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The role of geography in the analysis of industrial development strategies within the spatial organisation of a region

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Abstract. Through presenting the main axes in this study, it is clear that identifying a precise concept of industrial development is related to a wider idea of development. Despite that, the geographical view gives a wider and more comprehensive concept of the industrial development.

Moreover, balanced spatial development is closely related to industrial and agricultural development within the space of a geographical region. Industry and agriculture represent productive activities which form the economic basis for a region. Industrial development is the most important tool which is used in developing rural areas. Moreover, industrial development has a great role in developing other activities, especially services in a region. This is done through the capability of industry to provide requirements of other activities and absorb labour force surplus from other economic sectors. In addition, the industry sector increases economic revenues for the region and raises the individuals' incomes.

Strategies of achieving industrial development spatially differ from region to region. This relates to a group of variables, such as political and economic conditions in a region, its development, as well as size of industrial investments. However, accomplishing industrial development spatially requires putting appropriate developmental strategies which conform with a region's development level and available industrial investments, particularly, in underdeveloped regions with limited financial resources. These regions need to be identified as the most underdeveloped ones in order to attract industrial investments according to the unparalleled spatial development model. What should be taken into consideration is focus on adopting the modern technological development of industry in the field of spatially achieved industrial development through providing appropriate spatial elements. This should be followed by the distribution of modern industrial projects

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of large production capacity which exploit ideally the available geographical qualifications to attain big economic revenues that supports and develop other economic activities. This is reflected positively in the balanced spatial development of a geographical region.

Contents:

1. Introduction

The process of achieving industrial development in a geographical region is of great importance for spatial development. It represents the fundamental base that contributes to enhancing the chances of developing the economic and social structures of a given region in particular and the country in general. This can be achieved through optimal utilisation of the available development skills within the geographical space which will also secure job opportunities for labour force and contribute to increasing the individual's income rate. This will participate in elevating the reality of the region from decadence to economic development.

Industry and manufacturing are considered the most important economic activities fostering development. This is because industry is an intensive economic activity which invests the capital, and develops its basics and fundamentals which are the most important essentials for economic and social development all over the world. There is no dispute about the importance of industrial development and its positive effects on economic, social, political and strategic life. The standard of living, welfare, urbanisation, economic prosperity and international political weight relate to industry and its development (Abdul Jabbar, Salman, 2000: 43–63). The UN reports refer to the strong positive linkage of about 76% between transformational industry, its development and the average local growth in Les Economically Developed Countries (LEDCs). Moreover, there is a strong relation between increasing the average income of individuals and the development in industry (Ateqa, Besada, 1985: 67). This study asks some questions, present in specialist literature as well, namely whether appropriate developmental strategies contribute to enhancing opportunities of accomplishing industrial development within economically underdeveloped areas in a country and whether the absence of planning in implementing industrial projects affects negatively the levels of development in some areas in comparison with other underdeveloped areas. The study puts forward the following hypothesis: the contribution of industrial sector in spatial development within the underdeveloped areas depends mainly on the following: (a) introducing strategies which contribute to the development of the industrial sector in a way that confirms with the requirements of industrial development in the underdeveloped areas; (b) adopting industrial planning so as to contribute to the spatial balance of industrial projects and minimise the concentration of industries in some areas rather than the others; (c) achieving the spatial balance between a project site and available development skills in accordance with economic and social considerations of industrial development.

The study includes two sections. The first one focuses on the concept of industrial development and the relationship between geography and regional planning to achieve the spatial development within the geographical space. This section divides into three parts which refer to the concept of industrial development: the importance of accomplishing industrial development within the space of a geographical region, the challenges that face the industrial development within the space of a geographical region, and the strategies of industrial development within the space of a geographical region.

The second section concentrates on the industrial relations in enhancing industrial activities for spatial development. This section is divided into the following parts: the role of industrial technological advancement in achieving spatial development, and the effects of industrial development in the spatial structure of a geographical region. Additionally, there is an abstract and bibliography.

2. The nature of relationship between geography and regional planning and the effect of this relationship in industrial development within the geographical space. The concept of industrial development

There is a clear difference in identifying a specific concept for development in general and the industrial development in particular. The difference comes from a different angle from which the implications of development are viewed. The word 'development' means removing all developmental obstacles for the sake of using the available geographical components in a region, ideally to reach the stage of balance in spatial development within a geographical region (Khair, 2000: 14) sees the development as a large concept which refers to growth and consists of three main interrelated elements which form the essence of the developmental process. These elements are (Thirlwall, 1994: 9–10): (a) life-sustenance – this element relates to the provision of the main items for people, such as housing, clothing and the minimum of education, which means that a country cannot accomplish the comprehensive spatial development unless it meets the basic needs of all its people; (b) self-esteem, sovereignty and independence – a country cannot achieve comprehensive development unless it has the capacity for independence and equality among people; (c) freedom – it means eliminating negative aspects, such as poverty, ignorance as well as managerial and political corruption. People should have the opportunities to determine their destiny to reach human development.

These main elements of development influence each other. Lack of self-esteem and freedom are the result of low standard of living, while economic backwardness leads to poverty. Spatial development happens when economic progress helps meet peoples' basic needs, as well as ensures the country's and individuals' right of choice.

According to economists development means using modern technology in the production processes to increase the national income per capita (Berger, Charles, 1965: 8–9). In general, development is a process of change and transformation in the economic and social structures, which result from the increase as well as qualitative and quantitative change in materials and production of different economic activities within a region or a country.

Industrial development means the increase as well as qualitative and quantitative change in the production of industrial activity through ideal and efficient use of available geographical elements. This will lead to growth in individuals' incomes in a way this contributes to making clear changes in the social and economic structures to reach the balanced spatial development and integration of development in different centres of the same geographical space.

Development theories are considered as a means to achieve spatial development through specifying the appropriate rules to use the available resources in a region. Here comes the role of a geographer in the developmental process, since a regional planner cannot diagnose the reality of a region in all its geographical variables (natural, human and economic). A geographer has the experience and geographical knowledge to diagnose the region's potentialities in all its developmental variables. Then the role of a regional planner comes through identifying plans and suitable rules for achieving the best utilisation of resources to reach the balanced spatial development within the region's geographical space.

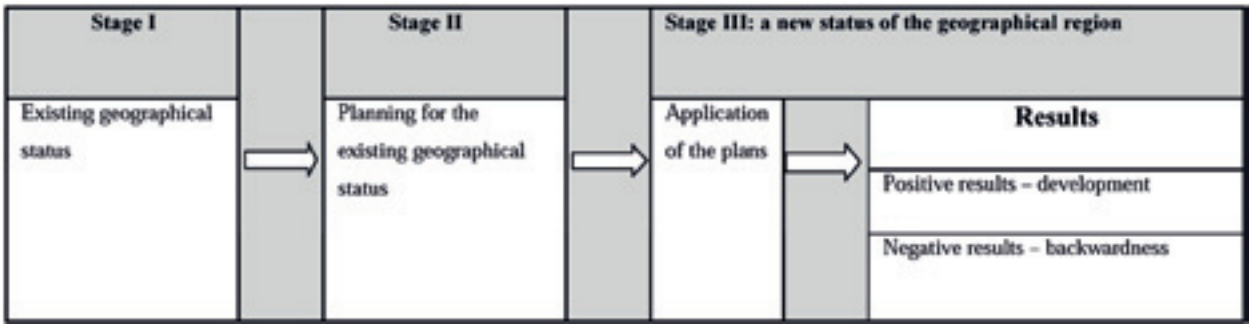

Fig. 1. The relationship between geography, regional planning and spatial development

Source: Saadi, M. and Saleh, A.-S., 2004: 18

As Fig. 1 indicates, the relationship between geography, regional planning and spatial development starts from the fact that a developmental process in a geographical region can be achieved through three interconnected stages which form the final result in the developmental process:

Stage I: studying and diagnosing the existing geographical situation in a region. In this stage, a geographical planner plays a prominent role in a way exceeding other scientific specialities; it is because he/she has the capacity to diagnose the existing geographical status in a region with all its geographical variations, such as the following: (a) natural geographical variations, including studying and diagnosing the nature of the geographical region with all its developmental variations with respect to the location, area, water resources, climate, natural vegetation, relief, soil and geological structure, etc.; (b) geographical and human variables, including studying the region's population in details according to population distribution, growth rate, population density, age structure, labour force, etc.; (c) geographical and economic variables, including studying the existing situation of the region's (basic and others) economic activities which represent industry, agriculture, trade and transportation, as well as other services.

Stage II: planning the existing geographical status in the region. This stage depends basically on the amount of information collected through identifying and diagnosing geographical variables of the region conducted in Stage I. Through Stage II, the process of planning the existing variables of the region starts to identify plans and rules which would achieve best utilisation of available resources in the region. Planning takes three main aspects: time planning, available development potentialities as well as planning efforts in the region.

Stage III: the new status of the geographical region (results of development). This stage represents the final outcome of the developmental process depending on the results reached for the geographical region. It depends on the hypotheses and results which were attained in Stages I and II. If the hypotheses and results are built on the correct basics, it will mean that the development results are positive. This in turn means creating new and developed reality for the underdeveloped region. This also means accomplishing the spatial development in the region; the positive results will be distinguished in their social and economic aspect and comprehensive in their effects. On the other hand, if the hypotheses are built on the wrong basics, the results of the development will be negative. This means failure of the developmental process so the region remains undeveloped. The negative results refer to that the backwardness is the only thing achieved. The processes of economic wasting for the available potentialities, time and efforts bring negative results.

Based on that, positive results of development can only be reached through applying different developmental plans. The final outcome of developmental process represents the results that depend on creating a new reality for the region; moving the geographical region from undeveloped to developed ones. Regions can be divided, according to the levels of spatial development into the following (Kukliński, 1975: 2–3): (A) developed regions – these regions show high levels of development with advanced economic and social levels. They witness grow-

ing prices of public services due to increasing demand and population concentration. These regions are poles of development; (B) natural or neutral regions – these regions are located around the regions of the first type. Moreover, the income levels are high with the increase of demand on labour force and the balance of services provided; (C) intermediate regions – in this type there is an overlapping between regions economically and socially well developed and those poorly developed. There is a relative balance in distributing income and labour force; (D) developing regions – these regions show lower population density and unexploited development potentials which can be exploited economically in a way that contributes to increasing individual's income and accomplish the region's development; (E) depressed regions – these regions are constantly in regression in terms of development levels because of concentration of old industrial activities which do not conform to modern technological progress. Additionally, there is a shortage of developed services and lower level of the labour force due to small productivity and low wages; (F) underdeveloped regions – these regions suffer from economic deterioration and recession. Such regions are agricultural in nature and lack necessary infrastructure.

Axis I – the importance of industrial development within the spatial domain, especially in underdeveloped regions, is clear by the following facts: (a) large and unbalanced concentration of major industrial activities and services within specific regions, especially in large urban centres, has contributed to significant differences and defects in the economic and social structure and the region's developmental level. This means some high rate activities are concentrated in some urban centres. On the contrary, in other regions, particularly rural areas, there are underdeveloped activities of slow growth and small economic revenues. This leads to the emergence of a development gap between these regions; (b) the difference in economic development levels between geographical regions results in serious social, political and ecological problems which big cities suffer from. Population growth and increasing demand for public services in these cities, as well as the inability to meet them, may create social and political pressures which lead to paying more attention to big cities at the expense of small regions, especially in rural areas which lack developed economic services. This problem is clear in LEDCs due to concentration of most developed economic activities in big city centres; (c) the problem of different levels of spatial development in regions is not limited to LEDCs where the problem is more sound; it is also found in More Economically Developed Countries (MEDCs) due to the fact that their industrial activities are focused on specific regions. For example, Japan attempts to create centres of industrial development to promote the underdeveloped regions which are located north of the Tokyo-Kyoto industrial concentration. Italy is also trying to promote the underdeveloped regions in the south through establishing poles of industrial development.

Achieving balanced industrial development through balanced spatial distribution of industrial activities and services at the regional level will contribute to mending structural disorders and approaching problems of economic and social backwardness in underdeveloped regions. This can be achieved through minimising variation in the levels of development and reaching the highest level of economic growth in addition to the efficient and ideal use of available geographical elements which take part in the region's development. In the field of industrial development, the focus is on the transformational industries as the best means to reach the spatial development.

Axis II – the challenges faced by the process of industrial development within underdeveloped geographical regions include the issue of selecting the industry type: whether it is traditional or technologically advanced and whether it is heavy or light industry. Generally, the basis of economic development in general and of the industrial development in particular, focuses on establishing heavy industries even when the economic sacrifices are significant. The agreement among these inclinations depends on the availability of development potentials in respect to the scale of demand for industrial production, as well as the availability of geographical resources (natural, human and economic) within the region.

The process of accomplishing industrial development requires precise identification of industrial activities which contribute to developing productivity of other economic activities, especially agriculture. Moreover, it contributes to appointing industrial projects which have the capacity of pro-

ducing goods economically to compensate importing big quantities of goods (Bryce, 1960: 19) .The process of differentiation between developing industrial or agricultural sectors, or both, is considered one of challenges faced by spatial development within geographical space. Despite completing the integration in developing both sectors, developing infrastructural projects in LEDCs is very important for the success of the developmental process. Agriculture and industry represent major sectors in the comprehensive spatial development within the geographical space through interrelation and overlapping between them.

Axis III – these are strategies for accomplishing the industrial development within the space of a geographical region. Achieving balanced and spatial industrial development in both LEDCs and MEDCs requires putting developmental strategies that conform with the nature of geographical regions, whether these regions are developed or not. This differentiation in the levels of spatial development requires setting developmental strategies appropriate to the nature of each region. Developmental strategies have the following major goals: (a) achieving the economic growth, especially in underdeveloped regions; (b) accomplishing social justice among regions; (c) utilising labour force and available geographical resources in a region, whether natural, human or economic.

What reinforces and enhances the policy of spatial development in respect to accomplishing the balance between the elements of economic growth and achieving the social justice or the complete utilisation of resources, are industrial investments which are an important tool for achieving balanced industrial development in different regions.

In order to minimise the differences of spatial developmental levels towards achieving balanced industrial development in the underdeveloped geographical regions, the strategies of spatial development should ensure balance in establishing large industrial projects to develop less developed regions. In addition, decision-makers should try to handle the regions of large industrial concentration through activating polarisation for industrial activities in the underdeveloped regions by enhancing the regions' capacity to attract industrial investments to achieve integration between industrialisation and spatial development as a means to parallel spatial development (Kukliński, 1975: 3). The disparity of distribution of economic projects in general and industrial projects in particular, between geographical regions stems from the following: (a) disparity in the developmental capacity between geographical regions; this is an attraction factor for economic activities, especially the industrial ones requiring space. The cause of this disparity is that there are regions of high concentration of economic activities while the others lack such activities; (b) agglomeration economies within developed regions play a great role in reinforcing these regions' capabilities to attract and polarise economic activities, especially the industrial ones. This happens at the expense of economic developmental opportunities for underdeveloped regions which suffer from inefficiency of agglomeration economies. Weaker economic activities and lower wages represent significant challenges to spatial development in underdeveloped regions (Mahmood, Al-Hadithi, 1995: 161–162); (c) developmental strategies, followed by most LEDCs, play a great role in increasing the developmental gap between geographical regions. This is due to the fact that these countries concentrate on developing specific regions, such as the capital or major cities, through the concentration of most economic activities and services in these regions and neglect of other regions, despite the availability of developmental potentials there.

The success of balanced spatial developmental process within the geographical space, especially in underdeveloped regions, requires considering three developmental and geographical dimensions which include the following (Mahmood, Al-Hadithi, 1995: 96) : (a) geographical dimension of development – this dimension relates to the size and type of available geographical resources in the regions. Spatial development requires considering dependence on exploiting locally available geographical resources (natural, human and economic) within the region, having identified the size and type of theses resources. The more and larger resources available in the region to be developed, the more helpful for the success and continuity of the developmental process it becomes. If the resources are few and limited, this will not help the process of spatial development. In this case, developmental planning procedures should consider the option of conveying the developmental resources from one region to

another in a way which contributes to the continuity of successful developmental processes, especially with the technological advancement in transportation. These factors minimise the effect of the availability of local geographical resources in the success of spatial economic and social development within a geographical region; (b) spatial dimension of development – the importance of spatial dimension arises from the fact that the spatial distribution of investments should be conducted according to prior studies. Distribution of investments, in particular the major ones, should be balanced in all geographical regions. Concentration of such investments in specific regions will lead to an imbalance in spatial development among all regions. The reason is that the revenues of development will be limited to the regions where the investments are located. Consequently, this will lead to the continuous development of these regions and, at the same time, continuous backwardness of other regions. Ultimately, this will increase the developmental gap between them; (c) time dimension of spatial development – planning to achieve balanced spatial development in any geographical region should consider the time dimension of the developmental process in the region, whether it is related to the exploitation of available geographical resources, which specifies the age of the developmental projects in a region, or to the economic revenues the developmental projects have achieved. Some of the projects bring rapid revenues while others are planned for future revenues. Prior identification of the economic revenues of the projects contributes to drawing the future picture of the plans and inclinations of the developmental process or the future of industrial projects in any geographical region.

3. The importance of industrial relations in strengthening the role of industrial activities in spatial development

The term *industrial relations* refers to correlations developing between endemic industries in a specific geographical region. They are connected to input and output relations of technical and productive features or they may be similar or different in production. The industrial relations should not be treated as a simple term; on the contrary, it should be tackled from various economic perspectives since it represents relationships integrated with other economic fields .

The relations between industry and the region on one hand, and between industrial activities themselves on the other hand, are becoming clearer in the present time. This stems from the tendencies of industrial investment within the space to concentrate on establishing industrial complexes which may best use of the available geographical elements of the region or of the neighbouring regions (Brucher, 1980: 88).

Moreover, the role of the economic relationships increases revenues from industrial activities within industrial complexes, which results from decreasing costs of industrial production due to economic savings. Integration of industrial activities is based on making a particular industry reliant on the products of another industrial activity as input in the production process within an industrial complex. Besides the fact that these activities take part in lowering the costs of industrial production, they make it possible to achieve the utmost profits or economic revenues; this contributes to the development of regions.

Industrial relations play a great role in fostering the capacity of industrial activities to achieve spatial development with a geographical region in accordance with the following developmental considerations.

First – regional importance of industry is identified through spatial relations linking it with the region in which the industry operates. The industry may emerge for the sake of exporting goods outside the region or the country and not for the region's needs. Industry cannot develop further in that region without establishing spatial relations with the region in which it is located (Al-Ashaib, 1989: 174). This is because the region affects the industry through its dependence on the spatially available elements to be located in the region. Moreover, industry affects the spatial structure of the region due to the developmental results of industrial activities.

Second – industrial relations play a prominent role in enhancing spatial development in a region because the existing relations between industrial activities within the industrial agglomeration

contribute to lowering costs of energy, transportation, communication, labour force and trade, etc. These elements increase savings from these industrial projects.

Third – whenever the existing spatial relationship between the industrial activities in the region are strong, this enhances their capacities to boost spatial development according to the following considerations: (a) absorbing the labour force surplus or unemployed energy in a particular industrial activity through providing job opportunities in other activities within the area of industrial agglomeration instead of migrating to other regions; ultimately, getting rid of or limiting unemployment; (b) providing a local market for industrial activities; the dependence on specific industrial activities on particular industrial products as input in the production process represents a local market to sell the products of this industry, which ultimately increases the economic revenues for these activities in the region.

Fourth – the role of industrial relations in fostering the ability of industrial activities to fulfil spatial development within the geographical space depends on the trade size, market capacity and the use of modern technology.

Major industrial activities have vast relations, the effects of which extend to local market and neighbouring regions. As a result, they have a great role in achieving spatial development through economic savings. This contributes to developing the economic fundament of the region. On the contrary, small industrial activities have limited relations and their effects are limited to the market where they are located. Moreover, their revenues are limited, which restricts their role in spatial development.

The use of modern techniques in production processes parallel with modern transportation lowers the costs of industrial production and increases profits of industrial projects. Generally speaking, there are two models of spatial correlations of industrial activities within the geographical space. They are as follows: (a) spatial relations which emerge between industrial activities and the geographical region where they are located or with neighbouring countries. This shows that industrial activities depend on investing available geographical elements within the region of the industry or neighbouring regions. This includes exploiting raw materials or labour force in addition to financial investments and marketing relations with other regions; (b) the input and output industrial relations that link local industrial activities in a particular region through dependence of a specific industrial activity on the products of other activities as inputs in the productive process. Furthermore, the products of that activity are required for the third industrial activity. It also absorbs the labour force surplus in other activities. This adds to increasing the revenues of the industrial activities through decreasing industrial production costs within the area of an industrial agglomeration.

Axis I: the role of technological advancement of industry in spatial development within the geographical region.

Technology represents the application side of scientific knowledge through which we can achieve the highest financial revenues and the best management of the resources in order to reach social and economic goals of the developmental process. This means technology includes applicable scientific knowledge. If it is not applicable, it is excluded from the concept of technology. The term and concept of industrial technology refers to applicable knowledge and repeated scientific experiments, which foster the development of the industrial sector and make it possible to achieve economic and social developmental goals within the space for the region. Technological advancement in industry is a process of applying scientific knowledge, where technological advancement – through new tools and machineries – participates in developing the industrial sector, increases production, improves its quality, minimises the costs, increases the individuals' income and develops the employees of the industrial sector (Mahmood, Al-Hadithi, 1995: 160).

This is reflected positively in spatial industrial development and develops the economy of the underdeveloped regions within geographical space. The mechanism to achieve technological advancement in industry within any geographical region is basically identified according to the nature and size of industrial activity as well as the level of labour force qualifications (Mahmood, Al-Hadithi, 1995: 161–162).

Technological advancement in the regions which are characterised by a high level of industrial production and labour force costs due to their high

skills, is achieved through intense use of capital in return of saving power. As for the regions that have huge human resources and low costs of labour force, the issue of technological advancement comes through saving capital and the intense use of labour force.

The role of modern industrial technology in the spatial development comes through a strong relation between industrial technology and industry, considering that industry is the activity in which most modern technology is applied. Technology and industrialisation are linked together. If there is no technical base dependant on the developed abilities and human skills, the manufacturing movement will not continue and the demand for industrial technology will cease. As a result, buying, using and developing the industrial technology is considered an important factor in the social and economic development of countries. Presently, technological changes help identify trends in industrial spatial development, followed by the development of the community as a whole. The experiences of advanced countries have proved that there are three factors which contribute to economic and industrial growth in a region. The factors are as the follows (Awda, 2000: 181): (a) building local capacities, especially human, at different levels; (b) using advanced technologies in industry; (c) supporting local research and developmental activities through comprehensive commitment and continuous support.

The level of spending on scientific research is considered a basic limit to generating inventions and innovations which serve the industry. Increased spendings lead to more inventions and innovations, which results in increasing the level of productivity as in MEDCs. On the other hand, low spendings will reflect negatively a decrease in the levels of industrial production as experienced in LEDCs.

Modern industrial technological advancement creates new site requirements which are different from traditional factor to locate industrial activities and achieve spatial development. Spatial elements for modern industrial technological advancement in the geographical region are as the follows (Mahmood, Al-Hadithi, 1995: 167–172).

First – the relationship between industry and research and development (R&D) centres in the region. Research and development in the industrial sector are considered the most important means of development of technological knowledge, which is the basic element in creating inventions and innovations. They, in turn, identify the industrial and technological advancement necessary for spatial development of industry. Thus, the most prominent demand of modern industry is to build a strong correlation between industrial activities and R&D centres. This in particular refers to universities which represent a settling necessity for modern technological industry. This is because they are centres of theoretical research, later applied by industries, of two types: (a) basic research, the aim of which is to increase human scientific knowledge without applying it; (b) applied research, conducted according to a prepared plan to apply it and handle the existing problems in the fields of industrial production or develop methods of manufacturing. This research should aim at solving industrial problems, modernising industry and making industrial expansion possible.

In the view of the importance of coordination between industry and R&D centres in achieving spatial development, most companies in MEDCs finance scientific centres, especially universities, which serve the industry. The aim is to prepare the basic research which, once applied, brings long term benefits. If the costs of funding such research are bigger than their application, the research outcomes find their way into application in the industrial sector by the industrial companies. The companies aim to transform the results of the basic research into practical results which can be beneficial in developing industry and increasing industrial production.

Countries interested in scientific research in the industrial fields are MEDCs in terms of industrial technology. Figure 2 shows the nature of relationship between science (R&D centres), industrial production and industrial technology in MEDCs and LEDCs. The figure shows a strong correlation between science and industrial production and modern industrial technology in MEDCs. The reason it that these countries have an advanced industrial base which is, at the same time, a source of advanced industrial technology which helps increase inventions and innovations. Ultimately, this develops the industrial production. This correlation in LEDCs is very weak because of the following: (a) low spending on scientific research; (b) lack of co-

ordination between industry and R&D centres, universities in particular; (c) dependence on imported industrial technology.

As a result, industrial production and industrial technology remain traditional in their form and are underdeveloped. Industrial technological development in a region depends on the level of integration and correlation between industrial activities and R&D centres, especially universities. Higher education institutions are the major generator of modern technological inventions and innovations which contribute to the development of industry and increase the level of industrial production. This is reflected positively in terms of spatial development of industry.

Second – training centres for labour force in the region. Since modern industry is continuously developing because of technological advancement, it is in need of technological infrastructure in education. This is represented by training centres as well as professional institutes of technology which seek to make labour force updated with modern industrial technology. Also, labour force should be qualified to deal with technological innovations because the development of industry is influenced greatly by the existence of training centres as well as the technical level of the labour force.

The importance of the skill level of the labour force in industrial technological advancement is based on the fact that the productivity of employees is correlated with the level of their educational background. Moreover, the skill level is strongly related with the continuity and industrial development, especially modern technological advancement of industry (Mahmood, Al-Hadithi, 1995: 39–40).

In this respect, labour force training centres are among the most important factors of industrial production and a basic requirement to achieve the modern technological advancement of industry. Such centres foster regional capacity to generate technological inventions and innovations which are necessary for industrial development within the space of a geographical region.

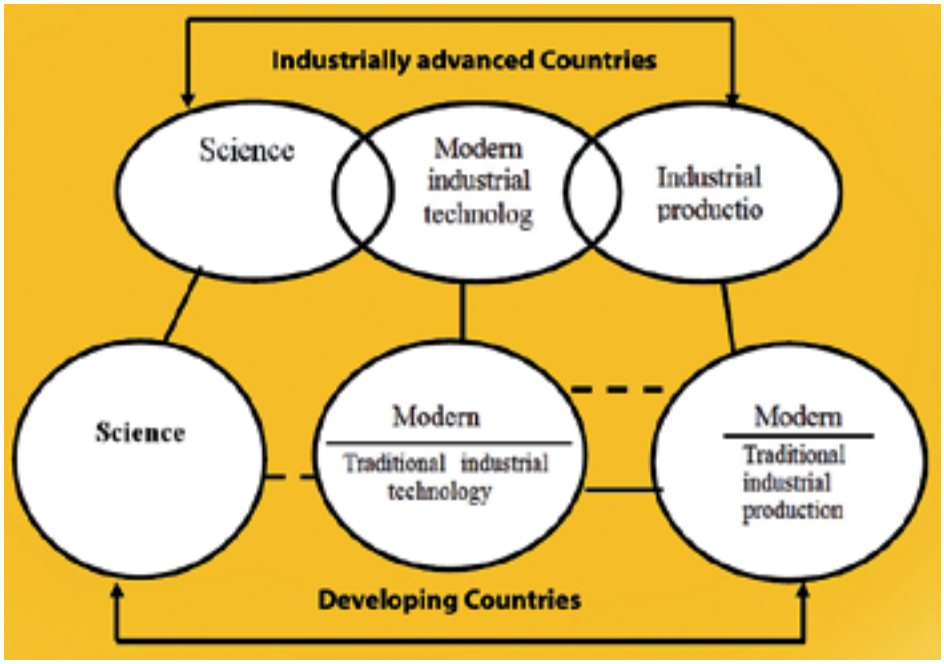

Fig. 2. Shows the relationship between science, industrial production and industrial technology in industrially advanced countries and the developing countries

Source: Kanan, A. and Kafor, H., 1988: 20

Third – dense concentration of high-tech industry. The basic goal of high-tech industry concentration is the expansion of technological inventions and innovations that serve modern technological advancement of industry. It is, however, possible only if modern industry is able to obtain industrial

technology at low costs. If not, then it is very difficult for some industries to use modern technology due to its high costs.

Fourth – spatial balance of urban structure in the region. Major urban centres represent a technological environment which is suitable for modern industry. They are the main incubators generating technological inventions and innovations necessary for modern technological advancement of industry. Moreover, urban centres contain motorways, markets and necessary infrastructure which serve modern industry and contribute to minimising productive costs of industry in the cities like Tokyo, Paris, Berlin and Warsaw.

The process of generating technological inventions and innovations, and chances of modern technological advancement of industry, strongly relate to two basic factors, namely the spatial development of cities and the development level of economies of industrial agglomerations (Estall, Buchanan, 1962: 99).

Fifth – information technology. Information technology plays a great role in increasing knowledge and exchanging information and thus participates in creating advanced industrial patterns. Also, it is the most important aspect of technological advancement of industry. It also has a major effect in minimising the density and patterns of spatial distribution of human settlements and economic activities, especially the industrial ones within the space of a region. Moreover, information technology is important in transferring technological inventions and innovations which are considered the basis of modern industrial technology and promote the role of information exchange among regions. It gives more freedom in selecting location of modern industrial activities and propagates technological innovations among non-neighbouring regions.

The role of modern industrial technology in achieving industrial development may open wide horizons to change social and economic structure for all countries, especially LEDCs, in accordance with the following developmental considerations: (a) modern technological advancement of industry contributes to increasing the level of industrial production and individuals' income. This is because the industry is the main economic sector that participates in increasing the national income. The increase of income levels will be reflected in savings level. As a result, it enhances investment abilities in different aspects of economic activity and this achieves developmental spatial balance among different regions; (b) technological advancement, especially in MEDCs, has a great role in maximising the number of educational institutions, especially those which serve the industry. Due to technological advancement population of urban areas increases, as well as health services and nutrition; (c) finding new ways of using raw materials and energy resources at low costs, which leads to diminishing the importance of the location of traditional energy sources. In addition, industrial activities are freed of location engagement through giving industrial activity more freedom in choosing the appropriate location for settling (Mahmood, Al-Hadithi, 1995: 33–34); (d) modern technological advancement of industry contributes to comprehensive spatial development through its role in social and economic activities within the space. It minimises developmental differences among regions and between rural and urban areas; (e) achieving the ideal use of labour force by training it in a way that conforms to modern technology in industry and maintains spatial development. In addition, it creates more job opportunities for labour force through its big role in increasing various branches of industrial production.

Axis II: effects of industrial development in the spatial structure of a geographical region. Industrial development is achieved through balanced distribution for industrial activities in a way that conforms with spatial distribution of accessible geographical elements within the space of a geographical region, especially in the underdeveloped regions. Industrial activity is considered a crucial element in comprehensive spatial development through generating changes in the spatial structure of a region. However, the role of industrial activity in achieving the spatial development and promoting economic base in a region depends on the capacity of industrial activity for increasing economic-industrial efficiency within space. This role can be achieved by the factors listed below.

First – concentration of industrial investment. Concentration of industrial investment has great influence as economic projects or through its effect in instigating other industrial activities and services. Directing financial-industrial investments towards underdeveloped geographical regions and

including them in specific industrial projects helps accomplish industrial development of regions. This will be reflected positively in the development of the regions' economy through diversity of production branches and absorbing cheap labour force surplus. Moreover, it allows exploiting available geographical qualifications of development and stimulates other sectors in the region.

Second – selection of a location for the industrial activity. It is based on industrial location processes where the location should guarantee maximum profits and minimum costs for the industrial activity.

Third – geographical location of a region. Geographical location of a region contributes to fostering the role of industrial activities and achieving the spatial development within the geographical space. The geographical elements of a region include climate diversity, which affects the variety of agricultural production, and the geological structure, which influences the diversity of mineral resources. In addition, there is easy communication within the region and with other regions, which helps facilitate the flow of raw materials on the regional or international level and contributes to expanding production. Therefore, a geographical element is considered an important factor in stimulating industrial development and achieving industrial development within the space of a geographical region.

Fourth – industrial agglomeration economies. This concept refers to the merits or the economic revenues which the industrial project gains within an industrial agglomeration area in a region. What distinguishes trends of industrial location is a strong inclination towards concentration of industrial activities in specific areas in a geographical region due to the advantages that economies of industrial agglomeration can achieve. These include sound and balanced distribution of industrial activities in underdeveloped regions and their capacity to exploit available geographical components to achieve the principle of economic efficiency. This principle can be fulfilled through earning maximum profits of the industrial projects which stimulates the process of industrial development and plays a great role in economic development in these regions. The positive development results, which are reflected in the industrial developmental process within the geographical space, are visible in the economic structure.

In addition to the economic and developmental impacts, industrial development has social and constructional effects within the space of the geographical region, which can be summarised as below.

First – the ideal distribution of industrial activities in regions will help achieve balance in population distribution. Dependence of the distribution of major industrial projects on the planning principle will help provide job opportunities for labour force surplus in underdeveloped regions and accomplish equality in income or provide other services. All these will limit population migration from underdeveloped to developed regions. In addition, this will help establish integrated settlements within the areas of industrial projects, which will minimise social differences among population, especially in housing and other services.

Second – through establishing industrial projects in rural areas, industrial development contributes in transforming these areas from those pushing labour force towards cities into areas attracting population from crowed cities. As a result, this will minimise the pressure on cities and activate social and economic development in rural areas, and thus minimise the economic and social differences between urban and rural areas.

Third – distribution of industrial projects has a significant effect on the change in land use pattern. This clearly appears through transforming large areas of agricultural land into industrial and housing estates as well as health, educational and cultural centres and other services which accompany housing estates.

Fourth – industrial activities in underdeveloped areas play a great role in boosting construction industry and developing residential areas. This is because establishing industrial projects within these areas is accompanied by building housing estates with all the necessary services (health, education, entertainment, finances, transportation, electricity, etc). The idea is to provide appropriate housing for employees of the industrial projects, especially as most workers are from outside the region of the industrial project, as well as the workers in other services within housing estates.

Fifth – the most prominent developmental impact of industrial projects within the space is the expansion in the field of education, in particular vocational education. It can be achieved through es-

tablishing educational institutes and training and developing centres, as well as by providing power services which is one of the most important requirements of modern industry. Consequently, industrial development is considered a basic factor in changing the pattern of social life, increasing standard of living as well as growth of cities within the space of a geographical region.

4. Conclusions

The relationship between geography and spatial development within the spatial organisation of a region is indicated through the following facts:

1. A prominent role of a geographer, which is clarified through studying existing developmental reality in a region or regions to diagnose which regions are developed and which need developmental investments. The aim is to increase the development level and remove development differences within geographical regions. Such effects are achieved by distributing economic activities and wealth, as well as increasing income level. Geographers diagnose accessible geographical resources in a region, which can be distributed among different economic sectors, and identify development level for each sector. This is done untill balanced spatial development is accomplished in the region through balancing all private or public investments revenues directed towards regions.
2. Since a geographical region represents an ideal base for spatial development, the planning process should utilise the geographical experience which is able to diagnose and identify all geographical variables of a region. These variables should be presented through the geographical information system which supports a planning process with necessary information to make developmental process successful in a region . This means that geography participates in feeding planning process with information and producing developmental outputs.
3. The dependence of regional planning on the traditional location theories, such as the theories of Christaller, Von Thunen (agricultural land use) and Feber (industrial location). These theories depend on geography in spatial distribution for geographical phenomena and suitable spatial solutions. In addition, they form the most important basis the planning processes depend on in the field of spatial development. This refers to the clear interrelation and linkage between geography, regional planning and spatial development within the geographical space.
4. A geographer's skills to diagnose all geographical variables (natural, human and economic) in regions, which form the basis of planning processes in a region. The geographer's importance emerges through his/her abilities to link the results of different studies.

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