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THE ESTIMATION OF THE SHARE OF TECHNOLOGICAL SPILLOVER IN SECTORIAL-REGIONAL GROWTH (CASE STUDY: 29 PRODUCTION SECTORS OF 30 IRAN PROVINCES)

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ABSTRACT

The main goal of this Research is the estimation of the share of technological spillover in sectorial-regional Growth. At first, a brief literature about growth and technological spillover are presented, and then the production function in Cob-Douglas form is assumed. We have used other counties' studies in technological spillovers. Then, 29 sectors of Iran Economy sectors are selected, this selection is done in a way that a good view of Iran economy totally could be shown. Geographical range for this thesis is 30 Iran provinces. Then, we have gathered the required data (according to Cob-Douglas production function) for 30 provinces due to 29 sectors in 1997-2005. We have combined panel data technique with spatial econometric for estimation of the model. Spatial econometric is the especial method for regional studies that features and regional differences will affect the model. Conclusions presented in two parts. At first, according to 2 digits ISIC code and then based on the three main sectors; agricultural, mining and industry and service. The positive effect of technological spillovers on growth was approved for 16 sectors of 29 sectors and among three main economy sectors agricultural, mining and industry and service, the agricultural proved to be the more impressionable sector.

Keywords: Technological spillovers, Regional economics, Spatial econometrics, Panel data, Sectorial-regional growth.

JEL Classification: C51, O33, R11.

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1. INTRODUCTION

One of the issues in the past, often been neglected in economic research, economic research in the following space. The importance of space in the form of economic activity led to a new branch of economics gradually take shape, now known by the name of the regional economy. Regional economy, which is in fact a framework, in which the spatial characteristics of the economic system, it can be understood. This means that the spatial dimension of spatial factors that influence economic activity, and identification of the effects of changes in these factors, the economic status of the population examined. What emerges is a relatively new branch of economics, which is, in the majority of economists in the analysis of their economic, spatial dimensions of economic activity, and the majority did not consider his analysis, on the principle that that, at a specific time and specific location of economic activities performed, the nature of the analysis in the space is very limited. On the other hand, other researchers in the social sciences, such as geography, which have important spatial dimensions, can provide real techniques, and to evaluate the scientific and economic explanations of economic behavior are not, and therefore, most efforts have , the success was limited by the quality of the image. The gap has been observed that none of the researchers in fields related to this issue were able to help and solve the problem.

The feeling of deficiency, leads to the fact that experts in various fields, including economics, geography, environment, and urban and regional planners, and urban and regional scientists, their hands so, they provide Tools analysis that can be applied to these issues in their logic, in areas of good practice note is not empty, Walter Izard valuable activities that were initiated in the late 1940s, the key role in the development of this branch of the economy.

Today, the importance of regional studies, and in the space of economic studies, the study uncovered Therefore, as the current study, in which we try to regional differences in economic analysis, due to the need for more you should be. Addressing the issue of production and the factors affecting it, it is not new in the economic literature, although the history of this discussion, you may return on front the modern era, but at least to Adam Smith, on the allocation of labor and means of production increase, evidence of the history of this debate. As the words of Adam Smith, characterized in discussions about the proposed production, as one of the main objectives of this discussion, consider the economic theorists, and how to increase productivity and output growth rates in more scientific terms is. Growth literature, an important part of the economic literature, it is allocated. The development of theories (which might be attributed to solo), and recent theories of growth - Endogenous- growth theory, theories of evolution and complexity, but the thing that most of these theories have in common , searching for the source of output growth of production factors.

Despite the efforts of many researchers, economic and statistical studies and calculations, to assess the influence crop growth rate, the growth rate of inputs, some economists believe that the rate of successful manufacturing organizations, to explain all the changes, the production growth rate is, therefore, inevitably the growth rate of the product, there's an explanation for it, as the economic waste in their formula. Technology and technological factors that have recently attracted much attention, and a lot of discussion and research about it and its role in the production took

place, like the recent growth theories, a position is important. Considering the technology and production functions and growth theories, theoretical and computational study of economics them, toward that, to some of the wastes listed in the role of technology in production growth rate to find the models. Overflows technology and its place in our growth issues on which, in the present study using a spatial econometric model, considering regional differences, role models in the development of technology - an area of particular. According to the statement, the importance of the regional economy, and the status of outstanding issues in the economic literature, the role of technology in economic growth models, this study aims at revealing the role of IT models, the development of various sectors of the economy, of course, consider the spatial and regional characteristics that influence growth. The research by taking 29 economic sectors, the share of each of the factors labor, capital, and technology in economic growth per sector, with a regional approach to the study. In this study, regional differences according to the country's 30 provinces, has been considered. Data for each province separately entered in the model, and its impact on every part of the study. According to the stated problem and the question of this study, this study seeks to answer is, it can be concluded as follows: The share of each sector in the development of technology and economic models, what is it? In addition to answering these questions, the contribution of other factors of production in each sector, as specified. Studies about the impact of technology on growth models in the country, the volume is small, but a good place studies, studies of Western countries. The following are some of the researches adapted.

2. ANALYSIS OF THE IMPACT OF TECHNOLOGY MODELS IN OTHER COUNTRIES

Articles and research on the impact of technology on growth models, which in other states, some of them we can mention:

2.1. McCunn (2001)

In a research project which is in the form of his PhD thesis, presented at the American University of Iowa, to assess the impact of technology on economic growth models, the 50 states in the US agricultural sector, in the period of 32 years (1982-1950) deals. This study is an economic analysis on the regional models, and cross-sectoral R & D as a source of economic growth, to examine the relationship between research activities and economic welfare (economic growth), for both industry and agriculture developed. The analytical model results indicate a correlation between the growth rate of the 50 districts of the state of Washington, in the agricultural sector. The convergence rate is variable, and the impact of its research activities in the region, the models of other areas of technology, and training of the work force. Relationship models R & D on growth in both agriculture and industry, as well as the different models studied, the results showed that the model represents the effect of weir R & D, between these two sectors and the impact of the weirs on the structure of production and allocation of resources in this section are is. Capital stock R & D each sector, the strong positive manufacturing sector, and the spillover effects of the part, the

models derived from agriculture stronger effects on the volume and structure of production in the industrial sector, and the models of cross-sector industry has less effect the agricultural sector. Policy recommendations findings of this study are:

A) planning, agriculture, individually and separately for each state, without considering the spillover effects of regional R & D, will reduce the effectiveness of these programs.

B) Due to the positive effect of spillover effects, intersectoral R & D in agriculture and industry, as well as the effect of higher agricultural industry, agricultural research programs, make sure these effects must be considered.

2.2. Bernstein and Nadiri (1989)

Who conducted a study to investigate the development and inter-sectoral models, according to the experimental application of dynamic duality they paid. Researchers on four machine tools industry, chemical, oil, tools, and their research, and related forms of investment and production, based on the dynamic duality theory, microeconomics, were investigated. The researcher's origin dynamics, the adjustment and the choice between the accumulation of physical capital, and capital R & D should be taken to see that this in turn is due to the fact that, unlike physical capital, an exclusive, firm used investment in R & D has spillover effects that can be used by competing firms. Spillover effects of R & D, in each sector may be under three headings, stated:

1. The cost of producing the parallel development of science and technology, an industry-wide declines. For all four cases, the effect of different coefficients approved.
2. The means of production and allocation of resources in response to changes resulting from the spillover effect is that, this is about the mentioned sections, will be accepted.
3. The rate of investment in R & D is affected models. The models show a reduction in investments in R & D, for each industry R & D is due to the weir.

Existence weir R & D, indicating the difference between public and private rates of return to R & D investment, the higher the rate of return on this investment of public R & D, rather than the private rate of return for each industry, announces that.

2.3. Costa and Iezzi (2001)

During the study, the effects of technology intersectoral models, done in different regions of Italy. Concluded that the weir between the same technology that, in terms of geographical distance from also- are striking, and dissimilar parts, even in the absence of geographical proximity, impression quantitative overflows technology, have experienced. The study also showed that, in terms of the technology spillover effects, the estimated speed of convergence in the production of various sectors to substantially increase.

2.4. Lucio *et al.* (2002)

During a study in the industrial sector in Spain, in the 80s and 90s did, the external static and dynamic effects on the growth of productivity. And found that these effects are specifically.

2.5. Brandt (2007)

Conducted a study to assess the effects of the models, the member countries of the Organization for Economic Cooperation and Development in Industry (OECD), did he get that overflow can be used as an external source of economies of scale in considered.

3. THE ANALYSIS OF THE MODELS OF TECHNOLOGY, IRAN

The effects of technology in the models, as a region, found a particular case, but in general studies that have been done on the effects of weirs in the economy, including:

Shahabadi (2001), who conducted a study to investigate the determinants of economic growth in the Islamic Republic of Iran. This research models the impact of R & D, based on the model developed for this purpose it was designed, the terms.

Akbari and Moalemi (2005), in a study using a spatial econometric methods have done, the economic integration of the countries of the Persian Gulf began. The positive effects of weirs, focus on convergence.

Asghar (2010), a study conducted on exports, the role of internal and external research and development activities in the field of oil exports. He found that the variable internal R & D capital, and foreign R & D capital stock variable, positive and significant effect on the performance of exports of the economy there.

Shahabadi *et al.* (2012), a study on the performance of the industry, the role of technology spillovers of foreign direct investment during the second, third and fourth tackle. The results of this study suggest that, during the Second Development Plan, a strong association between the promotion of human capital (standard capacity), to attract foreign investment, and the spillover effects of the industry there. While in the Plan, the above relation was observed that, due to the effects of the policy requirements of the program, the promotion of research and development, macro-economic level and support the new law, and the expansion of direct investment foreign policy in 1381 and reduce monopolies, and government policies in economy. Notably, during the Fourth Plan, although the association, the second program development, better and been more appropriate, but has performed poorly when compared to the third program, the reasons can be a mismatch between funding of research and researchers, and consumer research credits, current affairs agencies, lack of investment security and inefficient policies in support of domestic industry noted. It can be expressed in relation to the above, in the industrial sector during the period, tangible and not defensible. Mahmood Zadeh (2013), in a study using panel data, the total factor productivity in developing countries, according to the spillover effects of information and communication technology (ICT), the Payment. The results showed that the growth of real GDP, has the greatest effect on the total factor productivity growth. The effect of domestic investment, and ICT spillover is positive and significant. Development of human capital, has a positive effect, but it is not statistically significant. The investment in ICT, is effective in attracting foreign spillover effects. Empowerment, human capital, the factors affecting the uptake of ICT spillovers,

although this effect was not statistically significant, is unclear. The findings indicate that developing countries, the spillover effects of ICT investment, benefit.

4. DISCUSSION OF THEORETICAL MODELS AROUND TECHNOLOGY

Technology plays an important role in the theory of economic growth, and as a factor affecting growth in theoretical and applied studies, is of great concern (Costa and Iezzi, 2001). The importance of this factor in economic growth, to the extent that, many studies on how to upgrade the technology, manufacturing is done in different sectors, (Damur & Gujerati, 2006). To illustrate the concept of technological models, initially a key concept, we briefly examined.

4.1. Technology

Different definitions of technology are presented. The traditional microeconomic literature, technology consists of "all information about production factors, and how to combine them to produce the desired product" (Henderson and Quant, 1980). But in more recent writings, economics, technology has a special meaning, and to define these concepts, phrases like "improvement in one or more of the inputs" used. In microeconomic literature, agent technology have caused an increase in the amount of input .What product- stable or decreasing production cost, and this factor varies over time and generally improving and development (Debrtin, 1997). In addition to the above definitions, some modern definitions, the technology has been proposed. Most of these definitions, innovation, learning, and establishing knowledge, the use of new and less costly methods of production, are highlighted (Marian and Edenhofer, 2007). A more comprehensive definition of technology, as follows: "The technology consists of a set of Processes - include how to produce, how to use the equipment and experiment- that, to produce goods and services, and the transformation of inputs used. Technology includes tools the methods. IT knowledge base, to change the mode of production "(Damur & Gujerati, 2006). The development of new technologies and develop them, what is important is the role of human resources or in other words, human capital. In fact, human resources, educated, creative and innovative, the major cause of the development of technology, technology analysts and economists are, in their study are emphasized.

4.2. External Effects

Discussion of externalities, the issues that the weir technology is a reliable relation. The weir technology, a kind of positive externalities. The term external effects, related to the impact of the economic activities of an individual, a firm or group of firms is that they may be better or worse off. The definition of positive external effects are said to be "if the economic activity of enterprises, in addition to the benefit of businesses, create benefit for others, the phenomenon of so-called external positive factor." The effects of positive (or negative) are typically produced as an unwanted, and the firm's profit function is not evaluated. The external effects, are the byproduct of a firm, and the market is not competitive pricing.

4.3. Weir Technology

As is apparent from the above definitions, technology transfer between different sectors of production, the effect of changes in these sectors can be seen as an external effect. The era-depending on the impact on output growth, - can be positive or negative. Accordingly, weir technology, including a change in technology, a CO-, or the manufacturing sector due to the changes that occur in other sectors, and in general this effect, namely to promote positive product-, be measured. Technology- The source of variation, as a source of technology, intersectoral and inter-regional models - factors such as research and development (R & D), experience (Learning-by-doing), have been analyzed (Damur & Gujerati, 2006). The impact of technology, a production department, others from different parts of the theory, and many studies have been applied for. Although, analysis and promotion of technological innovation and technological change in its general form, are limited to the internal factors of the firm, the idea that knowledge sources and external factors, the promotion of technology firms are effective, Browse been general acceptance (Lucio *et al*., 2002).

In an environment of uncertainty, innovation capacity developed through knowledge transfer, and the macro-level growth models, have emphasized the role of science and technology models (Romer, 1990). But a very important factor in the models of technology, the space and distance. The types of analyzes which, in this regard, it is generally considered that this factor is strict. Studies in recent years show that the models of science and technology and the cost of acquisition of knowledge, individuals and firms that are geographically, with less space, less (Marian and Edenhofer, 2007).

Lucio and his colleagues, in a study on the external effects between different parts of the 50 provinces of Spain, to the conclusion that, being located close to the business and, in a particular area, a significant impact on the transfer of knowledge and weir technology, has been among the firms (Lucio *et al*., 2002). Also, studies have shown the high weir technology, the industry name or similar, to a greater proportion of these effects, has been named among other industries (Costa and Iezzi, 2001).

5. THE METHOD OF MEASURING CHANGES IN TECHNOLOGY AND MODELS

Technological developments - including the development of models technology- intangible phenomena and subtle. This makes it difficult to analyze data related to the causes and effects of them. Due to the lack of precise measurement, and define these changes, the methods used to estimate them. Continuing to refer to some of these methods:

5.1. Meters Technology as Part of the Production of Total Factor Productivity (TFP)

Generally technology as a factor in the productivity of factors of production - an effective global, will be considered. In these models, the production function is defined in the following ways:

$$q_i = f(\overrightarrow{A_1}, \overrightarrow{x_1}) \qquad (1)$$

$$Q_t = A(t).f(K_t, L_t) \qquad (2)$$

In the first equation, q_i Indicator of firm i is produced in a given time and $\overrightarrow{x_1}$ Represents the input vector, in the same period. In this equation, $\overrightarrow{A_1}$Vector technology, the course is given, may change over time (Damur & Gujerati, 2006). In the second equation $Q_t$the firm represents production (or part) in period t, K_t andL_t and the amount of capital and labor used in a given time period and $A(t)$Indicates the level of technology in this period, and it is assumed that the surface does not change over time (Murdoch and Sandler, 2002). These two models are equivalent and represent the same concept, the impact of technological change on production. But what is presented as an important question, how to measure the level of technology A (t), and or changes ($\frac{\dot{A}}{A}$). The measured, A (t) and its variations ($\frac{\dot{A}}{A}$) methods have been used in different studies, which are briefly described:

A-1) estimated assuming TFP returns than fixed scale: In this method, the relation in equation (2) and the logarithm of the ratio of the time, the following expression is obtained:

$$Q_{tg} = TFPG + S_k K_{tg} + S_l L_{tg} \qquad (3)$$

In equation (3), Q_{tg}Production growth rate, TFPG Total factor productivity growth rate, S_k Share capital, S_l The share of the labor force and K_{tg} AndL_{tg} the rate of capital and labor. With regard to efficiency, compared to the same scale. $S_k + S_t = 1$ And taking into account the total factor productivity growth rates, over a period of withdrawal, this factor is calculated as follows.

$$TFPG = (\ln Q_t - \ln Q_{t-1}) - \frac{1}{2}(Sk_t + Sk_{t-1})(\ln K_t - \ln K_{t-1}) - \frac{1}{2}(Sl_t + Sl_{t-1})(\ln L_t - \ln L_{t-1}) \qquad (4)$$

Using equation four, TFPG that equals ($\frac{\dot{A}}{A}$) is calculated.

A.2) to estimate changes in technology, using indicators of human capital: Costa and Iezzi (2001) Human Capital Index, were used to estimate changes in technology and spillover effects. In a study of two models of the effect of technology on regional growth in Italy did, the innovation is considered as follows:

$$A_{it} = A.R_{it}^{\partial 0}.R_{eit}^{\partial 1} \qquad (5)$$

In Equation 5, A_{it}The level of innovation in region i at time t, $R_{it}^{\partial 0}$Stock of technological knowledge stored in the period t, $R_{eit}^{\partial 1}$Potential models of other regions and $\partial 0$And $\partial 1$constant innovation and effective elasticity and other factors, including the level of technology. In Equation 5, R_{eit}This form can be considered:

$$R_{eit} = \sum_{j \neq i}^{n} r_{ij} R_{jt}^{\rho} \qquad (6)$$

Where, R_{jt}^{ρ} The effect of the j-th level of technology, to show the desired area. In this study, the index of human capital (average years of education of the labor force), as an instrumental variable for R_{it} Is used.

A-3) estimates of technological change, with the change in labor productivity (Lucio *et al.*, 2002), in a study of the role of external effects on productivity growth in the industries of Spain with regard to the production function in equation 2 and said it in a Cobb-Douglas technology changes, as a function of changes in labor productivity were calculated. Production function used in this study, this form is:

$$Y_{i,j,t} = A_{i,j,t} L_{i,j,t}^{\alpha} K_{i,j,t}^{\beta}$$

Given the condition of profit maximization, as follows,

$$\frac{K_{i,j,t} r_t}{L_{i,j,t} w_{i,j,t}} = \frac{\beta}{\alpha}$$

And the logarithm of the above equation, and substituting the second equation in the first production of the following:

$$\ln Y_{i,j,t} = \ln A_{i,j,t} + \alpha \ln L_{i,j,t} + \beta(\ln w_{i,j,t} + \ln L_{i,j,t} + \ln \beta - \ln \alpha - \ln r_t).$$

The above equation by subtracting the equation corresponding to a period of inactivity, the following equation is obtained:

$$\ln\left(\frac{Y_{i,j,t}}{Y_{i,j,t-1}}\right) = \ln\left(\frac{A_{i,j,t}}{A_{i,j,t-1}}\right) + (\alpha+\beta)\ln\left(\frac{L_{i,j,t}}{L_{i,j,t-1}}\right) + \beta\ln\left(\frac{W_{i,j,t}}{W_{i,j,t-1}}\right) - \beta\ln\left(\frac{r_t}{r_{t-1}}\right).$$

With little additional computation, one can obtain the following equation:

$$\ln\left(\frac{A_{i,j,t}}{A_{i,j,t-1}}\right)_{\text{global}} = \ln\left(\frac{\frac{Y_{i,t} - Y_{i,j,t}}{L_{i,t} - L_{i,j,t}}}{\frac{Y_{i,t-1} - Y_{i,j,t-1}}{L_{i,t-1} - L_{i,j,t-1}}}\right).$$

The left side of this equation, over a period of technological change, and the right of changes in labor productivity, at the same time shows. What is shown on the left, the level of technology in the economy. Lucio *et al.* (2002) using criteria such as production, distribution between industries and regions, changes in technology calculating the regional level.

A. 4) measure of technological change in the pattern of endogenous growth: rammers in their growth model, changes in technology are modeled as follows:

$$\dot{A}_i = \delta_i S_i^{\theta_i} H_i^{1-\theta_i} X_i, \quad 0 < \theta_i < 1, \ \delta_i > 0,$$

In this equation, Si represents the number of research scientists who, in the i Are busy research and study. Also Hi, industry-specific human capital stock is expected to perform the actual research and development, production methods and processes, are employed. Finally Xi spillover effects, resulting from changes in other sectors, which leads to changes in technology, in the case studies. In this equation, θ_iScientists productivity index parts (Doi and Mino, 2005)

A-5) production as a factor influencing the level of technology: some researchers, the role and scale of production and technological change have focused on the surface. Clark and colleagues, in a study of the factors influencing changes in technology, the scale factor, along with research and development (R & D) are located. They believe that by increasing production levels and learning experience increases during operation, and for this reason, the technology could be enhanced. Also, Lucio and his colleagues analyzed the spillover effects and their role in improving labor productivity in Spain, in the specified model, the role of the scale, and the scale of the study area, the level of technological change industry, the stresses in the region (Lucio *et al*., 2002), with this interpretation, would be under the assumptions of technology in the Cobb-Douglas asserted as follows:

$$A_{it} = A.X_{it}^{\alpha}.\sum_{j\neq i}^{n} x_{jt}^{\beta j}$$

In this equation, X_{it}^{α} The effect of the volume of production in the region of interest and $\sum_{j\neq i}^{n} x_{j=}^{\beta j}$ The effect of the volume of production in other regions of the technology in the region slightly- region i - show.

A-6) Other methods of estimation of technological change in the previous section, the main methods used to estimate the surface, and changes in technology are briefly examined. However, other techniques, more or less, in this case, is used. Mariani In their study, the factors affecting technology changes, the number of patents in the industry as the dependent variable (technological change), is considered (Marian and Edenhofer, 2007). In some studies, the level of spending on research and development (R & D), as a measure of the level of technology is considered.

5.2. Oriented Technology, to Labor and Capital

In some studies, unlike the previous case, the technology, the interest component of Total Factor Productivity (TFP), were included, in the form of different technology-oriented, focused on labor and capital can be evaluated . In this case, the effect of improving the production technology, as a result of increased production of the corresponding (capital and labor), will be. This type of analysis technologies often macroeconomic theories will be examined. Production function when the technology-oriented labor force is defined as follows:

$$Y = F[K, L.A(t)]$$

And focuses on investments in technology, these include the following:

$$Y = F[K.A(t), L]$$

First in technology-oriented labor force, variable represents the level and rate of change in technology, general labor productivity, and the second state capital of technology-oriented research and development (R & D), and indicators associated with it Barro and Sala-I-Martin (1999). Practical studies, generally the ways in which technological factors on the productivity of factors of production, it is considered used.

5.3. Modeling the Effects of Technology Weir

In the past, various methods of calculating changes in technology, were introduced briefly. At the end of this section, reviewed and adapted to the different modeling techniques, the models in the study of technology. In this section, only the methods of technology, in terms of total factor productivity has been produced, we studied.

The first method) In this method, the innovation (or technology), as a function of the level of technological knowledge, and potential models for other regions will be examined. Mentioned - technology function as in section A.2 noted, as follows:

$$\mathbf{A_{it} = A.R_{it}^{\partial 0}.R_{eit}^{\partial 1}}$$

In this model, the impact of technology in other models Areas - total -, in the Cobb-Douglas function traction $\partial 1$ The level of knowledge (technology) studied the impact of the model in the form of words R_{eit}Is indicated. This factor separately for each region considered to be calculated as follows:

$$\mathbf{R_{eit} = \sum_{j \neq i}^{n} r_{ij} R_{jt}^{\rho}}$$

This equation states that the level of technology that each region R_{jt} - With traction ρ Coefficient The rate of technological spillovers, in the r_{ij}region slightly- i - shares. The same place $\partial_1 = \frac{1}{\rho}$And placed second in the first equation, and using a Taylor expansion ($\rho = 0$around), the equation for the final model to analyze the effects of technological models, is obtained:

$$\mathbf{\ln A_{it} = \ln A + \partial_0 \ln R_{it} + \sum_{j \neq i}^{n} r_{ij} \ln R_{jt}}$$

Thus, the last sentence on the right shows the impact of technological models from other regions, the level of technology the study area (Costa and Iezzi, 2001). **The second method)**, some researchers channels of technology, including four cases considered. These include:

- The nature of the industry and its trends, technology and innovation, (γ_i)
- Firm size, sector or industry relative to total production, ($X_{i,j,t}/X_{i,t}$)
- The tendency to innovation, (γ_j)
- The size of the firm, the proportion of total production area ($X_{i,j,t}/X_{j,t}$).

In other words, the status and level of innovation, and technology firms in the region, the level of technology and innovation, the industry and the firm's share of the total manufacturing industry, and the entire region.

With the above assumptions and the assumption that the rate of innovation and technology and other sectors (other industries), and the level of innovation and technology and other areas of industry, the fall in the region, and with the added assumption etc. linearity of the innovation process, and the impact of technological change on the second-mentioned factors, the equation changes in technology firm (or industry) i i, j in region I wrote as follows:

$$\frac{\mathrm{d}A_{i,j,t}}{\mathrm{d}t} = A^{*}_{i,j,t}\Bigg(\theta_i\gamma_i + \theta_j\gamma_j + \gamma_i(1-\theta_j)\frac{X_{i,j,t}}{X_{i,t}} + \gamma_j(1-\theta_i)\frac{X_{i,j,t}}{X_{j,t}} + \gamma'_i(1-\theta'_j)\frac{X^2_{i,j,t}/N_{i,j,t}}{X^2_{i,t}} + \gamma'_j(1-\theta'_i)\frac{X^2_{i,j,t}/N_{i,j,t}}{X^2_{j,t}} + \theta'_i\gamma'_i\sum\nolimits_{\forall j}\left(\frac{X^2_{i,j,t}/N_{i,j,t}}{X^2_{i,t}}\right) + \theta'_j\gamma'_j\sum\nolimits_{\forall i}\left(\frac{X^2_{i,j,t}/N_{i,j,t}}{X^2_{j,t}}\right)\Bigg).$$

This equation shows that the growth rate of technology is dependent on the following factors:

- The specialized area of the industry in question, $espp_{i,j,t} = X_{i,j,t}/X_{j,t}$
- The level of expertise of the industry in question, $espi_{i,j,t} = X_{i,j,t}/X_{i,t}$
- The second of these two criteria can be divided by the number of firms, $(X^2_{j,t}/N_{i,j,t})\,espp^2_{i,j,t} = X^2_{i,j,t}/$ And $espi^2_{i,j,t} = X^2_{i,j,t}/(X^2_{i,t}/N_{i,j,t})$
- The diversity of firms in the region, $div_{j,t} = \Sigma_{\forall i}\left((X^2_{i,j,t}/N_{i,j,t})/X^2_{j,t}\right)$
- The level of the firm, the region is facing, $com_{i,t} = \Sigma_{\forall j}\left((X^2_{i,j,t}/N_{i,j,t})/X^2_{i,t}\right)$

(Lucio *et al.*, 2002).

The The second method) as mentioned in (a) -4, the measurement and modeling of the effects of technological models can be used as endogenous growth theory. The following equation describes the change as technology, in a particular industry, consider:

$$\dot{A}_i = \delta_i S_i^{\theta_i} H_i^{1-\theta_i} X_i, \quad 0 < \theta_i < 1, \quad \delta_i > 0,$$

As previously mentioned, the variable $\mathbf{X}=$ In this equation, showing the weirs of technology - the industry and the industrial. This factor can be indicated as follows:

$$X_i = \left(\phi_i^{\frac{1}{\eta}} A_i^{\frac{\eta-1}{\eta}} + (1-\phi_i)^{\frac{1}{\eta}} A_j^{\frac{\eta-1}{\eta}}\right)^{\frac{\eta}{\eta-1}}, \quad \eta > 0,\ 0 < \phi_i < 1,\ i \neq j,\ i,j = 1,2.$$

In this equation, the equation is called spillover effects, suggests that the assumption of only two industries, the technology spillover effect, as a function of the technology within the industry, technology and other industries, he said. The function of the equation, as shown CES. If the $\eta = 1$Is the Cobb-Douglas function, and if $\eta = \infty$ Is a linear function of technological change A_jAndA_i the Doi and Mino (2005)

6. THE ECONOMETRIC LITERATURE

Models to estimate the effects of technology on the growth of the manufacturing sector in each province, spatial econometric methods used. Spatial econometrics is one of Branches econometric studies used lie. Studies the characteristics and its relationship to space and place. In fact, the characteristics of an area, the location and the proximity distances, areas or places with them. Differences in spatial econometrics, with the ability and application of econometric techniques, the use of a data sample that contains one place. Akbari (2005) when the sample data has placed and component, the problem occurs that include:

A. spatial dependence between Observations
B. the relationship between spatial anisotropy (LeSage, 1999).

These two problems, determine spatial econometrics. Basic Econometrics, the Topics- the spatial dependence and spatial anisotropy ignore the lie, because according to these two cases, the basic assumptions of Econometrics, - ie Gosef- Markov assumptions, the optimal estimators minimum requirements squares are common, violated blocked. In case Gosef- Markov assumption is that the explanatory variables in Fixed repeated sampling, however, the spatial dependence among samples involve violations of this assumption, the spatial anisotropy, assuming a linear relationship determine the optimum violate observation example, because the assumption of spatial dependence between the data space by moving the sample data, the relationship will change, and the coefficients of the linear function is not dependent variable, and Consequently, econometric Practices general, will use. In this case, spatial econometrics, with regard to the issue of spatial dependence and anisotropy, the best linear estimator, will be provided (Akbari and Farahmandfar, 2005).

According Gosef- Markov theorem, sample data, regression, using the following equation:

$$Y = X\beta + \varepsilon \qquad (3-1)$$

Where Y represents the vector of n observations, X represents a matrix of n * k explanatory variables, β parameter vector K and ε N is the vector of random error. To maintain the process of data matrix X and the correct parameters β are constants, and therefore the distribution of sample vectors Y variance covariance structure, as εIs. By the theorem of Markov Gosef-, observation distribution of Y is such that, when moving between Observation, will show a constant value, and therefore the covariance between Observation zero, while the Input for example, which has a spatial dependence and spatial anisotropy, this phenomenon will not exist. Akbari (2005)

Mr Anslin the first time in 1988, the full reality of spatial econometrics, in a book called spatial econometrics, methods and models presented. The following tasks Anslin, spatial econometric issue, welcomed by many experts Economics, Geography, Sociology, and in general, science was. Anseline (1988). We Point spatial econometric methodology described below. At first it is necessary, the fundamental issue in spatial econometrics, the spatial dependence and spatial anisotropy, is further investigated.

6.1. Spatial Association

The problem of spatial dependence, Phenomenon that the sample data has a location component, occurs, so that when Observation related, i have a place like this observation to other Observation j is in place. This dependence can be between several observed to occur, so that i can be given any value, since it is expected later this year, sample data observed at a point in space, the values observed in elsewhere, depend. Are based on the following formula: Akbari and Moayedfar (2004).

$$Y_i = f(y_i) \qquad i = 1, \ldots\ldots, n \qquad j \neq i \qquad (3-2)$$

The formula represents the interaction variable values in different regions. In fact, in the presence of spatial dependence, the variable of interest in an area affected by other values in other areas. For example, the phenomenon of unemployment, in a place like i only influenced by factors within the same area, but other factors, therefore, a relationship which Space, or close proximity of the region to other regions is the unemployment problem in the area of effect put. Basic Econometrics, identification and assessment of these factors is not possible.

6.2. Spatial Anisotropy

Spatial anisotropy term refers to a shift in the relationship between Observation, in the geographical location (space) is. To illustrate, consider the following linear relationship:

$$\mathbf{Y_i = X_i \beta_i + \varepsilon_i y} \qquad (\mathbf{3-3})$$

i represents the observations obtained at n points in space, X_i Indicator vector (1 * k) of the explanatory variables, with parameters set β_i Related to it, Y_iThe dependent variable in observation space, ε_iRandom error is indicated. According to the above, when moving among Observation distribution of sample data represent the mean and variance will not be constant. For example, in a study of the growth rate of GDP, in different provinces of the country, may come from the fact that provinces with higher growth in the central part of the province with lower growth rates, located in the border regions. As a result, the spatial and temporal variation of the mean and variance of the sample data, may change. Therefore, in dealing with data Take place, Gosef- Markov assumption that, by moving the Observation distribution of sample data, the mean and variance are constant, will be overturned. LeSage (1999).

The model has been designed according to the literature, this is the equation of the production function model, the production function of the i-th component in the j th. This function can be specified as follows:

$$X_{ij} = A_{ij}. L_{ij}^{\beta_{ij}}. K_{ij}^{\gamma_{ij}} \qquad (1)$$

Variables in this model are:

X_{ij}This symbol indicates the production rate of the j-th, i've been in. Changes in this area, with symbol $\ln(X_{ij})$ Is shown.

A_{ij}This symbol indicates the technology, the production function of the j-th, i've been in. Changes in this area, with symbol $\ln(A_{ij})$ Is shown.

L_{ij}This symbol indicates the amount of labor involved, the j-th component in the i's. Changes in this area, with symbol $\ln(L_{ij})$ Is shown.

K_{ij}This symbol indicates the capital stock, i'm not in the j th. Changes in this area, with symbol $\ln(K_{ij})$ Is shown.

Considering equation (1), and the logarithm of the rate of production of the j-th equation of state i is calculated as follows:

$$\ln X_{ij} = \ln A_{ij} + \beta_{ij}.\ln L_{ij} + \gamma_{ij}.\ln K_{ij} \qquad (2)$$

The equation of the j-th generation, in my i as a linear function of changes in technology, changes in labor, and capital of the show.

7. THE FUNCTION OF COMPONENT TECHNOLOGY

In equation (1), variable A_{ij}As a function of the j-th component technology, was introduced in the i. This component can be defined as follows:

$$A_{ij} = \varphi_{ij}.\left(R_{ij}\right)^{\sigma_{ij}^{1}}.\left(\frac{1}{2}.\sum_{m=1}^{30} S_{im}^{1}.R_{ij}\right)^{\sigma_{ij}^{2}}.\left(\frac{1}{3}.\sum_{m=1}^{30} S_{im}^{2}.R_{ij}\right)^{\sigma_{ij}^{3}} \qquad (3)$$

In the above equation, the technology in my j, i is the province, as a function of the stock of existing technology, technology in the sector and the models of the other provinces have been shown, in terms of the theoretical principles of spatial analysis , the effect of technology on the weirs, the provinces Adjacent- First ring with 1/2 ratio, and the effects of technology weirs provinces, a second ring spatial proximity to a standstill, with a coefficient of 1/3 is included in the model. In this function, ie R_{ij}, The value of the j-th local technology, the province is the i. To calculate this component, the stock of human capital in the sector, has been used as an approximation. The human capital, as the total weight of the educated work force in a given sector is considered. In this regard, a small amount of local technology stocks, as follows for each sector in each province, is calculated:

$$R_{ij} = 2.H_{ij}^{1} + 4.H_{ij}^{2} + 6.H_{ij}^{3} + 9.H_{ij}^{4} \qquad (4)$$

In equation (5), the componentsH_{ij}^{1} ،H_{ij}^{2} ،H_{ij}^{3} And H_{ij}^{4}, respectively, the number of workers include Associate Degree, Bachelor, Masters and PhD, I worked in the manufacturing sector j, i is the province.The final model will be as follows:

$$\ln X_{j} = \ln \varphi_{j} + \sigma_{j}^{1}.\ln R_{j} + \sigma_{j}^{2}.\ln\left(\frac{1}{2}.S^{1}.R_{j}\right) + \sigma_{j}^{3}.\ln\left(\frac{1}{3}.S^{2}.R_{j}\right)$$
$$+\beta_{j}.\ln L_{j} + \gamma_{j}.\ln K_{j} + \varepsilon_{j}^{1} \qquad (5)$$

8. RESULTS OF MODEL IMPLEMENTATION

In this section, the overall outcome of the results of the model, about 29 of the three as the most effective growth factors, in all 29 districts, technology Overflows resultant impact on growth and overall review of these factors, the three parts general agriculture, industry, mining and services offered.

8.1. Effective Growth Factors

In this section, the factors that, according to the results of the model, the largest share in all 29 districts of the study have been presented.

Table-1. The most effective part of a 29-fold growth factors

Sector name	The most effective factor	acount
Agricultural and horticultural products	Technology Spillover	01.1
Livestock	Capital	04.0
Fisheries and aquaculture	Capital	57.0
Mining	Capital	79.0
Food and drink	Workforce	87.0
Manufacture of textiles	Technology Spillover	58.0
Apparel production. . . .	Workforce	17.1
Tanning and dressing of leather. . .	Workforce	59.0
Manufacture of wood. . .	Workforce	78.0
Manufacture of paper. . .	Workforce	74.0
Printing and publishing. . .	Workforce	22.1
Coke and petroleum products and ...	Workforce	78.0
Chemical products. . .	Workforce	88.0
Rubber and plastic products ...	Workforce	27.0
Manufacture of basic metals	Workforce	02.1
Mental fabric products. . .	Workforce	74.0
The administrative machinery And. . .	Technology Spillover	66.0
Manufacture of radio, television and ...	Workforce	33.5
Manufacture of medical and optical instruments.	Workforce	68.0
Manufacture of motor vehicles. . .	Workforce	08.1
Recycling	Workforce	68.1
Electricity and gas production. . .	Workforce	85.0
Collection and treatment and distribution of water	Workforce	17.1
Wholesale, and retail. . .	Workforce	51.0
Hotel and Restaurant	Workforce	93.0
Ground transportation. . .	Workforce	97.0
Research and Development	Capital	05.0
Education	Capital	06.0
Recreational and cultural activities.	Workforce	80.0

Source: Calculation Methods

8.2. Overflows the Impact of Technology on the Development of the Studied

In this section, as summarized results of the model, on the contribution of IT models, the 29-fold growth sectors offered. Of the 29 sectors studied, results, effectiveness Overflows technology, to 16 wards confirmed, and about 13 other results, indicating no effect and in some cases negative influence of this factor on growth.

Table-2. presents the results for 16 of these are in:

Table 2 - The effect of technology weir	
Name Section	**Value spillover effects**
Agricultural and horticultural products	01.0
Livestock	18.0
Fisheries and aquaculture	11.0
Mining	08.0
Manufacture of textiles	58.0
Tanning and dressing of leather. . .	29.0
Rubber and plastic products. . .	01.0
mental fabric products. . .	35.0
the administrative machinery. And. .	66.0
Manufacture of medical and optical instruments. . .	36.0
Collection and treatment and distribution of water	68.0
Wholesale, retail and. . .	26.0
Hotel and Restaurant	12.0
Ground transportation. . .	34.0
Education	15.0
Recreational and cultural activities. . .	16.0

Source: Calculation Methods

8.3. Overflows Impact of Technology on the Basis of 3 Main Parts

Table 3 summarizes the results of the implementation of the three major sectors of the economy, agriculture, industry, mining and services offered.

Table-3. The results are based on three sections

Sector name	The number of sub-sectors	Mean spillover effects
Agriculture	3	4333.0
Industry and mining	20	3875.0
Services	6	2175.0

Source: Calculation Methods

9. SUMMARY AND CONCLUSIONS

Economic growth, the economy is the oldest. History of economic thought, ways to increase the wealth of a society, as one of the basic concerns of economic thinkers, of course, we refer to. The thought of Aristotle, to school, trade and economic issues - that is, increase the wealth of the society more open Image of-, and finally to the present day economic literature is, all special focus on development issues, and increase the wealth of a their community. The last century has been accompanied by innovations and useful research that has been done on the economic growth, resulting in the emergence of new growth theories, including endogenous growth, and more. Note that a long time ago, in a hidden and now as a dominant, most studies have focused on the importance of technology as one of the most important factors affecting the economic growth. Agent technology is currently growing by leaps justify their path, and has a prominent role in the growth formula. Regional approach to economic issues is a relatively new approach, its use through

differences in economic studies, and the specific characteristics of each area of economic research, is considered, and the modeling becomes effective . With this approach, other factors are also known to affect growth. Another factor that is associated with the technology, and the technology is already weir less attention has recently gained particular importance in economic studies. This study is about the development of regional sector-, and factors affecting it, with a special focus on technology models as the most important factor in the growth of the region, where we tried the literature economic growth and regional Studies in two major categories, so convenient to be taken, and the effectiveness of IT models, the development of regional sector - to the extent specified. Although studies on the spillover effects on growth in Europe and the US, the multiplicity is good, but research in this regard in our country, not long history. This research may be, new research is twofold. The study area is sector - growth, factors affecting economic growth in 29 of the 30 provinces of the country, has been studied, in the study of panel data methods, have been used in spatial econometrics. The second case, the effect of technology on growth models. have. Because of the novelty of this study is that the findings of the precedent, this results in a very short, it can be in two areas:

A. The results of sections 29 Triple: Among the factors affecting the growth of the labor force, known as the most effective agent. In 19 of the 29 sectors of the labor force, the highest share in the growth. Positive spillover effects on growth for 16 of the 29 sectors are confirmed. Overflows 13 positive effects of technology on the rise, according to the results of the model will not be approved.
B. The results for the three sectors of the agriculture, industry, mining, and service sectors as agriculture Most impact part of the weir technology, according to the mean spillover effects, the following sections will be introduced. Furthermore, the positive effect on the growth of IT vulnerabilities in all three sub-sector has been confirmed.

Since the analytical model of research results, indicating a positive effect of technology models, the growth is mainly led the study, emphasizing the role of technology in economic growth. Special attention to technology and adequate funding, in order to increase the level of technology, it is a way of shaping applied research in the country, can be considered the most important corollary of this study. This must be a special focus on technology issues, with the inclusion of the regional characteristics. The results of this study confirm the effectiveness Overflows greater visibility than the neighboring provinces, the provinces have so far due to the investment in the field of technology development, we should be considering the impact area. Special status of the labor force, the growth in part - Regional, the results of this research. Furthermore, due to the fact that, in this study to calculate technology, an educated workforce productivity, though, and the results confirm the effectiveness of the weir technology. According to the teaching workforce, and providing bed and appropriate arrangements for the proper utilization of the workforce, it is proposed in this paper. And finally, a special influence in the agricultural sector, the weir technology that reflects the needs and potential of this sector to benefit more from spillover of technology.

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