The Effect of the Removal of Energy Subsidies in the Competitiveness of Iranian Steel Industries

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Abstract

The implementation of economic projects by targeting the subsidies can have a great effect on the cost competitiveness of the industries and their products. The global steel industry has been considered as a basic key industry in the industrialized countries. It is also among the industries that may be seriously affected by the enforcement of subsidies. This industry, requiring energy and high-tech, demands the capital. Accordingly, the energy input prices affect the cost of production and sales offers.
The prime cost is one of the determinants of an industry's competitiveness in the market. The study employed the law enforcement approach to the competitiveness of the industry during the 2007-2012 and combined data (panel data) to estimate the competitive capacity.
The results showed that the effect of targeted energy subsidies on the competitiveness of this industry energy has fallen over time.

*Keywords:*Subsidy, Energy carriers, Competitive, Panel data

1. Introduction

Iran's economy is in transition from a centralized planning towards a decentralized planning. Energy subsidies are one of the major issues in this transitional process. A large amount of annual national income is assigned to subsidies covering various types of energy carriers. Therefore, the removal of energy subsidies is of great importance. Targeted subsidies can result in increased productivity and economic competitiveness. On the other hand, one of the main ways to enhance competitiveness and gain new markets in the business and production environment is to reduce the total production costs. The increase in expenses is equal to the loss of the competitiveness of the manufacturing industries[1)].

The increase in the total cost of goods and services following the removal of energy subsidies is due to the presence of energy as a vital input (due to the low cost) in the production function of Iranian economy. Any change in the price of energy will influence the price index for goods and services through its cost share in the short term. It also affects goods and services price index through influencing other inputs in the long term.

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One of the most important factors affecting the cost of steel is the energy required for steel production. Steel industry and its related products are master key industries in Iran. They may have a great impact on jobs and economic growth. Iran has a comparative advantage in terms of steel production, development of disadvantaged areas and sustainable employment through this key industry. Therefore, the development of steel industry is more important than other industries.

The aim of the present study was to examine the effect of targeted energy carriers' subsidies on the competitiveness of steel industry in Iran. In this regard, by using the latest available panel data, the competitiveness of steel industry was calculated during 2007-2012. So the main question in this study was whether the removal of energy carriers' subsidies would increase the competitiveness of steel industry? The literature review and empirical studies will be presented in Section 2. Theoretical backgrounds and research methodology are in Section 3. The data analysis has been brought in Section 4. Finally, the concluding remarks are discussed in Section 5.

2 . Literature Review

The reduction of the major sources of energy in the world and the increase of energy prices have led to the big impact of the energy on the price of products. Consequently, authorities of different industries are taking various measures to reduce the cost of energy. Experts always give priority to energy in development

plans as a comparative advantage in Iran's industry. On the one hand, Iran has a very good position in the world in terms of all kinds of energy reserves and resources. On the other hand, these resources are more easily offered to various industries with prices much lower than those in other countries. Energy consumption in Iran is in contrast with the principles of productivity and energy efficiency promotion in the world.

As a result, comparative advantage in energy is used to cover other costs incurred by industries instead of moving towards the creation of value added and converting it into a competitive advantage. This is more pronounced in energy-intensive industries such as metal industries, particularly the steel industry. A significant part of the cost of steel is related to energy prices. Therefore, Iran has always been regarded as one of the best places in the world for steel production due to the facile availability of cheap energy.

Reviewing the evolution of excellent theories shows that we will face competitive advantage theory proposed by "Michael Porter". Perhaps, he is the most famous person in the field of competitiveness and competitive advantage. According to Porter (1990), it is better to use competitive advantage instead of comparative advantage to evaluate the competitiveness of countries, because competitive advantage considers other aspects of competition such a variety of products, different technologies, returns to scale, etc[2]. The most common definition of competitive advantage in the competition strategy literature is value creation or whatever causes revenue increase over costs. In other words, a firm or industry can compete when its unit cost is less than or equal to its competitors[3].

Porter has also investigated the sources of competitiveness and divided them into the following six groups:

1- The status of production factors. This includes the supplying factors (human resources, physical resources, capital resources, infrastructure and technical knowledge), the efficient use of production factors, focus on advantage factors such as information technology (IT), skilled labor, research and development, and so on. It also focuses on factors that contribute to high levels of expertise, especially those factors that contribute to continuous improvement, innovation and invention.

2- The structure of market demand. This includes the composition of domestic demands and customers, the size and pattern of the growth of domestic demands and the saturation rate of the market, customers' access to global markets and so on.

3- The status of related industries and suppliers. This includes the competitive advantage of related industries and suppliers and the presence of good suppliers and the related industries.

4- Firm strategy and competition. This covers strategies and structure of domestic firms, goals and motivation of firms, domestic competition (competitive environment), arrangement of new firms and so on.

5- The role of government. This relates to subsidies, capital market policies, education policies, price controls, investment in infrastructural sectors, the government's role in the market (either as a buyer or as a body issuing laws and regulations), the impact of regulations on the suppliers and related industries, media and advertising, tax policies and anti-cartel laws as well as government policies influencing all sources of the competitive advantage.

6- Unexpected events that have an immediate impact on the business environment such as new inventions, new technologies, severe fluctuations in production factors such as oil prices, significant fluctuations in the financial markets, interest rates, the rapid surge in demand, wars, natural disasters, etc. Porter also explained the relationship between these factors and the comparative advantage. However, he did not provide a method for calculating them.

Targeting assumes that a part of community has a higher priority to receive the transitional aids. Since resources are limited, priority should be given to distribute the aids. The aim of targeting is to identify those who are eligible for the transitional aids. Targeting subsidies came to operation since December 2010. One of the goals of this Act was to create sensitivity toward energy consumption by industry and increase productivity in this sector. This was expected to be realized through definition and implementation of modernization, optimization and complementary projects.

The major advantages of subsidies targeting include reducing the smuggling of subsidized goods because of price difference, cutting down the expenditures of the state, strengthening the private sector due to the sheer production of these items by the private sector, increasing the investment in non-subsidized goods, improving the quality of goods out of the supporting basket, developing technologies based on real prices and distributing the subsidies fairly[4].

Although numerous studies have been conducted on Iran's steel industry, no serious study has added the competitive advantage in this industry.

Siegel [5] conducted a theoretical study on international competitiveness. He proposed a framework for measuring competitiveness and its constituents through economic and mathematical relationships. Siegel and Cockburn 1995a and 1995b [6] can be mentioned here. One of the papers investigated various aspects of competitiveness while the second paper proposed indicators for competitiveness and fully explained their resources. They used their method for evaluating the competitiveness of industries in Mali and Côte d'Ivoire as its main financial competitors[7].

Torn (2005) examined the competitiveness of cereal production in some EU countries (Ireland, Italy, England, Germany, France and Denmark) during 1996-2000. In this study, profitability was considered as a measure of competitive performance while production costs, the value of output and productivity were considered as the sources of competitive performance. The results showed that productivity level in the UK, Ireland and France was higher than Denmark, Germany and Italy. Opportunity cost of resources owned by the respective countries had a significant impact on the competitiveness of cereal production in EU countries. In Italy, cash expenses as a percentage of total output were lower than other countries. However, Italy had the highest opportunity costs of resources owned by countries among the studied countries.

In a study entitled "Estimates of energy subsidies in China and the impact of reforming energy subsidies", Boqiang and Resosudarmo[8] examined the effect of eliminating or reducing energy subsidies on macroeconomic variables of China using a general equilibrium model. The results showed that welfare, GDP and employment could be reduced by 56.03, 1.2 and 1.42%, respectively. However, if 35% of savings gained by the removal of subsidies had been distributed between sectors with higher priority in terms of energy consumption such as agriculture, services and lighting of plants, welfare, GDP and employment would have been increased by 37.16, 0.0 and 0.53%, respectively. Kalbasi and Garivani [9] compared the competitiveness of Foolad Mobarakeh Complex with its competitors using three criteria including export or international competitiveness, domestic competitiveness and comparative advantage. The results showed that if the opportunity cost of capital were not considered in calculations, Foolad Mobarakeh would compete with domestic competitors. However, the export competitiveness index would be at break-even point. Moreover, according to comparative advantage index estimated at 1.39, the company may not be able to compete with foreign competitors in the case of accession to WTO . Considering the opportunity cost of capital in calculations showed that Foolad Mobarakeh Complex might not able to compete with domestic and foreign competitors before and after the accession to WTO[2].

Hosseini [10] examined the effect of the removal of energy subsidies on the competitiveness of Yazd Tire Complex using the competitive advantage concept and supportive factor analysis. The results demonstrated the cost competitiveness of Radial and Tube plants before implementing subsidies targeting. With the implementation of this Act, Tube products retained their competitiveness, while Radial products lost their competitiveness. But bias products showed no comparative advantage and competitiveness before and after the implementation of this Act. While bias products were strongly supported, radial products were slightly supported and Tube products were not supported at all.

3. Theoretical Backgrounds and Research Methodology

Competitiveness is the difference among countries in terms of the ability to change inputs into goods and services with respect to the maximization of firm's profit[3]. Competitiveness encompasses tangible assets and intangible assets (such as technology and executive skills) which are combined to improve the efficiency of the required inputs for producing goods. Siggel and Culibaly (1999) believe that the competitiveness of a firm is the ability of the firm to sell its products profitably. In other words, for a firm to have competitiveness, it should sell its products at a lower price with a higher quality. They believe that providing the economy of a country with favorable conditions, such as a high level of general education, productivity, natural resources, and trade-oriented economic policies, may have significant effects on the level of the competitive power of firms and industries. Siegel and Cockburn (1995) used the unit cost (UC) index to calculate cost competitiveness. Thus, a firm or industry is able to compete if its unit cost is less than or equal to the competiveness of foreign and domestic competitors. The unit cost (UC) is the total cost (TC) divided by the value of output (VO). The general form of this criterion can be expressed as follows:

$$UC = \frac{TC}{VO} = \frac{TC}{P.Q} \leq UC^{*} \qquad (1)$$

In the above equation, P is the product price, Q is the output and UC* is the unit cost of competitor. A firm or industry is able to compete when the unit cost of its products is less than or equal to its (foreign and domestic) competitors. In the long term and the perfect competition condition, international manufacturers will produce at a point where TC = P.Q. Therefore, UC* is equal to 1 and competitiveness criterion will be as follows:

$$UC \leq 1 \qquad (2)$$

In microeconomics, the unit cost is defined as the total cost divided by quantity (Q). Thus, the physical unit cost of goods is obtained. But it can be used as the unit cost when the products of two competitors are perfectly homogeneous. In the real world, it is rarely found given the product mix, different qualities and different after sales services. This is why it is divided by the value of product (VO), i.e. PQ, instead of dividing the total cost (TC) by quantity (Q). In other

[1] *Gross Domestic Product*
[2] *World Trade Organization*
[3] *B. Kogut (1985)*

words, the consumer compares and estimates quality, after-sales service, product mix, etc. Consumer will estimate the product quality according to the amount of purchase at various prices. When two firms have equal total costs, but one of them produces a higher quality product and sells it at higher price, the value of output (VO) will be increased, while the unit cost will be decreased. This means that this firm has a higher competitiveness compared to its competitor.
Therefore, the criterion used to measure competitiveness is the unit cost, which is expressed as follows:

$$UC = \frac{TC}{VO} = \frac{TC}{P.Q} \leq 1 \quad (3)$$

where the value of output (VO) can be evaluated at domestic price (Pd), world price (Pw) and shadow price (Ps). Given the above three types of prices, the competiveness is divided into domestic, international competiveness and comparative advantage. Here, TC is the total cost of production in domestic prices and Pd is the domestic price, $P_d=P_w(1+NRP)$. NRP is an implicit nominal protection rate obtained through domestic and international price comparisons.

$$NRP = \frac{P_d}{P_w} - 1 \quad (4)$$

Domestic competitiveness shows whether the firm is able to compete in the domestic market and in current situation, with deviations in product prices and production factors. This index is assessed by comparing the cost of domestic production with the value of output (VO).

3.1. Methodology

In this study, to investigate factors affecting the competitive, we used the panel data of econometrics model to show the effect of independent variables on dependent. The collected financial statement of 10 selected companies[1] in the steel industry was implicated during 2007-2012 [2] .Before estimating the model, the first step was to examine the stationary of variables. For this purpose, LLC [3] test was been used[11]. Limer test or F test was used to identify the variable or the constant intercept. Hausman test was used to detect the relationship between the explanatory variables and the intercept.

3.3.1. LLC Test

LLC test was chosen due to its suitability for panel data in a short time period (2007 to 2012). Moreover, according to Breitung and Westerlund (2009), LLC is more efficient than IPS[4] .

3.3.2. The Significance of Intergroup Effects

To estimate random effects, it is assumed that the intercepts (a_i) have a distribution similar to that of mean (a) and variance (σa^2). In this method, time is included and the group effects of units over the time are separately entered into the model as the explanatory variables. Limer F statistic was used to select the integrated model (regardless of group effects) or fixed effects approach.
In Limer F test, Hypotheses H_0 and H_1 are as follows:
H_0: the intercepts of all firms are equal.
H_1: at least, the intercept of one firm is different.
The F statistic is introduced using the restricted residual sum of squares estimated by OLS[5] model and unrestricted residual sum of squares (URSS) estimated by intergroup regression:
In the Limer test, the hypothesis H_0 or the same intercepts (the pooling method) is placed against the opposite hypothesis H_1 or different intercepts (panel data method). Therefore, if the hypothesis H_0 is rejected, panel data method will be accepted [12].

3.3.3. Fixed and Random Effects

After rejecting the null hypothesis, to accept the constant intercept model, the model was estimated using the random effect approach. The random effects approach considers the same intercept for all units. According to this approach, the difference between the intercept of each unit is transferred to the error component. Then, the sum of error and the intercept of all units results in a specific intercept for each unit. After estimating the model by both approaches, Hausman test was used to select fixed or random effects. It should be noted that if the presence of a different intercept for different groups is confirmed, then the best approach can be selected among fixed and random effects approaches using the Hausman test. The test statistic used to recognize fixed or random variations of cross-sectional units was calculated as follows:

$$H = \frac{\hat{\beta}_E - \hat{\beta}_{R\ (GLS)}}{VAR(\hat{\beta}_E) - VAR(\hat{\beta}_{R\ (GLS)})} \quad (5)$$

In the Hausman test, the null hypothesis is as follows:
H_0: There is no correlation between explanatory variables and individual effects.

This is because R.E model assumes that all αs are random. Therefore, there should be no correlation between Xs and αs. Hausman also used the hypothesis and stated that if there were no correlation between Xs and αs, R.E model would be better.

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[1] *Foolad Khuzestan - Kashan Steel - Rolling Steel Parts - Khorasan Steel – Foolad Mobarakeh- Zob Ahan Isfahan- Iran Alloy Steel- Kavian Steel- Sepahan Industrial Group- Pipe and Machine*

[2] *Due to the need for a sufficient number of observations, the data of 2010 was used in modeling*

[3] *Levin, Lin and Chu*

[4] *Im, Pesaran and Shin*

[5] *Ordinary Least Squares*

4. Data Analysis

The model examined in this study is as follows.

$$UC = f\,(Lp + Ep + In + Se + Fa + Pe + La + D_{90-91}) \quad (6)$$

where LP is labor productivity, EP is energy efficiency, IN is investment, SE is sale, FA is fixed assets, PE is energy prices, LA is skilled labor and D90-91 is the dummy variable related to targeting energy subsidies. LLC test results are given in Table 1. The results indicate the stationary of all variables at a level of 5%.

Table 1. Stationary of variables

Variable	Statistic	Probability	Result
UC	-2.1221	0.0169	Stationary at a level of 5%
LP	-3.8071	0.0001	Stationary at a level of 1%
EP	-8.04719	0.0000	Stationary at a level of 1%
IN	-66.5700	0.0000	Stationary at a level of 1%
SE	-17.4289	0.0000	Stationary at a level of 1%
FA	-5.0304	0.0000	Stationary at a level of 1%
PE	-5.8339	0.0000	Stationary at a level of 1%
LA	-10.5434	0.0000	Stationary at a level of 1%

Source: research findings

Limer F test was used to select the integrated model or group effects. The results are presented in Table 2.

Table 2. Limer F test

Null hypothesis	Statistic	Probability	Result
Cross-sectional and time effects are not significant.	12.4403	0.0000	H_0 is rejected

Source: research findings

The results showed that the null hypothesis concerning the equality of intercept (homogeneity) of all firms could be rejected with a confidence of 99%. Thus, the opposite hypothesis concerning the necessity of using panel model with group effects was accepted [2].

By using Eviews, Hausman test was performed for this model. The results are shown in Table 3 [3].

Table 3. Hausman test.

Null hypothesis	Statistic	Probability	Result
The use of model with group effects $E\,(U_{it} / X_{it}) = 0$	0.0000	1.0000	H_0 is accepted

Source: research findings

Since the calculated statistic was smaller than Chi-square value contained in the table, the H_0 hypothesis regarding the lack of correlation between Xs and random effects was accepted. So there was no correlation between explanatory variables and error components. In other words, the random effects model was preferred.

So, the model under investigation is as follows.

$$UC = \alpha_0 + \alpha_1 Lp + \alpha_2 Ep + \alpha_3 In + \alpha_4 Se + \alpha_5 Fa + \alpha_6 Pe + \alpha_7 La + \alpha_8 D_{90-91} + u \quad (7)$$

The above relation was evaluated based on panel data (Random effects model) of 10 selected companies in the steel industry during 2007-2012. The results of model estimation are shown in Table 4.

In the above equation, D_{90-91} is a dummy variable related to targeting energy subsidies. D_{90-91} is equal to 1 in 2011 and 2012, while it is equal to 0 for the previous years (before 2011). It is worth noting that targeting plan was implemented since late December, 2010; therefore D_{90-90} was equal to 1 in 2011 and 2012. Due to its low impact and lack of impact, dummy variable was equal to 0 during 2010.

As shown in Table (4), the coefficients of labor productivity and investment were significant at a level of 5% and 10%, respectively. Other coefficients were significant at a level of 1%. Therefore, these coefficients were valid with a confidence of 99%. The results indicated that targeting subsidies increased UC and led to a decline in competitiveness with increasing the costs for the selected companies. On the other hand, the energy price paid by the firms (PE) also increased the unit cost (UC) with the same result. The fixed assets (FA) with a significant positive coefficient showed that the increase in fixed assets could reduce competitiveness. This can be attributed to the lack of proper and efficient costing in average fixed assets among the selected companies.

It should be noted that the increase in labor productivity and energy results in more efficient production and lower costs. They also significantly affect the competitiveness index. According to Table 4, increasing labor productivity and energy will improve the competitiveness index. The increase in investment rate and sale has a positive effect on competitiveness. On the other hand, the use of skilled labor can improve competitiveness.

There are two main technologies in steel production in the world: blast furnace and direct reduction technologies. ZobAhan Isfahan uses blast furnace technology while companies like Foolad Khuzestan and Foolad Mobarakeh employ direct reduction technology. Steel production by blast furnace method requires lower energy. However, the use of

[1] To calculate the parameters, the financial statements during 2007-2012 were applied.
[2] The output of the software is provided in the Appendix 1.
[3] The output of the software is provided in the Appendix 2.

supplementary materials such as coke, which is rare in Iran, increases the cost of steel produced by blast furnace technology. In contrast, in direct reduction method, the cost of raw materials is lower while the energy cost is higher. Therefore, when there is no increase in the energy costs, the production method employed in Foolad Khuzestan has a higher profit margin.[13] The use of direct reduction method and electric arc furnaces for producing crude steel in medium scales (which is the case for the majority of Iranian companies) will be more advantageous for domestic producers when the natural gas is available at a price lower than the global prices. Since economies of scale in direct reduction method are lower than blast furnaces, the products made by this method have lower competitiveness at global level. Therefore, it is difficult to increase the share of Iranian companies of global steel trade. On the other hand, higher energy is consumed in direct reduction method[1] .

Table 4. Model estimates

Variable	Coefficient	T	Probability
C	0.9741	26.0202	0.0000
LP	-5.51E-5	-2.4508	0.0177
EP	-0.0039	-4.2250	0.0001
IN	-1.5E-8	-1.8736	0.0667
SE	-7.75E-9	-2.8208	0.0068
FA	1.91E-8	3.1384	0.0028
PE	1.56E-7	2.7766	0.0077
LA	-3.67E-5	-3.1145	0.0030
D_{90-91}	0.1641	10.8239	0.0000
F		12.9958	0.0000
Durbin-Watson		1.8915	
R^2		0.6708	
$\overline{R}^2$		0.6192	

Source: research findings

5. Conclusion

The results of panel data model showed that the increase in the price of energy carriers had a significant effect on the cost competitiveness index during 2011 and 2012. Therefore, targeting energy subsidies had an adverse impact on the competitiveness of the selected companies. Cheap fuel and rich energy resources are easily accessible to steel industry in Iran. This results in strong dependence of the steel industry to energy.

Despite the indirect supports, the competitiveness of companies has been significantly decreased after targeting the energy subsidies because of strong dependence to energy.

Opening capital required for constructing steel industry is higher than f the rest of higher industries. In case the energy subsidy is eliminated, the advantage of the relevant industry and the justification of investment in it will be lost. In the industrialized countries, the price of energy carriers and electricity of the production sectors are less than other sectors, especially household sector, whereas this is quite the opposite in Iran. Therefore, by considering the advantages of steel production, huge reserves of oil, gas, and coal, particularly iron ore, and technological advances that have occurred in the leading steel industries, it is necessary for the policymakers and managers of industries in the country to review the adjustment of energy consumption pattern and select an appropriate technology. They should also take measures to employ the preparatory strategies and plan infrastructures for the better implementation of the targeted subsidies project with fewer consequences and adverse effects as soon as possible. To do so, experiences of the top steel-producing countries may reduce the costs for executing the projects. A collaborative attempt should be made for future investments to construct the most modern technologies of steel production in the country.

We have to take steps, according to international standards, by taking into account the domestic capacities. Consuming scrap steel to produce steel using modern methods and improving its share in a long-term schedule should be placed on agenda. By considering the experiences of the leading countries in steel industry, it can be understood that participating in global competition as well as high production capacities depends on the use of blast and oxygen furnaces. Despite the removal of subsidies, the price of natural gas consumed in Iran will be at least 10% cheaper than the global prices. Moreover, since the current price of electricity in Iran is lower than the global prices, with eliminating subsidies and approaching the price of this input to the global prices, the advantage of Iran will be only in having a cheaper natural gas. Therefore, companies active in the steel industry can benefit from direct reduction and electric arc furnaces have a greater competitive advantage. They possibly offer their products at lower costs than competitors that have benefited from this technology. The disadvantage of steel industry in Iran is the lack of adequate labor productivity and the use of technologies with high levels of energy consumption.

[1]*The output of the software is provided in the Appendix 3.*

Appendices

Appendix1

Redundant Fixed Effects Tests
Equation: EQ01
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	12.440327	(9,42)	0.0000
Cross-section Chi-square	77.942540	9	0.0000

Cross-section fixed effects test equation:
Dependent Variable: UC
Method: Panel Least Squares
Date: 08/19/13 Time: 06:11
Sample: 1386 1391
Periods included: 6
Cross-sections included: 10
Total panel (balanced) observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.903159	0.023025	39.22506	0.0000
LP	-3.88E-05	2.41E-05	-1.611450	0.1133
EP	-0.000402	0.001034	-0.388591	0.6992
IN	-2.12E-09	7.80E-09	-0.272084	0.7867
SE	-5.40E-09	4.13E-09	-1.305176	0.1977
FA	1.81E-08	6.40E-09	2.819798	0.0068
PE	3.77E-08	4.74E-08	0.794455	0.4306
LA	-2.15E-05	1.09E-05	-1.984199	0.0526
DUMMY	0.169795	0.034224	4.961338	0.0000

R-squared	0.398582	Mean dependent var	0.931362
Adjusted R-squared	0.304242	S.D. dependent var	0.127004
S.E. of regression	0.105937	Akaike info criterion	-1.514468
Sum squared resid	0.572352	Schwarz criterion	-1.200316
Log likelihood	54.43404	Hannan-Quinn criter.	-1.391586
F-statistic	4.224943	Durbin-Watson stat	1.273571
Prob(F-statistic)	0.000610		

Appendix 2

Correlated Random Effects - Hausman Test
Equation: EQ01
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	8	1.0000

Cross-section random effects test equation:
Dependent Variable: UC
Method: Panel Least Squares
Date: 08/19/13 Time: 06:33
Sample: 1386 1391
Periods included: 6
Cross-sections included: 10
Total panel (balanced) observations: 60
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.031630	0.024477	42.14735	0.0000
LP	-4.96E-05	2.57E-05	-1.934545	0.0598
EP	-0.005262	0.000672	-7.833024	0.0000
IN	-1.49E-08	7.10E-09	-2.102392	0.0416
SE	-1.06E-08	3.04E-09	-3.492791	0.0011
FA	1.51E-08	6.16E-09	2.445385	0.0187
PE	2.13E-07	5.43E-08	3.918156	0.0003
LA	-4.34E-05	1.27E-05	-3.425168	0.0014
DUMMY	0.163441	0.013758	11.87977	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.835937	Mean dependent var	0.931362
Adjusted R-squared	0.769531	S.D. dependent var	0.127004
S.E. of regression	0.060971	Akaike info criterion	-2.513510
Sum squared resid	0.156134	Schwarz criterion	-1.885207
Log likelihood	93.40531	Hannan-Quinn criter.	-2.267746
F-statistic	12.58822	Durbin-Watson stat	2.385559
Prob(F-statistic)	0.000000		

Appendix 3

Dependent Variable: UC
Method: Panel EGLS (Cross-section random effects)
Date: 08/19/13 Time: 06:34
Sample: 1386 1391
Periods included: 6
Cross-sections included: 10
Total panel (balanced) observations: 60
Swamy and Arora estimator of component variances
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.974161	0.037439	26.02029	0.0000
LP	-5.51E-05	2.25E-05	-2.450810	0.0177
EP	-0.003990	0.000944	-4.225044	0.0001
IN	-1.50E-08	8.03E-09	-1.873639	0.0667
SE	-7.75E-09	2.75E-09	-2.820873	0.0068
FA	1.91E-08	6.07E-09	3.138493	0.0028
PE	1.56E-07	5.62E-08	2.776633	0.0077
LA	-3.67E-05	1.18E-05	-3.114501	0.0030
DUMMY	0.164187	0.015169	10.82392	0.0000

Effects Specification	S.D.	Rho
Cross-section random	0.092005	0.6948
Idiosyncratic random	0.060971	0.3052

Weighted Statistics

R-squared	0.670891	Mean dependent var	0.243230
Adjusted R-squared	0.619266	S.D. dependent var	0.107394
S.E. of regression	0.066266	Sum squared resid	0.223952
F-statistic	12.99548	Durbin-Watson stat	1.891535
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.035821	Mean dependent var	0.931362
Sum squared resid	0.917581	Durbin-Watson stat	0.461664

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