Péter Bálint Szabó:

“Comparison of State Support of Research and Development in the Electronics Industries of Japan, South Korea and Taiwan”

Topic and Research Question

The research is centered around works on industrial policy and state support for research and development in the electronics industries of Japan, South Korea, and Taiwan. The observed time period is 20 years, from the year 2000 to 2019.

The research question (RQ) is: *“If compared, does the performance of the electronics industry of Japan, South Korea and Taiwan correlate with state support of research and development?”*

The research question seeks to analyze the relationship between various performance indicators and various inputs coming from state, business, and higher education sources. In addition to the comparison of the country cases, the goal is to see if a linear relationship between the variables can be identified. The research question is going to be answered with the help of regression analysis.

The goal of asking this question, is to contribute to the debate on whether states should engage in industrial policy, specifically in relation to innovation and R&D support, specifically in the context of the electronics industry. Should governments allocate money for this, or should research be instead done by private enterprise or academia? Which one is more productive? Do any of this correlate with increased performance, for example in exports or new patent filings? This paper aspires to contribute towards the discourse on these issues.

State of the Art

The literature review starts with a definition of what industrial policy is with the first section discussing different definitions and approaches, laying the foundations for further analysis. Then, following the natural evolution of the theory, the second and third sections move from the broader scope of industrial policy to a narrower subset of it, R&D and innovation support specifically, with innovation systems theory being discussed in more detail.

Sections four and five explore applications of different approaches on first the electronics industry, followed by the three countries in scope, Japan, South Korea and Taiwan. Section six then looks at indicators with which to analyze and measure performance in policymaking.

The seventh section discussed methods to quantitatively analyze interactions between these factors, with specific attention given to the methodological limitations and risks associated with using such methods of analysis.

Methodology and Approach

Based on the literature review, twelve variables were chosen to answer the research question. To see whether the performance of the electronics industry correlate with state R&D support, all variables needed to be quantitative. Five of these variables are going to be output (dependent) variables, which represent the performance of the electronics industry. The remaining seven are going be input (independent) variables, representing various resources that have been used to reach these results. Regression provides analysis on the relationship between various variables individually, as well as part of the whole model. Thus, after running it, one can identify – within the context of the model – which ones correlate with each other most, and how much of their movement can be explained by the changes in other variables. In accordance with systems of innovation theory, the government is not the only main actor in innovation, but just one out of three, with the business sphere and higher education being the other two. Therefore, to have something to compare government spending to, business and academia were also included among the criteria.

Main Facts

In the first half of the empirical section, the data for each of the twelve variables were presented, with the country cases being compared to each other. One of the themes of the empirical studies of the literature review was, that Japan is supposed to be in decline, therefore it was interesting to see whether this claim would be supported here. The results of the observations are as follows:

Number of top spots - All 12 variables		
Year	2000	2019
1st	Japan - 10	Japan - 5
2nd	Taiwan - 2	South Korea - 4
3rd	South Korea - 0	Taiwan - 3

As the table shows, when examining all variables, the data does show an overwhelming Japanese lead in the year 2000, with the situation changing substantially by 2019, becoming considerably more balanced.

This does suggest, that while Japan did decline, it is only a relative decline, with South Korea and Taiwan making great strides and catching up, instead of Japanese performance becoming worse.

That being said, it is also worth noting, that most of the variables in which Japan is still in the lead are the absolute terms such as gross spending or the number of patents and citable scientific papers produced, which are being skewed by the fact that by far Japan is the largest of the three countries.

The data also depicts the Taiwanese government scaling back its involvement in research activities quite substantially, while becoming the leader in both total export and export market share of electronics. The South Korean electronics industry on the other hand, had the best stock market performance out of the three, as well as the highest per capita spending on research and development.

Results

After the empirical results, the output of the regression analysis was presented. Was there a linear relationship identifiable between state support first, but also business and higher education involvement and the performance of the electronics industry in Japan, South Korea and Taiwan, or not?

There were five dependent variables and three countries, making the total number of regressions 15. Out of these 15 models, 5 were statistically significant, while 10 were insignificant. Looking at the variables individually, there were 7 independent variables and five regressions for each country, making it 35 each. In total that ends up being 105, with 25 being statistically significant and 80 being insignificant. This means, that only in less than a quarter of the cases can it be confidently said, that a variable has some influence on the outcome.

To answer the research question, there were two variables for state support: the share of government performed, and government financed R&D. Two in each of the five regressions for the three country cases, making it 30 observations. Out of the 30, only 6 were statistically significant and 24 insignificant. Therefore:

Can it be confidently said, that in the electronics industry of Japan, South Korea and Taiwan, based on these set of criteria, state support of research and development influences the performance of the industry?

No, it cannot be confidently said.

Regarding the reliability of the result however, the numbers do show signs of multicollinearity, which throw the regression results in doubt, and should be examined by further research.

The research as two key takeaways: Always treat data like this with caution and skepticism, and always remember the context in which they are to be interpreted. Analyzing the real economy with finite variables is always going to be an oversimplification.

References

All references can be found in the full version of the MA thesis available at the University of Vienna, Department of East Asian Studies, at: https://utheses.univie.ac.at/.

About the Author

My name is Péter Bálint Szabó. I have earned my bachelor’s degree in Business and Management at Corvinus University in Budapest. During my MA studies in East Asian Economy and Society at the University of Vienna, I spent a year on student exchange at Meiji University in Tokyo. Previously, I have gained work experience at the Embassy of the United States of America in Hungary.

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Examination Date: 13. 06. 2022.