Productivity, Technical eficiency and internationalisation of the Spanish chemical sector

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Project abstract

This paper analyses the relationship between productivity and international position of Spanish chemical firms in the period 2005-2011. The goal is to determine whether companies that follow and international strategy, either with exports or by investment in foreign countries obtain greater productivity growth than these that do not operate in global market.

For this purpose a panel data set with microdata has been created. A preliminary analysis of the evolution of productivity growth in the sector is carried out. The measurement of Total Factor Productivity is performed. With the estimated TFP we analyze the differentials in productivity growth, comparing the effects of export and investment behavior with non-international firms.

Objectives

The work aims to assess whether international exposition have more productivity growth than their counterparts. Our results point that firms that follow international strategies have clearly more productivity growth.

Methodology / Materials

Following standard procedures we first estimate by econometric models a production function with panel data set for 2005-2011 period. Then, we estimate TFP as a residual from de estimation. We use a Cobb-Douglas production function that is a benchmark in these kind of works. Three estimation methods have been used: ordinary least squares (OLS), Fixed Effects and Random Effects. We then assess differences in productivity results by means of different normality tests: Epps-Singlenton and Kolomogorov-Smirnov two-sample rank sum (Delgado *et al.*,

In order to estimate firm-level TFP a standard process is to begin estimating the following regression equation:

$$y_{it} = \beta_l \, l_{it} + \beta_k k_{it} + \beta_m m_{it} + \omega_{it}$$

Where Y_{it} is total output of firm i at time t, L is labour, K is capital and M are intermediate inputs. And solve for $\ln(A_{it})$,

$$lnA_{it} = y_{it} - \hat{\beta} l_{it} \; \hat{\beta} k_{it} - \hat{\beta} m_{it} \quad (2)$$

Where A_{it} is total factor productivity.

Research update

The estimate of TFP is performed by choosing the method of FE, with the following results. FE explore the relationship between predictor and outcome variables within an entity. Where we can observe the evolution of the average TFP in 2005-2011, the tendency is clear, We can divide the period in three stages. In the first stage we can observe a little decrease. Nonetheless since 2006 there is a great enhance. And, the last stage we can analyze a stabilization of the TFP variable.

In the second picture, When We use the Kolmogorov-Smirnov test the result indicates that the firms that have a great productivity use the export in its process of internationalization. The evolution of TFP is clearly observed in the figure. The analysed period shows three periods. At the first stage, a small decrease may be observed. Nonetheless, since 2006, a great increase is shown.
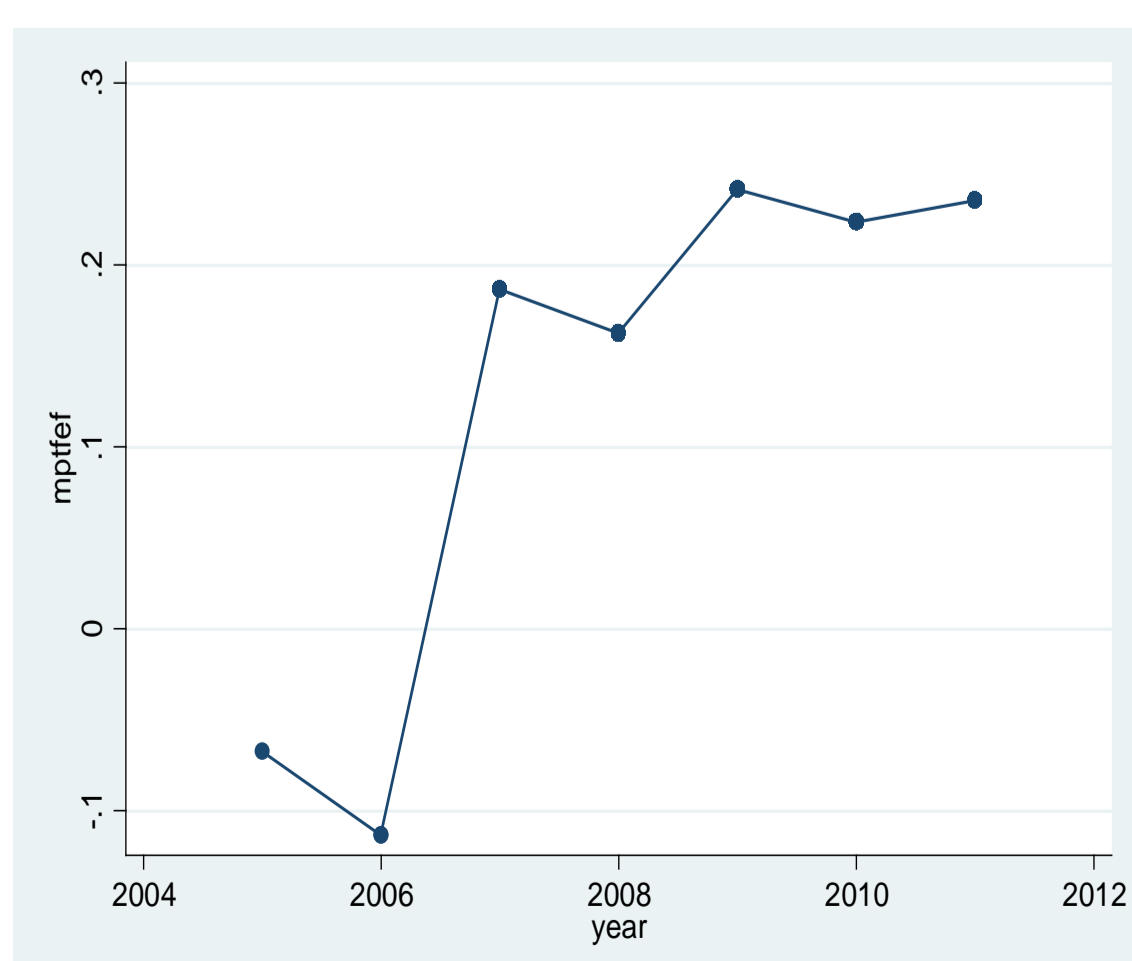
Two-sample Kolmogorov-Smirnov test for equality of distribution functions

Smaller group	D	P-value	Corrected
0:	0.0056	0.978	
1:	-0.0988	0.001	
Combined K-S:	0.0988	0.002	0.002

Note: ties exist in combined dataset;
there are 1678 unique values out of 1679 observations.

Conclusions

Productivity gap between firms of the Spanish chemist sector during the period 2005-2011.
It has used the parametric methodology proposed by FE, that minimizes the simultaneity slant using the demand of intermediate inputs as a proxy for unobserved productivity.
It demonstrates the existence of a direct link between the productivity of the companies with their international position.
A step towards new methods of approach and verification of hypothesis related to the benefits of international trade on productivity level.

Bibliography

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