Investigating the Effect of Globalization on Iran’s Cement Supply

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ABSTRACT

Joining the World Trade Organization (WTO) is the most important aspect of globalization which leads to free trade. Despite enhancing the economic foundations, free trade may bring about industrial shut-downs and expansive unemployment. Therefore, the major strategy adopted by nations should be advocating their economic priorities during the negotiations for joining the WTO. Iran became an observer member of the WTO in 2005 and currently is trying to specify its trading regime and operational plans based on economic and industrial priorities. Industrial priorities are determined based on strategic industries. Cement industry, being one of those strategic industries, plays an important role in the economic development and construction of nations and has the most expansive production level among other industries in today’s world. Thus, in this research, the effect of globalization on Iran’s cement supply during 1981-2011 is investigated. To this aim, two common indicators of globalization, namely the Level of International Trade (LIT) and the Integration of International Trade (IIT), and the Autoregressive Distributed Lag (ARDL) approach are used. The research’s hypothesis states that globalization has a positive effect on Iranian cement supply. The results indicated the presence of a long-term relation between the dependent variable and the independent variables. The results of the long-run estimation also verified the hypothesis and indicated that the effect of globalization on Iranian cement supply in long term is more than its effect in short term.

Key words: Globalization, Cement Supply, Autoregressive distributed lag.

Introduction

Globalization is one of the most significant issues of the current era that has been the concern of many scholars in the fields of politics, economics, and culture.

An optimistic view to the phenomenon of globalization implies that, during the recent decades, it has led to global GDP growth and a rapid boost in foreign direct investment, particularly in developing countries. Gradual elimination of trade and capital mobility barriers has brought about technological advances and constant reduction of transportation and communication costs, which in turn have enhanced the competitive power of industries and prompted new economical opportunities for all. A pessimistic view, however, indicates that globalization is dreadful governance which has targeted the valuable social, cultural and economic aspects of nations. The former group asserts globalization as advantageous and inevitable for future economic development of societies. Meanwhile, the latter holds that globalization increases inequality among nations. In recent years, much research has been conducted on trading policies and their effect on export development and industries’ growth. A major part of such studies demonstrate that trade liberalization, when exposes businesses to competition, regulates businesses and enhances their efficiency, and this way and through increasing the productivity, it escalates their export and, in turn, their chance of survival [8].

In this paper, the researchers will try to provide an answer to the question of whether globalization has a positive effect on supply of cement in Iran or not. To this aim, firstly, a review of the theoretical foundation of this research and relevant studies are presented and then, through introducing the
important indicators of globalization, the model of interest is presented. Finally, the experimental results of model’s coefficient estimates will be analyzed.

2. Theoretical Foundation:

2.1. Globalization: Opportunity or Threat:

Realization of the phenomenon of globalization is an evolutionary process that dims political and economic boundaries, increases communication, and enhances cultural interaction. Globalization is a multi-faceted phenomenon that influences all social, economic, political, legal, technological activities and so on.

The ever-increasing trend of establishment of organizations, regional-economic unions such as ECO, A3An, etc., financial markets integration, flow of foreign investment and other capital streams, monetary union of 11 European countries (Euro), continuous merger of global corporations (both economically and technologically), and, above all, the establishment of the World Trade Organization (WTO) are all manifestations of globalization.

The first step to promote globalization is developing an economically open atmosphere; this way, various governmental supportive policies would no longer be in force. In such atmosphere, opportunities will be made available to the sectors and activities that were almost deprived of governmental support but are now capable of competing, because such environment makes access to the market easier than before. On the other hand, globalization is deemed as a threat to those sectors and activities which used to have the power to compete due to enjoying unfounded and aimless support from the government.

Meanwhile, what is of importance to us is the precise knowledge of this phenomenon and its probable consequences so that we could be able to benefit from the advantages of this phenomenon and avoid or minimize its disadvantages.

Currently, a number of 155 countries are official members of the WTO. These countries account for 90.1% of the world population, 96.7% of global GDP, and 96.4% of the world trade. There are also about 32 observer countries which constitute 8.4% of the world population, 3.3% of global GDP, and 4% of the world trade. Based on anticipations by the WTO, once these 32 states become official members of the organization, the member states would represent 99.35% of the world population, 99.98% of the global GDP, and 99.95% of the world trade.

2.2. Cement Industry and Globalization:

Cement industry is a strategic industry which plays an important role in economic development and national construction. Moreover, in today’s world, it also has the most expansive production level among other industries. Cement is one of the mostly used industrial products throughout the world and has drawn the attention of all countries as a product for building the future, a prerequisite for development, employment and advancement. It is, however, of higher importance in developing countries and for building the infrastructures. Cement production serves as an indicator of growth and development of every nation.

Presently, many European countries prefer import of cement over its production because of environmental concerns and their special economic structure. Taking into account geographical extensiveness of Iran and its inexpensive production factors, it can act effectively in foreign cement markets.

Based on the global cement report, cement production in Iran in 2010 raised to 61 million metric tonne (mmt), compared to 59 mmt production of 2009, making Iran’s share about 1.85% of the total world cement production in 2010. In terms of cement production, Iran ranks fifth in the world and second in the Middle East, preceded by Turkey. Iran is one of the major exporters of cement in the world and ranks tenth in this regard (a much higher rank compared to the past).

Considering the fact that currently the WTO member countries constitute 96.4% of the world trade, Iran’s delay in joining the organization would picture an adverse vision for the future of its foreign trade. In such circumstances, it should identify its advantages and disadvantages and strive to develop and improve activities that enjoy comparative advantage.

3. Background:

Mahlam [14], examined the effects of trade liberalization in Zimbabwe. The result of that research showed that trade liberalization would increase the gains from export sector and enhance investment.

The study conducted by Winter Nelson and Anna [23], depicted that liberalization of coffee market in Tanzania resulted in a boost in the export of coffee, mainly because of a decrease in transportation costs.

The results of Weber’s study [22], showed that reducing import tariffs in Russia would increase export of food products from Kazakhstan.

Rosemary Okou [16], investigated the effect of trade liberalization on the growth of non-petroleum exports of Nigeria. In the proposed model, namely “vector error correction model”, the researcher examined the impact of factors such as global income, relative prices, and, particularly, the import of capital goods. The results showed that the growth in export of non-petroleum goods in globalization process was more in short run than in long run.
In a paper by Heshmati Molaei and Bidabad [9], the researchers examined the outlook of cement supply and demand in Iran and the world. Based on their study, Iran will have supply surplus which necessitates the possibility of exporting the surplus cement abroad. In general, it is expected that global demand for and production of cement will grow by 2-4%.

Bidabad [5], studied price liberalization of cement and its total supply and demand. In order to analyze the effect of elimination of governmental pricing of cement, the researcher simulated a model, the results of which indicated that eliminating cement pricing by the government would cause price liberalization to have little effect on cement production, consumption, export, import, and price. Nonetheless, it would make fluctuations in the trend of variables.

Milton Ramirez [18], studied some econometric models for Bolivian cement supply and demand. The study introduces the results of econometric estimates of Bolivian cement supply and demand in terms of simultaneous equations (two equations in this case). The purpose of the study was to measure the impact of factors influencing the cement market during 1994-2004. Five simultaneous equations models based on linear equations for supply and demand were considered to make it possible to explain the respective variables in the form of elasticity.

In a paper by Teitel [21], the researcher stated that, during 1950-1998, global export increased in line with the level of globalization.

Using a general equilibrium model, Boumellassa and Valin [6], studied the consequences of Vietnam joining the WTO. The results showed that there were positive trade outcomes for Vietnam after it joined the organization. Moreover, the obligations of the WTO increased Vietnamese export which was basically dependent on clothing and textile industries.

In their paper, Esfandiari and Ahmadian [7], investigated globalization and its effect on Iranian auto industry (domestic demand, import, export, and domestic supply). In their research, two globalization indicators, namely LIT and IIT, and ARDL model were used. The results showed that globalization of Iranian economy would positively influence domestic demand and import of cars, have no effect on exports, and negatively impact domestic supply of cars.

Kyophilavong et al. [13], investigated the effects of Laos joining the WTO on its economic growth and poverty. To this aim, the researchers used a standard global trade analysis model. Their results indicated that Laos would gain some advantages if it joined the WTO, but the benefits would be very trivial: GDP, exports, and imports would grow by 0.5%, 5.65%, and 7.9%, respectively, and people’s welfare would increase about one million U.S. dollars.

4. Methodology:

Since the data used in this research were time-series data, stationarity of each variable was tested before estimating the relations among them. For this purpose, generalized two-stage Dickey–Fuller test was performed. As it was found out that the variables were stationary of first and zero order, the ARDL model was used to study the cointegration relation of variables.

In order to investigate the short- and long-run relation between the dependent variable and other explanatory variables of the model, Engle-Granger cointegration method and error correction model (ECM) could be used. ECMs link short-term fluctuations of the variables to their long-term equilibrium values. If the model’s variables are cointegrated, the residual term of the short-term relation would be zero-order stationary, and it would therefore be possible to obtain ECM’s coefficients using OLS – without the fear of a false regression – and use $F$ and $t$ statistics for testing the model. However, if the model variables are zero- and first-order stationary, it would no longer be possible to use ECM for estimating the short-term coefficients of the model. Nonetheless, considering the limitations associated with the use of Engle-Granger method and ECM, and also in order to avoid the deficiencies of these models, including presence of bias in small samples and impossibility of testing the statistical hypotheses, more appropriate methods are recommended for the analysis of short- and long-term relation between the variables, among which is ARDL [17].

ARDL estimates short and long-term patterns of the model simultaneously and removes the problems associated with elimination of variables and cointegration. Therefore, because of avoiding problems such as autocorrelation and endogeneity, estimates given by ARDL methods are unbiased and efficient [19].

In this method, once the model is specified, the number of optimal lags of each variable, either endogenous or exogenous, should be identified. Microfit software allows the user to choose from among $\left( m + 1 \right)^{k+1}$ estimated models using either the Akaike, Shwarz-Bayesian, or Hannan-Quinn information criteria such that the number of the lags of the chosen model is optimum compared to that of other models. Typically, Shwarz-Bayesian information criterion (SBIC) is used to determine the optimal number of lags, because it uses fewer lags. After specifying the optimal econometric model, an estimate of the coefficients of the model’s variables is provided. These coefficients represent the dynamism of the model in short term.

ARDL method consists of two steps. In the first step, the presence/absence of a long-term relation among the variables of the model is investigated. Basically, this step aims to test if the estimated short-
term relation inclines towards equilibrium or not. To perform this test, the \( t \) statistic as proposed by Banerjee, Dolado, and Mestre is used. If the value of the \( t \) statistic estimated for the model is more than its value as determined by Banerjee, Dolado, and Mestre, the null hypothesis stating the absence of a long-run equilibrium relation is rejected and the alternative hypothesis is accepted. Moreover, it is possible to estimate the ECM related to the model selected by ARDL. For this, after performing the cointegration test on the variables, the error term of the cointegration regression with a time lag is set next to the first-order difference of other variables, and then the coefficients will be estimated using OLS. The error correction term coefficient represents the pace of adjustment towards the long-run equilibrium \[20\].

4.1. Globalization Indicators:

4.1.1. The Level of International Trade (LIT):

This indicator shows the extent of international relation for a given industry \[12\]. The indicator, which is the same Morris-Root index, is calculated as follows:

\[
LIT = \frac{(X_t + M_t)}{Y_t + M_t - X_t}
\]

Where LIT is the level of international trade in the industry, \( X_t \) is the export, \( M_t \) is the import, and \( Y_t \) is the production level of the given industry. A small value for LIT shows that the international relation is not an important aspect of the industry and the industry is less involved in trade given its low production level and vice versa. Although LIT is a highly appropriate indicator, it is merely a prerequisite and is not the sufficient condition for measuring the globalization level of an economy \[1\].

4.1.2. International Trade Integration Indicators (IIT):

This is actually the Grubel-Lloyd index which measures the international integration of a given industry \[12\] and is as follows:

\[
IIT = 1 - \frac{|M_t - X_t|}{(X_t + M_t)}
\]

where IIT is the intra-industry trade (or trade within a sector), \( X_t \) is the export, and \( M_t \) is the import. By definition, IIT is between zero and one. Zero indicates an absence of intra-industry trade (i.e., the trade consists solely of exports or imports) and a value of one is indicative of complete intra-industry trade (exports equal to imports).

In this paper, after incorporating LIT and IIT indicators as explanatory variables, Cement Supply model was estimated using the ARDL method and the Effect of Globalization on Iran’s Cement Supply was investigated.

5. Experimental Results:

5.1. Model Identification and Specification:

First, taking into account the studies on Globalization as well as studies on cement and its supply, an experimental model is introduced and examined based on the relevant theoretical issues, previous research, and Iran’s economic context. Then, the coefficients are measured and analyzed based on the proposed model.

The general form of the basic regression equation for the present study is as follows:

\[ YC = F(NC, MP, LIT, IIT) \]

which is estimated as the following logarithm for better measurement of the elasticities:

First model:

\[ LYC = \alpha_0 + \alpha_1 NC + \alpha_2 MP + \alpha_3 LLIT \]

Second model:

\[ LYC = \beta_0 + \beta_1 NC + \beta_2 MP + \beta_3 LIIT \]

where:

- \( YC \): Iran’s cement supply in ton
- \( NC \): nominal capacity of cement production in Iran in ton
- \( MP \): Iran’s free market cement price (Rials per ton)
- \( LIT \): Level of International Trade
- \( IIT \): Integration of International Trade

5.2. Variables Stationarity Test:

Econometric methods are used in experimental works if the time-series variables of interest are stationary. A time-series variable is stationary if its mean, variance, and autocorrelation coefficients remain constant over time. Thus, it is essential to ensure stationarity/non-stationarity of the variables before using them. In this research, unit root test is used to examine the stationarity of the variables.

Based on the unit root test, the international trade integration indicator and the nominal production level were stationary and the rest were non-stationary (table 1).
Table 1: Summary of series Unit-Root test by Eviews 6 software

<table>
<thead>
<tr>
<th>Variables</th>
<th>Type of Model</th>
<th>ADF Test Critical Value</th>
<th>Significance level</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td>LYC</td>
<td>Intercept</td>
<td>-0.36</td>
<td>-2.95</td>
<td>96.5</td>
</tr>
<tr>
<td>LNC</td>
<td>Intercept &amp; Trend</td>
<td>-4.61</td>
<td>-3.56</td>
<td>96.5</td>
</tr>
<tr>
<td>LMP</td>
<td>Intercept &amp; Trend</td>
<td>-1.73</td>
<td>-3.55</td>
<td>96.5</td>
</tr>
<tr>
<td>LLIT</td>
<td>Intercept</td>
<td>-2.41</td>
<td>-2.95</td>
<td>96.5</td>
</tr>
<tr>
<td>LIIT</td>
<td>Intercept</td>
<td>-3.35</td>
<td>-2.95</td>
<td>96.5</td>
</tr>
</tbody>
</table>

In order to determine the stationarity order of the variables, differencing is performed on those variables that are non-stationary. All the non-stationary variables here became stationary after one differencing operation (table 2).

Table 2: Summary of series Unit-Root test by Eviews 6 software

<table>
<thead>
<tr>
<th>Variables</th>
<th>Type of Model</th>
<th>ADF Test Critical Value</th>
<th>Significance level</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLNCY</td>
<td>Intercept</td>
<td>-6.85</td>
<td>-2.96</td>
<td>96.5</td>
</tr>
<tr>
<td>DLMP</td>
<td>Intercept &amp; Trend</td>
<td>-4.64</td>
<td>-3.56</td>
<td>96.5</td>
</tr>
<tr>
<td>DLIT</td>
<td>Intercept</td>
<td>-7.12</td>
<td>-2.96</td>
<td>96.5</td>
</tr>
</tbody>
</table>

5.3. Estimation of the Short-run Equation:

Taking into account the nature of the data under study and the point that some series are already stationary and some others become stationary after one time differencing, the use of typical methods for estimating regression models may result in false regression. To overcome this problem, the notion of cointegration is used. Since the overall variables are a combination of I(0) and I(1) series, ARDL is used in this research.

Table 3: Dynamic model

<table>
<thead>
<tr>
<th>Variable</th>
<th>First model, LIT index</th>
<th>Second model, IIT index</th>
</tr>
</thead>
<tbody>
<tr>
<td>LYC(-1)</td>
<td>0.624</td>
<td>5.568 (0.000)</td>
</tr>
<tr>
<td>LNC</td>
<td>0.244</td>
<td>2.694 (0.013)</td>
</tr>
<tr>
<td>LMP</td>
<td>0.604</td>
<td>2.44 (0.023)</td>
</tr>
<tr>
<td>C</td>
<td>2.87</td>
<td>2.349 (0.028)</td>
</tr>
<tr>
<td>Statistics</td>
<td>F</td>
<td>R2 Bar</td>
</tr>
<tr>
<td></td>
<td>849.73</td>
<td>0.993</td>
</tr>
</tbody>
</table>

Diagnostic Tests

<table>
<thead>
<tr>
<th>TEST STATISTICS</th>
<th>Diagnostic Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM Version</td>
<td>F Version</td>
</tr>
<tr>
<td>Serial Correlation</td>
<td>0.315 (0.575)</td>
</tr>
<tr>
<td>Normality</td>
<td>8.71 (0.013)</td>
</tr>
<tr>
<td>Heteroscedasticity</td>
<td>0.788 (0.375)</td>
</tr>
</tbody>
</table>

Table 4: Indicators that were used for dynamic model

<table>
<thead>
<tr>
<th>Liberalization index</th>
<th>Coefficient</th>
<th>T-Ratio[Prob]</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIT</td>
<td>-0.0189</td>
<td>-2.232 (0.036)</td>
</tr>
<tr>
<td>LIIT</td>
<td>0.011</td>
<td>2.6 (0.017)</td>
</tr>
</tbody>
</table>

According to the estimations regarding both models (table 3), the calculated $F$ value implies that the regression is generally significant at $R^2=0.99$. A modified $R^2$ means that the explanatory variables...
explain 99% of the changes in logarithm of cement supply. Moreover, pathological tests indicate that all classic assumptions (absence of autocorrelation, correct functional form, normality of residual terms, and homogeneity of variance) are held true for the model of interest.

Here, using the obtained results, the null hypothesis stating the presence of unit root or absence of cointegration (long-run relation) among the variables of the dynamic model is tested. As it was mentioned, if the sum of the coefficients of the lagged variables pertinent to the dependent variable is less than one, the dynamic model will tend towards the long-run equilibrium model. In ARDL method, the presence of a long-run cointegration relation is verifiable when the absolute value of the test statistic is more than the absolute value of its critical value (In order to perform this test, the sum of the coefficients of the lagged dependent variable is subtracted from one and divided by its variance.)

The value of the $t$ statistic required for performing the above-mentioned test based on what was already noted is calculated as follows:

$$ T = \frac{\sum_{i=1}^{p} \hat{\alpha}_i - 1}{\sqrt{\sum_{i=1}^{p} \hat{\epsilon}_i^2}} $$

The calculated statistic is -4.25 for LIT and -4.03 for IIT. As the absolute value of this statistic is more than the critical value given in the table proposed by Banerjee, Dolado, and Mestre (-3.91), the null hypothesis claiming an absence of a long-run relation is rejected and the presence of such relation is accepted. Therefore, the long-run model will be estimated.

5.4. Estimation of the Long-run Equation:

After estimating the dynamic (short-run) model and verifying the presence of a long-run relation, the latter relation will be estimated. The results of estimating the long-run relation is summarized in table 5.

<table>
<thead>
<tr>
<th>Variable</th>
<th>First model, LIT index</th>
<th>Second model, IIT INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNC</td>
<td>0.648</td>
<td>0.73</td>
</tr>
<tr>
<td>LMP</td>
<td>0.16</td>
<td>0.102</td>
</tr>
<tr>
<td>trade liberalization Indicator</td>
<td>-0.05</td>
<td>0.024</td>
</tr>
<tr>
<td>C</td>
<td>7.63</td>
<td>7.57</td>
</tr>
</tbody>
</table>

As the mentioned model has a logarithmic form, the coefficients of the independent variables which are logarithmic will express the sensitivity and elasticity of the variable which depends on them (the dependent variable).

The results obtained from various estimations of the cement supply model specifications, in which different indicators are used, are presented in table 5. The coefficients are consistent with theories and expectations. The variable representing the nominal capacity of cement production is significant and has a positive coefficient – based on the obtained results, the nominal capacity has the most impact on cement supply.

In the first specification, LIT indicator was used for analyzing the effect of globalization on cement supply. Here, all the variables of the model have had anticipated coefficients; the nominal production capacity is significant and has a positive coefficient. The price of cement in the free market is also significant and has a positive coefficient.

The results obtained from estimating the model with IIT indicator, as the second model, are provided in table 5. In terms of significance, the results regarding the coefficient of this globalization variable are different from the results obtained for the previous indicator. In this estimation, globalization has had a positive and significant effect on cement supply. Since the latter indicator is representative of the degree of international trade integration within the sector and serves as a reliable indicator of globalization, and although the other indicator received a negative sign, globalization has had a positive effect on the sector. In this model, the coefficient of the nominal production capacity is significant and positive, and the price of cement in the free market has had a positive and significant effect on cement supply.

5.5. Error Correction Model Estimation:

In order to examine the short-run variance of variables from their equilibrium values, the ARDL method formulates and estimates the ECM for the long term. Since the presence of a long-run relation was verified in the above-mentioned regressions, the regression ECM will be addressed in the rest of the paper.

As it can be seen, the value of the coefficient of determination indicates a relatively high explanatory power of the model. The most important part in the ECM is the coefficient of the error correction term (ECM(-1)), which is indicative of the adjustment
pace of the disequilibrium process. As it is observed, this coefficient is significant and negative, and verifies the cointegration among the variables. Based on theoretical expectations, if we move from one period to another, the variance of the function from its long-term course will be corrected in the next period by the variables of the model by 38% for the LIT pattern and 45% for the IIT pattern. Therefore, the move toward equilibrium happens at a relatively high pace.

Table 6: Error Correction Representation for the Selected ARDL Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>First model, LIT index</th>
<th>Second model, IIT INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLNC</td>
<td>0.244</td>
<td>2.69(0.013)</td>
</tr>
<tr>
<td>Dimp</td>
<td>0.0603</td>
<td>2.4 (0.023)</td>
</tr>
<tr>
<td>DLIIT</td>
<td>-0.019</td>
<td>-2.23 (0.036)</td>
</tr>
<tr>
<td>DLIIT</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DC</td>
<td>2.871</td>
<td>2.35 (0.028)</td>
</tr>
<tr>
<td>ECM(-1)</td>
<td>-0.38</td>
<td>-3.36(0.003)</td>
</tr>
<tr>
<td>Statistics</td>
<td>$R^2$ Bar</td>
<td>F</td>
</tr>
</tbody>
</table>
|            | 0.37                  | 0.26                  | 3.43        | 0.33                  | 3.91

6. Summary and Conclusion:

In the present era, trade liberalization and joining the WTO is a must. Therefore, conducting research on these issues is of special importance. As a result, taking into account the relative advantage of Iran with respect to cement production, estimating the cement supply function through incorporating globalization indicators as explanatory variables and using econometric methods are of particular significance. The subject of this research was determined in this regard and the respective function was estimated for the 31-year period (1981-2011).

Based on the results of model estimation, it is seen that the coefficients of all variables have a positive value, but the coefficient of the level of international trade has become a negative number. Meanwhile, IIT serves as an appropriate criterion for realization of globalization, because it is a function of the factors required for globalization, Previous research also indicates this fact [15].

The coefficient of the LIIT indicator was 0.024 for the long term, implying that one per cent increase in international trade integration would boost cement supply by 0.024%.

Based on the results of the estimation of the long-run model, the nominal capacity of cement production has the maximum effect on the supply increase. Therefore, it is recommended that the basis for an increase in cement supply should be established through providing the conditions required for liberalization and joining the WTO.

In general, Iran's cement industry enjoys a proper potential and capacity. Thus, taking into account the globalization trend, there is the hope that the industry would significantly prosper. The international trade integration indicator in this research also shows that the Iranian cement supply has set foot on the path towards globalization and global trade, and that more trade liberalization could positively affect cement supply.

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