Simulation Analysis of Brain Drain in Iran using System Dynamics Approach

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Abstract
Today, manpower is one of the prerequisite for a comprehensive development and skilled and educated manpower is considered the society's driving force, losing which is deemed to be like losing the country's main assets. In this study, by examining five scenarios based on the improvement of various factors and their analysis, it became clear that the improvement of social and cultural factors was effective in reducing the brain drain phenomenon. However, it did not have a significant impact on the reduction of the rate of elite emigration. Moreover, it was revealed that focusing on educational factors, in particular in the long run, in addition to the significant reduction of the rate of brain drain, could widely lead to the reduction of the rate of elite emigration. Finally, by using a scenario in form of the improvement of a combination of cultural, social and educational factors at the same time, both in the short- and long-term, the highest efficiency can be obtained, providing us with a significant reduction in both the rate of elite emigration and the rate of brain drain.

Keywords: *Brain drain, Emigration, System dynamics*

1. Introduction

The brain drain phenomenon in recent years has been one of the most important and controversial issues in less developed countries and even an advanced country like Canada. Although, the elite emigration has been a historical issue, it has gained interest as a social phenomenon to be resolved mainly from the early 1960s (Mountford, 1997). The scope of this phenomenon is not related to particular countries and is globally widespread; however, it has been often discussed in association with underdeveloped or developing countries (Beine et al., 2008). The opportunities and threats of the brain drain have become meaningful due to such a connection and concurrency with the concept of development (Solimano, 2010). In other words, the phenomenon per se, neither includes opportunity loss nor creates any threat. However, since its connection to the concept of development, its possibility of opportunities and threats has become meaningful (Güngör et al., 2007).
During the years 1960 and 1972, over three hundred thousand engineers, surgeons, technicians and skilled workers from developing countries took residence in the United

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States, Canada and England. According to the report by the International Monetary Fund, the process of manpower emigration from developing to the developed industrialized countries once again became intensified since the early 1990s. In the 1990 United States Census, it was found that of the seven million people immigrated to the United States; about 1.5 million people were highly educated from Asia and the Pacific (Torbat, 2002). What is certain is that the flood of the emigration of elite and professionals from developing countries surely causes these countries to lose the ability to make use of the modern science and technology which directly affects the process of production and export as well as the competitive power of economic entities in such countries (Mossayeb et al., 2006). As a result, paying more attention to this issue and applying correct short-term and long-term policies can play an essential role in the preservation and growth of human capital and the fundamental improvement of the country's economic conditions.

2. Background and literature

According to a new report by the International Monetary Fund in September 2009, Iran ranks first in the elite emigration among the 91 developing or underdeveloped countries. In this regard, the International Monetary Fund reported that nearly 180 thousand educated Iranians annually move out of the country in the hope of having a better life and finding better job opportunities. The International Monetary Fund added in its report that the emigration of nearly 180 thousand educated elites from Iran means an annual fifty billion dollars foreign exchange outflow from the country. This is despite the fact that the country's annual income from oil exports has been declared to be nearly $12 billion.

Table 1: Iranian elite society emigration data according to the International Monetary Fund's Statistics in September 2009

Iran's rank among the 91 developed or developing countries	Iranian elite emigration to Western countries	Iranian immigrants with higher education	Transfer of Iranian assets in form of human resources
First	150 to 180 thousand people annually	Daily: 15 postgraduates 2 to 3 PhDs Annually: 5475 graduates	To the United States: $4.5 billion To Europe: $6 billion To other countries: $1 billion

Table 2 shows the world's immigrant-sending and immigrant-receiving countries in the time period between 2000 and 2010. As is evident, with the exception of China and India, most the world's immigrant-sending and immigrant-receiving countries are developed

countries. In fact, the elites of these countries have just continually moved from one developed country to another.

Table 2: The most important world's immigrant-sending and immigrant-receiving countries between the years 2000 and 2010, according to the World Intellectual Property Organization's statistics in 2011

Country	Receiving immigrants	Country	Sending immigrants	Country	Emigration rate
The United States	195000	China	53600	Nepal	98
Germany	25300	India	40100	Bangladesh	97
Switzerland	20400	Germany	32200	Mauritania	96
England	15800	England	27800	Iran	96
Netherlands	9700	Canada	21300	Nigeria	95
France	9500	France	19100	Iraq	94
Canada	7300	The United States	11100	Pakistan	92
Singapore	6800	Italy	9800	Albania	91
Japan	6800	Netherlands	9100	Tanzania	91
Belgium	5000	South Korea	9100	Ghana	88

The third column of the table indicates the world's 10 countries with the highest emigration rate of innovators and inventors. This rate indicates what percentage of innovators and inventors in each country have resided in other countries of the world and have registered their initiatives in a country other than their home countries. The higher rate shows the greater depletion of the country in terms of the elite and creative people. As can be seen, all the 10 countries included in the ranking are less developed or developing countries. Unfortunately, Iran ranks fourth in the list and Iran's rate of emigration shows that in the years between 2000 and 2010, more than 96% of Iran's patents have been registered by Iranians outside the country. This means the definitive deprivation of the valuable benefits of human capital resources, for the prosperity and fertility of which the country's resources have been spent for years.

The literature on the brain drain phenomenon in Canada and the European Union's countries was first proposed in the world in the early 1960s (Beine et al., 2001). This phenomenon also began in Iran as a social harm in the same decade, simultaneous with the reconstruction of post-war Europe and the need to attract elites and professionals from Third World countries following the process of industrialization, which created another obstacle in the way of development of these countries (Sadeghi GhotbAbadi, 2007). This phenomenon was continued more seriously and extended more broadly almost from the early 1980s and growing and made Iran as one of the main centers for the export of human capital (Eshraghi, 2008).

A number of sporadic scientific studies began to appear in the field of elite emigration in Iran in the early 80's which were strongly continued in the late 80's. So far two studies have been conducted in Iran on the use of dynamic system modeling methods to reduce and eliminate the problem of the elite emigration. Fartookzadeh and Eshraghi (2008) conducted a research at Malek Ashtar University regarding the impact of the higher education system on the elite emigration in Iran and provided a package with four policies proposed based on the higher education system. Moreover, Parvizian et al. (2011) conducted a study at Isfahan University of Technology in the same field in Iran with the help of Gross National Product (GDP) and separately modeled three series of economic, social and educational factors and reported in their conclusions that educational factors had a greater effect on the elite emigration.

There have been also two large-scale studies conducted in the field of psychology and sociology and the identification of factors contributing to the elite emigration in Iran, which have been reviewed in more detail due to the recognition of original variables and to access the relationship between variables.

The research monograph by Bidkham (2013) considered sociocultural factors involved in the emigration attempted to prove the hypotheses through using the statistical analysis. Furthermore, Pourhassan (2011) in her master thesis had made use of three components of biological-social, internal push factors, and external attraction factors, where finally, by the combination of the intended indicators, she concluded that there was a significant relationship between the above social factors and the elite emigration.

3. Methodology

There are two main methodology used in this study: descriptive statistics and system dynamics. Descriptive statistics is used for several purposes. First, is to calculate the value score of factors. These factors are used just to identify which factor is the most influential or important for people to live in by calculating the means of every factor chosen by respondents about the importance of those factors. The second one is by analyzing the countries index to identify the high or low correlations between the factors. System dynamics is a computer-aided approach to policy analysis and design. The conceptual tools and concept of the field (including feedback thinking, stock and flows, the concept of feedback loop dominance, and an endogenous point of view) are as important to the field as its simulation method (Sterman, 2000). The use of system dynamics, in the end, is mainly to compare the base scenario where the policies have not been implemented, to the simulation when several mixed policies implemented into the model and which mixed policies come up with optimal result.

4. Dynamic modeling

4.1. Problem Statement

In the last few years, with regard to the brain drain phenomenon, we have faced the issue of globalization which has made almost all the countries in the world to deal with an irresistible flow. Scholars, scientists, professionals and graduates in each country are considered as generators of knowledge, and surely, every country with higher reserves of such a group of human capital could be placed in a higher rank. What is certain is that countries with greater access to modern science and technology have brighter future which

is not achievable unless countries benefit from educated and skilled manpower (Inayati et al., 2012b). Despite the important role professionals and graduates play in security, development and sovereignty of every country (Inayati et al., 2012a), and the fact that their emigration makes the country suffer from many problems which has currently turned into a national crisis, the brain drain phenomenon has received little principled and expert attention and the unparalleled elite manpower resources emigrated from the country, as a massive capital, have never received an appropriate and effective remedy.

Although, the issue of elite emigration in each country needs case studies to be conducted so that it can be properly discussed and cannot be explained with one universal prescription, some approaches can be proposed to resolve this crisis with regard to some common reasons for the elite emigration from developing countries (Zhongji et al., 2010). The brain drain phenomenon has been scientifically studied for more than 10 years. However, why is that this phenomenon continues to be one of the problems in an economic developed country like China despite the scientific and research development and advances? Where does this problem originate from and why no comprehensive solution has been implemented that is effective in the long-term? What are the main obstacles?

4.2. Dynamic Hypothesis

In Iran, according to the report by the Ministry of Education in the last ten years, an average of 850 thousand to one million people annually graduate at different levels. After becoming graduated, these people face three choices: first, they stop continuing their studies at postgraduate university level and enter the country's labor market, second, they continue their studies inside the country by participating in the entrance examination, and third, they leave the country to continue their education or to get expertise in their majors.

Based on the evidence and information, there is an opportunity in most cases for educational immigration up to three years after graduation, and the chance to succeed to immigrate becomes extremely lower after this period. Elites who move out of the country at this stage, are continuously studying at higher levels between 2 and 6 years to get expertise, after completion of this period, if do not have the obligation to return (scholarship), still have two choices: either go back to Iran and enter into the labor market or be absorbed by the market in the same foreign country and choose to live the rest of their life there. The second group is so-called the "brain drain", meaning the loss of elite human resource for the country. The most important factors for the brain drain include welfare differences (job, income and purchasing power), differences in the level of science and education in the country and abroad, differences in life satisfaction and the societal security level and finally, westernization. Moreover, important factors in reducing the brain drain are both national-cultural beliefs and family dependence.

The welfare difference can be summarized in two factors of job opportunity and employment position with the country's GDP as the main factor influencing them. Moreover, a higher education budget's share of GDP can increase the scientific level inside the country, resulting in a lower difference in the scientific level within the country and abroad. In addition to the education share of GDP, the elites who have returned to the country can also improve the scientific level inside the country, and conversely, by the increase of the brain drain, the scientific level goes up outside the country which results in an increased difference in the scientific level within the country and abroad. Moreover, the

increase of Iranian elites going abroad causes elites inside the country to be more interested to move outside the country. GDP is itself influenced by the country's entrepreneurship index and scientific level. With increasing job opportunities, new employment capacities are developed, resulting in the level of entrepreneurship to be raised. In addition, by increasing job opportunities, the relationship between industry and scientific centers is strengthened and therefore, practical and useful skills are increased within universities inside the country, which leads to the improvement of the entrepreneurship. Another contributing factor in increasing entrepreneurship is governmental support. The government can also reduce the elite emigration and encourage them to study and work in the country by the use of policies to promote elites attitude and to pay more attention to them. Differences in satisfaction and societal security include the tension index in the country, dissatisfaction with life and the country's crime index.

4.3. causal loop diagram

Based on the obtained relations from Fig. 1, 8 different causal loops affect the brain drain phenomenon, which are explained as follows:

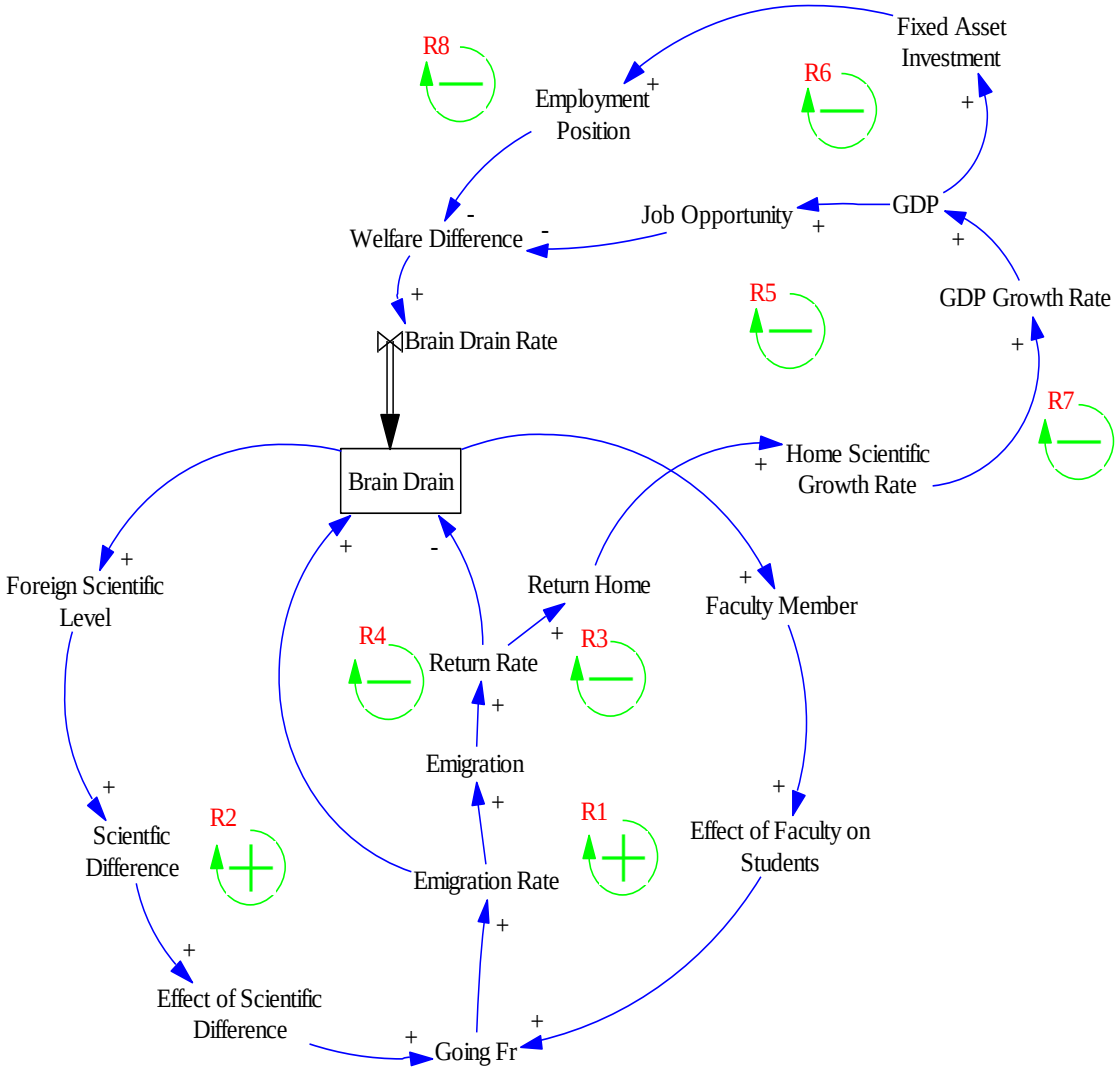

Figure 1: The subsystem diagram and the causal loops of the problem structure

- Loop1 of length 5: The brain drain rate in this loop controls the number and its increase causes Iranian professors and faculty members in universities abroad which itself has a greater impact on the Iranian graduates to join foreign universities to increase the chances of becoming faculty members. In this case, the emigration factor increases, which also raises the emigration rate and therefore, the brain drain rate. This is a positive loop.

- Loop2 of length 6: The increased brain drain rate causes them to be increased in number, which per se leads to a higher academic level outside the country. In this case, the difference in the scientific level inside and outside the country increases and therefore, the impact of difference in the scientific level becomes more visible and causes the emigration factor and the elite emigration rate to be increased which also increases the rate of the brain drain. This loop is also positive.

- Loop3 of length 7: The loop is similar to the loop1 with the difference that the increased rate of emigration and as a result, the increased number of elite emigrations causes the rate of return to country to increase and therefore, reduces the brain drain rate. This is a negative loop.

- Loop4 of length 8: The loop is similar to the loop2 with the difference that the increased rate of emigration and as a result, the increased number of elite emigrations causes the rate of return to country to increase and therefore, reduces the brain drain rate. This loop is also negative.

- Loop5 of length 13: This loop up to the length of 7 is similar to the loop3. Then, by an increase in the number of elites who return to their country, the scientific advancement increases which results in the GDP growth and increases the GDP number. As a result, there will be more job opportunities and the welfare difference within and outside the country is reduced. Consequently, there will be lower rate of the brain drain. This loop is negative.

- Loop6 of length 14: The loop is supplementing the loop5 and is the same as it up to the length of 11. The increased GDP number increases fixed asset investment and thus, improves employment positions and reduces the welfare difference inside and outside the country as well as the brain drain rate. Therefore, this is a negative loop.

- Loop7 of length 14: The loop is similar in performance with the loop5, with the only difference that instead of increasing Iranian professors and faculty members residing abroad, the increased scientific level outside the country has led to the increased emigration rate and thus, the increased rate of return to country.

- Loop8 of length 15: The loop is similar in performance with the loop6, with the only difference that instead of increasing Iranian professors and faculty members residing abroad, the increased scientific level outside the country has led to the increased emigration rate and thus, the increased rate of return to country.

4.4. Stock and Flow diagram

Since there have been almost a fixed number of graduates from Iranian universities over the last few years and with regard to the stability of the input rate and the 20-year prospective of the model, the number of potential academic emigration, i.e. the same number of graduates over the last three-year, is regarded as the first state and constant variable. Other state variables including the number of graduates tending to emigrate (elites) remained in the country, the number of early emigrants to pursue education, the number of elites returned home after graduation, the number of elites remained abroad after graduation (brain drain) and GDP value are controlled by a rate variable and investigated using other auxiliary variables and their relationship rates and some modification are imposed on them.

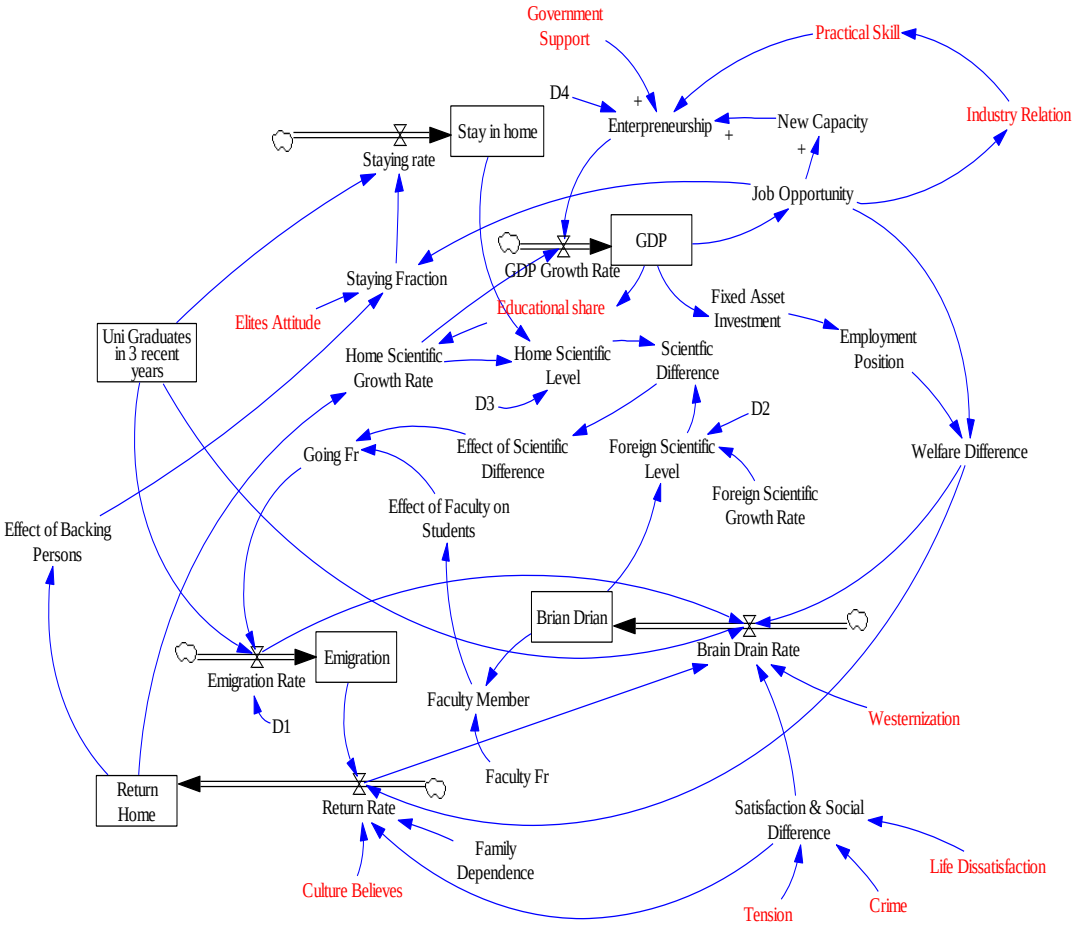

Figure 2: Flow diagram of the elite emigration model

4.5. Identifying leverage points of the model and scenario Generation

To design scenarios, the leverage points should be first identified. Leverage points should be common concerning the feature of imposing the short-term and medium-term modifications. According to the experts and the created model shown in Figure 2, the leverage points marked in red for the proposed model include:

A) Modifiable cultural factors including cultural beliefs and westernization.

B) Modifiable social factors including tension, crime and life dissatisfaction.

C) Modifiable educational factors including the educational share of GDP, teaching practical skills to students during their education.

D) Modifiable political factors including the status of the elite in the country, supporting entrepreneurship by the Government and improving the relationship between university and industry.

Based on the leverage points identified in the model and shown the Figure 2, it is possible to examine following scenarios in order to implement and predict future behavior of the brain drain rate, elites' returning home and their initial emigration:

- ✓ **Zero scenario: Continuing the status quo**
- ✓ **First scenario: Focusing on strengthening cultural factors**

This scenario means that the educational emigration and brain drain phenomenon should be controlled and its rate shall be reduced as much as possible through improving the leverage points in the Iranian cultural. Scenarios 0- 5 are applicable in two modes applicable in short term and in long term. On average, according to experts, the scenario applicable in the short term lasts for 2 years and the policies applicable in the long term takes 5 years. That is, in this study initiated in 2010, short-term scenarios and long-term policies will be valid since 2012 and 2015, respectively and until these years, the rates calculated by the system at a zero scenario (continuation of the status quo) shall be considered.

- ✓ **Second scenario: Focusing on strengthening social factors**
- ✓ **Third scenario: Focusing on strengthening educational factors**
- ✓ **Fourth scenario: Focusing on strengthening political factors**
- ✓ **Fifth scenario (Mixed): Focusing on simultaneous strengthening of three selected factors**

In this scenario, the emphasis is on improving three factors (namely cultural beliefs, share of education in GDP in Iran, and life dissatisfaction). These three factors were achieved based on test models and analysis of changes with regard to the changes of all the key points identified.

4.6 Model testing and simulation of scenarios and decision policies

As it is shown in Figure 2, the model was designed and simulated in the VENSIM software and its reliability was confirmed using suitability test, consistency test, and effectiveness test in accordance with the reference diagrams and expert opinion. The results of imposing various policies on the model were evaluated and analyzed.

• The results of the zero-scenario simulation: Continuing the status quo

As it can be observed in Figure 3, the elite academic emigration rate is almost constant until about 2014 and then it has remarkably increased from 115,000 persons in 2014 to 172 000 persons in 2030. According to Figure 4, the brain drain rate has been decreasing from 2010 to 2016. Then, however, it is along with a substantial growth until 2021 and continues with a little growth by 2030 and would be around 137 000 persons per year.

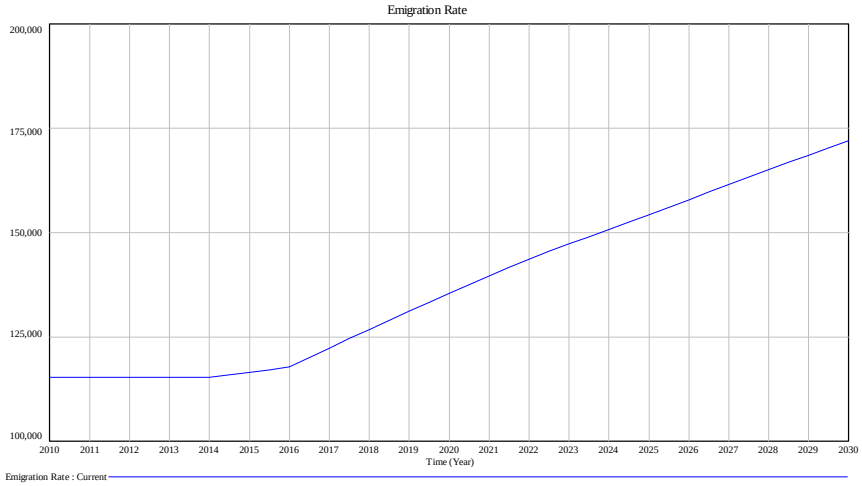

Figure 3: The results of the zero-scenario simulation for the elite emigration rate from 2010 to 2030

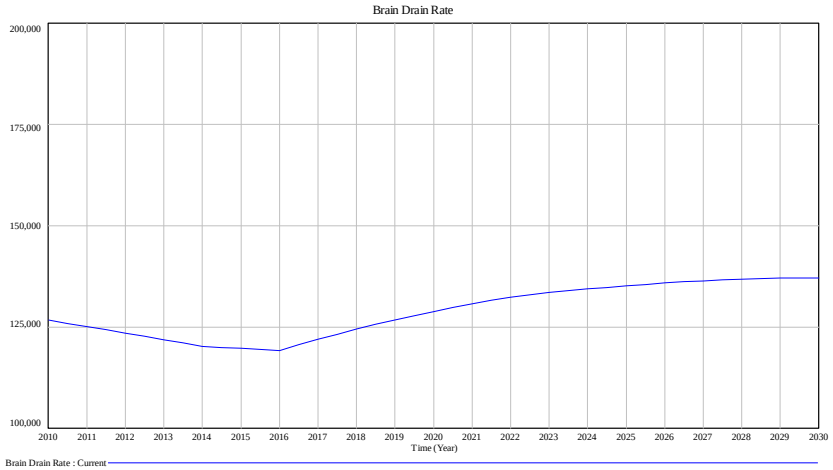

Figure 4: The results of the zero-scenario simulation for the brain drain rate from 2010 to 2030

• The results of the First Scenario simulation:

Implementing the first scenario based on Figure 5, it is observed that the brain drain rate will have been remained almost constant by 2016 and then it decreases compared to the zero scenario. As it was expected, the results of the long-term cultural modifications are better and more satisfying than short-term ones. According to Figure 6, the brain drain rate, compared to that of the Zero Scenario, improves since the beginning of the allowed year for imposing the scenario. Imposing short-term cultural modifications since 2023 and the long-term cultural modifications since 2018 reduces the brain drain rate. The results of the First Scenario show that this scenario is useful and effective in reducing the brain drain rate; however, it would not have a significant impact on reducing the elites' academic emigration rate.

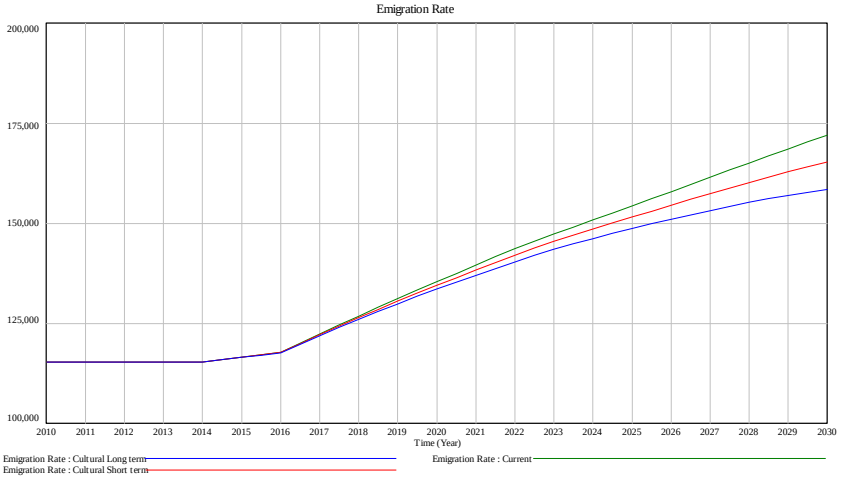

Figure 5: The results of the first scenario simulation for the elite emigration rate from 2010 to 2030

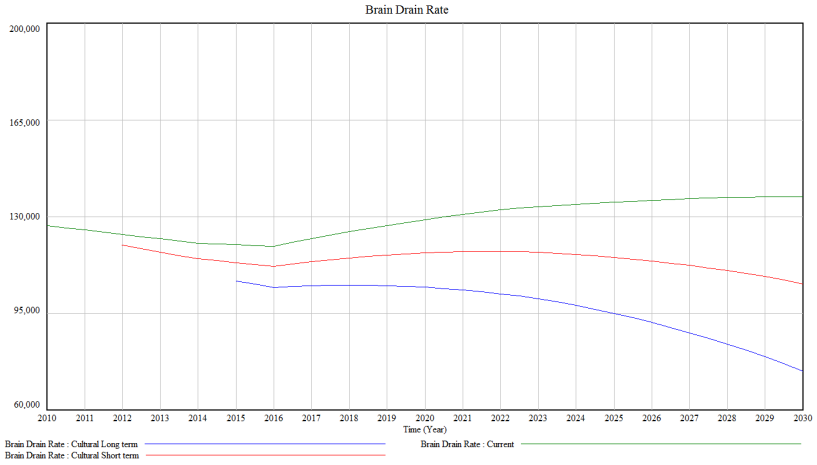

Figure 6: The results of the first scenario simulation for the brain drain rate from 2010 to 2030

• The results of the Second Scenario simulation:

According to Figures 7 and 8, the results of this scenario are almost similar to those of the previous scenario. However, the second scenario is slightly better than Scenario 1 with regard to the elites' academic emigration and brain drain rates. Imposing short-term cultural modifications since 2022 and the long-term cultural modifications since 2017 reduces the brain drain rate. The results of Scenario 2 as those of the Scenario 1 are useful and effective in reducing the brain drain rate; however, they would not have a significant impact on reducing the elites' academic emigration rate.

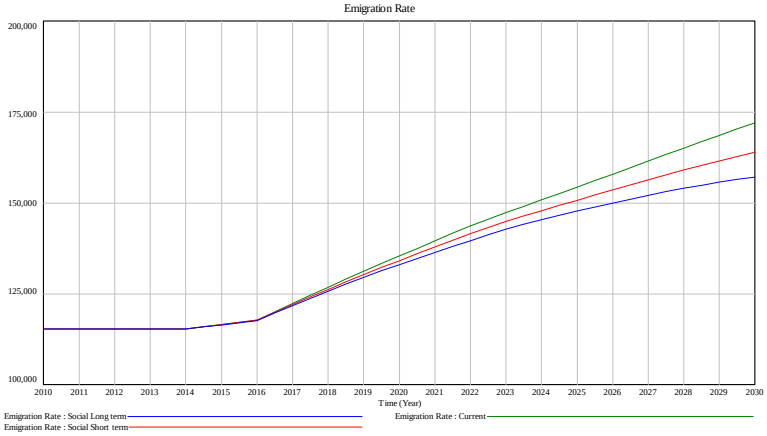

Figure 7: The results of the second scenario simulation for the elite emigration rate from 2010 to 2030

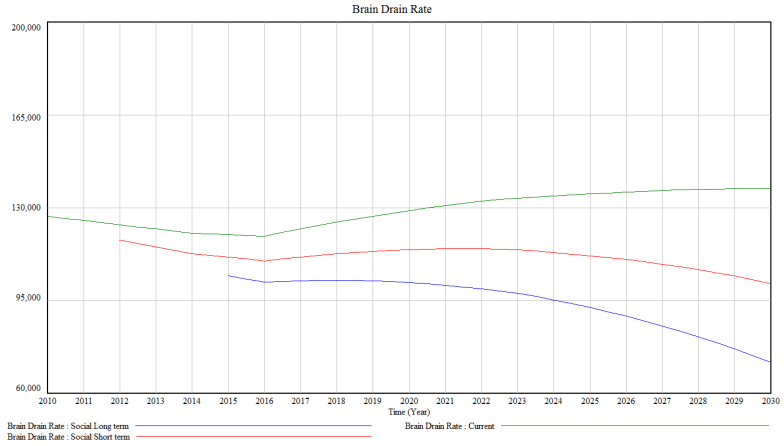

Figure 8: The results of the second scenario simulation for the brain drain rate from 2010 to 2030

• The results of the Third Scenario simulation:

Implementing the scenario 3 according to Figure 9, it can be seen that the brain drain rate has been increasing since the beginning of the allowed year of imposing the scenario. It is in the case that, as compared with the Zero Scenario, much more progress has been made. An interesting point is that this scenario using the policy of long-term academic modifications has reduced the brain drain rate since 2026.

According to Figure 10, the brain drain rate has improved since the beginning of the allowed year for imposing the scenario, comparing with the Zero Scenario. Imposing short-term cultural modifications since 2023 and the long-term cultural modifications since 2018 has again reduced the brain drain rate. The results of the Third Scenario show that this scenario is useful and effective in reducing the brain drain rate, especially in the long term. Unlike the three previous scenarios, it has been successful. Implementation of this scenario is also useful in reducing the brain drain rate; however not as much as the scenarios 1 and 2.

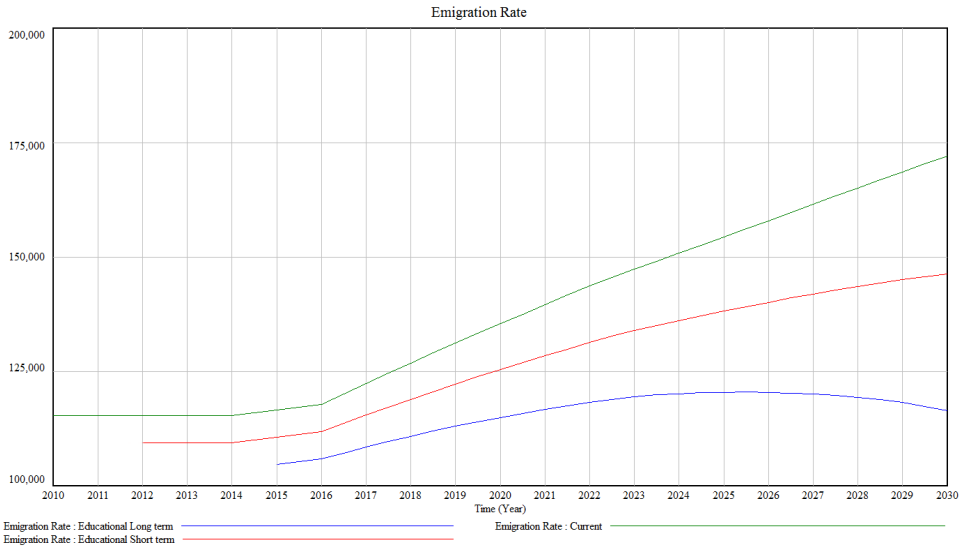

Figure 9: The results of the third scenario simulation for the elite emigration rate from 2010 to 2030

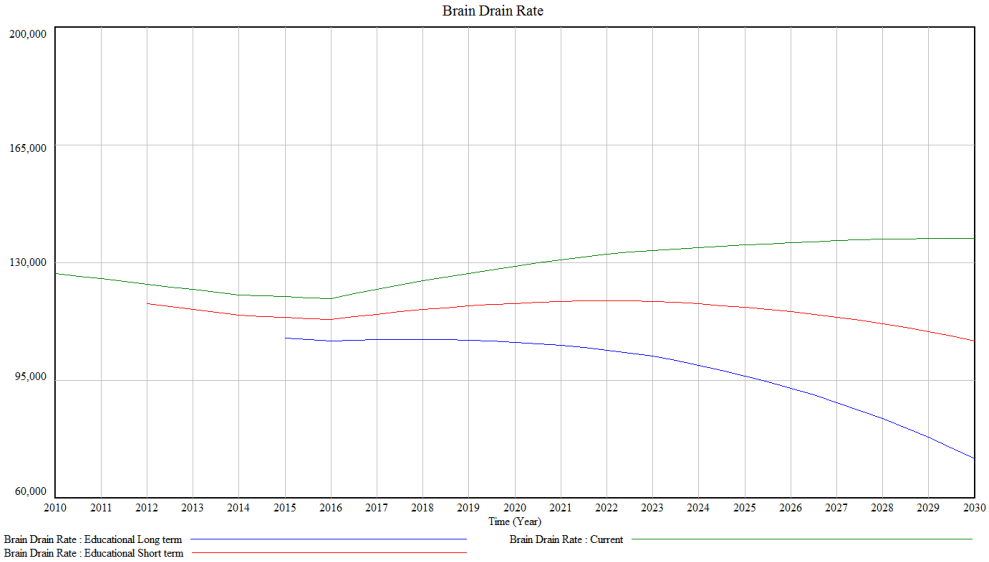

Figure 10: The results of the third scenario simulation for the brain drain rate from 2010 to 2030

• The results of the Fourth Scenario simulation:

Implementing the scenario 4 based on the Figure 11, it is observed that the brain drain rate will have been remained almost unchanged by 2018 and then it gradually decreases compared to the zero scenario. Hence, it is not acceptable as a successful scenario. Moreover, as it is shown in Figure 12, the brain drain rate, in comparison to the Zero Scenario, has a slight improvement. Short-term political modifications over the 20-year period have not significant decreased and have been unsuccessful. However, the long-term political modifications having a slight slope since 2025 reduces the emigration rate.

The results of the scenario 4 shows the failure of this scenario, especially in the short-term modifications and this scenario will not have a great impact in reducing the brain drain rate and elites' academic emigration rate.

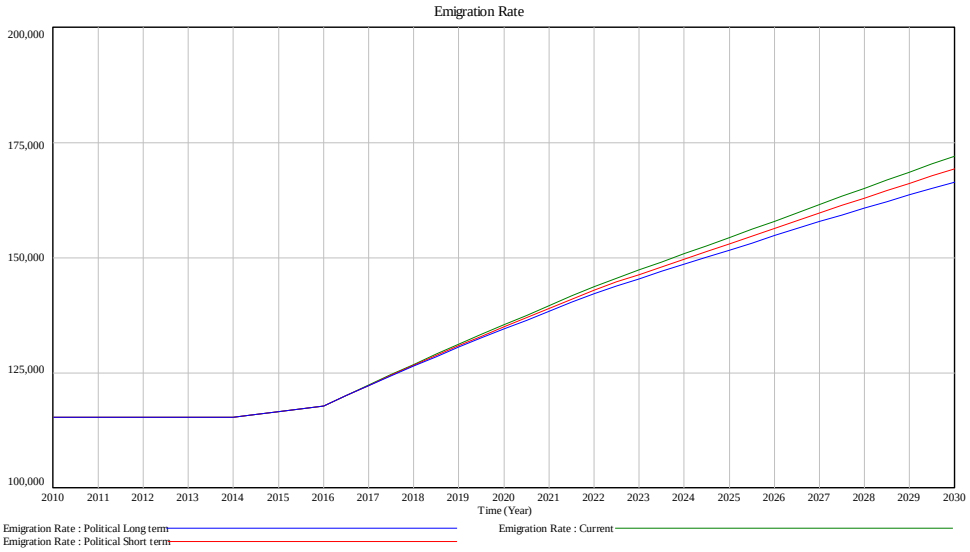

Figure 11: The results of the fourth scenario simulation for the elite emigration rate from 2010 to 2030

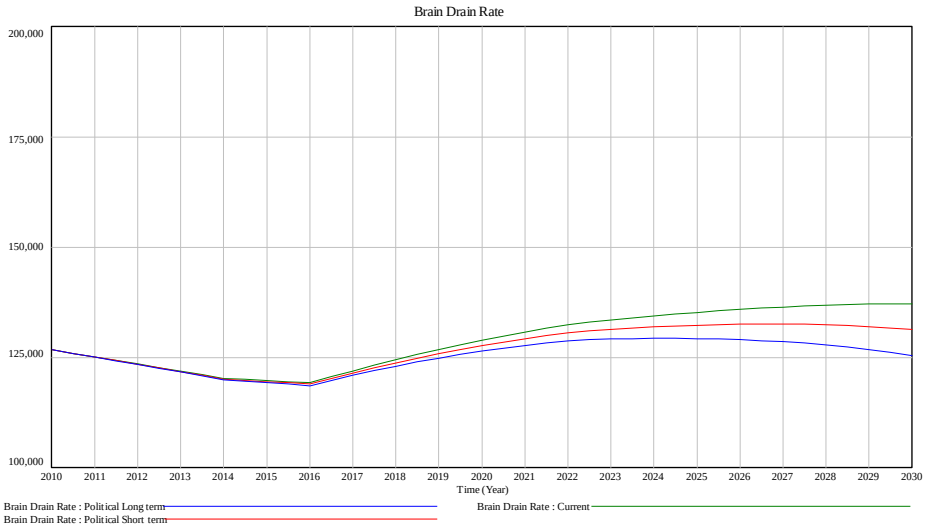

Figure 12: The results of the fourth scenario simulation for the brain drain rate from 2010 to 2030

• The results of the Fifth Scenario simulation:

Implementing the scenario 5 based on Figure 13, it is observed that the elites' emigration rate is less since the beginning of the allowed year for imposing the scenario, comparing with the Zero Scenario and is constant until 2014. Imposing the policy of short-term educational modifications for the first time at the end of the 20-year period, this scenario could stop and fix the growing rate of elites' emigration. This scenario could reduce the brain drain rate since 2025 in a long term.

As it is shown in Figure 14, the brain drain rate with imposing mixed short-term and long-term modification could constantly reduce the brain drain rate since the beginning of the allowed year for imposing the scenario and this is a great success for this scenario.

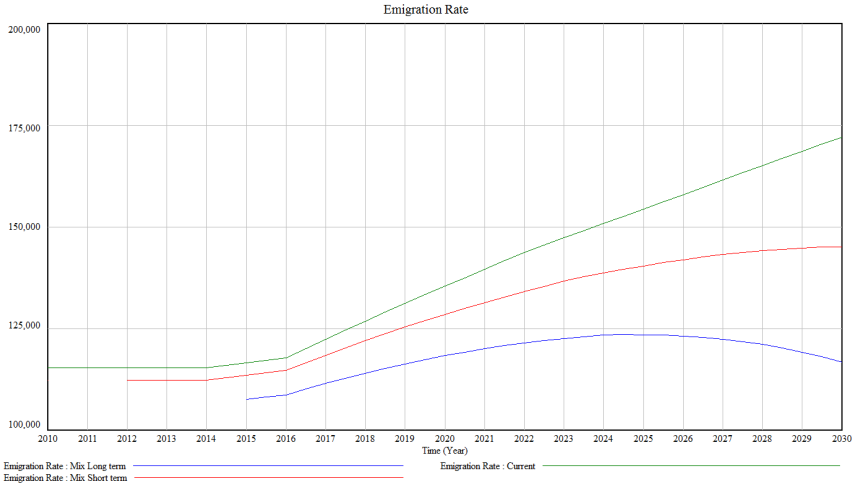

Figure 13: The results of the fifth scenario simulation for the elite emigration rate from 2010 to 2030

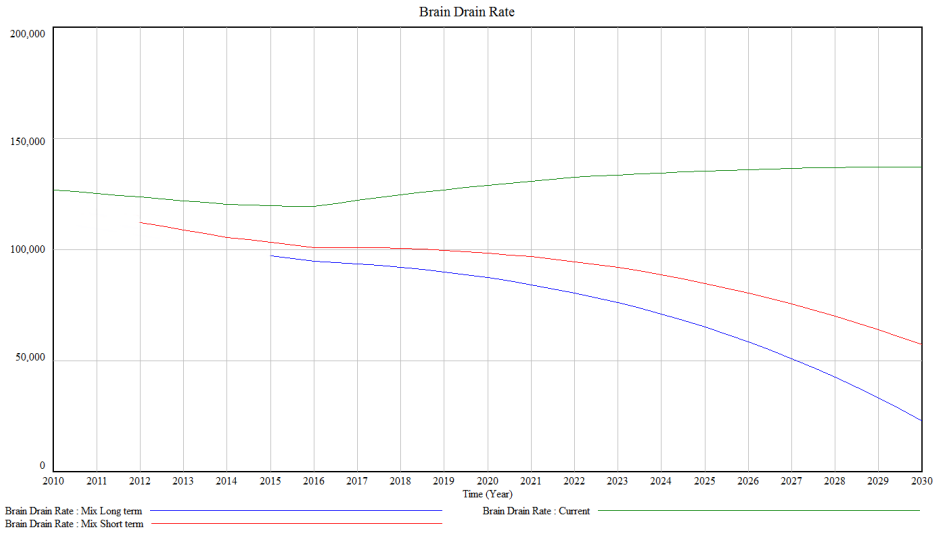

Figure 14: The results of the fifth scenario simulation for the brain drain rate from 2010 to 2030

According to Figures 15-17, in a comprehensive comparison of the results of all the scenarios, it is evident that the Scenario 5 has been more successful than all previous scenarios in implementing both mixed short-term and long-term policies, reducing the elites' academic emigration rate, increasing the elites' return home rate, and reducing the brain drain rate and is considered as the best scenario of this research. The only exception is the scenario 3 which has been slightly more successful than Scenario 5 in imposing long-term policies regarding the elites' emigration rate; however, Scenario 5 has superiority both in the short-term and long-term over the Scenario 3 regarding the rate of returning home and brain drain rate as the main issue in this research study. Implementing long-term policies, the Scenario 5 concerning the continuation of the status quo could decrease the elites' emigration rate 2/3 times, increase returning home rate more than 2 times, and decrease the brain drain rate less than 1/5 times.

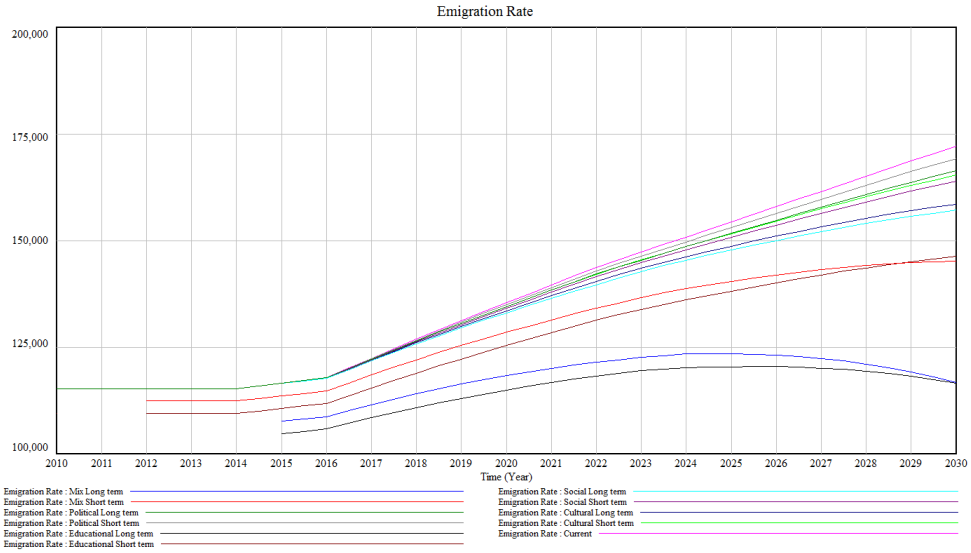

Figure 15: A comparison of simulated scenarios for the elites' emigration rate from 2010 to 2030

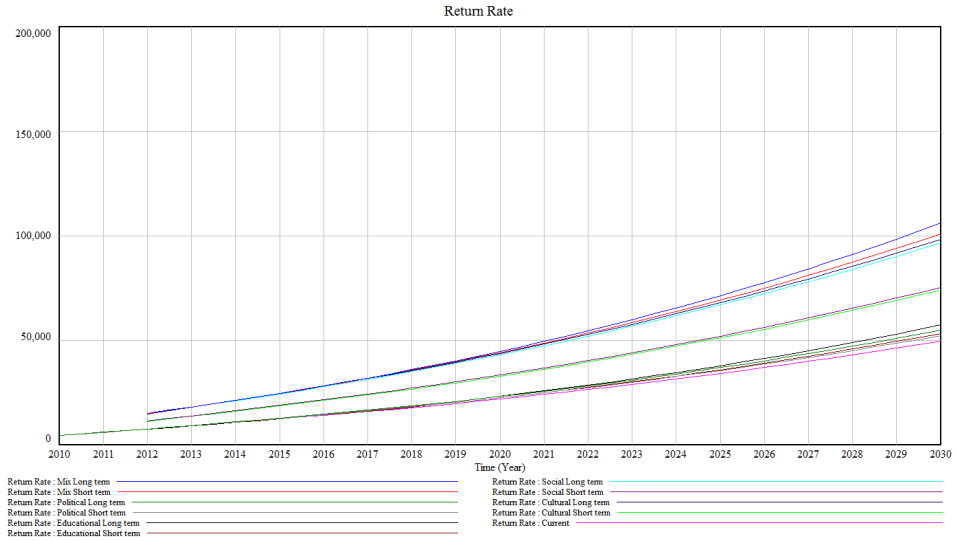

Figure 16: A comparison of simulated scenarios for the return home rate from 2010 to 2030

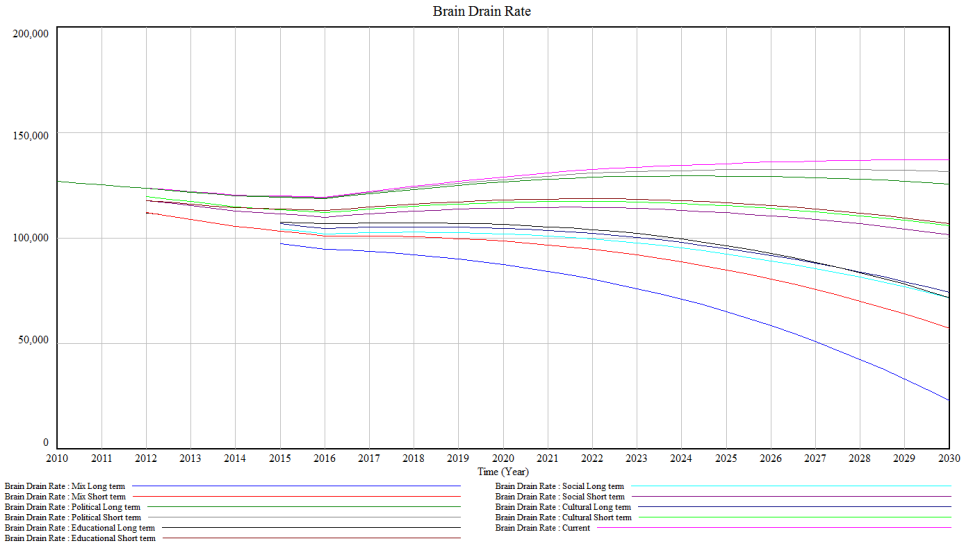

Figure 17: A comparison of simulated scenarios for the brain drain rate from 2010 to 2030

5. Conclusions and Future Research

5.1. Conclusion

Regarding the objectives of the study and the dynamic structure of this model, it can be claimed that using the system dynamics approach and selecting an appropriate scenario would cope with, control, and improve the brain drain phenomenon to a considerable extent over a 20-year prospective and make effective policies against the loss of this great national capital. With regard to the scenarios based on improving various factors, cultural, social, educational and political factors were investigated and it became evident that improving cultural factors (especially the improvement of national-cultural beliefs) as well as social factors (the reduction of life dissatisfaction factor on its top) can be effective in reducing

brain drain phenomenon; however, it has no effect on reducing the elites' emigration rate. Furthermore, focusing on educational factors (headed by a further increase of education share in GDP), especially in the long term, can be not only lead to a significant reduction of the brain drain phenomenon but also leads to extensive reduction of the elites' emigration rate.

In this study, focusing on improving political factors had no significant results in reducing the brain drain and elites' emigration rates and showed that political factors should be prioritized in policy-making decisions on this issue. Finally, using a mixed improvement scenario, the most influential factor in any of the cultural, social and educational factors at the same time, both in the short and long terms, can bring about the highest return and be regarded as the most successful scenario in terms of policy-making in order to provide the ground to significantly reduce the elites' emigration rate, with the help of effective educational factors, and to significantly reduce the brain drain rate.

5.2. Limitations and Recommendations

Study boundary and the scope of this investigation is focused on brain drain phenomenon in Iran and Iranian community and the scenarios are defined and applied with regard to the laws, culture, and accepted norms of the country. Heavy reliance of the brain drain phenomenon on the culture of each society and the impossibility to generalize many other similar studies in other countries to Eastern countries, especially Iran, are bilaterally true and the results of this study will not be widely applicable to other countries. This requires new considerations in accordance with the culture of the studied society. This study also focused on the emigration of the educated emigrants and elites and modeling was made based on the behavior of this population. Hence, migrating due to other non-academic purposes is the subject of this study.

In order to improve the quality of coping with the problem of brain drain phenomenon in the future, it is suggested that further research be conducted in the following areas:

1. Collecting further information using field activities such as questionnaires completed by the elites before and after emigration and reflecting the results in the dynamic model.
2. Distinguishing the elite emigrants based on their educational level and designing and simulating separate models with different coefficients of influencing factors.
3. Conducting research on how to implement the adopted policies as well as the precise estimation and optimization of the time needed to implement the policies using modern management techniques.

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