A System Dynamics Model for Analyzing the Effects of Government Policies: A Case Study of Iran's Cell Phone Market

Mehdi Zamanipour
Faculty of Engineering
Department of Industrial Engineering
University of Tehran
Tel: 98915-5622619
Email: Mehdi@zamanipour.com

Abstract

In 2005 Mr. Mahmoud Ahmadinezhad won the presidential election campaign and became the new president of Iran. He promised to change many of the usual social and economical rules and policies in Iran's society. For example, he decided to change the rate of tariff of products such as cell phones. The goal was to make Iran an independent country in producing cell phone and also to create new job opportunity, so he increased the rate of tariff for imported cell phones and signed new contracts with the cell phone companies to develop high technology of manufacturing or assembling cell phone. Therefore huge investment was done to make the first Iranian national cell phone. But the cell phone market was shocked by this hasty decision and little by little all of the cell phones in the market became contraband. In this research we are going to analyze the effect of changing the rate of imported cell phone and also we will explain some policies for setting the rate of tariff.

Key words: Rate of Tariff, Imported Cell Phone, Government Policies, Quality, Price

Introduction

When Mahmoud Ahmadinezhad won the presidential election of Iran's in 2005, many aspects of Iranian people changed. The main motto of Mr. President in that election was "We Can Do It". So after he was elected, one of his important policies was decreasing the dependency of the country from imported goods. Cell phone was one item of that list.

The government announced that they have signed contracts with two companies, LG and GTX to invest in Iran. They pledged to import two kind of manufacturing technology for producing cell phone, SKD and CKD. Manufacturing and assembling cell phone like any other industry

creates some new job opportunity and could respond to the people needs. Also since the product is a very technological base one, it needs huge capital for its R&D activities that must have been considered.

Although the rate of tariff for cell phone was 4% in 2004, it was increased suddenly to 60% by new government in 2005. Three month later, as the result of this strategy, more than 80% of the cell phones in the market became contraband, according to the government announcement. The official importing centers were about to become bankrupt. On the other hand people have bought inconsistent cell phone and most of them without guarantee or high quality.

Beside these problems, the government also lost most of its revenue from ligal import of custom duties. In 2004 the net demand for cell phone was 3.5 million and the ligal import was 3.2 million. But the ligal import of cell phone in 2005 was less than half of the import in 2004. Since cell phone operators expanded rapidly in 2005, market analysts had forecasted that the demand could go above 10 millions but only 1.55 million cell phones were imported from custom as ligal import. Thus more than 80% of demands should satisfied by traffickers. Unfortunately the internal manufacturer sold only 20000 of their products in 2005.Preventing the traffickers from importing illegal contrabands cell phones was a challenging task.

The government tried to change the people trends but the competitive cell phone market with progressive technological development voided their efforts, since the domestic cell phones could not adopt their features with other rivals.

Little by little it was revealed that the strategy was dawn. After two years of experiencing different short term strategies which caused a lot of ups and downs in the market, the government decided to close the production lines of domestic cell phone and the rate of tariff decreased to 10%.

In this research we will analyses the effect of different strategies for determining the rate of tariff of imported cell phone in Iran's cell phone market. In the next section we will define the problem. Then the causal loop diagram and the dynamic hypothesis will introduce. We present a system dynamic model to describe the elements of our hypothesis. Finally,we will explain the results of running our model under some assumption. A conclusion will discussed on the last section.

Problem Definition

As we explain in the introduction, we are going to develop a system dynamics model to simulate the situation of Iran's cell phone markets during past 3 years and show the effect of the rate of tariff on imported cell phone which is a kind of a very technological good. This model can extend to any other cases of products in this category.

The rate of tariff on cell phone was increased abruptly which was a shock to many retail stores and ordinary people. All cell phones in the markets suddenly became contraband and the police closed each store that had sold contraband cell phones. The price of the cell phones jumped up extremely. At the same time, tcell phones' quality became low since most of them were contraband. Although the price for domestic products was reasonably low but since the production lines and technological contracts were at the beginning, they did not have a satisfying quality.

Before we go through our dynamic hypothesis, we will mention the most important variables of our model:

Desirability of Domestic / Imported Cell phone:

In selecting and purchasing phase, almost every customer wants to optimize the quality of his cell phone by minimizing the cost of purchasing. It means he or she must considers the fixed and variable cost of his or her selection. So we describe his willingness to a cell phone as *Quality to Price ratio for Imported or Domestic Cell phone.*

Quality of Domestic / Imported Cell phone:

Although in our model the quality of imported cell phone is assumed constant but for a long time horizon it can change. On the other hand, we should consider the quality of domestic cell phone since it can be promoted.

Demand for Domestic Products (Demand for Imported Products):

In the cell phone market in our case, it is necessary to know which portion of cell phones are been made in Iran.

Revenue of Government:

Since we consider the domestic companies which manufacture domestic cell phones are owned by the government, we should take to account this variable.

Rate of Tariff for Imported Cell phone:

This is another important variable that affect on the price of imported cell phone and we should seek its variation over the time.

Casual Loop Diagram & Dynamic Hypothesis:

In this section, we depict the important loops of the causal diagram of our model.

In 2005 the second cell phone operator was established in Iran and little by little, many Iranian became potential customers for cell phone devices. Today, Iran has more than 35,000,000

million people who are using cell phone services. So many people have bought their cell phones for the first time in the last three years.

As demand for cell phone increased, and the government wanted to build new domestic factories, the production capacity was increased. So the production capacity in used also increase from zero.

By selling the first domestic cell phones the revenue of government increased and they were encouraged to invest in R&D activities. Little by little, the quality of domestic cell phones increased. So the quality to price ratio of domestic cell phones and correspondingly the desirability of domestic cell phones increased accordingly.

This is shown in Fig. 1.

As you can see in Fig.1 the demand of domestic cell phone can increase by encouraging people to buy the domestic cell phones. It means by increasing fondness of people to Iranian cell phones, the demand of that kind will increase.

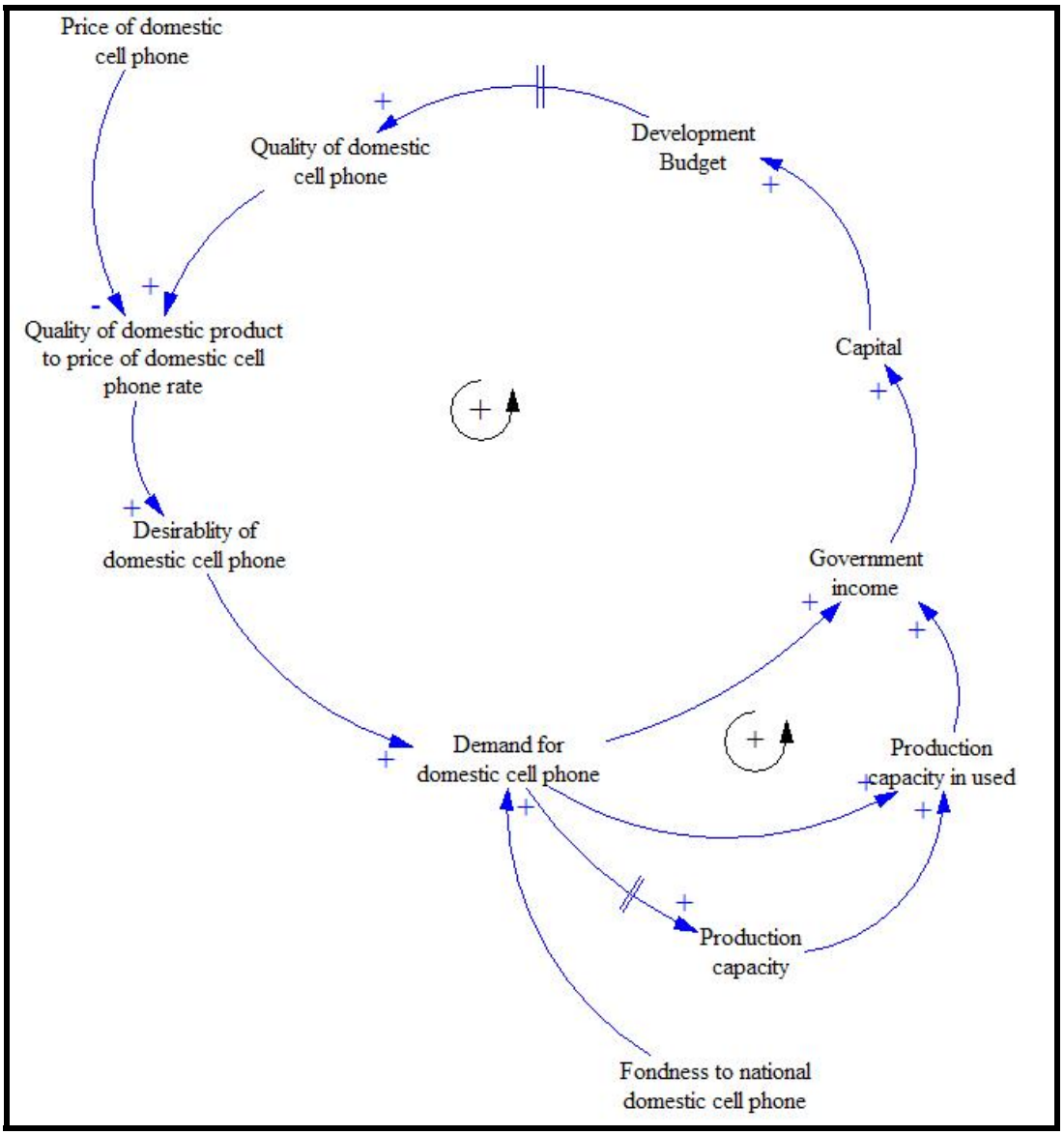

Fig. 1

The demand of imported cell phones can be satisfied in two ways: by ligal import from custom entrances or by contraband cell phones from traffickers.

The former would increase the quality of imported cell phones since most of services such as manufacturer's warranty can be consider in that way, while obviously the latter would diminish the quality on cell phones.

At the other hand, increasing the quality to price ratio of imported cell phones could result in increasing desirability of imported cell phones. As desirability increase the demand of imported cell phones increase. These can make two loops which can be seen in the bottom of Fig. 2.

If desirability of imported cell phones increases, the rate of tariff should increase since it may lead to losses for domestic companies. By increasing the rate of tariff, the price of imported cell phone increase and the quality to price rate decrease. Consequently the desirability of imported cell phones decrease.

These are constructing the upper loop in fig. 2.

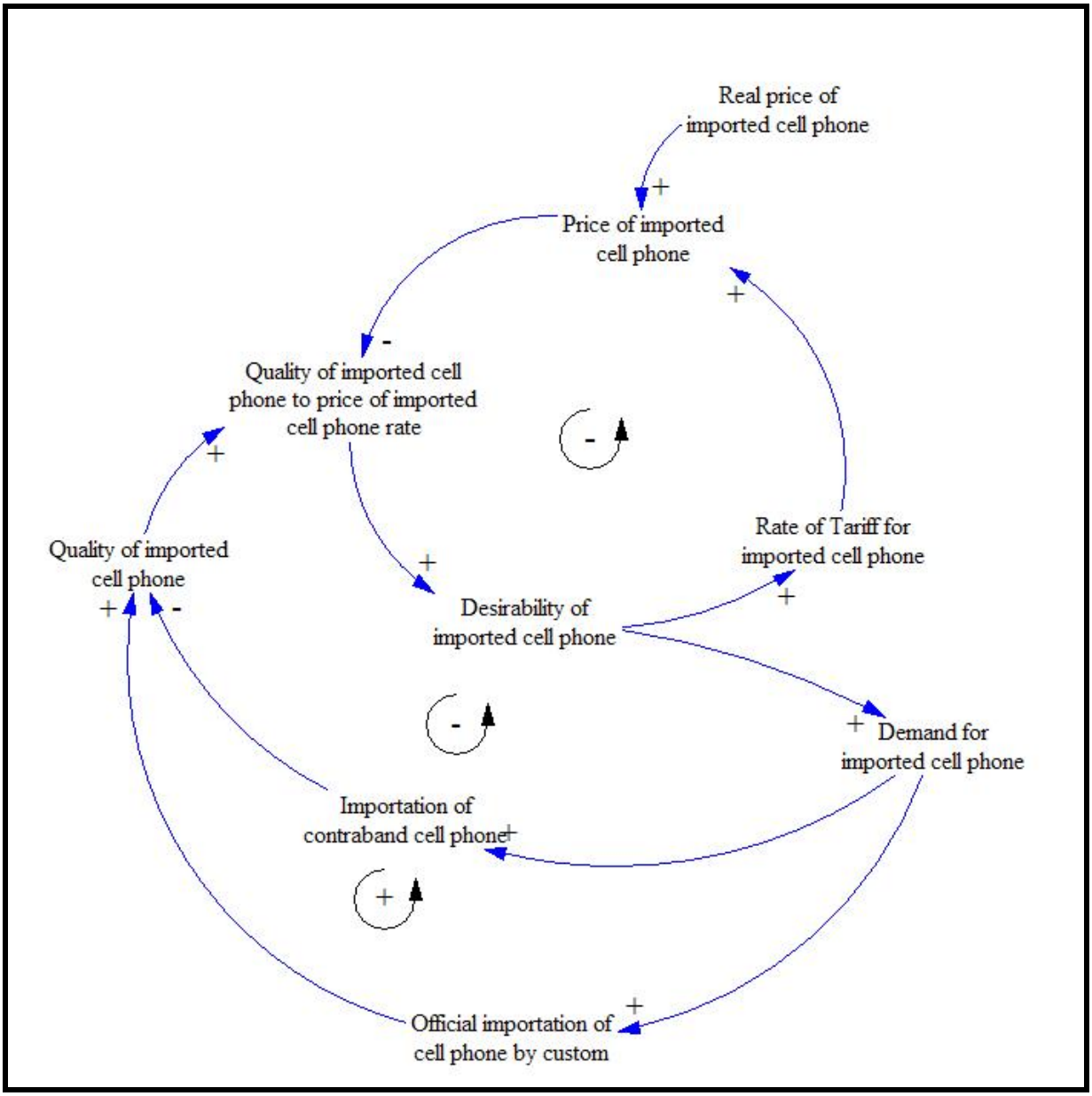

Fig. 2

Total demand for cell phone can be divided to domestic and imported demand. As demand for domestic cell phone increases, the desirability of domestic cell phone will increase and then the government income also increase. So to create a competitive situation for domestic cell phone to develop, the government tried to decrease the rate of tariff, then the demand for domestic cell phone decrease. This balancing loop can be seen in Fig. 3.

Regarding what we have depicted until now, we can explain our dynamic hypothesis as follow:

In the last 3 years, because of different tariff determination strategies of imported cell phones, the cell phone market has a lot of ups and down. Because the needs for cell phone increase, the government decided to make domestic cell phone. To support this decision, they increase the rate of tariff up to 15 times of the previous rate. Since domestic factories were at the beginning, the quality of domestic cell phone was not comparable with imported ones. Little by little more than 80% of cell phone in the market became contrabands. Domestic factories increased their production capacities but they could not fulfill the demand and also they could not satisfy the people.

So for managing the critical situation government decided to set a rational rate of tariff.

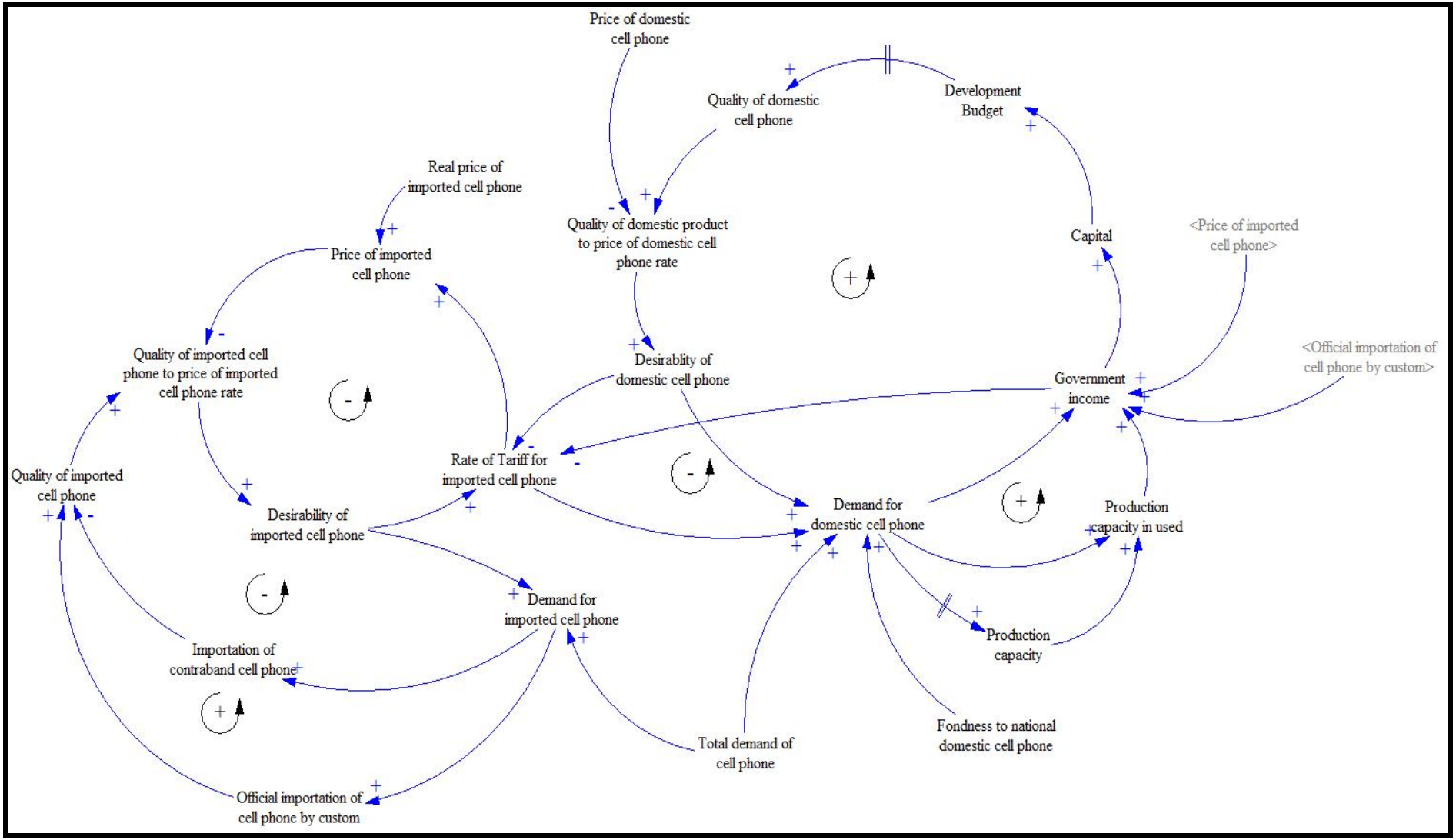
Price of domestic cell phone
Quality of domestic cell phone
Development Budget
Real price of imported cell phone
Quality of domestic product to price of domestic cell phone rate
Capital
<Price of imported cell phone>
Price of imported cell phone
Quality of imported cell phone to price of imported cell phone rate
Desirablity of domestic cell phone
Government income
<Official importation of cell phone by custom>
Rate of Tariff for imported cell phone
Quality of imported cell phone
Desirability of imported cell phone
Demand for domestic cell phone
Production capacity in used
Demand for imported cell phone
Production capacity
Importation of contraband cell phone
Fondness to national domestic cell phone
Total demand of cell phone
Official importation of cell phone by custom

Fig. 3

Flow Diagram and Model Description:

In this part we are going to develop a stock-flow diagram. We consider the situation in which government decided to invest in domestic cell phone makers and the production capacity increase and some people used these domestic cell phones. Because the rate of tariff was very high, most of the demand must be satisfied by domestic production.

Total Demand will increase as population increases, so it is a function of time. Since the desirability of imported cell phones was high, the contraband cell phones increase and people bought low quality cell phones. So increasing rate of government revenue decrease since legal import by custom and also selling domestic cell phones decrease. So the rate of tariff decreases and converges to a specific quantity.

As you seen in Fig. 4, the quality of imported cell phone through custom can not increased in a short time horizon. But the quality to price rate of imported product can change since the quality of imported cell phone trough trafficker's ways was low.

In our model we consider a coefficient which is budget needs for 1% improvement. Since cell phones are very technological dependent, the amount is very high.

Also we have a dependency coefficient for determining tariff rate which show the dependency of government for imported products.

The complete scheme of our stock model can be seen in Fig. 4

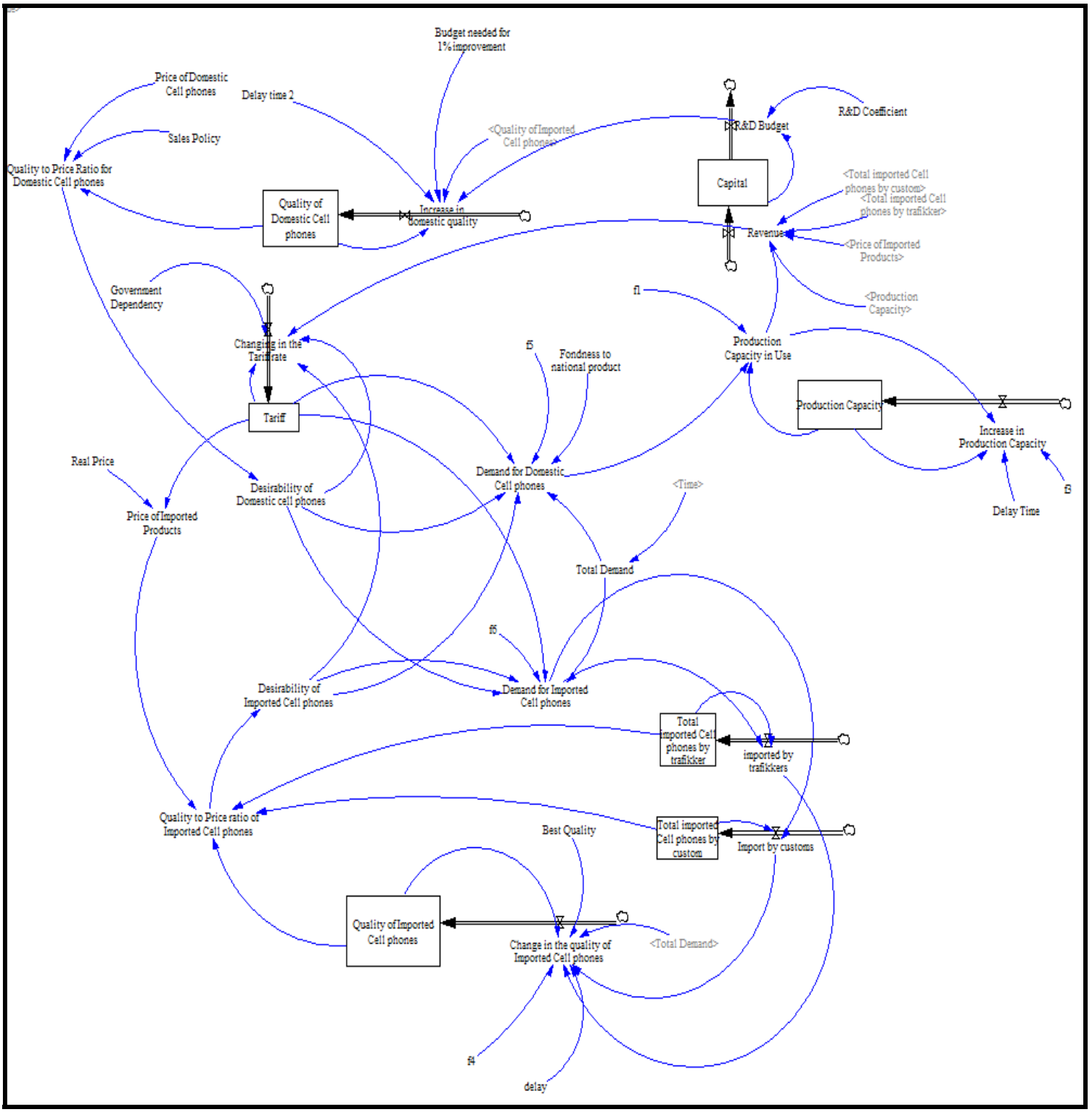
Budget needed for 1%improvement
Price of Domestic Cell phones
Delay time 2
Sales Policy
<Quality of Imported Cell phones>
R&D Coefficient
R&D Budget
Capital
Quality to Price Ratio for Domestic Cell phones
Quality of Domestic Cell phones
Increase in Domestic quality
<Total imported Cell phones by custom>
<Total imported Cell phones by trafikker>
Revenue
<Price of Imported Products>
Government Dependency
<Production Capacity>
fl
Changing in the Tariff rate
f5
Fondness to national product
Production Capacity in Use
Production Capacity
Increase in Production Capacity
Tariff
Real Price
Demand for Domestic Cell phones
<Time>
f3
Delay Time
Desirability of Domestic cell phones
Price of Imported Products
Total Demand
f6
Desirability of Imported Cell phones
Demand for Imported Cell phones
Total imported Cell phones by trafikker
imported by trafikkers
Quality to Price ratio of Imported Cell phones
Best Quality
Total imported Cell phones by custom
Import by customs
Quality of Imported Cell phones
Change in the quality of Imported Cell phones
<Total Demand>
f4
delay

Fig. 4.

Simulation & Results:

Since there was not any reliable data base for cell phone applicant in Iran, gathering exact and accurate information for our purpose was very difficult. But by talking with the important cell phone shopping centers it was revealed that the demand curve was approximately as follow. The production capacity also is depicted in Fig. 6.

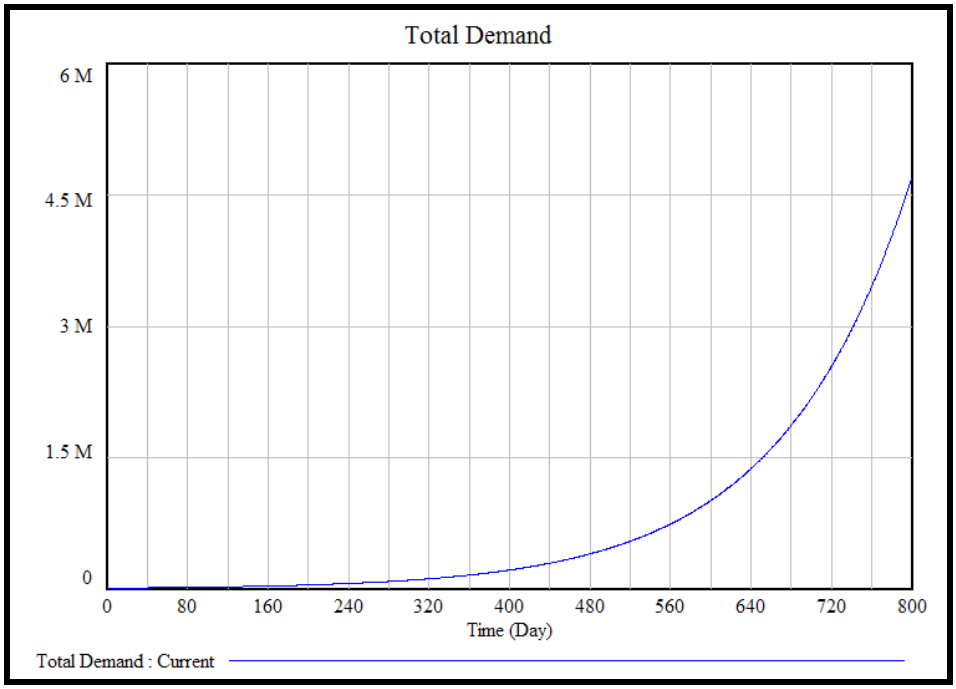

Fig. 5

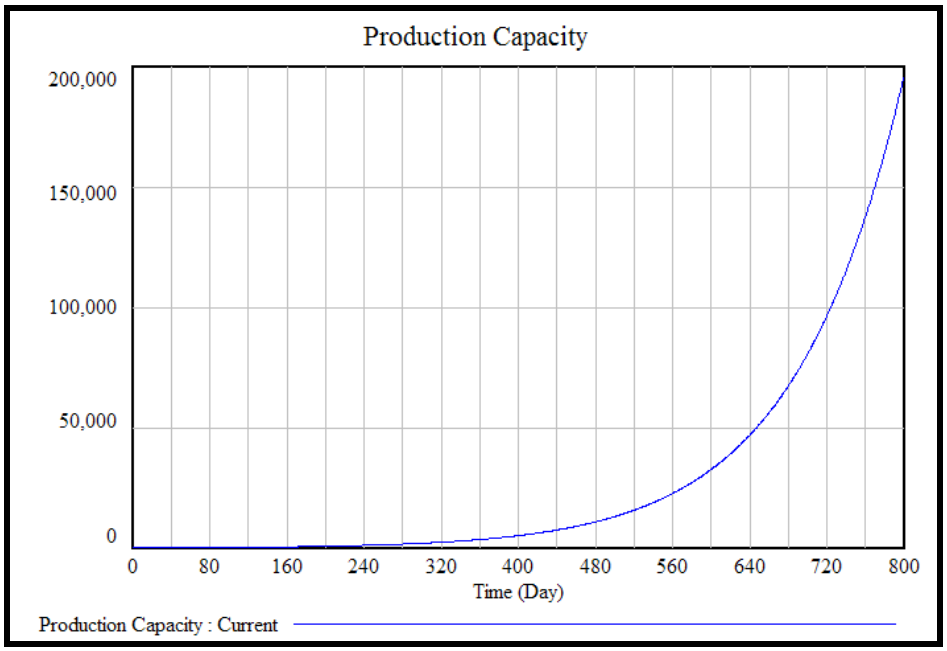

Fig. 6

By considering an optimistic coefficient for the development budget and a little amount for government dependency to importation duties, our model will result in the following figures.

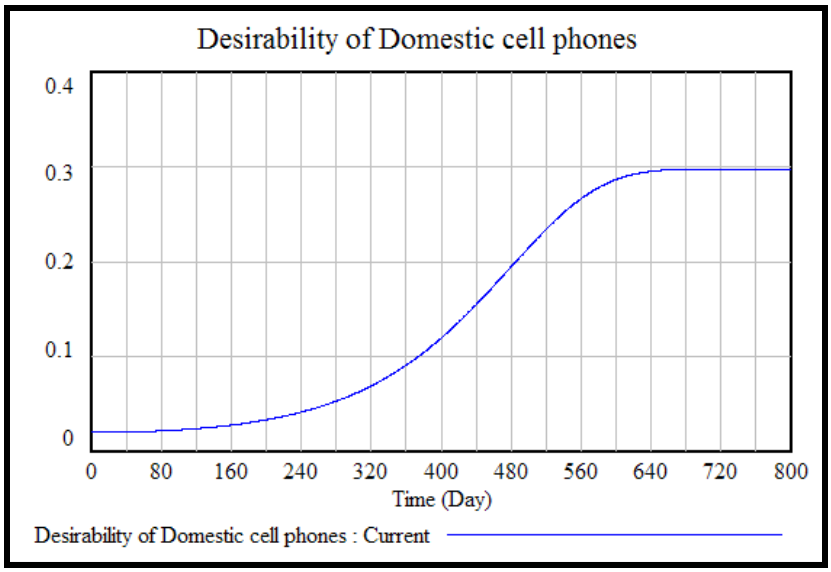

Fig. 7

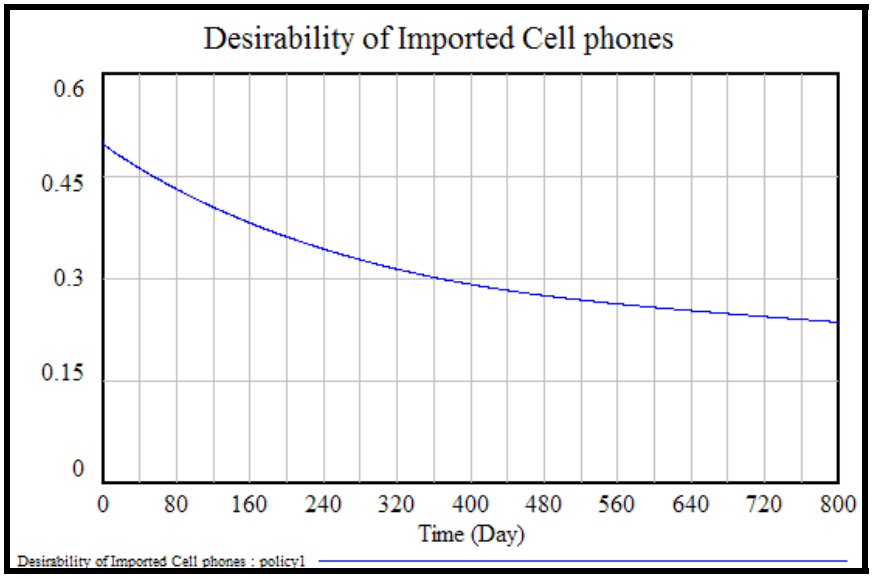

Fig. 8

As we set some optimistic assumptions for the developing domestic cell phone industries, the marginal amount of quality to price rate of imported cell phone is less than marginal amount of this rate for the domestic one. As you see, this amount is 0.3 for domestic products. It means that the domestic manufacturer was empowered by using government subsidies and gradually can compete with their rivals in the Iran's cell phone

market. Since they have some competitive advantages, the desirability of them will dominate the desirability of imported cell phones.

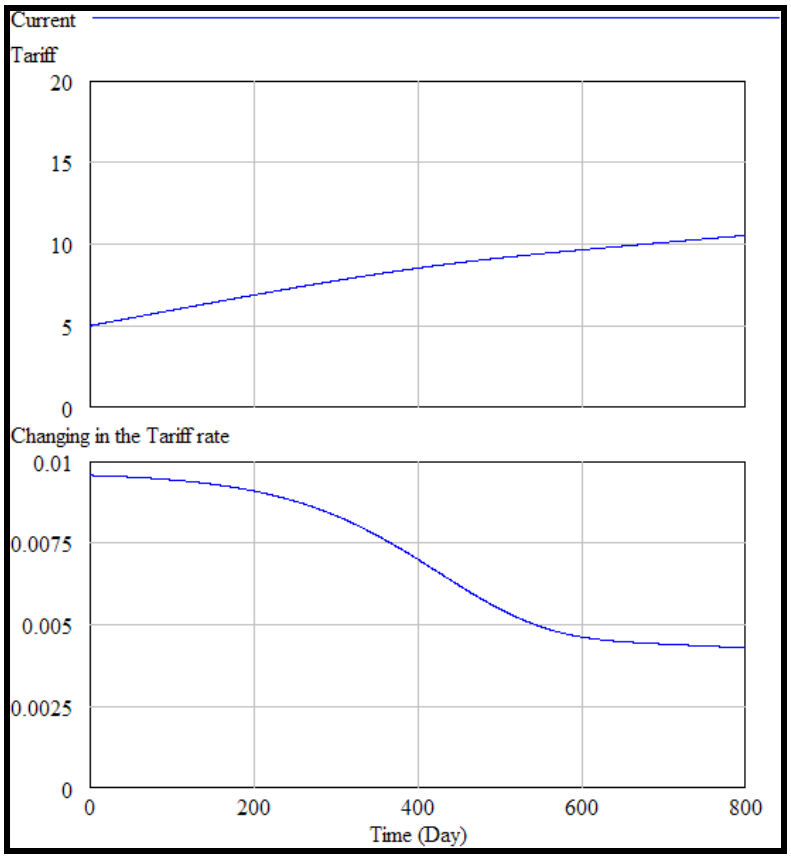

Fig. 9

So if the initial amount of tariff was set in 5%, the amount of tariff was going to converge to 12% as the rate of its changes converges to 0.004. Therefore the rate of tariff should be increased slowly and should coverage to nearly 12% at last.

Comparing different policies:

In this section we will compare three different policies. The first one is exactly what we had studied in the previous section.

1) The initial amount of tariff is 5% with an optimistic assumption for improvement of domestic cell phones.
2) The initial amount of tariff is 20% with a normal prediction for improvement in domestic cell phone industries.
3) The initial amount of tariff is 60% with a pessimistic assumption for improvement of domestic cell phones.

In the rest of figures we illustrate the result of running our model with these three policies. As you see in figure 10 the desirability of imported cell phones in the third policy is more than the others and also the desirability of domestic cell phone in this policy converge to 0.3 sooner than the others. We consider the quality of imported cell phones a constant value, since it was not in the scope of our research. So our model mandates the quality of domestic products to coverage to the imported ones. It means that the quality level of imported cell phones was a purpose for domestic companies. Because the quality of imported cells were set in 15000 units of quality, the quality of domestic cells was going to coverage to 15000 in all three policies (Fig. 13) and also the desirability of domestic cells was going to coverage to 0.3 for all of the policies. In this case the best policy is the one which coverage most quickly.

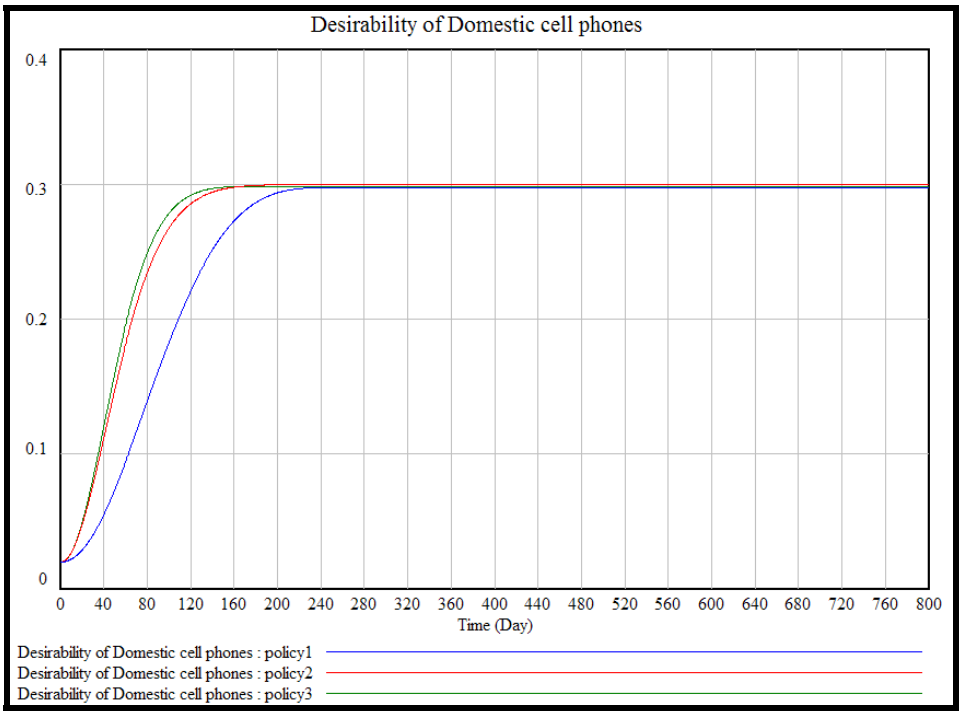

Fig. 10

Demand for domestic phones in policy 2 increased drastically with respect to the others. This was just because of normal rate of tariff and desirability of domestics in this policy.

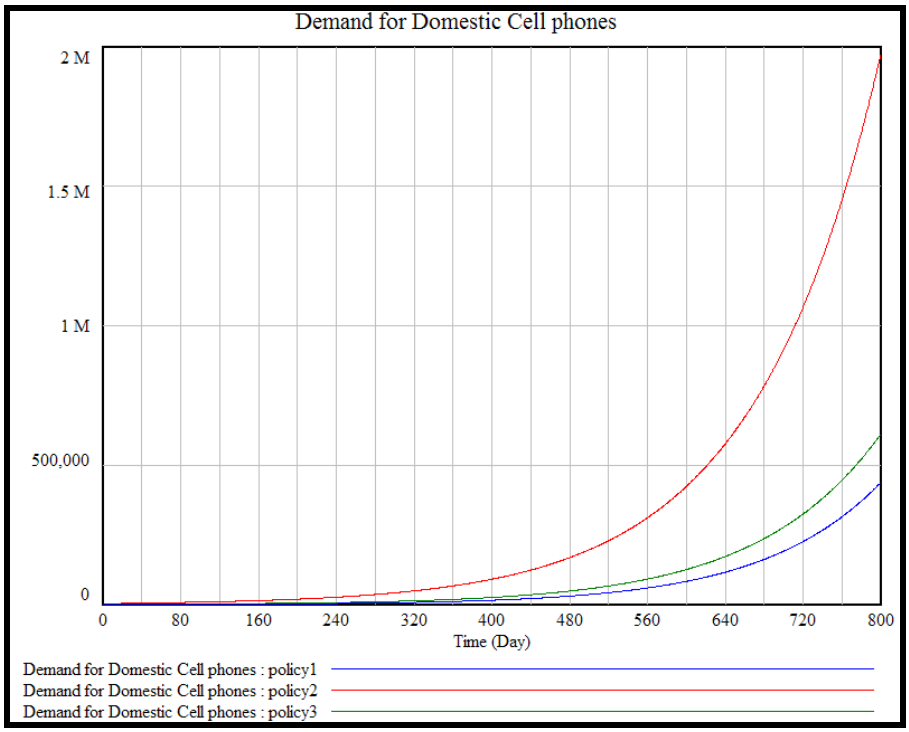

Fig. 11

Although the third policy was ranked 1 in the demand of domestic phones but it was the worst in imported demand as it is showed in Fig.12.

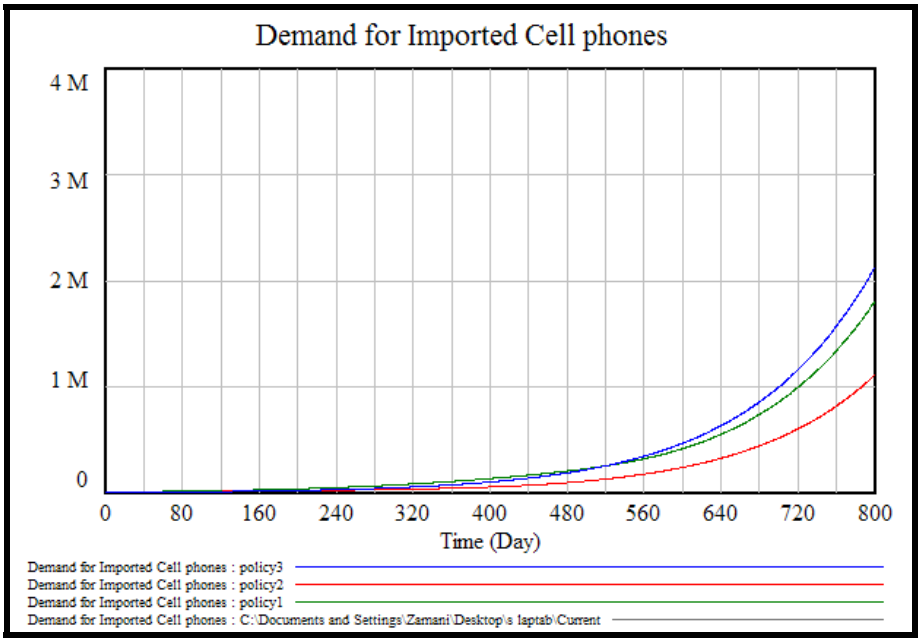

Fig. 12

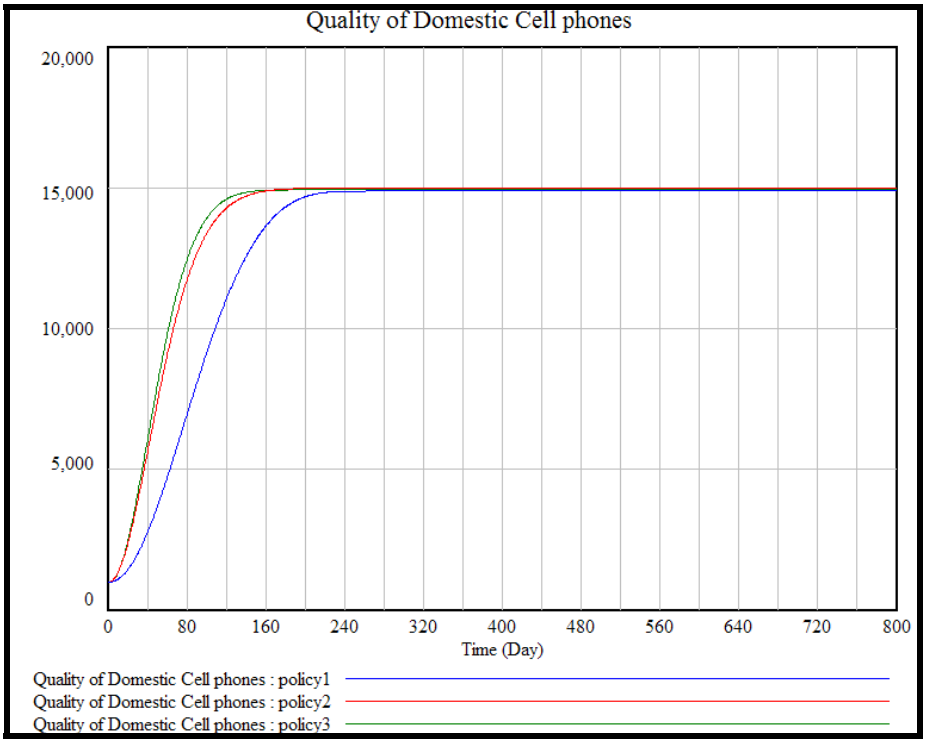

Fig. 13

As the government set the rate of tariff on 5%, the revenue of its supporting companies became the lowest between other policies. As explained the demand of domestic products in second policy was the best. In Fig.15 it is revealed the revenue in this policy in also the best. (Fig.14)

So it seems that by considering the second policy the desirability of domestic product converges quickly and the revenue of government is also considerable comparing with the result of other policies.

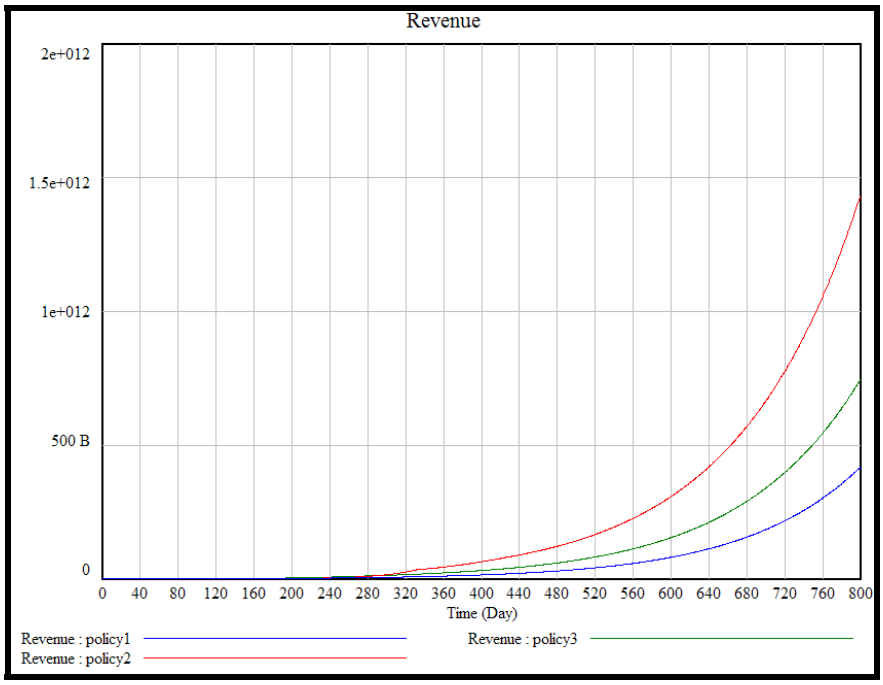

Fig. 14

Conclusion:

In this paper we analyzed important factors and their effects in changing the rate of imported products. We considered this problem as a case study of Iran cell phone market in which Iran government dealt with this problem from 2005 till 2008.

We use a system dynamic model to explain the relations between the dependent and independent factors in this problem. The rate of tariff was increased suddenly from 5% to 60% by the new government in 2005. By considering different policies, we concluded that government could get better result by following the second proposed policy in this paper, and increase the tariff rate gradually. If the government had kept the tariff rate around 20%, domestic manufacturer could have competed with their foreign rivals and improve their quality at the same time.

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