Evaluation of ComparativAdvantage in the Wood Products Industry in Iran

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ABSTRACT

Economists believe that the development of the industry sector is for the benefit of other sectors of the economy. In 23 groups of industrial activity in classification ISIC, the production and export of wood industries have received less attention in developing countries. exports of wood products have a major impact on the GDP and provide employment and sustainable development of natural resources.

In this study, the comparative advantages of wood and its sub-sectors in the economy of Iran has been analyzed over the period of 1999-2011. Auto Regressive Distributed Lags Method was employed to investigate the analysis of the dynamics of revealed comparative advantage of wood industry and its sub-sectors in the Iran's economy.

The results show that the wood industry in the period studied have no comparative advantage and the value added of the industry, export, physical and human investment and labor have a positive effect on the dynamics of comparative advantage in the long term. In short term, labor, human capital and the value added have a negative effect on the dynamics of revealed comparative advantage, and physical capital also has an insignificant effect on increasing the revealed comparative advantage.

Keyworlds

Comparative Advantage, wood industry, GDP.
JEL Classification: F11, F14, L73.

1. Introduction

The need for economic development in developing countries is not hidden from anyone, where the huge gap between these countries and the industrialized countries is rising;therefore, developing countries should put the development planning at the top of their activities.In this context, the industrial development is considered to be a fateful decision for these countries, since it can cause mobility in a significant proportion of national resources towards economic development andchanges the material basic and foundations of society.

The importance of the industry sector and its fundamental role and contribution, as the most important factor in stimulating economic growth in both developed and developing countries, is absolutely outstanding.So that many economists believe that the development of the industry sector is for the benefit of other sectors of the economy,meaning that there is a close relationship between the various economic sectors andgrowth and development of the industry sector encourages the other sectors of the economy and increase employment, production and income in the whole economy.

23 groups of industrial activity have been defined in two-digit code classification (ISIC). In these industries, the production and export of wood industries and their products have received less attention in developing countries.

While, this industry is considered as a competitive advantage in international trade in industrialized countries and newly industrialized, some of them are pointed as following:

Wood products industry is a diverse industry that contributes to economic development in rural and urban communities in the world, and it is an important part of society in all countries of the world. It is divided into two main groups: wood and paper industry.

This paper studies wood industry and its products because this industry has been considered in emerging countries such as China, due to its potential role in economic development.

In the 20th century, production and trade in the global wood products sector wasdominated by European and North American countries. Countries such as Canada, United States, Finland and Germany have traditionally been large producers and important players in international markets (Global wood and…perspectives 2007). However, globalization, the recent financial crisis and rapid economic development in some emerging economies have caused international wood products markets to undergo

profound changes in the 21st century. Emerging players such as China, Brazil and Russia have gained importance in the international marketplace (Laaksonen-Craig and Toppinen 2008). Using sawn softwood and plywood (softwood and hardwood) as examples, Investigations indicate a decline in production and consumption in developed countries and an increase in production and consumption in emerging economies. The abbreviation BRIC in the figures represents Brazil, Russia, India and China, which are four of the world's fastest-growing economies (Wan 2014).

Thus, given the importance of this industry among the industrialized countries, expansion of production in this industry and considering the factors affecting its development seem essential. For this purpose, for adapting appropriate industrial development policies in this field, identifying existing and potential facilities and resources can ensure business development and expansion of commercial markets for products of this industry, so based on that, the economic development of the country is possible. Because of the special situation of industrial goods in the international trade, they are lack of many shortcomings and limitations governing the initial and raw material. However, the attention devoted to the development of export will not be a fruitful work without acknowledgment of the facilities, capabilities, trends and industry and production structure of the country and its different regions, (Bender and Lee 2002).

So it seems that, according to Ricardo, utilization of production, based on comparative advantage, can help the development of industrial products very much and in order to create an appropriate mutation in production and export of non-oil products and also cut dependence on revenues from crude oil, first the comparative advantages of existing production and then the revival of potential advantages and other competitive factors should be considered by adopting appropriate production and export policies.Because otherwise, even in the best possible condition, only domestic consumption will be possible for all of our country products, despite the possibility of compete with imported goods. Therefore we should start to make competitive products with high added value by applying necessary modifications and using export development strategy.

Therefore to achieve industrial development and its continuation,in addition to the widespread use of traditional factors of production (labor and physical capital),attention to the country's comparative advantages in production and also increasing the production through diversification ofgoods production, in terms of structure and number of goods, is inevitable.

So Iran, as a developing country based on traditional trade theory, can export the primary goods and import the industrial goods not necessarily for always.But by capital accumulation and technological improve, it can transport its comparative advantage from primary goods to simple industrial goods, and then to more complex industrial goods gradually.For this purpose,

The present paper attempts to assess Iran's Revealed Comparative Advantage (RCA) in wood industry and based on two-digit code of the International Standard Industrial Classification (ISIC) and two discussions of comparative advantage and factors affecting comparative advantage in wood industry and its sub-sectors are considered, and the following five hypotheses are evaluated and tested:

Hypothesis 1:Labor, as a production factor with comparative advantage, has a positive effect on the dynamics of comparative advantage.

Hypothesis 2:Physical and human investment has a positive effect on the dynamics of comparative advantage.

Hypothesis 3:The value added, as the structural changes factor in production and exports, has a positive effect on the dynamics of comparative advantage.

Hypothesis 4:Intensity of domestic and foreign demand and exchange rate, have a positive effect on the dynamics of comparative advantage.

Hypothesis 5: Wood industry and its sub-sectors in Iran's economy have no comparative disadvantage.

RCA for Iran's wood industry has been calculated for the period of 1999-2011 and data has been collected to estimate the RCA Model. Auto Regressive Distributed Lags (ARDL) Method has been employed to investigate the effects of factors affecting comparative advantage in wood industry.

Accordingly, the second section of the paper deals with the expression of the theoretical discussions. The third part is overview of previous studies. The fourth section is devoted to specify the model andPart Fifth deals with the results of the estimation of the model. The final sections of this paper are Conclusions and hints proposed.

Theoreticalliterature

Existence a comparative advantage in producing and exporting goods isone of the contributing factors in understanding a country's export capabilities to adopt appropriate policies in that field.Simply it is believed thatcountries come into foreign trade and start exchange of goods at the international level, because of the existence of the comparative advantage in the production of goods.

The comparative advantage, which is considered in association with international trade, means thatif a country produces a good cheaper than other goods,this country has a comparative advantage in the production of this good andit can benefit from the export of the good, which it has comparative advantage in it, by entering in the arena of global trade.The concept or principle of comparative advantage has changed greatly since its emergence.Adam

Smith's theory of absolute advantage, Ricardo's theory of comparative advantage and Ohlin and Heckscher theory are the most important proposed theories in the field of comparative advantage, which have investigated this field by using a traditional view.

While the principle of comparative advantage as expounded by David Ricardowas couched in terms of technological superiority, the principle, when phrased in termsof comparing opportunity cost or relative prices of goods and services betweencountries is sufficiently general to encompass a variety of circumstances. Furthermore,although Ricardo's explanation of comparative advantage was in static terms,comparative advantage is a dynamic concept. A country's comparative advantage in aproduct can change over time due to changes in any of the determinants of comparativeadvantage including resource endowments, technology, demand patterns,specialization, business practices, and government policies.

So it seems that, according to Ricardo, utilization of production, based on comparative advantage, can help the development of industrial products very much and in order to create an appropriate mutation in production and export of non-oil products and also cut dependence on revenues from crude oil, first the comparative advantages of existing production and then the revival of potential advantages and other competitive factors should be considered by adopting appropriate production and export policies.Because otherwise, even in the best possible condition, only domestic consumption will be possible for all of our country products, despite the possibility of compete with imported goods. Therefore we should start to make competitive products with high added value by applying necessary modifications and using export development strategy.

Import and export of wood and wood products, and their domestic production has a major impact on the gross domestic product and creates productive employment along with stable development of natural resources. Planning wood and wood products supply is based on increasing or decreasing trend in consumption of wood and wood products in the future. Wood and wood products market adjustment can be achieved through domestic production or increase or decrease in imports and exports based on the increasing or decreasing needs of the country's future. The lack of competition between domestic producers and the same type of foreign producers, and consumers' tend to buy foreign products are of the factors that can influence on production, import and export in wood industry, which is one of the problems in this field (Yazdani, 1995). Also, the high prices of wood and wood products likely caused to change the basis of the activities of the industry owners and produce the substitutes, which reduces the amount of production compared to demand and leads to import the productions of this industry (Zahmatkesh,

1993). Thus, the wood resource constraints and lack of wood supply will be increased over time in Iran. In addition to the problems of import and export of wood and wood products, tariffs of customs of Iran should be considered (Koushki, 2006).

Thus, in these circumstances, with the increasing consumption of wood and wood products and with wood resource constraints, fluctuations in supply and demand will be occurred in this market and it will influence the price, producers and consumers and trade of these products in the economy of the country. But before the discussion of trade and considering export processing of these industries, according to the theories of international trade, the comparative advantage of production and exports of this industries must be evaluated, and since no studies have been carried out about the comparative advantage of production and exports of wood industries, we will analyze the comparative advantage of this industry and its sub-sectors in Iran, so the policy guidelines will be presented for policy makers.

Empirical Literature

Wan (2014), Wood competitive advantage in China and Finland were studied. This study contributes to the evolution of research on competitive advantage in thewood products industry by approaching it from the dynamic capability perspective (DCP)and natural resource-based view (NRBV) of the firm. Both quantitative and qualitative dataand research methods were used to facilitate comparative analysis at multiple levels ofdecision-making. This dissertation examines the sources of SCA and the correspondingchanges in competitive strategies in the wood products industry in two contexts: China andFinland. The results indicate a growing trend in transitions from production to market andto stakeholder orientation, from a cost leadership to a differentiation strategy, and from lowvalue-added to high value-added products in both countries. Along with these transitions,the sources of SCA have changed from focusing solely on tangible resources to integratingintangible resources.

Tolunay (2014) study Perspectives and Attitudes of Forest Products Industry Companies on the Chain of Custody Certification in Turkey. The research methods included descriptive statistics, one-way analysis of variance and the Duncan test. As a result, it was detected that there are differences in the perspectives and attitudes towards the chain of custody certification system of the companies operating in the four main branches of the forest products industry in Turkey. The certification most demanded is the Forest Stewardship Council (FSC) CoC certification, with a share of 15%; and Programme for the Endorsement of Forest Certification (PEFC) CoC is demanded by 2% of companies.

MalekiGholandoz (2014), studiesIdentifying and Ranking of Factors Affecting Customer Satisfaction of the Household Wood Furniture Industry by Multi-Attribute Decision Making Method. To compete in value creating and attempt to achieve sustainable competitive advantage and a strategic advantage over competitors have resulted in an increased attention to the importance of customer and his/her satisfaction. This is particularly important wood industry that deals with a wide range of customers with different tastes and attitudes. As a result, this study using library research and customer survey, attempts to identify factors influencing customer satisfaction and determine their relative impact using TOPSIS as one of the most important multi-criteria decision-making methods.

Levchenko (2014), study Measurement and Implications of Comparative Advantage.In this study, estimate productivities at the sector level for 72 countries and 5 decades, and examine how they evolve over time in both developed and developing countries. In both country groups, comparative advantage has become weaker: productivity grew systematically faster in sectors that were initially at greater comparative disadvantage. These changes have had a significant impact on trade volumes and patterns, and a non-negligible welfare impact. In the counterfactual scenario in which each country's comparative advantage remained the same as in the 1960s, and technology in all sectors grew at the same country-specific average rate, trade volumes would be higher, cross-country export patterns more dissimilar.

Asumadu(2013) study Marketing Strategy for the Guyana Wood Products Industry Sector. The main conclusion States that there is need to embark on extensive public education to improve the understanding and knowledge of domestic consumers in selecting wood for a range of building and construction activities. Such public education should also focus on the durability of timber as well as the environmental benefits of using wood in comparison with nonwood substitutes.

Nonejad et al. (2013) have analyzed Effects of comparative advantage on exports.The present paper attempts to assess Iran's Revealed Comparative Advantage (RCA) in industrial subsectors based on two-digit code of the ISIC and effects of five top subsectors with the highest average of RCA on the total Iranian real industrial exports. RCAs for Iranian industrial subsectors for 2001-2010 time periods. ARDL Method was employed to investigate the effects of these subsectors on the total Iranian real industrial exports. The econometric results show that the subsectors with highest RCA average have a positive and significant effect on the total Iranian real industrial exports.

Bayatkashkoli(2008), Estimate trend of timber and wood products export and import in Iran. Review is showed that their competitive powers are lower than foreign products but manufacture order is successful. The research meth-odologies are analytic and approximate and forecasting methods were used to establish. The result of; Orders forecasting data are reliable even with height MAPE, because MAD, bias and coefficient of determination are appropriate in here. Some orders exports and imports will increase trend for example; exports and imports totality and timber order.

2. Materials and Methods
Introducing the model and research variables
In international economic literature, there exist two general views about measuring comparative advantages; the traditional view and the contemporary view. The first view indicates the comparative advantages of the country among the economic activities by using pre-trade information as ex-ante. But the second view calculates the comparative advantages by using post-trade information and based on foreign commercial statistics as ex-post. This view is the same method of revealed comparative advantage (RCA). It should be considered that relatively, a country exports a good, which its production cost is lower than for other countries and imports a good, which its production cost is higher than for other countries, so revealed comparative advantage method consist of all factors affecting comparative advantage including the producing, export and demand aspects. This index shows the potential power of goods' comparative advantage.

Measurement of comparative advantage
For the first time, Balassa (1965) has invented the term revealed comparative advantage (RCA) and used it to assess the export performance as one of the methods to determine the comparative advantage in terms of application. This index was defined for industrialized countries. According to a study that was done in the context of comparative advantage, in addition to pointing to the Balassa index, Valras (1991) states that Balassa index focuses on producing and exporting of developed countries and low and middle income countries with agricultural products have not been considered. But Balassa index can be easily expanded by incorporating all countries and all commercial goods to reflect the global comparative advantage.

Balassa evolved index
The variable of revealed comparative advantage of the industry: that is the contribution of export goods of each country in the total exports of that country related to the contribution the country's export in total global exports.
In this study, among the existing indexes, the normalized form of the Balassa evolved index will be used to measure the comparative advantage, which is presented by Brasili et al (2000) in equation 5 as follows:

$$RCA_a^i = \frac{(X_a^i / X_t^i)}{(X_a^w / X_t^w)}$$

(1)

In this Balassa evolved index, indices i indicates the country under evaluation, indices a represents the good under investigation (production or non-production) and w and t indices represents all traded goods and all countries in the world respectively. Therefore, the variables of Balassa evolved index can be defined as follows:

Xia: the value of the export of the good a (production or non-production) in the country

Xit: the value of the export of all exported goods of the country i

Xwa: the value of the export of the good a in the world level

Xwt: the value of the export of all exported goods in the world level

Therefore, Balassa evolved index calculates the contribution of export goods of each country in the total exports of that country related to the contribution the country's export in total global exports.

Regarding that all components of RCA index are positive, so the numerical value of this index varies between zero and infinity.If the numerical value of the index is greater than unity, indicating that the country i has a comparative advantage in the exports of the good a, and in case it's less than one, the country doesn't have comparative advantage in the exports of that good.

Also, considering the changes in this index as a trend over a period of several years, it can be concluded that whether or not the country i has comparative advantage in the exports of good a.

Factors affecting the dynamics of comparative advantage

International trade, through a better allocation of resources, increases incomes,

Saving, and investment, thus enabling a country to realize higher growth even in fullyemployed economies. In addition, for developing countries, trade can enable them totransform consumption goods and raw materials into capital goods as well as gaintechnological know how from technologically advanced countries.Specialization through trade benefits not only the export industry, but all other industries (through increased demand for their products) related to the export industries.

Identifying production facilities is of interest to economists in production and trade discussion, so the countries can be specialized in production based on comparative advantage. But considering that the traditional concept of comparative advantage has changed and comparative advantage in management, technology and commercial pol-

icies leads to the specialization of countries in production and exports, in this study the factors affecting comparative advantage will be investigated, and for this purpose, several factors affecting the comparative advantage will be theoretically studied.

Technological Superiority,(2) Resource Endowments, (3) Demand Patterns (Dev Gupta, 2006), (4) National and International Policies, (5)Human capital intensity and education policy (Kowalski, 2011), (6) Value Added.

Technological Superiority

Adam Smith's principle of "absolute advantage" and David Ricardo's principle of"comparative advantage", in general, are based on the technological superiority of one country over another country in producing a commodity. Industrially advanced nations in general had an early start in most manufacturedproducts and services, which allowed them to enjoy large national and international-markets. Industrially advanced nations were thus able to export new products until such time that the products were produced by other low factor cost countries. Vernon's (1966) Product Cycle hypothesis emphasizes the importance of the nature and size of home demand for new products in highly industrialized countries. Since, initially, the new product involves experimentation of the features of the product as well as the production process, the countries that have sufficient home demand for such products produce and export them. As the specific nature of demand becomes more universal and the technology more easily available to others, the nation loses comparative advantage in that product. Meanwhile, the firms are likely to have developed another product that enables the nation to gain comparative advantage in that product.

Resource Endowments

Availability of resources in a country provides another source of comparative

Advantage for countries that do not necessarily possess a superior technology. Undercertain restrictive assumptions, comparative advantage can be obtained due todifferences in relative factor endowments. As propounded by Heccksher and Ohlin, acountry has a comparative advantage in the production of that commodity which usesthe relatively abundant resource in that country more intensively. The so called Hecksher-Ohlin-Samuelson (HOS) theory of comparative advantagebuilt on Ricardo's general formulation and provided an explanation as to why opportunitycosts of production may differ across countries. According to this theory, comparativeadvantage depends on differences in relative factor endowments (land, labor and capital)and production processes of different goods which use these factors in differentproportions. Theoryemphasized the interaction between product and countrycharacteristics that together form the basis for comparative advantage.

Human capital intensity and education policy

In addition to physical capital the current study controls for human capital as a sourceof comparative advantage. The importance of human capital accumulation in economicperformance has been studied by many economists. Recently, Barro and Lee (2010) created anew dataset of stocks of human capital based on educational attainment and found thatlength of schooling has a significant effect on output as well as income at the countrylevel, particularly for secondary and tertiary levels of education. The current exercise calculates the stocks and ratios of available human capital usingthe Barro and Lee (2010) To control for human capital asa source of comparative advantage in the presented empirical trade model these indicatorsof human capital are interacted with the skilled labor-intensity calculated at the level ofmanufacturing sector and defined as a share of skilled labor in industry's total purchasesof primary factors of production. The distinction between tertiary and secondaryeducation in Barro andLee (2010) data allows a more nuanced analysis of relevance ofeducation policy for trade outcomes in the discussion of results.

Demand Patterns

The role of demand and the size of the home market for products are already evident in (1) establishing the equilibrium terms of trade and therefore the division of gains from trade; (2) economies of scale; and (3) product cycle hypothesis. In addition, Linder (1961) emphasized the role of demand in the home market as a stepping stone towards success in international markets. According to Linder, manufacturers initiate the production of a new product to satisfy the local market. In this step, they learn the necessary skills for making the product by more efficient techniques, which in turn, give these nations comparative, advantage in the product vis-à-vis other countries. Linder's study postulates exporting the product to countries with similar tastes/demand patterns.

National and International Policies

 National policies towards infrastructure, export promotion, education and training, R&D policy related to export industries can go a long way in creating and sustaining comparative advantage. Industrial policies such as production subsidies, tax preferences, restricted tendering of Government contracts, anti-trust policy, and a number of other means are often used to provide an advantage to domestic industries. Likewise, the commercial policies aimed at restricting imports through tariffs, quotas, voluntary export restraints, import licensing, local content rules, restriction on outsourcing, escape clauses, etc. have been used to the advantage of domestic import competing industries. Policy driven benefits realized by the industries through internal and/or external economies, in the long run, may become a source of comparative advantage to these industries.

Value Added

Value added in the industrial sector is one of the indexes, which is used to investigate the structure of the industry. Changes in the structure of industries may be due to changes in comparative advantage in the industry. The structure of an industry is formed of two main components: the technical structure of the industry and the structure of industry market, the greater attention are paid to the technical conditions, which causes the maximum production by using a combination of production factors. Thus, considering the production type including work-intensive, capital-intensive and knowledge-intensive, composition and diversity of production is determined, and the comparative advantage has a fundamental role in determining the composition of the production. Using the comparative advantage with its traditional concept leads to the work-intensive combination, and comparative advantage with its modern concept leads to the capital-intensive or knowledge-intensive combination. The comparative advantage of each country depends on this issue that whether this country has moved to the combination of knowledge-intensive production factors by changing and creating the comparative advantage, or the combination of their production factors are based on natural resources and cheap labor (the traditional concept comparative advantage).

Generally, structural changes depend on the factors such as changes in industrial investment, removing the competitor industries in the market, changes in the productivity of producing factors, changes in technology level of production methods, changes in the intensity of domestic and foreign demand for industrial products. Thus, the change in each of the above factors leads to changes in the structure and the level of industrial activity and its results will be reflected in changes in comparative advantage and added value of the industry.

If the industrial activity in the studied period, is able to increase the size and power of its activity and has a higher growth in added value compared to other industries, change and improvements in comparative advantage, by using knowledge-intensive combination of production, can be one of the factors of this high added value.

Factors affecting the industry RCA are shown in Figure 2;

Figure 2: TheFramework for Comparative Advantage
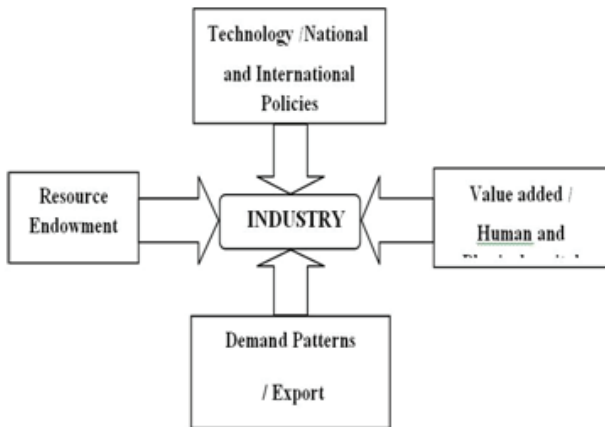
Empirical methodology
The empirical model

The comparative advantage is not static in today's world and all of the countries move to create the comparative advantage and dynamic comparative advantage. Iran, as a monoculture and developing country, focuses on natural resources significantly and its leading industries include those are somehow related to oil, while other industries such as wood industry have been neglected and industrialized and newly industrialized countries attempt to developing this industry in the world. Based on these facts, the factors affecting the dynamics of comparative advantage have been investigated. In order to estimate the direction and the effects of independent variables on the dependent variable (RCA), or to estimate the elasticity coefficients of RCA compared to the independent variables, among the variables affecting the dynamics of comparative advantage, and following the export model of Cerra&-Dayal-Gulati and the comparative advantage model of Nonejad, the Cobb-Douglas function and the following variables, will be used to investigate the dynamics of comparative advantage:

$$RCA = f(L\ HC\ I\ VA\ D\ X\ RER)\ (2)$$

That in this function, RCA is revealed comparative advantage index, L is the total employment in the industry, HC is human capital, I represents the amount of investment , VA is the value added, D represents domestic demand, X is the exports and RER represents the exchange rate. β parameters show the elasticity of revealed comparative advantage of the industry relative to the above variables.

$$RCA = \beta_0 + \beta_1\ L + \beta_2\ HC + \beta_3\ I + \beta_4\ VA + \beta_5\ DE + \beta_6\ X + \beta_7\ RER + \mu_i (3)$$ where the μ_i represent the elasticity coefficients

Equation (3) above shows the long-run equilibrium relationship.

The linear form the above function (Cobb-Douglas func-

tion of factors affecting revealed comparative advantage) is as follows:

$$LnRCA = \beta_0 + \beta_1 LnL + \beta_2 LnHC + \beta_3 LnI + \beta_4\ Ln\ VA + \beta_5\ Ln\ DE + \beta_6\ Ln\ X + \beta_7\ Ln\ RER\ (4)$$ where the β_i represent the elasticity coefficients

Equation (4) above shows the long-run equilibrium relationship.

In the above equation labor, as the country's natural resource and a low cost production factor in the country, has a positive relationship with comparative advantage. Investment, is a solid foundation of export in the industry. This variable leads to appearing comparative advantage in the long term and can a suitable ground for creation of comparative advantage in future periods. Therefore, the increase in this variable leads to an increase in the comparative advantage. If the industrial activity in the studied period, was able to increase the power and expansion of its activity, in this case, it will have a higher growth in value-added compared to other industries. Industries can increase their value-added through creation of comparative advantage. So it can be said that the added value can improve the comparative advantage and have a positive effect on it.

Demand in the domestic market and export demand also increase revealed comparative advantage index and have a positive effect on it.Exchange rate is as a factor for increasing exports and also RCA. Increasing the exchange rate will lead to increase in revealed comparative advantage.

3.   Results and Discussion
Model Estimation

In linear form of Cobb-Douglas function of comparative advantage (Eq. 4), first the stationary of variables is examined. The generalized Dickey-Fuller and Perron test have been used to ensure of being static for the time series variables used in the model, and the results have been summarized in table 1.

As can be seen in Table 1, the variables used in the study are of order zero and one at the 1, 5 and 10 % level of significance. Thus, it is possible to use Auto- Regressive Distributed Lags (ARDL) Method.

Econometric Methodology
Autoregressive Distributed Lag (ARDL) Model

The unit roots were tested through the ADF and PP methods, and the existence of cointegration between the series in the long and short run was analyzed through the ARDL test approach. This method, developed by Pesaran, Shin and Smith through their study in 2001, has important advantages over the other methods of cointegration. The first of these advantages is that cointegration between series can be tested even where the series have different degrees

of stability. According to the estimation procedure, ARDL form of Equation (4) will be in the form of Equation (5):

$$Ln\ rca_t = \beta_0 + \sum_{i=1}^{p} \theta_1\ ln\ rca_{t-1} + \sum_{i=0}^{q1} \theta_2 ln\ l_{t-1} + \sum_{i=0}^{q2} \theta_3 ln\ hc_{t-1} + \sum_{i=0}^{q3} \theta_4 ln\ i_{t-1} + \sum_{i=0}^{q4} \theta_5 ln\ va_{t-1} + \sum_{i=0}^{q5} \theta_6 ln\ d_{t-1} + \sum_{i=0}^{q6} \theta_7 ln\ x_{t-1} + \sum_{i=0}^{q7} \theta_8 ln\ rer_{t-1} + \upsilon_t (5)$$

This includes selecting commands ARDL model (p, q1,q2,q3,q4,q5,q6, q7) in six variables using Akaike information criterion.

In the last step of ARDL estimation, vector error correction model (ECM) has been used to determine the dynamics of comparative advantage in wood industry, which in fact is a vector auto regressive model or a cointegration feature in which short-term relationships along with long-term relationships are examined.

$$\Delta\ Ln\ rca_t = \alpha + \sum_{i=1}^{p} \beta_{1i} \Delta lnrca_{t-i} + \sum_{j=1}^{q} \beta_{1j} \Delta lnl_{t-j} + \sum_{k=1}^{q} \beta_{2k} \Delta lnhc_{t-k} + \sum_{l=1}^{q} \beta_{3l} \Delta ln\ i_{t-l} + \sum_{m=1}^{q} \beta_{4m} \Delta ln\ va_{t-m} + \sum_{n=1}^{q} \beta_{5n} \Delta lnd_{t-n} + \sum_{p=1}^{q} \beta_{6p} \Delta lnx_{t-p} + \sum_{q=1}^{q} \beta_{7q} \Delta lnrer_{t-q} + \rho ecm_{t-1} + \upsilon_t (6)$$

The initial step of the ARDL method is conditional VECM estimated by ordinary least squares to test for long-term relationship between the variables (Pesaran, et al., 2001). At this stage, Schwarz Bayesian criterion is selected to determine the lag length. So the lowest degree of freedom is lost due to the small sample size.Cointegration between the variables and lags of dependent and independent variables are identified by using F-test.Schwars Bayesian Criterion has given Lag 1 to variables RER, VA, DE and Lag 0 to the other variables.

By performing ordinary least squares and Bounds tests, existence of long-term relationship between the variables is accepted.In other words, in this test, the upper and lower limits are obtained as critical values for F statistics, by regarding them, the null hypothesis will be rejected at the significance level of 1 percent, and the long-term relationship between the variables will be confirmed.The results of this test are shown in Table 2. In the next step, ARDL model determines the long and short term relationships between time series. In table (2), the long-term relationship between the variables has been estimated based on the function (5).

4. Results and Discussion
Revealed comparative advantage in Iran's Wood industrial

The values of all variables under study in the time period of 1999 to 2011 were collected from the data available at the Statistical Center of Iran and the International Trade Center (ITC) and the values of RCA index have been given en in (Figure 1), upon which the following results were obtained:

Figure 1: The comparative advantage of the wood industry and its sub-sectors in the period 1999 -2011
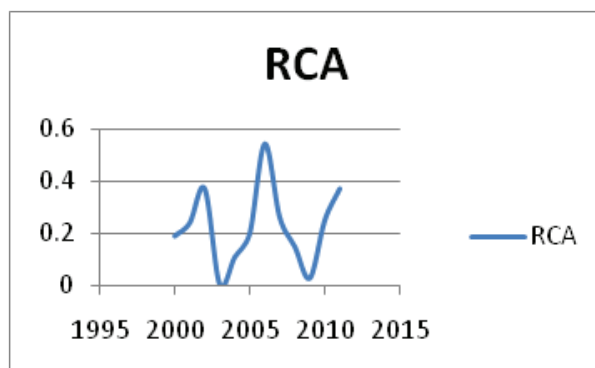
Source: Calculation Methods

Wood industrial without comparative advantage during the period under study.

Studying the process of comparative advantage in this industry shows that in the investigated period, comparative advantage in the wood industry has been associated with many fluctuations.

In 2006, comparative advantage in this industry had the highest value that can be due to the increase in the formation of fixed capital in this year, which has become more than 4 times. But in addition to these variables, increasing exchange rate, and consequently the increase in exports in the industry also had a positive effect on increasing comparative advantage in these years. Thus, it seems that the acceleration of exports during these years, has been more than world's acceleration and this change have contributed to the improvement of comparative advantage. Thus, with respect to the effects of two variables of capital and export, it can be said: if long-term investment has been performed in this sector of the industry, its exporting power was stronger than the present time and there was no need to use exchange systems for rapid but cross-sectional mutation in exports.

Results of the Long-run RCA Equation
The results of estimation of RCA equation in the long-term are shown in Table 2.The results show that the predicted signs of the variables are consistent with the existing theoretical foundations.Also estimating the equation of revealed comparative advantage in the long-term shows that labor has a positive effect on the dynamics of comparative advantage.This is not surprising,because developing countries have a comparative advantage in the labor; they have abundant and cheap labor.Thus they can reduce production costs and benefit from trading of this

good (Ricardo).

The results also show that there exists a significant and positive relationship between human and physical capital with the dynamics of revealed comparative advantage. Investment is the solid foundation for exports in industry and in long-term leads to the emergence of comparative advantage.Investment in prior periods, prepare a suitable ground for creation of comparative advantage in future periods. Positive relationship between the variables capital and the RCA is quite evident, by studying the relation of physical and human investment with comparative advantage.

Also the other results of this estimation indicate that domestic demand and foreign demand of the wood industry dynamics has a positive and significant effect on the comparative advantage of this industry. Such that, if the producers, with innovations in the industry and increasing product quality, try to increase domestic and foreign demand for its products in the market, they certainly revolutionize the comparative advantage in this industry, and considering the importance of this industry in the world and in the European and American industrialized countries and newly industrialized countries such as China, they cause to lead wood industry in Iran to an industry with comparative advantage, by creating and changing the comparative advantage and benefit from its global trade advantages.

Exchange rate is one of other factors affecting dynamics of comparative advantage, which has a positive effect on the variable RCA.Exchange rate is a factor for increasing export and consequently increasing RCA.Due to increased exports of the wood industry, increasing export exchange rate, used in this industry in the years studied, has led to creating the comparative advantage in these years.On the other hand,in case the growth of domestic demand is higher than the growth of exports,increasing exports cannot have a positive effect on comparative advantage.During the study period, the growth of domestic demand was 26% and the growth of exports was 50% and increasing exports can increase the RCA.

The added value is also positively correlated with dynamics of comparative advantage.If an industrial activity in the studied period, has a higher growth in value added compared with other industries, that industry will be able to increase the extent and power of its activity, and move towards change and increase the comparative advantage. Considering the low value added of this industry and its fluctuations in the studied period, the effect of the added value on dynamics of comparative advantage are negligible in this study.

Results of the Error Correction Model

The results of error correction model are interred in Table 3.The short-term results show the dynamics of comparative advantage in the wood industry and its products,the signs of the coefficients of all variables in the short-term and long-term are not similar, and there are slight differences among these coefficients. The value added of the industry appears with a negative sign and this indicates that there is no significant structural change in wood industry, through increasing the value added.Based on the theoretical principles presented about the value added of industry,the technical structure of the wood industry was not in such a way that can maximize the production of the industry's goods by using a combination of production factors, and so it causes the change in comparative advantage in the production structure of all types of work-intensive, capital-intensive and knowledge-intensive.However, other factors are also effective in reducing the value added of this industry and consequently the negative effect on the revealed comparative advantage of wood industry. These include:lack of adequate supply of raw materials, inadequate infrastructure in the field of production, inadequate and out-of-date technology, the shortage of skilled personnel in this field of activity, lack of access capital, lack of the culture of quality assurance and the limited capacity marketing.

Structural changes in the industry and its effects on the dynamics of the revealed comparative advantage, heavily depends on both domestic and foreign demand for industrial products.The severity of both types of demand in the short term in the wood industry, its products and the subsectors of this industry had a positive effect on the revealed comparative advantage of the industry.Exchange rate in the short term is more effective of export and consequently on the revealed comparative advantage of the industry.In the short-term study, labor and human capital had a negative effect on the revealed comparative advantage of wood industry. The absorption of both variables of labor has been reduced in this period.Due to the fact that labor is cheap andaffordable in the country, increasing this variable could have a positive effect on the revealed comparative advantage.Reducing labor and human capital in this industry may be due to the lack of labor supply in the industry, which can be effective in low level of the revealed comparative advantage in this industry, through reduced productivity, reduced innovation, lack of improved technology due to the lack of skilled and educated labor in this industry and consequently the absence of creation and changes in comparative advantage of wood industries.Error correction value indicates that 36% of short-term imbalances can be corrected at any period.

5.   Conclusions and suggestions

Ricardo's theory of comparative advantage states that countries trade goods, in which they have a comparative advantage in the production and export.According to this theory, cheap labor and natural resources of the countries leads to comparative advantage of the country's production and exports.Nowadays, comparative advantages is far from its traditional concept andother factors cause the emergence of comparative advantage in the countries, such as technology, trade policies (such as trade liberalization that leads to increased competition, big market promotion, transfer of technology and efficiency in production), human capital and foreign trade.Each of these factors has a significant and importance impact on the dynamics of comparative advantage and on the creation and changes in comparative advantage.Among the industries in the world and Iran, which are classified according to the ISIC classification system, wood industries and their products are considered by industrialized and newly industrialized countries.On the other hand,given the dramatic changes such as globalization, rising energy costs, development and technological mutations that have occurred in the global business environment,wood products industry are met with increasing challenges including production costs, rapid transfer of technology and increasing environmental protection. Today, the traditional sources of competitive advantage based on economies of scale are not sufficient in a highly dynamic and competitive market (GUN, 2014).

Considering the importance of this issue in the world,in this study, comparative advantage of wood industry and the factors affecting its dynamics have been examined in the period of 1999-2011 by using the ARDL technique. Almost no comprehensive study has been done about this subject in Iran.According to this research, four hypotheses have been tested;the first hypothesis states the effects of labor (as a production factor with comparative advantage), on the dynamics of comparative advantage of the wood industry is positive, according to the study, this hypothesis has a positive effect in long-term and negative effect in short-term on revealed comparative advantage.In the second hypothesis, physical investment in the wood industry has a positive effect in long-term and short-term on the dynamics of revealed comparative advantage, and causes the appearance of comparative advantage. Capital investment has a positive effect in long-term and negative effect in short-term on the dynamics of revealed comparative advantage. According to the third hypothesis, value added, as an agent of change in the production structure and comparative advantage, has a positive effect in the long-term and a negative effect in the short term on revealed comparative advantage.In the fourth hypothesis, the intensity of domestic and foreign demand has a posi-

tive effect on dynamics of comparative advantage in long-term and short-term and the exchange rate increases RCA through increasing exports.Finally, in the fifth hypothesis, it is confirmed that wood industry and its sub-sectors has a comparative disadvantage in the economy of Iran.

Suggestions

The results show that thecomparative advantage is not only including labor and natural resources but also is as a result of changes in production and trade policies and institutions.Therefore the production institutions and above all, the government, can play a major role in changes, creation and the dynamics of comparative advantage in wood industry and its sub-sectors.

• planning, regulation and other therapeutic processes of the government for forest and production, the use of wood and wood products in the other industries.

• creating a stable, transparent and participatory regulatory environment in which the growth business of wood industry and its productions are possible and new innovative business is creates in it.

• Government support in the form of government procurement, planning and the other processes, which leads to production with low cost and protecting the environment and life cycle, by creating the motivation of using forest and wood industry and its products.

• Investment in stable plantation and forest.

• Investing in diversified and emerging industrial opportunities such as solid wood products, engineered wood products, carbon sequestration, bioenergy, bio-chemicals, biofuel, and natural resource improvement.

• Development of industry, technology and research that improves the management performance.

• Industrial plans create opportunities to improve market performance and value added in the industry, by ensuring the access to labor education, development of skills and innovation for current and future skill needs.

Table1.Unit Root Tests

Variables	PP		ADF		Results of sta-tionary test
	t-Statistic	Test critical value	t-Statistic	Test critical values	
Ln RCA	-3.27**	-3.17	-5.11*	-4.42	I(0)
Ln L	-5*	-4.2	-4.45*	-4.2	I(0)
Ln HC	-4.6*	-4.2	-4.25*	-4.20	I(0)
Ln I	-7.9*	-4.2	-9.7*	-4.2	I(1)
Ln VA	-3.4**	-3.2	-5.3*	-4.4	I(1)
Ln X	-3.7*	-3.1	-2.9***	-2.7	I(0)
Ln DE	-3.5**	-3.3	-3.41**	-3.4	I(1)
Ln RER	-3.7***	-3.4	-3.6***	-3.4	I(1)

Source: Calculation Methods
*، **and ***Respectively Indicates rejection of the null hypothesis is at a significance level of 0.01, 0.05 and 0.1.

Table 2. Estimation Results of the ARDL (1,1,0,1,0,1,0,1) Model Dependent variable is LOGRCA

variable	Coefficient	Standard Error	t statistics
LnL	0.36	0.162	4.2316
LnHC	0.32	0.134	4.7612
LnI	0.78	0.044	6.6120
LnVA	0.10	0.101	2.623
LnDE	0.6	0.120	5.217
LnX	0.9	0.04	7.0548
LnRER	0.46	0.32	3.9261
CONSTANT	3.87	2.1	2.477
TREND	0.54	0.13	4.7
R-squared	0.77		
Adjusted R-squared	0.81		
DW stat	2.6		
F Test	34.15	I(0)=4.67	I(1)=8.34

Source: Research findings

Table 3: error correction model for ARDL

variable	Coefficient	Standard Error	t statistics
dLnL	-0.29	0.21	-4.4
dLnHC	-0.35	0.19	-4.7
dLnI	0.35	0.08	5.8
dLnVA	-0.23	0.11	-2.6
dLnDE	0.48	0.14	5.7
dLnX	0.94	0.06	7.1
dLnRER	0.9	0.46	3.9
CONSTANT	-23.1	0.9	-2.3
ecm(-1)	-0.36	0.09	-7.7
R-Squared = 0.84		Adjusted R-squared = 0.79	
DW-statistic = 2.2		Schwarz Bayesian Criterion = 11.5	

Source: Research findings

Resources

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