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Trade Openness and Spatial Distribution of Manufacturing Industries: Iranian Provincial Evidence

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Abstract

This paper aims to study the impact of trade openness on the spatial concentration of economic activities of manufacturing industries within the framework of New Economic Geography (NEG) theory. A three-step approach was used for testing the research hypothesis. The stationary test results of variables, in the first step, indicated that the variables are I (1). The results of the Pedroni panel cointegration test specified a long-run relationship between variables. In the third step, using GMM and fixed effects methods, the specified model was estimated for

28 provinces of Iran from 2004 - 2013. The findings show that trade openness has a negative and significant effect on the geographical distribution of manufacturing industries in the provinces of Iran. Indeed, the export promotion policies since the 1990s have led to the dispersion of manufacturing industries in the Iran provinces.

Keywords: Trade Openness, Spatial Concentration, Manufacturing Industries, New Economic Geography, Iran.

JEL Classification: F13, R12, O14, O53.

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1. Introduction

The expansion of metropolises is considered as a critical problem of developing countries in recent decades. Now, there is a question about the factors underlying the concentration of economic activities in a limited number of cities or regions in a country. Krugman and Elizondo (1996) argue that import substitution policy is a major force behind the concentration of industries in developing countries. When policymakers are changing the trade patterns in developing countries, they do not pay much attention to the impacts of these policies on the economic geography of those countries. Such neglect is a mistake because the trade policies of developing countries and the spatial distribution of economic activities are closely linked (Krugman, 1991). The new economic geography (NEG) and new trade theory (NTT) emanate from the founding theory of Krugman (1980). The literature of The New Economic Geography reveals that trade policies, according to the comparative advantage theory and Heckscher–Ohlin model, affect the economic geography within a country. In new economic geography models, trade policies change the relative strength of agglomeration and dispersion forces and the tension between these forces determines the spatial distribution of economic activity of a country. It is worth mentioning that such regional conditions as access to international markets are an important factor that determines the affecting level of trade policies. Crozet and Soubeyran (2004) argued that if domestic firms are able to compete in a particular international market, the decline in trade costs will result in a concentration of economic activity in the regions that have better access to foreign markets.

In addition to the geographical aspect of trade effects, another issue is the study of developing countries, and this article aims to assess the role of trade openness on the spatial distribution of industrial activities in the provinces of Iran. Iran's trade policy over the last half-century is divided into two parts. During the first

25 years, the strategy of import-substitution was applied in Iran until the early 1990s, and since then, the export development approach has been adopted. It is estimated that by applying such policy, the export value-added ratio of the Iranian manufacturing industry has increased from 0.23 in 2004 to 0.5 in 2013, although the same ratio has decreased from 0.08 to 0.04 in the province of Tehran (Statistical Center of Iran, 2014). The spatial pattern in the distribution of economic activities in Iran is also significant. At the national level, several provinces are more prominent in terms of concentration than other provinces, and in some cities, at the provincial level, there is a high density of population and activity. For example, constituting only 1% of Iran's total area, Tehran province's shares of gross domestic product (GDP) and total population was 32% and 22% in 2004 and both decreased to 30% and 19% in 2013, respectively. The shares of employment and value-added of Tehran's manufacturing industries have declined from 32% and 28% in 2004 to 26% and 18%, respectively (Statistical Center of Iran, 2014). The key question now is whether or not changing the trade policy patterns has an effect on the spatial distribution of manufacturing activities in the Iran provinces. The main purpose of this paper is using Iran's manufacturing industries data in the period of 2004 to 2013 to evaluate the effect of the trade openness on the spatial concentration of manufacturing industries activities in 28 provinces of Iran. This paper is organized as follows. Section 2 reviews the theory and empirical evidence. Section 3 describes the methodology. In Section 4, empirical results are presented. The final section addresses the findings and conclusion.

2. The Theoretical Framework

The initial studies of the spatial aspects of economic activity occurred in the 16th to 18th centuries at the mercantilism school. Studies in the field of "economic geography" began seriously after the 1950s which is divided into

exogenous and endogenous agglomerations. The earliest theory of location can be divided into two branches: “least-cost theory”, oriented on the supply side, and “spatial competition theory”, oriented on the demand side of the economy (Fujita et al.,1999). The endogenous agglomeration, introduced by Krugman (1980), is one of the important features of the models called the New Economic Geography (NEG). Krugman raised these questions: what, in particular, are the causes of trade between economies with similar factor endowments, and what is the role of a large domestic market? Krugman (1991) and Krugman and Elizondo (1996) examined the role of trade policies on the spatial distribution of economic activities within the framework of the NEG. New trade theory and new economic geography models featuring economies of scale and trade costs show that sectors with increasing returns to scale tend to locate in regions with better access to the markets of their respective products. In other words, industries with increasing returns to scale tend to locate in regions with large market potentials; however, the way consumers choose the location depends on the distribution of the manufacturing firms. Krugman and Elizondo (1996) argued that with the opening of the economy, the dispersion of manufacturing firms will increase. They also revealed that a reduction of trade costs is more likely to lead the manufacturing sectors to be spatially concentrated. They showed that reducing the trading costs declines the benefits of being close to areas with large markets, and it is likely that agglomerations-related costs (such as congestion and high rent costs) would prevail over agglomerations forces, which would result in the dispersion of the manufacturing industries. On the contrary, Monfort, and Nicolini (2000), Paluzie (2001) and Crozet and Soubeyran (2004) believe that the effects of the reduction of trading costs result in the internal concentration of the activities. On the other hand, based on the approach developed by Ottaviano et al., (2002), Behrens et al., (2003) suggest that growing openness to international trade has a significant impact on the degree of

agglomeration of economic activities within countries. The dispersion forces of this model include the lack of inter-regional mobility of workforce (Krugman, 1991) and the competitive effect (Ottaviano et al., 2002). Behrens (2004) argues that in the reduction of international trading costs, dispersion of internal economic activities is determined by the interregional trading cost which in turn depends on the country's transportation infrastructure and internal trade structure.

In general, theoretical models have yielded different results, and whether the shift in trade policies can lead to the concentration or dispersion of economic activities remains an empirical question. However, concerning Iran, arguments show a dispersion of the manufacturing industry is in line with Krugman and Elizondo's (1996) model. The first reason is that the costs of transportation and land rent are likely to be very strong forces in a country like Iran. Second, the existing empirical evidence suggests that the supportive policies over the past decades in Iran have transformed the country into an endogenous economy in which strong input-output relations have been formed between industrial sectors. Thus, it is expected that the reduction of international trade barriers contributes to undermining relations. It is expected that congestion costs increase as the concentration of economic activities increase and then agglomeration costs would prevail over its benefits, and the dispersion of economic activities may occur. Considering these two reasons, Krugman and Elizondo's (1996) model can be found best to study the effect of trade policies on the spatial patterns of economic activities in the regions of Iran. Accordingly, this paper tries to test this hypothesis that "the reduction of trade barriers will result in dispersion of economic activities". Empirical evidence of the impact of trade policies on the concentration or dispersion of economic activities is divided into two parts: cross-country and intra-national. Ades and Glaeser (1995) and Moomaw and Shatter (1996) argued that trade openness has negative impacts on urban concentration. Junius (1999),

Moomaw and Alwosabi (2004), Nitsch (2006), Brülhart and Sbergami (2008) and Ramcharan (2009) found that the effect of trade liberalization did not have a significant effect on the geographical distribution of activities. Henderson (2000) proposed that trade openness may not have a significant effect on the geographical distribution of activities if the country's largest city has a harbor. Henderson (2003) suggested that trade liberalization has resulted in the spatial concentration of trade. Egger et al. (2005) revealed that countries with faster rising openness have faster rising regional wage differentials. Henderson and Kuncoro (1996) suggested that trade liberalization is concerned with the dispersion of economic activities in Indonesia. Hanson (1997) showed that trade liberalization in Mexico had no significant effect on the concentration of economic activities while Hanson (1998) changed the concentration index and found out that trade openness has negatively affected Mexico in terms of concentration. Conducting a study in the Philippines, Pernia and Quising (2003) found out that regions with growing openness have higher growing GDP per capita and spatial divergence has occurred. The results of Kanbur and Zhang (2005) studies in China revealed that an increase in trade openness is associated with increases in all concentration measures. Redding and Sturm (2008) studied West Germany and found out that in the presence of trade openness border cities grew relatively faster than interior cities and concentration has decreased. Sanguinetti and Volpe Martincus (2009) revealed that industries with falling tariffs tend to disperse away from the capital of Argentina, Buenos Aires. Brülhart and et al., (2010) found out that border regions experience higher post-liberalization growth of both wages and employment in Austria. Table 1 shows a summary of previous empirical studies.

Table 1: Summary of previous empirical studies

Author(s) (1)	Data and time coverage (2)	Methods (3)	Results (4)
Ades and Glaeser (1995)	85 countries; 1970–1985	Cross country OLS and IV	Openness has a negative impact on urban primacy
Henderson and Kuncoro (1996)	Indonesia; 106 regions; 6 manufacturing industries 756 to 4,857 plants per industry; 1980–1985	Panel with year fixed effects	Openness has no statistically significant impact on concentration
Moomaw and Shatter (1996)	90 countries; 1960, 1970 and 1980	Cross country OLS; panel with Country fixed effects	Openness has a negative impact on urban primacy
Hanson (1998)	Mexico; 32 regions; 54 manufacturing industries; 1980, 1985,1993	Panel with region and industry fixed effects	Employment gradient turns from positive to negative
Junius (1999)	23 countries; 1990	Cross country OLS	Openness is not statistically significant
Moomaw and Alwosabi (2004)	33 Asian and American Countries; 1960–1990	Panel with country fixed effects	Openness is not statistically significant
Pernia and Quising (2003)	Philippines; 14 regions; 1988–2000	Pooled OLS	Regions with higher growing openness have higher faster-growing GDP per capita
Kanbur and Zhang (2005)	China; 30 regions; 1952–2000	Time-series OLS	Increases in trade openness are associated with increases in all three concentration measures
Nitsch (2006)	110 countries; 1970–1985 and 1985–2000	Cross country OLS and IV; Panel with country and year fixed effects	Openness is not statistically significant
Brülhart and Sbergami (2008)	114 countries; 1960–2000	Dynamic panel (system GMM)	The interaction effect is not statistically significant
Redding and Sturm (2008)	119 West German cities; 1919–2002	Panel with city and decade fixed effects	Border cities grew relatively more slowly than interior cities
Sanguinetti and Volpe Martincus (2009)	Argentina 125 manufacturing industries; 24 regions; 1985- 1994	Panel with region, industry and year fixed effects	Industries with falling tariffs tend to disperse away from Buenos Aires
Ramcharan (2009)	128 countries; 1990	Cross country OLS	Openness is not statistically significant
Brülhart et al. (2010)	Austria; 2,422 regions; 1975–2002	Panel with region fixed effects	Border regions experience higher post-liberalization growth of bout wages and employment

Source: Organized by authors

3. Methodology

The purpose of this paper is to investigate the effect of trade openness on the spatial concentration of manufacturing industries in Iranian provinces. To achieve this goal, because of possible non-stationary variables, a three-step approach is used. Thus, the research variables are tested in terms of stationery. If variables are stationary, in the second stage, the panel cointegration test is performed to evaluate the long-run relationship between the variables of the research. Finally, the effect of trade liberalization on the spatial concentration of Iran's manufacturing industries is estimated in the form of a dynamic panel.

3.1. Panel data Unit Root Testing

Panel data unit root tests including Levin, Lin and Chu (LLC) (2002), Breitung (2000), Im,Pesaran and Shin (IPS) (2003), Hadri (2000), Phillips-Perron (PP) and Dickey and Fuller (ADF) (1979) are based on the Fisher test (Maddala and Wu, 1999; Choi, 2001). In this paper, LLC, IPS, PP and ADF tests are used to test the stationary variables. The LLC test assumes a common unit root process for all the stages, while the IPS, PP, and ADF tests allow for individual unit root processes. LLC and Breitung consider both ADFs models in the individual unit root test as following:

$$\Delta y_{\mathrm{it}} = \alpha\, \mathrm{y}_{\mathrm{i,t-1}} + \sum_{j=1}^{p_i} \beta_{ij} \Delta \mathrm{y}_{\mathrm{i,t-j}} + \mathrm{X'_{it}}\gamma + \varepsilon_{\mathrm{it}} \qquad (1)$$

Where i and t indicate provinces and time, respectively. $\alpha = \rho - 1$ is common for all stages. $H_0: \alpha = 0$ is the null hypothesis. The IPS, PP, and ADF tests follow the individual root test whereas their null hypothesis is as $H_0: \alpha_i = 0$ indicating that ρ is subject to change in different stages (ρ_i). In fact, in these three tests, ADF

regressions are separately estimated, and then the mean of *t* statistics for all α_i is extracted from individual ADF regressions.

3.2. Panel Cointegration

Pedroni (1999, 2004) and Kao (1999) generalized the residual-based tests of Engle and Granger (1987) to test the cointegration in panels. The individual Fisher test is another cointegration testing approach based on the Johansen test. The residual-based cointegration test suggested by Engle and Granger is another test in which cointegration exists if a set of I(1) variables can be modeled. If the residuals appear to be I(0) the variables are said to be cointegrated, and there is a long-run relationship between the variables. Pedroni proposes several tests for cointegration that allow for heterogeneous intercepts and trend coefficients across cross-sections. The tests verifying null hypothesis of no cointegration in both Pedroni and Kao tests whereas Kao's approach specifies cross-section specific intercepts and homogeneous coefficients on the first-order regressions.

Using Johansen (1991) test for cointegration, Maddala and Wu (1999) consider Fisher's (1932) suggestion to combine individuals tests, to propose an alternative to the two previous tests, for testing cointegration in the panel data by combining individual cross-sections tests for cointegration in which test statistic is χ^2 and based on the Johansen trace and maximum eigenvalue tests.

3.3. Model

"Dynamic Panel Data" is used to estimate the effect of trade openness on the spatial distribution of industrial activities in the provinces of Iran. Adopting the dynamic panel data approach, in addition to increasing the number of observations, the panel can be used to control the specific unobserved effects (Temple, 1999). The linear dynamic panel model is as follows:

$$y_{it} = \sum_{j=1}^{p} \alpha_j y_{i,t-j} + X'_{it}\,\beta + \mu_i + \varepsilon_{it} \quad (2)$$

Where μ_i denotes a cross-sectional specific effect and in the presence of such effects, the results of the cross-sectional estimations are considered biased. Then, Arellano and Bond (1991) proposed Generalized Method of Moments (GMM) which is based on the first-stage residuals differences in which μ_i is eliminated in the model and after differencing the model is as follows:

$$\Delta y_{it} = \sum_{j=1}^{p} \alpha_j \Delta\, y_{i,t-j} + \Delta X'_{it}\,\beta + \Delta\varepsilon_{it} \quad (3)$$

The GMM method allows for estimating the proposed model. Since economic data are often subject to fluctuation, Arellano–Bond estimator is suitable to estimate the dynamic panel data models. The main purpose of using this method is to minimize simultaneity biases. Furthermore, to control the simultaneity, GMM estimator has two significant characteristics: First, this estimation can control the measurement error in comparison with cross-sectional regression. Second, even if the explanatory variables are endogenous $[E(X_{it}\varepsilon_{is}) \neq 0]$, the GMM estimator will be compatible. GMM estimator compatibility depends on the validity of the instruments and the lack of serial correlation of residual terms. Accordingly, Arellano and Bover (1995) proposed the Sargan test which is the instruments validity test and, Blundell and Bond (1998) proposed AR(1) and AR(2) tests to measure first and second-order serial correlations. The null hypothesis of the test represents the validity of the instruments and existence serial correlations. In fact, this version of the Sargan statistic can apply for models estimated using instrumental variables from ordinary time series or cross-sectional data. However,

when using panel data, this statistic can be used to test the "endogeneity" of explanatory variables (Sargan, 1975; Bhargava, 1991).

4. Data and Empirical Results

This paper considers the manufacturing industries of 28 provinces of Iran during 2004-2013. The data is derived from the Statistical Center of Iran. This center publishes an annual report containing information on industrial firms. Employment rate data has been used to measure the spatial distribution of industries in the provinces of Iran as a dependent variable. If X_{it} denotes the number of employment of manufacturing industries in province *i* at time *t,* then S_{it} is a spatial distribution of employment rate of manufacturing industries of province *i* out of total employment rate at time *t* (Sanguinetti and Volpe Martincus, 2009).

$$S_{it} = \frac{X_{it}}{\sum_{i=1}^{N} X_{it}} \tag{4}$$

Where N is the number of provinces. The export to added value ratio was used as a trade openness variable (Krugman and Elizondo, 1996; Pernia and Quising, 2003), the ratio employees to all employees with a college education was used as the variable of human capital. Furthermore, the road density index, the ratio of the length of highways, and main and suburban roads to the area were used as proxy of the infrastructure variable.

Table 2: Descriptive statistics

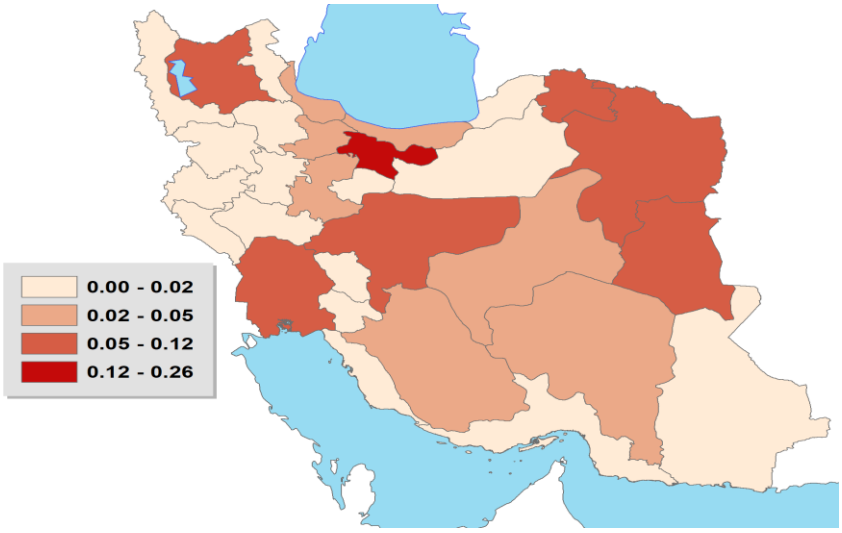
provinces	Area Share	Employment spatial distribution			Trade Openness		
		2004	2013	Average*	2004	2013	Average*
East Azerbaijan	0.03	0.05	0.06	0.05	0.15	0.24	0.22
West Azerbaijan	0.02	0.02	0.01	0.02	0.18	0.47	0.24
Ardebil	0.01	0.01	0.01	0.01	0.03	0.13	0.12
Isfahan	0.07	0.12	0.12	0.12	0.23	0.38	0.24
Ilam	0.01	0.00	0.00	0.00	0.24	0.71	0.26
Bushehr	0.01	0.01	0.01	0.01	0.80	1.27	1.33
Tehran	0.01	0.32	0.26	0.29	0.06	0.12	0.09
Charmahal-Bakhtiari	0.01	0.00	0.01	0.01	0.27	0.30	0.38
Khorasan	0.18	0.08	0.07	0.08	0.17	0.24	0.16
Khozestan	0.04	0.04	0.06	0.05	0.78	1.16	0.93
Zanjan	0.01	0.02	0.02	0.02	0.22	0.35	0.27
Semnan	0.06	0.02	0.02	0.03	0.05	0.13	0.09
Sistan-Balochestan	0.11	0.00	0.00	0.00	0.07	0.06	0.06
Fars	0.08	0.03	0.03	0.03	0.16	0.28	0.17
Qazvin	0.01	0.05	0.05	0.05	0.15	0.15	0.14
Qom	0.01	0.02	0.02	0.02	0.03	0.47	0.18
Kurdistan	0.02	0.001	0.001	0.001	0.24	0.34	0.20
Kerman	0.11	0.01	0.03	0.02	0.35	0.24	0.53
Kermanshah	0.02	0.01	0.01	0.01	0.07	0.20	0.23
Kohgiloye-Boyerahmad	0.01	0.001	0.001	0.001	0.29	0.41	0.24
Golstan	0.01	0.01	0.01	0.01	0.17	0.35	0.28
Gilan	0.01	0.03	0.03	0.03	0.06	0.05	0.06
Lorestan	0.02	0.01	0.01	0.01	0.09	0.26	0.14
Mazandaran	0.01	0.03	0.04	0.03	0.09	0.23	0.13
Markazi	0.02	0.06	0.05	0.05	0.22	0.40	0.25
Hormozgan	0.04	0.01	0.01	0.01	0.38	0.95	1.09
Hamedan	0.01	0.01	0.01	0.01	0.13	0.46	0.28
Yazd	0.05	0.03	0.04	0.03	0.19	0.11	0.20

Source: Statistical Center of Iran; survey on manufacturing establishments with 10 and more workers reports

*The numbers are provincial average during 2004 through 2013.

As Table 2 shows, the share of employment in Tehran province, the capital of Iran, declined from 32% in 2004 to 26% in 2013, and the average share of employment is 29% in the manufacturing industries, whereas Tehran province covers only 1% of the total area of Iran. The share of employment in Esfahan and Khorasan provinces is 12% and 8%, respectively, which place them in the second and third rank after Tehran. On the other hand, the provinces of Sistan-Baluchestan and Kerman comprise 22% of the total area of Iran, but the share of employment in these provinces is only 2%. The trade openness index at the beginning and the end of the studied period has increased in almost all provinces of Iran, except four provinces of Sistan-Baluchistan, Kerman, Gilan, and Yazd. An important issue to be considered during the studied period is the average trade openness index in Bushehr and Hormozgan provinces (more than 1); however, it should be noted that both are oil-producing provinces with harbor facilities, and their major export is petrochemical products (Statistical Center of Iran, 2014). Figure 1 shows the spatial distribution of employment in the provinces of Iran in 2013.

Figure 1: The provincial share of employment in Iran (2013)



Source: Statistical Center of Iran.

4.1. Panel Unit Root and Cointegration Test Results

The Unit Root test results of the research variables are shown in Table 3. The LLC test results indicate that, except for the road density, the other variables are stationary. However, the results of the IPS, ADF-Fisher and PP-Fisher tests reveal that all variables have a unit roots at the level and they are stationary at the first difference. Considering the unit root test results, it can be concluded that all variables are I(1), so one can proceed to the next step which is the panel cointegration test.

Table 3: Panel Unit Root Test Results

variables	LLC	IPS	ADF-Fisher	PP-Fisher
Log (concentration)	-4.05***	-0.17	57.6	57.02
dlog (concentration)	-7.32***	-3.13***	103.17***	191.8***
Log (trade openness)	-2.98***	0.08	53.9	60.5
dLog (trade openness)	-3.56***	-1.79***	71.78**	178.7***
Log (human capital)	-7.64***	-0.5	61.2	163.2***
dLog (human capital)	-4.63***	-1.82**	78.87***	204.1***
Log (road density)	16.07	6.32	13.51	84.4***
dLog (road density)	1.63	-1.1*	76.4**	275.3***

***, **, * denote significance at 1%, 5% and 10%, respectively.

Pedroni cointegration test was applied to examine the existence of long-run relationship between the variables. As shown in Table 4, the null hypothesis is rejected in the four out of seven test statistics, therefore it can be concluded that there is a long-run relationship between the dependent variable and explanatory variables.

Table 4: Pedroni Panel Cointegration Test Results

Statistics	Weighted-Value
Panel v-Statistic	-2.46
Panel rho-Statistic	3.15
Panel PP-Statistic	-4.04***
Panel ADF-Statistic	-3.94***
Group rho-Statistic	5.73
Group PP-Statistic	-5.16***
Group ADF-Statistic	-3.27***

*** denotes significance at 1%

4.2. Model Estimation Results

Previously, test results showed that there is a long-run equilibrium relationship between the variables. In this section, the impact of trade openness on the geographical distribution of industrial activities is examined using Iranian provincial data. Table 5 shows the dynamic panel model estimation results using two different methods, namely, GMM and fixed effects. In the former, the Hansen-Sargan statistic shows the validity of the instruments used in the model and the results of AR(1) and AR(2) tests also indicate no sign of residual first and second-order autocorrelations. The coefficient of interest shows that trade openness has negative and statistically significant influence on the spatial concentration of industrial activities in Iran. Therefore, the main research hypothesis is confirmed at 1% significance level. It means that more degree of trade openness leads to more (less) dispersion (concentration) of economic activities. This is consistent with those of Krugman and Elizondo (1996), though some other works have reported reverse association. For example, Hanson (1998) in Mexico has found this effect to be positive in 1985 and negative in 1993. Further investigations revealed that considering openness as the ratio of trade to GDP (including oil) may result in different conclusions. It implies the critical role of oil revenue in shaping the relationships among economic variables in oil-based economies like Iran. The lagged value of the dependent variable also shows a positive and significant effect implying the more dispersion in current year the greater dispersion will occur next year. In other words, more concentration of industries in one region encourages establishment of new ones in the same area in the next period. For the other two variables, our findings are consistent with prior expectations, as it's commonly believed that more infrastructure (like roads) and greater stock of human capital should result in more absorption of industrial investment implying more

concentration in developed provinces. Moreover, by comparing two estimation methods, one, clearly, finds superiority of GMM over fixed effects.

Table 5: Estimation Results

Variables	(1) GMM	(2) Fixed Effects
constant	-	-1.28***
		(0.27)
Log (concentration)(-1)	0.54***	0.68***
	(0.03)	(0.05)
Log (trade openness)	-0.08***	-0.02**
	(0.003)	(0.01)
Log (road density)	0.22***	-0.01
	(0.05)	(0.08)
Log (human capital)	0.23***	0.1
	(0.08)	(0.08)
Hansen-Sargan J Test	20.8	-
Prob J Statistic	(0.65)	
Likelihood ratio F Test	-	1.75**
Hausman Test	-	41.8***
AR(1)	-0.19	-
AR(2)	-0.21	-
Number of observations	224	252

Note: The dependent variable is the “spatial distribution of employment” which is referred to as concentration. Standard errors are in parentheses. ***, ** denote significance at 1% and 5%, respectively.

5. Conclusion

New Economic Geography theory states that trade policies impact the dispersion of industries among the regions. This theoretical expectation is validated by some empirical works while some other studies have reported no sign of association. On the other hand, some believe that trade liberalization may result in dispersion of economic activities across countries, and some expect an increase in the number of agglomeration types. In this paper, the impact of trade openness on the geographical dispersion of manufacturing industries in the provinces of Iran was evaluated within the framework of the "New Economic Geography" theory. In order to measure the openness of the economy, the export to value-added ratio of the manufacturing industries was used, and the employment share of manufacturing industries in Iran provinces was applied to calculate the geographical dispersion. A three-stage approach was used to test the hypothesis of the research. In the first step, stationarity of variables was examined and the results revealed that all variables are integrated of order one. In the second stage, Pedroni cointegration test was applied that revealed existence of a long-run equilibrium relationship among the variables. In the third stage, using the GMM and fixed-effects approaches, the regression model was estimated using data for 28 provinces of Iran from 2004 to 2013. The results show that trade openness has negative effect on the concentration rate of manufacturing industries in the provinces of Iran. This finding is in line with some previous studies including Krugman and Elizondo (1996). In the Iranian context this could be attributed to the export promotion policies launched in the 1990s. Meanwhile, we have found that more developed provinces are more likely to absorb industrial investment as the effects of road density and human capital, were positive.

This paper has some recommendations for Iranian policymakers. First, considering indirect (direct) relationship between trade openness and

concentration (geographic dispersion), it should be clearly kept in mind that WTO membership (which is currently in process) will result in more spatial dispersion of industries. From equity point of view, it should be regarded as an achievement, since it leads to more evenly industrially developed provinces. Second, more attention should be paid to underdeveloped provinces like Sistan-Balochestan, Hormozgan, and Kohgiloye-Boyerahmad. To be more specific, our findings suggest more investment in infrastructure (including roads) and human capital in these provinces in order to absorb greater industrial investment and change them into developed regions.

References

Ades, A. F. and Glaeser, E. L. (1995). Trade and circuses: Explaining urban giants. Quarterly Journal of Economics, 110(1), 195–227.

Arellano, M. and Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Journal of Review of Economic Studies 58 (2), 277–297.

Arellano, M. and Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. Journal of Econometrics, 68(1), 29–51.

Behrens, K., (2004). International integration and regional inequalities: how important is national infrastructure? CORE Discussion Paper 2004/66.

Behrens, K., Gaigné, C., Ottaviano, G., Thisse, J. (2003). Inter-regional and international trade: seventy years after Ohlin. CEPR Discussion Paper No 4065.

Bhargava, A. (1991). Identification and panel data models with endogenous regressors. Review of Economic Studies. 58 (1): 129–140.

Blundell, R., and Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics, 87(1), 115–143.

Breitung, J. (2000). The Local Power of Some Unit Root Tests for Panel Data, in B. Baltagi (ed.), Advances in Econometrics, Vol. 15: Nonstationary Panels, Panel Cointegration, and Dynamic Panels, Amsterdam: JAI Press, p. 161–178.

Brülhart, M., Carrère, C., and Trionfetti, F. (2010). How wages and employment adjust to trade liberalisation: Quasi-experimental evidence from Austria. Mimeo, University of Lausanne.

Brülhart, M. and Sbergami, F. (2008). Agglomeration and growth: Empirical evidence. Journal of Urban Economics, 65(1), 48–63.

Choi, I. (2001). Unit root tests for panel data. Journal of International Money and Finance, 20(2), 249-272.

Crozet, M., and Soubeyran, P. K. (2004). EU enlargement and the internal geography of countries. Journal of Comparative Economics, 32(2), 265-279.

Dickey, D. A., and Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American statistical association, 74(366a), 427-431.

Egger, P., Huber, P. and Pfaffermayr, M. (2005). A note on export openness and regional wage disparity in central and eastern Europe. Annals of Regional Science, 39(1), 63–71.

Engle, R. F., and Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. Econometrica: Journal of the Econometric Society, 55(2), 251-276.

Fisher, R. A. (1932). Statistical Methods for Research Workers, 4th Edition, Edinburgh: Oliver & Boyd.

Fujita, M., Krugman, P. and Venables, A. (1999). The spatial economy: Cities, regions and international trade. Cambridge, MA: MIT Press.

Hadri, K. (2000). Testing for Stationarity in Heterogeneous Panel Data, Econometrics Journal, 3, 148–161.

Hanson, G. H. (1997). Increasing returns, trade and the regional structure of wages. The economic journal, 107(440), 113-133.

Hanson, G. H. (1998). Regional adjustment to trade liberalization. Regional Science and Urban Economics, 28(4), 419– 444.

Henderson, J. V. (2000). The effects of urban concentration on economic growth. (NBER Working Paper No7503).

Henderson, J. V. (2003). The urbanization process and economic growth: The so-what question. Journal of Economic Growth, 8(1), 47–71.

Henderson, J. V. and Kuncoro, A. (1996). Industrial centralization in Indonesia. World Bank Economic Review, 10(3), 513–540.

Im, K. S., Pesaran, M. H., and Shin, Y. (2003). Testing for unit roots in heterogeneous panels. Journal of econometrics, 115(1), 53-74.

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. Econometrica: Journal of the Econometric Society, 59(6), 1551-1580.

Junius, K. (1999). Primacy and economic development: Bell-shaped or parallel growth of cities? Journal of Economic Development, 24(1), 1–22.

Kanbur, R. and Zhang, X. (2005). Fifty years of regional inequality in China: A journey through central planning, reform and openness. Review of Development Economics, 9(1), 87–106.

Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. Journal of econometrics, 90(1), 1- 44.

Krugman, P. (1980). Scale economies, product differentiation, and the pattern of trade. American Economic Review 70 (5), 950–959.

Krugman, P. (1991). Increasing returns and economic geography. Journal of Political Economy, 99(3), 483–499.

Krugman, P. and Elizondo, R. L. (1996). Trade policy and the third world metropolis.Journal of Development Economics, 49(1), 137–150.

Levin, A., Lin, C. F. and Chu, C. (2002). Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties, Journal of Econometrics, 108(1), 1–24.

Maddala, G. S. and S. Wu (1999). A Comparative Study of Unit Root Tests with Panel Data and A New Simple Test, Oxford Bulletin of Economics and Statistics, 61(Special Issue), 631–52.

Monfort, P. and Nicolini, R. (2000). Regional convergence and international integration. Journal of Urban Economics, 48(2), 286–306.

Moomaw, R. L., and Alwosabi, M. A. (2004). An empirical analysis of competing explanations of urban primary evidence from Asia and the Americas. Annals of Regional Science, 38(1), 149–171.

Moomaw, R. L. and Shatter, A. M. (1996). Urbanization and economic development: A bias toward large cities? Journal of Urban Economics, 40(1), 13–37.

Nitsch, V. (2006). Trade openness and urban concentration: New evidence. Journal of Economic Integration, 21(2), 340–362.

Ottaviano, G. I. P., Tabuchi, T. and Thisse, J.F. (2002). Agglomeration and trade revisited. International Economic Review, 43(2), 409–436.

Paluzie, E. (2001). Trade policies and regional inequalities. Papers in Regional Science, 80(1), 67–85.

Pedroni, P. (1999). Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors, Oxford Bulletin of Economics and Statistics, 61(Special Issue), 653–70.

Pedroni, P. (2004). Panel Cointegration; Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis, Econometric Theory, 20(03), 597– 625.

Pernia, E. M. and Quising, P. F. (2003). Trade openness and regional development in a developing country. Annals of Regional Science, 37(3), 391–406.

Ramcharan, R. (2009). Why an economic core: Domestic transport costs. Journal of Economic Geography, 9(4), 559–581.

Redding, S., and Sturm, D. (2008). The costs of remoteness: Evidence from German division and reunification. American Economic Review, 98(5), 1766–1797.

Sanguinetti, P., and Volpe Martincus, C. (2009). Tariffs and manufacturing location in Argentina. Regional Science and Urban Economics, 39(2), 155–167.

Sargan, J. D. (1975). Testing for misspecification after estimating using instrumental variables. Mimeo. London School of Economics.

Statistical Center of Iran (2014). Survey on manufacturing establishments with 10 and more workers reports, Different years.

Temple, J. (1999). The new growth evidence. Journal of Economic Literature 37(1), 112–156.