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**Brazil**

**Proconfis Alagoas**

**(BR-L1374)**

**Economic Analysis Annex**

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1. **Introduction**

The State of Alagoas (SoA) is one of the less developed Brazilian States. Mainly due to funds scarcity and fiscal constraints, the limited capacity of the State Government to provide infrastructure certainly has been playing an important role in the persistence of this socioeconomic context. In effect, according to the Brazilian Ministry of Transports, from 2,317 Km of State highways in Alagoas, almost 35% are not paved. In the State of São Paulo for example, only 5% of the State Highways are not paved. Moreover, other infrastructure sectors, like sanitation, also need more investments to meet, at least, the national coverage level. The bottlenecks resulting from the existing infrastructure gaps undermines competitiveness of the State and may threaten the development of tourism, an activity which could effectively contribute to jobs creation and to the economic growth needed to reduce poverty in the State .

In order to overcome these problems, The State of Alagoas is working with the Inter-American Development Bank (IDB) to develop a policy based loan in the scope of the *Programa de Consolidação do Equilíbrio Fiscal* or PROCONFIS program. The objective of this program is to support fiscal sustainability and increase the level and quality of public investment. To reach this goal, program will support policy actions to: i) increase the collection of ICMS, ii) improve the efficiency of public spending, iii) improve public investment management (particularly in transport and water and sanitation ones), and iv) strengthening the capacity of integrated planning and coordinated of public and private investment geared towards the development of the tourism sector..

Initially, this study will provide a preliminary evaluation of the Proconfis Project for the State of Alagoas, relying on Social Accounting Matrix (SAM) multipliers. Considering that the objective of the project is to support fiscal sustainability and increase the level and quality of public investment, this study focuses on how new infrastructure investments, financed by an increase of tax collection, will impact on local economy. Furthermore, it will be investigated the supposed effects on the local economy if the additional tax collection is used to other purposes rather than public investments, like targeted transfers to poor households. In order to compare these possible different uses for the additional tax collection, it will be considered the following measurable benefits for these policies: total production, value added, employment and household income in the State of Alagoas.

This study also assumes that the implementation of the Proconfis project will effectively strength the tourism activity by means of public investments geared towards to the development of this sector. Hence, this study will rely on SAM multipliers to analyze to what extent an increase in visitors’ expenditures, supposedly resulting from the project, could impact on socio-economic indicators, like production, value added, employment and household income.

The Proconfis also will be evaluated using a Computable General Equilibrium (CGE) Model calibrated for the economy of Alagoas. In effect, the same changes in the economy of Alagoas previously described will be simulated in a CGE model. Among other methodological advantages, important aspects of income generating process resulting from these shocks can be assessed by this type of model, like, for example, how the dynamics of capital-labor ratio can affect economic variables, such as wages and household incomes. It is worth noting that the multiplier approach does not capture the long term effects resulting from the infrastructure investments which are, as pointed out by several authors, the most relevant impacts of this kind of change on the economy. The CGE model can capture such effects, and then it can provide more reliable impacts of infrastructure investments on the local economy. Furthermore, the model also allows considering different ways of financing infrastructure investments, enabling the implementation of the suggested simulations.

Besides this introduction, the report has other five sections. In the next one, it will be presented the used methodology to calculate the SAM multipliers and the CGE model will be described. In the third section, a briefly description of the construction of Social Accounting Matrix for the State of Alagoas will be done and the additional data set used in the calibration of the CGE model, like the elasticities and infrastructure capital stock, will be shown. The next section proposes some possible scenarios resulting from the Proncofis project which will be simulated using the SAM and CGE approaches. In the following section, firstly, it will be presented the multipliers calculated from the SAM. Then, the SAM based impacts of the Proconfis are presented. Finally, the CGE approach results are shown. In the last section, some conclusions are presented.

# Methodology

# Multiplier analysis

In this section, it will be presented the methodology to calculate the SAM multipliers for the State of Alagoas. The multipliers will be obtained using the traditional approach described by Pyatt and Round(1988) and Miller and Blair (2009). Using the general structure of the SAM presented in the Figure 1, it will be shown how to calculate the SAM multipliers.

**Figure 1: General Structure of a SAM**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | ***Activities*** | ***Factors*** | ***Consumers and firms*** | ***Exogenous accounts*** | ***Total*** |
| ***Activities*** | T11 | 0 | T13 | X1 | Y1 |
| ***Factors*** | T21 | 0 | 0 | X2 | Y2 |
| ***Consumers and firms*** | 0 | T32 | T33 | X3 | Y3 |
| ***Exogenous account*** | L1 | L2 | L3 | L | Y4 |
| ***Total*** | Y1’ | Y2’ | Y3’ | Y4’ |  |

The element T11 represents the inter-industry purchases and T21 the functional distribution of income. In the cell T32 is registered the distribution of factors income among households and firms. The use of income is registered in the cells T13 and T33. All this elements are considered endogenous. The exogenous account can be the government account, rest of the world and capital accounts.

From this SAM example, it is possible to derive the following accounting identities:

*Y1 = T11+T13+X1*

*Y2 = T21+X2*

*Y3= T32+T33+X3*

Defyning Aij= Tij/Yj’, then,

*Y1 = A11 Y1 +A13 Y3 +X1*

*Y2 = A21 Y1 +X2*

*Y3= A32 Y2 +A33 Y3 +X3*

The coefficients **A11** are the input-output technical coefficients, indicating the direct effects resulting from an increase of sectorial production. The submatrix **A21** describes the use of factors of production (capital and labor) per unit of product. The elements of **A13** are averages propensities, indicating what portion of household income is allocated to consume different items. The matrix **A32** shows the labor and capital shares of factors income distributed across households and firms. Finally, the results reported in **A33** show that portion of the income of households and firms used for transfers between these two institutional sectors.

Using matrix notation, this equation system can be written as:

or simply,

|  |  |
| --- | --- |
|  |  |

Where (I – A)-1 is the SAM multiplier matrix. Because (I – A)-1 can be considered constant, then it is possible to know the effect of an element of Y, given a variation on an element of X using the following equation:

|  |  |
| --- | --- |
|  |  |

Table A1 presents the SAM multipliers matrix (I – A)-1 for Alagoas. Using these results, it will be calculated the employment multipliers. But firstly, it was necessary to calculate the following labor coefficient using equation below:

|  |  |
| --- | --- |
|  |  |

Where *ei* indicates how much labor is used per production unit, *Li* represents the total employment on sector *i* and *Xi* is the production level on activity *i*. The employment multiplier is calculates using the following equation:

|  |  |
| --- | --- |
|  |  |

Where ***Z*** is the SAM inter-industry multiplier matrix, ***E*** is the employment multiplier vector. The multiplier will inform how much extra labor units will be required when there is a unitary raise on production of the activity. Furthermore, this multiplier can be split into direct effect and indirect plus the induced effect.

* 1. **Description of the CGE Model**

The CGE model used in this study is similar to the model used in the evaluation of the Prodetur-Pará Project (see Araujo Jr, 2012). However, the model presented here considers the infrastructure capital as production factor enabling the assessment of the infrastructure investments from a supply-side approach. The first block of equations of the CGE model describes the production technology and factors demand. On the top level of the nested production structure, value added (*VA*) and intermediary inputs (*CI*) are combined in a Leontief production function. Value added is calculated in a lower level as a Cobb-Douglas aggregation of physical capital (*K*) and labor (*LD*). Equations 2 and 3 present two possibilities of taking into account infrastructure capital in the CGE model. In equation 2, the productivity parameter is a function of the entire infrastructure capital stock (*KG*) divided by the total private capital stock of the economy, enabling to capture the congestion effects on the infrastructure capital when private capital growth faster than it. In equation 3, the productivity parameter is a function of sanitation and water infrastructure (*KGS*), transport infrastructure (*KGT*) and the other infrastructure types (*KGO*). Physical capital is sector specific and labor will be split into two types: skilled (those with 8 or more years of formal schooling) denoted by *LSK* and low skilled (those with less than 8 years of formal schooling) denoted by *LLSK*. The two types of labor are aggregates into a CES function to form the total labor demand. Demand for skilled and low-skilled labor is defined according equation 6, which was obtained minimizing the total costs of using both types of labor. Because total labor demand is a CES aggregation of the two of labor, average wage (*ω*) is a CES combination of the two types wages (*ωS*, for skilled labor and *ωLS* for low skilled labor). Intermediary inputs matrix (*CIJij*) is calculated using input-output technical coefficients.

|  |  |
| --- | --- |
|  | (1) |
|  | (2) |
|  | (3) |
|  | (4) |
|  | (5) |
|  | (6) |
|  | (7) |
|  | (8) |
|  | (9) |

Income equations are accounting identities mapping the flow of income from value added to domestic institutional sectors of the model: firm, households and government. Firms, whose income is *YF*, receive all capital income. Local households will be disaggregated according to their income level (five or more categories) and receive their income (*YH*) from production factors, dividends (calculated as share *SHKH* of total firms’ income) and government transfers (*TRFH*). Households’ savings (*SH*) is its total revenue less total consumption (*CTH*) less income taxes (*ITXH*). The state indirect taxes (*TXSE*) and constitutional transfers (*TGE*) from federal government compose stale level government revenues. Households’ direct income tax is entirely collected by federal government. However, one fraction (*θK*) of capital income tax (*IKTX*) is collected within the state and other by federal government. Imports taxes (*TXSM*) are collected by the federal government. In addition, according Brazilian laws the municipalities and states shall transfer a fraction of their revenue (*ΦG*) to federal government.

|  |  |
| --- | --- |
|  | (10) |
|  | (11) |
|  | (12) |
|  | (13) |
|  | (14) |
|  | (15) |
|  | (16) |

The equations showing how income is allocated between consumption and savings are presented in the sequence. Consumers demand (*CHi*) equations are obtained solving a Cobb-Douglas utility maximization problem. Local (*GE*) and federal (*GF*) government purchases are defined using fixed shares of aggregate real spending on goods and services. Private capital goods demand (*INV*) is also defined in this block of equations. Furthermore the visitors’ sectorial expenditures (*GTRN*) are calculated using fixed shares of total visitors’ expenditures. Public demand for capital goods (*IGS*) is defined as the sum of the demand for capital goods of each type of public investment. Institutional sectors’ savings are defined as revenue minus incomes uses (consumption, taxes, transfers and dividend payments).

|  |  |
| --- | --- |
|  | (17) |
|  | (18) |
|  | (19) |
|  | (20) |
|  | (21) |
|  | (22) |
|  | (23) |
|  | (24) |
|  | (25) |

In the next block of equations, the preference for imported and domestic goods is modeled. It is assumed that locally made and imported (from the rest of the country and from abroad) goods are imperfects substitutes. This geographical differentiation is introduced in the model specifying a two level Armington type aggregation function. In the first level, imported goods from the rest of the country (*MB*) and domestically produced goods (*XDD*) are aggregated to generate a composite good *QD*. In the second level the domestic composite good is combined with imported goods from the rest of the world (XM), resulting in the composite good *QM*.

|  |  |
| --- | --- |
|  | (26) |
|  | (27) |

The parameter *σiM* is the substitution elasticity between imports and domestically produced goods, and . The parameter *σiD* is the substitution elasticity between locally produced goods and imported from the rest of the country, and .

A cost minimization program subject to equations 26 and 27, results in the demand equations for imports and domestically produced goods (equations 28 and 29):

|  |  |
| --- | --- |
|  | (28) |
|  | (29) |

Local producers can sell goods either in the domestic market or abroad. With other words, the producers differentiates the production destination, firstly choosing the share out of the domestic sectorial production (*X*) that is sold within the domestic market (D) and other share that is exported (*EX*). Then is chosen the portion of exports sold in the rest of the country (*ED*) and which is sold abroad (*EI*). The choice of the optimal allocation production between exports and local sales is modeled according to a constant transformation elasticity function (CET). Equations 30 and 31 are such CET function aggregating exports and domestic sales and equations 31 and 33 are obtained from const minimization problem constrained by 30 and 32. Consequently, the extent to which relative prices affect geographical destination of goods depend on the elasticity of transformation.

|  |  |
| --- | --- |
|  | (30) |
|  | (31) |
|  | (32) |
|  | (33) |

Where and are the transformation elasticities.

The balance of payments savings with respect the rest of the world (*SEXT*) and with respect to the rest of the Brazil (*SRBR*) includes only the commerce flows, as can be seen in the following equations:

|  |  |
| --- | --- |
|  | (34) |
|  | (35) |

Because the production functions and the Armington and CET functions are homogenous of degree one, Euler’s theorem for homogenous functions guarantees that the prices equations from 36 to 41 have the following forms. These expressions calculate consumer price (P) the prices of the products domestically (*PD*), the prices of imported products from the rest of the world and from Brazil (*PXM* and *PMB*), the price of foreign and domestic exports (*PE* and *PED*), producer price (*PX*), value added price (*PVA*) and capital remuneration (*R*).

|  |  |
| --- | --- |
|  | (36) |
|  | (37) |
|  | (38) |
|  | (39) |
|  | (40) |
|  | (41) |

In addition, it is assumed that economy of Para is that of a small economy, so that it does not exert any influence on export and import prices. Where *ER* is the Exchange rate, *PWM*i and *PWE*i are the international prices of the imported and exported products. The parameter *tmi* represents the imports tax rates and *PRB* is the price on the rest of the country.

|  |  |
| --- | --- |
|  | (42) |
|  | (43) |
|  | (44) |
|  | (45) |
|  | (46) |

The market clearing equations establish the equilibrium between supply and demand of goods and factors and between investment and savings. The variables *UNES* and *UNEU* represent the unemployment rates between skilled and unskilled workers in the State od Alagoas. The variable *IG* represents the public investment in the economy of Alagoas. The prices of the model adjust to maintain the model in equilibrium.

|  |  |
| --- | --- |
|  | (47) |
|  | (48) |
|  | (49) |
|  | (50) |

The model’s dynamics is driven by capital accumulation and labor force growth. The model is designed in such a way that it will produce a baseline time path for all endogenous variables. Along this time path, the economy of the state of Para is growing at the average rate observed in the last years. The last equation is a version of the investment accelerator model, where private investment is function of the previous investment, the GDP variation and from the public investment. Based on this equation, in the model, the larger is the public investment, the larger is the private investment. Hence, the infrastructure investments affect the product raising the productivity of factors and by increasing private investment which raise private capital stock, which also increase the economy product.

|  |  |
| --- | --- |
|  | (51) |
|  | (52) |
|  | (53) |
|  | (54) |
|  | (55) |
|  | (56) |
|  | (57) |

The equations 58 and 59 are the wage equations of the model. These equations are in accordance with the labor market theory of wage determination. According to this theory, the larger is the unemployment rate the lower is the wage to offer labor.

|  |  |
| --- | --- |
|  | (58) |

|  |  |
| --- | --- |
|  | (59) |

# 3. Data

In this study, the CGE model will be calibrated to reproduce a Social Accounting Matrix (SAM) of the state of Alagoas whose general structure can be observed in Figure 2. The SAM has the traditional accounts observed elsewhere. However, what differentiates this SAM is the presence of the Visitor account, registering tourist expenditures on local goods and services. Below, a brief description of main features of the model is presented.

**Figure 2: General structure of the aggregated SAM**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accounts** | ***Activities*** | ***Labor*** | ***Capital*** | ***Firms*** | ***Households*** | ***Government*** | ***Visitor*** | ***Rest of the world*** | ***Rest of the Country*** | ***Capital***  ***account*** |
| ***Activities*** | IC |  |  |  | CH | CG | CT | EXP | EXP-RC | CF |
| ***Labor*** | LI |  |  |  |  |  |  |  |  |  |
| ***Capital*** | KI |  |  |  |  |  |  |  |  |  |
| ***Firms*** |  |  | CI |  |  |  |  |  |  |  |
| ***Households*** |  | LI |  | DIV |  | TRF |  |  |  |  |
| ***Government*** | ITX |  |  | DTXF | DTXH |  |  |  |  |  |
| ***Visitor*** |  |  |  |  |  |  |  | RTF | RTD |  |
| ***Rest of***  ***the world*** | IMP |  |  |  |  |  |  |  |  |  |
| ***Rest of the Country*** | IMP-RC |  |  |  |  |  |  |  |  |  |
| ***Capital***  ***account*** |  |  |  | SE | SH | SG |  | SF | SRBR |  |

***Key:***

|  |  |  |
| --- | --- | --- |
| IC: Intermediate consumption | SE: Firms savings | CF: Demand for capital goods |
| LI: Labor income | SH: Households savings | IMP-RC: imports from the rest of the country |
| KI: Capital income | CG: Government purchases | EXP-RC: exports from the rest of the country |
| ITX: Indirect taxes | TRF: Government transfers | SRBR: savings of the rest of the country |
| IMP: Imports | SG: Public savings | RTD: Available domestic tourist resources |
| DIV: Dividends | CT: Tourists consumption |  |
| DTFH: Direct income tax –Households | RTF: Available foreign tourist resources |  |
| CH: Household consumption | SE: Foreign savings |  |
| DTFF: Direct capital tax –firm | EXP: Exports |  |

The proposed CGE models will be calibrated for the base year 2004. This year was chosen because the most recent input-output table for the State of Alagoas is for 2004. This matrix is a sub-matrix of an inter-regional input-output system of the economy of the Northeast Region of Brazil elaborated by the Banco do Nordeste (BNB) in 2010. The information related to the production, distribution of value added across sectors and final demand elements (aggregated household consumption, government purchases, capital formation, exports) will be obtained from this input-output matrix of the state of Alagoas.

The main database used to construct the SAM of the State of Alagoas was the Input-Output Matrix (IOM) of the States of the Northeast Region, built by the Banco do Nordeste for the year 2004.This matrix is actually an inter-regional input-output system, in which are registered intersectorial transactions within each state and between the states of the region. The matrix of Alagoas is therefore only a submatrix of this input-output system.

The values of the supply-side variables of the SAM (intermediate ​ consumption of all economic activities, the distribution of value added between labor and capital, the indirect taxes and the imported intermediate inputs) were gathered from the data registered in the IOM of Alagoas. Moreover, using the IOM of Alagoas it was possible to build the vectors containing the elements of final demand (household consumption, government consumption, exports and demand for capital goods). To complete the construction of the SAM, it was still remaining information about the distribution of income between households and firms, government transfers, direct taxation, visitors spending and savings. These data were collected consulting the data sources listed in Table 1.

**Table 1: Data sources used to build the SAM of Alagoas**

|  |  |
| --- | --- |
| **Information** | **Data source** |
| Distribution of value added to households and firms | 2004 PNAD microdata and System of National Accounts (IBGE) |
| Government transfers | 2004 PNAD microdata and National treasury |
| Indirect taxes | National treasury |
| Visitors expenditures | FIPE Domestic tourism sourvey |
| Savings | System of National Accounts (IBGE) |

After having completed the SAM using the data sources ​​shown above, some accounts of the SAM were disaggregated. Firstly, the labor factor was divided into skilled and unskilled labor. In this work, the definition of skilled labor was based on the number of years of formal education. Those with eight or more years of formal education were considered skilled and those with less than eight years of study were called unskilled workers. This procedure captures how low is the average education level of the workforce in Alagoas, which is a relevant structural feature of the local economy. Moreover, this disaggregation enables taking into account how labor income is distributed between skilled and unskilled workers.

The numbers presented in Table 2 stand for the sectoral composition of the labor force according to educational level. These data were obtained from the 2004 PNAD microdata. Initially, it is important to note that the table provides information for 23 activities. This is the number of sectors considered in this study. The definition of this number of activities is due to the need to reconcile the data IOM with other databases such as the 2004 PNAD. Examining the data in the table, in the agricultural sector 97.46% of workers have less than eight years of study. Among the typical activities of tourism, the Accommodation sector presents a more significant presence of skilled workers (66.57%). In the Food services sector, only 25.03% of the employees have at least eight years of study.

**Table 2: Sectorial employment composition according Skill level (%)**

|  |  |  |
| --- | --- | --- |
| **Activity** | **Unskilled** | **Skilled** |
| Agriculture, Forestry, Fishing and Hunting | 97.46 | 2.54 |
| Petroleum Products Manufacturing | 75 | 25 |
| Foods and bevarages | 80.3 | 19.7 |
| Textiles | 83.33 | 16.67 |
| Clothing | 62.51 | 37.49 |
| Wood Products | 100 | 0 |
| Paper Manufacturing | 25 | 75 |
| Chemical Manufacturing | 66.67 | 33.33 |
| Nonmetallic Mineral Product Manufacturing | 91.67 | 8.33 |
| Metal and Machinery Manufacturing | 90.91 | 9.09 |
| Other industries | 57.14 | 42.86 |
| Utilities | 71.43 | 28.57 |
| Construction | 87.8 | 12.2 |
| Commerce | 69.23 | 30.77 |
| Transportation and Warehousing | 88.89 | 11.11 |
| Passagers transports | 64.87 | 35.13 |
| Postal Services and informations | 33.33 | 66.67 |
| Finance and Insurance | 6.25 | 93.75 |
| Real Estate and Rental | 80 | 20 |
| Accommodation | 37.5 | 62.5 |
| Food services | 74.7 | 25.3 |
| Public Aministration | 33.43 | 66.57 |
| Other Services | 66.77 | 33.23 |
| Total | 77.36 | 22.64 |

The account of the households was disaggregated into eight categories according to the level of monthly household earnings, as shown in Table 3. This procedure was necessary to enables the assessment of the program effects on poverty and inequality. The household groups were chosen in order to reconcile data on income gathered from PNAD and data on household consumption observed in the 2002/2003 POF[[1]](#footnote-1). Table 3 also shows the number of households and total income by income group in Alagoas. According to the data, 54% of households belong to the first income group (R$ 0.00 to R$ 496.00). These same households concentrate only 14%of total household income in the State. At the other extreme of the distribution, the 2.4% of households whose monthly earnings are above R$ 3,720.00 concentrate 33% of all income. The observed concentration of wealth is reflected in the high value of the Gini index found for the state of Alagoas.

**Table 3: Number of households and total annual earnings by monthly earnings intervals in Alagoas 2004.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Household groups**  **by monthly**  **earnings ranges**  **(R$)** | **Identification of the Household** | **Number of households**  **by monthly**  **earnings intervals** | **Total household income by monthly earnings Intervals**  **(R$ million)** |
| 0 |-- 496 | HH1 | 405,409 | 1,783.54 |
| 496 |-- 744 | HH2 | 159,252 | 1,743.62 |
| 744 |-- 1.240 | HH3 | 97,372 | 1,837.73 |
| 1.240 |-- 1.488 | HH4 | 15,470 | 519.82 |
| 1.488 |-- 1.984 | HH5 | 24,116 | 969.64 |
| 1.984 |-- 2.480 | HH6 | 10,010 | 475.37 |
| 2.480 |-- 3.720 | HH7 | 12,285 | 897.27 |
| 3.720 |-- ... | HH8 | 18,200 | 4,130.61 |
| TOTAL | | 742,114 | 12.357,59 |
| Gini índex |  | 0.6049 | |

Other important information for the purposes of this study is the tourist total expenditure in the State of Alagoas. The calculation of the touristic spending was carried out based on the number of visitors in the state in 2004, the average stay and the tourist expenditures per capita/day. According to The Secretaria do Turismo de Alagoas (SETUR-AL), the duration of stay of visitors in Maceió, the main touristic city of the State, was 3.7 days and the number of visitors was 600.000 in 2011[[2]](#footnote-2). The number of visitors in 2004, the base year of the SAM, was estimated supposing a growth rate of 5% per year for the number of visitors[[3]](#footnote-3). On the basis of the study about the Brazilian Tourist profile (FIPE, 2012), in the State of Alagoas the per capita visitor expenditure was, on average, R$1,012.92 in 2011. Deflating this value to 2004 prices, the considered reference value for the per capita visitor expenditures was R$702.78. The total visitors’ expenditures is calculated multiplying the number of visitors by the per capita expenditures/day and by the duration of stay. Table 4 displays the data on tourism activity in Alagoas including the visitors’ expenditures.

**Table 4: Values for the tourism variables**

|  |  |
| --- | --- |
| **Tourism variables** | **Reference values** |
| Number of visitors in 2004 | 426,409 visitors |
| Per capita expenditures | R$ 702.78 per visitor |
| Duration of stay | 3.7 days |
| Total visitors expenditures | R$ 299.67 million |

The distribution of visitors’ expenditures in the State was determined using the information gathered from FIPE domestic tourism survey. Table 5 presents the estimated vector of tourism expenditures in Alagoas in 2004.

**Table 5: Distribution of visitors according expenditures item**

|  |  |  |
| --- | --- | --- |
| **Expenditure Item** | **Share**  **(%)** | **Expenditure amount**  **(million R$)** |
| Local Transport | 4.56 | 13.67 |
| Accomotadion | 20.71 | 62.06 |
| Food | 32.14 | 96.31 |
| Shopping | 20.25 | 60.68 |
| Excursions | 9.44 | 28.29 |
| Entertainment | 7.06 | 21.16 |
| **Other** | 5.85 | 17.53 |
| **TOTAL** | **100,00** | 299.67 |

The infrastructure capital stock of the SoA will be calculated using the perpetual inventory method according to Kamps (2004). This method relies on the hypothesis that the capital stock at the beginning of the following period t (*KGt+1*) is the result of the capital stock at the beginning of the current period (*KGt*), of gross investment in the current period (*IGt)* and of depreciation in the current period (*DGt*):

|  |  |
| --- | --- |
|  | (60) |

Assuming a constant depreciation rate, *φ*, equation 60 can be written as:

|  |  |
| --- | --- |
|  | (61) |

To calculate the infrastructure capital stock of the State of Alagoas using this methodology, the first step is to obtain a time series of public investments. These data were provided by the State Treasury Department of Alagoas from 2007 until 2012. Additional information on public investment was gathered in the National Treasury database since 1998. After having calculated the real growth rate of public investments from these data, it will be constructed an artificial series of public investments on the State of Alagoas beginning in 1950 and finishing in 1997. According to the methodology, in 1950 the capital stock will be *KG1951=(1-φ)KG1950 + IG1950*. In 1950 the infrastructure capital stock is supposedly equal to zero[[4]](#footnote-4), then *KG1951*= *IG1950*. The infrastructure capital stock in 2004 will be obtained accumulating the investment according equation 53 using the artificial series of public investment and the available data. The Figure 3 presents the infrastructure capital stock of the State of Alagoas. To estimate this series, a yearly depreciation rate of 2% was used and it was assumed that public investment is growing at a constant rate of 5% per year. It is important to point out that this series was built using only investment done by the State Government. The public investment done by the federal Government was not considered because of the lack of data.

The Sanitation and Water and Transports infrastructure capital were calculated in a similar way, using data provided by the Secretaria da Fazenda of Alagoas. Figure 4 presents this information. The other infrastructure capital stock was found as the difference between the total infrastructure capital stock and the transport and Sanitation capital stock.

**Figure 3: Infrastructure Capital Stock in the State of Alagoas**

Before 1998

**Figure 4: Transports and Sanitation and Water Capital Stock in the State of Alagoas**

The elasticity of the product with respect the infrastructure capital was gathered in the literature. In the Brazilian economic literature, this elasticity varies from 0.07 (see Florissi (1997)) to 1.12 (according to Ferreira (1996)). The estimate of Easterly and Rebelo (1992) for this elasticity in developing countries is 0.16. In this study, it will be used the Florissi (1997) estimate (0.07) for the elasticity. There is no known estimate for the elasticity of product with respect the different types of infrastructure. Then, it will be adopted the hypothesis assumed by Bayoudh (2012), in which the productivity of the economy depends more on transport capital than on water and sanitation infrastructure. Hence, the elasticity with respect the transport capital will be set to 0.1, whilst for the other types of infrastructure, the elasticity is 0.07.

The model uses the Behar (2010) estimates for the elasticities of substitution between skilled and low skilled labor. The elasticities of substitution were gathered from Tourinho et al. (2005) and Haddad (2005) (see Table 15) and the elasticities of transformation were obtained from Tourinho et al. (2005).

**Table 6: Armington Elasticities of Substitution**

|  |  |  |
| --- | --- | --- |
| **Activity** | **International** | **Regional** |
| Agriculture and Livestock | 0.343 | 1.57 |
| Mining | 1.278 | 2.079 |
| Manufacturing | 1.278 | 2.079 |
| Transports and other Services | 1.465 | 0.05 |

Source: Haddad (2005).

# 4. Some Possible Scenarios resulting from the PROCONFIS

One of the aims of the Proconfis project is increase the collection of ICMS. The baseline data displayed in Table 7 provides a projection for the ICMS collection without the PROCONFINS from 2012 to 2020. In this projection, the nominal tax collection growths by 9.2% per year due to GDP growth and inflation. The counterfactual projection includes an additional increment of 3% per year in real terms because of the fiscal effort. After 2015, it is assumed that the 3% drops to a 1% increase, tapering off to 0% increase by 2020. In a more conservative scenario, the 3% growth rate drops to 0.5% after 2015. Table 7 shows the values for these two scenarios from 2012 until 2020. The deviation of the tax collection from the baseline is the expected impact of the Proconfis project on the ICMS tax collection in the State of Alagoas.

**Table 7: Possible Scenarios for the Proconfis project**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | Baseline scenario:  Tax Collection Without  the fiscal effort (R$ Million) | 1% growth after 2015 | | 0.5% growth after 2015 | |
| Counterfactual  scenario:  Tax Collection  With the fiscal  effort (R$ Million) | Deviation  from  the base line  (R$ Million) | Counterfactual scenario:  Tax Collection  With the fiscal effort (R$ Million) | Deviation from  the base line (R$ Million) |
| 2012 | 2,460 | 2,460 | 0.0 | 2,460 | 0.0 |
| 2013 | 2,686 | 2,767 | 80.6 | 2,686 | 80.6 |
| 2014 | 2,933 | 3,112 | 178.6 | 2,933 | 178.6 |
| 2015 | 3,203 | 3,500 | 297.0 | 3,203 | 297.0 |
| 2016 | 3,498 | 3,859 | 361.8 | 3,498 | 343.0 |
| 2017 | 3,819 | 4,256 | 436.4 | 3,819 | 395.0 |
| 2018 | 4,170 | 4,692 | 522.1 | 4,170 | 453.7 |
| 2019 | 4,554 | 5,174 | 620.3 | 4,554 | 520.1 |
| 2020 | 4,973 | 4,973 | 0.0 | 4,973 | 0.0 |

Once the expected effects on tax collection are established, the assessment of the Proconfis project will focus on the effects of the different uses of this additional tax collection. Initially, it will be admitted that the increase of tax collection resulting from the project can be fully allocated to the following purposes: infrastructure investments and transfers to poor households.

In the SAM based analysis, the infrastructure investments will be simulated assuming that the increase of tax collection will raise the production of the Construction sector in the State of Alagoas. Thus, it will be analysed only the short run demand-side effects resulting from the infrastructure investments. In the CGE model approach, the increase on the infrastructure investments will be simulated raising the investment on Transports and Sanitation infrastructures. Furthermore, it will be admitted that the new infrastructure investments have positive impacts on the tourism activity in Alagoas. In effect, the number of visitors, the duration of stay and the daily per capita tourist expenditures will raise because of the infrastructure improvements funded by the additional resources of the Proconfis project. The scenarios described in Table 8 for the tourism variables will be simulated. The last column of Table 8 shows the impact on visitors’ expenditures induced by the scenarios.

**Table 8: Possible scenarios for the tourism variable after the infrastructure investments**

|  |  |  |
| --- | --- | --- |
| **Scenarios** | **Description of the Scenarios** | **Impact on visitors expenditures (R$ Million)** |
| Scenario 1 | Increase of 100,000 visitors | 70.28 |
| Scenario 2 | Increase of 0.3 day in the during of stay | 24.30 |
| Scenario 3 | Increase of the per capita expenditure of 10% | 29.97 |
| Scenario 4 | The three scenarios together | 140.27 |

# 5. Results

# 5.1 Multipliers results

Production and value added multipliers calculated from the SAM of Alagoas are displayed in Table 9. The highest production multiplier is observed in the Clothing sector (2.18). An increase of R$1,000,000.00 in final demand in this economic activity will raise the total production of R$ 2,180,000.00, in 2004 prices. The Accommodation sector is the typical activity of tourism which has the highest production multiplier (1.72). Regarding the value added multiplier, the activity of Real Estate and Rental has the highest multiplier (1.34). The Accommodation sector is the tourism activity which has the largest value added multiplier (1.24).

**Table 9: SAM production and value added multipliers for the economy of Alagoas**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Economic activity** | **Multiplier** | | | |
| **Production** | **Ranking** | **Value added** | **Ranking** |
| Agriculture, Forestry, Fishing and Hunting | 1,64 | 19 | 1,08 | 10 |
| Petroleum Products Manufacturing | 1,79 | 13 | 0,80 | 21 |
| Foods and bevarages | 2,05 | 3 | 0,97 | 14 |
| Textiles | 1,84 | 9 | 1,05 | 11 |
| Clothing | 2,18 | 1 | 1,15 | 7 |
| Wood Products | 1,53 | 23 | 0,75 | 22 |
| Paper Manufacturing | 1,84 | 10 | 0,99 | 13 |
| Chemical Manufacturing | 1,62 | 22 | 0,66 | 23 |
| Nonmetallic Mineral Products | 1,88 | 8 | 0,93 | 15 |
| Metal and Machinery | 1,70 | 16 | 0,81 | 20 |
| Other industries | 1,88 | 7 | 0,83 | 19 |
| Utilities | 1,76 | 14 | 1,22 | 6 |
| Construction | 1,64 | 20 | 0,91 | 16 |
| Commerce | 1,79 | 12 | 1,25 | 3 |
| Transportation and Warehousing | 1,79 | 11 | 0,84 | 18 |
| Passagers transports | 1,69 | 17 | 0,88 | 17 |
| Postal Services and informations | 1,91 | 5 | 1,13 | 9 |
| Finance and Insurance | 2,06 | 2 | 1,23 | 5 |
| Real Estate and Rental | 1,62 | 21 | 1,34 | 1 |
| Accommodation | 1,72 | 15 | 1,23 | 4 |
| Food services | 1,69 | 18 | 1,01 | 12 |
| Public Aministration | 1,96 | 4 | 1,28 | 2 |
| Other Services | 1,90 | 6 | 1,14 | 8 |

Table 10 presents the sectorial employment multipliers in Alagoas. The Agricultural sector has the highest potential to generate direct jobs in Alagoas. Each increase of R$1,000,000.00 in the production, at 2004 prices, generates 353 jobs in the State. However, the Agricultural sector is not among the activities with the greatest potential to generate indirect jobs (multiplier equal to 42). The indirect and induced employment multiplier for the Foods and beverages sector is equal to 125. Because of this result, this activity has the largest potential to generate indirect jobs in the state.

**Table 10: SAM Employment multipliers**

|  |  |  |  |
| --- | --- | --- | --- |
| **Activities** | **Direct** | **Indirect +induced** | **Total** |
| Agriculture, Forestry, Fishing and Hunting | 312 | 42 | 353 |
| Petroleum Products Manufacturing | 6 | 36 | 42 |
| Foods and beverages | 2 | 125 | 127 |
| Textiles | 17 | 42 | 60 |
| Clothing | 145 | 53 | 198 |
| Wood Products | 20 | 28 | 48 |
| Paper Manufacturing | 20 | 44 | 63 |
| Chemical Manufacturing | 1 | 45 | 46 |
| Nonmetallic Mineral Products | 23 | 39 | 63 |
| Metal and Machinery | 12 | 32 | 44 |
| Other industries | 18 | 61 | 79 |
| Utilities | 2 | 37 | 40 |
| Construction | 47 | 34 | 81 |
| Commerce | 85 | 44 | 129 |
| Transportation and Warehousing | 20 | 41 | 62 |
| Passagers transports | 29 | 37 | 66 |
| Postal Services and informations | 2 | 44 | 45 |
| Finance and Insurance | 9 | 49 | 58 |
| Real Estate and Rental | 3 | 35 | 39 |
| Accommodation | 22 | 43 | 64 |
| Food services | 50 | 43 | 93 |
| Public Aministration | 38 | 51 | 89 |
| Other Services | 104 | 48 | 152 |

The effects of a unitary increase in final demand on household income are presented in Table 11. The multiplier of the Agricultural sector for the group of households with the lowest income (HH1) is equal to 0.2. This value means that an increase of R$ 1,000,000.00 in the Agricultural sector final demand will raise total income of this household category by R$ 200,000.00. The richest household group (HH8) has the largest multipliers in all sectors, mainly due to the high level of total income of this group of households.

**Table 11: Household income multipliers by activities**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sectors** | **Household groups** | | | | | | | |
| **HH1** | **HH2** | **HH3** | **HH4** | **HH5** | **HH6** | **HH7** | **HH8** |
| Agriculture, Forestry, Fishing and Hunting | 0,200 | 0,146 | 0,151 | 0,027 | 0,058 | 0,021 | 0,052 | 0,250 |
| Petroleum Products Manufacturing | 0,080 | 0,071 | 0,082 | 0,027 | 0,051 | 0,021 | 0,050 | 0,255 |
| Foods and bevarages | 0,151 | 0,117 | 0,125 | 0,028 | 0,057 | 0,022 | 0,052 | 0,252 |
| Textiles | 0,148 | 0,117 | 0,128 | 0,032 | 0,064 | 0,025 | 0,060 | 0,303 |
| Clothing | 0,163 | 0,134 | 0,144 | 0,036 | 0,072 | 0,029 | 0,066 | 0,318 |
| Wood Products | 0,115 | 0,086 | 0,092 | 0,020 | 0,041 | 0,015 | 0,039 | 0,201 |
| Paper Manufacturing | 0,090 | 0,096 | 0,111 | 0,039 | 0,075 | 0,035 | 0,069 | 0,319 |
| Chemical Manufacturing | 0,079 | 0,064 | 0,072 | 0,020 | 0,039 | 0,015 | 0,038 | 0,196 |
| Nonmetallic Mineral Products | 0,107 | 0,089 | 0,100 | 0,029 | 0,056 | 0,022 | 0,055 | 0,284 |
| Metal and Machinery | 0,119 | 0,094 | 0,101 | 0,024 | 0,048 | 0,019 | 0,044 | 0,218 |
| Other industries | 0,090 | 0,083 | 0,094 | 0,029 | 0,057 | 0,024 | 0,053 | 0,257 |
| Utilities | 0,112 | 0,090 | 0,109 | 0,038 | 0,068 | 0,024 | 0,072 | 0,405 |
| Construction | 0,107 | 0,084 | 0,095 | 0,027 | 0,051 | 0,019 | 0,051 | 0,275 |
| Commerce | 0,162 | 0,140 | 0,153 | 0,042 | 0,083 | 0,035 | 0,076 | 0,357 |
| Transportation and Warehousing | 0,100 | 0,085 | 0,095 | 0,028 | 0,053 | 0,022 | 0,051 | 0,252 |
| Passagers transports | 0,121 | 0,105 | 0,114 | 0,030 | 0,060 | 0,026 | 0,054 | 0,249 |
| Postal Services and informations | 0,099 | 0,091 | 0,109 | 0,039 | 0,072 | 0,029 | 0,072 | 0,376 |
| Finance and Insurance | 0,098 | 0,104 | 0,124 | 0,047 | 0,088 | 0,039 | 0,084 | 0,413 |
| Real Estate and Rental | 0,104 | 0,083 | 0,105 | 0,041 | 0,072 | 0,024 | 0,079 | 0,466 |
| Accommodation | 0,148 | 0,158 | 0,172 | 0,052 | 0,106 | 0,052 | 0,090 | 0,365 |
| Food services | 0,124 | 0,111 | 0,123 | 0,036 | 0,070 | 0,031 | 0,065 | 0,305 |
| Public Aministration | 0,134 | 0,150 | 0,167 | 0,054 | 0,108 | 0,054 | 0,093 | 0,385 |
| Other Services | 0,156 | 0,139 | 0,150 | 0,039 | 0,080 | 0,036 | 0,070 | 0,312 |

Based on the pattern of tourists spending, it was possible to determine in which sectors an expansion of R$ 1,000,000.00 in tourist expenditure will impact. This information enables to know the production and value added multipliers of tourism. According to the results displayed in Figure 5, this increase in tourists spending will raise production of the economy by R$ 1,740,000.00 and the value added by R$ 1,090,000.00.

**Figure 5: Tourism production and value added multipliers**

In Figure 6 are reported the employment multipliers of tourism. The results show that for each increment of R$ 1,000,000.00 over visitors’ expenditures, 87 new jobs are created. From this total, 44 are direct jobs and 43 jobs are the result of the indirect plus induced effects.

**Figure 6: Tourism employment multipliers**

The impact of tourism on households’ income can be calculated through the multipliers presented in Figure 7 below. According to the results, an increase of R$ 1,000,000.00 in tourists expenditures will raise the total income of the poorest households by R$140,000.00. In the group of higher income households, the increase in total income is R$310,000.00. From this interpretation, it is clear that groups of households who benefit the most from the expansion of the tourist spending are lower income (HH1, HH2 and HH3) and the higher income household group.

**Figure 7: Tourism household earnings multipliers**

# 3.2 Analysis of the PROCONFIS

In this section it will be presented only the Multipliers results for the scenario where the ICMS collection growths by 1% after 2015. The obtained results from the second scenario are presented in the Appendix (Tables A2 to A5). The results cover the period of 2013 to 2019, when the deviation from the tax collection baseline is different from zero. It is important to point out that in this study, it is adopted the hypothesis that the multipliers are constant over time. Therefore, it is assumed that the technical relationships between inputs and outputs and the distribution of income among families and factors remain unchanged throughout the simulation period. A final observation concerns the base year matrix. Because the base year of the MCS is 2004, the monetary values are deflated to 2004 prices to calculate the effects on employment, because these effects are calculated from a coefficient that measures the amount of labor by R$ in 2004 prices.

Table 12 displays the impacts of the scenarios of possible uses for tax collection on total production and value added. According to this multiplier approach, when the State Government uses the extra tax collection to fund a rise infrastructure investments the total production increase by R$1,018.0 million and value added by R$565.4 million in 2019. These benefits are considerably larger than the obtained ones if the Government had used these resources to implement targeted direct transfers to poor households.

**Table 12: Impacts of the Proconfis project on Production and Value added**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | **Infrastructure** | | **Transfers to poor households** | |
| Production  (R$ million) | Value Added  (R$ million) | Production  (R$ million) | Value Added  (R$ million) |
| 2013 | 132.3 | 73.5 | 49.2 | 31.3 |
| 2014 | 293.2 | 162.8 | 109.0 | 69.4 |
| 2015 | 487.4 | 270.7 | 181.2 | 115.4 |
| 2016 | 593.7 | 329.8 | 220.7 | 140.6 |
| 2017 | 716.2 | 397.7 | 266.2 | 169.6 |
| 2018 | 856.8 | 475.8 | 318.5 | 202.9 |
| 2019 | 1018.0 | 565.4 | 378.5 | 241.1 |

As can be seen in Table 13, in 2019 14,077 new jobs are directly created as consequence of the infrastructure investments. Including the induced plus indirect effects, under this scenery 24,476 new jobs would be required in 2019. The disoccupation rate in the State of Alagoas (9.29% of the economic active population[[5]](#footnote-5) in 2011) would decrease 1.88 percentages points if this change had happened. Table 12 also shows that using the resources to alleviate poverty has smaller impacts on employment when compared to the infrastructure investments potential impacts.

**Table 13: Impacts of the Proconfis project on employment**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Infrastructure** | | | **Transfers to poor households** | | |
| **Direct** | **Induced**  **+**  **indirect** | **Total** | **Direct** | **Induced + indirect** | **Total** |
| 2013 | 2,382 | 1,759 | 4,141 | 1,997 | 1,628 | 3,624 |
| 2014 | 5,052 | 3,732 | 8,784 | 4,235 | 3,452 | 7,688 |
| 2015 | 8,038 | 5,938 | 13,975 | 6,739 | 5,493 | 12,232 |
| 2016 | 9,369 | 6,921 | 16,291 | 7,855 | 6,403 | 14,258 |
| 2017 | 10,814 | 7,989 | 18,803 | 9,066 | 7,390 | 16,457 |
| 2018 | 12,381 | 9,146 | 21,527 | 10,379 | 8,461 | 18,840 |
| 2019 | 14,077 | 10,399 | 24,476 | 11,802 | 9,620 | 21,422 |

The effects of these two shocks on household income in 2019 are presented in Table 14. As expected, between the scenarios, the increase of infrastructure investments had the largest impact on household income, excepting for the poorest household. An increase of R$620.3 million on the production of the construction sector would raise the income of the poorest households by R$66.23 million and the richest households by R$171.04 million. The targeted transfers to poor households have the largest direct effect on the income of the lowest income household, but the indirect effects are the smallest among the three scenarios.

**Table 14: Impacts of the Proconfis project on Household income**

|  |  |  |
| --- | --- | --- |
| **Household**  **types** | **Infrastructure** | **Transfers to poor households** |
| HH1 | 66.23 | 649.73 |
| HH2 | 52.30 | 24.21 |
| HH3 | 59.17 | 26.97 |
| HH4 | 16.86 | 7.51 |
| HH5 | 32.02 | 14.57 |
| HH6 | 11.74 | 5.73 |
| HH7 | 31.88 | 13.96 |
| HH8 | 171.04 | 71.13 |

The impacts of the considered scenarios on household income can be better understood analysing them with respect the original income level of each household type (see table 15). The findings show that the infrastructure investments raise total income of the poorest group by 3.73% and the richest by 4.15%. These results, indicates that this scenario may contribute to increase income inequality in the state of Alagoas. Differently, the transfers to poor households reduce inequality due to the direct impact on household HH1.

**Table 15: Impacts of the Proconfis project on Household income (%)**

|  |  |  |
| --- | --- | --- |
| **Household**  **types** | **Infrastructure** | **Transfers to poor households** |
| HH1 | 3.73 | 73.18 |
| HH2 | 3.01 | 2.79 |
| HH3 | 3.23 | 2.95 |
| HH4 | 3.25 | 2.90 |
| HH5 | 3.32 | 3.02 |
| HH6 | 2.48 | 2.42 |
| HH7 | 3.56 | 3.12 |
| HH8 | 4.15 | 3.45 |

The impacts of the changes on tourism variables are presented in table 16. The growth of 100,000 in the number of visitors will raise production and value added by R$ 122.91 million and R$ 76.7 million. If the duration of stay is 4 days (after the increase of 0.3 day) then the overall production and value added would increase by R$ 42.5 million and R$ 26.53 million. Considering that the daily per capita tourist expenditures are 10% higher, production and value added would growth by R$ 52.41 million and by R$ 32.72 million. Under the fourth scenario, the raise of production and value added are R$245.32 million and R$ 153.13 million, an amount equivalent to 1.31% of the Alagoas Value Added in 2004.

**Table 16: Impacts of the simulated scenarios for Tourism variables on Production and Value Added of the State of Alagoas**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | First scenario | Second  scenario | Third Scenario | Fourth Scenario |
| Production (R$ million) | 122.91 | 42.50 | 52.41 | 245.32 |
| Value Added (R$ million) | 76.72 | 26.53 | 32.72 | 153.13 |

As expected, the first scenario has larger impacts on employment than the second and the third ones. According to the results, the increase on the visitors’ inflow can, potentially, demand 6,083 new jobs in the economy of Alagoas. From this total, 3,071 are direct jobs in the activities which sell products and services to visitors. The indirect plus the induced effects are responsible by the remaining of the impacts on employment (3,012). The fourth scenario has expressive impacts on employment. If this change occurs, the unemployment rate on the State of Alagoas would decrease from 9.29% to 8.27%, considering the disoccupation rate of 2011in Alagoas.

**Table 17: Impacts of the simulated scenarios for Tourism variables on employment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **First scenario** | **Second**  **Scenario** | **Third Scenario** | **Fourth Scenario** |
| Direct | 3,071 | 1,062 | 1,309 | 6,129 |
| Induced + indirect | 3,012 | 1,041 | 1,284 | 6,012 |
| Total | 6,083 | 2,103 | 2,594 | 12,141 |

Tables 18 and 19 present the impacts of the simulations on household income. In Table 17 the findings are expressed in absolute terms. Under the first scenario, for example, the income of the poorest households would increase by R$9.63 million and the richest by R$21.9 million. When these values are expressed in relative terms (see Table 18), the impact on the lower income household is higher than the effects on the income of the richest group. This result suggests that, given the structural features of the economy of Alagoas, the development of tourism activity can reduce income inequality in the State.

**Table 18: Impacts of the simulated scenarios for Tourism variables Household Income**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Households Types** | **First scenario** | **Second**  **scenario** | **Third Scenario** | **Fourth Scenario** |
| HH1 | 9.63 | 3.33 | 4.11 | 19.23 |
| HH2 | 8.84 | 3.06 | 3.77 | 17.65 |
| HH3 | 9.67 | 3.34 | 4.12 | 19.30 |
| HH4 | 2.72 | 0.94 | 1.16 | 5.43 |
| HH5 | 5.44 | 1.88 | 2.32 | 10.86 |
| HH6 | 2.44 | 0.84 | 1.04 | 4.88 |
| HH7 | 4.85 | 1.68 | 2.07 | 9.67 |
| HH8 | 21.90 | 7.57 | 9.34 | 43.71 |

**Table 19: Impacts of the simulated scenarios for Tourism variables Household Income (%)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Households Types** | **First**  **Scenario** | **Second**  **scenario** | **Third Scenario** | **Fourth Scenario** |
| HH1 | 0.54 | 0.19 | 0.23 | 1.08 |
| HH2 | 0.51 | 0.18 | 0.22 | 1.01 |
| HH3 | 0.53 | 0.18 | 0.22 | 1.05 |
| HH4 | 0.52 | 0.18 | 0.22 | 1.04 |
| HH5 | 0.56 | 0.19 | 0.24 | 1.12 |
| HH6 | 0.51 | 0.18 | 0.22 | 1.03 |
| HH7 | 0.54 | 0.19 | 0.23 | 1.08 |
| HH1 | 0.53 | 0.18 | 0.23 | 1.06 |

# 3.3 CGE analysis

The CGE model used in this study is dynamic and in the first year it reproduces the 2004 SAM for the State of Alagoas. Across the subsequent years, it assumed a real growth rate of 5% per year for the real variables. This is approximately the average real growth rate of the Value Added in the State of Alagoas between 2002 and 2010 according to the System of Regional Accounts of IBGE. This growth rate makes the ICMS collection of the model reach the observed value in 2012. However, all the nominal variables of the model, including the ICMS collection, are expressed in 2004 prices, because the model is homogenous of degree zero in prices. Using the accumulated IGP-M price index between 2004 and 2012, is possible to express the ICMS collection in current prices. Based on this growth rate, a projection for the Alagoas Economy was done from 2004 until 2013, when the Proconfis will be implemented. From 2013 on, it will be implemented the proposed changes on infrastructure and on tourism variables.

It will be considered that the total infrastructure investment will rise by R$100.00 million per year from 2014 until 2017. These new investments will be equally divided between Transports and Sanitation investments. Then, in 2017 it will be invested additional R$200.00 million on each of these areas. The time horizon for these simulations finishes in 2025. In other simulation exercise, the same amount is directly transferred to the poorest household. These amounts will supposedly be funded using the extra tax collection. It will be admitted that fiscal effort will reduce the richest households’ capital income because they own most of the firms’ profits. Then, in the model, the infrastructure investments will be financed by a reduction of the capital income of the richest household group.

For the analysis of the tourism variables changes, the time horizon considered in the model is twelve years, from 2014 to 2025. An economic evaluation will be carried out supposing that, from the invested amount, R$50.00 million are geared towards the strengthening of the tourism activity in the State. This value is considerably higher than the infrastructure costs of the Prodetur-Para and Prodetur-Paraiba projects. The project will be implemented from 2014 to 2017. During this period, the project begins to affect tourism variables from the third year on (or from 2016 on), gradually increasing its effect till 8 years after the end of execution (end of 2025).

The benefits resulting from the changes on tourism variables are the deviations from the GDP baseline. The project costs include the total amount invested and the maintenance costs estimated as 15% of the total investment. Relying on these information, it will be calculated the Net Present Value (NPV) and the Internal Rate of Return (IRR) resulting from these cost-benefit analysis. It also be calculated the minimum effect on tourism variable that make the project economically feasible for this investment.

In Figure 7 it is presented the deviation of Value Added and Production from the baseline after the infrastructure investments, considering that the congestion parameter in the equation 3 **ϕ**is set to one. These results can be understood as the impact of the new investments on both variables. During the initial years, when the new investments occur, the impacts are larger on both variables. Because of the congestion effects, the deviation from the baseline tends to disappear of if no new infrastructure investments are done.

**Figure 7: The impacts of the infrastructure investments on Value Added and Production**

As the multiplier approach has already indicated, the impacts of the infrastructure investments are larger for the richest household group (see Table 19). During the initial years, due to the funding scheme, the income of the richest household group is reduced. In 2014, for example, the income of the richest household is 4.33% lower than the reference value in this year. However, after the fourth year, the income of this household group had the largest increase among all groups.

**Table 19: The impacts of the infrastructure investments on Household income (%)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Households** | ***Years*** | | | | | | | | | | | |
| ***2014*** | ***2015*** | ***2016*** | ***2017*** | ***2018*** | ***2019*** | ***2020*** | ***2021*** | ***2022*** | ***2023*** | ***2024*** | ***2025*** |
| **HH1** | 0.02 | 0.59 | 1.02 | 1.46 | 1.86 | 1.70 | 1.67 | 1.61 | 1.55 | 1.48 | 1.40 | 1.30 |
| **HH2** | -0.01 | 0.48 | 0.85 | 1.22 | 1.62 | 1.48 | 1.45 | 1.40 | 1.34 | 1.27 | 1.19 | 1.10 |
| **HH3** | -0.01 | 0.50 | 0.89 | 1.29 | 1.69 | 1.55 | 1.52 | 1.48 | 1.42 | 1.36 | 1.28 | 1.19 |
| **HH4** | -0.01 | 0.48 | 0.86 | 1.25 | 1.65 | 1.53 | 1.52 | 1.48 | 1.44 | 1.38 | 1.32 | 1.23 |
| **HH5** | -0.03 | 0.49 | 0.89 | 1.30 | 1.75 | 1.62 | 1.60 | 1.57 | 1.53 | 1.47 | 1.40 | 1.32 |
| **HH6** | -0.08 | 0.35 | 0.68 | 1.03 | 1.47 | 1.36 | 1.34 | 1.31 | 1.26 | 1.20 | 1.14 | 1.05 |
| **HH7** | -0.01 | 0.52 | 0.92 | 1.33 | 1.76 | 1.63 | 1.61 | 1.58 | 1.54 | 1.48 | 1.42 | 1.33 |
| **HH8** | -4.33 | -3.98 | -3.78 | -3.58 | 1.87 | 1.73 | 1.72 | 1.68 | 1.64 | 1.59 | 1.52 | 1.43 |

The impact of the targeted transfers to the poorest households has limited impacts on production and value added (see Figure 8). This occurs mainly due to the initial reduction on the richest households’ income which reduces the value added and production. The ending of the funding scheme in 2018 positively impacts production and value added, and from 2019 on both variables present positive deviations from its baseline. Based on these findings, one can conclude the negative impact of the funding scheme overcomes the positive impact of the targeted transfers to poor households.

**Figure 8: The impacts of the targeted transfers on Value Added and Production**

Table 20 presents the impacts of the targeted transfers on household income. In spite of the large impact on the poorest household income (8.81% higher than the reference value), as a result of the negative effects of the reduction of the richest household income, during the initial years, the total income of the other groups decreased. Then, this policy may reduce poverty, but it may also reduce the welfare of the other household groups, if it is financed like in this simulation.

**Table 20: The impacts of the targeted transfer on Household income (%)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Households** | ***Years*** | | | | | | | | | | | |
| ***2014*** | ***2015*** | ***2016*** | ***2017*** | ***2018*** | ***2019*** | ***2020*** | ***2021*** | ***2022*** | ***2023*** | ***2024*** | ***2025*** |
| **HH1** | 8.81 | 9.23 | 9.67 | 10.14 | -0.08 | -0.06 | -0.05 | -0.04 | -0.03 | -0.03 | -0.02 | -0.02 |
| **HH2** | -0.11 | -0.13 | -0.16 | -0.18 | -0.06 | -0.05 | -0.04 | -0.03 | -0.02 | -0.01 | -0.01 | 0.00 |
| **HH3** | -0.11 | -0.13 | -0.15 | -0.17 | -0.06 | -0.05 | -0.04 | -0.03 | -0.02 | -0.01 | -0.01 | 0.00 |
| **HH4** | -0.11 | -0.14 | -0.15 | -0.17 | -0.05 | -0.03 | -0.02 | -0.02 | -0.01 | 0.00 | 0.00 | 0.01 |
| **HH5** | -0.12 | -0.14 | -0.16 | -0.18 | -0.05 | -0.04 | -0.03 | -0.02 | -0.01 | -0.01 | 0.00 | 0.00 |
| **HH6** | -0.14 | -0.16 | -0.18 | -0.20 | -0.04 | -0.03 | -0.02 | -0.01 | 0.00 | 0.00 | 0.01 | 0.02 |
| **HH7** | -0.11 | -0.13 | -0.15 | -0.17 | -0.05 | -0.04 | -0.03 | -0.02 | -0.01 | -0.01 | 0.00 | 0.00 |
| **HH8** | -4.47 | -4.71 | -4.96 | -5.22 | -0.05 | -0.04 | -0.03 | -0.02 | -0.02 | -0.01 | -0.01 | -0.01 |

The results presented in Table 21 stand for the impacts of the two simulated scenarios on employment in the State of Alagoas. These results are the deviation from the baseline for total employment in the model. As can be noted, the value of the congestion parameter plays an important role in the determination of the impacts of the investments on employment. Supposing that the congestion effect is small (**ϕ** = 0.1), in 2025 19,168 new jobs would be created due to the investments done between 2014 and 2017. If the congestion effect is high (**ϕ** = 1), the investments done in the first four years no longer induce positive impacts on employment in 2025. The column **Average** indicates the average of the obtained impacts on employment considering the three values (1.0, 0.5 and 0.1) for the congestion parameter. The last column shows the effects of the targeted transfers on employment.

**Table 21: The impacts of the infrastructure investments and targeted transfers on employment**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Years** | **Infrastructure investment according to congestion parameter** | | | | **Targeted transfers** |
| **ϕ** = 1 | **ϕ** = 0.5 | **ϕ** = 0.1 | **Average** |
| 2014 | 532 | 532 | 532 | 532 | 356 |
| 2015 | 1724 | 2225 | 2624 | 2191 | 255 |
| 2016 | 2316 | 3755 | 5125 | 3732 | 179 |
| 2017 | 2793 | 5171 | 7867 | 5277 | 118 |
| 2018 | 2622 | 5978 | 10323 | 6308 | -288 |
| 2019 | 1861 | 5743 | 11712 | 6439 | -227 |
| 2020 | 1476 | 5521 | 12946 | 6648 | -184 |
| 2021 | 1086 | 5283 | 14160 | 6843 | -150 |
| 2022 | 718 | 5028 | 15383 | 7043 | -123 |
| 2023 | 366 | 4756 | 16623 | 7248 | -101 |
| 2024 | 26 | 4469 | 17883 | 7459 | -85 |
| 2025 | -305 | 4167 | 19168 | 7676 | -73 |

The changes on tourism variables have the impacts on GDP and Production presented in Table 22. As expected, the larger is the impact on visitors’ expenditure under the proposed scenarios the larger are the effects on the local economy.

**Table 22: The impacts of the Tourism scenarios on Value Added and Production (R$ million)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Years | Scenario 1 | | Scenario 2 | | Scenario 3 | | Scenario 4 | |
| GDP | Production | GDP | Production | GDP | Production | GDP | Production |
| 2014 | - | - | - | - | - | - | - | - |
| 2015 | - | - | - | - | - | - | - | - |
| 2016 | 3.06 | 4.65 | 2.95 | 4.48 | 3.61 | 5.48 | 9.71 | 14.73 |
| 2017 | 6.07 | 9.25 | 5.85 | 8.92 | 7.17 | 10.93 | 19.41 | 29.58 |
| 2018 | 9.54 | 14.57 | 9.20 | 14.05 | 11.28 | 17.22 | 30.78 | 46.97 |
| 2019 | 13.44 | 20.54 | 12.96 | 19.80 | 15.90 | 24.29 | 43.71 | 66.76 |
| 2020 | 17.78 | 27.19 | 17.14 | 26.21 | 21.04 | 32.17 | 58.30 | 89.06 |
| 2021 | 22.57 | 34.52 | 21.75 | 33.27 | 26.72 | 40.88 | 74.62 | 114.01 |
| 2022 | 27.83 | 42.58 | 26.82 | 41.04 | 32.98 | 50.46 | 92.80 | 141.76 |
| 2023 | 33.58 | 51.40 | 32.36 | 49.53 | 39.82 | 60.94 | 112.93 | 172.50 |
| 2024 | 39.85 | 61.00 | 38.39 | 58.77 | 47.29 | 72.38 | 135.17 | 206.40 |
| 2025 | 46.67 | 71.44 | 44.95 | 68.82 | 55.42 | 84.82 | 159.65 | 243.68 |

The NPV and IRR of each scenario are shown in Table 23. According to the results, all the scenarios make the project feasible at 12 % IRR, considering the investment of R$50.00 million. The minimal changes on tourism variables that make the project feasible are displayed in Table 24. If in 2025 the number of visitors raise by 80.000 or if the during of stay increase by 0.24 day or if the per capita expenditure raise 7.0%, a tourism project in Alagoas with this amount would be feasible considering a 12% IRR.

**Table 23: NPV and IRR resulting from the scenarios**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | Costs  (R$ million) | Benefits (R$ million) | | | |
| Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
| 2014 | 12.5 | - | - | - | - |
| 2015 | 12.5 | - | - | - | - |
| 2016 | 12.5 | 3.06 | 2.95 | 3.61 | 14.73 |
| 2017 | 12.5 | 6.07 | 5.85 | 7.17 | 29.58 |
| 2018 | 7.5 | 9.54 | 9.20 | 11.28 | 46.97 |
| 2019 | 7.5 | 13.44 | 12.96 | 15.90 | 66.76 |
| 2020 | 7.5 | 17.78 | 17.14 | 21.04 | 89.06 |
| 2021 | 7.5 | 22.57 | 21.75 | 26.72 | 114.01 |
| 2022 | 7.5 | 27.83 | 26.82 | 32.98 | 141.76 |
| 2023 | 7.5 | 33.58 | 32.36 | 39.82 | 172.50 |
| 2024 | 7.5 | 39.85 | 38.39 | 47.29 | 206.40 |
| 2025 | 7.5 | 46.67 | 44.95 | 55.42 | 243.68 |
|  | | | | | |
| NPV (Million R$) | | 20.2 | 17.0 | 36.7 | 227.8 |
| IRR (%) | | 19.0 | 18.0 | 23.8 | 57.8 |

**Table 23: Minimal impact on tourism variables**

|  |  |  |
| --- | --- | --- |
| Number  of visitors | During  of stay | Per capita  expenditure growth |
| 80,000 | 0.24 day | 7.0% |

Based on the results of Table 24, it is possible to conclude that increase of per capita expenditure have the highest impact on employment (2,465 new jobs in 2025) among the three first scenarios. The fourth scenario, evidently, has the highest impact on employment. It’s worth noting that the results of the first scenario differ from the results of Table 17 due to the adopted static SAM multipliers analysis. In the CGE approach, it is evaluated the increase of the number of visitors in 2025 considering that the number of visitors growths at an annual rate of 5%.

**Table 24: The impacts of the tourism scenarios on employment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
| 2014 | - | - | - | - |
| 2015 | - | - | - | - |
| 2016 | 132 | 127 | 156 | 418 |
| 2017 | 265 | 256 | 313 | 845 |
| 2018 | 419 | 404 | 495 | 1344 |
| 2019 | 592 | 571 | 700 | 1912 |
| 2020 | 785 | 757 | 928 | 2552 |
| 2021 | 998 | 962 | 1181 | 3267 |
| 2022 | 1233 | 1189 | 1460 | 4063 |
| 2023 | 1491 | 1437 | 1766 | 4942 |
| 2024 | 1772 | 1708 | 2100 | 5913 |
| 2025 | 2079 | 2003 | 2465 | 6979 |

Table 25 show the average impact of the scenarios on household income during the last three years of this analysis (2023, 2024 and 2025). The consequent impacts on poverty of these incomes changes are presented in Table 25. The reference value for poverty incidence Alagoas is 63.743%, for a poverty line of R$155.00 in 2004. The fourth scenario can reduce poverty incidence by 1.7449 percentage points. The Gini coefficient remains practically unchanged after the scenarios, suggesting that the development of the tourism activity may have low redistributive effects in the State of Alagoas.

**Table 25: The impacts of the Tourism scenarios on Household income (%)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Scenarios | Households | | | | | | | |
| HH1 | HH2 | HH3 | HH4 | HH5 | HH6 | HH7 | HH8 |
| Scenario 1 | 1.10 | 1.15 | 1.12 | 1.06 | 1.12 | 1.23 | 1.05 | 0.85 |
| Scenario 2 | 1.06 | 1.10 | 1.08 | 1.02 | 1.08 | 1.18 | 1.01 | 0.82 |
| Scenario 3 | 1.30 | 1.36 | 1.33 | 1.25 | 1.33 | 1.46 | 1.24 | 1.01 |
| Scenario 4 | 3.72 | 3.89 | 3.81 | 3.59 | 3.81 | 4.18 | 3.56 | 2.89 |

**Table 25: The impacts of the Tourism scenarios on Household income**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Scenarios | **Poverty incidence**  **Headcount (%)** | **Poverty**  **Reduction (%)** | **Gini** | **Gini**  **reduction** |
| Scenario 1 | 63.033 | -0.7103 | 0.529074 | -0.00026 |
| Scenario 2 | 63.496 | -0.247 | 0.529084 | -0.00025 |
| Scenario 3 | 63.033 | -0.7103 | 0.529027 | -0.00031 |
| Scenario 4 | 61.998 | -1.7449 | 0.528477 | -0.00086 |

# 6. Concluding remarks

On the base of the obtained results, the conclusion of this study is that the use of the additional tax collection to fund infrastructure investments generates considerable benefits, in terms of production, value added, employment and household income. The targeted transfers, as expected, impacted the poorest income and may reduce poverty in the group of households which received the resources. But the social effects of this policy, in terms of value added for example, is lower than the first shock. Due to the chosen funding scheme, this policy can eventually reduce the income of the other groups of households.

Considering that the changes on tourism variables are consequence of a share of the infrastructure investments, the benefits public resources geared towards infrastructure investments are even larger. The obtained results from the changes on tourism variables also indicates that development of the tourism activity in the State of Alagoas can bring considerable benefits in terms of new jobs opportunities and poverty reduction.

# 7 – References

1. BAYOUDH, Mohamed, 2012. *Investissement en infrastructure publique et croissance en tunisie: une analyse en équilibre général calculable*, Thèse présentée à la Faculté des études supérieures et postdoctorales de l’Université Laval, Québec.
2. DWYER, L., FORSYTH, P., and SPURR, R. 2004. *Evaluating tourism's economic effects: new and old approaches*. Tourism Management*, 25*(3):307-317.
3. DUMONT, J.C. and S. MESPLÉ-SOMPS, (2000) *The Impact of public infrastructure on competitiveness and growth: A CGE analysis applied to Senegal*, miméo, CREFA, Université Laval, Québec*.*
4. ESTACHE, A., J-F. Perrault and Savard L. (2007) *Impact of infrastructure spending in Mali: a CGE modeling approach*, *GRÉDI*, W-P 07-24.
5. EASTERLY, W. and REBELO, S. 1993. *Fiscal Policy and Economic Growth*. Journal of Monetary Economics, v. 32, p. 417-458.
6. FERREIRA, Pedro Cavalcanti. *Investimento em infraestrutura no Brasil: fatos estilizados e relações de longo prazo*. Pesquisa e Planejamento Econômico (PPE), Rio de Janeiro, v. 26, n. 2, p. 231-252, 1996.
7. FLORISSI, Stefano. *Infrastructure, Public Capital and Growth in the Brazilian Economy*. Análise Econômica, ano 15, p. 69-80, Março de 1997.
8. FUNDAÇÃO INSTITUTO DE PESQUISAS ECONÔMICAS – FIPE. *Caracterização e dimensionamento do turismo doméstico no Brasil – 2011*, relatório executivo, 2012
9. GUILHOTO, Joaquim José Martins; AZZONI, Carlos Roberto; ICHIHARA, Silvio Massaru; KADOTA, Décio Katsushigue; HADDAD, Eduardo Amaral. *Matriz de Insumo-Produto do Nordeste e Estados: Metodologia e Resultados. Fortaleza*, 2009.
10. Instituto Brasileiro de Geografia e Estatística — IBGE. *Pesquisa nacional por amostra de domicílios 2004: Microdados*. Rio de Janeiro: IBGE, 2005.
11. Instituto Brasileiro de Geografia e Estatística — IBGE. *Contas Regionais do Brasil 2004-2008*. Rio de Janeiro: IBGE 2010.
12. Instituto Brasileiro de Geografia e Estatística — IBGE. *Pesquisa de orçamentos familiares 2008-2009: despesas, rendimentos e condições de vida*. Volume 1. Rio de Janeiro: IBGE, 2010.
13. Instituto Brasileiro de Geografia e Estatística — IBGE. *Sistema de contas nacionais: Brasil 2004-2004*. Rio de Janeiro: IBGE 2010.
14. KAMPS, C. (2004) *The Dynamic Macroeconomic Effects of Public Capital: theory and evidence for OCDE countries*. Springer, 1 ed.
15. PYATT, Graham; ROUND, Jeffery. *Social Accounting Matrices: a base for planning*. The World Bank, 1988.
16. TAYLOR, J. E. 2010. *Technical guidelines for evaluating the impacts of tourism using simulation models*. Technical Notes No. IDB-TN-229.
17. THORBECKE, Erik. *Social Accounting Matrices and Social Accounting analysis*. In ISARD et. Al. Methods of interregional and regional analysis. Ashgate, 1998.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | S1 | S2 | S3 | S4 | S5 | S6  Table A1: SAM multipliers | S7 | S8 | S9 | s10 | s11 | s12 | s13 | s14 | s15 | S16 | S17 | S18 | S19 | S20 | S21 | S21 | S23 |
| S1 | 1,0604 | 0,0215 | 0,3188 | 0,0417 | 0,0377 | 0,0227 | 0,0311 | 0,0835 | 0,0265 | 0,0257 | 0,1058 | 0,0303 | 0,0232 | 0,0358 | 0,0231 | 0,0266 | 0,0270 | 0,0311 | 0,0271 | 0,0397 | 0,0477 | 0,0393 | 0,0379 |
| S2 | 0,0032 | 1,0289 | 0,0016 | 0,0014 | 0,0012 | 0,0011 | 0,0017 | 0,0141 | 0,0229 | 0,0039 | 0,0021 | 0,0142 | 0,0082 | 0,0010 | 0,0007 | 0,0008 | 0,0009 | 0,0010 | 0,0009 | 0,0009 | 0,0009 | 0,0013 | 0,0013 |
| S3 | 0,0482 | 0,0288 | 1,1855 | 0,0403 | 0,0454 | 0,0286 | 0,0378 | 0,0287 | 0,0337 | 0,0315 | 0,0358 | 0,0494 | 0,0314 | 0,0499 | 0,0317 | 0,0370 | 0,0376 | 0,0427 | 0,0378 | 0,0571 | 0,0801 | 0,0555 | 0,0528 |
| S4 | 0,0014 | 0,0013 | 0,0012 | 1,1290 | 0,3755 | 0,0014 | 0,0032 | 0,0009 | 0,0062 | 0,0026 | 0,0160 | 0,0012 | 0,0012 | 0,0017 | 0,0022 | 0,0012 | 0,0014 | 0,0016 | 0,0012 | 0,0015 | 0,0014 | 0,0016 | 0,0035 |
| S5 | 0,0000 | 0,0001 | 0,0000 | 0,0001 | 1,0043 | 0,0000 | 0,0001 | 0,0000 | 0,0000 | 0,0001 | 0,0001 | 0,0000 | 0,0000 | 0,0001 | 0,0001 | 0,0001 | 0,0001 | 0,0001 | 0,0000 | 0,0001 | 0,0001 | 0,0001 | 0,0001 |
| S6 | 0,0074 | 0,0052 | 0,0065 | 0,0070 | 0,0083 | 1,0321 | 0,0077 | 0,0042 | 0,0066 | 0,0070 | 0,0083 | 0,0072 | 0,0064 | 0,0086 | 0,0058 | 0,0062 | 0,0071 | 0,0089 | 0,0075 | 0,0093 | 0,0069 | 0,0095 | 0,0102 |
| S7 | 0,0012 | 0,0015 | 0,0013 | 0,0028 | 0,0135 | 0,0012 | 1,0517 | 0,0013 | 0,0019 | 0,0032 | 0,0063 | 0,0017 | 0,0013 | 0,0021 | 0,0020 | 0,0015 | 0,0032 | 0,0066 | 0,0016 | 0,0016 | 0,0014 | 0,0024 | 0,0080 |
| S8 | 0,0320 | 0,0199 | 0,0155 | 0,0341 | 0,0206 | 0,0235 | 0,0471 | 1,0581 | 0,0397 | 0,0337 | 0,0783 | 0,0106 | 0,0126 | 0,0141 | 0,0071 | 0,0106 | 0,0089 | 0,0097 | 0,0089 | 0,0096 | 0,0081 | 0,0135 | 0,0158 |
| S9 | 0,0008 | 0,0019 | 0,0010 | 0,0007 | 0,0008 | 0,0011 | 0,0012 | 0,0009 | 1,0778 | 0,0026 | 0,0024 | 0,0008 | 0,0470 | 0,0009 | 0,0006 | 0,0006 | 0,0009 | 0,0013 | 0,0018 | 0,0008 | 0,0007 | 0,0018 | 0,0018 |
| s10 | 0,0003 | 0,0059 | 0,0005 | 0,0006 | 0,0022 | 0,0011 | 0,0054 | 0,0005 | 0,0015 | 1,0674 | 0,0144 | 0,0003 | 0,0009 | 0,0003 | 0,0003 | 0,0003 | 0,0004 | 0,0004 | 0,0003 | 0,0003 | 0,0002 | 0,0004 | 0,0005 |
| s11 | 0,0035 | 0,0039 | 0,0035 | 0,0038 | 0,0096 | 0,0038 | 0,0087 | 0,0026 | 0,0042 | 0,0150 | 1,0715 | 0,0040 | 0,0040 | 0,0048 | 0,0081 | 0,0046 | 0,0044 | 0,0125 | 0,0042 | 0,0044 | 0,0035 | 0,0054 | 0,0052 |
| s12 | 0,0296 | 0,0762 | 0,0359 | 0,0560 | 0,0479 | 0,0318 | 0,0446 | 0,0501 | 0,0942 | 0,0492 | 0,0424 | 1,1187 | 0,0258 | 0,0444 | 0,0334 | 0,0309 | 0,0377 | 0,0392 | 0,0247 | 0,0351 | 0,0328 | 0,0475 | 0,0550 |
| s13 | 0,0036 | 0,0117 | 0,0037 | 0,0042 | 0,0047 | 0,0033 | 0,0049 | 0,0034 | 0,0066 | 0,0037 | 0,0050 | 0,0043 | 1,0341 | 0,0054 | 0,0044 | 0,0040 | 0,0072 | 0,0153 | 0,0286 | 0,0046 | 0,0038 | 0,0256 | 0,0139 |
| s14 | 0,1120 | 0,1110 | 0,1261 | 0,1391 | 0,1928 | 0,1154 | 0,1361 | 0,0913 | 0,1380 | 0,1101 | 0,1336 | 0,1086 | 0,1282 | 1,1331 | 0,1360 | 0,1447 | 0,1211 | 0,1319 | 0,1067 | 0,1443 | 0,1514 | 0,1410 | 0,1433 |
| s15 | 0,0272 | 0,1110 | 0,0420 | 0,0325 | 0,0375 | 0,0275 | 0,0410 | 0,0330 | 0,0698 | 0,0455 | 0,0441 | 0,0279 | 0,0253 | 0,0472 | 1,1524 | 0,0628 | 0,0244 | 0,0185 | 0,0145 | 0,0198 | 0,0208 | 0,0207 | 0,0216 |
| S16 | 0,0372 | 0,0324 | 0,0350 | 0,0374 | 0,0427 | 0,0269 | 0,0385 | 0,0244 | 0,0343 | 0,0306 | 0,0322 | 0,0391 | 0,0318 | 0,0483 | 0,0368 | 1,0462 | 0,0466 | 0,0518 | 0,0398 | 0,0485 | 0,0373 | 0,0537 | 0,0572 |
| S17 | 0,0354 | 0,0588 | 0,0368 | 0,0376 | 0,0410 | 0,0268 | 0,0572 | 0,0313 | 0,0474 | 0,0442 | 0,0403 | 0,0517 | 0,0346 | 0,0526 | 0,0508 | 0,0445 | 1,2102 | 0,1300 | 0,0442 | 0,0475 | 0,0408 | 0,0933 | 0,1188 |
| S18 | 0,0558 | 0,0511 | 0,0510 | 0,0555 | 0,0598 | 0,0386 | 0,0613 | 0,0595 | 0,0594 | 0,0585 | 0,0571 | 0,0594 | 0,0430 | 0,0582 | 0,0489 | 0,0571 | 0,0625 | 1,2343 | 0,0520 | 0,0529 | 0,0443 | 0,1180 | 0,0527 |
| S19 | 0,0749 | 0,0707 | 0,0692 | 0,0739 | 0,0842 | 0,0523 | 0,0759 | 0,0452 | 0,0658 | 0,0590 | 0,0611 | 0,0773 | 0,0627 | 0,0979 | 0,0713 | 0,0740 | 0,0948 | 0,0919 | 1,0800 | 0,0991 | 0,0766 | 0,1081 | 0,0941 |
| S20 | 0,0010 | 0,0012 | 0,0010 | 0,0011 | 0,0012 | 0,0008 | 0,0013 | 0,0007 | 0,0014 | 0,0009 | 0,0010 | 0,0013 | 0,0011 | 0,0014 | 0,0016 | 0,0021 | 0,0015 | 0,0020 | 0,0013 | 1,0015 | 0,0014 | 0,0025 | 0,0024 |
| S21 | 0,0142 | 0,0140 | 0,0132 | 0,0141 | 0,0158 | 0,0108 | 0,0157 | 0,0089 | 0,0161 | 0,0113 | 0,0127 | 0,0147 | 0,0130 | 0,0186 | 0,0176 | 0,0218 | 0,0166 | 0,0217 | 0,0149 | 0,0194 | 1,0151 | 0,0271 | 0,0268 |
| S21 | 0,0040 | 0,0072 | 0,0045 | 0,0048 | 0,0053 | 0,0036 | 0,0069 | 0,0035 | 0,0058 | 0,0049 | 0,0050 | 0,0050 | 0,0040 | 0,0068 | 0,0081 | 0,0049 | 0,0070 | 0,0072 | 0,0042 | 0,0049 | 0,0042 | 1,0074 | 0,0076 |
| S23 | 0,0922 | 0,1296 | 0,1032 | 0,1107 | 0,1246 | 0,0761 | 0,1613 | 0,0783 | 0,1197 | 0,0907 | 0,1078 | 0,1403 | 0,1015 | 0,1632 | 0,1538 | 0,1095 | 0,1934 | 0,2067 | 0,1270 | 0,1330 | 0,1101 | 0,1912 | 1,1742 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | s10 | s11 | s12 | s13 | s14 | s15 | S16 | S17 | S18 | S19 | S20 | S21 | S21 | S23 |
| K | 0,5725 | 0,5268 | 0,5352 | 0,6576 | 0,6335 | 0,4668 | 0,5089 | 0,4312 | 0,6188 | 0,4636 | 0,4797 | 0,9747 | 0,6377 | 0,6637 | 0,5100 | 0,4409 | 0,7896 | 0,7455 | 1,1687 | 0,4018 | 0,5521 | 0,4322 | 0,5084 |
| LUSK | 0,4340 | 0,1154 | 0,3040 | 0,2771 | 0,3138 | 0,2267 | 0,1229 | 0,1343 | 0,1763 | 0,2340 | 0,1438 | 0,1388 | 0,1761 | 0,2977 | 0,1707 | 0,2290 | 0,1209 | 0,1089 | 0,0913 | 0,2694 | 0,2162 | 0,2245 | 0,3014 |
| LSK | 0,0809 | 0,1620 | 0,1342 | 0,1509 | 0,2167 | 0,0639 | 0,3628 | 0,0927 | 0,1432 | 0,1164 | 0,2152 | 0,1130 | 0,0976 | 0,2972 | 0,1671 | 0,2298 | 0,2274 | 0,3804 | 0,0830 | 0,6013 | 0,2720 | 0,6264 | 0,3342 |
| EMP | 0,4699 | 0,4324 | 0,4393 | 0,5397 | 0,5199 | 0,3831 | 0,4177 | 0,3539 | 0,5079 | 0,3805 | 0,3937 | 0,8000 | 0,5234 | 0,5447 | 0,4186 | 0,3619 | 0,6481 | 0,6119 | 0,9592 | 0,3298 | 0,4532 | 0,3547 | 0,4173 |
| HH1 | 0,1997 | 0,0802 | 0,1507 | 0,1482 | 0,1634 | 0,1147 | 0,0903 | 0,0791 | 0,1077 | 0,1195 | 0,0904 | 0,1125 | 0,1068 | 0,1624 | 0,1003 | 0,1210 | 0,0999 | 0,0992 | 0,1044 | 0,1493 | 0,1242 | 0,1351 | 0,1564 |
| HH2 | 0,1468 | 0,0714 | 0,1176 | 0,1177 | 0,1341 | 0,0863 | 0,0963 | 0,0641 | 0,0889 | 0,0942 | 0,0831 | 0,0906 | 0,0843 | 0,1406 | 0,0857 | 0,1054 | 0,0916 | 0,1047 | 0,0829 | 0,1580 | 0,1117 | 0,1506 | 0,1394 |
| HH3 | 0,1515 | 0,0827 | 0,1250 | 0,1283 | 0,1448 | 0,0925 | 0,1109 | 0,0719 | 0,1005 | 0,1012 | 0,0939 | 0,1093 | 0,0954 | 0,1538 | 0,0957 | 0,1142 | 0,1092 | 0,1245 | 0,1056 | 0,1725 | 0,1237 | 0,1669 | 0,1502 |
| HH4 | 0,0267 | 0,0272 | 0,0276 | 0,0321 | 0,0359 | 0,0204 | 0,0393 | 0,0202 | 0,0295 | 0,0236 | 0,0294 | 0,0380 | 0,0272 | 0,0416 | 0,0276 | 0,0300 | 0,0393 | 0,0475 | 0,0415 | 0,0524 | 0,0359 | 0,0545 | 0,0393 |
| HH5 | 0,0584 | 0,0512 | 0,0570 | 0,0638 | 0,0724 | 0,0414 | 0,0752 | 0,0389 | 0,0563 | 0,0480 | 0,0567 | 0,0684 | 0,0516 | 0,0830 | 0,0536 | 0,0605 | 0,0724 | 0,0884 | 0,0721 | 0,1059 | 0,0706 | 0,1084 | 0,0800 |
| HH6 | 0,0212 | 0,0208 | 0,0222 | 0,0246 | 0,0295 | 0,0150 | 0,0348 | 0,0149 | 0,0219 | 0,0187 | 0,0244 | 0,0242 | 0,0189 | 0,0353 | 0,0219 | 0,0262 | 0,0293 | 0,0391 | 0,0241 | 0,0524 | 0,0306 | 0,0538 | 0,0357 |
| HH7 | 0,0524 | 0,0497 | 0,0522 | 0,0604 | 0,0664 | 0,0393 | 0,0687 | 0,0378 | 0,0548 | 0,0445 | 0,0530 | 0,0717 | 0,0514 | 0,0757 | 0,0507 | 0,0543 | 0,0717 | 0,0839 | 0,0789 | 0,0897 | 0,0646 | 0,0928 | 0,0704 |
| HH8 | 0,2511 | 0,2556 | 0,2531 | 0,3040 | 0,3188 | 0,2013 | 0,3194 | 0,1961 | 0,2846 | 0,2186 | 0,2573 | 0,4060 | 0,2757 | 0,3579 | 0,2523 | 0,2498 | 0,3766 | 0,4135 | 0,4667 | 0,3661 | 0,3057 | 0,3853 | 0,3131 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | K | LUSK | LSK | EMP | HH1 | HH2 | HH3 | HH4 | HH5 | HH6 | HH7 | HH8 |
| S1 | 0,027 | 0,058 | 0,046 | 0,021 | 0,062 | 0,054 | 0,061 | 0,070 | 0,048 | 0,068 | 0,057 | 0,023 |
| S2 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,002 | 0,001 | 0,001 |
| S3 | 0,037 | 0,077 | 0,064 | 0,030 | 0,079 | 0,070 | 0,084 | 0,094 | 0,069 | 0,100 | 0,083 | 0,033 |
| S4 | 0,001 | 0,001 | 0,002 | 0,001 | 0,001 | 0,001 | 0,002 | 0,002 | 0,002 | 0,003 | 0,002 | 0,002 |
| S5 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| S6 | 0,007 | 0,011 | 0,012 | 0,007 | 0,011 | 0,010 | 0,013 | 0,016 | 0,011 | 0,017 | 0,015 | 0,009 |
| S7 | 0,001 | 0,001 | 0,002 | 0,001 | 0,001 | 0,001 | 0,002 | 0,002 | 0,002 | 0,003 | 0,003 | 0,002 |
| S8 | 0,008 | 0,011 | 0,012 | 0,007 | 0,010 | 0,009 | 0,013 | 0,016 | 0,012 | 0,019 | 0,017 | 0,009 |
| S9 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 | 0,002 | 0,002 | 0,001 |
| s10 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| s11 | 0,004 | 0,004 | 0,006 | 0,004 | 0,003 | 0,003 | 0,005 | 0,006 | 0,005 | 0,009 | 0,008 | 0,006 |
| s12 | 0,024 | 0,037 | 0,038 | 0,021 | 0,035 | 0,032 | 0,041 | 0,051 | 0,038 | 0,058 | 0,052 | 0,028 |
| s13 | 0,004 | 0,004 | 0,006 | 0,004 | 0,004 | 0,004 | 0,005 | 0,007 | 0,005 | 0,009 | 0,008 | 0,006 |
| s14 | 0,105 | 0,118 | 0,154 | 0,099 | 0,107 | 0,101 | 0,125 | 0,175 | 0,143 | 0,215 | 0,229 | 0,155 |
| s15 | 0,014 | 0,018 | 0,021 | 0,013 | 0,017 | 0,016 | 0,021 | 0,027 | 0,021 | 0,033 | 0,030 | 0,018 |
| S16 | 0,040 | 0,053 | 0,062 | 0,036 | 0,047 | 0,046 | 0,061 | 0,082 | 0,061 | 0,103 | 0,085 | 0,052 |
| S17 | 0,042 | 0,035 | 0,061 | 0,041 | 0,023 | 0,027 | 0,045 | 0,071 | 0,055 | 0,098 | 0,093 | 0,066 |
| S18 | 0,051 | 0,035 | 0,070 | 0,052 | 0,023 | 0,026 | 0,041 | 0,069 | 0,054 | 0,102 | 0,115 | 0,090 |
| S19 | 0,079 | 0,111 | 0,125 | 0,072 | 0,099 | 0,094 | 0,130 | 0,168 | 0,126 | 0,202 | 0,171 | 0,101 |
| S20 | 0,001 | 0,001 | 0,002 | 0,001 | 0,001 | 0,001 | 0,001 | 0,002 | 0,001 | 0,003 | 0,003 | 0,002 |
| S21 | 0,015 | 0,021 | 0,025 | 0,013 | 0,016 | 0,018 | 0,026 | 0,036 | 0,028 | 0,044 | 0,038 | 0,017 |
| S21 | 0,004 | 0,005 | 0,006 | 0,004 | 0,004 | 0,004 | 0,006 | 0,008 | 0,006 | 0,009 | 0,009 | 0,005 |
| S23 | 0,121 | 0,099 | 0,174 | 0,120 | 0,068 | 0,077 | 0,121 | 0,191 | 0,153 | 0,276 | 0,269 | 0,197 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | K | LUSK | LSK | EMP | HH1 | HH2 | HH3 | HH4 | HH5 | HH6 | HH7 | HH8 |
| K | 1,223 | 0,278 | 0,341 | 0,206 | 0,244 | 0,236 | 0,319 | 0,429 | 0,327 | 0,530 | 0,489 | 0,306 |
| LUSK | 0,073 | 1,092 | 0,111 | 0,067 | 0,082 | 0,079 | 0,102 | 0,138 | 0,106 | 0,170 | 0,160 | 0,100 |
| LSK | 0,078 | 0,078 | 1,114 | 0,075 | 0,062 | 0,064 | 0,089 | 0,131 | 0,104 | 0,175 | 0,173 | 0,120 |
| EMP | 1,004 | 0,229 | 0,280 | 1,169 | 0,201 | 0,194 | 0,262 | 0,352 | 0,269 | 0,435 | 0,401 | 0,251 |
| HH1 | 0,100 | 0,431 | 0,107 | 0,047 | 1,047 | 0,046 | 0,060 | 0,082 | 0,063 | 0,101 | 0,095 | 0,060 |
| HH2 | 0,080 | 0,305 | 0,175 | 0,045 | 0,039 | 1,038 | 0,051 | 0,069 | 0,054 | 0,087 | 0,083 | 0,053 |
| HH3 | 0,104 | 0,292 | 0,201 | 0,076 | 0,043 | 0,042 | 1,057 | 0,078 | 0,060 | 0,098 | 0,093 | 0,060 |
| HH4 | 0,043 | 0,024 | 0,081 | 0,043 | 0,012 | 0,012 | 0,016 | 1,023 | 0,017 | 0,029 | 0,027 | 0,018 |
| HH5 | 0,073 | 0,074 | 0,158 | 0,066 | 0,023 | 0,023 | 0,031 | 0,044 | 1,034 | 0,055 | 0,053 | 0,034 |
| HH6 | 0,024 | 0,028 | 0,085 | 0,024 | 0,009 | 0,009 | 0,013 | 0,018 | 0,014 | 1,023 | 0,022 | 0,014 |
| HH7 | 0,081 | 0,052 | 0,133 | 0,073 | 0,023 | 0,022 | 0,030 | 0,042 | 0,032 | 0,053 | 1,050 | 0,032 |
| HH8 | 0,485 | 0,155 | 0,520 | 0,528 | 0,115 | 0,112 | 0,153 | 0,209 | 0,161 | 0,262 | 0,246 | 1,158 |

**Table A2: Impacts of the Proconfis project on Production and Value added under de second scenario for tax collection after 2015**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | **Infrastructure** | | **Transfers to poor households** | |
| Production  (R$ million) | Value Added  (R$ million) | Production  (R$ million) | Value Added  (R$ million) |
| 2013 | 132.3 | 73.5 | 49.2 | 31.3 |
| 2014 | 293.2 | 162.8 | 109.0 | 69.4 |
| 2015 | 487.4 | 270.7 | 181.2 | 115.4 |
| 2016 | 562.9 | 312.6 | 209.2 | 133.3 |
| 2017 | 648.2 | 360.0 | 241.0 | 153.5 |
| 2018 | 744.6 | 413.6 | 276.8 | 176.3 |
| 2019 | 853.5 | 474.0 | 317.3 | 202.1 |

**Table A3: Impacts of the Proconfis project on employment under de second scenario for tax collection after 2015**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Infrastructure** | | | **Transfers to poor households** | | |
| **Direct** | **Induced**  **+**  **indirect** | **Total** | **Direct** | **Induced + indirect** | **Total** |
| 2013 | 2,382 | 1,759 | 4,141 | 1,997 | 1,628 | 3,624 |
| 2014 | 5,052 | 3,732 | 8,784 | 4,235 | 3,452 | 7,688 |
| 2015 | 8,038 | 5,938 | 13,975 | 6,739 | 5,493 | 12,232 |
| 2016 | 8,882 | 6,561 | 15,443 | 7,446 | 6,070 | 13,516 |
| 2017 | 9,788 | 7,231 | 17,018 | 8,206 | 6,689 | 14,895 |
| 2018 | 10,760 | 7,949 | 18,709 | 9,021 | 7,353 | 16,374 |
| 2019 | 11,803 | 8,719 | 20,521 | 9,895 | 8,066 | 17,961 |

**Table A4: Impacts of the Proconfis project on Household income under de second scenario for tax collection after 2015**

|  |  |  |
| --- | --- | --- |
| **Household**  **types** | **Infrastructure** | **Transfers to poor households** |
| HH1 | 55.53 | 1,089.50 |
| HH2 | 43.85 | 40.59 |
| HH3 | 49.61 | 45.23 |
| HH4 | 14.14 | 12.60 |
| HH5 | 26.85 | 24.44 |
| HH6 | 9.85 | 9.61 |
| HH7 | 26.73 | 23.42 |
| HH8 | 143.41 | 119.28 |

**Table A5: Relative Impacts of the Proconfis project Household income under de second scenario for tax collection after 2015**

|  |  |  |
| --- | --- | --- |
| **Household**  **types** | **Infrastructure** | **Transfers to poor households** |
| HH1 | 3.13 | 61.36 |
| HH2 | 2.53 | 2.34 |
| HH3 | 2.71 | 2.47 |
| HH4 | 2.73 | 2.43 |
| HH5 | 2.78 | 2.53 |
| HH6 | 2.08 | 2.03 |
| HH7 | 2.99 | 2.62 |
| HH8 | 3.48 | 2.89 |

1. Brazilian Household Exempenditure Survey. [↑](#footnote-ref-1)
2. <http://www.abeoc.org.br/2012/01/setur-al-fecha-indicadores-de-desempenho-da-hotelaria-de-maceio/> [↑](#footnote-ref-2)
3. If the SETUR-AL provide the number of visitors by year, it is possible to calculate the real growth rate of the number of visitors in Alagoas. [↑](#footnote-ref-3)
4. This hypothesis relies on the information on sanitation infrastructure gathered in the IBGE statistics of the XX century [↑](#footnote-ref-4)
5. Source: 2011 PNAD microdata. [↑](#footnote-ref-5)