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Structure of Production with Urban–rural Income Inequalities in the Framework of Structural Path Analysis: The Case of Iran

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Abstract

The first experimental SAM for Iran was constructed more than three decades ago under the supervision of Prof. Pyatt. Based on this work Prof. Pyatt had observed that the way in which Iran was spending oil revenues was likely to exacerbate urban–rural income differentials in Iran. In his approach to SAM he did not distinguish between factorial and institutional income distributions preferring to amalgamate both. Prof. Pyatt's viewpoint and his approach which was largely ignored at that time many still hold true for the Iranian economy today. However, we believe that considering factorial and institutional income distributions separately, would portray a more complete picture of the complexities of structure of production with urban–rural inequalities. In this paper, we attempt to analyze the structure of Production and urban–rural income distributions in terms of factorial income distribution (private and public labour incomes) and institutional income distribution (urban and rural households) in the structural path analysis framework.

For this purpose, we have used the 1996 SAM Constructed by the Economic Research Center, Faculty of Economics, Allameh Tabatabai University, in collaboration with Statistical Centre of Iran and Central Bank of Iran.

Keywords: Input-output, SAM, Urban-rural, Income Distribution.

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Introduction

Before the oil revenues quadrupled in the early 70's, the main objective of planning in Iran was building industries through import substitution (Banouei, 1989). The issue of the development of resource-based industries and their impact on distributional questions arose after the quadrupling of oil revenues in the seventies (Banouei, 1992 a, Banouei, 1992 b, Prasad, Banouei and Swaminathan, 1992). Since then, the analysis of the growth equality trade off issue for the dual characteristics of the Iranian economy has been the main concern of researchers and policy makers. Using partial approaches, the economists of the then Plan and Budget Organization optimistically accepted Kuznet's hypothesis. They suggested that in the short run there was no remedy for urban–rural income inequalities but in the long run, growth – oriented policies would bridge this gap (Vakil, 1975).

However, these analyses were not justified and in fact exacerbated urban–rural income inequalities (Nili and Farahbakhsh, 1998, Bulmer – Thomas and Zamani, 1989).

After the revolution the social aspects of growth equality trade off has been the main focus of policy makers. The results were not up to expectations. In the nineties, we observe that overall policies as well as the impact of economic liberalization could almost bring about an expected growth rate for the economy but they did not accompanish a favorable increase in employment nor bridge the gap between urban–rural income inequalities (Management and Planning Organization, 2003)[1].

These observations are similar to the following statement made by Prof. Pyatt around three decades ago: "In this particular case, the results turned out to be rather interesting. They suggested that the way in which Iran was spending its oil revenues was likely to exacerbate urban–rural income differentials …" (Pyatt 2001, p.60). However, Prof. Pyatt did not specify which sector/ sectors of economy was/were likely to widen or reduce urban–rural income inequalities. He also did not distinguish separate accounts for factor and institutional incomes. Very recently, some analysts applying the conventional multiplier approach, reached the conclusions that the overall policies of sectoral expansions will tend to increase sectoral urban–rural income inequalities, and as compared to other sectors of economy, the policies of expansions of agriculture, agro-based industries and construction have a greater tendency to increase

urban- rural labour incomes as well as urban–rural household incomes (Banouei and Asgari 2003). These observations are based on conventional multipliers which provide the global (direct and indirect) effects of exogenous accounts on endogenous accounts. These lines of analyses have their own limitations as they cannot reveal socio – economic aspects of the complexities of the production processes both for analysts and policy makers.

To reveal these complexities we apply structural path analysis as an advance to conventional multipliers to deal with urban–rural inequalities both in factor account and institutional account.

The contents of this paper are organized as follows:

In Section 1, we briefly explore the methodology of the paper. Data base and data adjustments will be covered in Section 2. In Section 3, we present the empirical results and analysis. In the last section we end with the summary and conclusions.

1- The Methodology of the Paper

In order to understand the basic structure of a SAM and its function in the economy, the appropriate way is to organize all accounts of SAM into endogenous and exogenous accounts in a matrix framework. Three accounts, namely: production activities, factors, and institutions (households and companies) are considered to be endogenous accounts which in fact reveal the structure of the economy. All the other accounts are exogenous (government, capital and the rest of the world). Table 1 shows the resulting simplified SAM.

The above table sets out a Social Accounting Matrix in terms of endogenous accounts and exogenous accounts. The accounts are interlinked in four regions, denoted by I, II, III and IV. In reading this table, it is important to keep in mind the convention that entries are to be read as receipts for the row accounts in which they are located and expenditure or outlay for their column accounts. The SAM is square because each account has both receipts and expenditures; and the row and column sums for a given account for an outlay of one type must be equal to its corresponding receipts (Pyatt & Round, 1979). In Region I, we have a square matrix Nij (i,j = 1,2,3) which shows all current

Table1– Simplified Social Accounting Matrix in terms Endogenous and Exogenous Accounts

Receipts → / Expenditures ↓		Endogenous Accounts			Exogenous Accounts	Totals
		1-Production Activities	2- Factors of Production	3- Institutions i.e. Households and companies	Sum of other Accounts	
Endogenous Accounts	1-Production Activities	N_{11}	O	N_{13}	x_1	y_1
	2- Factors of production	N_{21}	O (I)	O	x_2	y_2
	3- Institution i.e. Households	O	N_{32}	N_{33}	(II) x_3	y_3
Exogenous Accounts	Sum of other Accounts	l'_1	l'_2 (III)	l'_3	l (IV)	y_x
Totals		y'_1	y'_2	y'_3	y_x	

transactions between three endogenous accounts. There are five endogenous transactions and transformations .N11 shows the intermediate input requirements (i.e, the input – output transactions) , N13 reflects the expenditure pattern of the various institutions including the different household groups on the commodity (equivalent to production activities) which they consume. N21 is the matrix which allocates the value added generated by the various production activities into income accruing to the various factors of production. N32 reflects the mapping of the factorial income distribution into household income

distribution (by household groups). Finally, N33 gives the inter – institutional transfers among different type of households or between companies and household (Thorbecke and Hong – Sang , 1996). In Region II, x1 , x2 and x3 are the sum of exogenous injections of three endogenous accounts (government expenditures, investment, and exports, respectively). Vector (x1) represents the total exogenous demand for production activities resulting from government consumption, investment and export demand. Similarly, x2 and x3 respectively represent the total exogenous factors accruing from abroad and total exogenous income of different types of institutions (Socio – economic household groups and companies) that they get from abroad. Likewise l1 , l2 and l3 in Region III represent the corresponding leakages, from savings, imports and taxation. L in Region IV denotes a matrix of SAM transactions between exogenous accounts. This matrix is considered to be a residual matrix where its elements show the balance of trade, government savings and current account deficit on balance of payment. y1, y2 and y3 are incomes of three endogenous accounts, i,e. production activities (y1), factor income (y_2) and the household and companies incomes (y_3).

1-1- Accounting multiplier

For analytical purposes, it is required that the endogenous part of transaction matrix (N_{ij}) in Table 1 be converted into a corresponding matrix of average expenditure propensities. This can be obtained simply by dividing a particular element in any of the exogenous accounts by the sum of total expenditure for the column account in which the element occurs (Thorbecke and Hang – Song, 1996). The coefficients are obtained as follows

$$B_n = N \hat{y}_n^{-1} \qquad (1)$$

Where $\hat{y}_n$ is a diagonal matrix whose diagonal elements are y_1, y_2 and y_n.

$$N = B_n \hat{y}_n \qquad (2)$$

From equation (1) the matrix of average expenditure propensities is as follows

$$B_n = \begin{bmatrix} B_{11} & O & B_{13} \\ B_{21} & O & O \\ O & B_{32} & B_{33} \end{bmatrix} \quad (3)$$

Matrix B_n is corresponds to Table 1 which is composed of different subsets of coefficients. They are as follows:

B_{11} = matrix of average expenditure propensities of Leontief's input – output

B_{13} = matrix of average expenditure propensities of households

B_{21}= matrix of average primary inputs of factors of production

B_{32}=matrix of average income earned by institutions from primary incomes.

B_{33}= matrix of average income earned by institutions from current transfers.

From the definition of B_n, we can express a combined balanced production – income equation for three endogenous accounts in the SAM framework as follows:

$$y_n = B_n y_n + x \quad (4)$$

This equation states that total income of three endogenous accounts (y_n) is equal to income earned from current transactions among different endogenous accounts plus incomes accrued from exogenous accounts (x).

Equation (4) can be rewritten as follows:

$$\begin{aligned} y_n &= (I - B_n)^{-1} x \\ &= M_a x \end{aligned} \quad (5)$$

Where $M_a = (I - B_n)^{-1}$

In equation (5), $(I\text{-}B_n)^{-1}$ represents the accounting multiplier matrix, it explains the results obtained in a SAM and not the process by which they are generated (Khan and Thorbecke, 1989) [2].

In order to use M_a matrix for socio – economic analyses, we need to accept at least two major assumptions.

1- There exists excess capacity which would allow all prices to remain constant and that expenditure propensities of endogenous accounts remain constant [3].

2- The production technology and resource endowments in a specific period are given (Thorbecke, 1997).

While these assumptions may limit the flexibilities of M_a matrix for socio – economic policies analyses, as compared to other multipliers, they can reveal a comprehensive picture of the economic structure (Banouei and Asgari, 2002).

1-2- Structural Path Analysis As Applied to the Iranian Economy.

The accounting multiplier matrix approach shown in Equation (5) generally provides the global (direct and indirect) effects of injections from exogenous variable (x_i) on endogenous variables via M_a matrix.

Such an effect may reduce the usefulness of such an approach for analysts and policy makers. Recently Defounry and Thorbecke (1984), and Khan and Thorbecke (1989) have shown that the global effect can be decomposed by structural path analysis, and therefore throw light on the complexities of the socio – economic Production process.

In contrast with accounting multiplier matrix (which gives scalar numbers) structural path analyses reveals specific individual sectors like activities, factors and household groups through which influence is transmitted from one sector of origin to its ultimate destination in a socioeconomic system represented by a SAM.

Structural path analysis recognizes four influences. They are as follows.

I – Direct Influences of i on j along an Arc

$$I^{D}(i \rightarrow j) = a_{ji} \qquad (6)$$

Where I denotes the magnitude (intensity) of influence of i on j along an arc. D represents that the influence is direct, a_{ji} being the (j,i)th element of the matrix of average expenditure propensities B_n [4].

II – Direct Influence along an Elementary Path

The direct influence transmitted from a pole i to a pole j along a given elementary path is equal to the product of the intensities of the arcs constituting the path. Therefore,

$$I^D (i\ldots j) = a_{jn} \ldots a_{mi} \quad (7)$$

If p= (i,x,y,j) , from equation (7) the intensity of influence along an elementary path with three arcs can be expressed as follows:

$$I^D (i\ldots j)\ p \equiv ID\ (i,x,y,i) = axi\ ayx\ ajy \quad (8)$$

Where p shows the number of paths

III – Total Influence

Direct influences of i on j along an arc or along an elementary path cannot reveal the indirect influences that are generated on some of the paths in the form of loops, circuits and networks. To unveil these indirect effects, total influence is used. i.e.

$$I^T(i\rightarrow j)\ p = ID\ (i\rightarrow j)\ PMP \quad (9)$$

Mp, a scalar captures the extent to which the direct influence along path p is amplified through the effects of adjacent feedback circuits [5].

IV – Global influence

Global influence is directly obtained from the accounting multiplier matrix M_{aij} as it captures the full effects of an exogenous injection -dxi on the endogenous variable j. Therefore,

$$IG\ (i\rightarrow j) = M_{aji} \quad (10)$$

and matrix $Ma= (I - B_n)^{-1}$ can be called the matrix of global influence. The flexibility of the structural path analysis is that it can decompose global influence into a series of total influences. The latter, in turn, can be broken down into a series of direct influences multiplied by a quantity (scalar) called the path multiplier. Therefore, the Equation (10) can be decomposed as follows:

$$I^G (i \rightarrow j) = maij = \sum_{p=1}^{n} I^T (i \rightarrow j) = \sum_{p=1}^{n} I^D (i \rightarrow j) PMP \qquad (11)$$

Where $I^G(i \rightarrow j)$ represents global influence of pole i on pole j and p stands for elementary path. To illuminate the structure of production with urban–rural income inequalities in Iran, all four influences have been used.

2- Data Base and Data adjustments

The 1996 SAM was constructed jointly by Economic Research Center, Faculty of Economics, Allameh Tabatabaie University, Statistical Center of Iran and Central Bank of Iran. This matrix contains 94 rows and columns [6].

For empirical purposes, the following adjustments have been made:

A. The size of 94 × 94 matrix has been reduced into 17 × 17 in the following ways:

- The 22 groups of commodities and services in the "use" matrix and 21 activities in the "make" matrix culled out into seven major commodity groups and activities: agriculture, mining agro – based industries, other industries, water, electricity and gas, construction and services.

- In the generation of income accounts q groups of factors of production has been regrouped into 6 groups of factors: Employment compensation of the urban private sector, employment compensation of the urban public sector, employment compensation of the rural private sector, employment compensation of the rural public sector, mixed income and operational surplus less mixed income.

- In the institutional and capital accounts four domestic institutions namely: urban household, rural household, companies and government have been included and a separate account for the rest of word is considered.

B. The next step was to estimate a final table either in commodity × commodity or industry × industry under commodity or industry technology

assumptions. With the help of IO – SAM software, we could estimate the final table based on industry × industry under industry technology assumption.

C- Seven sectors, six groups of factors of production and three institutions are considered to be endogenous accounts whereas government, capital, and the rest of world accounts are taken to be exogenous accounts.

3- Empirical Results and Analyses

In this section, structure of production with respect to urban–rural income inequalities is analyzed. For this purpose, , the global effect of a unit increase (increase of one billion Rls) in exogenous variables of each seven sectors and also its decomposed components such as direct influence and total influence on the urban rural labour and household incomes have been considered.

3.1- The Influence of Production Activities on Urban–rural Labour Incomes

The result of global influences of a unit increase of exogenous variables of seven sectors on urban–rural labour incomes are presented in Table 2, Columns 1 to 6.

The results show that, the global influences of all the seven sectors generate more incomes to urban labour as compared to rural labour (cols 1&4). No doubt this observation supports other studies using partial equilibrium approach (Vakil, 1975, Nili and Farahbakhsh, 1998). Of the seven sectors, policy expansion of services and construction sectors with 0.374 and 0.349 billion Rls respectively generate more income to urban labour. Agriculture and agro based industries with 0.321 and 0.305 billion Rls come next.

Considering the rural labour incomes (col.4) we observe that, as compared to the other sectors, the expansion of construction, agriculture and agro based industries appear to generate more income to rural labour.

Apart from geographical and structural factorial income distribution, the geographical and structural distribution of private and public factorial income

Table2: Global Influences of Production Activities on Urban–rural Labour and Urban–rural Household Incomes

Destination →(j) Origin	TU Lab 1=2+3	UP lab 2	UpUlab 3	TRlab 4=5+6	RPLab 5	RPulab 6	Tho 7=8+9	Uho 8	Rho 9
Ag	0.305	0.107	0.198	0.161	0.103	0.058	1.808	1.283	0.525
min	0.127	0.030	0.097	0.044	0.019	0.025	0.702	0.534	0.168
Agb	0.321	0.117	0.204	0.136	0.078	0.058	1.608	1.124	0.484
Oi	0.217	0.077	0.140	0.076	0.037	0.039	0.661	0.425	0.236
Weg	0.252	0.054	0.198	0.078	0.032	0.046	0.985	0.738	0.245
Con	0.349	0.0171	0.178	0.162	0.112	0.050	1.403	0.978	0.425
Ser	0.347	0.092	0.282	0.120	0.045	0.075	1.491	1.078	0.415

Agriculture (Ag), Mining (Min), Agrobased industries (Agbi), other industries (oi), Water, electricity and gas (Weg), Construction (Con), Services (Ser), Total Urban Labour income (TUlab), Urban Private Labour income (Uplab), Urban Public Labour income (Upulab), Total Rural Labour income (TRlab), Rural Private Labour income (Rplab), Rural Public Labour income (Rpulab), Urban households (Uho), Rural households (Rho)

distribution gap can be discerned from the table. In regard to this the results reveal that the influence of all seven sectors provides more income to public labour. Urban public labour benefits more than rural public labour. Looking at the above findings, one is tempted to suggest that the policies of economic liberalization followed during the last decade did not have a favorable impact on the changes of the structure of the Iranian economy.

This may be considered to be one of the main impediments in reducing the acute unemployment problem in Iran. In fact, some studies came to the conclusion that the public sector in Iran cannot generate more employment as it has reached the saturation stage (eg. Farjadi, 1997).

The above analysis and observations are based on global influence. From a policy standpoint, however, such observations appear to be of limited usefulness, as it does not identify the various paths along which an influence due to a unit increase in exogenous variable of each production activity is transmitted. Considering the Iranian economic situation, we maintain that identifying the various paths could have at least two advantages: Firstly, it can provide a better ground for policy makers to decide

Which path / paths are more private oriented or more public oriented in generating income and or employment. Secondly, one can get a complete picture of the complexities of the functioning of the structure of the economy.

The results of the influences of production activities on urban labour (urban private labour and urban public labour) and on rural labour (rural private labour and rural public labour) in terms of global influence and its decomposed components are presented in Table 3.

Cases A1, A2, A3 and A4 explore the path analysis from an injection into the agricultural sector to rural – urban (private and public) labour incomes. In Cases A1 and A3, it is observed that 38.7 and 72 percent of global influences of 0.107 and 0.103 billion Rls of additional labour income are caused directly by demand for labour. However, Cases A2 and A3 show that the additional public labour demands created by the agricultural sector are all indirect. The mixed income and the service sector appear to have an important role in bringing additional demand for both urban and rural public labour.(28.2% in case A1 and 21.9% in case A3; co1.8. Table3).

Table 3– Structural Path Analysis: Global Influences, Direct influences and Total Influences for Selected paths

(1) Path origin (i) →	(2) Path Destination (j)	(3) Global Influence $I^G(i\rightarrow j)$= maji	(4) Elementary Paths (i→j)	(5) Direct Influence $I^D(i\rightarrow j)\times P$	(6) Path multiplier M=	(7) Total Influence $I^T(i\rightarrow j)P$	(8) $\frac{I^T(i\rightarrow j)}{I^G(i\rightarrow j)}$ (percent)
Ag (A1)	Upulab	0.107	Ag→Uplap	0.024	1.738	0.042	38.7
			Ag→Ser→ Uplap	0.004	2.873	0.011	9.9
			Ag→Mi→Uho→Agbi→Uplap	0.002	3.196	0.006	5.6
			Ag→Mi→Uho→Ser→Uplap	0.004	3.041	0.012	11.2
			Ag→Mi→Rho→Ser→Uplap	0.001	3.005	0.004	3.8
Ag (A2)	Upulab	0.198	Ag →Uplap	0.004	1.876	0.007	3.5
			Ag→ Ser→Uplap	0.017	2.862	0.049	24.9
			Ag→Rplab→Rho→Ser→Uplap	0.002	2.926	0.006	3.0
			Ag→Mi→Uho→Ser→Uplap	0.018	3.041	0.056	28.2
			Ag→Mi→Rho→Ser→Uplap	0.006	2.994	0.019	9.6
			Ag→Mi→Uho→Aghi→Ser→Uplap	0.002	3.725	0.006	3.0
Ag (A3)	Rpulab	0.103	Ag→ Rplab	0.049	1.665	0.004	71.9
Ag (A4)	Rpulab	0.058	Ag→ Rpulab	0.005	1.711	0.008	13.9
			Ag→Ser→ Rpulab	0.004	2.849	0.012	21.9
			Ag→Mi→Rho→ Rpulab	0.002	2.975	0.005	8.5
Min (A5)	Upulab	0.030	Min→Upulab	0.003	1.093	0.003	9.3
			Min→Os→Com→Uho→Min→Upulab	0.001	2.729	0.004	12.7

Table 3– Structural Path Analysis: Global Influences, Direct influences and Total Influences for Selected paths

(1) Path origin (i) →	(2) Path Destination (j)	(3) Global *Influence* $I^G I \rightarrow j$=maji	(4) Elementary Paths (i→j)	(5) Direct Influence $I^D(i \rightarrow j) \times P$	(6) path Multiplier M=	(7) Total Influence $I^T(i \rightarrow j)$ P	$I^T(i \rightarrow j)$ — $I^G(i \rightarrow j)$ (Percent)
Min (A6)	Upula	0.097	Min→Upulab Min→Mi→Upulob Min→Mi→Uho→Ser→Upulob Min→Os→Uho→ser→Upulab Min→Os→Com→Uho→Ser→Upulab Min→Os→Com→Uho→Ser→Upulab	0.003 0.003 0.003 0.002 0.007	1.206 2.072 2.609 2.445 2.729	0.036 0.006 0.005 0.006 0.018	37.2 5.7 5.3 6.3 18.5
Min (A7)	Rplab	0.019	Min→Rplab	0.002	1.065	0.002	12.9
Min (A8)	Rpulab	0.025	Min→Rpulab Min → Os → Com →Uho →Ser →Rpulab	0.007 0.002	1.062 2.740	0.008 0.005	29.9 18.4
Agbi (A9)	Uplab	0.117	Agbi→Uplab Agbi→Ag→Uplab Agbi→Ser→Uplab Agbi→Ser→Uplab Agbi→Ag→Mi→Uho→Ser→Uplab	0.027 0.008 0.005 0.001 0.001	1.775 2.363 2.923 3.651 3.725	0.047 0.019 0.015 0.004 0.005	40.4 15.8 12.9 3.8 4.1

Table 3– Structural Path Analysis: Global Influences, Direct influences and Total Influences for Selected paths

(1) Path origin (i)	(2) Path Destination (j)	(3) Global Influence $I^G(i\rightarrow j)$= maji	(4) Elementary Paths (i→j)	(5) Direct Influence $I^D(i\rightarrow j)\times p$	(6) path multiplier M=	(7) Total Influence $I^T(i\rightarrow j)P$	(8) $\frac{I^T(i\rightarrow j)}{I^G(i\rightarrow j)}$ (percent)
Agbi (A12)	Rpulab	0.058	Agbi→Rpulab	0.003	1.757	0.006	10.0
			Agbi→Ag→Rpulab	0.002	2.347	0.004	6.3
			Agbi→Ser→Rpulab	0.006	2.909	0.018	31.5
			Agbi→Ag→Ser→Rpulab	0.001	3.644	0.005	9.3
			Agbi→Mi→Uho→Rpulab	0.001	3.276	0.003	5.9
			Agbi→Ag→Mi→Uho→Ser→Rpulab	0.002	3.729	0.006	10.1
Oi (A13)	Upulab	0.077	*Oi→Uplab*	0.028	1.567	0.044	56.9
			Oi→Ser→Uplab	0.002	2.815	0.010	13.9
Oi (A14)	Upulab	0.140	Oi→Upulab	0.025	1.710	0.042	40.4
			Oi→Mi→ Upulab	0.017	2.787	0.047	32.3
			Oi→Ag→uho→Ser→ Upulab	0.002	3.219	0.005	3.6
			Oi→Mi→uho→Ser→ Upulab	0.002	3.431	0.007	5.1
			Oi→Os→ com→uho→Ser→ Upulab	0.001	3.599	0.004	3.2
Oi (A15)	Rpulab	0.037	Oi→Rpulab	0.010	1.541	0.016	42.6
Oi (A16)	Rpulab	0.039	Oi→ Rpulab	0.008	1.535	0.012	30.1
			Oi→Ser→ Rpulab	0.004	2.781	0.012	31.0
Weg (A17)	Upulab	0.054	Weg → Upulab	0.007	1.239	0.009	16.5
			Weg →Oi→ Upulab	0.001	1.782	0.002	3.8
			Weg →con→ Upulab	0.002	1.277	0.002	3.6
			Weg →Ser→ Upulab	0.003	2.355	0.008	14.6

Table 3– Structural Path Analysis: Global Influences, Direct influences and Total Influences for Selected paths

(1) Path origin (i)	(2) Path Destination (j)	(3) Global Influence $I^G(i\rightarrow j)$= maji	(4) Elementary Paths (i→j)	(5) Direct Influence $I^D(i\rightarrow j)\times p$	(6) path multiplier M=	(7) Total Influence $I^T(i\rightarrow j)P$	(8) $\frac{I^T(i\rightarrow j)}{I^G(i\rightarrow j)}$ (percent)
Weg (A18)	Upulab	0.198	Weg → Upulab Weg →Ser→ Upulab Weg →Os→Com→uho→Ser→Upulab	0.076 0.016 0.002	1.362 2.327 3.056	0.104 0.037 0.013	52.4 18.5 6.4
Weg (A19)	Rplab	0.032	Weg→ Rplab Weg→Con→ Rplab	0.004 0.001	1.209 1.248	0.005 0.001	16.6 4.4
Weg (A20)	Rpulab	0.046	Weg→Rpulab Weg→Ser→ Rpulab Weg→Rpulab→Uho→Ser→Rpulab Weg→Os→Com→Uho→Ser→Rpulab	0.014 0.004 0.001 0.001	1.205 2.318 2.745 3.072	0.017 0.009 0.002 0.003	36.4 20.4 4.3 7.2
Con (A21)	Uplab	0.171	Con→ Uplab Con→Oi→ Uplab Con→Ser→ Uplab	0.096 0.009 0.004	1.117 1.605 2.116	0.107 0.015 0.009	62.7 8.6 5.5
Con (A22)	Upulab	0.178	Con → Upulab Con →Oi→ Upulab Con →Ser→ Upulab Con →Oi→Ser→ Upulab Con →Uplab→Uho→Ser→ Upulab Con →Rplab→Rho→Ser→ Upulab Con →Mi→Uho→Ser→ Upulab Con →Mi→Rho→Ser→ Upulab	0.007 0.008 0.021 0.006 0.005 0.003 0.006 0.002	1.235 1.754 2.096 2.824 2.467 2.344 2.639 2.615	0.009 0.014 0.043 0.016 0.013 0.007 0.016 0.006	5.2 8.1 24.4 8.8 7.5 3.8 9.1 3.1

Table 3– Structural Path Analysis: Global Influences, Direct influences and Total Influences for Selected paths

(1) Path origin (i)	(2) path Destination (j)	(3) Global Influence $I^G(i\rightarrow j)$= maji	(4) Elementary paths (i→j)	(5) Direct Influence $I^D(i\rightarrow j)\times p$	(6) path multiplier M=	(7) Total Influence $I^T(i\rightarrow j)P$	(8) $\frac{I^T(i\rightarrow j)}{I^G(i\rightarrow j)}$ (percent)
Con (A23)	Rplab	0.112	con→Rplab	0.070	1.091	0.076	68.4
			con→Oi→Rplab	0.003	1.58	0.005	4.8
Con (A24)	Rpulab	0.050	Con→Rpulab	0.003	1.089	0.004	7.1
			Con→Oi→Rpulab	0.003	1.577	0.004	8.0
			Con→Ser→Rpulab	0.005	2.084	0.011	22.5
			Con→Oi→Ser→Rpulab	0.001	2.818	0.004	8.1
			Con→Uplab→Uho→Ser→Rpulab	0.001	2.477	0.003	6.9
			Con→Mi→Uho→Ser→Rpulab	0.002	2.650	0.004	8.5
Ser (A25)	Uplab	0.092	Ser→Uplab	0.028	2.086	0.053	62.9
				0.001	2.815	0.003	3.5
				0.002	2.116	0.003	3.6
				0.001	3.268	0.003	3.6
Ser (A15)	Upulab	0.282	Ser→Upulab	0.129	2.063	0.266	94.3
Ser (A26)	Rplab	0.045	Ser→Rplab	0.006	2.099	0.013	29.1
			Ser→Con→Rplab	0.001	2.130	0.002	5.5
			Ser→Mi→Uho→Ag→Rplab	0.001	3.056	0.003	7.8
Ser (A27)	Rpulab	0.075	Ser→Rpulab	0.036	2.053	0.069	91.3

The above findings reveal a special situation in the Iranian economy. There is a widespread belief among analysts and policy markers in Iran that encouraging the service sectors with public oriented activities cannot generate productive labour, and therefore, the funds should be canalized to the private oriented activities (Iran Daily News paper, 2003).

Cases A5 to A8 reveal the path analysis of influences of mining sector (including crude petroleum and natural gas) on urban and rural labour incomes. The results show that all additional income for labour which is generated by the mining sector is public oriented labour income. 37.2% of global influence is caused through direct interaction between mining sector and urban public labour (cases A6, col.8) whereas 29.9% additional rural public labour income is caused through only a single path (Case 8, (col.8)).

Cases A9 to A12 illustrate the effect of agro-based industries on the urban–rural labour incomes 40%, of the global influence is explained in a single path where there is direct linkage between agro based industries and urban private labour. (Case 9, col.8) The remaining additional incomes of urban private labour are generated through indirect effects of other paths. The results of case A10 are very interesting. They show that the global influence of additional income of 0.204 billion Rls of urban public labour is two times that of urban private labour income. This additional income is not caused directly but indirectly through agro-based services and then urban public labour which constitutes 34.3% of the total global influence. Similar trends can be found in the cases of A_{11} and A_{12}. Cases A_{13} to A_{16}, reveal the effect of other industries on urban–rural labour income. Direct influences of other industries in generating additional income for both urban private and urban public labour are very high. For example 56.9% of additional income of total influence 0.077 billion Rls is explained through a single path (case A13, col.8) whereas the share of additional income of urban public labour constitutes 40.4% of the total influence of 0.140 billion Rls (case 14, col.8). Almost the same trend can be discerned from rural private and public labour income. Being large industries, highly capital intensive and almost public enterprises, one would have expected a higher share of urban and rural public labour incomes than the actual figures say.

Cases A17 to A20 reveal the result of the effect of water, electricity and gas on urban–rural labour income being a public sector; the overall results are not up to expectation. More than 52.4% of the total additional income of urban public

labour is illustrated in a direct path (case A18, col.8) whereas; the similar path for urban private labour is only 16.5%. A similar finding can be observed for cases of A19 and A20.

Cases A21 through A24 explore the global influences, direct influences and total influence of construction sector of urban rural labour incomes. The results of Cases A21 and A22 show that, the expansion of construction sector provides more income to urban public labour than urban private labour (0.171 billion Rls) respectively. Out of total additional income of 0.171 billion Rls, 6 2.7% is revealed in a single path which is a direct path (case A21. col.8). Whereas 24.4% of the total additional income of urban public labour (0.178 billion Rls is explained indirectly where the role of service sector as supplier of intermediary sector is paramount (case A22, col.8). A similar observation can be made in the cases of A23 and A24.

The impact of service sector on urban– rural labour income in terms of global influences and its decomposed components are shown in Cases of A25 to A28. The results are not up to the mark, as additional total income of urban public labour generated by the service sector (i.e.0.282 billion Rls) is three times more than the total additional private labour income (i.e. 0.892 billion Rls) (cases A25 and A26) . 94%of the total additional income of urban public labour is illustrated in a single path where there is a direct interaction between service and urban public labour (case 26, col.8) whereas in the case of A25, 63% of the total additional income is caused by direct linkage between service sector and urban private labour income. Almost a similar trend can be seen from the figures of the cases A27 and A28. Therefore, the influences of construction and service sector on rural and urban factorial income would suggest that the expansion of the construction sector has a tendency to reduce urban–rural inequalities in general and private – public labour income inequalities in particular. While the expansion of the service sector gives exactly the opposite effect.

4-2- The Influence of Production Activities on Urban–rural Household Incomes

The results of the influences of production activities on urban and rural income are presented in cols 8 and 9, Table 2. From the figures it can be observed that the urban household benefits more than the rural household from

sectoral expansion policies. The global influences of agriculture, agro – based industries and service sectors, with total additional incomes of 1.283, 1.124 and 1.076 billion Rls, when compared to the other sectors, are significant. Whereas agriculture and then agro based industries, not to mention construction and services, do play an important role in increasing total incomes of rural households. Unfortunately due to the lack of data, we could not trace specifically whether urban– rural incomes generated by production activities are caused by private or public urban– rural labour incomes. Perhaps, by looking at the structural path analysis, one may throw light on this aspect and draw some policy implications. Table 4 shows the decomposed global influences of urban and rural household incomes for all the seven sectors which are organized in cases B1 to B14.

Cases B1 and B2 reveal the global influences and their decomposed component of agriculture on the urban– rural household incomes. It is observed that out of a total income of 1.283 billion Rls accrued to urban households, 6 3.8% is canalized though agriculture, mixed income and urban household nexus (case B1, col.8). Whereas in the case of B2, out of 0.524 billion Rls of rural households, 59.1% is explained in a path where agriculture interacts with mixed income and then rural household (case B2, col.8). These results would suggest that the additional mixed income generated in the agricultural sector bring the highest income to urban households while rural households gain more income through additional income of rural public labours. However, rural rather than urban households gain almost three times more through agriculture – rural private labour and rural household's nexus when considering similar paths (15.6% in the case B2 and 4.4% in case of B1). Cases of B3 and B4 which illustrate the influences of mining sector on the urban–rural household incomes, show that out of 0.534 billion Rls of the urban household income, 46.5% is caused through mining, operational surplus, company and then urban households (case B3, col.8), whereas 18.8 % of the total additional incomes accrued by the rural households is caused by a path where mining sector interacts with mixed income and rural household income (cases B, col.8). However it goes without saying that 15.5 percent of the total additional income of rural households is unveiled in a path where mining sector is linked with operational surplus and rural household incomes.

Therefore, the results in the cases of B1 to B4 would suggest that the urban households will benefit more through mixed income and rural households through rural public labour incomes when considering the agriculture sector. Considering the mining sector, the results suggest that urban households gain more through operational surplus which is almost true for rural households as well.

Cases B5 and B6 depict the effects of agro- based industries on the incomes of urban and rural households. The figures show that, out of 1.128 billion Rls of additional income of urban households, 29.5% is disclosed in a path where agro based industries is linked to agriculture, mixed income and urban households (case, B5, col.8) A similar trend is observed in the case of rural household incomes.

Considering the effects of other industries on the incomes of urban and rural households, (Case of B7 and B8), the results show that out of 0.425 billion Rls of the total additional income accrued to urban households, 32% is explained in a path where other industries interact with mining sector, operational surplus, companies and urban households (Case B7, col.80) where the rural households benefit more when other industries generate more mixed income which indirectly benefits rural households. As out of 0.236 billion Rls of rural households, 19.4% is canalized through other industries, mixed income and rural households (Case B3, col.8)

Table 4- structural path Analysis: Global I fluevces, Direct Influence and (Effects of production Activities on urban and Rural House holds Incomes)

(1) Path origin (i)	(2) Path Destination (j)	(3) Global Influence $I^G(i\rightarrow j)$=maj i	(4) Elementary Paths (i→j)	(5) Direct Influence $I^D(i\rightarrow j)\times$ p	(6) path multiplier M=	(7) Total Influence $I^T(i\rightarrow j)P$	(8) $\frac{I^T(i\rightarrow j)}{I^G(i\rightarrow j)}$ (percent)
Ag (B1)	Uho	1.283	Ag→Uplab→Uho	0.023	2.445	0.056	4.4
			Ag→Mi→Uho	0.136	2.590	0.819	63.8
			Ag→Mi→Uplab→Uho	0.016	3.004	0.049	3.8
			Ag→Min→Mi→Uho	0.025	3.041	0.075	5.8
			Ag→Os→Com→Uho	0.016	2.748	0.034	3.4
Ag (B2)	Rho	0.524	Ag→Rplab→Rho	0.049	1.891	0.092	15.6
			Ag→Mi→Rho	0.156	2.251	0.0351	59.1
			Ag→Ser→Mi→Rho	0.012	2.975	0.036	6.1
				0.028	1.947	0.055	10.3
Min (B3)	Uho	0.534	Min→Uplab→Uho	0.033	2.209	0.074	13.8
			Min→Mi→Uho	0.043	1.969	0.084	15.7
			Min→Os→Com→Uho	0.113	2.193	0.0248	46.5
Min (B4)	Rho	0.168	Min→Uplab→Rho	0.007	1.391	0.010	5.9
			Min→Mi→Rho	0.016	1.912	0.032	18.8
			Min→Os→Rho	0.017	1.521	0.026	15.5

Table 4- structural path Analysis: Global I fluevces, Direct Influence and (Effects of production Activities on urban and Rural House holds Incomes)

(1) Path origin (i)	(2) Path Destination (j)	(3) Global Influence $I^G(i\rightarrow j)$=maji	(4) Elementary Paths (i→j)	(5) Direct Influence $I^D(i\rightarrow j) \times p$	(6) path multiplier M=	(7) Total Influence $I^T(i\rightarrow j)P$	(8) $\frac{I^T(i\rightarrow j)}{I^G(i\rightarrow j)}$ (percent)
Agbi (B5)	Uho	1.128	Agbi→Uplab→Uho	0.026	2.577	0.066	5.9
			Agbi→Mi→Uho	0.068	2.795	0.191	17.0
			Agbi→Ag→Mi→Uho	0.103	3.196	0.332	29.5
			Agbi→Ser→Upulab→Uho	0.023	3.151	0.07	6.1
Agbi (B6)	Rho	0.484	Agbi→Rplab→Rho	0.012	2.027	0.023	4.8
			Agbi→Mi→Rho	0.034	2.482	0.084	17.3
			Agbi→Ag→Rplab→Rho	0.016	2.499	0.040	8.3
			Agbi→Ag→Mi→Rho	0.051	2.842	0.0142	30.1
			Agbi→Ser→Mi→Rho	0.017	3.24	0.055	11.4
Oi (B7)	Uho	0.425	Oi→Uplab→Uho	0.027	2.614	0.070	11.2
			Oi→uplab→Uho	0.024	2.614	0.062	9.8
			Oi→Mi→Uho	0.036	2.940	0.105	16.8
			Oi→Os→Uho	0.008	2.635	0.021	3.4
			Oi→Ser→Upulab→Uho	0.016	3.219	0.051	8.1
			Oi→Ser→Mi→Uho	0.024	3.331	0.082	13.1
			Oi→Os→Com→Uho	0.022	2.941	0.063	10.1
			Oi→Min→Os→Com→Uho	0.007	2.942	0.020	32
Oi (B8)	Rho	0.236	Oi→Rplab→Rho	0.010	1.941	0.020	8.4
			Oi→ Rpulab→Rho	0.008	1.941	0.015	6.3
			Oi→Mi→uho	0.018	2.593	0.046	19.4
			Oi→Ser→Rpulab→Rho	0.004	3.071	0.013	5.7
			Oi→Ser→Mi→Rho	0.012	3.404	0.040	17.0

Table 4- structural path Analysis: Global I fluevces, Direct Influence and (Effects of production Activities on urban and Rural House holds Incomes)

(1) Path origin (i)	(2) Path Destination (j)	(3) Global Influence $I^G(i\rightarrow j)$= maji	(4) Elementary Paths (i→j)	(5) Direct Influence $I^D(i\rightarrow j)\times p$	(6) path multiplier M=	(7) Total Influence $I^T(i\rightarrow j)P$	(8) $\frac{I^T(i\rightarrow j)}{I^G(i\rightarrow j)}$ (percent)
Con (B9)	Uho	0.978	Con→Uplab→Uho	0.093	1.982	0.184	18.8
			Con→Mi→Uho	0.105	2.246	0.237	24.2
			Con→Oi→Mi→Uho	0.012	2.988	0.035	3.6
			Con→Ser→Uplab→Uho	0.002	2.467	0.048	4.9
			Con→Ser→Uplab→Uho	0.030	2.639	0.078	8.0
			Con→Os→Com→Uho	0.015	2.233	0.034	3.4
Con (B10)	Rho	0.425	Con→Uplab→uho	0.070	1.420	0.099	23.4
			Con→Mi→uho	0.052	1.944	0.101	23.8
			Con→Oi→Mi→uho	0.015	2.594	0.038	8.9
			Con→Oi→Ser→Mi→uho	0.004	3.446	0.013	3.2
				0.072	2.188	0.0157	21.3
Weg (B11)	Uho	0.738	Weg→Upulab→Uho	0.072	2.188	0.157	21.3
			Weg→Mi→Uho	0.033	2.480	0.081	11.0
			Weg→Os→Uho	0.028	2.208	0.061	8.3
			Weg→Ser→Rpulab→Uho	0.015	2.734	0.041	5.5
			Weg→Ser→Mi→Uho	0.022	2.925	0.066	8.9
			Weg→Os→Com→Uho	0.074	2.464	0.181	24.6
Weg (B12)	Rho	0.249	Weg→Rplab→Rho	0.014	1.572	0.022	8.8
			Weg→Mi→Rho	0.016	2.154	0.035	14.0
			Weg→Os→Rho	0.011	1.715	0.019	7.6
			Weg→Ser→Rpulab→Rho	0.004	2.582	0.011	4.2
			Weg→Ser→Mi→Rho	0.011	2.882	0.032	12.8
			Weg→Uplab→Uho→Ser→Mi→Rho	0.003	3.009	0.009	3.5

Table 4- structural path Analysis: Global I fluevces, Direct Influence and (Effects of production Activities on urban and Rural House holds Incomes)

(1) Path origin (i)	(2) Path Destination (j)	(3) Global Influence $I^G(i\rightarrow j)$=maji	(4) Elementary Paths (i→j)	(5) Direct Influence $I^D(i\rightarrow j)\times p$	(6) path multiplier M=	(7) Total Influence $I^T(i\rightarrow j)P$	(8) $\frac{I^T(i\rightarrow j)}{I^G(i\rightarrow j)}$ (percent)
Ser (B13)	Uho	1.076	Ser→Uplab→Uho	0.027	2.434	0.065	6.1
			Ser→Upulab→Uho	0.122	2.434	0.297	27.6
			Ser→Mi→Uho	0.0185	2.604	0.481	44.7
			Ser→Os→Uho	0.014	2.440	0.034	3.2
			Ser→Os→Com→Uho	0.037	2.724	0.0102	9.5
Ser (B14)	Rho	0.415	Ser→Rplab→Rho	0.006	2.290	0.014	3.4
			Ser→Ruplab→Rho	0.034	2.290	0.077	18.4
			Ser→Mi→Rho	0.091	2.559	0.233	56.0
			Ser→Os→Rho	0.06	2.336	0.013	3.2

The results of the effects of construction sector on the urban and rural incomes of the households (the cases of B9 and B10) suggest that urban and rural households gain more from urban private and rural private labour incomes. As out of 0.978 billion Rls of additional income accrued by the urban households, 18.8% is exercised through a path where construction links with urban private income. (case B9, col.8). The similar path has more effects for the rural labour income. As out of 0.425 billion Rls additional income of rural households, 23.4% is explained in a path where construction sector contributes additional income to rural private labour income and hence more additional income to rural households. (Case B10, col.8). The role of mixed income for generation of additional income of urban households and rural households cannot be ignored: This appears to have more effects on urban than on rural households. As 24.2% of total additional income of urban households is transmitted through construction, mixed income and urban households, while the similar transmission for rural households is 23.3%).Considering the cases of B13 and B14 we observe that both urban and rural households gain from two distinct paths due to the expansion of the service sector. One is through additional income of urban public labour and the other is the additional mixed incomes. Glancing at the results of case B13, we can discern that, out of total additional income of 1.076 billion Rls for urban households, 44.7% is unveiled in a path where service sector creates more mixed income and hence more additional incomes for urban households (Case B13, col.8) and 27.6% of the total additional urban households is caused through the other path, that is services, urban public labour and urban households. Mixed income has more influence in revealing the major part of total additional rural households incomes generated indirectly by the service sector, than rural public labour income. The results reveal that 56% of total additional rural households income of 0.415 billion Rials is disclosed in a single path, that is, service sector linked with mixed income and rural households income, whereas, 18.4% of the total additional households income is explained in other paths where rural public labour income plays an important role in increasing rural household income.

5- Summary and Conclusions

In this paper, we have used the Social Accounting Matrix to explore some of the socio-economic aspects of the Iranian economy with special emphasis on

factorial and institutional income distributions. For this purpose, we have employed structural path analysis which can provide global influence of one account on the other account and its decomposed components in terms of direct influence and total influence of the seven major sectors of Iranian economy on the following accounts: urban private labour income, urban public labour income, rural private labour income, rural public labour income, urban household income, and rural household income.

■ Overall the results show that global influences of all seven sectors would exacerbate urban rural income differentials. This is true for both factors of production (labour – income and institutional households) incomes. This finding not only supports Prof. Pyatt's observation (mentioned in the introduction) but also supports other studies using the partial equilibrium approach.

■ The global influences of construction, agriculture and agro-based industries appear to generate more income to both rural labour and rural households.

■ The global influences of all seven sectors provide more income to public labour. Urban public labour gains more than rural public labour. In consonance with this finding, we are tempted to suggest that the policies of economic liberalization which had been followed during the last decade in Iran did not have much impact on the changes of the structure of the Iranian economy.

Urban households gain more than rural households from the global influences of all seven sectors. Agriculture, agro–based industries and service sectors have more impact on both urban and rural household's incomes than the other sectors of the Iranian economy.

The above observations are based on the global influences of one account on the other accounts. From a policy standpoint, they appear to be of limited use. As they cannot throw light on the complexities of the production process, we have decomposed the global influences to identify the various paths along which an influence due to a unit increase in exogenous variables of each production activity is transmitted. We have maintained that considering the Iranian economic situation, identifying different paths, could at least have two advantages. It can provide a better ground for the policy makers to decide the nature of socioeconomic aspects of factorial and institutional income distributions. Secondly, they can get a complete picture of the complexities of

the functioning of the private or public oriented structure of the economy. The results show that:

■ Agriculture has direct influences on urban and rural private labour incomes. However, its influence on urban and rural public labour income is indirect and highly related to the development of service sector and also to the increase in mixed income both of which is caused by the initial influence from the agricultural sector.

■ A major part of additional income generated by the mining sector is directly canalized to urban-rural public labour income.

■ Urban private labour accrued directly more than 40% of income from the agro based industries. Whereas around 50% of total additional income of rural private labour is transmitted by interaction between agro–based industries and agricultural sectors. The major influences of agro–based industries on urban and rural public labour are transmitted under the condition of the development of service sector (34.3% and 31.5% for urban and rural public labour incomes respectively).

■ More than 62% of the total additional income of urban private labour and 68% of the rural private income generated by the construction sector are the results of direct linkage between them. The gain for urban and rural public labour due to the effect of construction sector is indirect and relatively insignificant. The service sector plays an important role in transmitting additional income to both labours (24.4%in the case of urban public labour and 22.5% in the case of rural public labour).

■ The tendency of the influence of service sector is highly concentrated on the urban and rural public labour incomes. More than 94.3% of the total additional income of urban public labour and 91.3% of the total additional income of rural public labour are unveiled through the direct path of service sector to the mentioned labours .However, the direct contribution of service sector to urban private labour income is more than two times that of rural private labour.

■ Tracing the influences of production activities on urban and rural households income in the path analysis, we find that the additional mixed income generated by agriculture is the main factor for raising urban-rural household's incomes (63.8% and 59.1%) respectively. Besides, the additional incomes which go to rural households through agriculture – rural private labour

and then to rural household's nexus are four times more than the urban household incomes when considering a similar path (44% as compared to 15.6%).

In the case of the mining sector, the results suggest that, the linkage between mining, operational surplus and companies are the main cause of urban household incomes. 46.5% of the total additional urban household income is illustrated through the mentioned linkages whereas similar linkage for rural households is only 15.5%.

■ Agro–based industries provide more income to urban households when agro based industries interact with agriculture and mixed income (around 30% of total income). A similar trend can be observed for rural households.

■ The transmission of total influence of construction sector through mixed income to urban–rural incomes as compared to agriculture is less conspicuous, and therefore, urban–rural private labour incomes can be considered to be the main factor for generating additional incomes to urban and rural households due to influence of construction sector. 18.8% and 23.4% of total urban and household income is canalized through linkages between construction and urban–rural labour incomes, whereas 24.2% and 23.8% of total urban–rural households incomes are illustrated in paths where construction interacts with mixed income.

Two distinct paths can be identified for additional increase of urban and rural household's incomes due to expansion of service sector. One is through urban–rural public labour and the other is through mixed income. The additional income generated through services, mixed income and rural household nexus is three times more than service-rural public labour and rural households. Whereas for urban household it is almost half.

Notes

[1] According to the report, the unemployment rate in year 2000 was 14.25 percent. It subsequently reduced to 14.2 and 13 percent in the years 2001 and 2002 and standard of living of rural households constitute 60 65 percent of urban households.

[2] We are aware of some of the limitations of accounting multiplier matrix Ma, especially the assumption of the unitary expenditure elasticities in matrix B_n.

However, on account of paucity of data, like many other countries, we have used the accounting multiplier matrix for our analytical purposes.

[3] In recent years some researchers tried to relax this assumption for some sectors of the economy, especially, agricultural sectors (Subramanian and Sadoulet, 1990).

[4] As stated in Note 2, because of lack of appropriate data in Iran, instead of using marginal expenditure propensities, we have used average expenditure propensities.

[5] The detailed proof of the equation (8) with illustrations is given in an appendix in Defourney and Thorbecke (1984).

[6] It seems that Iran was the first developing country to construct an experimental SAM in the early 705 under the leadership of Prof. Pyatt. Unfortunately, for about three decades, Iranian statistical experts and academics did not explore further in this area. The 1996 SAM is considered to be the second attempt which is more comprehensive than the first attempt (Banouei and Banouei, 2002).

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