Productivity, Technical efficiency 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 those 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. 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-Singleton and Kolmogorov-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:

\[ y_{it} = \beta_1 l_{it} + \beta_2 k_{it} + \beta_3 m_{it} + \epsilon_{it} \]

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 \( \ln(A_{it}) \),

\[ \ln(A_{it}) = y_{it} - \beta_1 l_{it} \frac{k_{it}}{A_{it}} - \beta_3 m_{it} \]

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.

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


Methodology / Materials

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Two-sample Kolmogorov-Smirnov test for equality of distribution functions

<table>
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<th>Small group</th>
<th>D</th>
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<tr>
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<td>Combined K-S</td>
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Note: ties exist in combined dataset, there are 1678 unique values out of 1679 observations.