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Multiplier Analysis in the Framework of Many Producers and Many Consumers of the SAM for the Iranian Economy*

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Abstract

In this article, the socio-economic analysis of the SAM multiplier, and its flexibility with respect to the aggregate Keynesian multiplier, extended Keynesian multiplier, Loentief's production multiplier and Miyazawa's combined multiplier will be briefly reviewed. Thereafter, we highlight the methodology of SAM in terms of endogenous and exogenous accounts with emphasis on the two main approaches of SAM multiplier: accounting and fixed price multiplier Matrices. With reference to the availability of the Iranian data, we observed that, due to lack of information, the fixed price multiplier could not be used, and therefore, the accounting price multiplier has been applied for socio and economic analysis. Secondly, the original form of the 1996 SAM is available in terms of commodity x industry and industry x commodity matrices. For our analytical purposes, it is therefore required that these matrices should be converted into final matrix either by industry technology and commodity technology assumptions in the SAM. The final results which for the first time reveal the socio-economic aspects of the Iranian economy in a consistent way, will be presented and analysed in three separate sections as follows: matrix multiplier for production, matrix multiplier for factor of production, and matrix multiplier for domestic institutions. The results of these matrices have been decomposed and analysed in terms of initial effects, truncated closed loop effects, other effects and closed loop effects.

Keywords: Multiplier Analysis, Producers, Consumers, SAM.

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1.Introduction

In the aggregate Keynesian Model, the economy is considered to be an aggregate producer and an aggregate consumer. Therefore, its consumption multiplier gives the aggregate income distribution [1]. Kaldor, Pasenetti and Kalecki, on the basis of the class division of Karl Marx, extended the single producer and single consumer of Keynes into a single producer and two consumers (Labours and Capitalists), which later on came to be known as extended post Keynesian models [2]. As major data requirements for both the models come from aggregate national accounts, simultaneous socio-economic analysis of structure of production and income distribution are beyond the scope of these models. This is one of the limitations of these models.

Structure of production and its matrix multiplier do play an important role in the many producer and single consumer of Leontief's model. Leontief assumes households as an exogenous variable. Therefore, simultaneous socio-economic analysis of structure of production and income distribution cannot be derived from his model [3].

In order to quantitatively analyse the structure of production and income distribution at the sectoral level in a consistent framework, one needs to combine the extended macro closure with Leontief's model. This is what Miyazawa has done. The matrix multiplier derived from Miyazawa's combined model, reveals directly and indirectly structure of production and income distribution, at least for two classes (labourers and capitalists) of the society. As compared to the matrix multiplier of social accounting, Miyazawa's multiplier does not have sufficient flexibility with respect to comprehensive disaggregation of socio-economic groups of income-expenditure of households. This is one of the limitations of the Miyazawa's model [4].

In the SAM, it is possible to comprehensively disaggregate accounts and sub-accounts of different socio-economic groups of household sector along with the other accounts in a consistent format within a matrix framework. As compared to the former multipliers, such a disaggregation gives more flavour to flexibity of the SAM multiplier to analyse the socio-economic aspects of society [5].

In this paper, we attempt to briefly present the analytical aspects of SAM with special emphasis on the functioning of its multiplier in the economy, and, also, to apply it for the Iranian economy. For this purpose, the contents of this article, are organized as follows:

In Section 2, the methodology of SAM with special reference to two approaches: average coefficients of Stone-Pyatt-Round, and marginal coefficients of Thorbecke are presented. The nature and organization of data is discussed in Section 3. In Section 4, the socio-economic analysis of the results is given.
The summary and conclusions constitute the last section of this article.

2. Methodology of SAM

In order to understand the basic structure of a SAM and its function in the economy, the appropriate way is to organize all accounts in a consolidated endogenous and exogenous accounts in a matrix framework. Table 1, shows the structure of a consolidated SAM.

Table –1. Structure of SAM in Terms of Endogenous and Exogenous Accounts

Reciepts Expenditures	Endogenous Accounts	Exogenous Accounts	Totals
Endogenous Accounts	N (I)	X (II)	Y^d
Exogenous Accounts	L (III)	R (IV)	Y^x
Totals	Y'^d	Y'^x	

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 [(6)]. 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 outlays for their column account. The SAM is square because each account has both receipts and expenditure; and the row and column sums for a given accounted for an outlay of one type must be equal to its corresponding receipts. In the SAM, endogenous accounts consists of production accounts, factor of production accounts and domestic institutional current accounts. The remaining accounts such as government current account, capital account, the rest of the world account, indirect taxes and subsidies are taken to be exogenous accounts.

In Table 1, N in region I, is a square matrix which shows all the current transactions among all the endogenous sub-accounts (production, factor of production and domestic institutions).

$Ne = n$, and e denotes a unit row vector. Therefore,
n = Vector row sums of N.
$N = [N_{ij}]$ and $ij = 1, 2, 3$
X = matrix of injections from exogenous account in Region (II) into endogenous accounts in Region I.
$Xe = x$ = Vector of row sums of X, and
$x = [x_i]$, $i = 1, 2, 3$
$Y^d_e = [y^d_i]$ shows the sum of incomes of all endogenous accounts.
L= matrix of leakages from endogenous accounts in Region III into exogenous accounts in Region I.
$e'L = l$ = vector of colum sum of l.
R = matrix of SAM transaction between exogenous accounts in Region IV. This matrix is considered to be a residual matrix where in its element shows the balance of trade, government savings, and the current account deficit on the balance of payments.
$Y'^d_e = [y'_i]$ denotes the column sum of expenditure of all endogenous accounts.
Y^x and Y'^x reveal sum of income and expenditure of exogenous accounts respectively.
On the basis of Table 1 and taking into account the above explanation, this table can be presented with more disaggregated accounts.
In Table 2, the exogenous accounts have been combined together, and the sum of exogenous injection is also consolidated into one vector (hence x_i, $i = 1, 2, 3$ represents the sum of injections from abroad, investment and government expenditures affecting i).

Table –2. The Disaggregate Accounts of SAM in Terms of Endogenous and Exogenous Accounts

Receipts → Expenditures ↓		Endogenous Accounts			Exogenous Accounts	Totals
		1-Production Accounts	2- Factor of Production	3-Institutions Households and Companies	4-Capital, Government and the Rest of the world Accounts	
Endogenous Accounts	1-Production accounts	N_{11}	O	N_{13}	x_1	y_1^d
	2-Factor of Production	N_{21}	O	O	x_2	y^d_2
	3- Institutions Household + Companies	O	N_{32}	N_{33}	x_3	y^d_3
Exogenous Accounts	4- Capital, Government and the Rest of the World Accounts	l'_1	l'_2	l'_3	R	y^x
Totals		y'^d_1	y'^d_2	y'^d_3	y'^x	

Likewise, l_i's represents the corresponding leakages. Thus, the above simplified and truncated SAM consolidates all exogenous transactions and corresponding leakages and focuses exclusively on the endogenous transactions and transformations. Five endogenous transactions and transformation appear in Table 2. N_{11} shows the intermediate input requirements (i.e., the input/output transactions), N_{13} reflects the expenditure pattern of the various institutions including the different household groups on the commodity (equivalent to production activities) which they consume. N_{21} is the matrix which allocates the value added generated by the various production activities into income accruing to the various factors of production. N_{32} reflects the mapping of the factorial income distribution into household income distribution (by household groups). Finally, N_{33} gives the inter-institutional transfers among different type of households or between companies and households.

On the basis of Table 2, and balance production equation of the conventional Leontief, the balance combined production – incomes (i.e., factor of production and institutions) equation for three endogenous accounts can be expressed as

$$y^d_i = n + x_i \qquad (1)$$

Where $Ne = \sum_j N_{ij}$ and $Ne = n$

Equation (1) shows that the total income of endogenous accounts (y^d_i) equals to sum of incomes of transactions of endogenous accounts (n) and incomes received from exogenous accounts as injections (x_i).

In order to apply the equation (1) to socio economic anlayses, we need to understand the role of matrix multiplier which can be derived from this equation.

The existing literature, provides us with two kinds of matrix multipliers. One is accounting price and the other is fixed price. The coefficients matrix used in the former are all in average terms, whereas in the latter, at least in the case of household consumption, are in marginal terms.

2-1. Accounting Price Multiplier

For analytical purpose, the endogenous part of the transaction matrix in Table 2, is converted into the corresponding matrix of average expenditure propensities. This can be obtained simply by dividing a particular element in any of the endogenous accounts by the sum total of expenditure for the column account in which the element occurs [(7)].

These coefficients are obtained as follows.

$$B = Ny^{d-1}$$

$$N = By^d \qquad (2)$$

From equation (2), the matrix of average expenditure propensities is

$$B = \begin{bmatrix} B_{11} & o & B_{13} \\ B_{21} & o & o \\ o & B_{32} & B_{33} \end{bmatrix}$$

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

B_{31} = matrix of average expenditure propensities of households

B_{21} = matrix of average expenditure income of production factor

B_{32} = matrix of average income of domestic institutions

B_{33} = matrix of average current transaction between domestic institutions
Substituting equation (2) in equation (1), gives the following equation.

$$y^d = By^d + x \quad (3)$$

Which states that row sums of endogenous accounts can be obtained by multiplying the average expenditure propensities for each row by the corresponding column sum and adding exogenous income x.

Equation (3) can be rewritten as follow:

$$y^d = (I-B)^{-1}x = Mbx \quad (4)$$

In equation (4), $(I\text{-}B)^{-1}$ represents the accounting price multiplier because it explains the results obtained in a SAM and not the process by which they are generated. In order to use $(I\text{-}B)^{-1}$ matrix for socio-economic analysis, we need two assumptions:

1-There exists excess capacity which would allow all prices to remain constant and that expenditure propensities of endogenous accounts remain constant [8].

2-The production technology and resource endoments in a specific period are given [9].

As these assumptions may limit the flexibilities of the matrix multiplier of $(I\text{-}B)^{-1}$ for socio and economic analyses, it can reveal the comprehensive picture of the economic structure as compared to the other multipliers [10].

The matrix of $(I\text{-}B)^{-1}$ has many advantages. One of them is that it can be decomposed. For this purpose, it is assumed that for any matrix $\widetilde{B}$ of the same size as B and such that $(I-\widetilde{B})^{-1}$ exists. Therefore, from equation (3), we can write

$$y^d = By^d - \widetilde{B}y^d + \widetilde{B}y^d + x$$

$$y^d - \widetilde{B}y^d = By^d - \widetilde{B}y^d + x$$

$$= (I-\widetilde{B})^{-1}(B-\widetilde{B})y^d + (I-\widetilde{B})^{-1}x \quad (5)$$

$$B^* = (I-\widetilde{B})^{-1}(B-\widetilde{B})$$

Substituting B^* in equation (5), we get

$$y^d = B^*y^d + (I-\widetilde{B})^{-1}x \quad (6)$$

Multiplying throughout by B^* and substituting for B^*y^d on the right hand side of equation (6), now gives

$$y^d = B^{*2}y^d + (I + B^* + B^{*2})(I-\widetilde{B})^{-1}x \quad (7)$$

Similarly, multiplying both sides (6) by B^{*2} and substituting for $B^{*2}yd$ and substituting for $B^{*2}yd$ in (7), we get

$$y^d = (I - B^{*3})^{-1}(I + B^* + B^{*2})(I - \widetilde{B})^{-1}x = Mbx \quad (8)$$

$$Mb = Mb_3 Mb_2 Mb_1$$

and

$$Mb_3 = (I - B^{*3})^{-1} \quad , \quad Mb_2 = (I + B^* + B^{*2})^{-1} \quad , \quad Mb_1 = (I - \widetilde{B})^{-1}$$

Therefore, it is shown that the multipliers contained in matrix *Mb* can be decomposed into component parts which reflect the contribution of the various mechanisms which result from the interrelationships that exit between the endogenous accounts.

Submatrix Mb_1 has been termed as the multiplier matrix with "own direct" or "transfer effects" (11).

These multipliers show how an exogenous injection into a specific set of the endogenous accounts, due to the endogenous variables that make up this set of accounts. The multipliers contained in Mb_2 have been called "cross effects" or "open loop" multiplier, and capture the interactions among and between the sets of endogenous accounts. Finally the multipliers in Mb_3 have been called "closed loop" or "circular" multipliers and show how an exogenous change in the economy will result in endogenous demand which circulates back to increase income beyond the size of initial change (12).

In order to facilitate the presentation of the empirical results, the decomposed accounting multiplier matrix *Mb* can be converted into four additive components as follows:

$$Mb = I + (Mb_1 - I) + (Mb_2 - I)Mb_1 + (Mb_3 - I)Mb_2 Mb_1 \quad (9)$$

The first term in equation (9) is the initial exogenous injection into the endogenous accounts, the second term is the net contribution of transfer multiplier effects, the third term is the net contribution of open loop effects and the fourth is the closed loop multiplier effects (13).

2-2. Fixed Price Multiplier

One limitation of the accounting multiplier matrix Mb, as derived in equation (4), is that it implies unitary expenditure elasticities as shown in B, and assumes that average propensities to expenditure are equal to marginal propensities to expenditure.

While this assumption may be defensible for all other elements of matrix B, it is certainly unrealistic for the expenditure pattern of the household groups

(B_{13}), because the propagation process derived from it, overestimates the economy. A more realistic alternative is to specify a matrix of marginal expenditure propensities (C below) corresponding to the observed income and expenditure elasticities of the different agents, under the assumption that prices remained fixed [14]. In this case, matrix C formally differs from matrix B in the following way: $C_{11}=B_{11}$ $C_{21}=B_{21}$, $C_{32}=B_{32}$ but $C_{13}\neq B_{13}$.
Expressing the changes in incomes (dy^d) resulting from changes in injections (dx), one can write the equation (3) as follows:

$$dy^d = Cdy^d + dx \tag{10}$$

$$dy^d = (I-c)^{-1}\, dx = Mc\ dx \tag{11}$$

In equation (11) Mc represents a fixed price multiplier matrix and its advantage is that it allows any nonnegative income and expenditure elasticities to be reflected in *Mc*.
As stated in the introductory part of this article, due to the lack of data, only the accounting price multiplier has been used for analytical purposes.

3. The Data Base

The 1996 SAM which has been constructed jointly by Economic Research Center, Faculty of Economics, Allameh Tabatabaie University, Statistical Center of Iran and Bank Markazi of Iran, has been used. This matrix contains 94 rows and columns.
For empirical purposes, the following adjustments have been made.
A. The size of 94×94 matrix, has been reduced into 36×36 in the following ways:
- The 22 groups of commodities and services aggregated into 3 groups: agriculture, industry and services.
- The 21 sectors culled out into three major sectors: agriculture, industry and services.
- In the generation of income accounts, 9 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 the other operation surplus.
- In the allocation of income account, distribution of income account, and capital account, four domestic institutions have been included: urban households, rural households, companies and government. In the fixed capital formation account, three major sectors, that is agriculture, industry and services, have been covered. In flow of fund accounts: currency,

deposits and others, and a separate account for the rest of world account is considered.

B.The next step was to estimate a final table either in commodity × commodity or industry × industry under commodity technology or industry technology. With the help of IO-SAM software, we could estimate two final tables: commodity × commodity under industry technology and industry × industry under commodity technology. For empirical presentation, commodity × commodity under industry technology has been selected and the 1996 SAM containing 27×27 has been balanced.

C. After balancing reduced SAM, in order to estimate the multiplier matrix Mb and its components, $(Mb_1\text{-}I)$, $(Mb_2\text{-}I)\ Mb_1$ and $(Mb_3 - I)\ Mb_2Mb_1$, for socio-economic analysis, we organized all the 1996 SAM account in terms of endogenous accounts and exogenous accounts. Table 1 shows the 1996 SAM where all the accounts have been set out in terms of endogenous and exogenous accounts. Out of 27 rows and columns, 13 are endogenous accounts. These accounts are as follows:

1. production account (agriculture, industry and services), 2- factors of production accounts (employment compensation of urban private sector; employment compensation of urban public sector; employment compensation of rural private sector; employment compensation of rural public sector; mixed income and other operational surplus), 3- current domestic institutional accounts (urban households, rural households, and companies).

The other accounts (capital, government, taxes, subsidies and the rest of the world) have been consolidated. The consolidated account, is known as exogenous accounts [15].

4. The Empirical Results and their Analysis

On the basis of equation (9), the aggregated 1996 SAM (Table 6), multiplier matrix *Mb* and its decomposed components: $(Mb_1 - I)$, $(Mb_2 - I)\ Mb_1$ and $(Mb_3 - I)\ Mb_2\ Mb_1$ for the Iranian economy have been estimated, and the results are shown in Tables 6, 7, 8, 9 and 10 respectively.

The analyses of data are organized in three distinct sections as below:

4-1. Production Multiplier Matrix

Table 3 shows the results of production multiplier for three major sectors of the economy: agriculture, industry and services. The data reflect the direct and indirect effects of one unit worth (one billion rials) of injections of each sector on the production of that sector. The column sum of each sector shows total production which is supposed to be produced by each sector in order to meet the direct and indirect requirements of one extra unit worth of injection.

The results depict that agricultural sector with 3.442 billion rials.

Table -3. Production Multiplier Matrix (Direct and Indirect Effects of one billion rials Injections).

	1-Agriculture	2- Industry	3- Services
1- Agriculture	1.547	0.405	0.371
2- Industry	1.227	2.64	1.045
3- Services	0.668	0.448	1.612
Totals	3.442	2.917	3.028

Source: Table 7

Contributes more to the total economy as compared to service sector (3.028 billion rials) and industrial sector (2.917 billion rials). Out of the total 3.442 billion rials by the agricultural sector 1.547 billion rials is to be produced directly and indirectly within the agricultural sector, In order to meet directly and indirectly the one unit worth of injection in agriculture, the other two sectors have to produce, 1.227 and 0.668 billion rials respectively.

Similar explanations are applied to industry and service sectors.

The above results reveal the overall effects. One of the advantages of the matrix multiplier in SAM is that each element of it can be decomposed similar to what is expressed in equation [(9)].

For example, the direct and intermediate requirement within agricultural sector to satisfy one unit worth of extra injection in that sector, is 1.547 billion rials. This increase in output is due to four effects: Initial effects, transfer effects, cross effects (open loop effects), and closed loop effects. The overall results are shown in Tables 7, 8, 9 and 10 respectively.

Therefore, we can write $1.547 = 1+0.12+0.212+0.125$

To satisfy the direct and indirect requirements of the same amount of injection in agriculture, the industry and service sector should produce

Table –4. Factors of production Multiplier Matrix (Direct and Indirect Effects of one billion rials of Injections)

	1-Agriculture	2-Industry	3-Services
4-Employment comp. urban Prvt sector	0.082	0.093	0.086
5-Employment comp. Urban Pub. Sector	0.121	0.069	0.232
6- Employment comp. rur. Prvt. Sector	0.106	0.065	0.049
7- Employment comp. Rur. Pub. Sector	0.038	0.039	0.063
Totals (4+5+6+7)	0.347	0.266	0.430
8- Mixed Income	1.000	0.481	0.654
9-Other operation surplus	0.846	0.851	0.930
Totals (8+9)	1.846	1.332	1.583
Sum totals	2.193	1.598	2.014

Source: Table 7

directly and indirectly 1.227 and 0.668 billion rials, which are due to the four effects as follows:

$1.227 = 0 + 0 + 0.607 + 0.620$

$0.668 = 0 + 0 + 0.318 + 0.350$

The remain figures in Table 3 can be decomposed in the similar way.

4-2. Factors of Production Multiplier Matrix

The direct and indirect effects of one extra unit worth of injection of each sector with emphasis on the structural distribution on the different socio-economic groups of factor of production have been estimated and shown in Table 4. These figures represent the direct and indirect income generation of three main sectors on the 6 groups of the factors of production.

The results show that total income (directly and indirectly) generated by the three sectors of economy, agricultural sector with total income of 2.193 billion rials stands first. Services and industry with 2.014 and 1.598 billion rials respectively come after agriculture.

Therefore, it is observed that emphasis on development of agriculture can directly and indirectly lead to more production and generate more income to the factors of production.

Of the total income generated by agriculture, the share of labour income is 15.8 percent and the remaining 84.2 percent is the share of other non-labour factor of production. The mixed income with 45.5 percent constitutes the highest share of the total income generated by agriculture.

The share of capital (operation surplus) is 38.6 percent which takes the second position. The labour or capital shares out of 45.5 percent of income has not been distinguished here and need a separate attempt [16], as the mixed income belong to those groups of self-employment who do not have employees. Separating about 46 percent of mixed income and allocating it to labour compenation and capital is beyond the scope of this article and requires a separate attempt. Besides, the results reveal that the highest shares of mixed income are concentrated in those sectors which have highest self-employment, like agriculture and services [17].

Similar to the figures of Table 3, each element of Table 4 can be decomposed in four components.

For example, direct and indirect effects of a unit worth increase of injection in agriculture, brings about an increase of 0.106 billion rials for employment compensation of rural private sector and other operating surplus of 0.846 billion rials. These figure can be decomposed as follow.

$0.106 = 0 + 0 + 0.008 + 0.098$

$0.846 = 0 + 0 + 0.086 + 0.759$

4-3. Income Multiplier Matrix of Different Domestic Institutions

The results in Table 5 show the direct and indirect effects of a unit worth increase of injection of each economic activities on increase of income of domestic institutions like urban households, rural households and companies.

The results reveal that the highest income generated directly and indirectly is in the agricultural sector with 2.419 billion rials.

The incomes generated by the services and industrial sectors are 2.245 billion rials and 1.813 billion rials respectively.

Table- 5. Institutional Income Multiplier Matrix in Different Sectors (Direct and Indirect Effects of one billion rials of Injections)

	1-Agriculture	2-Industry	3- Services
1- Urban Households	0.981	0.691	0.925
2- Rural Households	0.614	0.331	0.427
3- Companies	0.824	0.811	0.893
Totals	2.419	1.331	2.245

Source: Table 7

The overall results of Table 5 give an indication that the direct and indirect effects of socio-economic development of all three sectors in Iran economy will lead the institutional income distribution towards urban households. The direct and indirect effects of the development of industrial sector as compared to the development of agricultural sector, has less tendency to widen the distributional issue of income between urban and rural areas. Just the opposite is observed in the case of service sector.

5. Summary and Conclusions

The contents of this article, have been organized in five sections. In Section 1, the socio-economic analysis of SAM multiplier, and its flexibility with respect to the aggregate Keynesian multiplier, extended Keynesian multiplier, and Miyazawa's multiplier have been briefly reviewed. The methodology of SAM in terms of endogenous and exogenous accounts with emphasis on accounting price and fixed price multipliers are presented in Section 2. In Section 3, the nature of data and its adjustments in the SAM framework have been discussed. In Section 4, the empirical results with respect to three SAM multipliers: production, factor of production and domestic institutional multipliers have been presented. The overall results indicate that:

- The direct and indirect effects of an extra unit worth (one billion rials) of injection in each sector, will lead to more production in agricultural sector than in the other two sectors (industry and services).
- The same direct and indirect effects propagate the highest incomes for factor of production by the agricultural sectors.
- Of the total income generated by the agricultural sector in the overall economy, 15.8 percent is the income share of labour and 84.2 percent of the total income goes to non-labour.
- Out of 6 groups of the factors of production in agricultural sector, share of mixed income is 45.5 percent of the total income generated by that sector which is considered to be the highest one.
- The results also reveal that the agricultural sector has more tendency to generate more income to the domestic institutional sectors.
- The direct and indirect effects of the development of agriculture, industry and service sector bring about more income to urban households than to rural households, and thereby showing a widening inequality of incomes between urban and rural areas [(18)].
- It is observed that distributional gaps between urban and rural household in development of industrial sector is less than agricultural and service sector. The development of service sector has a tendency to exarcebate the socio-economic policy of distributional issues as compared to the development of agriculture and industrial sectors in Iran.

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15. For detailed information regarding the role of endogenous and exogenous accounts and their classification in SAM, refer to:
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16. For detailed information regarding the role of mixed income in socio-economic analysis of income distribution and employment, refer to: Banouei, A.A., and Mahmoodi, M. (2001) The Importance of Mixed Income

and its Link to Generation of Employment in the Framework of Semi-SAM, Plan and Budget, No. 74 (in Persian)

17. Whether the estimation of mixed income in different sectors could be considered a good approximation for determination of informal sector in the economy, requires a separate attempt.

18. Similar results had been observed by Prof. Pyatt thirty years back. For detailed information about his conclusion, refer to, Pyatt, G (2001).