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Modeling Household Income and Consumption Expenditure Multipliers for Uzbekistan Based on SAM

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Abstract

The empirical analysis of current development process impact on welfare and distribution of income and consumption among individuals has been at the centre of economic research over the last three to four decades, since this type of research has largely come to address important issues of inequality and poverty measurement. Post-2015 Development Goals agenda has placed greater focus of economic policy to such the priority areas as sustainable economic development, poverty reduction and employment growth based on activation of new sources related to the increase in the quality of human capital. In this regard, special attention is required to study the effectiveness of mechanisms to promote sustainable growth of welfare and improvement of living standards in Uzbekistan.

This article discusses the multiplicative effects of economic shocks on incomes and consumption of household quintiles using data from the SNA accounts on distribution and use of income. Particularly, it analyses the path of quality of life of society and possibility to achieve a significant goal to improve the competitiveness and efficiency of the national economy applying SAM model in order to measure population differentiation in terms of spending on food and non-food consumer goods and services.

Results show, that despite the fact that the impact multiplier of food production is the largest for the first quintile (relatively to multiples of non-food industries and services), its impact is small enough to be a tool for poverty reduction in Uzbekistan. Moreover, only the stimulation of production of goods and services may not have a significant impact on the reduction of inequality in income distribution. The preferred tool to protect vulnerable sectors of the population and reduce poverty is targeted support, which forms the basis for the economic policy of Uzbekistan on the way to sustainable and shared growth.

Introduction

Long-term objectives of sustainable economic growth challenge current approaches to economic policy-making and putting into the foreground activation of new sources of economic growth, primarily related to the increase in the quality of human capital, macroeconomic efficiency and innovative capacity of the economy. Attainability of these goals calls for relevant macro-economic models providing reasonable settlement in the framework of long-term shared growth. This social aspect of development (shared growth of welfare) can be studied in terms of consumer spending differentiation dynamics which directly affects the level of security in food and non-food consumer goods and services of different population income groups.

Economic growth in Uzbekistan over the past 10 years compared with other CIS countries was one of the highest (GDP increased by almost two times or 2.6 times in purchasing power terms). Stable economic growth led to per capita incomes growth and shrinkage in the share of poor population by 10 percentage points. Further successful of social and economic development critically depends on the balanced strategy of macroeconomic regulation aimed at low-income households and reduction of population differentiation in terms of consumer expenditures.

This paper considers the effect of the economy growth and its sectors development, as well as on-going policy measures on inequality in income and consumption. Using SAM model the hypothesis of a strong correlation between the growth of output in three aggregate sectors of the economy (industry, agriculture and services) and growth of income and consumption is tested.

In the theory of national accounting, Social Accounting Matrix (SAM) is a special tool for analysis of the relationship between the structural characteristics of the economy and the distribution of income and consumption expenditure over quintiles. SAM gives a combined representation of supply and use tables and accounts of institutional sectors (household and the government sectors income distribution and use accounts).

This approach is widely used to study the partial equilibrium (which misses changes in (1) the price level and (2) the level of supply according to assumption of limited volume of resources), taking into account all direct and inverse relationships of flows in the business cycle [1-3]. "Under certain conditions (the existence of excess capacity and underutilized labour resources) SAM evaluates the effects of exogenous changes on economy. As long as the excess capacity and labour prevails, any exogenous change in demand can be met by a corresponding increase in production [3], without causing any effect on prices". SAM multipliers derived through inverse transformation of the SAM matrix evaluate total direct and indirect effects of exogenous shocks on the endogenous accounts (i.e. on the aggregate production of goods and services, factors revenues and incomes of socio-economic groups).

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The main data source used for construction of SAM for Uzbekistan was System of National Accounts (SNA), last available Input - Output table, National Household Budget Surveys.

Compared with the Input-Output model with fixed coefficients, SAM model allows a more complete analysis of the multipliers because of estimation of the effects of income distribution. The advantage of this model over the Input-Output model is a feedback relationship from factor incomes (wages, profit, mixed income, etc.) of different quintiles to final household demand. In this regard, SAM represents all flows in economic cycle and serves as the basis for the construction of a simple linear multiplier model, linking primary incomes and final expenditures in the economy (in a closed character). However, application of the SAM model is limited due to assumptions on the availability of underutilized (idle) resources (limited capacity to increase supply), and the fixed level of prices, which is a serious limitation for the long-term estimations. However, there is a lot of research, showing these two conditions are met in most of the developing economies with rigid prices and are widely used in DSGE modelling. Another possible drawback of the SAM model is the use of "unitary expenditure elasticity's", which may differ significantly from the marginal values [3]. But again log-linearization of DSGE model is a simplification that affects results to large extent.

Therefore, SAM multipliers of endogenous accounts represent a linear model reflecting the structural characteristics of the income distribution among different income groups (quintiles) under current production and consumption patterns.

Finally, Deaton states that comparisons of economic growth effects on welfare based on national accounts can overstate mean consumption growth since they exclude services that are not changed in a market (of low-income economies) causing the measured fraction of people in poverty to be underestimated. Despite this fact, based on the methodology of social accounting matrix have been constructed for various developing countries such as China, Indonesia, Malaysia, Africa and others.

Methodology

SAM is a set of macroeconomic indicators of the country at a particular time, and is used to assess the macroeconomic impact of microeconomic effects (according to the household budget surveys). Thus, innovation of the SAM approach is integration of the macroeconomic and microeconomic data into a coherent system (Table 1).

Decomposition of the matrix on exogenous and endogenous variables makes it possible to go from the structured system of SAM data in tabular form to SAM model. As a rule, accounts specified as instruments of economic policy (for example, government spending, including social protection, investment and exports), are exogenous

and accounts specified as targets should be endogenous (eg., output, demand goods, factors and income or household expenditure). Then the impact of any changes in exogenous SAM accounts is transmitted through the interdependent system of SAM endogenous accounts. Interrelated system assumes that the income factors of households and production are derived through the multiplicative effects of exogenous shocks on the economy.

The total multiplier in this extended model $M=(I-A)^{-1}$ is calculated from the matrix identity $Y=A*Y+X$, for which $Y=(I - A)^{-1} * X=M* X$. Matrix of multipliers can be interpreted as a simplified model, showing relationships in the whole economic system. Thus, SAM model shows total multipliers as final results derived from patterns, but does not reflect the process by which they are created.

In this system, vector of incomes of endogenous accounts Y (production activities y_1, factor income y_2, household income y_3) can be obtained by multiplying the vector of exogenous shocks X on the multipliers matrix M. These endogenous indicators show the total effect, including the direct and indirect effects, and the impact of cyclic interactions caused by initial increase in any of the exogenous components (x1, x2 and x3).

Estimation Results

The total multiplier for Uzbekistan

We begin our analysis with calculation of the total multipliers for Uzbekistan economy. In the base SAM matrix economy is represented by three aggregated sectors covering the production and consumption of food and non-food goods and services (Figure 1), and five household income groups (Figure 2).

An analysis of the overall structure of multipliers for Uzbekistan (Figure 1) showed that the average multiplier effect is 2.33, which means that the positive shock or infusion into the economy of 1 million sum (for example, due to an increase in public spending or investment), will increase output of all industries by an average of 2.33 million sum.

The elements of the total multipliers matrix reflect the interdependent nature of the production process that is showing how much each sector is integrated with other sectors. For example, the intra-relationships (diagonal elements) of non-food products sector are higher (1.69) than in other sectors (1.45 in food and service sectors) [4]. However, non-food products sector has not yet become a potential tool for activation of production and demand for intermediate products of other sectors (eg, it induces intermediate demand in services sector only on 0.25 units). Service industries are closely integrated with other sectors (2.65) and infusion (government spending, investment and exports) in the service sector is important for the active work of other sectors of the economy; the greatest contribution of the development of the services sector is the expansion of production of non-food products

Account	1a-PA	1b – CM	2-FP	3a-HH&OI	3b … 5 EXO	Income
1a-PA		A1a,1b=T1a,1b/Y1b			X1a	Y1a
1b-CM	A1b,1a=T1b,1a/Y1a			A1b,3a=T1b,3a/Y3a	X1b	Y1b
2-FP	A2,1a=T2,1a/Y1a				X2	Y2
3a-HH&OI			A3a,2=T3a,2/Y2	A3a,3a=T3a,3a/Y3a	X3a	Y3a
3b…5 Leaks	B1a=L1a/Y1a	B1b=L1b/Y1b	B2=L2/Y2	B3a=L3a/Y3a		
Expenditure	E1a=Y1a	E1b=Y1b	E2=Y2	E3=Y3a		

Note: Y(t)=A Y (t) + X(t)=(I – A) –1 X(t)=MaX(t), Where, t: Period; Y: Endogenous vector of incomes; X: Exogenous vector of expenditures; A: Average propensity to consume matrix for endogenous variables.

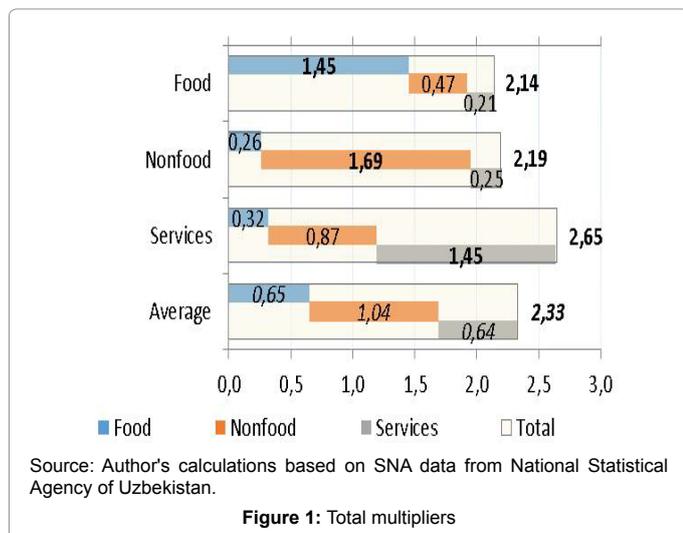**Table 1:** SAM model мatrix coefficients and vectors.

Source: Author's calculations based on SNA data from National Statistical Agency of Uzbekistan.

Figure 1: Total multipliers

Source: Author's calculations based on SNA data from National Statistical Agency of Uzbekistan.
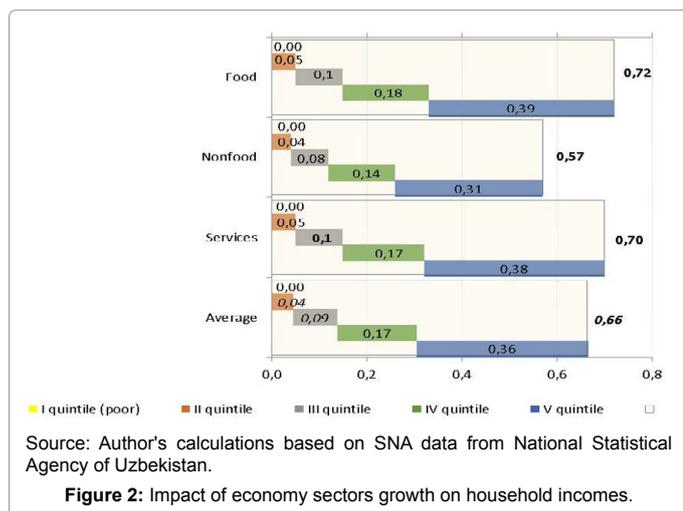
Figure 2: Impact of economy sectors growth on household incomes.

(0.87). This means that in economic policy, it is preferable to stimulate the development of the service sector, as this sector has the greatest positive effect on the whole system of production, in particular for the stimulation of production of non-food products.

On the other hand, food products are somewhat less integrated with other sectors (2.14), including the smallest induce of growth in the sphere of services (0.21), thus showing that the investment in this area will have a somewhat smaller multiplier effect on the volume of production in the economy as a whole (stimulating growth of the sector of non-food industries by 0.47).

At the same time, the institutional sector of non-food items receives the highest revenues (1.04) under a current patterns of stimulation of all economy sectors compared with lower revenues received by the sector of food and services sector (0,64-0,65).

Furthermore, the growth of production and generation of revenues in certain sectors of the economy lead to changes in the dynamics of household incomes (Figure 2). Since earnings are the result of the circulation of the various cash flows in the economic system, it becomes important to analyse structure of relationships in the economy and assess the effects of external factors and shocks on income distribution, first of all on the income of poor households. Such assessment of the impact of shifts in the level and structure of production and final consumption on economic growth, incomes and consumer spending rates meets the challenge to achieve the potential level of economic development through the improvement of human capital (due to growth of spending on education and health) or better economy structure [5].

We focus attention on the main source of household income, which is promoting production activities (other possible sources of household incomes are growth of other factor incomes besides salary, such as profits from business activities, income from property and farms, as well as household income received in the form of transfers, including those from abroad).

Figure 2 shows household incomes growth submatrix M_{31}, which shows changes in incomes in each quintile of households under the influence of one unit of financial investments in the economy sector. The sum of each column reflects the impact of the growth in economy sectors on the growth of income of each quintile.

Investing 1 million sum in the economy will increase incomes of all households by 0.67 million sum (1.99/3). However, the greatest multiplier effect is for Vth quintile (1.08), which means that the greatest benefit from the stimulation of production will receive the wealthiest segment of the population. It is interesting to note that highest income growth this richest V-th quintile will receive from the growth of production in industries that produce food products (0.39) and services (0.38).

Investments in the production of food products and services has the highest multiplier effect on the incomes of all household groups (0.72 and 0.70, respectively), but they will lead to rise in the level of differentiation of incomes if there will be no additional income redistribution instruments (except of existing proportional taxation of personal incomes).

Households are divided into 5 groups according to their monthly per capita income, where I and V are quintile is the group of households with the lowest and highest income, respectively.

Submatrixes M_{13}, M_{23}, M_{33} reflect changes of growth in consumption, factor incomes and household incomes from the one unit of cash injections in each income quintile group.

Matrix M_{33} (Figure 3) reflects the impact of exogenous increases in household income to given household quintile income and income of other quintiles.

This matrix is a structural measure of inequality of income distribution, since it shows how the exogenous incentives to increase household income affect these incomes.

With the exogenous growth of income of all households on the 1 unit (mln. UZS) incomes of 5th quintile will increase by 2.57 units (mln. UZS), whereas the incomes of the1st and 2nd groups will rise insignificantly (by 1.002 and 1.19 units, respectively) requiring direct assistance to the poor population in the form of transfers.

Referring to the values of the columns, note that 1.87 is the highest rate among the groups making it obvious that an increase in incomes of the poor will result in the largest income growth for all groups of households. That means that when the state targeted support for low-income population by means of a transfer of 1 unit (mln. UZS), income of the total population will increase by 1.86 units (mln. UZS), showing sizeable assistance to each household.
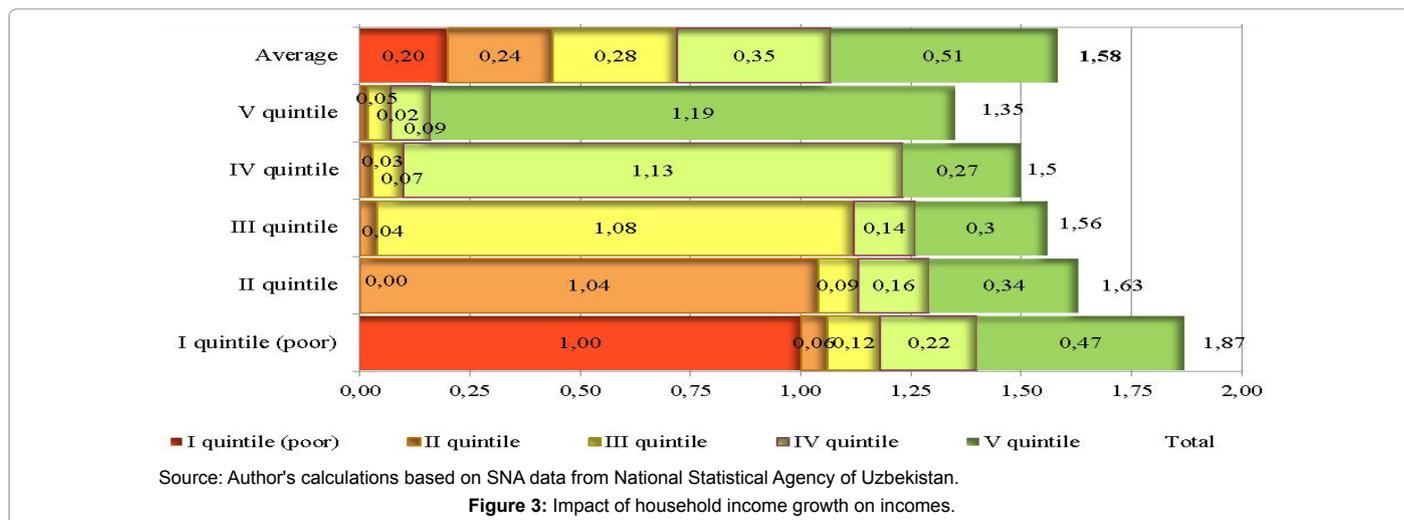
Source: Author's calculations based on SNA data from National Statistical Agency of Uzbekistan.

Figure 3: Impact of household income growth on incomes.

An analysis of the total sum of the rows of matrix in depicted in Figure 3 shows valuable structural patterns of the income distribution at the present stage of economic development, income distribution is not in favour of the poorest households, which also have the lowest level of consumption. This suggests that any intervention of economic policy increases incomes of this group of households and will lead to a more equitable distribution of income.

The increase in incomes of the poorest groups of the population has the greatest multiplier impact on the income growth of all household groups (1.87).

Multiplier effect of consumption growth M_{13}, despite not being a direct measure to reveal poverty, is among the main indicators revealing population differentiation through more or less elastic average propensities to consume goods and services (Figure 4). For example, more than unit elastic linear elasticity's of consumption reveal high dependency of consumption goods on income meaning this this commodities are luxury for given income group.

Note that all elements of the matrix decrease uniformly, moving along the row (from the quintile I to quintile V), which indicates that the average propensity to consume is higher among the poor than the rich. Therefore, the multiplier of the quintile I is the highest (2.85), which means that with an increase in incomes of the most disadvantaged by 1 unit (mln. UZS) increases consumption by 2.85 units (mln. UZS). Therefore, promoting the increase of income of the poorest group will lead to a significant increase in demand for goods and services, thereby contributing to the growth of GDP.

Secondly, despite the fact that a largest share of consumer spending in all quintiles is expenditures on food products, consumption growth multipliers of non-food products in all groups except the first quintile are higher than the multiplier effect of growth of consumption of food products. This indicates that at the present stage of development of the economy households with an increase in their incomes tend to reduce the share of food products and increase the share of non-food goods (and services) in their total expenditures (Figure 5), because the most part of population has not yet reached "the saturation point" in the demand for durable goods (household appliances) and other non-food commodities (household goods). Thus, rising levels of per capita incomes will lead to higher demand and probably faster growth of production of the non-food products only if there will be available
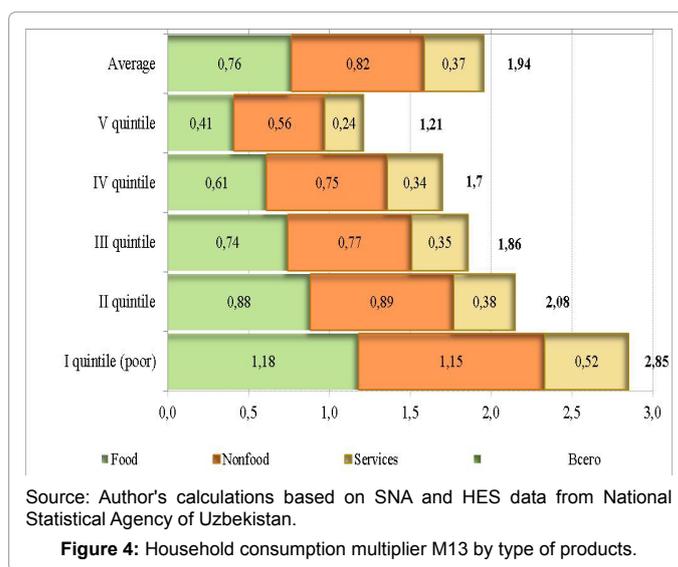

Source: Author's calculations based on SNA and HES data from National Statistical Agency of Uzbekistan.

Figure 4: Household consumption multiplier M13 by type of products.

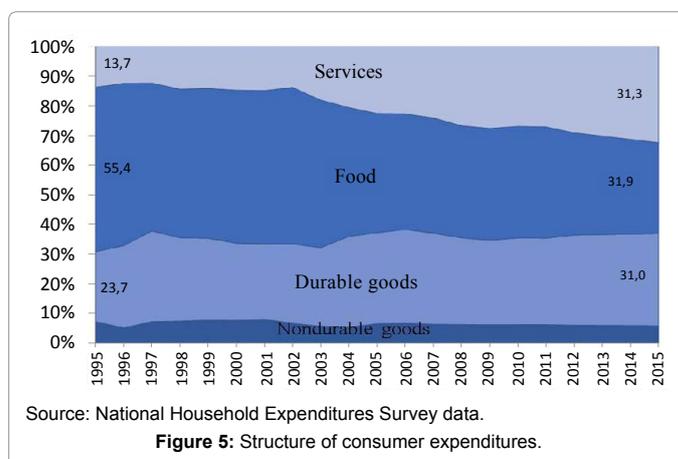Source: National Household Expenditures Survey data.

Figure 5: Structure of consumer expenditures.

underutilized resources of production, otherwise in the case of a lack of spare capacity there will be rise in prices and imports of non-food goods.

As a result, changes in the structure of household final consumption in the direction of increasing expenditures on paid services (including services that impact on improving the quality of human capital, i.e. education and health services) and non-food products, along with a direct positive impact on the economic growth acceleration in the short term provides a qualitative impact on the macroeconomic dynamics, contributing to changes in the structure of produced GDP in the direction of increasing the share of services and high-tech sector, which is a factor of long-term economic growth.

Conclusion

Summarizing the results of the analysis, it can be concluded that the hypothesis of a strong relationship between growth of output in three aggregate sectors of the economy (industry, agriculture and services) and growth of income and consumption is rejected. To verify the factors of poverty reduction (in terms of per capita income) four different multiplier effects are identified, illustrating four structural patterns of economy.

First, investments in the production of food products and services have the highest multiplier effect on the incomes of all household groups (0.72 and 0.70, respectively). However, the greatest multiplier effect is for V-th quintile, which means that the wealthiest segment of the population will receive the greatest benefit from the stimulation of production (income growth of the V-th quintile from the growth of production in industries that produce food products is 0.39 and services is 0.38). Therefore, only investments in the production of food products and services will lead to rise in the level of differentiation of incomes if there will be no additional income redistribution instruments (except of existing proportional taxation of personal incomes). This suggests that any intervention of economic policy that increases incomes of this group of households, will lead to a more equitable distribution of income.

Next, striking demonstration of last fact is given by estimated structural patterns of the income distribution (Figure 3) at the present stage of economic development, which show that income distribution is not in favour of the poorest households. Total sum of the first row equals to almost unity, showing that de facto there is no multiplier effect on the poorest quintile when incomes of all quintiles are increased equally. From the other side, the straightforward increase in incomes of the poorest groups of the population has the greatest multiplier impact on the income growth of all household groups (1.87).

Third, an analysis of the overall structure of the total multiplier for Uzbekistan economy shows that it is preferable to stimulate the development of the service sector, as this sector has the largest positive effect on the whole system of production and acceleration of growth rates of total output in the entire economy. In particular development of the services sector is fundamental for the expansion of output of non-food commodities (with the highest cross-sectorial multiplier effect equal to 0.87), whereas non-food products sector has not yet become a potential tool for activation of production and demand for intermediate products of other sectors (eg, it induces expansion in services sector only on 0.25 units). Moreover, such stimulation of

services could lead to increased demand for other industries (food and non-food production), which provide an additional source of income of other population groups and thus subsequently leads to an increase of incomes of the poor.

Fourth, the multiplier of consumption, in spite of the fact it cannot serve as a tool to fight poverty, is one of the main indicators to revealing population differentiation through changes of expenditure multipliers (eg., when high average propensities to consume testify the food is still considered luxury for the poor). The average propensity to consume food is much higher among the poor (1.18) than the rich quintile (0.41), and the resulting total multiplier of the first quintile is the highest (2.85). Therefore, stimulation of income growth in the first quintile will lead to a rapid increase in demand for goods and services, thereby immediately contributing to the growth of GDP.

Thus, basing on the sub-matrix of household income growth, we can conclude that the highest multiplier effect on the income of all household groups (0.72) has a stimulation of food production.

Despite the fact that the multiplier of increasing food production on household incomes is highest, it is small enough to stimulate the growth of incomes of the poorest quintile, and the stimulation of production of goods and services without the support of socially vulnerable layers of the population will have limited impact on the reduction of poverty and income inequality.

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