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Testing the New Structural Economics Hypothesis at the Iranian Provinces Level: Using GMM Approach

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Abstract:
The new structural economics approach to industrial policy is to follow a strategy of comparative advantage. According to this thinking, determining the relative prices of production factors by the market mechanism and providing the soft and hard infrastructure required by the government for industries that are compatible with the production factor's structure, are the two determining factors of industrial development strategy. Considering that one of the key hypotheses of this approach is to increase economic growth as a result of comparative advantage following policy, this study has tried to test this hypothesis in the provinces of Iran in the period of 2005-2017 using the GMM. The findings of this study show that the hypothesis is confirmed at the level of Iranian provinces; Also, the change in the model estimation method did not change the research findings, so it is reliable. Therefore, it is recommended that policy makers consider the policy of following the comparative advantage of the region in designing the industrial development strategy.

1. Introduction

Industrial policy means any government intervention or policy that attempts to improve the business environment or change the economic structure towards sectors, technologies or tasks that are expected to provide better prospects for economic growth or create better social welfare than when there is no such intervention (Warwick, 2013). Industrial policy is an important tool for a government to guide economic development; By implementing industrial policy, the government firstly intervenes in the process of resources allocation and

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distribution of benefits, secondly, by influencing the behavior of companies, it limits or encourages them to enter economic activities, and thirdly, it directs industrial development (Chen & Xie, 2019).

Industrial policy design requirements and its framework to achieve economic growth have undergone extensive changes over time. The first formal statement of industrial policy with the content of supporting infant industries was proposed by the first US Secretary of the Treasury, Alexander Hamilton. This official statement preceded Ricardo's theory of comparative advantage against the dominant approach of free trade and the concept of supporting young national industries in competition with superior foreign producers (Cohen & DeLong, 2016). Factors such as the growth of nationalism and anti-colonialism in Latin America (Prebish, 1950), the Russian October Revolution and industrial development with socialist patterns in the Eastern Bloc (Erlich, 2013), the crisis of 1930 (Singer, 1950) caused structural thinking to spread. The main idea of this thinking can be seen in a theory that Prebish (1950) and Singer (1950) had proposed; According to them, in order not to be exploited by developed countries, developing countries should develop their domestic industries through a process known as import substitution policy. The observed results of using this approach were not satisfactory. Negative experiences in the countries of Latin America, Africa and South Asia caused structuralism to give way to a market-oriented approach and recommended again by international institutions such as the World Bank (Williamson, 2002). The set of market-oriented policies, later known as the Washington Consensus, encouraged countries to implement economic liberalization, privatization and stabilization programs. The consequences of the implementation of these policies were also not satisfactory and were controversial at best (Easterly, 2002; Lin, 2015; Loayza et al., 1999). The failure of these two approaches, along with the remarkable success of several developing countries, led Professor Justin Lin to present the theory of New Structural Economics (NSE) in 2010. The NSE emphasizes the role of government intervention in the market economy and is of the opinion that governments should be a suitable guide for companies according to different conditions; Especially for solving the problem of external effects and providing the necessary hard and soft infrastructure that companies may face in the process of industrial upgrading. These are the cases that companies cannot overcome with internal decision-making (Lin, 2015). The NSE states that the strategy of industrial policy should be of the type of following comparative advantage (CAF) and claims that if this strategy is adopted, we will see a good performance in economic growth. In this theory, by introducing an index to measure the degree of compliance of industrial policy with comparative advantage, Lin has made it possible to examine its impact on economic growth empirically.

The experience of development programs in Iran shows that these programs were implemented in a minimal way (Sharifzadegan & Norayi, 2015). Specifically,

regarding industrial policy-making, during the past three decades, the Ministry of Industry, Mining and Trade has prepared four documents and a plan related to industrial strategy, but none of these plans have been implemented (JafartashAmiri, 2020). Although this situation calls the policymakers to pay more attention to this issue, it should be noted that every country in the world, whether intentionally or unintentionally, pursues industrial policy, and therefore the possibility of evaluating its industrial policy (Lin et al., 2011).

The importance of the subject of industrial policy and the assessment of its performance on the one hand and the lack of domestic empirical studies in this field prompted us to conduct the present research with the aim of testing the hypothesis of the new structural economics approach to industrial policy at the level of Iranian provinces. The main question of the research is whether following the policy of comparative advantage can improve the performance of the economic growth of the provinces of Iran. The answer to this question will be a good guide for policymakers in designing the industrial policy of their region. To perform this test, the dynamic panel data method (GMM) was used in the period of 2005-2017 (according to the available data). Also, for the purpose of sensitivity analysis, the static panel data method has been used to examine the stability of the estimated coefficients with respect to the change of the estimation method.

The framework of the article is as follows. In the second part, the theoretical foundations of the research are given; In the third part, we review the latest studies on industrial policy. The fourth section is dedicated to the research method and the data used, and then the fifth section deals with data analysis and model estimation. The analysis of the sensitivity of the results to the change of the estimation method of the model has been investigated in this section. In the end, the research findings are examined and analyzed.

2. New Structural Economics Foundations

Before the introduction of new structural economics by Justin Lin in 2010, two main development strategies were followed by different countries. Based on the first approach, which is called "Development Economy 1.0", policymakers followed the structuralist approach in the 1960s and 1970s. Some developing countries, such as Brazil, India, Egypt, Ghana, and the Republic of Korea, have developed advanced industries similar to those of high-income countries in order to keep pace with advanced countries such as Japan and the United States. Although initially successful, they quickly fell into crisis and stagnation (Lin & Wang, 2016). In the 1980s, development thinking shifted to neoliberalism. The second approach, "Development Economy 2.0", emphasized some key policies such as privatization, liberalization and consolidation. Based on the doctrine of this thinking, developing countries were encouraged to increase competition

among industries by deregulating domestic markets, deepening financial markets, and minimizing trade protectionism. This approach not only increased the income gap between middle-income and high-income countries, but its validity also coincided with the emergence of global issues such as climate change, concentration of power in companies, development in industries with new technology, expansion of inequality in Globalization and financial crises were challenged (Collier, 2018; Gertz & Kharas, 2019; Lin & Wang, 2016).

The failure of the two mentioned approaches, along with the success of some developing countries, led Justin Lin - the senior economist of the World Bank - to present a new strategy in the field of economic development called the new structural economics. This new thinking, which is referred to as the third wave of development thinking, can be considered a combination of neoclassical economics and old structural economics. NSE's approach in supporting economic sectors is a unique approach. In a study entitled "Comparative Advantage: The Silver Bullet of Industrial Policy", Lin and Monga discuss the conditions in which industrial policy, or government intervention, fails or succeeds. They argue that in most cases, industrial policies fail due to strategic mistakes in choosing goals that are not compatible with the level of development of a country and the structure of production factors in the same period. According to what has been learned from the experience of choosing useless and unworkable development goals in different countries, it is recommended that industrial policies be in accordance with the comparative advantage of the country; The advantage that is determined by the structure of production factors at the time of strategy design (Lin & Monga, 2013). NSE theory takes a dynamic view of industrial structure instead of a static view. The recommendation of this theory is that industrial development strategies should be compatible with the resources structure because the economic structure, technological structure, industrial structure and soft and hard infrastructure of a country change over time. The amount of production factors and its structure determines the income of the entire economy and the relative price of production factors at any time. After determining the relative price of production factors, the comparative advantage of an economy can be seen in the sectors that have the lowest cost of production factors. Based on this, the industrial structure, which is a function of the structure of production factors, is determined. By creating such a business environment in the economy, if a company operates in an open and competitive market, then it can earn a reasonable profit and be stable without receiving government subsidies. An enterprise is viable when the technology used in it and the industry in which it operates are compatible with the comparative advantage of the country and the government has provided the soft and hard infrastructure needed by the industries (Lin, 2017). The existence of such enterprises in the economy - in the first stage- causes an economic surplus, and in the second stage, it leads to the improvement of the structure of production factors. By improving the

structure of production factors, a new optimal economic structure is defined, which itself requires the use of a new industrial policy appropriate to the new conditions. In this situation, we will see dynamic economic growth.

On the contrary, if the industrial policy is followed based on the strategy of defying the comparative advantage (CAD), then the enterprises that are created, in addition to being unsustainable, their survival depends on government support and continuous and significant policy benefits. The CAD strategy will have exactly the opposite result of the CAF strategy; That is, it leads to lack of competitiveness, reduction of capital return rate, increase of rent-seeking activities and flexibility of the budget in the companies that are in priority. Although adopting a strategy of defying comparative advantage is attractive to political leaders and people of less developed countries, including the intellectual class, because most people directly witness the difference between the industrial and technological structure of developed countries and their own country, it should also be noted that the result of this is nothing but a reduction in economic growth and capital accumulation (Lin & Zhang, 2007).

Although the new structural economics approach to industrial policy emphasizes the importance of following comparative advantage, it notes that it is only one part of a complete set of policies, institutions, capacities, and arrangements that must work together in order to increase the likelihood of success. Also, the NSE theory shows flexibility towards the strategy of following comparative advantage and states that a country that wants to accelerate its industrial development process may need to distance itself somewhat from its current comparative advantage and carefully strengthen a set of high-tech products; This requires the existence of a capable, organized, regular and ready government to cooperate closely with the private sector, and such a government can be tied to difficult performance criteria.

Lin and Liu (2004) introduced an index called TCI to test the hypothesis of new structural economics; A hypothesis according to which if a region bases its industrial policy on following comparative advantage, it will have economic growth. This index is defined as:

$$TCI_t = \frac{AVM_t / LM_t}{GDP_t / L_t} \qquad (1)$$

AVM is the region value added in the industrial sector, GDP is the region value added, LM is the number of workers in industrial sector, and L is the total number of workers in the region. If the CAD strategy is adopted by the government, the value of the index will increase because the pursuit of this strategy requires the government to grant exclusive positions to the companies in the market in order to overcome the problem of their survival in the priority sectors, overcome and reduce their investment and operating costs by paying credits and raw materials. On the one hand, such policy measures increase AVM,

and on the other hand, since investing in priority industries requires more capital and less labor, the numerator of the fraction in the equation will be larger (Lin & Chang, 2009).

3. Literature Review

The importance of the subject of industrial policy has caused researchers to conduct significant studies about it. The latest foreign and domestic studies in this field with emphasis on the theory of new structural economics are as follows. Gnangnon (2020) investigated the effect of adopting the policy of following comparative advantage and aid for trade (AFT) on structural changes in the manufacturing sector. He covered 81 countries between 1996 and 2016. The results showed that aid for trade can promote structural changes only in countries that have followed the strategy of following comparative advantage. Olanrewaju et al. (2020) combined the new structural economics and the new institutional economics together and examined the impact of applying the policy of comparative advantage following on Nigeria's GDP per capita during the period 1998-2017. Based on the obtained results, the implementation of the policy of following the comparative advantage has had a negative and significant effect on the GDP per capita of Nigeria, which means that the hypothesis of the new structural economics is not confirmed. Chen and Xie (2019) empirically investigated the impact of industrial policy on China's economic growth in the period of 2003-2015. The result of this study shows that China's industrial policy has significant positive effects on economic growth and the rationalization of industrial structure is an important channel of industrial policy to improve economic growth. The result of the study supports the hypothesis of new structural economics that industrial policy has a positive effect on economic growth. Bruno et al. (2015) tested the hypothesis of new structural economics among 160 countries with an emphasis on emerging economies. The results of the study showed that the type of development policies of governments had a significant impact on economic growth; This means that the policy of following comparative advantage has a positive effect on economic growth. They also realized that with the reduction of financial disturbances, the positive effect of the implementation of this policy on economic growth increases. Siddique (2014) examined the impact of industrial policy strategy on the level of poverty among 113 countries for the years 1980 to 2000. A key finding of this study was that the adoption of a comparative advantage defying strategy is associated with a higher level of poverty. Lin and Chang (2009) investigated the effect of government strategy choices on economic growth among 122 different countries during the period 1962-1999. The results showed that the use of strategies that ignore comparative advantage had a negative and significant effect on the growth performance of selected countries.

Dehghan et al. (2017), while explaining the theoretical foundations of industrial development strategy from the perspective of new structural economics, presented the principles and indicators of this strategy. The indicators of this strategy include how to take examples from countries with a similar structure in terms of production factors and pay attention to the comparative advantage of sectors and sub-sectors arising from the production factor's structure. Other principles of this approach include export-oriented industrialization, paying attention to foreign direct investment outside and within the network of developing countries, integrating the government and the market to achieve industrial development, determining facilitating duties for the government in this field and adopting a gradualism approach in the path of industrial development. Mirjalili (2018) has studied the theoretical evaluation of the new structural economics. In this study, after examining the previous approaches in the field of economic development, he introduced the NSE theory and its frameworks.

4. Methodology

4.1. Model

The purpose of this research is to investigate the role of industrial development strategy on the economic growth of Iranian provinces. For this purpose, the experimental model of Lin (2009) who presented this theory is followed:

$$GROWTH_{i,t} = C + \alpha TCI_{i,t} + \beta X + \vartheta \qquad (2)$$

where $GROWTH_{i,t}$ represents the economic growth rate at time t and for province i, $TCI_{i,t}$ represents the policy measurement index of following comparative advantage at time t and for province i. X is the control variables which, based on various studies, include two key variables, i.e., physical capital and labor force. All model variables are estimated in log mode. The scope of study in this research is all the provinces of the country. Also, the required data was collected from the website of the Central Bank, the website of the Statistics Center and the statistical yearbook of the provinces during the period of 2005-2017. Due to the lack of access to provincial data, the amount of government construction costs was used as a substitute for the annual physical capital variable and was realized based on the year 2015.

It is expected that the relationship between economic growth and physical capital and labor force is positive. According to the hypothesis proposed in the approach of new structural economics to industrial policy, if the policy-making moves towards following the comparative advantage, we will have economic growth. Since the high amount TCI indicates that the policy is against the following of the comparative advantage, it is expected that there is a negative relationship between TCI and economic growth.

4.2. Estimation Method

In this study, dynamic panel data (GMM) econometric method is used among different methods of panel data. The reason for using the GMM model is related to the dependent form of the proposed economic model, where the dependent variable of economic growth is given with a lag on the right side of the equation. Caselli et al. (1996) for the first time used the GMM estimation method of dynamic panel data in the estimation of economic growth models. Bond et al. (2001) have examined in detail the use of this method in the estimation of growth models.

$$Y_{i,t} = \alpha Y_{i,t-1} + \beta X_{i,t} + \varepsilon_{i,t} + \mu_i \qquad (3)$$

$\varepsilon_{i,t}$ is the fixed effect of provinces and μ_i is the standard error or disturbance component. With the presence of the lagged dependent variable between the explanatory variables, the model will be analyzed dynamically. In such a situation, OLS estimates do not have the required consistency; On the other hand, two-stage estimation methods 2SLS or GMM are used. Since, 2SLS estimation results in lack of statistical significance due to incorrect selection of instrumental variables, the generalized method of moments (GMM) is used (Baltagi, 2011).

The dynamic panel data GMM method is used when the number of cross-sectional variables (N) is more than the number of time (T) (N>T), which is also the case in the current article, that is, the number of provinces (30) is more than the number of time (18). A feature of this method is that even if the explanatory variables are endogenous, we will still have a consistent estimator.

There are two methods to estimate the model in the dynamic panel data GMM method. The first basis of dynamic GMM models was proposed by (Arellano & Bond, 1991)which is called first-order differential GMM method. In 1995, Arellano-Bover and in 1998, Blundell-Bond presented changes in the first-order differential GMM method and introduced the orthogonal GMM method. The difference between these two methods is that in the Arellano-Bond method, all the available lags are used as an instrumental variable, while in the Blundell-Bond method, lagged levels are used as an instrumental variable. Although the Arellano-Bond method is more famous than the Blondel-Bond method, the second one has advantages over the first method that researchers prefer to use. Among the advantages that can be mentioned is that the second method provides more efficient and accurate estimations by improving the accuracy and reducing the bias of the sample volume limitation. The consistency of GMM estimators depends on the validity of the instruments and the absence of serial correlation of disturbance elements. For this purpose, Arellano and Bover (1995) presented the Sargan test for the validity of the instruments, and Blundell and Bond (1998) presented the AR(1) and AR(2) tests to check the first and second order serial correlation of error terms (Baltagi, 2011).

5. Findings

Before estimating the model and analyzing the results, first, the change process of the main variable of the research, i.e., the industrial development strategy of the provinces, is examined descriptively. The performance of the provinces in terms of following the comparative advantage or defying it has been calculated for each province through formula number 1 which was presented in section 2. The higher the value of the calculated index, it means that the executive policies were against the comparative advantage of the province. The value of this index for different provinces and for the whole of Iran in the period of 2005-2017 is reported in the appendix Table.1.

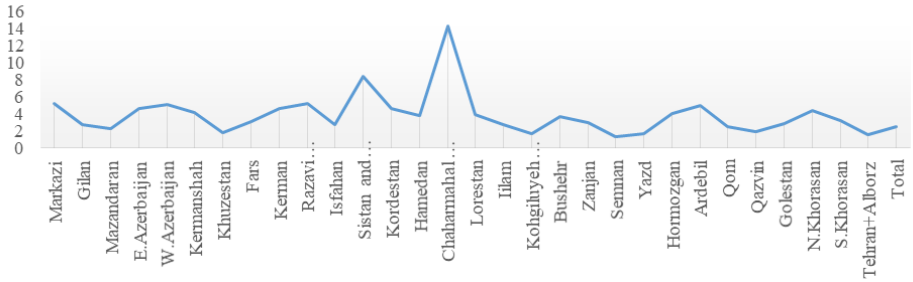


Figure 1. Average TCI for Iranian provinces (2005-2017)

Source: Research Findings

As can be seen from the information in appendix Table 1, the trend of TCI index changes in the period of 1384-1396 for the whole of Iran can be divided into three periods. The first period covers the years 1384 to 1388, which shows that the index was almost stable. For the years 1388 to 1391, we see that the policies have moved towards dealing with the comparative advantage, and finally the third period, which covers the years 1391 to 1396, has shown the orientation of the policies towards the comparative advantage. The trend of index changes in different provinces indicates several points: The first point is that the direction of policies between 1384 and 1396 - despite slight fluctuations in some years for a number of provinces - in most Except for the three provinces of Khorasan, Razavi, Chaharmahal Bakhtiari, Kohkiloyeh, and Boyer Ahmad, the provinces of Iran have been stable; While in the two provinces of Khorasan, Razavi, Kohkiloyeh, and Boyar Ahmad, we are facing an increase in the index, which means a performance contrary to comparative advantage, but in Chaharmahal Bakhtiari province, we observe a decreasing trend of this index, which can be a sign of improving policies in this province to follow the comparative advantage;

Second point: To compare the status of the provinces with each other, we used the average index during the investigated time period for each of the provinces and the whole of Iran. The average index for different provinces and the whole of Iran shown in chart 1 shows that the provinces of Mazandaran, Khuzestan, Kohkiloyeh and Boyer Ahmad, Semnan, Yazd, Qazvin and Tehran (including Alborz) are the provinces that have had better executive performance in order to follow the comparative advantage of their region.

5.1. Cross-Sectional Dependence

Sarafidis and Wansbeek (2012) gave considerable importance to the fact that in order to analyze panel data, the dependence between sections should be evaluated. The importance of considering this issue is that if there is a dependency between the sections, then the obtained results are likely to be inconsistent and will have bias. This issue has also been considered by Bai and Kao (2006). In addition, Baltagi has shown that if there is dependence between sections, the conventional methods of fixed effects and random effects will not be valid for estimating coefficients (Baltagi, 2011). In order to test the dependence of sections, the CD statistic introduced by Pesaran has been used:

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\widehat{\rho_{ij}}\right) \qquad (4)$$

$\widehat{\rho_{ij}}$: Pearson's pairwise correlation coefficients of residual terms, N: number of sections, T: time period

This test can be performed for balanced and unbalanced panel data. Another advantage of this test is the more reliable results obtained for large cross-sectional dimensions and small-time dimensions and the resistance of the results to the occurrence of one or more structural failures in individual regression slope coefficients.

If the calculated CD statistic is higher than the critical value at a specific significance level, the null hypothesis of non-dependence of sections will not be accepted, which in other words indicates the existence of dependence between sections. The results of this test in Table 1 show that the null hypothesis of no dependence between sections is rejected. Therefore, it can be said that the investigated provinces have shown dependence on each other in terms of the investigated variables.

Table 1. Cross-Sectional Dependence Test Result

Prob.	statistic CD	Variable
0000.	51.58	Non-Oil GDP
0000.	41.27	TCI
0000.	.0914	Labor Force
0000.	.9568	Physical Capital

Source: Research Findings

5.2. Unit root test in panel data

One of the necessary steps in all experimental researches is to check the validity of the used variables. Although there are different methods to perform this test, but according to the rejection of the hypothesis of non-dependence between sections, the probability of the unit root results being false through the unit root tests introduced by Levin, Lin and Chu and Im, Pesaran and Shin will increase. Therefore, in order not to face this problem, we have used the cross-sectional Augmented unit root test (CIPS) which was introduced by Pesaran in 2007 in the case of dependence between sections (Pesaran, 2007). The statistic of this test, which is based on the average of individual cross-sectional ADF statistics, is calculated as described in equation 5:

$$CIPS(N.T) = \bar{t} = \frac{1}{N}\sum_{i=1}^{N} \tau_i(N.T) \qquad (5)$$

τ_i : statistic of the CADF model for each individual cross-section in the panel, N: number of cross-sections, T: time period (Pesaran, 2007).

If the value of the CIPS statistic is greater than the critical values, the null hypothesis, i.e., the absence of significance of the variable, is rejected. The results of this test (Table 2) show that all the variables are stationary at the level or after one differentiation.

Table 2. Unit Root Test Results

(First Diff) CIPS	(Level) CIPS	
***-3.15	-2.04	**Non-Oil GDP**
***-3.68	2.73	**TCI**
**-2.83	-2.26	**Labor Force**
***-3.45	-2.30	**Physical Capital**

Note: * and ** indicates 5% and 1% significance level respectively.
Source: research finding

According to the result obtained from the unit root test, the presence of long-term convergence between the variables can be investigated. Although panel cointegration tests such as Kao (1999) and Pedroni (2004) have been introduced, they do not have the necessary validity due to the existence of dependence between sections. Therefore, other tests such as Westerlund (2007) can be used,

which have less error in the presence of cross-sectional dependence. The Westerlund variance ratio test statistic is calculated as $VR = \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{E}_{it}^2 \hat{R}_i^{-1}$ wher $\hat{E}_{it} = \sum_{j=1}^{t} \hat{e}_{ij}$ ، $\hat{R}_i = \sum_{t=1}^{T} \hat{e}_{it}^2$ and $\hat{e}_{it}$ are the residuals of the panel data regression model. The null hypothesis of this test is based on the first-order autoregression process. The result of this test, which is shown in Table 3, confirms the hypothesis of the existence of a cointegration relationship between the variables of the model.

Table 3. Westerlund Cointegration Test Result

Prob	Statistic	
0130.	2072.	Variance Ratio

Source: Research Findings

After proving the existence of cointegration between the variables of the model, we can estimate the model based on the GMM dynamic panel model without worrying about the false regression problem. Four different models have been used to analyze the sensitivity of the results. The results of these models, which include SYS-GMM and DIFF-GMM - each of these models are estimated by one-step and two-step methods - is reported in Table 4. In the lower part of the table, the number of sections, the number of instruments, autocorrelation tests, and instrument validation tests are reported.

Table 4. Model Estimation Result (GMM)

(Dep. Var: Non-Oil Real GDP Growth in Constant Prices)				
GMM (SYS-Two)	GMM (SYS-One)	GMM (DIFF-Two)	GMM (DIFF-One)	**Variable**
0.96** (0.011)	0.96** (0.010)	0.78** (0.061)	0.76** (0.013)	**GDP (-1)**
-0.014** (0.008)	-0.012** (0.006)	-0.039** (0.022)	-0.045** (0.006)	**TCI**
0.010** (0.004)	0.012** (0.003)	-0.013** (0.007)	-0.016** (0.003)	**Physical Capital**
0.011** (0.008)	0.008** (0.005)	0.015** (0.019)	0.021*** (0.007)	**Labor Force**
30	30	30	30	**No. Sections**
27	26	25	25	**No. Instruments**
-3.95(0.00)	-3.93(0.00)	-3.72(0.00)	-3.62(0.00)	**AR(1)**
-1.47(0.14)	-1.47(0.14)	-1.62(0.10)	-1.57(0.11)	**AR(2)**
28.71(0.15)	28.71(0.15)	29.41(0.10)	29.41(0.15)	**Hansen**

Note: ** indicates significance level at 5%.
Source: Research Findings

Before analyzing the results obtained from the estimation of four models using GMM, it is necessary to check the validity of the instrumental variables to fix the correlation between the lag of the dependent variable and the error term. The results of the AR(1), AR(2) and Hansen tests, which are reported in the lower part of Table 4, show that the null hypothesis that there is no autocorrelation between the instrumental variables and the error term can be accepted for all models. Therefore, the used instrumental variables have the required validity.

TCI coefficient is negative in all models and significant at 5% level. This result confirms the hypothesis of the new structural economics theory; In other words, increasing the tendency to policies to deal with comparative advantage leads to the weakening of the economic performance of the provinces. The estimated coefficient has values between -0.012 and -0.045. Considering that all the variables are logarithmic, the estimated coefficients indicate the elasticity of the dependent variable compared to the explanatory variable. Therefore, for the TCI variable, it can be inferred that a 10% increase in TCI, if other conditions are constant, leads to a decrease in the economic growth of the provinces by approximately 0.003%. This result is consistent with the findings of Chen and Xie (2019), Bruno et al. (2015) and Lin and Chang (2009).

The control variables of labor force and lagged dependent variable are positive in all models and significant at 5% level. This result is consistent with expectations. The variable coefficient of GDP(-1) indicates that a 10% increase in the economic growth of the province in one period, assuming other conditions are constant, increases the economic growth of the next period by approximately 0.08%. Also, the variable coefficient of labor force shows that a 10% increase in the labor force of the province increases the economic growth of the province by almost 0.001%. Unlike the two mentioned variables, the coefficient of the control variable of physical capital is not stable in different models and its sign is variable. While the coefficient of physical capital in two SYS-GMM models has a positive sign and is significant at the 5% level, in the two DIFF-GMM models it has a negative sign and is significant at the 5% level. Perhaps the negative impact of physical capital on the economic growth of the provinces is caused by the measurement error due to the lack of accurate information. As explained in the data section, the information related to the construction expenditures of the government has been used as a proxy of the physical capital variable; Therefore, the negative impact of physical capital on the economic growth of the provinces can be attributed to various factors such as the huge delay of projects until the time of exploitation, the selection of projects without economic justification and based solely on political criteria.

In order to analyze the sensitivity of the results to the change of the estimation method, we estimate the model using estimators that can be used in the static panel. For this purpose, it is first necessary to determine the type of estimation

method (ordinary least squares/fixed effects/random effects). In the first step, the F statistic is used to determine the presence or absence of intercept for each province. According to the calculated F statistic of 401.04, the null hypothesis of the test based on the use of the ordinary least squares method is rejected, and therefore different intercepts (fixed effects or random effects) should be included in the model. Then, to test which of the two methods of fixed or random effects should be chosen, Hausman's test was used. The calculated χ^2 statistic of 33.37 rejects the null hypothesis of using the random effects method. Therefore, the fixed effects method for estimating the model is confirmed, and the results related to this method are reported in Table 5. It should be noted that since Breusch-Pagan's autocorrelation tests and modified Wald test indicate the presence of heterogeneity and autocorrelation variance in the model, the fixed effects method is estimated based on the GLS method. All calculations were done through STATA.15 software.

Table 5. Model Estimation Result (Fixed Effect)

Fixed Effect estimation Dep.Var (Non-Oil Real GDP Growth in Constant Prices)			
Standard Error	t-statistic	Coefficient	Variables
0.014	-3.00	-0.042**	TCI
0.007	4.57	0.034**	Physical Capital
0.026	2.28	0.060**	Labor Force
0.157	36.97	5.83**	Intercept
$R^2 = 0.57$			

Note: ** indicates 5% significant level
Source: Research Findings

The results obtained from estimating the model using the static panel method (fixed effects) show that the TCI coefficient is still negative and is significant at the 5% level. Therefore, it has the necessary stability to change the estimation method. The two variables of labor force and physical capital also have significant and expected positive coefficients.
The results obtained from the estimation of the model indicate that policy-making based on comparative advantage has a positive and statistically significant effect on the GDP of the provinces. Based on this, if the policy makers follow the policy of following the comparative advantage, they will see an increase in the economic growth of the provinces.

6. Conclusion

Industrial policymaking, or in other words, government interventions in order to direct economic activities, has always been one of the topics of interest to theorists and researchers. Review of industrial strategy literature indicates three main types of thinking. While the approach of structural economics to industrial

policy emphasizes the importance of the government's role and encouraging backward countries to establish the existing industries of advanced countries in their own countries, the Washington Consensus approach is the opposite; This means that it emphasizes the importance of the role of the market in the implementation of industrial policy and encourages countries to policies such as liberalization, deregulation, and privatization. The results of the implementation of these two approaches in different countries showed that not only the expected economic growth was not achieved, but the gap between rich and poor countries increased. The failure of these two approaches, along with the observation of significant economic growth in some developing countries, led to the introduction of a new approach called new structural economics by Justin Lin in 2010. One of the key features of this approach is establishing a balance between the roles of the government and the market. New structural economics believes that policy makers should follow the policy of comparative advantage. In this way, by activating the market mechanism, the relative prices of the production factors are determined, and the economic actors take into account the amount of the production factors and their relative prices, and enter into activities that are economical. Meanwhile, the government is obliged to provide the hard and soft infrastructure needed for those activities. The economic surplus created by these activities leads to a change in the structure of the factors of production, and therefore the industrial structure and required infrastructures also change. The new structural economics has introduced an index to measure the degree of non-compliance with the policy of comparative advantage and claims that if the policy of comparative advantage is followed, we will see an improvement in economic growth.

This study, for the first time among domestic studies, tried to test this hypothesis at the level of Iranian provinces in the period of 1384-1396. Using the GMM model, it was determined that the coefficient of the mentioned index is negative and statistically significant. The analysis of the sensitivity of the results to the change of model estimation methods indicates the stability of this result and shows that the findings of the research can be trusted. Based on the findings of the research, in order to increase economic growth in different provinces, policy makers should adopt the policy of following comparative advantage. Of course, as the new structural economics states, following the comparative advantage is only one part of a complete set of policies, institutions, capacities and arrangements that should be used together in order to increase the probability of industrial policy success.

Appendix

Table 1. Calculated TCI (Iran Provinces, 2005-2017)

Isfahan	Razavi Khorasan	Kerman	Fars	Khuzestan	Kermanshah	West Azerbaijan	East Azerbaijan	Mazandaran	Gilan	Markazi	Total	
3.174	0.212	4.124	3.195	1.446	4.180	3.535	4.635	2.427	2.106	4.720	2.404	**2005**
2.990	0.225	4.961	2.938	1.584	3.480	3.625	4.184	2.406	2.328	4.769	2.425	**2006**
3.224	0.219	3.688	2.474	1.556	3.132	4.261	4.237	2.161	2.191	3.683	2.244	**2007**
3.642	0.227	3.690	2.496	1.573	4.443	4.887	3.914	1.818	2.329	3.796	2.464	**2008**
2.859	3.871	3.969	2.578	1.692	4.104	4.467	3.966	1.904	2.392	5.513	2.088	**2009**
2.605	2.864	3.621	2.450	1.525	3.962	5.039	3.878	2.012	2.334	5.802	2.156	**2010**
2.584	4.223	5.869	3.494	1.462	5.973	6.636	6.114	2.369	2.973	6.356	2.636	**2011**
2.273	3.893	10.015	4.377	2.696	5.796	6.808	6.269	2.556	3.072	6.066	2.976	**2012**
2.724	4.563	5.434	4.396	2.331	4.474	5.965	5.257	2.349	3.379	7.495	2.913	**2013**
2.332	4.592	3.336	3.857	2.321	4.099	5.619	5.147	2.065	3.247	5.543	2.660	**2014**
2.213	3.641	3.715	3.079	1.571	3.792	6.022	4.639	2.318	3.220	6.829	2.558	**2015**
1.842	3.359	3.635	2.258	1.382	2.564	3.744	3.549	1.579	2.103	3.592	1.805	**2016**
2.149	34.807	3.642	2.297	1.354	2.948	3.919	3.724	2.016	2.360	2.546	1.763	**2017**

Yazd	Semnan	Zanjan	Bushehr	Kohgiluyeh and Boyer-Ahmad	Ilam	Lorestan	Chaharmahal and Bakhtiari	Hamedan	Kordestan	Sistan and Baluchestan	
1.430	1.010	3.071	3.160	0.457	1.734	4.405	51.862	5.030	3.983	5.638	**2005**
1.791	1.110	2.680	3.315	0.482	1.397	3.356	46.243	4.553	3.594	5.206	**2006**
1.450	1.115	2.583	3.320	0.437	0.875	3.412	37.463	3.763	3.881	4.607	**2007**
1.754	0.889	2.944	3.364	0.522	1.310	3.345	36.816	4.597	5.384	6.027	**2008**
1.783	1.003	3.360	3.677	0.764	1.811	3.690	0.935	4.166	5.354	6.486	**2009**
1.454	0.970	2.796	3.464	0.749	1.613	3.016	1.310	3.730	4.772	5.759	**2010**
2.376	1.427	3.214	3.688	1.981	3.254	4.702	1.844	3.620	5.000	13.039	**2011**
1.604	1.330	3.177	5.310	4.090	4.171	4.389	2.060	3.441	5.365	13.331	**2012**
1.621	1.504	2.926	4.765	2.254	5.243	3.800	1.680	2.873	4.466	13.234	**2013**
1.537	1.539	2.431	4.867	2.835	5.294	4.032	1.318	3.123	4.765	11.186	**2014**
1.865	1.866	2.968	2.875	2.754	5.169	5.000	1.600	3.571	5.330	12.877	**2015**
1.325	1.565	2.651	1.947	2.100	1.690	2.937	0.949	2.374	4.031	6.487	**2016**
1.345	1.358	2.817	2.488	2.065	1.170	3.836	0.067	3.675	3.541	4.801	**2017**

South Khorasan	North Khorasan	Golestan	Qazvin	Qom	Ardebil	Tehran	Hormozgan	
2.598	5.772	3.126	1.424	2.832	4.068	1.315	2.918	**2005**
2.568	4.541	2.731	1.573	2.674	3.766	1.341	3.470	**2006**
2.208	4.053	2.624	1.217	2.145	2.944	1.203	2.718	**2007**
2.590	3.897	2.954	1.436	2.238	2.578	1.341	2.708	**2008**
2.635	4.043	2.546	1.496	1.966	3.216	1.415	3.438	**2009**
2.337	4.141	2.606	1.553	2.072	3.164	1.491	4.179	**2010**
3.613	4.675	2.881	2.168	2.799	7.095	1.814	4.073	**2011**
4.001	4.820	2.881	2.136	3.092	6.343	1.727	4.611	**2012**
4.281	5.017	2.928	2.362	3.065	5.704	1.758	6.225	**2013**
3.846	3.811	2.909	2.190	2.725	6.370	1.785	3.623	**2014**
3.631	4.408	3.064	2.171	2.633	6.346	1.852	4.867	**2015**
3.092	3.181	2.489	1.929	1.909	5.130	1.278	3.999	**2016**
3.561	4.112	2.710	1.852	2.106	6.625	1.273	4.841	**2017**

Source: Research Findings

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آزمون فرضیه جدید اقتصاد ساختاری در سطح استان‌های ایران: با استفاده از رویکرد GMM

چکیده:

رویکرد اقتصاد ساختارگرایی جدید به سیاست صنعتی پیروی از استراتژی مزیت نسبی است. بر اساس این تفکر، دو عامل تعیین کننده استراتژی توسعه صنعتی عبارتند از تعیین قیمت نسبی عوامل تولید توسط مکانیسم بازار و ایجاد زیرساخت‌های نرم و سخت مورد نیاز دولت برای صنایعی که با ساختار عامل تولید سازگار هستند. با توجه به اینکه یکی از فرضیه‌های کلیدی این رویکرد افزایش رشد اقتصادی در نتیجه سیاست پیروی از مزیت نسبی است، این پژوهش سعی دارد فرضیه مذکور را با استفاده از روش GMM در سطح استان‌های ایران در دوره زمانی 1384 تا 1396 مورد آزمون قرار دهد. یافته‌های پژوهش نشان دهنده تایید این فرضیه در سطح استان‌های ایران می باشد. همچنین تحلیل حساسیت نتایج نسبت به تغییر در روش برآورد مدل حاکی از عدم تغییر در یافته‌های تحقیق است. بر این مبنا، توصیه می‌شود سیاست‌گذاران در طراحی استراتژی توسعه صنعتی، سیاست پیروی از مزیت نسبی منطقه را مد نظر قرار دهند.

واژه های کلیدی: سیاست صنعتی، اقتصاد ساختاری جدید، مزیت نسبی، ایران، GMM

طبقه بندی JEL: O18, O47, O53, O25