8	LAJES DAS FLORES	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	4
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	15
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	28	2	3	0	0	0	0	0	0	0	33
11	MADALENA	0	0	0	0	0	0	0	0	0	1	36	2	0	0	0	0	0	0	0	39
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	1	4	17	0	0	0	0	0	0	0	22
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	21
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	47	0	1	4	63
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	25
16	PONTA DELGADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	772	1	9	1	783
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	24	0	0	25
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	26	0	75	0	102
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	23	32
20	AZORES	27	28	37	245	80	1	91	3	16	30	42	22	21	11	26	856	25	85	28	1674

K Real Estate and Business Services (12)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
2	CALHETA	0	37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
3	VELAS	0	0	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
4	ANGRA DO HEROISMO	0	0	0	245	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	259
5	VILA PRAIA VITORIA	0	0	0	18	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	121
6	CORVO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7	HORTA	0	0	0	0	0	0	114	0	0	1	0	0	0	0	0	0	0	0	0	115
8	LAJES DAS FLORES	0	0	0	0	0	0	0	6	2	0	0	0	0	0	0	0	0	0	0	8
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	9
11	MADALENA	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	16
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	0	2	12	0	0	0	0	0	0	0	14
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0	29
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	57	0	0	1	85
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	2	0	18
16	PONTA DELGADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	670	0	3	0	673
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	20	0	0	22
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	3	82	0	129
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	13	21
20	AZORES	17	37	34	264	117	1	114	6	6	10	18	12	29	27	16	781	23	87	14	1613

L Public Administration (13)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200
2	CALHETA	0	129	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	132
3	VELAS	0	5	180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	185
4	ANGRA DO HEROISMO	0	2	0	1896	156	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2055
5	VILA PRAIA VITORIA	0	0	0	138	856	0	0	0	0	0	0	0	0	0	0	0	0	0	1	995
6	CORVO	0	0	0	0	0	47	0	0	0	0	0	0	0	0	0	0	0	0	0	47
7	HORTA	0	0	0	3	0	0	967	0	0	0	0	0	0	0	0	0	0	0	0	970
8	LAJES DAS FLORES	0	0	0	0	0	0	0	114	8	0	0	0	0	0	0	0	0	0	0	122
9	STA CRUZ FLORES	0	0	0	0	0	0	0	1	192	0	0	0	0	0	0	0	0	0	0	193
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	215	19	0	0	0	0	0	0	0	0	234
11	MADALENA	0	0	0	0	0	0	0	0	0	6	191	11	0	0	0	0	0	0	0	208
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	2	11	196	0	0	0	0	0	0	0	209
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	369	0	0	1	0	0	0	370
14	LAGOA	0	0	0	0	1	0	0	0	0	0	0	0	0	172	0	189	1	6	5	374
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	291	2	5	2	0	300
16	PONTA DELGADA	0	0	0	0	0	0	0	0	0	0	0	1	3	0	2	2935	1	27	4	2973
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	213	0	0	220
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	252	2	488	1	744
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	56	1	3	170	231
20	AZORES	200	136	183	2037	1013	47	968	115	200	223	221	208	372	172	296	3441	223	526	181	10762

M Education (14)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92
2	CALHETA	0	79	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82
3	VELAS	0	5	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114
4	ANGRA DO HEROISMO	0	2	1	824	103	0	0	0	0	0	0	0	0	0	0	2	0	0	0	932
5	VILA PRAIA VITORIA	1	1	1	48	262	0	0	0	0	0	0	0	0	0	0	0	0	0	0	313
6	CORVO	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
7	HORTA	0	0	0	0	0	0	346	0	1	1	1	1	0	0	0	0	0	0	0	350
8	LAJES DAS FLORES	0	0	0	0	0	0	0	13	11	0	0	0	0	0	0	0	0	0	0	24
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	44	0	0	0	0	0	0	0	0	0	0	44
10	LAJES DO PICO	0	1	0	0	0	0	0	0	0	101	1	3	0	0	0	0	0	0	0	106
11	MADALENA	0	0	0	0	0	0	0	0	0	3	84	6	0	0	0	0	0	0	0	93
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	6	7	87	0	0	0	0	0	0	0	100
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	136	0	0	1	0	0	0	137
14	LAGOA	0	0	0	0	1	0	0	0	0	0	0	0	0	117	0	66	0	6	10	200
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	0	0	0	0	114
16	PONTA DELGADA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1886	4	129	18	2038
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	103	1	0	110
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	66	0	340	0	411
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	2	0	154	168
20	AZORES	93	88	113	873	366	5	347	13	56	111	93	97	136	117	120	2038	109	476	182	5433

N Health and Social Work (15)

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
2	CALHETA	0	36	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
3	VELAS	0	3	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89
4	ANGRA DO HEROISMO	0	0	0	962	14	0	0	0	0	0	0	0	0	0	0	1	0	0	0	977
5	VILA PRAIA VITORIA	0	0	0	62	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	209
6	CORVO	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
7	HORTA	0	0	0	0	0	0	403	0	0	0	0	0	0	0	0	0	0	0	0	403
8	LAJES DAS FLORES	0	0	0	0	0	0	0	6	4	0	0	0	0	0	0	0	0	0	0	10
9	STA CRUZ FLORES	0	0	0	0	0	0	0	0	45	0	0	0	0	0	0	0	0	0	0	45
10	LAJES DO PICO	0	0	0	0	0	0	1	0	0	59	4	0	0	0	0	0	0	0	0	64
11	MADALENA	0	0	0	0	0	0	0	0	0	0	64	1	0	0	0	0	0	0	0	65
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	1	1	50	0	0	0	0	0	0	0	52
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	67	0	0	0	0	0	0	67
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	43	0	1	0	80
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	0	0	2	0	73
16	PONTA DELGADA	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	1237	0	24	5	1269
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	0	0	71
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	0	181	0	278
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	1	94	111
20	AZORES	50	39	88	1025	161	5	404	6	49	60	69	51	67	38	71	1394	71	209	99	3956

OP Social and Personal Services; Domestic Staff

	Municipalities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	AZORES
1	STA CRUZ GRACIOSA	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93
2	CALHETA	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59
3	VELAS	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93
4	ANGRA DO HEROISMO	1	0	0	814	175	0	1	1	0	1	0	0	0	0	0	0	0	0	0	993
5	VILA PRAIA VITORIA	0	0	0	60	1234	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1295
6	CORVO	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
7	HORTA	0	0	0	0	0	0	299	0	0	0	0	0	0	0	0	0	0	0	0	299
8	LAJES DAS FLORES	0	0	0	0	0	0	0	39	3	0	0	0	0	0	0	0	0	0	0	42
9	STA CRUZ FLORES	0	0	0	0	0	0	0	1	49	0	0	0	0	0	0	0	0	0	0	50
10	LAJES DO PICO	0	0	0	0	0	0	0	0	0	55	1	2	0	0	0	0	0	0	0	58
11	MADALENA	0	0	0	0	0	0	1	0	0	0	59	1	0	0	0	0	0	0	0	61
12	SAO ROQUE DO PICO	0	0	0	0	0	0	0	0	0	0	1	51	0	0	0	0	0	0	0	52
13	VILA DO PORTO	0	0	0	0	0	0	0	0	0	0	0	0	130	0	0	0	0	0	0	130
14	LAGOA	0	0	0	0	0	0	0	0	0	0	0	0	0	124	0	169	1	2	1	297
15	NORDESTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	50
16	PONTA DELGADA	0	1	0	0	0	0	2	0	0	0	0	0	1	0	0	1597	0	8	2	1611
17	POVOACAO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	105	0	0	108
18	RIBEIRA GRANDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	3	393	0	474
19	VILA FRANCA CAMPO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	1	1	76	93
20	AZORES	94	60	93	874	1409	3	303	42	52	56	61	54	131	124	50	1862	110	404	79	5861