Market Analysis Using System Dynamics: Focusing on the Stone Industry

Iranian marble

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Abstract

In order to analyze and examine the situation of the stone market more accurately and to create a precise and efficient view of the market and the relationships existing in it, an attempt has been made to achieve this goal by using the methodology of system dynamics. In this study, Vensim software was used for simulation.VENSIM has been used and finally all the relevant outputs have been examined in the validation and scenario chapters. This method, by examining the cause-and-effect and logical relationships between the variables in the market, provides us with the power to analyze and examine more precisely the situation and analyze the consequences and risks of policies and decisions. In this research, we find that the effects of high marginal costs in the country are the main reason for our inability to compete with the world and as a result of the import ban and the small amount of exports. We also gain insights into the markets and the clear result of the research findings is that plans to increase production capacity without increasing demand are meaningless and market growth is dependent on demand growth. In this industry, especially demand and market growth are not in the hands of manufacturers and are assumed to be an external factor. In such circumstances and by analyzing the existing scenarios, we find that reducing the marginal cost of production by using line improvement plans is the best solution for the stone industry.

Keywords: Systems Dynamics, Market, Stone Industry, Demand, Perspective, Final Cost

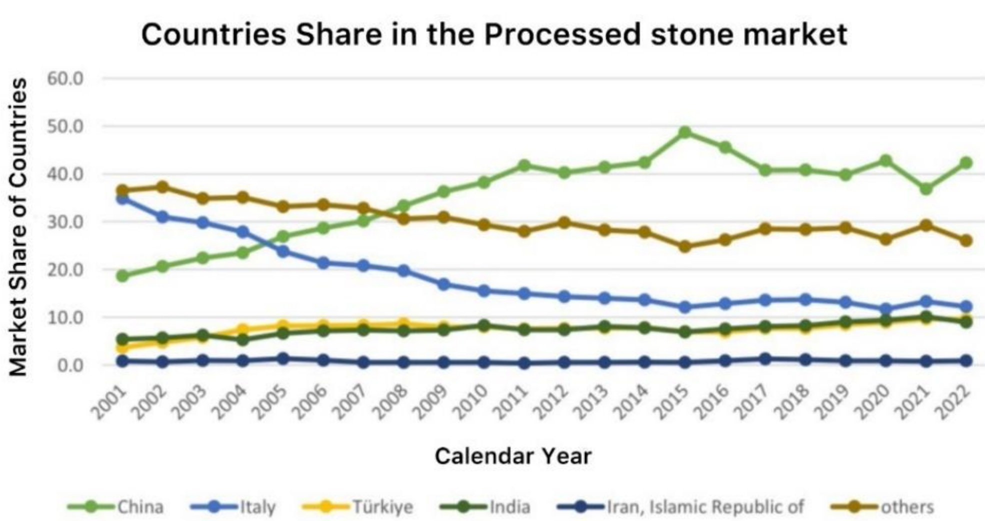
1. Introduction

The stone industry is one of the oldest industries in the world. The economic and social benefits of this industry are undeniable. From the time of ancient Egypt and the construction of the Three Pyramids to ancient Rome and their widespread use of marble stones to build columns and beautify buildings, marble has been used.

This industry is among the 50 largest markets in the world and is also one of Iran's important non-oil exports and also produces many job opportunities. Iran has high potential in the field of building stones and is one of the leading exporters of this industry. The diversity and number of Iranian mines is also significant.

Despite Iran's diversity and high potential in building stones, Iran has not been able to adequately absorb Global Markets in terms of production and export. The complexity of global markets and the existing loop effects make it difficult for industrialists to understand some relationships and structures.

The main issue of all industries and businesses is making the right decision to solve existing challenges with minimal cost and risk. Unfortunately, Iran's stone industry is facing many challenges. Many times, existing solutions can have unpredictable effects. For example, is it wise to provide energy subsidies for stone production and extraction? Will equipping workshops and mines with modern technologies increase Iran's market share? Is the cost of equipping workshops and mines worth this increase in market share? Iran's market share is shown in Chart (1).

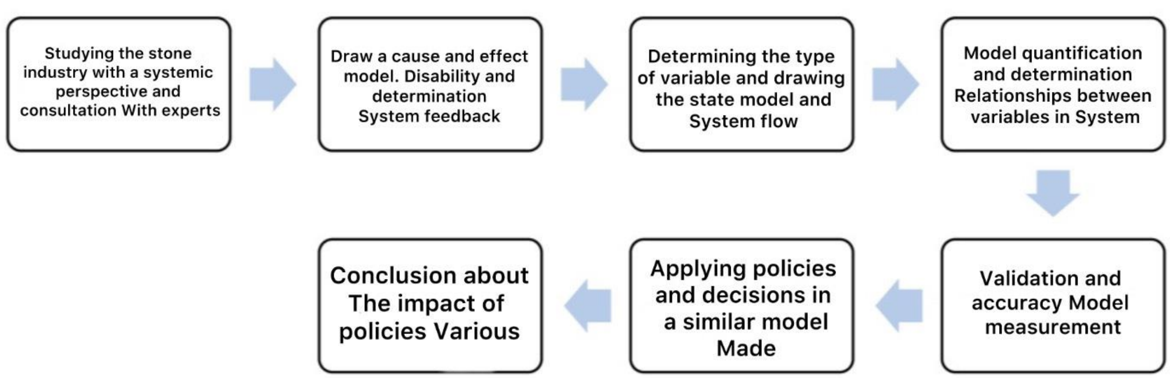


Iran's share of the global market Chart 1

The main problems of the industry are the high final cost and lack of competitiveness in the world. The export profit margin is high due to the high price of Iran compared to the world, and this makes imports impossible because it destroys the domestic market. The biggest obstacle on this path is the traditional nature of the industry, its inefficiency, and lack of optimization.

In addition to creating a holistic view for managers, which makes us aware of the hidden aspects and long-term effects of problems and challenges our current mental models to make better changes, system models also have other benefits, including making it easier to find causes in complex systems, not requiring large and accurate data, being able to analyze industries that do not have accurate historical data, and giving us the ability to find existing explicit and implicit feedback loops, and ultimately being very useful for analyzing policies and decisions. For these reasons, we use this type of modeling for the problem of predicting the trend of the stone market volume.

Drawing a system model begins with studying the issue and consulting with experts from a holistic and systemic perspective, focusing on determining the boundaries of the problem and clarifying the problem and variables. Then comes the analysis of the system structure. At this stage, the focus is on determining the subsystems of the problem and determining local and global feedback. This is done by drawing a model.What happens after this stage is CLD's turn (according to the model)It turns out that at this stage the types of variables are determined and plotted. After this stage, we enter the discussion of formulating (SFD). We will do mathematics and create functions for each variable. After completing the model and all variables have a mathematical relationship, it is time to test and validate the existing model. Then, and only after this stage, we can begin to simulate the model and apply policies to it. These steps are performed using existing simulation software.
Figure 1 presents a schematic of the overall research process.



Steps to implement the research Figure 1

The ultimate goal of the project is to improve attitudes and find the best solution to solve industry problems and create a systemic and causal understanding of how the market functions. Finally, we want to draw conclusions about the industry and examine the policies of macro institutions and the effects on the market. At the end of this research, like any other research, it is hoped that some existing questions can be answered, and the most important question is what to do. A question that has brought numerous solutions to the minds of industry activists, but do these solutions have positive effects on the environment and if so, are these effects sustainable? Also, sometimes some solutions have a positive effect on some factors but destroy some factors. The goal of the present project is to analyze these issues with a focus on the economic and production aspects, and social and environmental variables are not included in this model.

2. Literature review

The global stone and marble industry is one of the oldest economic sectors and has historically contributed to construction, employment, and trade. Despite the long-standing application of marble—from ancient Egyptian architecture to Roman engineering—it continues to play an essential role in modern construction markets. Iran possesses significant geological diversity and ranks among the world's major producers of dimension stones; however, its export performance and global competitiveness remain disproportionately low relative to its production capacity. Several descriptive studies have highlighted this mismatch and documented inefficiencies, high production costs, outdated technology, and structural constraints in Iran's stone sector

Research conducted in other developing economies reveals similar challenges. Kandil et al. (2006) examined the Egyptian marble industry and identified issues such as limited technological advancement, reliance on second-hand machinery, and insufficient market data—barriers that closely resemble Iran's circumstances. Studies from Nigeria (Adebimpe et al., 2002) and Pakistan (Mansoor et al., 2012) further demonstrate that outdated extraction techniques, high operational costs, and low integration with global markets are common constraints in resource-rich developing nations.

Alongside economic perspectives, environmental and sustainability-based analyses have grown substantially in recent years. Bianco and Blengini (2018) integrated Life Cycle Assessment (LCA) with System Dynamics (SD) to evaluate environmental impacts across the dimension-stone supply chain in Italy. Traverso et al. (2010) assessed the environmental footprint of Sicilian marble and concluded that extraction efficiency, energy use, and waste generation are critical determinants of sustainability. These studies highlight the value of combining dynamic modeling with environmental analysis to capture the complex interactions between production decisions, technological changes, and long-term ecological impacts.

Beyond the stone industry specifically, SD has been widely applied to resource-based sectors, enabling detailed analysis of feedback loops, delays, and policy outcomes. Lyneis (2000) demonstrated the effectiveness of SD in market forecasting and structural analysis. Their study compared multiple forecasting approaches and emphasized three major advantages of system dynamics: (1) more reliable short- and medium-term forecasts; (2) improved identification of causal mechanisms behind market behavior; and (3) the ability to evaluate alternative policy scenarios before implementation. The study further discussed practical considerations such as integrating new system models with existing organizational models and the limitations of purely numerical predictions. A case study in the jet-aircraft industry illustrated these concepts.

Similarly, Buongiorno (1996) combined econometrics, mathematical programming, and SD to model the forestry sector, comparing the strengths and weaknesses of each methodological approach. Although marble-specific SD literature remains limited, SD has been effectively applied to several mining and energy sectors. Fan et al. (2007) developed an SD model for coal investment in China, incorporating production capacity, mine development rates, investment flows, and reserve availability. Additional studies have applied SD to forecast workforce demand in healthcare (Chung et al., 2010), evaluate oilfield production in China (Tang et al., 2010), and examine policy responses to energy-price fluctuations in coal-based industrial districts (Wang et al., 2017). These studies collectively demonstrate that SD is particularly well-suited for analyzing industries driven by natural resources, capital-intensive production, and policy sensitivity—conditions highly relevant to the stone industry.

In recent years, advances in SD have extended its capabilities into competitiveness modeling, policy uncertainty, and integration with modern analytical methods. Santos and Ferreira (2021) constructed an SD model to analyze competitiveness in mining industries and found that production cost structures, CAPEX/OPEX cycles, and technological upgrading are decisive for global positioning—directly aligning with challenges in Iran's stone industry. Zhang et al. (2020) incorporated uncertainty into SD-based mineral market forecasting and demonstrated the importance of sensitivity testing for robust policy evaluation. Li et al. (2022) applied an SD framework to evaluate environmental and economic interactions in stone processing, showing that production-line optimization significantly reduces marginal costs and enhances market viability.

Hybrid modeling approaches have also gained prominence. Hosseini and Khalilzadeh (2021) combined SD and agent-based modeling (ABM) to simulate producer behavior and investment dynamics. Zhao et al. (2022) integrated machine-learning forecasting techniques with SD to improve demand-prediction accuracy in volatile commodity markets. These modern approaches indicate a broader methodological shift that enhances traditional SD models by incorporating behavior, uncertainty, and data-driven components. Studies focusing on global value chains (GVC) and trade dynamics further demonstrate that competitiveness in the stone industry is shaped by technological modernization, logistics efficiency, international standards, and cost structures. Pellegrini (2021) showed that participation in GVCs enhances export performance in the marble sector, especially for countries with modernized production lines and competitive pricing structures. Carvalho (2020) modeled tariff shocks and found that industries with high final costs—such as Iran's marble sector—are highly vulnerable to import liberalization. Zhang and Ling (2022) developed an SD-based framework to assess competitiveness in the global stone industry and identified production efficiency, domestic cost structure, and supply chain stability as key determinants of market share.

Research Gap

Despite the diverse body of research across economic, environmental, and policy dimensions, no existing study has developed a system-dynamics-based model for Iran's processed marble market. Previous studies on Iran's stone industry are predominantly descriptive and lack dynamic modeling of price behavior, production capacity adjustment, demand formation, and policy impacts. Furthermore, scenarios such as import liberalization, price regulation, and production-line optimization have not been analyzed through a feedback-based framework. This absence of dynamic, causal modeling constitutes a clear gap in the literature.

Research Contribution

This research fills the identified gap by developing the first system dynamics model of Iran's processed marble market, integrating three interconnected subsystems—pricing, production, and demand. The model provides a causal explanation for observed market behavior and evaluates a range of policy scenarios, including capacity expansion, production-line optimization, trade liberalization, and price intervention. By focusing on marginal costs, market share dynamics, and supply–demand interactions, the study offers a comprehensive and dynamic perspective that has been absent from previous literature.

3. Methodology

The methodology of system dynamics was developed in the late 1950s as a result of efforts to study and address such dynamic and long-term policy issues that are prevalent in both the public and private sectors. A group of researchers led by J. W. Forrester began a new field that later came to be called industrial dynamics. System dynamics is a methodology for studying and managing complex feedback systems, such as those found in business and other social systems. Since this method is used in this study, we will describe it in detail below, but here we will briefly outline its advantages that led to its selection for this study. (Since it is well-known, a description of this method is given in the appendix.)

- Designed to respond to complex and nonlinear behavior of systems
- The ability to incorporate human behavior and will into the models of this method
- Designed to find emergent relationships between components of a problem that give rise to emergent properties.

- Because it is based on a systems approach, the concepts of systems that are often seen in complex management issues are included in this The method is understandable.

- The ability to model knowledge and learning in this method

- Generality of the method

- Large and growing number of users

- Provide few details

- Connection to the content level of the system

- Ease of using the model and the availability of appropriate software

System dynamics is a methodology for studying and managing complex feedback systems, such as those found in business and other fields.
Social systems. In fact, it can be said that this methodology has been used to examine and study all types of feedback systems. Although the word "system" is used for many situations, "feedback" is considered a characteristic adjective in this context. Feedback refers to a situation in whichAlthough it is possible that X also affects Y and then Y affects X. This influence is carried out through a chain of causes and effects. Predicting the behavior of the system through independent study of the relationship between X
And It is not possible. Only studying the entire system as a feedback system leads to the modification of the results of X and Y and, in turn, the relationship between Y It will be.

- First, it identifies a problem.

- Forms dynamic hypotheses that explain why the problem occurred.

- Creates a computer simulation model of the system underlying the problem.

- Examines and tests the model to ensure that it reproduces the behavior observed in the real world.

- Designs and tests different alternative policies that could improve the problem.

- And finally implements the chosen solution

This methodology was first introduced by J. Dalio. Forrester. His first book, published in 1961, "Industrial Dynamics," is still considered an important reference book in this field. Since the publication of this book, the scope of applications of this methodology has expanded significantly and currently covers the following areas:

- Planning and designing strategies and policies for the commercial sector
- Public sector management and policymaking
- Biological and medical modeling
- Energy and Environment
- Theorizing in the natural and social sciences
- Dynamic decision making
- Dynamics of complex nonlinear systems

Some issues are dynamic and are considered long-term policy issues. “Dynamic” means “changing over time.” Dynamic issues require ongoing, dynamic management actions. The optimal location of an oil well may be a very complex problem, but it is still a static decision-making problem. The decision is made once but is not monitored and revised periodically based on its results. However, the dynamic issues mentioned above must be managed and monitored continuously. Therefore, specifically in the field of management and policy, dynamic issues are issues that are continuous, chronic, and recurring in nature. In these cases, we take management action, observe the results, evaluate them, and take new actions that will lead to new results, new observations, and new actions. In this way, a closed loop is formed. In other words, most dynamic management problems are “feedback” problems. Feedback loops exist not only between the control action and the system, but also between different components within the system.

Therefore, these dynamic feedback problems are said to be systemic in nature, in other words, they arise as a result of complex interactions between system variables. Since dynamic management requires a flow of dynamic decisions, the focus of research in this area should not be on point and individual decisions, but rather on the decision-making rules (policies) by which decisions are made. In this method, thinking is based on cause and effect, and the focus is on feedback links (loops) in the system in order to extract dynamics from the loop. The existence of a loop means that a variable changes due to its own change, which causes complex behaviors.

Therefore, not seeing it will lead to a lack of proper understanding of the system's behavior. Another important issue in this type of modeling is determining the boundary and environment and internal and external variables, which also has a serious impact on correctly predicting the behavior of the model. By asking the question, "What is the cause, effect, or agent of something else?", we can gain insight into what the so-called cause and effect are in a phenomenon. For example, some links are logical and clear:

- Food eaten and the person's weight
- Population and mortality
- Fire and smoke

And some links are not direct causal and are complex: shorter daylight hours and increased suicides. Of course, these cases also become clear and evident if the intermediate variables and their adequate explanations are drawn and stated.

Example of cause and effect loops, Figure 2.

4. Body

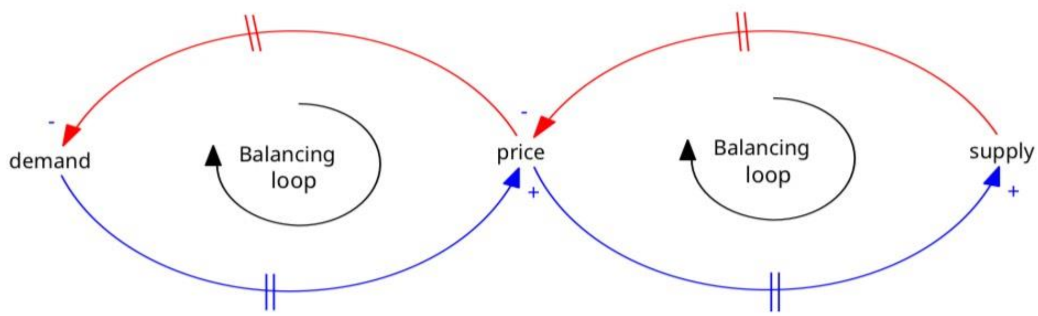
To do this, we must first be able to examine the market with the right perspective, and finding the right perspective that can be the intellectual foundation of our model is not an easy task. The market is complex, and therefore we need to continue our research with a solid foundation, otherwise the research path will go astray. This perspective will eventually become a simulated model of the world and the market. The current project uses one of the simulation methods for modeling, that is, it recreates a model similar to the real world. Without a proper understanding of the real world, simulating it is impossible and will not achieve the desired result. In the following, we will refer to one of the most famous and prominent perspectives on how the market works, a perspective that has formed the infrastructure of microeconomics and is still used by economists to justify many economic issues, and that perspective is the invisible hand (Adam Smith, this theory about the invisible hand The relationships in the market are between its main elements, namely: suppliers, consumers, price. In a free market, prices and quantities of goods are naturally regulated by the forces of supply and demand. This process is as follows:

1. Increase in demand: When the demand for a good increases, the price of that good also increases. This increase in price encourages producers to increase their production to take advantage of this opportunity.

2. Increase in supply: As production increases, the supply of goods increases. This increase in supply gradually causes prices to fall until they reach equilibrium.

3. Decrease in demand: If demand for a good decreases, prices will decrease. This decrease in price encourages producers to reduce their production, which helps rebalance the market.

The existing model only deals with the processed marble market and divides this market into three subsystems and reconstructs market relations by establishing connections between them. First, we refer to the price subsystem, which is the most quantitative and most accessible subsystem of the market.



The equilibrium loop governing markets based on the invisible hand theory, Figure 3.

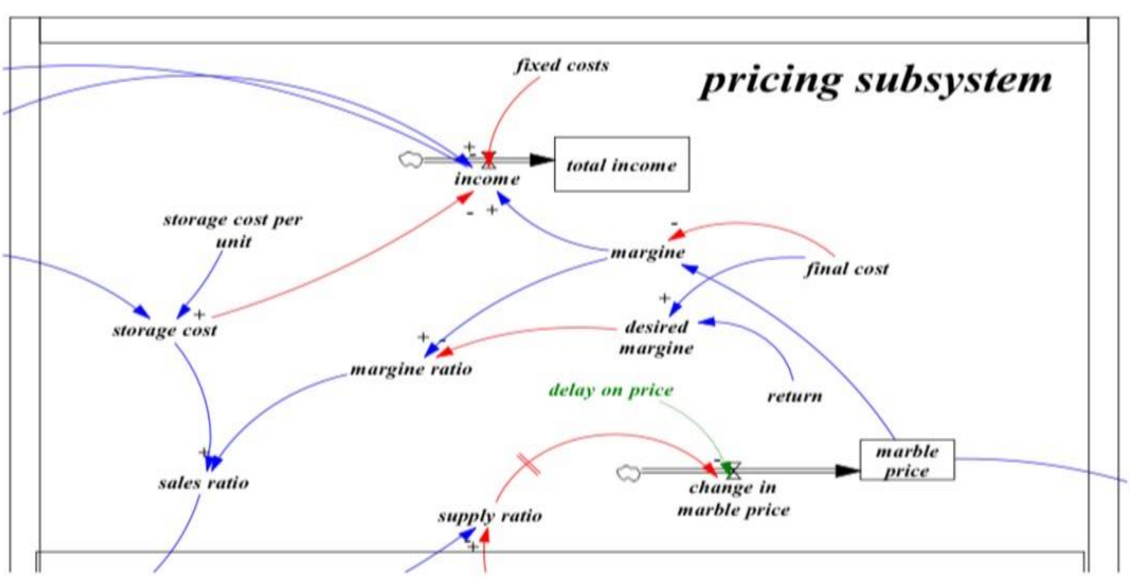
Price subsystem

The price subsystem consists of two important components, one is the price of processed marble and the other is the total revenue from the processed marble industry. Price leads to higher profit margins and is positively related to it, but profit margins are not only made up of price and the marginal cost factor is also of great importance. The difference between price and marginal cost gives the profit margin. Another important item in the price subsystem is income, which is added to the total income of the industry as a rate. Of course, fixed costs and storage costs must be deducted from the final income to arrive at the final net income of the industry.
There are three important rates in this subsystem that control the behavior of the model.

1-It is true that profit margin ultimately generates revenue, but the only criterion is not whether the profit margin is positive: margin ratio In fact, if the profit margin is less than the desired number of producers, these people will not be willing to sell their product at this price. In reality, if prices and profit margins are lower than a certain number, people are willing to stock more of their goods and the sales rate decreases. The producers' desired profit margin is the same as the rate of return .

2-Producers want to sell as much of their goods as possible and are interested in satisfying all the demand in the market: sales ratio They will sell, but this will be if they earn the desired profit margin. Otherwise, they will store their goods, but this storage cannot continue forever because storing goods entails costs, and if these costs increase significantly, they are willing to sell their goods even at a price lower than their desired profit.

3-The supply rate is actually the main determinant of price in the market. This rate is the ratio between the amount of demand and the amount of accumulation in the market: supply ratio. And the amount of goods in the market is the accumulation. In fact, the more goods are accumulated in the market, the applicants are aware of this abundance and are willing to pay less. The suppliers also know that their goods are abundant and offer lower prices. On the other hand, if the demand for accumulation in the market increases and exceeds the amount of goods produced, it means that the applicants are willing to pay higher prices to meet their needs. The schematic of the price subsystem is shown in Figure 4.



Price subsystem Figure 4

Production (supply) subsystem

Other important elements of the market are producers and suppliers, who are influenced by and influence demand and price. This subsystem also has two important components .The total number of marble processing workshops in the country, with the rate of change in the number of workshops being: Number of workshops : Its increase and decrease leads to ultimately, a growing market will also increase the number of products produced, resulting in: Change in number of workshops Conversely, if the industry is declining, the number of producers will also decrease. This growth and decline depends on the income that this industry is producing. If the industry's income is high and people are willing to invest and create new products, there are also limitations. The stone industry is not the only income-generating industry. There is also a factor called industry mobility, which is the result of the difference between the income of this industry and other industries. Also, the cost of building each new product makes it impossible to consider the growth of the industry solely based on its income. In reality, there are few industries that are unprofitable, and industries decline if they cannot compete with the income of competing industries. Finally, there is a delay in the construction of workshops for 15 time steps, which is considered one season.

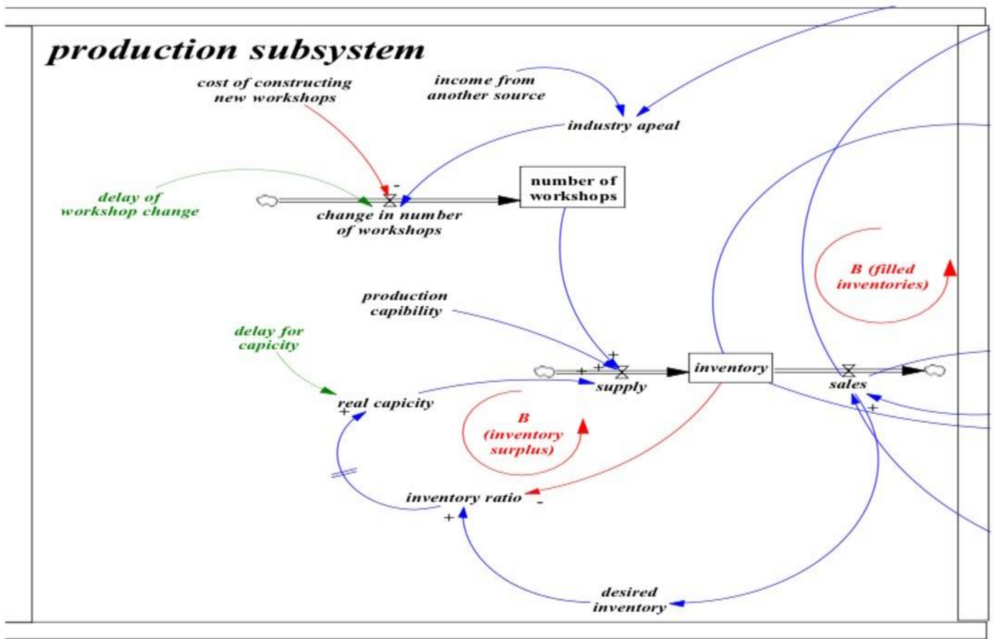
Ultimately, producers supply the product, and each producer has a certain average production capacity, and from this: Supply Not everyone uses 100% of their production capacity. Ultimately, the amount of supply depends on the number of products, the capacity they produce with, and the average production capability of each workshop.

This variable can actually be said to be an important point in production. In the opinion of some people, the number of producers if: Real capacity If the price increases, the supply will also increase, but this is not true. In fact, manufacturers usually do not produce at 100% of their capacity, but sometimes they produce at less than 50% of their capacity. In this model, we call the factor affecting this case the inventory rate. The inventory rate is the difference between the current inventory of the product and the amount of inventory that the manufacturers desire. This is the desired inventory. It depends on the

amount of sales. The effect of this factor on capacity is also delayed and factories cannot increase or decrease their capacities at the same time.

Sales are also a percentage of the domestic demand inventory. It is possible that more goods will be sold than the inventory and then returned to Sales. Production of payment deficit

Figure 5 shows a schematic of the supply subsystem and manufacture



Production subsystem Figure 6

Market Subsystem (Demand)

The third component of the demand subsystem of the product model is directly related to the housing market. In this subsystem, an increase or decrease in the actual market price does not affect the housing market directly; rather, the housing market is influenced by even minor changes in the price of marble stone. In other words, the construction cost of a house is not limited solely to the price of stone, and the housing market has its own independent dynamics. Nevertheless, this subsystem is interlinked with the demand subsystem.

Backorder: This variable essentially reflects the latent demand for marble stone in the market. Whenever the product is purchased or replaced, the latent demand is gradually satisfied until it eventually reaches completion. In practice, this means that unfulfilled demand for marble stone accumulates in the form of a backlog, which, as supply enters the market, will be gradually transformed into realized demand. This process, in turn, exerts upward pressure on price levels.

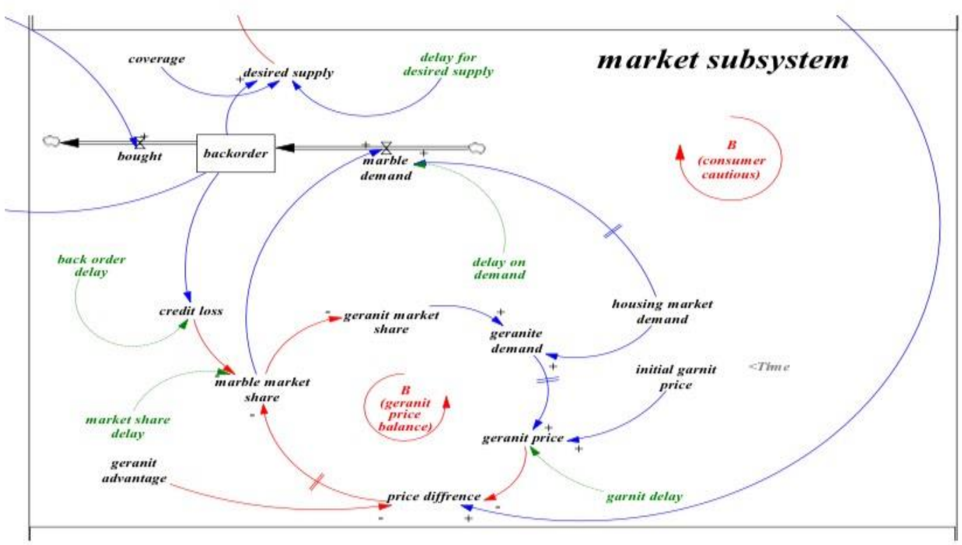
Marble market share: This variable indicates the share of marble in the overall housing market, emphasizing that the price of marble stone is also influenced by its market share. From an economics perspective, the market share of any product depends on the extent of available substitutes. For marble, this means that the greater the share of marble relative to its substitutes, the stronger its price-setting power. Conversely, if substitutes expand their presence, marble's market share declines, leading to downward pressure on prices.

Granite price: An increase in granite prices would normally lead to a reduction in marble's market share. However, this reduction does not occur in every situation and depends on the degree of differentiation between marble and its substitutes. If the differentiation is limited, substitution occurs quickly, reducing marble's market share. However, in cases of strong differentiation, marble demand is less sensitive to granite price increases, leading to a slower decline in market share. Nevertheless, when marble's price simultaneously increases along with granite, this upward adjustment—particularly when accompanied by supply shortages—can amplify marble's market share but with a time lag.

Granite advantage: This variable highlights the relative desirability and competitive edge of marble over granite. A greater differentiation advantage allows marble to maintain its demand strength even in the presence of higher prices. Conversely, when differentiation is limited, demand becomes more sensitive to price changes, leading to quicker reductions in marble's market share.

Credit loss: In cases where suppliers fail to meet their obligations, this leads to a reduction in credibility and subsequently lowers marble's market share. This process delays supply and shifts unsatisfied demand to competitors, thereby strengthening rival markets.

Marble demand: Finally, the total demand for marble in Iran's construction market—whether derived from domestic consumption or imports—is considered an essential factor in this subsystem. Since marble imports to Iran are highly restricted, the total demand is primarily satisfied through domestic production, making the dynamics of supply and demand within the domestic market critically important.
The relationship between sales and demand in this subsystem has been illustrated in the form of interconnected demand subsystems, as shown in Figure 6.

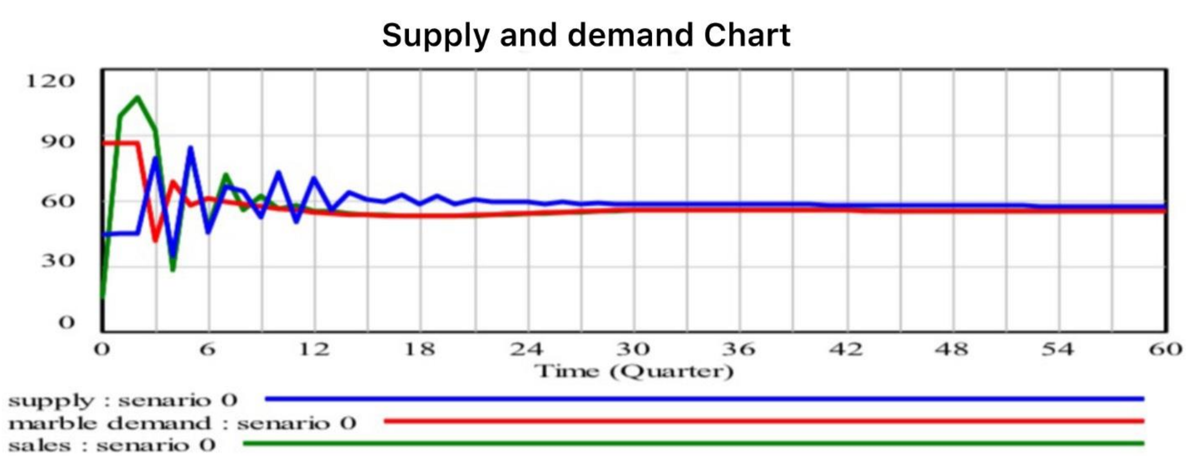


Market subsystem Figure 6

The three subsystems described are related to each other, and this relationship occurs through some variables. The following shows how to create relationships between the subsystems and the overall schematic of the system is shown: The price subsystem through the income variable. It is related to the production subsystem. In fact, income from the market causes production to grow, and production also increases with increased sales (income). It increases revenue. Also, the amount of inventory produced provides information feedback to the supply rate and inventory cost, and is related to the sales rate. It affects sales volume. Price also affects the market, causing a decrease or increase in market share (sales ratio) Marble becomes a commodity. Demand ultimately causes a surplus or shortage with information feedback and changes the price. The amount of sales also depends on the amount of demand accumulation.

Validation

Supply and demand logic: In the market, as stated, the logic of supply and demand is such that it always moves towards balance and their amounts also approach each other. In the developed model, the sales volume, supply volume, and demand volume all tend to the same direction, which is completely in line with the logic of the market. The sales volume and demand volume match each other, and the supply volume is slightly higher than the demand, which is logical considering the amount of storage in warehouses. This trend is drawn in Figure 7.

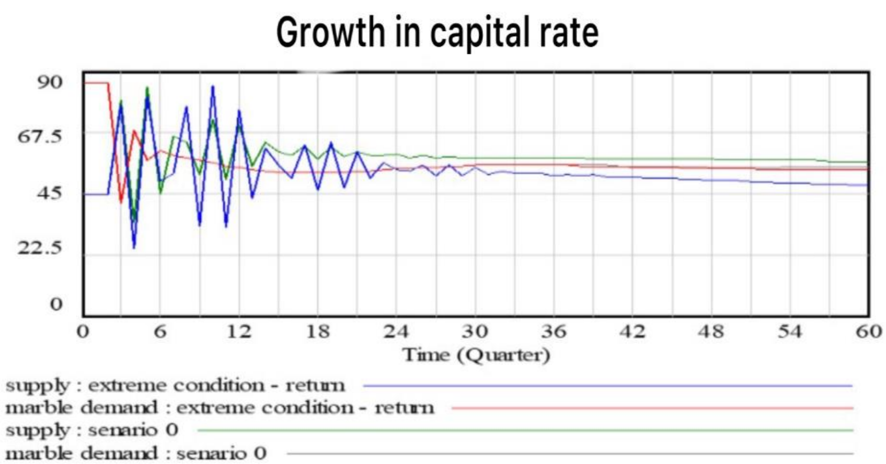


Marble supply and demand Figure 7

Validation method (Extreme Condition testing)

One of the methods of validating dynamic system models is to use the extreme conditions method. This means that by changing one of the variables in the model to an extreme, we pay attention to the model's response and examine this response logically. If the model's response to these extreme conditions is logical, we are assured of the validity of the model. By moving a variable to an extreme, we realize the model's shortcomings in displaying the mechanism of the world, and this also helps us in the process of developing the model. Increasing and decreasing variables at each point in the model development process helps us greatly in refining the model.

Next, we will examine the effect of increasing the expected return on investment. By increasing this number, we expect the price of the commodity to increase and cause a market recession for a period of time. If this happens, demand and supply will decrease. This change is shown in Figure 8.



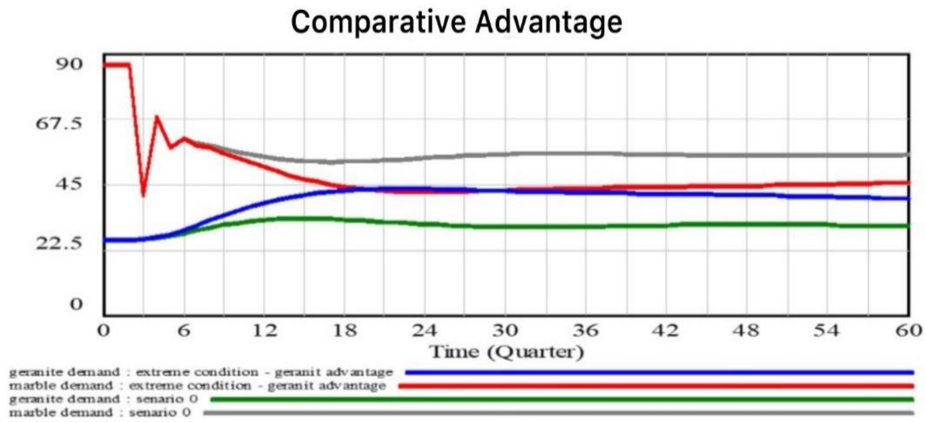
The impact of increasing return on investment on supply and demand Figure 8

Another impact of this change on the model is the increase in prices and the decrease in the number of workshops. This is shown in the diagram.

Granite Advantage Reduction:

Another fixed variable in the model is the relative advantage of granite. By reducing this relative advantage in the model, we study its results on the model.

One of these effects should be a significant decrease in the demand for marble and an increase in the demand for granite, which is emphasized in Figure 9 of the model results.



Running scenarios

Implementation of development and capacity increase plans: In this scenario, only increasing the production capacity of the factories is considered. These plans It does not include plans to reduce final costs. These plans mean purchasing more production equipment, hiring more people, etc. to increase the average production capacity of each workshop.

Implementation of line optimization programs: In this scenario, we examine a policy that reduces waste, accidents, and damage. And... If workshops and industry are optimized, the final cost of producing goods will be reduced. Therefore, by implementing this policy, we can hope to increase demand and increase supply while reducing prices.

Import liberalization: In the current market, the import of processed marble is prohibited, but what would happen if these imports were liberalized? Naturally, due to the high final cost of our products compared to foreign industries that have been working on their own production lines for years, the need for the import of foreign goods at low prices will take a large share of the Iranian market out of the hands of domestic producers. This liberalization will cause a percentage of the total Iranian housing market to be converted into demand from the global market, with a proportion of the difference in prices between Iran and the world, and demand from the domestic market will decrease, which will reduce the volume of the marble market and the stagnation of this industry. The following are diagrams related to this scenario.

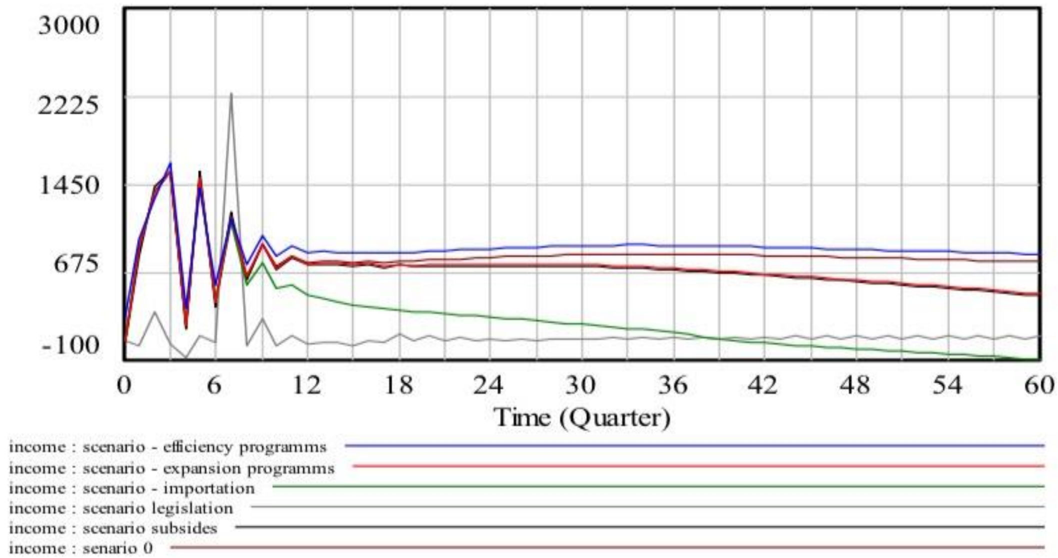
The impact of this on the market is a price reduction. This also has a negative impact on the number of workshops and income. In fact, unlike previous scenarios where there was a way to return the market, in this scenario the market is completely destroyed. One of the main reasons for this is that in the event of import liberalization, access to a market with unlimited supply is available, in which Iranian demand is ineffective in its price and is capable of meeting all Iranian demand. With this liberalization, it is true that the price of the product decreases and as a result, demand also increases, but at these prices no one is willing to sell a product that has been produced at a higher final cost, and as a result, they prefer warehousing to production. In a short period of time, the production capacity and workshops are all reduced, and ultimately the domestic market is generally transferred to the foreign market. The only way to deal with this is to reduce final costs. A price reduction does not increase the number of workshops, and this sales rate always remains the same. In other words, in this scenario, the domestic market breaks down and all market measurement factors show the state of market destruction. The simultaneous decrease in production capacity and the number of workshops indicates the total destruction of the domestic market.

Order price scenario: Another well-known case in our country is command pricing. In this scenario, the results and effects This policy, this command pricing has helped increase demand by lowering prices, but as a result, the profit from sales has decreased and the sales rate has decreased. The inventory has accumulated in high production and backward demand, and this causes stagnation in the production market, as a result, great pressure is placed on producers and individual demand is not met. This policy is very harmful to producers, it has a significant negative impact on their income, which ultimately leads to the closure of workshops.

Government Subsidies Scenario: The topic of subsidies in the stone industry is debatable, and many are concerned about its impact on their production capabilities. They are dissatisfied. We will address this issue in this scenario.

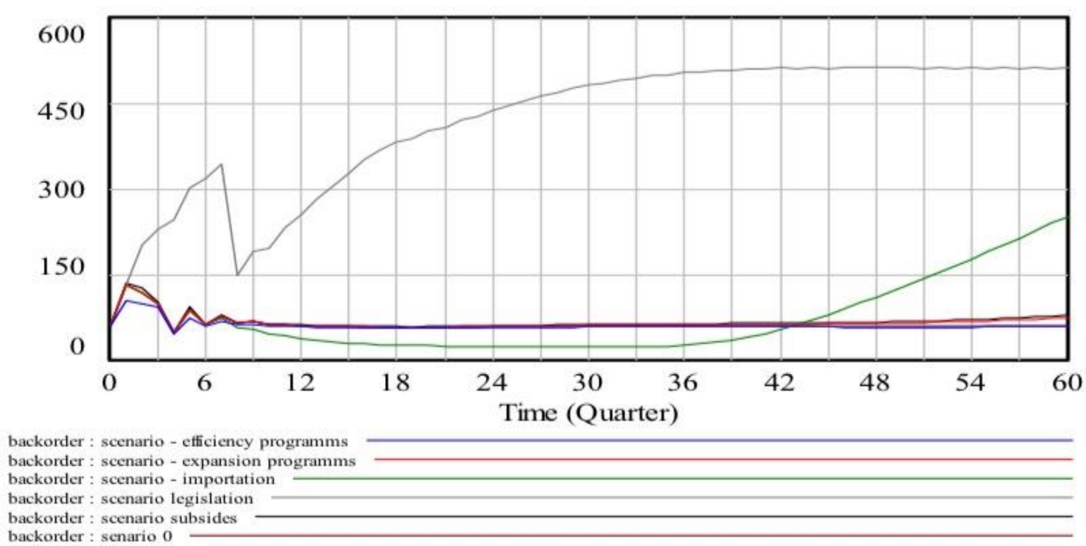
Comparing scenario results

The results of the scenarios need to be compared with each other and a solution found to improve the situation of the stone industry. In this section, there is a need to compare the graphs and tables of the scenarios in the most important criteria, namely income and It is to ensure the most important elements of manufacturer satisfaction and back order Consumers should be checked.
In Figure (10) the income of different scenarios is compared and according to the results, the best scenario is the implementation of improvement projects. These projects are the only scenario that increases the income of the industry.



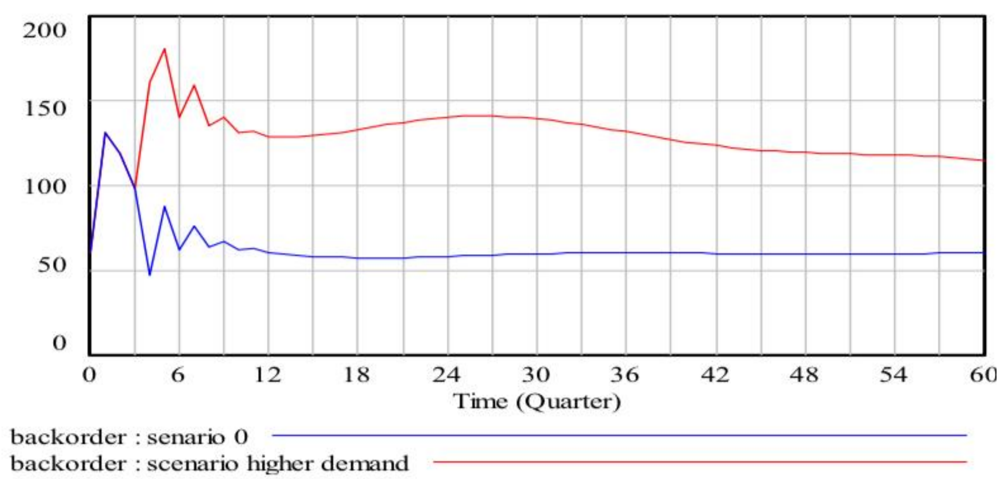
Comparison of the impact of scenarios on revenue Figure 10

In the next step, scenarios are also examined on demand accumulation.



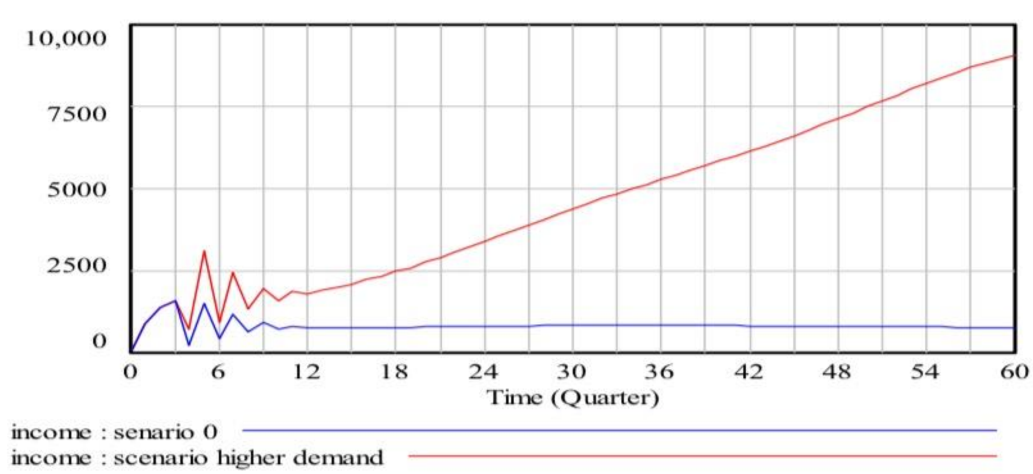
Comparison of the impact of scenarios on demand accumulation Figure 11

In the demand accumulation diagram, we see that again the improvement projects scenario has not had a negative impact on this case, while some scenarios have significantly increased this variable. Among the implemented scenarios, 6 scenarios have been compared, and the import scenario has not been included in the comparisons because it is clearly not a suitable scenario. Based on the results of the scenarios and simulations, the best current solution is improvement programs and investment in optimization projects. Of course, in this model, things such as increasing product demand through price reduction are assumed to be impossible. As we mentioned earlier, reducing the price of stone does not lead to an increase in housing production. The best way to improve income in these conditions is to sell at the same rate but with a higher profit margin, which is possible by implementing improvement plans. Perhaps if the final cost is reduced enough, it will be possible to compete with the global market. However, investing in increasing production capacity seems futile because overall demand depends on housing growth, and due to the fixed demand, this growth in production does not benefit producers. Finally, we will examine the impact of this by increasing demand three times so that we can Gaining insight into how the market works, the chart shows the impact of this increase in demand on income and demand accumulation.



The effect of increasing demand on accumulated demand Figure 12

Increasing demand increases the accumulation of demand in the country because it takes time for the country's production and demand to be coordinated, of course, this process of accumulation of demand is decreasing.



The effect of increasing demand on accumulated demand Figure 13

The impact of increased demand on revenue cannot be compared to any scenario dominated by producers. As a result, it should be noted that market growth depends to a large extent on increased demand, and in the event of increased demand, projects to increase production capacity can be considered. Otherwise, the creation of production capacity will not go beyond the level of paper and the feasibility study. Although this increased demand is the best solution to increase industry revenue, this variable is not available to stone producers, and for this reason we did not consider it in our scenario analysis. Among the scenarios available to producers, investment in improvement projects seems to be the best available scenario, and the command pricing scenario is the worst type of response to the industry. It is concluded from this model that market growth is due to demand growth, and especially in raw material markets such as stone, which do not have a direct impact on customers and their needs to be able to create new demand, the best thing for this type of industry is improvement, which both increases profit margins and creates the assumption of global competition.

Final conclusion

In this research, we investigated the marble market, focusing more on processed marble. The resulting model provided us with a new idea and perspective on the market mechanism.

One of the main points of attention in this model is the market structure, which is based on growth. Contrary to popular belief, this growth is dependent on market growth and the creation of demand in the market. One of the reasons for this is that capitalist systems that are based on the market are constantly looking for new markets. Every market stabilizes after a while, and its income is fixed and does not attract new investment. This is also mentioned in the book The Wealth of Nations. Initially, markets are pristine, but after a while, as producers increase and the market remains the same, it causes a decrease in income and an increase in competition, which ultimately leads to a recession in the market.

Therefore, perhaps the statement that consumerism is the need of today's market is not so wrong because by increasing demand, it increases production and ultimately creates more income.

Another important result of this research is the issue of monopoly in the market. Increasing the final cost does not have much effect on the amount of buyers buying from us because there is no competitor with unlimited production capacity, and this accumulated demand must eventually be met, and buyers are forced to buy at high prices, which as a result leaves no incentive for producers to reduce final costs. The pressure of the monopoly market is on buyers, and ultimately it falls on the people in a chain reaction.

But at the same time, we cannot recklessly make policies and liberalize imports. This can cause serious damage to the industry, so we must rely on another policy until Iranian goods become competitive.
The events and policies of the marble industry have a significant impact on its substitute product, which is granite. An increase in its price increases the price of granite, and an increase in demand for it reduces the demand for granite. In general, when setting policies for products, the effects of these policies on substitute products should also be considered, and the marble industry is no exception.

Different scenarios were examined, from increasing capacities to improving technology and government support programs, but the only policy that had positive effects was the policy of implementing improvement plans aimed at reducing the final cost. Reducing the final cost can help us achieve higher income while producing at the same level as the market needs and not harming the industry in the production and supply sectors, and also reduce the price, and also help in the stone supply chain. The implementation of these projects will not only improve production but also improve the situation of consumers. It should be noted that the main focus should be on reducing the final cost. By continuing this policy and reducing the final cost and price of Iranian products, perhaps after a few periods we will be able to compete with global prices and quality, enter the export arena, and also survive the terrible effects of imports.
The best decision and policy currently being implemented by competing countries is to optimize lines, reduce repairs, maintenance and breakdowns, reduce waste, improve transportation, and ultimately reduce the final cost of warehousing and transportation, improve lines, reduce time and shifts, and as a result, reduce wages, etc.

The market is a complex issue, and unfortunately, in our country, sometimes there is no proper understanding of the market, and increasing production is considered equal to increasing income, and any policy is considered permissible for this increase in production, which is wrong. Policies related to reducing production costs while maintaining production volume and capacity provide much better responses to the industry. We hope that by presenting this research and future research, we will help create a correct understanding and attitude towards the market and take Iran's hard stone industry to higher levels.

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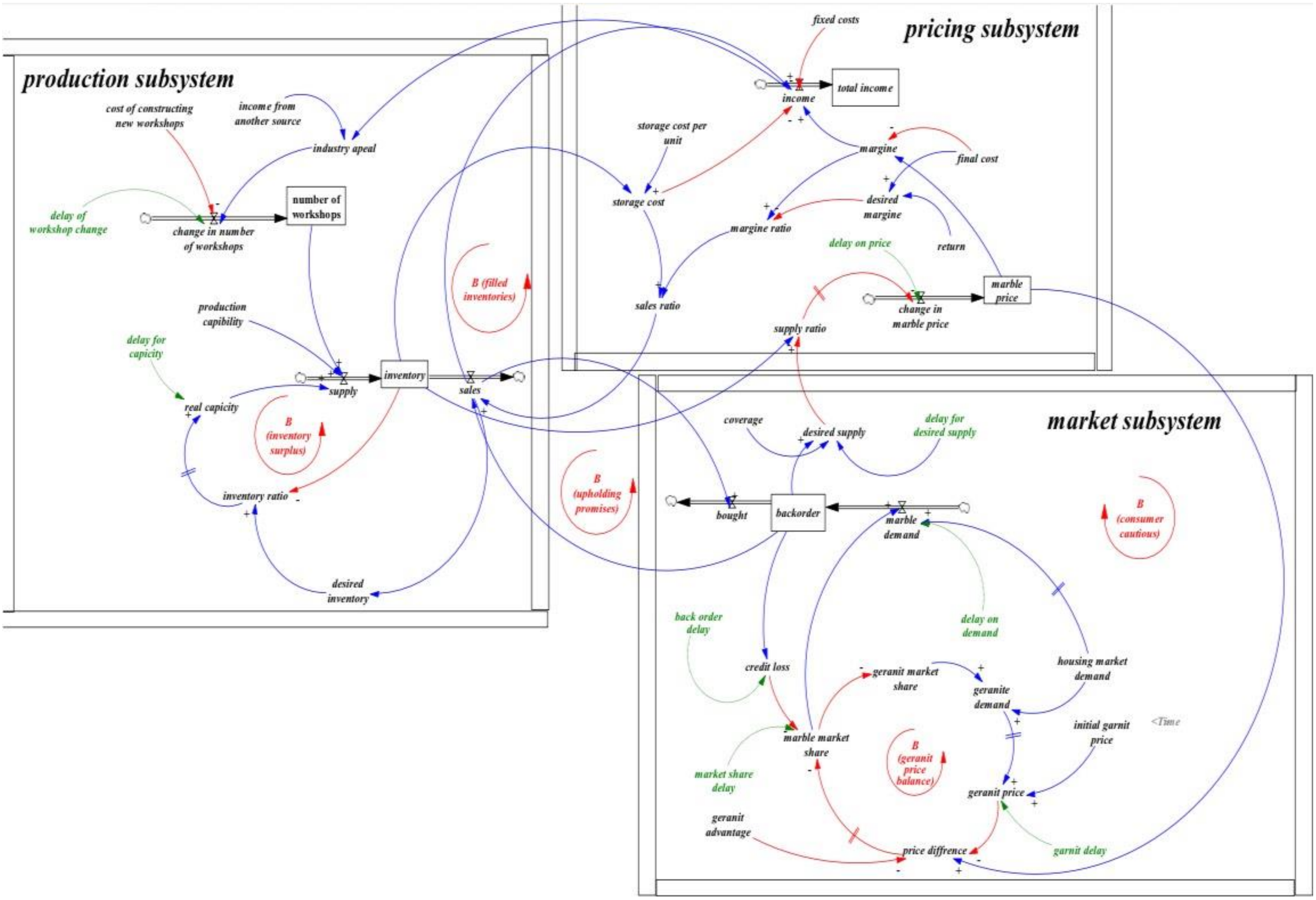
production subsystem
cost of constructing new workshops
income from another source
industry apeal
delay of workshop change
change in number of workshops
number of workshops
production capibility
delay for capicity
real capicity
supply
inventory
sales
B (inventory surplus)
B (filled inventories)
inventory ratio
desired inventory
pricing subsystem
fixed costs
income
total income
storage cost per unit
storage cost
margine
final cost
desired margine
margine ratio
return
delay on price
sales ratio
change in marble price
marble price
supply ratio
market subsystem
coverage
desired supply
delay for desired supply
B (upholding promises)
bought
backorder
marble demand
B (consumer cautious)
back order delay
delay on demand
housing market demand
credit loss
geranit market share
geranite demand
initial garnit price
<Time
marble market share
B (geranit price balance)
market share delay
geranit price
geranit advantage
price diffrence
garnit delay