Preparation of Regional Input - Output Table for Fars Province in 2011 (GRIT1Method)

Maryam Akbarzadeh, Firoozeh.Esmaeilzadeh, Alireza.Poostvar, and Mojtaba.Manuchehri

Abstract—Preparation of regional input-output tables requires statistical methods combined with high costs and too much time. Obtained estimates by non-statistical methods have low confidence coefficient. Therefore, integrated methods for this purpose are suggested by recent input – output studies. In this study, first GRIT method is introduced as an appropriate integrated method for preparation of input - output table of Fars province. Next, input - output table is prepared for Fars province using this method.Therefore, this study is based on input - output table of national economy in 2001. Necessary modifications performed in the field of changes at level of prices and differences of regional trade compared with other areas at national level. Moreover, up to date statistics and information and technical experts view on the various economic sectors along with input - output table 33 was used in 2011 followed by investigation of general structure of the province economy based on the amounts of added value obtained from this table.

Keywords—grit, Input- output , table. Regional,

I. INTRODUCTION

WHAT is important in each country's economic area is to lead the economy towards the desired direction. This indicates that each economic system requires planning. However, in today's world, the extensive amount of statistics and information in various economic fields has been caused the need to develop robust statistical systems.

Input-output table is a strong and effective statistical technique that theoretically relies on a strong theoretical hypothesis. This technique provides information related to various economic sectors and investigate transactions between them. This method is of high ability to predict and explain changes in predictable economic variables. Therefore, works and writings related to the development and planning and input-output analysis will be used as an essential tool for production of planning sectors. The theory of input-output is mainly

Maryam Akbarzadeh, Economic and Manegment Department, Islamic Azad University, Bandar lengeh Branch, Bandar lengeh,Iran. (corresponding author to provide e-mail: mrymakbarzadeh@yahoo.com)

Firoozeh esmaeilzadeh, Arman Insurance, Shiraz .Iran(e-mail:fir.esmaeilzade@gmail.com)

Alireza Poostvar, Economic and Manegment Department, Islamic Azad University, Bandarlengeh Branch, Bandarlengeh, Iran(e-mail: poostvar1389@yahoo.com).

Mojtaba Manuchehri ,Economic and Manegment Department, Islamic Azad University, Bandarlengeh Branch, Bandarlengeh, Iran(e-mail: m.manuchehri1356@yahoo.com)

focused on interaction of productive activity in different economic sectors because they require a variety of intermediate goods to produce a certain product. Therefore, input-output table can be used to investigate economic structure of a region and its economic interaction. Thus providing input-output table of Fars Province is one of the basic needs of the province development planning in order to provide a foundation for analyzing economic structure, identification of economic relations, the national economy as well as a tool for economic planning in the province. Therefore, the present study is an attempt to use GRIT method to prepare above mentioned table for the year 2011 as commodity-commodity table.

II. METHODS TO PROVIDE REGIONAL INPUT-OUTPUT TABLES

Regional input-output tables can be created as statistical or non-statistical method, or a combination of the two. In statistical methods, information about the phenomena is prepared by full enumeration methods, sampling procedure, and the use of existing data in statistical sources and references of relevant organizations and institutions. In this method despite the use of accurate methods for data collection and substantially large volume samples, there are a number of limitations including long time to obtain data and large required budget.

In non-statistical methods, references variables are commonly used at national level to estimate information related to the regions. Obviously, this type of calculations can lead to significant error. This is usually because the regional technical coefficients are assumed to be the same with that of the country technical coefficients. But the advantage of non-statistical method is that does not include limitations of statistical methods and requires a short time and much less cost to prepare tables compared with that of statistical methods.

Another option to prepare regional input-output table is to use integrated methods. Integrated methods are a combination of statistical and non-statistical methods. Therefore, this method includes advantages of both mentioned methods. In fact, this method creates an appropriate integration of reliability and efficiency in providing input-output table. In such methods, related national ratios will be modified using existing regional information based on conditions in the study area. GRIT method is considered as one of the best available integrated methods. (1)

Historical background of GRIT method dates back to calculations of Queensland Regional Input-Output Table in 1980 by Jensen West (G, R. West, R.C. Jensen, 1980) (16,21).In 1976, Following discussions between the economic operators and the research team of the University of Queensland, it was agreed to provide input-output tables and coefficients for Queensland areas. To do so, a group of researchers became responsible for preparation of tables. The main problem of these researchers was selecting the proper method for table preparation because both statistical and non-statistical methods were inappropriate due to their specific limitations. (19,22)Therefore, researchers decided to provide a new method to prepare regional Input-Output Table in order to provide a good combination of reliability and efficiency. As a result, integrated methods were taking into consideration and GRIT method was discovered after a theoretical research period. Finally, a report entitled GRIT for Queensland Commercial - Industrial organization was prepared in 1977.(18) Next, in 1979, the authors of report on the northern and southern states of Australia were ordered by the government to prepare related input-output tables in the region. This work was characterized by changes and adjustments on the overall approach of GRIT and a new system provided as "GRIT II". Jensen and West report provided a combined report of GRIT and GRIT II methods as well as input-output table in North Queensland and South Australia.

In 1999, Plan and Budget Organization of Isfahan Province provided a report on Esfahan macroeconomic by a group entitled committee of macroeconomic. This research project has been published in 7 volumes that its second report for the first time in Iran introduced GRIT method which represented 50 input-output table of Isfahan Province calculated by the mentioned method. Followed by this research project, (2)Majid Sameti and Mehdi Naraghi in a shared paper provided a brief introduction of GRIT method and then used Input-output table obtained from this method in order to investigate employment in different economic sectors with emphasis on the building and housing sector(5). Also Bahram Hekmat, in his Master's thesis in 2003, investigated prioritizing of investment in the economic sectors of Ilam province using input-output table. For this purpose, input-output table of Ilam province was prepared by GRIT method in 23 sections.

III. GRIT METHOD

Stage 1: Modification of national table(6)

First step: In this step, appropriate national input-output table will be selected. Although there are different national tables for different years and different sectors, it is to better work based on the most detailed table and the latest available time table. But the decision will vary dependent on analysts view, their recognition of the region as well as the intended purpose of the calculated table.

Second step: This section deals with the adjustment of the price level.

 Because price changes in different parts of the table do not happen in a similar manner, appropriate adjustments to the national table should be considered within the constraints of time and budget predicted for related study considering changes in the level of prices since the first year (selected year of national table).

Third step: Relationship between a nation's economy and other foreign economies is different from country's trade relations with each other as constituent regions within a country. This difference.
results from far greater degree of freedom of national economic trade
relations with other regions of the world. This actually evokes a completely open economy model. Therefore, this section is an attempt to perform some modifications or adjustments in the national tables for Department of International Trade (Imports) so that provide tables representing a closed national economy. In other words, it is assumed that these products are produced by various sectors of the national economy rather than imported goods.

Stage 2: Modification of regional imports

Fourth step: In this step, parts of national tables are recognized in the economy of the study area that does not exist in reality and their commercial coefficient will be transferred in to the same row in the regional table.

Fifth step: Followed by fourth step, those remaining coefficients in the national coefficient matrix can be modified decreasingly. This remained value will be imported in to the import section in the import row. There are various methods used to perform such modifications. It appears that it will be appropriate to select simple place coefficient for Queensland in Australia. But this does not justify in any way the reason of selecting this coefficient for other regions of other countries.

Stage3: Definition of regional sections

Sixth step: This step is aimed at entering superior detailed data in the coefficients tables. In other words, if there are estimates that analysts believe are better and more detailed than similar figures obtained by mechanical methods of first and second stages, they can by replaced by Coefficients obtained in the previous stage.

Seventh step: In this step of GRIT system process, economic sectors are combined in such a way that form smaller tables that their smaller structure are more fit with other areas.

Eighth step: In this step, followed by sixth step, just data provided in a more general level of economic sectors in the level of regions will be considered in the table obtained by seventh step.

Ninth step: In this step, preliminary transactions tables will be prepared. These tables are obtained by multiplying column elements in production estimation (output) of each sector to change coefficients in to first estimates of transactions.

Tenth step: This step is devoted to obtain estimate of final demand in Preliminary Input-Output Tables. There are two methods to estimate final demand: First, final demand is considered as the remaining value to create consistency in rows and columns of table. Second, independent estimates of

final demands will be used. Selection between these two methods is dependent on data related to the regional final demand and degree of confidence in these information.

Eleventh step: If regional integrated tables are required, greater integration should be performed.

Twelfth step: This step is devoted to extraction of incremental coefficient and Leontief inverse table of sample tables.

Stage 5: Extraction of final transactions tables

Thirteenth step: This step includes examination of regional input-output tables in details, entering superior data in these tables and performing final required modifications. This step is necessary if the regional table of region be prepared.

Fourteenth step: This step is devoted to the preparation of the final table of transactions.

Fifteenth step: Final step of GRIT is devoted to calculation of Leontief inverse tables and Incremental coefficient for each of regional and area (province) tables.

If you are using Word, use either the Microsoft Equation Editor or the MathType add-on (http://www.mathtype.com) for equations in your paper (Insert | Object | Create New | Microsoft Equation or MathType Equation). "Float over text" should not be selected.

IV. PREPARATION STEPS OF INPUT-OUTPUT TABLE OF FARS PROVINCE

1-regional input-output table based on GRIT method is selection of national input-output table as a basis for next steps. Therefore, national input-output table in 2001 developed by the Statistical Center of Iran was selected as the most appropriate available national input-output table to be used for preparation of Fars province input-output table.(4)

2-Updating of national input-output table: in this step, values of table in 2001 and monetary value in 2011 were changed. To do so, the price index of 2011 to 2001 was used to modify national transactions matrix rows.

3. Imports internalizing: in this step, national economy was closed. That is assuming national economic has nothing to do with external world while closed national economy for the region is considered as the world closed economy. For this purpose, intermediate imports of the sectors also considered as a part of the production of sectors in transactions matrix. Moreover, imports intermediate matrix in 2001was available in the input-output table of 2001. Therefore, there was no need to calculate this matrix in this section. First, this matrix was updated using price index in the second step and next it was added to matrix of available transactions.

4. Reducing the number of the table sections: For preparing the next steps in the table, there is a need to modify the table technical coefficients in terms of regional trade types. This requires the calculation of location coefficients (LQ). Statistical limitations make it possible to calculate location coefficients only for 35 sectors of the national table. Therefore, in this step, table sectors were integrated based on International Standard Industrial Classification of All Economic Activities (ISIC).

5-Modification of intermediate consumption: up to this point, transaction matrix has been modified to a monetary value in 2011. But it is assumed that the intermediate demand figures in Table are constant. Therefore, To modify the physical volume table values from 1380 to 1390 ,statistics of intermediate consumption to fixed price of various activities during mentioned was obtained using Iran National Accounts. Then the figures of Table were prepared for 35 section of the table considering ISIC classification. Finally, ration of the values for the year 2011 were used as modification coefficients in the columns of 35section transactions matrix.

6 - Direct coefficients matrix calculation: In this step, intermediate values of each section of the table were divided by output value of the same sector. Overall national direct coefficient matrix was obtained in 35 sections.

7 - Removing the non-productive sectors in the region: after investigation of 35 parts it was concluded that the two parts of coal and tobacco products does not exist in the region. This means that these sectors have no productive activity in the region. Therefore, trade coefficients related to these sectors are considered as import coefficients and will be imported into the import row. Moreover, trade coefficients of columns relevant to this section were removed completely from the table. By doing this, the matrix sectors of direct coefficient were reduced from 35 parts to 33 parts while table he structure and the tables coordinated with the regional economic structure in terms of sectors structure. (12)

8 - Decomposition of national coefficients to production coefficients and regional import: Certainly the initial payments obtained from the table up to this stage do not include import values.(13) However, a significant portion of the regional communications is performed through imports. Therefore, it seems necessary to decompose the national coefficients in to regional coefficients and import coefficients. National coefficients should be modified so that national and regional import coefficient can be obtained from them. Thus, location coefficients (LQ) of various sectors were used.

LQ = Employment of the sector in the region / total region employment / employment in the sector / total employment in the country

Location coefficients are commonly used to determine the specialized status of economic activity in a region compared with a wider region or the whole country. These factors can be taken into consideration as an appropriate indicator of import sections and their level of imports in the region. Therefore, LQ value smaller than national coefficients is the regional share and the rest, 1-LQ , is the share of regional imports. Therefore, employment location coefficients were calculated in this step with two simple and modified methods. Next steps were performed by the two calculated LQ. Finally, the results suggested that calculations based on modified LQ were more satisfactory. (5)

9 – Preparation of transaction table between industries: In this stage, the transaction matrix was calculated by multiplying the output of the corresponding column in the same area in a different part by regional direct matrix coefficients obtained in the previous step.

10 - At this point, intermediate imports matrix and region imports calculation was carried out.

11 - At this stage, the vector of final demand and value added in the regional table were calculated as the remaining values

TABLE I
CLASSIFICATION OF 33 SECTION

1-Crops	12-Wood and wood products	23-Motor Vehicle Body - Parts and insert
2- Horticulture and forestry products	13-Paper - Printing and publishing	24- Other equipment and transport equipment and parts are
3-Livestock and live poultry and its Product	14-Oil	25- Of other commodities not classified
4- Fish and other fishing products	15-Chemical product	26- Services, public accommodations
5- Crude oil and natural gas	16- Rubber and plastic products	27- Of eating and drinking places
6-Iron ore - copper - and a variety of minerals	17-Other mineral products	28- Carry and transfer services
7- Water - Electricity - Gas, Construction	18-Furniture	29- Post and telecommunication services
8- Animal and vegetable oils and fats	19-Iron - Steel and Other Metals	30-Education
9- Other food and drink products	20-Metal products	31- Health
10-Textiles	21-Machinery and appliances	32-Recreational and cultural services
11- Apparel and shoes	22-Broadcasting and telecommunications equipment and related devices	33-Other Services

V. THE STRUCTURE OF THE PROVINCE ECONOMY AND ITS PLACE IN THE COUNTRY ECONOMY BASED ON TABLE FINDINGS

The following Figure shows the combination of demand and supply of products in province economy based on input-output table. Accordingly, total demand and supply of goods and services in the province equals 6789449 billion rials On the supply side, 93/8 percent of the total supply of province includes output value while 6/2% of the remaining part is the share of province total supply of imports. Moreover, 91/9% of total province output value includes added value and 8/1% includes intermediate inputs of the province.

On the demand side7/6% of total province demand includes marginal demand and 62/4% includes intermediate inputs of the province.

Figure view of the Fars province economy in 2011 based on input-output table (current prices - Billion rials)
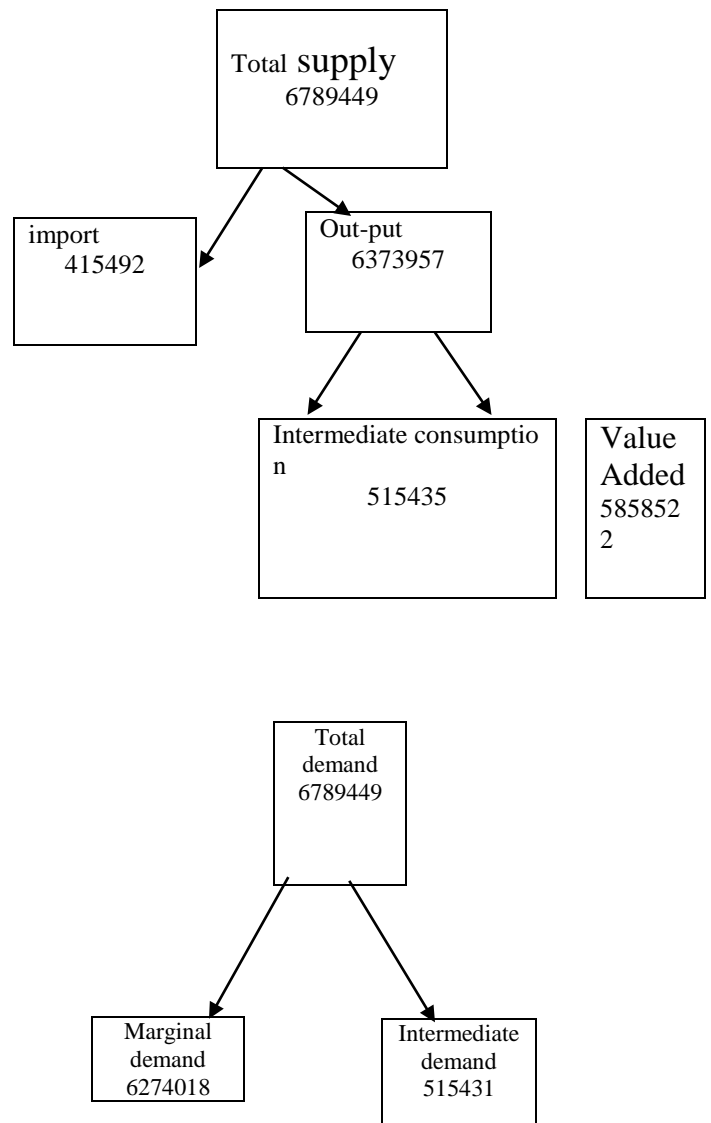

Fig. 1 combination of demand and supply of products in province economy based on input-output table

VI. CONCLUSION AND SUGGESTIONS

Fars province input-output table was obtained in 33 sectors using GRIT method with lowest cost and in the shortest amount of possible time. An important feature of obtained table is that it is completely compatible with data available in national accounts (productive account of provinces) (9)in terms of concepts, applied classifications and value of results. Therefore, this investigation was performed by a comparison between table results and similar estimations provided by Management and Planning Organization Experts from productive account of provinces (2011)(10) in order to provide an accurate evaluation of performed calculations. The results

of this study indicate that 80% of findings related to parts of the table are consistent with available estimates in productive account of province. This is a good result which shows accuracy of the table. However inconsistencies that can be seen in 20% of these sectors may result from statistical limitations of the study. Because despite the use of available data, professional attempts to compare and investigation of quality and reliability of statistics, and selection of the best method, again there are some limitations to perform this method particularly in industry sector. Therefore, undoubtedly the present table will not be without error. However, according to available conditions, it is the best table that might be provided. Finally, considering data and time limitations as well as applications of Input-Output table and GRIT method features, there are some suggestions to guide researchers and analysts as follows:

- In this study, national table of 2001 was used(7) in order to prepare province table. However, national input-output table for 2011 are currently under consideration by Statistical Center of Iran. Therefore, it is suggested, if possible, to prepare province tables based on this table.

- It is suggested, if possible, that provincial tables also be prepared by statistical methods.

- It is suggested, if possible, that provincial tables be prepared in more extended dimensions.

- It is suggested that sectors of final demand and value added in available table be separated into their components

- Considering GRIT features, it is suggested that input-output table be calculated for regions in different areas with least statistical level.

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