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Sustainable Development and Migration in Iranian Frontier Counties

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Abstract

The socio-economic changes of recent decades in Iran, accompanied by the lack of regional balance and over-concentration of facilities in some areas, have caused regional inequality in Iranian society and determined the direction of migration flows. The purpose of this study is to investigate the relationship between four dimensions of sustainability (social, economic, physical-access and environmental) in the border counties of Iran and the net migration in these areas. This study used the data of general population and housing censuses, and other related findings to measure sustainability and net migration. The findings of this study show that the general status of social, economic and especially environmental indicators in Iranian border counties is not good. Also, most of the indicators – except for social – are in a poor condition in the southern counties, especially those in southeast, south, and southwest of Iran. The results also show that there is a significant relationship between economic sustainability and migration. In general, southeastern, western and southwestern border regions of Iran have poor conditions in terms of both sustainable development indicators and negative migration rate.

Keywords: Internal Migration, Iranian Frontier Counties, Net Migration, Regional Inequalities, socio-economic changes, Sustainable Development.

Introduction

The socio-economic changes of recent decades in Iran, accompanied by the lack of regional balance and over-concentration of facilities in some areas, have led to deprivation elsewhere. Therefore, some areas have performed better than others. As a result, they have enjoyed more growth and development (Taghvaei and Saboori, 2012). This situation, i.e. regional differences in the process of national development, has resulted in a per capita income gap between different regions of the country, resulting in economic and social differences between these regions at the national level (Hataminejad et al., 2011). These cases have led to regional inequality in Iranian society today (Fatholahi et al., 2017).

This inequality is more pronounced in the border regions of Iran, despite the vast potential of these areas compared to other regions. Study results indicate that the development rate of border and central regions is 57% and 169%, respectively. This shows that regional inequality between border and central regions is very high with a ratio of 1.6. In fact, it can be argued that the central regions of Iran are about three times more developed than the border regions (Ibrahimzadeh et al., 2012). Surveys in the border regions of Iran indicate social and economic imbalances between the central and border regions (Ebrahimzadeh et al., 2012: 214). Therefore, the developmental inequalities of the border regions of Iran compared to other regions, especially the developed areas of central Iran (Beheshti et al., 2018; Salehi, 2018; Pourasghar Sangachin et al., 2013; Fatholahi et al., 2017; Andalib and Motavaf, 2009), has confronted these areas with social and demographic issues.

Studies show that the imbalance in the distribution of facilities and capital in Iran leads to the formation of migration flows towards development axes (Ghaderi Hojjat et al., 2010; Mousavi et al., 2015). Iran's immigration statistics of the last three decades shows that an average of one million people are displaced each year across the country (Mahmoudian and Ghasemi-Ardahaee, 2014). However, the situation of Iranian borders in terms of population displacement and migration flows has not been specifically explored in a separate study. What is at the core of this study is not only to recognize the migration status of Iranian border counties , but to investigate the relationship of social, economic, environmental and physical stability and sustainability of these areas with their net migration. In addition, the paper deals with the way differences in Iranian border regions are analyzed with respect to the relationship between migration flows and sustainability indicators.

There is much debate today in the literature on internal migration, regional inequality, and development (Amara and Jemmali, 2018; Greenwood, 1975). A key theme of most of these studies is the investigation of mobility as a social, economic, and cultural response to inequality and poverty (Bell et al., 2015; Hamid, 2010; Amara and Jemmali, 2018). The theory of neoclassical economics sees people's movement as a result of the weight of economic choices between places. Individuals choose a place that optimizes and maximizes their well-being (Cadwallader, 1993; Jobes, 2000). The neoclassical approach to migration is based on wage differences between areas with migration outflow and inflow. In this view, the main cause of migration is the expectations of immigrants for higher income (Todaro, 1969: 140). Based on the neoclassical theory of migration, at the micro level, human agents, as rational agents, decide to migrate based on cost-benefit calculations. Assuming that the choice is free and there is full access to information, they expect to go to a productive place where the highest pay is received. This capacity depends on the specific skills of individual processes and the specific structure of the labor market (De Haas, 2008).

The macro-level neoclassical economics theory describes migration in terms of geographical differences. Wage differences drive low-wage workers to high-wage areas that lack workforce. "Thus, the neoclassical theory views migration as the rational choice of individuals, a means by which surplus labor in less-developed, low-wage areas is transferred to high-wage developed areas; it is viewed as a personal choice and expectation" (Todaro, 1969; Harris & Todaro, 1970).

Todaro argues that economic incentives of immigrants are stronger than other incentives: it is primarily economic considerations (i.e. unequal distribution of capital and labor force and consequently wage differences) that encourage one to migrate. He argues that migration is fundamentally based on the economic and rational calculation of the immigrant (McCatty, 2004). The neoclassical theory of migration views rural-urban migration as an integral part of the overall development process, whereby the surplus of rural labor supplies the labor of urban industrial economy (Lewis, 1954). It is a well-known historical economic fact that, with financial advances, the gradual transfer of economic agents takes place from traditional agricultural-based villages to modern urban industries (Tudaro, 1969: 139).

Proponents of the new immigration economics theory have criticized neoclassical economics theory for considering immigration as a personal decision. They believe that migration decisions are not made solely by individual actors, but also by larger units such as the family or household. These decisions are made to maximize income, minimize risks and overcome local labor market constraints. The risks may be related to product insurance, unemployment, labor market opportunities, capital markets, and so on. In this view, therefore, migration is considered as household's economic strategy, a strategy adopted by households and families to disperse income risks and overcome local labor market constraints. In this case, only a minority of members of the community will emigrate because it is not in the family's interest that all its members emigrate: One or more family members (mostly young members) would preferebly emigrate (Stark, 1991).

Economic migration theories focus more on wage differentials and job opportunities and do not address many of the factors that influence the attraction or repulsion of immigrants (Zanjani, 2001: 122). The "pull-push" models of migration also show that individuals are pushed from the areas with economic recession and pulled towards affluent areas (DaVanzo, 1981). Everett S. Lee emphasized the push-pull theory and considered it the origin of migration. Lee's emphasis is on intervening obstacles. As he put it: There is a set of intervening obstacles between two locations; these are few in some cases and many in some other cases (Hajhoseini, 2006). He considers higher educational facilities, employment and income opportunities to be at the root of pull factors. In contrast, high costs of living in the new location, being away from home and environmental pollution are the push factors (Papoli Yazdi, 2002: 165).

In this view, the decision to migrate is determined by the following factors: (1) Factors related to origin areas; (2) Destination related factors; (3) Interventional barriers (such as distance, physical barriers, immigration laws, etc.); and (4) Personal factors (Lee, 1966: 54-55). The effects of each factor will vary according to personality and individual characteristics, such as age, sex, education, skill level, race, ethnicity, and so on. These factors (positive, negative, neutral) will be different for different people at both the origin and destination. For example, good weather is an attractive factor and inappropriate weather is a deterrent/repulsion factor, or a good education system may be a positive factor for children and adolescents and a negative factor for citizens who have no children because of higher related taxes they have to pay to finance education in that area, while for an unmarried taxpayer with no taxable property, the education system is considered a neutral factor (Haj Hosseini, 2006). Therefore, in each domain, several factors are effective in attracting or repelling immigrants (Lahsaeizadeh, 1989: 61). The strength of Lee's theory is his proper emphasis on personal factors. It is under the influence of these factors that some emigrate and some stay in their residence place (Zanjani, 2001: 133). Therefore, the personal characteristics of immigrants, including age, sex, literacy, self-reliance, ethnic and racial solidarity, should also be considered as influential on immigration (Ghasemi-Ardahee, 2006: 58-59). The push-pull model is essentially an individual choice and a balanced model, and is therefore similar to neoclassical micro-models.

Bani Asadi et al. (2013) argues that pull factors or attractions are mainly better job opportunities, better opportunities for earning more, attractive recreational and cultural activities, good and acceptable working and living environments such as housing, educational services, and, finally, opportunities for accessing vocational and professional training centers. He also cites the existence of hidden unemployment, exploitation system backwardness, lack of living facilities, and particularly low income of rural people as the push/repulsion factors (Bani Asadi et al., 2013: 184-185).

In general, according to these theories, inappropriate economic-physical factors in one place cause people to leave their place of residence and move to another place that is economically, socially and physically better. Numerous studies have been conducted on the subject of immigration in Iran. A number of these studies have highlighted the role of development plans, modernization, oil revenues, policy making and development budget in inter-provincial migration flows (Aghajanian and Lahsaeizadeh, 1991; Sanaei, 1996; Salehi, 1998; Zahed Zahedani, 2004). Other studies have focused on the role of economic, social and macro-level demographic variables such as income and wages, employment, growth and population density in migration flows (Pourjalali et al., 1997). A number of other studies have focused on the changes in migration patterns and flows over time, the role of individual determinants of migration and factors such as networks and the role and status of women (Kousheshi, 2004; Moshfegh, 2010; Ghasemi-Ardahaee, 2013; Mahmoudian, 2000). Despite their strategic importance in economic, social, and political terms, the Iranian border regions have been overlooked in immigration studies in Iran. However, ignoring these areas can have irreparable

consequences in different sectors. Therefore, it is important to pay attention to the demographic behavior of these areas, especially locational displacements, as it can be useful in future planning and policy making. Therefore, as the previous migration studies have not paid much attention to the role of regional inequalities and economic, social, etc. differences, this research seeks to investigate the status of Iran's border regions in terms of development indicators, and whether there is a link between development indicators and migration patterns in these areas.

Summing up the views on planning to migrate in such theories as neoclassical economic theory, the push-pull model and human capital model shows that migration depends on individuals' assessment of the conditions of their origin and destination as well as their personal characteristics. The theory of neoclassical economics sees people's movement as a result of the weight of economic choices between places. People choose a place that optimizes and maximizes their living conditions. Push-pull models of migration also show that people are pushed out of the regions with economic recession and poor living conditions and are pulled towards affluent areas. Finally, human capital models suggest that those with better economic and social resources are more likely to migrate to improve their situation. That is, if people come to the assessment that destination's pull is more than origin's push and overall assessment of costs and benefits is inclined towards the benefits, they will decide to migrate.

Therefore, in this paper we examine the migration flows in the Iranian border regions using the impact of a set of attraction and repulsion (pull and push) factors such as educational disparities, employment, access to health and education and living opportunities, environmental characteristics, and so on. (Greenwood, 1997; Papoli Yazdi, 2002).

Therefore, the present research is intended to study, firstly, the characteristics of the Iranian border regions in terms of migration, and, secondly, to identify and characterize these developmental indicators, especially sustainable development indicators. Third, by studying the relationship between development and migration indices in Iranian border regions, better planning can be made to reduce development and migration differences.

Methodology

The research method is secondary analysis of the data for 2016 Population and Housing Census and other related findings. Accordingly, sustainability has been assessed in terms of the four social, economic, physical-access and environmental dimensions across Iranian border counties (118 counties). Shannon entropy method was used to determine the weight of each item of sustainability dimension. VIKOR model was used to rank the counties. The final basis for evaluating the sustainability of studied indices was the use of barometric method.

To measure sustainability in this method, an interval scale of 0 to 1 was measured to accurately indicate the sustainability condition. On this scale, (0-0.2) was completely unsustainable, (0.2-0.4) was relatively unsustainable, (0.4-0.6) was semi-sustainable, (0.6-0.8) was relatively sustainable and (0.8-1) was completely sustainable (Table 1). In the barometric model, the numbers indicate the sustainability condition.

Table 1. Numerical values of the sustainability state

Value	Equivalent	Status
0-20	0-0.2	Bad or unsustainable
20-40	0.2-0.4	Relatively unsustainable
40-60	0.4-0.6	Moderate sustainability
60-80	0.6-0.8	Relatively sustainable
80-100	0.8-1	Acceptable or sustainable

In the present study, in order to formulate a systematic and logical framework of indicators that reflect the characteristics of sustainable development of Iranian border regions, the main indicators affecting the status of sustainable development in these regions were selected in a systematic approach based on the review of past studies (Table 2).

"Development creates positive changes that induces quantitative growth and generates qualitative development in economic, social and environmental systems" (Kowalik et al., 2017). As such, these changes are closely linked to the concept of sustainable development, whose goal is to achieve higher levels of social and economic growth that are associated with improving or at least preventing deterioration of the natural environment (Pawlewicz et al., 2019). Conceptually, "sustainable development is a development in which the continuous supply of needs and satisfaction of individuals is accompanied by an increase in the quality of human life" (Allen, 1980). The result of such a view of the concept of development will be "meeting the rational needs of the present generation without compromising the power of future generations". This definition of sustainable development is outlined in the 1987 report of Brundtland entitled "Our Common Future" as follows; it appears to be the most famous and comprehensive definition to date of the sustainable development approach: "Sustainable development is the development that meets the needs of the present generations of the world, without compromising the capabilities of future generations to meet their needs, and that is the sustainable development of human-nature relations around the world" (UNCED, 1992).

Today, various indicators based on socio-economic, environmental, infrastructure, etc. indices are used to measure and evaluate the sustainable development of urban and rural settlements (Gorbenkova et al, 2018). In general, to evaluate the status of sustainable development, many researchers have developed conceptual models or indicator systems from different perspectives (Zhang et al., 2019). For example (Bolis et al. (2014) developed a conceptual model with an axiological perspective which includes satisfaction with human needs, natural resources, and decision making. Li et al. (2009) have developed a system consisting of 52 items/indices that includes productivity and economic growth, infrastructure and ecology, environmental protection, and social and welfare development (also cited by Zhang et al., 2019).

A review of these studies shows that, in general, models are created from three or four constituent systems with a different set of actions (Gorbenkova et al., 2018) and indicator systems are again organized around three or four systems, including socio-economic and environmental factors. Sustainable development requires a holistic view of environmental, social and economic development policies and the integration of these three dimensions. Theoretical explanations of the concept of sustainable development, which emphasize the interaction of the three dimensions of economic, social and environmental development, are shaped by conservatism, environmentalism and socialism. The ultimate goal of economic development is to achieve sustained economic growth, maximize benefits, conserve and recycle resources, and reduce waste, and in social development, satisfying needs and increasing self-reliance have become meaningful (Pourtahari et al., 2010).

Thus, from the conceptual or the indicator approach, the indices can be divided into four main groups: environmental, economic, social, and institutional-physical (United Nations, 1996; Ameri Siahooie et al., 2011: 168; Hedayati Moghadam et al., 2016). For example, the United Nations has introduced various indicators to measure the sustainability of development in countries. These indicators are divided into four main groups: Social, economic, environmental and institutional indicators (United Nations, 1996).

Based on the literature reviewed, the four-part Sustainable Development Model, which includes a number of indicators to measure sustainable development in each sector, was used in this

study. These four sections include biological, institutional-physical, social and economic dimensions. Referring to the works of Kazemi Mohammadi (2001), Ameri Siahooie et al. (2011), Anabestani et al. (2011), and Hedayati Moghadam et al. (2016), these four parts were used for the Iranian community.

1. Social indicators

Social dimension is the broadest dimension of sustainability. In the literature on sustainability, indicators related to basic needs and quality of life improvement fall into this domain. In general, social sustainability measures emphasize the development of human resources to provide social welfare, to foster citizen participation, to support the poor and the low-income classes, and to improve their standard of living. Indicators such as literacy, access to insurance, urbanization and population growth rate, population density, sex ratio and population percentage of 0-14 years and over 65 years fall in this dimension.

2. Economic indicators

When discussing social and environmental sustainability, it is necessary to know that both require a system of economic activity that is linked to the ecological network of life and the social network of life that we are part of, and that we depend on it for our health, welfare and quality of life. In economic orientation, the capacity of the region to meet the economic needs should be created to increase the per capita income of citizens and increase employment opportunities, the number and types of skills in proportion with the growth of the workforce in the city (Rahimi, 2004: 116). Here are indicators such as employment and unemployment rates, economic participation, the proportion of employees in different sectors and the dependency burden.

3. Environmental indicators

These criteria primarily refer to the degradation of the natural environment and then show the long-term effects on the region, the country and the world in its macro dimension. In this regard, attention to the constraints such as land, water, air, biodiversity and other elements of the natural environment is one of the fundamental measures that should be taken into account in order to achieve sustainability (Ameri Siahooie et al., 2011: 169). In this dimension, mean of precipitation and temperature indices, earthquake zoning, average slope class of suitable land and ratio of agricultural land to total land area of the city are considered.

4. Physical indicators

These indicators include environmental orientation, communication, provision of educational, health and medical facilities, and provision of suitable housing (Ameri Siahooie et al., 2011: 169; Hedayati Moghadam et al., 2016). Indicators of Internet access, access to school and education, access to libraries, access to health care and housing quality have been measured in this dimension.

Table 2. Indicators and ascending or descending indices used to measure the sustainability of border counties

Socio-demographic index	
0 to 14 years percentage	Descending
65+ percentage	Descending
Population growth rate	Ascending
Population density	Ascending
Sex ratio	Ascending
Urbanization rate	Ascending
Average household size	Descending
Women's literacy rate	Ascending

Socio-demographic index	
Total literacy rate	Ascending
The proportion of literates with higher education to the total literate people	Ascending
Ratio of population having insurance to the total population	Ascending
Physical-access index	
Internet access	Ascending
Class per capita	Ascending
School per capita	Ascending
Access to the library in every 10,000 people	Ascending
The ratio of the number of physicians to the total population	Ascending
Ratio of health centers to the urban population	Ascending
Quality of housing	Ascending
Environmental index	
Average precipitation (long-term/mm)	Ascending
Average temperature	Descending
Earthquake zones spectroscopy	Ascending
Medium degree of suitable lands' slope	Ascending
The ratio of agricultural lands to the total lands of the county	Ascending
Economic index	
Gross dependency burden	Descending
Net dependency burden	Descending
Employment rate	Ascending
Unemployment rate	Descending
women employment rate	Ascending
Economic participation	Ascending
Youth unemployment rate (15-29)	Descending
The ratio of agricultural workers to total workers	Ascending
The ratio of industry sector workers to total workers	Ascending
Ratio of service sector workers to total workers	Ascending

Important points were taken into account for ranking cities in terms of sustainability. Data analysis was in the form of relative and indexing figures so that it could be compared; it was carried out at the level of border counties. Given that indices do not have the same validity in terms of value orientation, it is also important to put the indices in the same direction. For example, some indices are descending in the sense that they decrease as the value increases, such as the unemployment rate, and some are ascending, meaning that they increase as the value increases, such as the employment rate. Therefore, in this case, all the indicators should be in ascending order. One of the simplest and most efficient methods for reversing descending indices is to deduct the desired descending index column from a base number or a number greater than the maximum value observed in the same column. Also, as development indices in each of the social, economic, environmental, etc. dimensions do not have a unified basis in terms of measurement scale, it is necessary to measure the scale difference by normalizing the indices. Then, the Shannon entropy method is used to control the differences between variables.

The word VIKOR is derived from a Serbian word meaning Multicriteria Optimization and Compromise Solution and is one of the most applicable multi-criteria decision-making (MCDM)

methods for solving discrete problems. This method is based on compromise planning. The basis of the compromise models is provided by Yu (1973) and Zeleni (1982). Justified compromise solutions that are close to the ideal solution are determined by decision makers' specific credentials. Developed by Opricovic and Tzeng, it focuses on rating and selecting a set of options and on solving problems with disparate criteria (different measurement units) that can help decision makers reach a final solution.

The steps of this method in a multi-criteria decision making problem, with n criteria and m alternatives, are as follows:

– Forming the decision matrix
– Calculating the normalized values
– Weighting of the normal matrix
– Determining the ideal positive and negative points
– Calculating the values of the options' distance with the ideal solution (S and R)
– Calculating Qi value and final ranking of options
– Rating options based on Qi values (Aghajani Bazzazi et al., 2011: 2551).

Table 3. Overview of the border regions of Iran

Number of rural areas	Number of urban areas	Rural population	Urban population	Total population	County	Province
25099	320	7814714	10640283	18288813	118	16

Source: General Census of Population and Housing 2016; State Divisions 2016 of the Ministry of Interior

Net migration, as another important variable in this study, was calculated with respect to the immigrants entering and leaving the border counties based on the general population and housing census results of 2016. The collected information was analyzed using GIS and Geode software in order to analyze the relationships between the four dimensions of sustainable development and migration. Arc Map software was used to study the status of Iranian border counties in terms of the studied variables. Geoda software and Moran's I statistic, BiLISA significance map and LISA cluster map were used to investigate the relationships and effects of the four sustainability indices on migration.

Results and Discussion

Figure 1 shows the status of Iranian border counties with respect to net migration. Bandar Abbas, Kangan, Bandar Lengeh and Abu Mousa counties in southern Iran have the highest positive net migration. It seems that the establishment of oil and gas related industries as well as heavy industries such as aluminum and gasoline in the southern regions of Iran have provided the basis for population movements to these areas. Also, the county of Rasht in northern Iran is one of the areas with high net migration. The spatial distribution presented in Figure 1 indicates that Ahvaz has the highest negative net migration. Overall, among the border counties, 22 counties have high positive net migration and 10 counties have high negative net migration, and other counties have a moderate status.

The patterns resulted from the findings suggest that the out-migration of Iran's land borders makes them likely to lose population, especially in the southeast, west and northwest regions of the country. These findings are consistent with those obtained by Rostamalizadeh and Hosseini (2015) and, especially in the western and northwestern regions of Iran, with the findings of Zanjani (2001) and Mahmoudian and Ghasemi-Ardadee (2014) who conclude that most of the border provinces of Iran in these areas have negative net migration. Also, according to the findings of Rostamalizadeh

and Hosseini (2015), the most important causes of inter-provincial migration in Iran during 2006-2011 were following the household, employment and education.

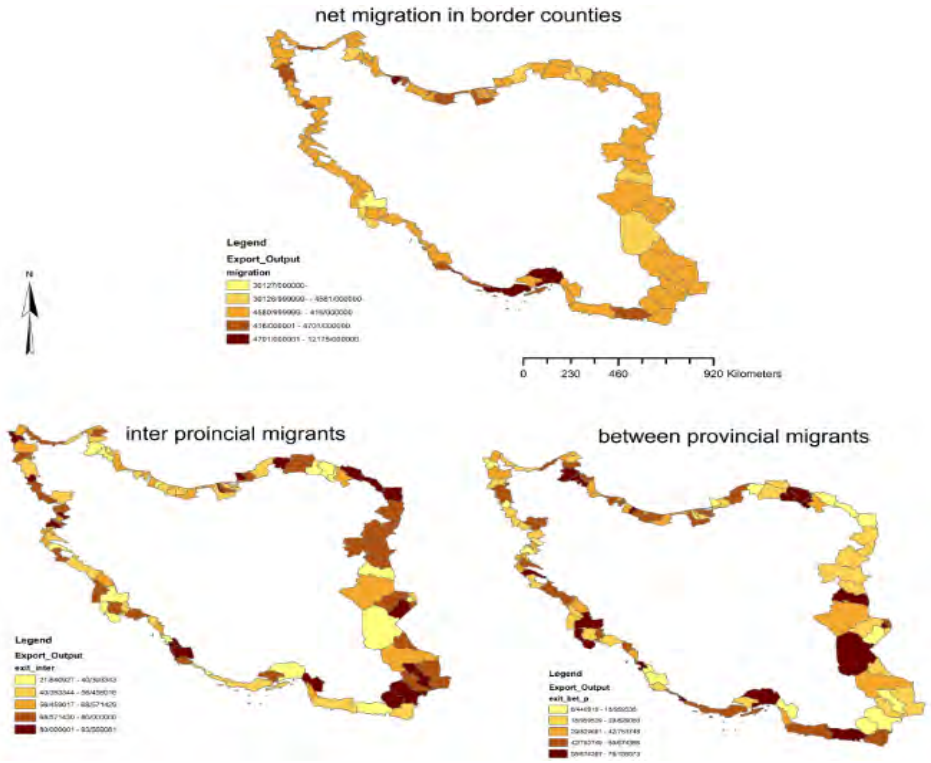

Figure 1. Migration status in Iranian border counties

Figure 2 shows the status of Iranian border counties /counties with regard to sustainability indicators, including social, economic, environmental and physical indicators. Social sustainability index shows that western and southern counties have lower social sustainability and eastern counties of Iran have higher social sustainability than other regions. The highest rates of social sustainability are in Nehbandan, Mirjaveh, Assaluyeh and Kangan counties. The highest percentage of counties frequency is related to the average sustainability status followed by relatively unsustainable index. It is clear that about 57% of border counties are moderately sustainable, 23% are relatively unsustainable, and about 83% of border counties (106 counties) are in relative and moderate status in terms of social sustainability indices.

It can be argued that, first, the southwest and west and, second, the northwest and northeast of Iran have conditions that have led to instability of their social and demographic situation for reasons such as development status (Beheshti et al., 2018; Salehi, 2018; Pourasghar Sangachin et al., 2013; Fatholahi et al., 2017), net negative migration (Rostamalizadeh and Hosseini, 2015; Mahmoudian and Ghasemi-Ardadee, 2014), and climate, geographical, ethnic and religious characteristics. Also, the southern and northern parts of Iran have a better social status: south due to the oil and gas industry and its strategic islands and the north due to its favorable climate.

Physical unsustainability is low in northeast, northern, northwest and western counties and high in southeastern ones. Among the border counties of Iran, Zahedan, Mirjaveh, Mehrestan and Saravan in Sistan and Baluchestan province and Qeshm in Hormozgan province, which are mostly located in the south and southeast of the country, are unsustainable in terms of physical and accessi-

bility status. The status of relatively unsustainable counties, which includes 17 counties, shows that most of them are in Sistan and Baluchestan and Khuzestan provinces. However, there were three counties in West Azerbaijan, one in Bushehr and one in Hormozgan provinces. Qasrshirin in Kermanshah province is the most sustainable border county in terms of physical and accessibility indices. About 57% of border counties are moderately sustainable, 23% are relatively unsustainable, and about 83% of border counties (106 counties) are in relative and moderate status in terms of physical and accessibility indices.

What is known is that the various aspects of sustainable development eventually reinforce each other and reproduce development or underdevelopment. It is also clear that underdevelopment in southeast and southwest areas is more pronounced than in other border regions, indicating historical underdevelopment in these areas, which somehow shows itself in all its dimensions.

Also, environmental sustainability is lower in eastern, southeastern and southern counties and higher in western and northern counties. With regard to environmental indicators, as the results of this study show, about two-third (42 counties) of border counties are in an unsustainable condition, which are mostly located in the southern half of the country and in the eastern, southeastern, south and southwestern parts of Iran. Generally, most of these counties are located in the five provinces of Hormozgan, Sistan and Baluchestan, Bushehr, Khuzestan and South Khorasan. Most of the sustainable and relatively sustainable counties are located in the north, northwest and west of Iran. The results show that about 67% of frontier counties, i.e. 79 border counties, are in an unsustainable or relatively unsustainable condition in terms of environmental sustainability. Also, 19% are in moderate sustainability status, and only about 14% of the border counties, i.e. 17 counties, are environmentally sustainable or relatively sustainable.

Generally, if we divide Iran into two northern and southern halves, the southern half, which stretches from east to southeast and south to southwest, is in an unsustainable state in terms of natural environmental indicators, the most important of which is the climate and geography of these areas, which is tropical and desert with high temperatures and low rainfall. These conditions make the situation difficult for living and lead to instability/unsustainability. The northern half is in a better condition due to the good climate.

The results also show that, among the border counties of Iran, only the two counties of Assaluyeh and Kangan have a very high economic sustainability. Low economic sustainability is more pronounced in eastern and southeastern counties of Iran. Therefore, in the economic index, most of the border cities are not in a good condition. Most importantly, the distribution of this index is somewhat balanced in a way that this problem is present in most border regions. Parts of the southern part of Iran are in a better economic condition due to the oil and gas industry, but the southeast, east and west of the country, as most studies show, face challenges in terms of economic condition due to low development indices.

In general, the results of this section show that the status of social, economic and especially environmental indices in the border regions of Iran is not good. This finding is consistent with the results of Beheshti et al., 2018; Salehi, 2018; Pourasghar Sangachin et al., 2013; Fatholahi et al., 2017; and Ibrahimzadeh et al., 2012. Only the condition of physical and accessibility index is somewhat favorable as compared to other indices. Also, the overall Sustainable Development Index is not in a good condition, as most of the border counties are low to moderate in terms of this index. Most importantly, in terms of most of these indicators – except for the social indicator – the southern part, especially the south-east and south-southwest of the country, has a poor condition. That is, while it is true that the border regions of Iran are not in a good condition in terms of many of these indicators, even within the border regions themselves, the southern half provinces, especially Sistan and Baluchestan, Hormozgan and Khuzestan, have a worse condition. The most critical indicator is

the environmental index that covers the entire strip from east to southwest and requires relative measures.

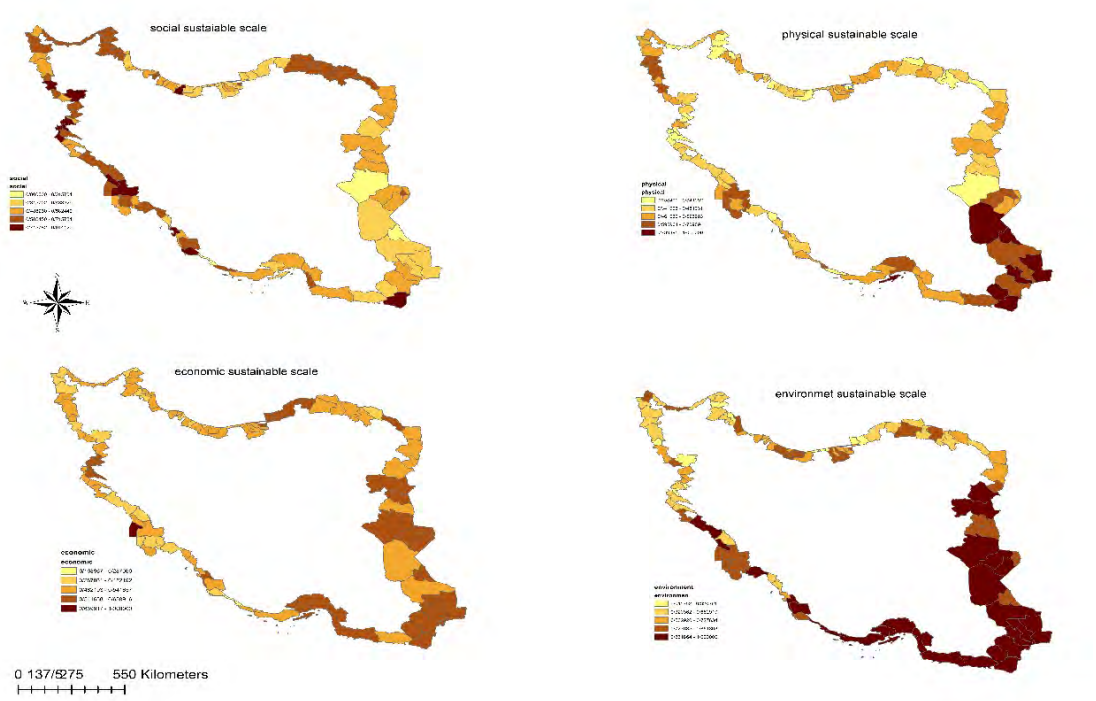

Figure 2. The status of Iranian border counties from the perspective of sustainable variables and net migration

In Fig. 3, the degree of association between migration variable and social, economic, physical and environmental sustainability indices is tested and spatially determined. The Moran's I statistic indicates that the migration variable has a weak and negative relationship with the social sustainability index, but it is not significant (moran's I = -0.07, p = 0.127). In addition, the BiLISA Significance Map (BLSM), which shows the significance of the relationship of migration and social sustainability for each of the border counties, indicates that the significance of this relationship for one county (Asaluyeh) is p = 0.001, for six counties is p = 0.01, and for two counties is p = 0.05. However, the relationship between the two variables was not significant in 96 counties.

The relationship between migration and economic sustainability (moran's I = -0.11, p = 0.03) is negative and significant. This relationship suggests that the presence of heavy industries and the creation of related jobs, especially in smaller geographical areas such as a county, have significant effects on the population's tendency to move towards these areas. This confirms Todaro's view of immigration that the economic motive is stronger than other motives for immigrants (Todaro, 1971). This relationship was stronger (p = 0.001) for two counties of Assaluyeh and Kangan, where the industrial zones of Iran are characterized by the presence of South and North Pars gas fields. It was p=0.01 for Deir, which is located in the neighborhoods of Assaluyeh and Kangan. This relationship was significant (p = 0.05) for other 10 counties specified in Figure 2. This relationship suggests that immigration is an economic response to inequality and poverty, and confirms the results ob-

tained by Amara and Jemmal (2018). It is also a confirmation of neoclassical economic theory and economic theory of immigration.

The Moran's index of the relationship between immigration and physical sustainability (moran's I = -0.05, P = 0.246) indicates a weak, negative, albeit insignificant, relationship. However, BLSM showed a significant relationship (P = 0.001) for the three border counties in southeastern Iran and for the other 17 counties, mainly located in the eastern border of Iran.

The Moran's I statistic indicates that the migration variable has a weak and negative relationship with the environmental sustainability index, but it is not significant (Moran's I=-0.03, p=0.334). In addition, the BLSM, which distinctly shows the significance of the relationship of migration and environmental sustainability for each of the border counties, indicates that the significance of this relationship for 5 counties – mostly in southern borders – is p = 0.001, for 8 counties is p = 0.01, and for 14 counties is p = 0.05. However, the relationship between the two variables was not significant in 88 counties.

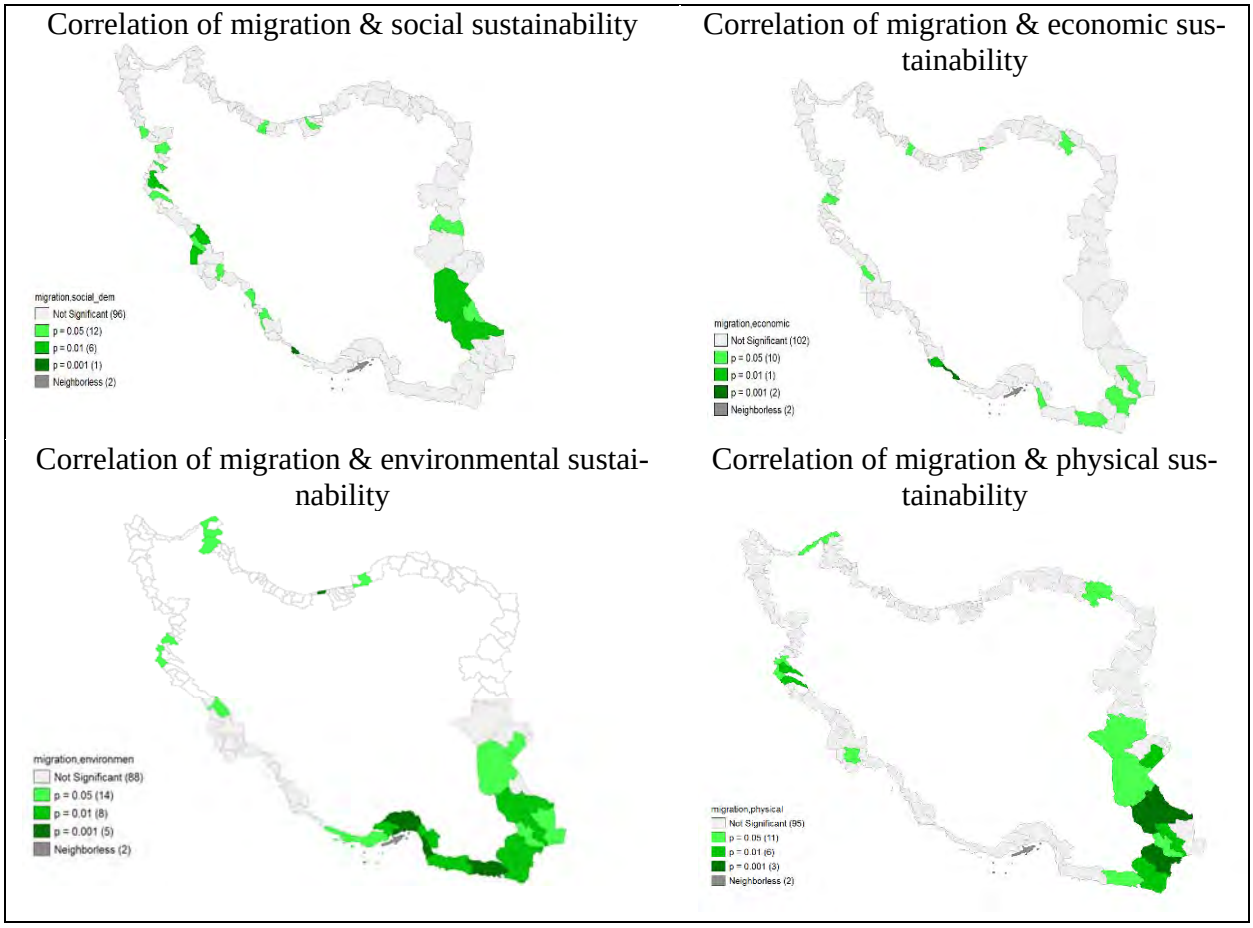

Figure 3. Correlation between migration and sustainability scales

These findings indicate that developmental inequalities in social, economic, environmental, and physical dimensions have led to the migration of individuals, reflecting differences in such dimensions of sustainable development as educational attainment, employment, access to health and education and living facilities, environmental characteristics, etc. that have led to migration from border regions. This is consistent with the push-pull theory which argues that people are pushed

from areas with inadequate living conditions and economic recession and pulled towards affluent areas.

Figure 4 shows the clustering of border counties of Iran based on the relationship between migration variable and sustainability indices. Clustering of counties based on two variables of migration and economy indicates that seven counties , mainly located in the south-east (Konarak, Sarbaz, Sib and Soran) south and west Iran (Javanrood, Salas Babajani, Dashte Azadegan), are in clusters that refer to areas with high rates of migration and low economic sustainability. The second cluster, which involves Quchan located in northeastern Iran, is low in terms of migration while experiencing favorable economic conditions. Also the counties of Assaluyeh and Kangan in the south of Iran as well as Rudsar in the north, form a cluster in which there is high positive migration and favorable economic conditions. The fourth cluster refers to areas with negative migration and poor economic sustainability, e.g. Turkmen in northern Iran.

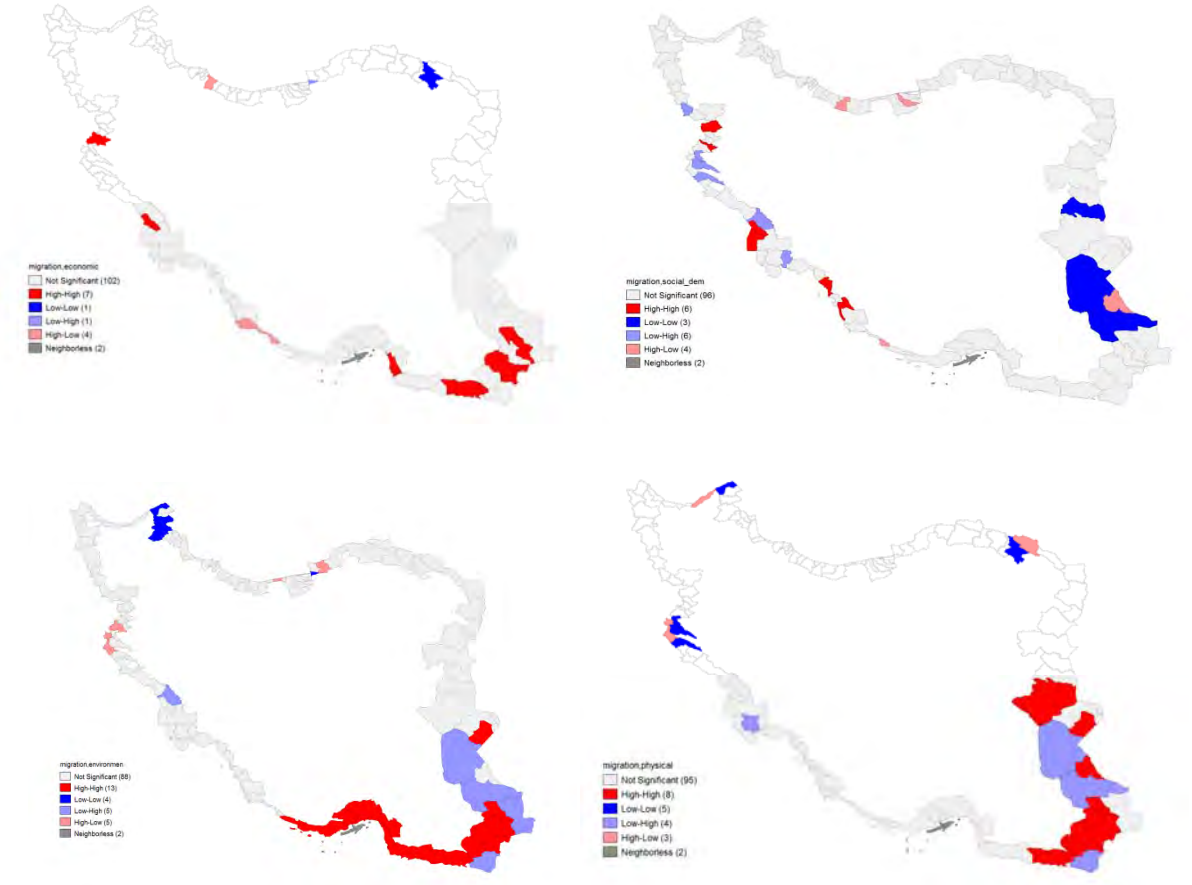

Figure 4: LISA cluster map; migration & sustainability scale

Four clusters can be mentioned based on two variables of migration and social sustainability. The first cluster involves regions with negative migration balance but socially appropriate conditions. These counties are mainly located in the east and southeast of Iran, e.g. Zahedan, Sarbisheh and Khash. The second cluster includes border regions with high and positive migration balance but not socially in desirable conditinos, e.g. Tangestan, Genaveh, Hoveizeh, Dashte Azadegan, Marivan and Javanrood. Some areas have a favorable social status and positive net migration. The counties of

Neka, Mirjaveh and Chalus are part of this cluster of border counties. Also, negative net migration represents unfavorable social conditions for the counties of Bandar Mahshahr, Shush, Ilam, Gilan Gharb, Sar-e-Pul-e-Zohab, and Sarvadasht, located in south and west of Iran.

Clustering of border regions of Iran with regard to migration and environmental sustainability variables indicates that Shush, Chabahar, Saravan, Khash and Zahedan in southeast of Iran are not environmentally in a proper condition, thus experiencing negative migration balance. However, northern counties of Iran have a major role in attracting immigrants due to favorable weather conditions. Babolsar, Mahmoud Abad and Aq Qala are among these counties. Clustering according to the migration and physical sustainability variables also points to four clusters. The first cluster includes counties that have positive migration balance but has a low level in terms of physical sustainability. These counties, mainly in south-eastern Iran, point out that the physical status of these areas has not played a decisive role in attracting immigrants.

Conclusions

In general, the results of this study show that the status of social, economic and especially environmental indicators in Iranian border counties is not good. The condition of the physical and accessibility index is somewhat better than that of other indices. Most importantly, in terms of most of these indicators – except for the social indicator – the southern part, especially the south-east and south-southwest of the country, has a more unsustainable condition. That is, even within the border regions themselves, the southern half provinces, especially Sistan and Baluchestan, Hormozgan and Khuzestan, have a worse condition. The most critical indicator is the environmental index that covers the entire strip from east to southwest and requires relative measures.

Patterns resulting from the ranking and zoning of border counties of Iran show that, in the first look, we are faced with two northern and southern halves. The northern half has relatively favorable and the southern half has relatively unfavorable indices. The conditions are somewhat different within these halves. In the southern half, the worst condition is related to Sistan and Baluchestan, followed by Hormozgan, Khuzestan and Bushehr and to some extent South Khorasan and Ilam. The situation in Sistan and Baluchistan is worse than that in other southern provinces. In the northern half, the situation in the northern provinces is somewhat better than that in other border provinces.

The results also show that the pattern of migration outflow is more noticeable in the rural areas of south-east and partly west of Iran. In contrast, the pattern of migration inflow is more noticeable in the north and south. As the northern and southern provinces have water borders, they are not as important as the eastern and western provinces which have land border. Therefore, border regions of Iran, especially land borders, suffer from population loss, especially in south-east, west and southwest of the country. Part of this situation is due to regional inequalities and underdevelopment of these areas. As the level of sustainability of Iran's border regions shows, these areas are at the low and medium sustainable development levels.

Also, the analytical results show a significant relationship between migration and sustainable economic development: regions with lower level of development have negative net migration. In this regard, Mahmoudian and Ghasemi-Ardahaee (2014) study of inter-provincial migration in Iran confirms this finding. They show that the developed central provinces, such as Tehran and Isfahan, have had the highest net positive migration in the last four decades, and border provinces such as East Azerbaijan, Kermanshah and Khuzestan have had the highest negative net migration, indicating that economy plays a role in orienting migration flows.

It is suggested to address the inequalities between border and central areas in order to stabilize the migration flow of border counties of Iran. Therefore, given the results and findings of this

study, it is required to pay attention to and have practical plans for the development of border areas. This attention should be in a way that the development plans and strategies for these areas are prioritized. Also, due to differences between the border counties of Iran in terms of different indices of sustainable development, serious attention must be paid to the southern half provinces of the country.

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