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Does Market Potential Matter? Evidence on the Impact of Market Potential on Economic Growth in Iranian Provinces

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Abstract

The market potential is an indicator showing the level of market access and national demand for products of a region. The aim of this study is to study the effect of market potential on regional economic growth in 28 Iranian provinces over the years 2001–2011. In order to do that, a model of regional growth was estimated by using Spatial Dynamic Panel Data technique. This technique allows us to control for endogeneity biases. Based on the findings, the market potential has a significant positive impact on economic growth of Iranian provinces. This means that as the regional market of products gets bigger, it will experience a higher economic growth.

Keywords: Market Potential, Regional Economic Growth, New Economic Geography Model, Spatial Dynamic Panel Data.
JEL Classification: R23, R15, R11.

1. Introduction

The market potential is an indicator that shows the level of market access. In fact, the term is taken from physics. It has emerged into economic studies from Harris (1954). Harris defines the market potential for a specific area as gross domestic product (GDP) of other regions divided by the distance between regions. Market potential affects regional growth from several channels. As an area has a larger market potential, it has a larger market to sell its goods. The larger

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market, effects on the manufactures' profitability; because larger markets increase the demand for various regional products, and manufacturing firms will benefit from increasing returns to scale. So, the manufacturers located in areas with larger market potential has higher profitability than firms settled in areas with smaller market potential. So, an area with larger market potential will be an attractive site for industrial firms' concentration. According to the new economic geography model, concentration of industrial activities in a region leads to regional growth by Localization Economics. Furthermore, agglomeration of activities can also lead to higher productivity, real wages and higher living standards, and regional economic growth. Several studies on the impacts of market potential on the economic variables have been done. The first group of studies examined the impact of market potential on GDP and growth (Clemente, Pueyo and Sanz, 2009; Enbai, Hong and Wenqing, 2012; Martinez-Galarraga, Tirado, and González-Val, 2015). The second group of studies investigated the impacts of market potential on wages (Niebuhr, 2003; Redding and Venables, 2004; Amiti and Cameron, 2004; Hanson, 2005; Head and Mayer, 2006; Paillacar, 2007; Lopez and Faina, 2007; Kosfeld and Eckey, 2010; Fally, Paillacar, and Terra, 2010; Hering and Poncet, 2010; Pareds, 2012; Kamal, Lovely, and Ouyang, 2012; Cieślik and Rokicki, 2013; Turgut, 2014). The third group of studies are those which investigated the the impact of market potential on industrial activities' concentration (Hanson, 2004; Harris, 2008; Tokunaga and Jin, 2011; Bagoulla and Peridy, 2011), and the fourth group focused on the impacts of market potential on productivity (Ottaviano and pinelli, 2006; Nicoloni and Artige, 2010; Liu and Meissner, 2015).

This paper studies the impact of market potential on regional economic growth within the framework of the new economic geography model. In the new economic geography models, the focus is on industrial concentration as one of the most important variables affecting regional growth. Therefore, growth and concentration of industrial activity are interdepended. On the other hand, according to Cambridge Econometrics (2008), Tokunaga and Jin (2011), and Bagoulla and Peridy (2011), the market potential affects industrial activities and there is a relationship between them. Therefore, in estimating growth model, the endogeneity between variables should be considered. Also, two problems arise when estimating growth and agglomeration economies: unobserved heterogeneity and simultaneity. If we cannot control this problem, we will have biased estimation. So, in order to control this problem, we used generalized method of moments in spatial panel data. This method has not been used in any other research studies.

The contribution of this study is considering the effect of market potential on regional economic growth in Iran for the first time, and using spatial dynamic panel data to consider this effect.

The remainder of the paper proceeds as follows. Section 2 investigates the theoretical framework of market potential impact on economic growth. Section 3 presents model specification and description of the data used. Section 4 proceeds spatial autocorrelation of provincial real product in Iran, and section 5 shows basic results. Conclusions and recommendations are presented in Section 6.

2. Theoretical Framework

The market potential was presented by Colin Clark. It was similar to the concept of the population potential (the potential population) stated by Jon Stewart (1947). The market potential is an indicator of the severity of the market connections or access to the market. This concept is taken from physics, in similarity to the strength of an electric, magnetic and gravitational field formula (Harris, 1954). Market potential is designed to assess the spatial relationships between producers and market which shows the flow of goods from one point to another. Market potential or the market capability of each province is actually a measure of the national market demand for a province product. As the market demand for a region's products increases, the production in the region increases. Market size is an important factor in locating and establishing a manufacturer in one region. Two theories are proposed in relation to locating activities. In the first, locating is conducted based on the cost, and the models include Weber’s model, the Von Thunen’s model, the sum of the minimum distance method model, and the Léonard model. In this category, transportation costs and adjacency to the market are important elements in locating firms. In the second category, locating is conducted based on market structure. In these models, firms producing market monopoly locate closer to the consumer’s market.

Therefore, access to markets and intermediate inputs is important in locating, and manufacturers try to be located near the market. Being near the market makes manufacturers' access to consumers and suppliers easier, and thus reduces the cost of transportation. In new economic geography model, one of the main growth factors of a region is its market size. In this model, the interaction of increasing returns to scale, market size, distance and industry structure are addressed.

The turning point of these models is recognition of the increasing returns and transportation costs that makes the market size important (Cambridge Econometrics, 2008; Fujita and Mori, 2005). In the new economic geography model, economic activities are concentrated to obtain economies of scale, and are located where there is a large consumer market with better access to production markets (Cambridge Econometrics, 2008); because adjacency to the markets makes access to consumers and manufacturers easier, and as a result reduces the cost of transportation. Reduction of transportation costs lead to increase in profit, and thus, in turn, increase wages. The appeal of high wages, in addition to increasing intra-regional labor income causes migration flows towards areas placed close to the market. Migration increases the population in these regions which will lead to larger domestic markets for the exchange of goods and services, information and production. Increase in the amount of demand for the products of a region attracts industrial firms to the area, as with higher local demand, domestic economies to scale increases and attracts more manufacturers. Increase in the number of manufacturers may result in an integration in the region and through economies of agglomeration (a kind of positive externality in production), production of manufacturing firms in the region increases, and in the end, growth in the region economy will occur. So, it could be stated that according to the new economic geography model, if there is a high demand for products of an area, manufacturers will benefit more of locating in this area. They can also pay higher nominal wages and increase labor income. This leads to higher local demand (because of increased local workers’ income and labor migration to the region), and external demand (national level) for products. It increases manufacturers' production and economic growth in the region.

3. Model Specification

This paper examines the impact of market potential on regional economic growth by using new economic geography (NEG)[1] models. The equation 1, which resembles that proposed by Ottaviano and Pinelli (2006), takes the following form:

$$L(GDP_{it}) - L(GDP_{it-1}) = \alpha + \beta L(GDP_{it-1}) + \gamma_1 L(h_{it}) + \gamma_2 L(k_{it}) + \gamma_3 L(S_{it}) + \gamma_4 L(MP_{it}) + \mu_i + \varphi_{it} \quad (1)$$

Where the dependent variable (i.e., logarithmic growth rate of per capita GDP at the province level ($L(GDP)$)) is regressed on a set of explanatory variables consistently employed in the growth literature. We consider three sets of variables traditionally considered in the growth literature: proximate sources of growth (physical capital ($L(k_{it}$)), human capital ($L(h_{it})$), structural change variable (the regional share of manufacturing in total employment ($L(S_{it})$), and second nature geography or NEG variables (market access ($L(MP_{it})$)). The main explanatory variable in our analysis is market access (regional market potential). We also include regional fixed-effects (μ_i) to control for other regional characteristics not accounted for in the specification (e.g., first nature causes and geography). φ_{it} stands for the error term, i shows provinces[2] of the country indicating i: 1, ..., 28, and t represents time t: 2001 ... 2011.

We can write the equation 1 as follows:

1. Theoretical models state that the interaction between transport costs, increasing returns and size of market under a monopolistic competition framework can lead to spatial agglomeration of economic activity and to the upsurge of income differences across regions (Krugman, 1991).
2. Khorasan was the largest province of Iran until it was divided into three provinces of Razavi Khorasan, North Khorasan, and South Khorasan in 2004. Therefore, there was no statistical data about these three provinces available for the year 2004 and before. Furthermore, the statistical data was not either available for Alborz Province, which was formed by division of Tehran Province into two provinces of Tehran and Alborz in 2010. Therefore, the statistical data of Tehran Province has been used in this study to account for the data concerning Alborz Province.

$$L(GDP_{it}) = \alpha + (\beta+1)L(GDP_{it-1}) + \gamma_1 L(h_{it}) + \gamma_2 L(k_{it}) + \gamma_3 L(S_{it}) + \gamma_4 L(MP_{it}) + \mu_i + \varphi_{it} \quad (2)$$

Since the data used in this study are spatial and affected by spatial interactions, employing classical econometric is not suitable; because spatial interactions violate Gauss-Markov assumptions and spatial econometrics should be used to control these interactions. Specification of spatial model to estimate the impact of market potential on the growth of Iranian provinces is provided in the following equation:

$$L(GDP_{it}) = \alpha + \delta \sum_{j=1}^{n} W_{ij}\, L\big(GDP_{jt}\big) + (\beta+1)L(GDP_{it-1}) + \gamma_1 L(h_{it}) + \gamma_2 L(k_{it}) + \gamma_3 L(S_{it}) + \gamma_4 L(MP_{it}) + \mu_i + \varphi_{it} \quad (3)$$

In the spatial models, to enter the location dimension, spatial weight matrix is used. In equation 3, Wij is the i, jth element in a 28 × 28 spatial weight matrix. This matrix defines the spatial interactions between spatial units, and is constructed based on distance (latitude and longitude) or the contiguity (map) (Leasage, 1999). This study uses a distance and contiguity matrix. In the first type of matrix, the distance of each point in the space or any observation at any point is calculated relative to the central, fixed points or observations. Therefore, observations close to each other should reflect higher spatial interactions than those that are far apart. In other words, spatial interactions and its effects between observations must be reduced by increasing the distance between the observations. In this paper, it is considered as follows:

$$W_{ij} = \begin{Bmatrix} \frac{1}{d_{ij}} & i \neq j \\ 0 & i = j \end{Bmatrix} \quad (4)$$

d_{ij} is the distance between provinces i and j. In the second matrix, the spatial effects are defined by adjacency relationship. Contiguity criteria of obtained data will be based on Map information. Based on these information, we can determine which areas are neighbors. In this paper, this type of matrix is considered as follows:

$$W_{ij} = \begin{Bmatrix} 1 & \text{if the province } i \text{ has a border with provinces } j \\ 0 & \text{otherwise} \end{Bmatrix} \quad (5)$$

And $\sum_{j=1}^{N} W_{ij} = 1$

3.1 Data

GDP data for the period 2001–2011 was collected from provincial statistical year books published by statistical center of Iran. We calculated real GDP by using province price index.

For calculating the regional share of manufacturing in total employment (industrial activity concentration), Nakamura and Paul (2009) index was used:

$$S_j^C = \frac{X_j}{\sum_{j=1}^{J} X_j} = \frac{X_j}{X_*} \quad j = 1,\ldots,J \tag{6}$$

X_* stands for the total added value in the industrial sector and X_j is the industrial added value of the region j. J represents the province. S_j^C shows the industrial sector concentration in the region j. This index is between zero and one. If the industry is completely concentrated in one area, it will be one, and if the industry is distributed in some large areas with very small shares, this indicator will tend towards zero. To calculate the index, we used provincial statistical year books published by the statistical center of Iran. To calculate the real capital stock in this article, the government credit for development plus credits to the private sector were considered as investment variable in the province, and was calculated by exponential method. In the exponential method, you must first estimate capital stock by estimation of the $IN_t = IN_0 e^{\lambda t}$ exponential function. In this equation, t represents the gross investment variable, and IN_0 is the gross investment made in the base year (2000). The logarithmic transformation for the exponential function is $Ln(IN_t) = Ln(IN_0) + \lambda t$. After estimating the relationship with OLS method, the process time coefficient (λ) is achieved in the equation. To determine the capital in 1999, excluding capital depreciation, the $K_0 = \frac{IN_0}{\lambda}$ equation is used. Taking into account the depreciation of capital and deduction of 5% of the capital as depreciation, capital reserves in 1999 is calculated according to the current price-to-be. Then, using K defined as $K_t = \frac{K_{t-1} + I_t}{1+\delta}$ and based on capital stock in the base year, the values of capital reserves for different years is calculated. In the above equation, δ as the indicator of capital depreciation rate is considered 5% (Zaranejad and Ansari, 2007). It should be noted that real capital stock are calculated by the price index. These data was collected from provincial statistical year book.

Regarding each province, the variable 'the average number of years of schooling of the workforce' was defined through the use of provincial statistics on levels of education of the workforce aged 10 years and above. Based on their educational levels, the workforce in each province was divided into 6 categories, namely those who had attended adult literacy classes, elementary school, junior high school, senior high school, pre-university school, and higher education. The average number of years of schooling of employees was 3 for those who had attended adult literacy classes, 5 for those who had attended elementary school, 8 for those attended junior high school, 11 for those attended senior high school, 12 for those attended pre-university school, and 15.5 for those attended higher education. Then, for each level of education, the average number of years of schooling of the employees was multiplied by the percent of relevant employees aged 10 years and above, and the obtained values for the 6 levels were ultimately added together[1]. To do all of this, the data collected from provincial statistical yearbooks and published by the Statistical Center of Iran was used.

To calculate market potential data, Liu and Meissner indicator (2015) was used. In this index, provinces got assumed as circular and the market potential was calculated as follows:

$$TMP_{ii} = FMP_i + DMP_i \tag{7}$$

$$FMP_i = \sum_{s \neq i} \frac{Y_s}{d_{is}}$$

$$DMP_i = \frac{Y_i}{d_{ii}}$$

FMP_i stands for the foreign market potential, DMP_i is the domestic market potential, d_{is} is the distance of i province from other

1. One limitation of the present study was that due to the lack of accurate statistical data, the applied method did not account for the employee's in-service training which are very useful and in accordance with the expertise required, and which can increase labor productivity.

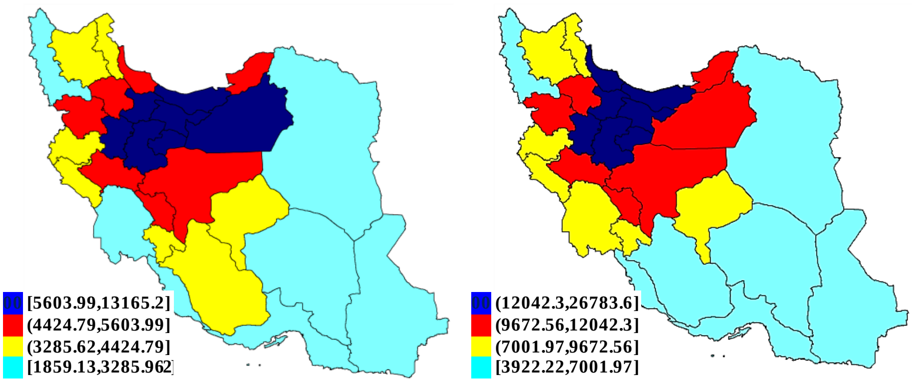
provinces, $d_{ii} = \sqrt{Aria_i/\pi}$ is the distance of i province from itself, and $Aria_i$ is area of the province i, and π is 3/14.

To calculate the domestic and foreign market potential of each province, real domestic gross production per province and the distances from other provinces per kilometer are considered. The reason for using this indicator is that both the domestic and foreign market potentials are considered; so it is a more comprehensive index and can be calculated based on data and statistics of provinces in Iran. Table 1 represents descriptive statistic for the examined variables.

Table 1: Indicators of Descriptive Statistics for the Examined Variables

Variable	Obs	Mean	Standard deviation	Min	Max
LK	308	5.32	0.43	4.28	6.91
LS	308	-1.79	1.08	-4.32	-0.96
LH	308	6.64	0.38	5.97	7.97
LMP	308	3.82	0.22	3.27	4.42
LGDP	308	4.85	0.43	3.79	6.17

Figure 1 represents maps for market potential of Iranian provinces over the years 2001–2011.



Market potential, 2011 **Market potential, 2001**

Figure 1: Market Potential of 28 Iranian Provinces over the Years 2001–2011

4. Spatial Autocorrelation of Provincial Real Product in Iran

To examine the spatial dependence of labor productivity, Moran's I Statistic (1950) was used as a useful tool for measuring the degree of a dependency between a variable in one region and the same variable in a neighboring region. Moran statistics is as follows:

$$I = \frac{n\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}(X_i - \bar{X})(X_j - \bar{X})}{(\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij})\sum_{i=1}^{n}(X_i - \bar{X})^2}$$

n is the number of provinces that have been considered in our study (28 provinces). X_i is the real GDP provinces, $\bar{X}$ is the average GDP of all the provinces, and W is weight spatial matrix. Furthermore, the null hypothesis (H_0) states that there is no spatial autocorrelation.

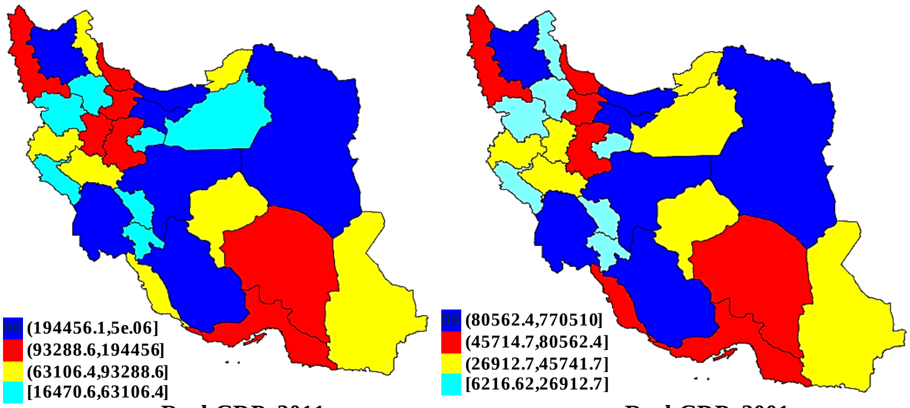
A positive Moran's I index value can indicate that real GDP is similar in contiguous provinces (i.e. provinces with a high level of real GDP have been contiguous to each other, and those with a low level of real GDP have been contiguous to each other too). Also, negative values imply that a dissimilar pattern is established in the neighboring provinces. When the value of this statistic is zero, there is a random distribution of real GDP between these provinces (Huang and Chand, 2015). Moran test results are shown in Table 2. Moran statistic value is positive and statistically significant for all studied years, and there is a spatial autocorrelation in real GDP of Iranian provinces at the 10% significance level.

Table 2: Global Moran I Statistic for Regional Productivity

Year	Moran's I value	Standard deviation	p-Value
2001	0.029	0.053	0.097
2002	0.031	0.049	0.090
2003	0.021	0.054	0.138
2004	0.026	0.054	0.112
2005	0.027	0.053	0.101
2006	0.029	0.051	0.097
2007	0.030	0.050	0.092
2008	0.017	0.046	0.117
2009	0.021	0.047	0.109
2010	0.032	0.050	0.081
2011	0.037	0.054	00.086

*Adjacency matrix is constructed based on map.

Figure 2 represents maps for Real GDP of Iranian provinces over the years 2001–2011.



Real GDP, 2011 **Real GDP, 2001**

Figure 2: Real GDP of 28 Iranian Provinces over the Years 2001–2011

5. Empirical Results

Based on equation 3, the growth equation is:

$$L(GDP_{it}) = \alpha + \delta \sum_{j=1}^{n} W_{ij} L(GDP_{jt}) + (\beta + 1) L(GDP_{it-1}) + \gamma_1 L(h_{it}) + \gamma_2 L(k_{it}) + \gamma_3 L(S_{it}) + \gamma_4 L(MP_{it}) + \mu_i + \varphi_{it}$$

Since according to the new economic geography models, the industrial activity concentration variable is interdependence with the growth (industrial activities concentration affects growth and vice versa), this endogeneity between variables should be considered. Also, two problems arise when estimating growth and agglomeration economies: unobserved heterogeneity and simultaneity. Some characteristics that the econometrician does not observe can be related to both growth and agglomeration. So, φ_{it} is correlated with the independent variables. This issue is known as the 'unobserved heterogeneity' problem. In equation 2, LS_{it} is likely to be correlated with φ_{it}. Transportation infrastructures, natural resources or public services can increase the regional growth, and a region with richly transportation infrastructures, natural resources or public services will be more attractive for firms (Martin, Mayer & Mayneris, 2011). There is a positive correlation between unobserved variables and agglomeration. Consequently, the OLS estimates of the coefficients are biased.

On the other hand, by the negative or positive shock in the region, other firms may close or open. So, φ_{it} and agglomeration correlated. To address those problems, we use a GMM approach.

Six variables in the equation above including the real capital stock (LK), industrial activities concentrations (LS), human capital (Lh), the market potential (LMP), production of other provinces ($LGDP_{jt}$), and province production in the prior period ($LGDP_{it-1}$) influence on economic growth in the region. In Table 3, two models have been estimated. In model 1, the contiguity matrix is created based on the map considering a Queen like contiguity, and in model 2, the contiguity matrix is constructed based on distance.

Table 3: Estimation Results of Regional Economic Growth
(Alternative Specification of Spatial Weight Matrix)

Variables	W–nearest neighbors			W–nearest at distance		
	coefficient	t-stat	p-value	coefficient	t-stat	*p*-value
LRGDP (-1)	0.349***	21.47	0.000	0.383***	24.03	0.000
Lh	0.095***	5.35	0.000	0.067***	8.32	0.000
LK	0.042***	5.55	0.000	0.027***	4.19	0.000
Lag	0.066***	10.34	0.000	0.059***	9.60	0.000
LMP	0.157***	2.21	0.028	0.457***	5.36	0.000
W*LGDP	0.493***	7.43	0.000	0.178***	2.44	0.016
Constant	-0.609***	-3.81	0.000	-0.134	-0.94	0.347
R^2	0.9818			0.9716		
R^2 Adjusted	0.9815			0.9710		
Log likelihood	531.4420			541.8503		
WALD Test	14787.7613***		0.000	9357.0791***		0.000
F- Test	2464.6269***		0.000	1559.5132***		0.000
Sargan Test	24.055		1.000	26.054		1.000

Notes: (1) real GDP is a dependent variable.
(2) *** indicate statistical significance at the 0.01, 0.05, and 0.1 levels, respectively.
(3) The numbers of observations equals to the numbers of years in each period multiplied by 28 provinces.

According to Table 3, the logarithm of concentration of industrial activity has a positive effect on real GDP in both models, and is significant at the 5% significance level. According to the new economic geography theory, industrial concentration in one region can attract the innovation, increase knowledge, bring about technological changes, diversify the production and increase the real income of that region, and so lead to regional growth. The logarithm of capital stock variable showed positive and significant impact on regional per capita GDP on both models ($p<0.05$). The idea that as the physical capital is higher, the economic growth will be higher, has been taken from Adam Smith, and several theoretical studies also have confirmed it. The logarithm of human capital variable showed a positive and significant impact on the 5% level of significance. As human capital goes higher, production is expected to grow faster. Increasing human capital can also increase the innovative capacity and the application of new technologies in a region, which in turn leads to an increase in the production and productivity. So, as the human capital increases, the necessary infrastructure for the use of imported technology will also increase. It also makes it possible for a better utilization of physical capital. The logarithm of the market potential also showed a positive relationship with economic growth in both models with a %5 level of significance. Market potential or the market capacity of each province is actually a measure of the national market demand for a province production. As the market demand for the productions of a region increases, its productions will increase, and the existing industries in the region will be more concentrated. Also, as the demand for regional products increases, the firms' profit will increase which leads to higher migration of capital and labor to that area. It should be noted that the positive effect of market power (market potential) is in accordance with trade theories and based on these theories, the domestic regional gross production of a region importing goods from another region has significant impact on the exporter region's exports, leading to higher exports and growth in that region. In new economic geography models, those areas with larger markets have competitive advantage. According to the new economic geography model, if there is a large demand for products of a region, the manufacturers will benefit more from settlement in this area resulting from the economies of internal scale. They can pay higher nominal wages leading to higher local demand (due to both increased workers' income and labor migration to the region). In addition, external demand (national level) for products will occur and manufacturers' production increase causing growth in the region. According to the Table 3, the impact of market potential using the contiguity matrix based on distance is more than geography matrix based on adjacency. According to Table 3, the Wald test and F statistics indicate that the whole model is significant. For ensuring the suitability of instrumental variables in GMM, Sargan test was used. The null hypothesis of this test indicates the appropriate instrumental variables. Based on the results of this test, validation of instrumental variables used in spatial GMM was approved. It should be noted that in both models, a two-stage estimator (two step estimator) was used in the GMM.

6. Conclusion and Recommendations

A province's economic growth may not only depend on its own inputs of capital, labor, and human capital; but it may also be subject to market capacity and other factors of the surrounding provinces. In this study, we applied Moran index to provincial GDP per capita from 2001 to 2011. We found a positive and spatial autocorrelation among provinces, confirming the existence of inter-provincial spillovers. We calculated market potential by using Liu and Meissner indicator (2015), and adopted a new economic geography model for measuring the effect of market potential on regional economic growth. A model of regional growth was estimated by using spatial dynamic panel data techniques for 28 Iranian provinces over the years 2001–2011. We contribute to the literature studying the effect of market potential on regional economic growth in Iran for the first time, and using spatial dynamic panel data to consider this effect that previous studies did not use.

The empirical results showed that the market potential had a positive relationship with economic growth in both models with a %5 level of significance. We found that controlling for other important growth factors, increasing the market potential by 10% points would increase the provincial GDP per capita by 1.57–4.57% points. As a major policy recommendation, this paper explores the existence and the magnitude of the effects of regional growth spillover and market potential has positive effect on regional economic growth. To further promote more balanced economic growth across different regions, our study suggests further facilitating market freedom and removing local economic protection.

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