

PRELIMINARY EVALUATION OF IMPACTS FROM SCIENCE-TECHNOLOGIES TO ECONOMIC DEVELOPMENT OF RED RIVER DELTA AREA

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Abstract:

The paper has targets to evaluate impacts from science and technology (S&T) to economic development of Red River Delta area through interactive relations between indicators reflecting S&T activities. The evaluation is based on integrated approaches and selections of related factors. Particularly in this paper, the research team conducted the separate evaluations of S&T factors from many other factors. By using iterative functions for identification of these relations, the study helps to identify the rate of impacts from these factors and then to identify orientations to adjust them in order to enhance the effectiveness of economic development.

Keywords: *Evaluation of impacts; Science and technology; Economic development; Red River Delta.*

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1. General introduction

There exist, up to now, very few research works related to evaluations of impacts from S&T to economic development. Some of them deal only with global views and qualitative assessment of the matter, rather than quantitative assessment. They did not yet indicate the way the actual S&T activities impact the economic development and the rate of these impacts.

In order to have a full picture of S&T activities and economic development of Red River Delta area, various indicators may be listed out and they can be presented in absolute or average figures. Every indicator reflects one or few aspects of S&T activities or economic development. The full picture should be based on analysis of many, as more as possible, various indicators which reflect all the aspects of the research problem. From another side, however, a large number of indicators would make the problem too complex and then the analysis may be spread out. Many indicators might be overlapping, not easy to be collected in practice, and even in some circumstances the collected data are not highly trusted. For study of impacts from S&T activities to economic development of Red River Delta area, we could not get indicators which reflect directly these relations and could not

also to define how much a unit can get benefits from expenditures for S&T activities. We need, therefore, to build related factors to compute specific indicators for science-technology and economic development separately, then to apply mathematical models to study relations, to evaluate interactive trends between them. The research team of the project Application of methods of parameter assessment combined with eco-mathematical models (production functions) to express the relations between the productivities and input factors.

Therefore, the evaluation of impacts from S&T factors to the economic growth of Red River Delta area would contribute to make proposals of policies for effective use of resources and objectives of sustainable development.

2. Research methodologies

On basis of research objectives, in order to get data for iterative analysis of interactive relations between S&T activities and economic development in Red River Delta area, the research team conducted the collection of data related to necessary indicators of every cities and provinces in Red River Delta area.

Also, on basis of actual situations of existing and available data from management practice, we selected the most specific indicators for S&T activities and economic development.

2.1. Specific indicators of S&T activities

They are divided into two groups: statistic indicators of labor qualities and statistic indicators of technological capacities.

- Group of statistic indicators of labor qualities include the rate of labors by technical qualification level and the average number of years of education for labors from 18 years old age up.
- Group of statistic indicators of technological capacities is divided into 3 sub-groups:
 - + *Sub-group of indicators of technological innovations*: Average investment capital for a labor and the evaluation score of technological level.
 - + *Sub-group of indicators of technology transfer*: Rate of foreign direct investment (FDI) to the total investment capitals and the average fixed asset value of a labor and the average energy power consumption by person.

- + *Sub-group of indicators of information technologies*: The number of telephone subscribers, number of computers by person, and some other indicators such as the number of units equipped with LAN, Website and e-trade.

The above noted indicators are converted to corresponding specific values, then to average values to produce the specific indicators of qualities of labor, technological innovations, technology transfer and information technologies. Finally, the average figures of these indicators are the S&T specific indicators.

2.2. Specific indicators of economic development

Labor productivity (based on added values): Average incomes by person and benefit rate, export rate, budget collection-expenditure rate.

Every above noted corresponding indicators are converted to corresponding specific values, then to average values to produce the specific indicators of economic development.

3. Research results

On basis of collected data, the research team conducted calculations of values, figures, and specific indicators of S&T activities and economic development of Red River Delta area which are seen as follows:

3.1. Calculations of specific indicators of S&T activities

- Calculations of labor quality from data of rates of technically qualified labors:

Table 1. Indicator of labor quality

No	Cities/Provinces	Indicator (%)	Rank	No	Cities/Provinces	Indicator (%)	Rank
1	Hanoi	77.34	1	7	Hai Phong	45.85	2
2	Quang Ninh	39.86	3	8	Hung Yen	26.66	10
3	Vinh Phuc	16.31	12	9	Thai Binh	27.47	8
4	Bac Ninh	29.51	7	10	Ha Nam	26.75	9
5	Ha Tay (former)	31.81	5	11	Nam Dinh	31.03	6
6	Hai Duong	24.08	11	12	Ninh Binh	33.55	4

Source: Statistical Yearbook of cities/provinces and calculations/processing of survey data by the research team.

- Calculations of indicators of technological capacities:

Indicator of technological innovation is calculated on basis of budget expenditures for S&T activities.

Indicator of technology transfer is calculated on basis of data on the rates of FDI to the total investment capitals, the rates of attraction of investments and the volume of power consumption by person.

Indicator of information technologies and communication is calculated on basis of the score of computer use by person and the number of operating telephone subscribers.

Table 2. Indicators of technological capacities

Unit: %

No	Cities/Provinces	Ind. of tech. capacities	Ind. of tech. innovat.	Ind. of tech. transfer	Ind. of IT and commun.	Rank
1	Hanoi	69.45	67.17	68.37	70.83	1
2	Quang Ninh	50.93	40.97	50.86	53.47	4
3	Vinh Phuc	50.14	44.10	56.16	47.14	5
4	Bac Ninh	51.43	46.08	54.29	50.63	3
5	Ha Tay (former)	39.66	27.05	33.90	47.13	12
6	Hai Duong	48.12	36.45	50.42	49.31	6
7	Hai Phong	56.66	49.44	55.93	59.01	2
8	Hung Yen	45.27	41.45	46.69	45.17	8
9	Thai Binh	40.38	37.60	34.44	45.53	11
10	Ha Nam	46.70	35.38	42.47	52.71	7
11	Nam Dinh	40.82	32.53	36.30	46.27	10
12	Ninh Binh	41.00	39.47	37.26	44.18	9

Source: Statistical Yearbook of cities/provinces and calculations/processing of survey data by the research team.

3.2. Calculations of specific indicators of economic development

- On basis of average GDP figures by person, GDP growth speed, export rates and budget collection the specific indicators of economic development are calculated and the results are presented in Table 3.

Table 3. Common indicator of economic development

Unit: %

No	Cities/Provinces	Comm. ind. of ec. dev.	Ind. of ave. GDP by person	Ind. of growth speed	Ind. of export rate	Ind. of budget collect.	Rank
1	Hanoi	65.81	79.91	56.48	36.94	85.13	1
2	Quang Ninh	58.24	54.12	64.59	45.67	66.33	2
3	Vinh Phuc	50.15	40.10	77.22	12.57	53.69	4
4	Bac Ninh	40.81	40.67	69.41	10.68	13.99	5
5	Ha Tay (former)	28.95	28.73	49.16	8.16	9.76	9
6	Hai Duong	36.79	39.69	54.39	9.83	22.74	7
7	Hai Phong	56.12	56.69	55.10	36.96	76.19	3
8	Hung Yen	39.62	37.96	61.35	21.69	17.42	6
9	Thai Binh	26.79	29.16	36.19	12.86	17.17	11
10	Ha Nam	28.45	26.14	45.61	12.97	14.24	10
11	Nam Dinh	25.68	25.86	36.43	15.26	14.24	12
12	Ninh Binh	30.73	23.26	59.32	5.51	13.72	8

Source: Statistical Yearbook of cities/provinces and calculations/processing of survey data by the research team.

3.3. Evaluation of impacts from science-technology to economic development

From the outcomes presented in Tables 1, 2 and 3 we can make comparison of the levels of technical qualification, technological capacities and economic development between cities and provinces as follows:

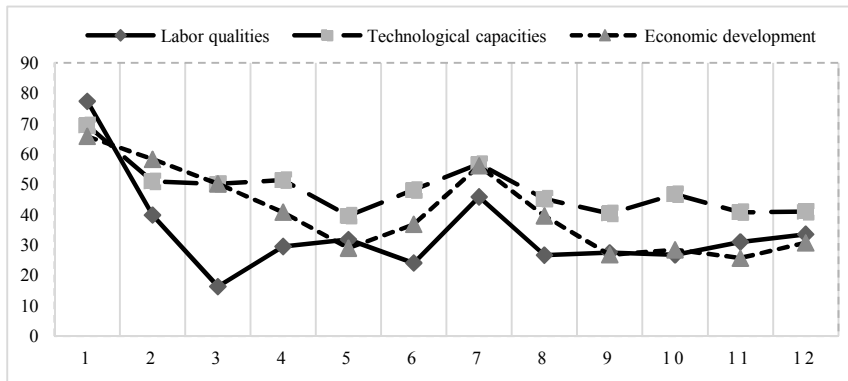
Table 4. Common indicators of labor qualities, technological capacities and economic development

No.	Cities/Provinces	Labor qualities		Technological capacities		Economic development	
		Ind. (%)	Rank	Ind. (%)	Rank	Ind. (%)	Rank
1	Hanoi	77.34	1	69.45	1	65.81	1
2	Quang Ninh	39.86	3	50.93	4	58.24	2
3	Vinh Phuc	16.31	12	50.14	5	50.15	4
4	Bac Ninh	29.51	7	51.43	3	40.81	5
5	Ha Tay (former)	31.81	5	39.66	12	28.95	9

No.	Cities/Provinces	Labor qualities		Technological capacities		Economic development	
		Ind. (%)	Rank	Ind. (%)	Rank	Ind. (%)	Rank
6	Hai Duong	24.08	11	48.12	6	36.79	7
7	Hai Phong	45.85	2	56.66	2	56.12	3
8	Hung Yen	26.66	10	45.27	8	39.62	6
9	Thai Binh	27.47	8	40.38	11	26.79	11
10	Ha Nam	26.75	9	46.70	7	28.45	10
11	Nam Dinh	31.03	6	40.82	10	25.68	12
12	Ninh Binh	33.55	4	41.00	9	30.73	8

Source: Calculations by the research team

It is possible to present the indicators of labor qualities, technological capacities and economic development in graphics (the absciss presents the cities/provinces from 1 to 12, the ordinates presents the values of indicators) as follows:



Scheme 1. Common indicators of labor quality, technological capacities and economic development respectively.

By analysis of the data in Table 4 and the graphic lines in Scheme 1, we can note that globally the cities/provinces which have high values of the indicators of labor qualities and technological capacities have also high values of the indicator of economic development and inversely. Of course, there are some exclusive cases, namely Hai Phong City and Thai Binh Province. The relations between the labor qualities, technological capacities and economic development are proportional and present the global and interactive trends.

On basis of available data we can conduct the iterative analysis for correlations between the three indicators where the indicator of economic development is the dependent variable noted as Y, the indicator of labor quality is the first independent variable noted as X_1 and the indicator of technological capacities is the second independent variable noted as X_2 .

Applying the linear model for assessment of the correlations we can obtain the formulas between them as follows:

- Correlation between the labor qualities (X_1) and the economic development (Y)

$$\bar{Y}_{x_1} = 21.21 + 0.57x_1$$

- Correlation between the technological capacities (X_2) and the economic development (Y)

$$\bar{Y}_{x_2} = -28.90 + 1.44x_2$$

Calculations give also the specific factors of tough relations between Y and X_1 ; between Y and X_2 as follows:

- Between X_1 and Y: $\bar{R}_{x_1y} = 0.6411$
- Between X_2 and Y: $\bar{R}_{x_2y} = 0.8878$

4. Conclusions

On basis of data and graphic presentations of the indicators of labor qualities, technological capacities and economic development and, particularly, the calculations of iterative equations and factors of relations we can make the following conclusions.

The outcomes of research show that the both factors of labor qualities and technological capacities cause considerable impacts on economic development. We can note also that the cities and provinces in Red River Delta area which have higher level of labor qualities and technological capacities would potentially have higher results of economic development.

We can note also that the technological capacities cause stronger impacts to economic development than the labor qualities do. Namely, the factor of correlations between the technological capacities and the economic development ($R_{x_2y} = 0.8878$) is superior to the one between the labor qualities and the economic development ($R_{x_1y} = 0.6411$).

The evaluation of impacts from S&T activities to economic development is a highly necessary work which covers the large scope and contents of research space. Therefore, on basis of this grassroots level research project, we would like to make a proposal to make, in coming years, research

projects of higher level to evaluate the impacts from S&T activities to economic development in a more detail and concrete manner for individual sectors of regional scale./.

REFERENCES

1. Tang Van Khien. (2007) *Method of calculation of common indicators of economic development for the whole national economy*. Bulletin Statistic Science. No. 03/2007, p. 41.
2. Tang Van Khien. (2008) *Method of calculation of common indicators of technological capacities*. Bulletin Statistic Science. No. 02/2008, p. 1.
3. Tang Van Khien. (2008) *Iterative analysis of interactive impacts between S&T activities and economic development through data of 84 processing industries Grade IV*. Bulletin Statistic Science. No. 03/2008, p. 1.
4. Nguyen Van Ban, Tran Anh Tuan. (2008) *Building the database of the socio-economic and science-technology fields for the three key economic areas*. Key ministerial level research task. Center for Regional Research and Development.
5. Tran Anh Tuan. (2013) *Research for evaluation of impacts from S&T advances to food production in Vinh Phuc Province*. Grassroot level research project. Center for Regional Research and Development.