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Spillover Effect of Technical Change at Agricultural and Industry and Mining Sectors of Iran, A CGE Model Approach

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Abstract: Productivity promotion is undoubtedly the requirements of economic growth, which according to the change at production inputs and development of technology and human capital, also has a growing importance. At economic lecture technology defined as production method and technology change is altering at ratio of production factor. TC (technical change) through change of production inputs share will be change the productivity. This will change the input ratio to production. The impacts of technical change on different sectors of the economy as well as on the economic variable in these sectors are likely to differ. Hence in this study, in order to examine TC in relation to other economic variables, at first production function with two inputs (capital and labor) estimated for Iran economy. Then changing the ratio of production inputs in the form of different scenarios, changing at economic sectors estimated. In order to examine all aspect we use a computable general equilibrium model. The results show improve technology coefficient of capital has greater impact at economy than improved technology coefficient of labor. In addition, these results indicate a strong relationship between the agriculture sector and industry-mine sector at economy of Iran.

JEL Classification: O33 % C68 % Q10 % L60
Key word: Technical Change % Economic Sectors % CGE model

INTRODUCTION

Productivity promotion is undoubtedly the requirements of economic growth, which according to the change at production inputs and development of technology and human capital, also has a growing importance. Hence, investigation of variable that affect at growth or decline in productivity is considered among the topics of interest to research. Undoubtedly technology is one of the major variables affecting productivity. At economic lecture technology defined as production method and technology change is altering at ratio of production factor [1]. TC (technical change) through change of production inputs share will be change the productivity. This will change the input ratio to production.

In the absence of any technological change, all changes in the level of output would bias depend on changes in the quantities of production factors, Long run economic growth is associated with technological progress in the both neo-classical growth models, which treated technological change as exogenous and even in the endogenous growth models.

There are two well-known growth models: the neo-classical (Solow) model and the endogenous model, which both define and discuss the technology evolution and its effect on economic growth. According to neo-classical growth model, technology is treated as an exogenously given and cost free factor, which its evolution determines by an exogenously law. As a contrast opinion the endogenous growth model considers technology as a result of investment in the research and development (R&D) sector and market forces guide its development. Both models suffer of some shortages.

Technical progress disembodied if it is a result of new equipment or new skills and is called disembodied if output increase as a result of improvement in productivity

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of old equipment (and existing skills) when quantity of inputs remain unchanged. Characteristic of disembodied technological change is thus factor augmentation.

There is direct relationship between TC (technical change) and productivity, which it can be said to technical change at the end caused to increasing at productivity [2]. In economic production function technical change and improvements in the process for production goods and service can shift production function upward that at the end it caused to increasing productivity level [3].

The economic significance of technical change (TC) and productivity growth has been the subject of investigation in many empirical studies on economic structure (e.g. Solow, [4] and Jorgenson, [5]). At the economic lectures has examined the impacts of technical change by using mainly two different approaches: the index number approach and the econometric approach [6]. In these articles productivity index calculated mainly by estimation production function. There is different definition for technical change.

The impacts of technical change on different sectors of the economy as well as on the economic variable in these sectors are likely to differ [7]. Hence in this study, in order to examine TC in relation to other economic variables, at first production function with two inputs (capital and labor) estimated for Iran economy. Then changing the ratio of production inputs in the form of different scenarios, changing at economic sectors estimated. In order to examine all aspect we use computable general equilibrium.

Literature Review: There is various practical researchers work on technical change. According to Jin and Jorgenson [8] the standard econometric approach to investigation the rate of technical change was introduced by Binswanger and described by Binswanger and Ruttan, Jorgenson and Ruttan. Pue-on and *et al.* [4] explored efforts to encourage producers to use agricultural machinery and equipment will significantly improve agricultural productivity, income distribution amongst social groups, as well as macroeconomic performance in Thailand by using Computable General Equilibrium. Heshmati and Kumbhakar [2] assumed technical change is mostly endogenous variable that function of time trend and other exogenous factors. They calculated TFP (total factor productivity) and showed that the estimated rate of TFP growth is technology driven. At the other article Jin and Jorgenson [8] presented new approach to econometric modeling of substitution and technical change. They investigated the effect of input and output price at technical change by using price translog function and showed find that biases of technical change are substantial in magnitude, comparable to responses to price changes. By estimation production function for Indonesian manufacturing, Margono and Sharma [9] decomposed skill-biased technical change. They have found that the enhancement technical change and technical efficiency are an important means to improve productivity level in the Indonesian manufacturing. Baltagi and Rich [6] examined technical change between Production and nonproduction labor in US manufacturing industries by using general index approach over the 1959-1996 periods. The result of this study showed that skill-biased technical change effects are most evident prior to 1983.

Model Details: We use the model that has been made by Dr Lofgren as a base and extend and adjust it for Iran economy.

Table 1, indicates details of institutions, production factors, activities and commodities in model. Model details follow data of computed SAM.

In this model it is assumed that each sector maximizes its own profit subject to the neoclassical production function with constant substitution elasticity for factors and fixed coefficients for intermediate inputs.

$$QA_a = ad_a \prod_f QF_{fa}^{a_{fa}} \quad a \in A, f \in F \tag{1}$$

$$QINT_{ca} = ica_{ca}.QA_a \tag{2}$$

Each activity is able to produce other sectors products. Only oil and gas sector products only one output (oil and gas). Figure 1 illustrates production technology in economy.

In the goods market prices are flexible and change for cleaning markets in the competitive condition. Thus demanders and suppliers are price taker in this model. The factor incomes generated in the production process, are paid in fixes shares to the enterprises. These incomes are distributed between enterprises (for capital factor) and household (for capital and worker factor) in constant ratio. Enterprises spend their income on paying tax, purchasing consumption goods or saving. The residue of enterprises' income transfers to households (as capital gain) or other economic enterprises (transfer between enterprises).

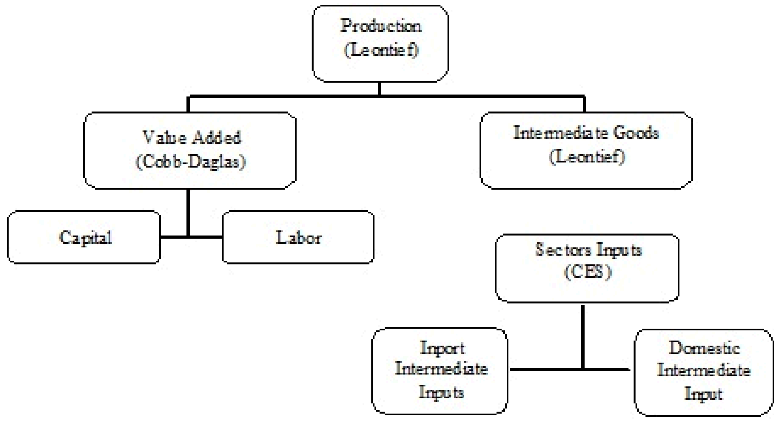

Fig. 1: Production Technology

Table 1: Model Details

Set	Elements
Activities	Agricultural, Industry and Mining, Oil and Gas, Service, Construction
Goods	Agricultural, Industry and Mining, Oil and Gas, Service, Construction and Trade commodities
Factors	Labor force and Capital
Households	Rural and Civic
Other Institutions	Government, Enterprises and Rest of The World

Households also earn from their own primary production factors stock (directly from labor force and directly and indirectly from capital through firms).

$$YF_{hf} = (\sum_{a} \overline{WF}_{f}.WFDIST_{fa}.QF_{fa} + tr_{f.row}.EXR) \quad (3)$$
$$h \in H \;,\; f \in F$$

Furthermore total income of households contains transfer payments from other economic institutions (government, enterprises and income of labor force who work out of country).

$$YH_{h} = \sum_{f} YF_{hf} . + \sum_{i} tr_{hi} \quad (4)$$
$$h \in H \;,\; f \in F \;,\; i \in I$$

Households spend their income on paying tax, consumption and saving. They also transfer some of their own income to enterprises (for investment). The household consumption is shown by demand function results from maximizing the utility function.

$$QH_{ch} = \frac{b_{ch}(1-\overline{MPS}_{h})(1-ty_{h})YH_{h}}{PQ_{c}} \quad (5)$$
$$c \in C \;,\; h \in H$$

The government income results from the direct tax (income tax) and indirect tax (tax on sale, import, export and economic activities) and foreign loans.

Tax bases include constant ratio of tax rates. This income is spent on government fixed consumption expenditure or transfer payments to other domestic institutions. Some of government income may be used for paying back the foreign loans. What remains from government income will be saved. If the government saving is positive it specifies the budget surplus and if it is negative, it specifies budget deficit. Considering the government budget deficit in a specific year, government investment expenditure is provided by financial resources of monetary system of the country.

Other countries, on the one hand, communicate with domestic economy by giving financial payments in the form of loan or investment, to government or financial market ;and on the other hand,by receiving loans ' payback, taking loan from domestic government or absorbing financial payments from financial market.In addition, the other aspect of foreign countries cooperation with domestic economy occurs by importing commodities or exporting.The assumption considered in this model is that in comparison with world economy, the economy of country is small scaled. So, export and import are done under price circumstances, determined globally.Transferring the income of labor force, working out of country, towards country and on the opposite side, transferring the income of foreign labor force, working inside country to out of country, is another aspect of domestic economy cooperation with global economy.

In this model, the assumption of qualitative difference between domestic products and import commodities is considered. On domestic demand side, this qualitative difference is taken into consideration under the assumption of imperfect substitution between import and domestic products which are supplied in domestic market. It means that if a specific good has an import equivalent, aggregate domestic demand -for households, government consumption, investment and intermediate demand - is prepared by combination of import goods and domestic products (in another word it is called composite commodity).

$$QQ_c = aq_c\,(d_c^q \,.QM_c^{-r_c^q} + (1-d_c^q)\,.QD_c^{-r_c^q})^{-\frac{1}{r_c^q}} \quad c\in CM \qquad (6)$$

The optimum demand quantity of these two groups of commodities depends on their relative price.

$$\frac{QM_c}{QD_c} = \left[\frac{PDD_c}{PM_c}.\frac{d_c^q}{1-d_c^q}\right]^{\frac{1}{1+r_c^q}} \quad c\in CM \qquad (7)$$

Similarly it is also assumed that there is an imperfect transfer for selling domestic products domestically and for their external selling (export). It means that domestic producer is able to supply his or her own product in domestic markets or export them.

$$QX_c = at_{cz}\,(d_c^t .\,QE_c^{r_c^t} + (1-d_c^t).\,QD_c^{r_c^t})^{\frac{1}{r_c^t}} \quad c\in CE \qquad (8)$$

The optimum supplied quantities of these two markets are also determined by their relative prices.

$$\frac{QE_c}{QD_c} = \left[\frac{PE_c}{PDS_c}.\frac{1-d_c^t}{d_c^t}\right]^{\frac{1}{r_c^t-1}} \quad c\in CE \qquad (9)$$

Considered assumptions on both demand side and supply side of the economy, lead to make domestic price system independent from international prices and also makes export and import response to relative prices changes.The quantity of supply and demand responses to occurred changes in relative prices depend on elasticity's, which are defined for equations.

The institution residual income after expenditure deduction is its accumulation. In this study, it is assumed that economic factors don't invest their entire saving, but they keep some in the form of financial funds. These funds contain money and deposited loans, foreign assets and other financial assets.Therefore, total accumulation of each institution, equals sum of the institution's saving and its funds in the last period. Economic institutions allocate some of their accumulation for investment and financial funds.In this model; demand for financial funds is accounted as an equivalent for money transactional demand. Hence, the amount of financial funds is a ratio of each institution's income. After allocating accumulation of each institution to investment and financial funds, investment begins in various economic sectors.

Sum of investment, done by institutions in each economic sector, show the total investment in that specific sector; which is prepared by capital, produced by different sectors. In money market, there is complete movement of financial funds. It means that some of funds can be attained from foreign country and similarly some of funds are transferred to out of country.

The relationships, explained the production, consumption and labor force market, are achieved considering of economic factors behaviors. But all in all, constraints which face economy in reality should be considered. These constraints might not be revealed in economic factors behaviors. Real constraints, remarked in model, are constraints, related to commodity and production factor markets; and nominal constraints, refer to current account, saving-investment account and financial account.

Supply in composite commodity market, is a combination of domestic products, sold in domestic markets and import commodities. Also, demand contains final demand for consumption and investment, demand for intermediate inputs and demand for transactional commodities. Changes in domestic products, supplied in domestic markets, establish equilibrium in domestic output market. However, variation in the amount of import commodities, establish equilibrium in import commodities market.

In primary factor market, we achieve to factors demand function by maximizing profit function for every activities:

$$\overline{WF}_f\,.WFDIST_{fa} = \frac{a_{fa}\,.PVA_a\,.QA_a}{QF_{fa}} \quad a\in A,\, f\in F \qquad (10)$$

In labor market, it is assumed that there is unemployment in this market and according to the assumption of labor force complete movement, wages are fixed but number of labors, used in each sector, is variable. As a result, variation in number of labors,

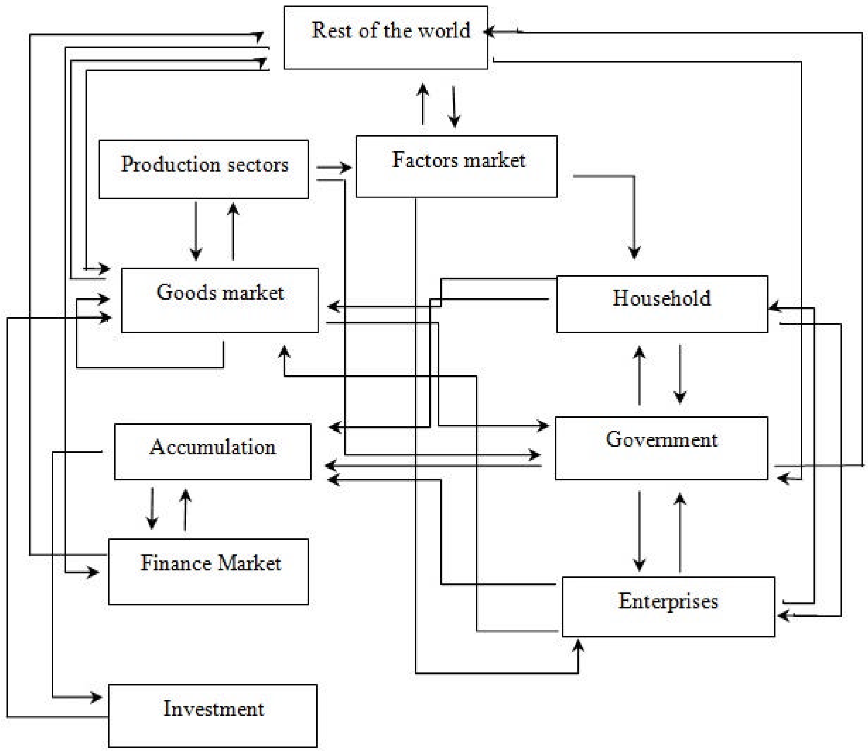

Fig. 2: Model Structure

used in each sector, assures equilibrium in that sector. But in capital market, the amount of capital, used for each sector, is fixed and there is full employment of capital. Variation in rental price of capital assures equilibrium in this factor's market.

Regarding the assumption of fixed foreign saving, current account, considering the rest of the world, will be balanced by import variation. But in saving-investment account, it is assumed that balance in each institution's investment assures equilibrium in that institution.In financial account, regarding fixed primary asset and foreign saving, capital outcome would assure equilibrium in this market.

This model is used for comparative static analysis and doesn't contain any dynamic aspect. For the reason that the capital stock is fixed, this model can be called a short run model. Since the model is computed under the assumption of existence of general equilibrium in economy, for policy analysis, it is assumed that economy moves from one single point to another one (Model equations are based on study of Lafgren 2003 and it was adjusted for Iran Economy). Figure 2 shows the model structure.

Accounting the Requiered Sam Table: Required social accounting matrix in present paper has resulted from social accounting table, accounted for Iran by Dr. Banooei and Dr. Asgari for the year 2001[1]. It consists of 22 types of commodities, 21 production sectors and 7 types of production factors, first and second income allocation account, income and capital expense of civic and rural households, enterprises and government, financial account with 4 sub-accounts and the rest of the world account. Fixed capital formation account is also computed for 21 production sectors.

In the present study, using mentioned social accounting matrix, MACRO SOCIAL ACCOUNTING MATRIX (MACRO SAM) and MICRO SOCIAL ACCOUNTING MATRIX (MICRO SAM) have been computed in proportion to represented general equilibrium model in this paper.

As a result, commodity and service; and activity accounts are summarized in five sectors: agricultural, oil and gas, industry and mining, service and construction. Two types of production factors- labor force and capital-have been considered, too. First and second income allocation account and income expense account

[1]: Ali Asghar Banooei and Manoochehr Asgari , "Iran's social accounting table for the year 2001". Institution of economic research of Iran, Bank of data and papers of Iran's economy

have been also summarized in just one account for civic and rural households, enterprises and government. Financial account is used as just one account, too. Moreover, fixed capital formation account has been prepared and summarized for five given sectors.

Determining Model Parameters: The model has been specified and solved by GAMS program.It contains 2 types of parameters. Share parameters are accounted directly from SAM data and behavioral parameters are accounted by data, out of SAM. These parameters results from previous studies in Iran or similar countries; or estimations, used for similar general equilibrium models.

Simulation: Before going into the technological change forms, it is necessary to understand the terms of the definition of "technical change" and "technological change" because both terms are used in research involving invention and innovations. Jackson defines technical change as "any change in knowledge about production: about methods of production, about products or about inputs to making products and it results in both invention and innovations" Jackson [10]. However, the author states that technological change is the process innovation which involves "a physical alteration (plant, equipment or intermediate products) as a central feature. He also points out that capital-saving (or using) and labor-saving (or using) are the parts of non-neutral technological change [10].

Non-neutral technological change was first introduced by W.E.G. Salter. The original definition of non-neutral technological change was "the labour or capital-saving biases of technical advance are measured by the relative change in capital per labour unit when relative factor prices are constant" [10]. Jackson followed Salter's definition in the production functions as follows:

$$Q = ZL^a K^b \tag{11}$$

Where; Quantity output, Z adjustment factor, L input of labor, K input of capital, the partial elasticity of labor and the partial elasticity of capital. Equation 11 can be expressed in K as a function of Q and L:

$$K = (\frac{Q}{Z})^{\frac{1}{b}} L^{-(\frac{a}{b})} \tag{12}$$

If we take derivative of the equation 12 with respect to L, $\frac{dK}{dL}$;

$$\frac{dK}{dL} = -(\frac{a}{b})(\frac{Q}{Z})^{\frac{1}{b}} L^{-(\frac{1}{b})} \tag{13}$$

The condition for cost minimization is given as follows:

$$\frac{dK}{dL} = -\frac{P_L}{P_K} \tag{14}$$

Where; PL wage rate and Pk price of unit of capital.

Therefore, equation 13 is equal to equation 14:

$$-(\frac{a}{b})(\frac{Q}{Z})^{\frac{1}{b}} L^{-(\frac{1}{b})} = -\left(\frac{dK}{dL}\right) \tag{15}$$

Solving equation 15 for the minimum cost quantity of input of labor (L*) gives:

$$L^* = \left[\frac{\left(\frac{a}{b}\right)}{\left(\frac{P_L}{P_K}\right)}\right]^{-a} \left(\frac{Q}{Z}\right) \tag{16}$$

Dividing equation 11 by 16, yields the minimum cost of the capital-labor $\left(\frac{K}{L}\right)^*$ ratio as;

$$\left(\frac{K}{L}\right)^* = \left[\frac{\frac{P_L}{P_K}}{\frac{a}{b}}\right] \tag{17}$$

Jackson (1998) called a non-neutral technological change as "capital-using" or "labor saving" if the ratio of exponent ($\frac{a}{b}$) falls and then the capital-labor ratio at minimum cost $\left(\frac{K}{L}\right)^*$ increases, meaning that capital is substituted for labor. In contrast, he defined a non-neutral technological change as "capital-saving" or "labor using" if the ratio of exponents $\left(\frac{K}{L}\right)^*$ rises and then the capital-labor ratio at minimum cost $\left(\frac{K}{L}\right)^*$ decreases, indicating that labor is substituted for capital (Table 2).

Simulation Results: Four scenarios examined in this article and Effectiveness of their implementation on important economic variables, namely employment, production, foreign trade, household income, investment and GDP are studied. Scenarios are:

Table 2: A synopsis of possibilities of non-neutral technical change

The ration of exponents (a/b)	The capital-labor ratio at minimum cost $\left(\frac{K}{L}\right)^*$	Non-neutrality is referred to as:
Falls	Increases	Capital-using/ Labor-saving
Rises	decreases	Labor-using/ Capital-saving

Source: Based on Jackson (1998)

Table 3: Coefficients Value

Coefficient	Labor Coefficients (a)		Capital Coefficients (ß)	
Sectors	Agriculture	Industry and Mining	Agriculture	Industry and Mining
Primary Value	0.05	0.24	0.95	0.76
After 5% increase	0.06	0.26	0.99	0.79

Table 4: Effects on Employment

Sector	Technology coefficient	Total employment	Agriculture employment	Industry-mine employment	Building employment	Service employment
agriculture	Labor	1.68	3.94	0.72	0.57	0.67
	Capital	0.89	-9.74	6.36	4.37	6.09
Industry-mine	Labor	3.14	3.33	1.61	2.64	3.25
	Capital	6.95	7.8	-8.75	5.86	7.52

- Effect of 5% increase in the technology coefficient of labor in agricultural sector
- Effect of 5% increase in the technology coefficient of capital in agricultural sector
- Effect of 5% increase in the technology coefficient of labor in industry -mine sector
- Effect of 5% increase in the technology coefficient of capital in industry-mine sector

Primary values for a and ß, computed on Iran SAM table, shows in the Table 3.

Before stating the results of the scenario, mention a point is essential;

In general equilibrium model used in this article the existence of unemployment has been assumed; hence the size of the labor in the economy can grow but the total amount of capital in the economy assumed constant. So increasing capital at one economic sector to reach equilibrium required decreasing capital at other economic sector. Due to this, at scenarios of improve technology coefficient of capital, increase investment efficiency, reduced amount of capital will be used. Therefore capital released from this part is absorbed in other economic sectors. The results of scenario show which economic sectors attract more capital.

Employment: Increase the technology coefficient of labor at economic sectors caused increasing the demand for these inputs. According to unemployment assumption is expected to increase employment at related sector. And through next and previous links effect at the employment in other economic sectors. As technology coefficient of capital improved caused expanding role of capital in the production process can be expected increasing the coefficient has reversed effect on employment in the relevant sector.

Increase technology coefficient of capital in the industry and mine sector will have the greatest impact on employment levels. As shown at table-4, increase 5% technology coefficient of capital at this sector increase 6.95% at total employment. Results show; at general increasing at technology Coefficients at industry and mine sector as compared with agriculture has better impact at employment levels. But increasing technology coefficient of labor at agricultural sector has a greater impact on total employment as compared with increasing technology coefficient of capital. Table 4 show that improve technology coefficient of labor at agricultural sector will create the greatest jobs in the agricultural sector. These results indicate that agricultural sector of Iran for two reason prepared to absorb the labor has its own:

- Agricultural labor was simple and does not require high skills
- Next and previous links between this sector and the industry-mine sector is such that If the production of industry-mine sector increased demand for agricultural product also increased and as a result employment at this sector increased.

Results show that least effect of increasing technology coefficient of labor at agriculture sector related to building sector. Employment level of this sector as a result of 5% increase of technology coefficient of labor at agriculture sector is only 0.57%. By improve capital coefficient at agriculture sector amount of labor using at this sector decrease 9.74%. But improve this coefficient lead to increase employment at other economic sector that greatest increase related to industry-mine sector. Improve this coefficient at industry-mine sector also reduce 8.75% employment at this sector and increase employment at the other economic sector that greatest increase in employment at agriculture sector (7.8%) and then service sector(7.5%). This issue indicates a strong relationship between industry and agriculture in Iran and the service sector base on its service structure take positive effect from this improved.

Production: Improve Coefficients technology will lead to increased production in the relevant economic sector and be expected the distribution effects of this production improved on other economic sectors was positive.

As shown at Table 5 capital coefficient improved in both agriculture and industry sectors will have a greater impact on relevant production levels than improve labor coefficient at these sectors. 5 percent increase at technology coefficient of capital in agriculture sector cause the Production of this sector 11.59% increase In case this increase when technology coefficient of labor improved is 1.09 %. Increase technology coefficient of capital will increase to more production in compared with increase technology coefficient of labor (8.57 percent vs. 3.61 percent). Comparing these results shows increase technology coefficient of labor at industry and mine sector has sufficient effect at production of this sector toward improved this coefficient at agriculture sector. This point refers to nature of simple labor at agriculture sector.

Looking at the Table 5 can be received that the greatest impact of increase technology coefficient of labor and capital at agriculture sector at production of industry and mine sector and service sector is next in rank. Improve these coefficients at industry and mine sector has the greatest impact on the production of service sector.

Foreign Trade: Impact of improve technology coefficients on export of the relevant sector will be positive. Given the dependence of the sector production to import of intermediate goods, expected the import of sector will be increase while production of this sector increase. The effect of improve coefficient on export and import of other economic sector depends on relationships between economic sectors.

Technology coefficient improved has positive effect at both sector of agriculture and industry-mine. According to Table 6 at both sector (agriculture and industry-mine) improve technology coefficient has positive effect at foreign trade of relevant market. 5% increase at technology coefficient of capital at agriculture sector increase export of this sector to 61.21%, in case the same increase at technology coefficient of labor at this sector increase export only 4.98%. Improve technology coefficient of capital at industry-mine sector increase 4.98% export of this sector. Improve technology coefficient of capital at industry-mine sector increase 29% export of this sector and this number for labor factor is 11.28%. As shown at Table 6 import of industry-mine sector more affected by improve technology coefficient than agriculture sector. The most Impressible export of other market from improve technology coefficient at agriculture sector related to service sector (12.29%) and then industry-mine at the next rank (9.79%) which caused technology coefficient improved of capital at this sector. Same number for import of intermediate commodity and industry-mine sector are 5.16% and 2.08% respectively. The most effected export of other market from improve coefficient at industry-mine sector is service commodity market and about import of intermediate commodity it is more impressible.

Capital: Should be noted the volume of total capital in the economy is assumed constant. Thus results of the scenarios indicating that improve technology coefficient of each economy factor how to reduce the use of capital inputs used in this sector. In other words expected that improve coefficients for the production factors caused substitution of factors with capital and lead capital to other economic sector.

As shown at Table 7 increase technology coefficient of capital at agriculture sector reduce the amount use of capital input in this sector to 8.73%, whereas increase this coefficient for labor only reduce 1.4% amount of capital at agriculture sector. As the table shows the greatest attraction of released capital take place at industry-mine sector. Increase 5% technology coefficient of capital at industry-mine sector reduce 8.2% use of capital at this sector and by improve coefficient for labor factor amount of 4.91% capital released at this sector. Agriculture sector has the greatest amount of capital absorb from industry-mine sector and service sector with small difference in second place.

Table 5: Effects on Production

Sector	Technology coefficient	Agriculture sector production	Industry-mine sector production	Building sector production	Service sector production
agriculture	Labor	1.09	0.41	0.35	0.37
	Capital	11.56	3.37	2.34	3.2
Industry-mine	Labor	1.62	3.61	1.71	1.93
	Capital	3.53	8.57	3.53	4.21

Table 6: Effects on Foreign Trade

Sector	Technology coefficient	Agriculture	Industry	Service	Intermediate commodity
Export					
Agriculture	Labor	4.98	1.07	1.33	-0.48
	Capital	61.21	9.79	12.29	-4.15
Industry-mine	Labor	1.52	11.28	7.21	-3.22
	Capital	3.13	29	17.35	-7.59
Import					
Sector	Technology coefficient	Agriculture	Industry	Service	Intermediate commodity
Agriculture	Labor	0.13	0.27	0.11	0.59
	Capital	1.06	2.08	0.78	5.16
Industry-mine	Labor	1.93	1.49	0.51	3.3
	Capital	4.32	3.05	0.81	7.46

Table 7: Change at capital at different economic sector

Sector	Technology coefficient	Agriculture	Industry-mine	Building	Service
Agriculture	Labor	-1.4	0.31	0.16	0.26
	Capital	-8.73	2.42	0.505	2.16
Industry-mine	Labor	1.53	-4.91	0.85	1.45
	Capital	3.3	-8.2	1.43	3.02

Table 8: Effects on GDP and Its Components

Sector	Technology coefficient	GDP	Consumption	Government expenditure	Investment	Net export
Agriculture	Labor	0.49	0.48	-0.1	0.58	1.55
	Capital	4.24	3.98	-0.83	4.48	13.77
Industry-mine	Labor	2	1.93	-0.97	2.03	6.54
	Capital	4.3	3.83	-2.25	4.33	14.53

Table 9: Effects on Households Income

	Agriculture		Industry-mine	
Technology coefficient	Labor	Capital	Labor	Capital
Urban household	0.48	3.96	1.92	3.78
Rural household	0.48	4.04	1.94	3.97

Macroeconomic: As it is shown in table 8, Improve technology coefficient of capital at both sectors agriculture and industry-mine has most effect at GDP (4.3% and 4.24% respectively). GDP affected differently from improve technology coefficient of labor at both sector. Improve 5% at technology coefficient of labor at industry-mine sector increase 2% at GDP in case this number for agriculture sector is 0.49%.

Improve coefficients at both sector reduce government expenditure, whereas improve coefficient has positive effect at the other sub-variable of GDP. The greatest increase at investment as a result of improved technology coefficient of capital at agriculture sector (4.48%) with small different as a result of improve this coefficient at industry-mine sector (4.33%) and least increase of that in result of improved technology coefficient of labor take place at agriculture sector.

Consumption more affected by improve technology coefficient of capital than improve this coefficient at labor factor. Net export also with increase at technology coefficient of capital at industry-mine sector will show the greatest increase and the least increase of that as a result of improved technology coefficient of labor at agriculture sector.

In Come: Improve technology coefficient of capital and labor has positive effect at urban and rural household income. Income of both household more affected by improve technology coefficient at two sectors of agriculture and industry-mine. The greatest increase at rural household income related to improve at technology coefficient of capital at agriculture sector and urban household also take greatest amount of their income from improve this coefficient and improve technology coefficient of capital at industry-mine sector with small different increase urban household income. The results are presented in the following Table 9.

RESULTS AND DISCUSSION

Undoubtedly one of the important factors in the growth process apart from the growth of savings and investment is increase productivity and improving production technology. But perhaps the point that it is necessary for further study is Effects of technological change in various economic sectors. At this paper effect of technology coefficient of labor and capital at agriculture and industry-mine sectors investigated by using a static countable general equilibrium model. Result show that improved technology coefficients have different effect at economic sectors. Summary results can be stated as follows:

- Increase the technology coefficients in the industry-mine sector have better impact on total employment toward agricultural sector.
- Improve the technology coefficient of capital in both sectors will have a greater impact on increasing productivity in cooperation with improve the labor coefficient.
- Improving technology coefficients on the foreign trade sector is making a positive impact. Most effective market is service market and most impressible import market is intermediate commodity market.
- Improving the coefficients in both industry and agriculture with respect to the fixed capital stock, thereby reducing the volume of the initial investment in the sectors and greatest absorb of released capital from agriculture sector related to industry-mine sector and vice versa.
- Capital Improvement coefficients technology puts a greater impact on GDP.GDP increased due to improved technology coefficients of labor show a significant difference in the two sectors.
- All components of GDP increase as a result of improved technology excepted government spending. The income of urban and rural households has highest impact from technology coefficient of capital improved at agriculture sector.

And the Results Can Be Said: Improve technology coefficient of capital has greater impact at economy than improved technology coefficient of labor. In addition, these results indicate a strong relationship between the agriculture sector and industry-mine sector at economy of Iran.

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