

# Corruption, Political Stability and Efficiency of Government Expenditure on Health Care -- Evidence from Asian Countries

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## Abstract

This research explores the efficiency of government expenditure on health care by Asian countries and the impact of political factors on the efficiency. For Asian countries, it is of great importance for governments to convert the economic development to the improvement of residents' welfare and health condition. Though it is often said that political factors may affect the efficiency, their effects have not been clarified enough, especially in Asia. This research first calculates the efficiency score with Data Envelopment Analysis. After that, we explore the impact of political and other factors with regression. With the result of the calculation, the research found that the degree of corruption has a negative effect on the efficiency of health care expenditure, while stable political condition and democracy affects the efficiency positively, which suggests that anti-corruption measures, stable political conditions and democratic system are favorable for the improvement of the efficiency of expenditure on health care of Asian countries.

Keywords: corruption, political stability, efficiency, health care expenditure, Asia

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# 1 Introduction

Health care expenditure is an important field for the government in many countries. As of 2011, it accounts for approximately 15% of government expenditure on average in the world. With such a high proportion, the efficiency of government's expenditure on health care is also becoming increasingly important, because the budget of a country is limited, while the outcome of the health care systems needs to be improved. Therefore, it is crucial to examine the efficiency of such expenditure, so that countries could see their performance and make effort to improve the efficiency and allocate budget resource effectively.

Recently, political factors such as corruption, democracy and political stability are often recognized as the main factors to influence the efficiency. While the effect of political factors on economy (Salinas-Jiménez and Salinas-Jiménez 2007; Asatryan and De Witte 2015; Perotti 1996) or expenditure itself are researched, the political effect on efficiency is rarely examined. Therefore it is important to focus on the political effect on efficiency.

Related research on efficiency of expenditure are done by using various data from countries such as EU member states and OECD (Organization of Economic Cooperation and Development) members to developing countries. However, little research was done on Asian countries. These years, Asian countries have achieved rapid economic growth. On the other hand, these faces the aging problem. Therefore, governments of these countries have to find some effective ways to convert the economic growth to the improvement of citizens' living standards through efficient expenditure in fields such as health care. Moreover, good health care may help raise the quality of labor force, which facilitates further economic growth. Therefore, it is extremely important to measure the efficiency of the health expenditure of these countries and explore what factors affect it.

Given these situation, in this research, we try to answer: How do corruption, political stability and democracy influence the efficiency of government expenditure on health care in Asian countries? Are there other factors that also affect the efficiency?

This paper will use a non-parametric method- Data Envelopment Analysis to calculate the relative efficiency of a group of Asian countries, and attempt to measure the effect of various factors, including corruption, political stability and democracy.

The rest of the paper consists of 5 sections: the health outputs and the proportion of health care expenditure as well as their relation with corruption in Asian countries is overviewed in Section 2. Then, in Section 3, we review literature with respect to the effect of political factors and government expenditure efficiency. In Section 4, we describe the method to calculate the efficiency score- Data Envelopment Analysis and provide the result. In Section 5, we propose the hypothesis to test and estimate a Tobit model to clarify the effect of corruption, political stability and other political and socio-economic factors on the efficiency score. Section 6 is the conclusion of the research.

## 2 Efficiency of Government expenditure on health care of Asian countries

### 2.1 Health care output/outcome in Asian Countries

In order to measure the situation of health care output/outcome, we need to adopt appropriate indicators correctly. As widely accepted indicators that show the level of output/outcome of the health care system, we focus on four outputs/outcomes, which are life expectancy, infant survival rate, DPT and measles immunization rates. Table 1 shows the descriptive statistics and the coefficient of variation of the four outputs of 33 Asian countries<sup>2</sup> that are the objective of the research. It is shown that there exists disparity among countries.

Table 1 Descriptive statistics of health outputs (%)

	Mean	Standard deviation	Min	Max	Coefficient of Variation
Life expectancy	72.53	5.21	62.2	83.1	0.0718
Infant survival rate	97.76	1.64	93.17	99.78	0.0168
DPT immunization	91.19	9.52	50	99	0.1044
Measles immunization	90.1	11.3	40	99	0.12543

Source: calculation by the authors.

### 2.2 Relation between corruption and the efficiency

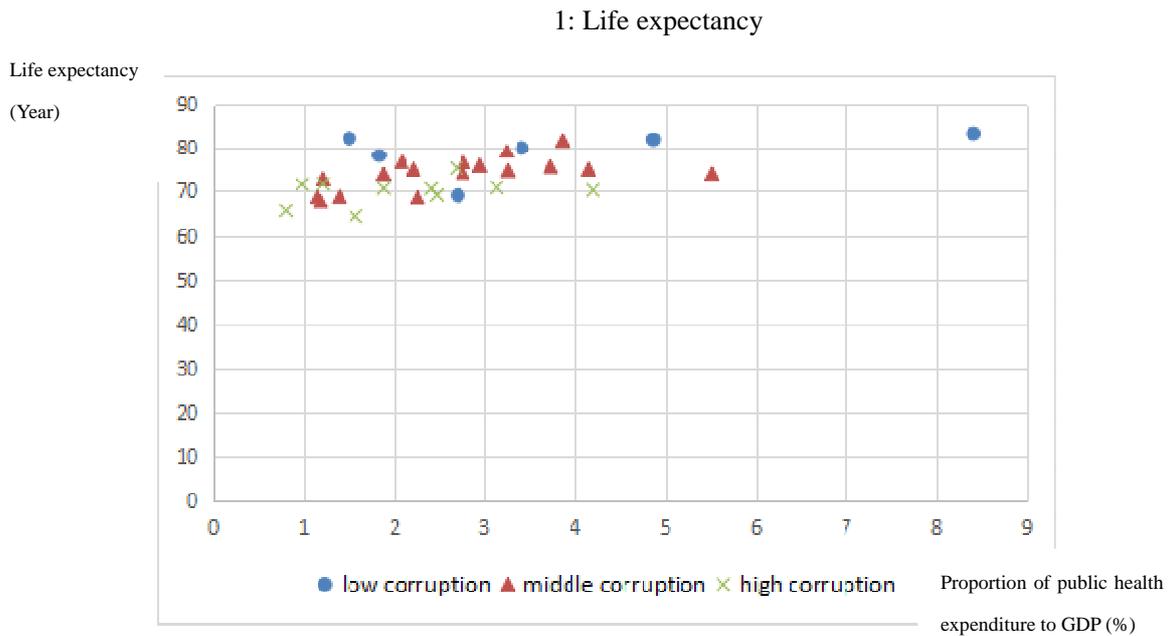
As discussed in Section 3 below, corruption may be one of the factors that have led to the difference of efficiency, because in Asian countries, corruption is one of the major problem that the health care system faces<sup>3</sup>. To examine this, we plot our outputs/outcomes mentioned above, which are life expectancy, infant survival rate and immunization rates of measles and DPT, with proportion of public health expenditure of the 33 countries in 2012 in Figure 1. We divided the

<sup>2</sup> These countries are: Armenia, Azerbaijan, Bangladesh, Bahrain, Bhutan, China, Cyprus, Georgia, Indonesia, India, Iran, Israel, Jordan, Japan, Kazakhstan, Kyrgyzstan, Korea Rep., Lao PDR, Lebanon, Malaysia, Mongolia, Nepal, Oman, Philippines, Qatar, Saudi Arabia, Singapore, Thailand, Tajikistan, Turkey, Uzbekistan, Vietnam, Yemen Rep.

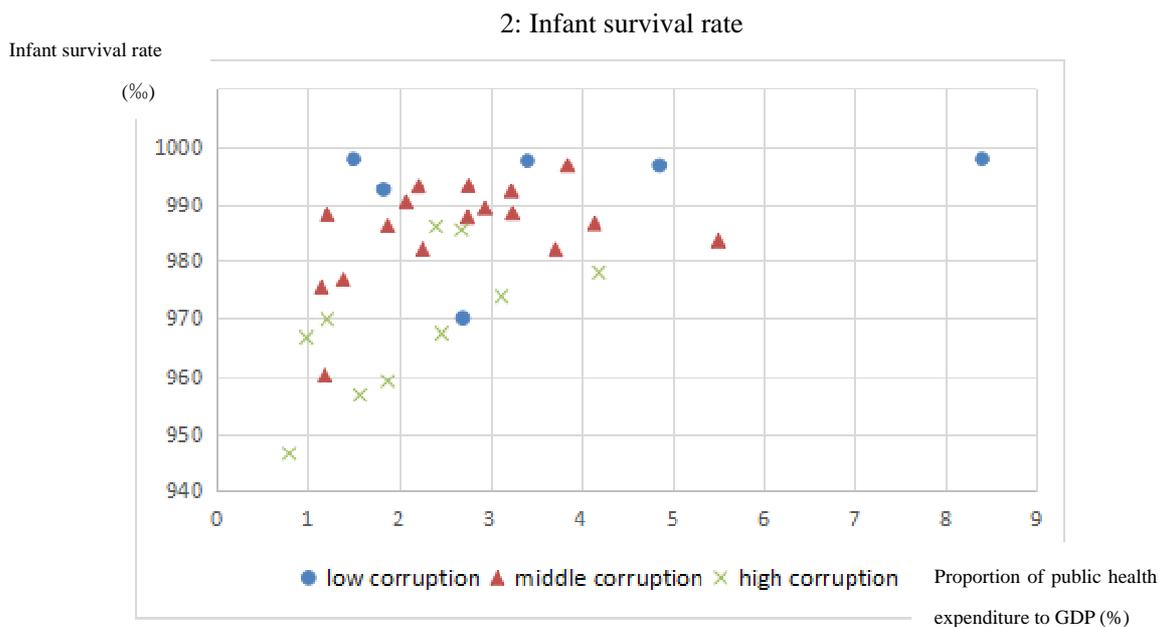
<sup>3</sup> For example, in China, in recent years, several cases of corruption were revealed. In 2006, Heping Hao, head of the department of medical equipment in the National Food and Drug Administration, got 50,000 yuan (about 7,200 dollars), one car and three membership cards that value approximately 500,000 yuan (about 72,000 dollars) as bribe. Hong Bai, a governor in the Health Bureau of Beijing, illegally took 4 million yuan (about 580,000 dollars) of public fund for personal purpose in 2011. In addition, Lanmao Xie, deputy head of the Health Bureau of Xingguo County, Jiangxi Province, illegally took 2.1 million yuan (about 300,000 dollars) of public fund for personal purpose in 2014.

countries into 3 groups according to the level of corruption perception, the value of the index of which are [0,3] (high corruption), [3,6] (middle corruption) and [6,10] (low corruption) respectively. We found that even under similar proportion of expenditure, the output of the low corruption countries tend to be better and the output of countries in the highly corruption group tend to be worse. This shows that the difference of efficiency may come from the different level of corruption.

**Figure 1 Health outputs and the proportion of public health expenditure to GDP, 2012**

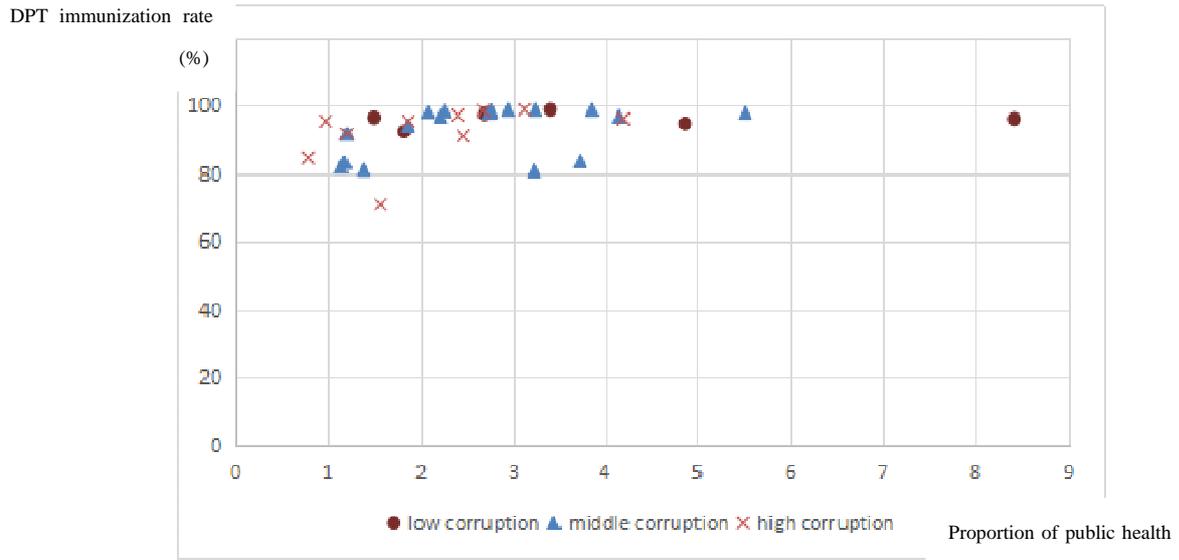


Source: calculation by the authors.



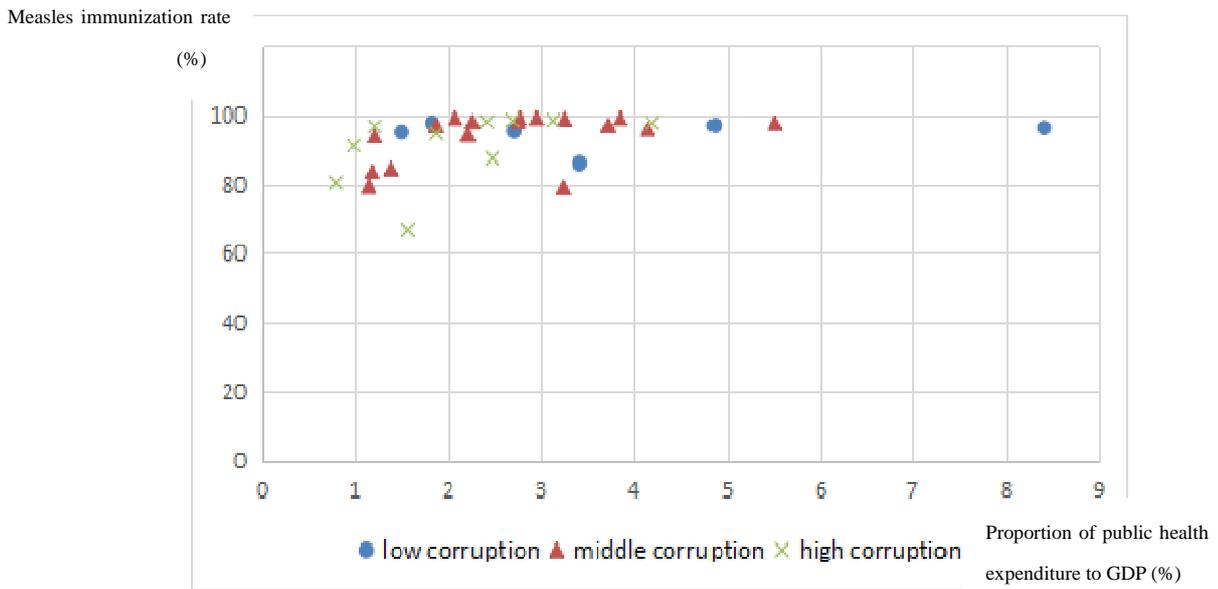
Source: calculation by the authors.

### 3: DPT immunization rate



Source: calculation by the authors.

### 4: Measles immunization rate



Source: calculation by the authors.

### 3 Literature review and Contribution

As countries develop, political situation become one of the key elements to determine the government behavior. One strand of research focus on the relationship between political factors such as corruption, political stability and democracy, and government expenditure itself. Corruption is argued to distort resource allocation in government expenditure and affect the expenditure on health care. Shleifer and Vishny (1993) claim that corruption reduces investments in high value projects such as health and education. Mauro (1998) finds that corruption is likely to reduce the expenditure on health care. Delavallade (2006) shows with examples of developing countries that corruption distorts the structure of government expenditure. The proportion of expenditure in total budget in sectors such as education and health is reduced. Factor and Kang (2015) also find that higher corruption decreases health expenditure as share of GDP. There are also research proving that corruption lowers the level of health outcome. For example, Azfar and Gurgur (2008) find that corruption decreases the health outcome such as immunization rates and the satisfaction of public health service. With respect to the relation between democracy and government expenditure, Kotera and Okada (2017) suggest that democratization increases expenditure on health.

Although previous literatures provide evidences that corruption causes distorted government expenditure structure and reduces health expenditure, most of them concentrate on the level of expenditure rather than the efficiency of health care expenditure. Given the limited fiscal budget under the aging society, the effect on efficiency should be examined, in addition to the effect on the level of expenditure. If efficiency can be improved, it is possible to achieve a higher level of health care service with less expenditure.

As another strand of research, there exist some research on the efficiency of health care expenditure.<sup>4</sup> However, these research do not consider the effect of political factors on the efficiency. In addition, these previous research focus mostly on developed countries. No research focuses on Asian countries.

Therefore this paper provides the following new approaches. Firstly, this paper is the first attempt to examine the political effect on the efficiency of health care. Secondly, this paper focus on Asian countries where improving efficiency is urgent. In the following, we evaluate the impact of political factors on the efficiency of health care, namely whether anti-corruption, stable political conditions and democratic system would potentially raise the efficiency of expenditure of these countries or not.

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<sup>4</sup> Gupta et al. (2001) measure the efficiency of education and health care expenditures of African countries. Afonso and St. Aubyn (2006i) use quantity inputs such as hospital beds per 10,000 people rather than the amount of expenditure to calculate the efficiency of health care expenditure of OECD members.

## 4 Efficiency of government expenditure on health care

### 4.1 Methodology

Data Envelopment Analysis is used for this research to calculate the efficiency of government expenditure on health care. It is a non-parametric method. For calculation, every country is regarded as a decision making unit (DMU). The efficiency scores range from 0 to 1. Graphically, the efficient units form a convex frontier, and other units locate under the frontier.

The method is used to solve a problem consists of several equations. When there are  $n$  DMUs, for the  $i$ -th DMU, DEA is to solve the mathematical programming problem that<sup>5</sup>

$$\begin{aligned} \text{Max } & \lambda_i \delta_i \\ \text{s.t. } & \delta_i y_i \leq Y\lambda, x_i \geq X\lambda, n1'\lambda = 1, \lambda \geq 0 \end{aligned}$$

$X$  is the input matrix while  $Y$  is the output matrix.  $\delta_i$  is the  $i$ -th DMU's distance to the efficiency frontier and the efficiency score. The constant vector  $\lambda$  are "the weights used to compute the location of an inefficient DMU if it were to become efficient"(Afonso and St. Aubyn 2006ii). The vector  $n1$ , which is  $n1$  is a  $n$ -dimensional vector of ones, and the associated restriction is to let the frontier be convex.<sup>6</sup>

### 4.2 Data

This research focuses on Asian countries, and the period of expenditure is from 2006 to 2012. As data is not available for some of these countries, we select 33 countries whose data for every variable is complete as the objective of the research.

#### Input for DEA

For conducting the Data Envelopment Analysis, we use the ratio of government expenditure on health care to GDP as the indicator for input. We call this "Ordinary efficiency". However it might be better to eliminate the effect of the different stage of aging society in each country. Therefore we additionally consider another type of efficiency, which is "Adjusted efficiency". Adjusted efficiency is calculated by equation (1) to eliminate the effect of aging which may raise the proportion of expenditure and cause biased result in efficiency score. (For example, Japan has a aging rate higher than 26%. This may cause high proportion on public health expenditure. When we calculate its efficiency, it may cause the underestimation of its efficiency. As oppose, other country may have high relative efficiency because of low proportion on public health expenditure with low aging rate.)

Adjusted proportion of government expenditure on health care to GDP

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<sup>5</sup> Refer to Afonso A. & St. Aubyn M. (2006ii)

<sup>6</sup> Refer to Afonso A. & St. Aubyn M. (2006ii)

$$= \frac{1}{1 + (AgingRate_i - AgingRate)} \times \text{non-adjustment proportion} \quad (i=1,2,\dots,33) \quad (1)$$

For the ordinary efficiency, we will take the effect of aging into account through adding aging rate as an independent variable in the Tobit model in the second step of the analysis.

### **Output/Outcome for DEA**

While for output, we use several indicators that are comparative among countries and are considered to be useful to measure the output/outcome achieved by health care services provided by governments. These indicators are life expectancy, infant survival rate, immunization rate of diseases such as measles and DPT. If the input, public health expenditure, is utilized efficiently with little loss to activities such as disease protection plan, introduction of high-quality medicine and medical equipment, and construction of public health facilities, the outcome above would perform well.

### **4.3 Result**

This research uses the input-oriented approach, by which we know the degree to which input can be reduced with the same amount of outputs, as the outputs here are considered to be limited to a range. Also, as increasing inputs does not necessarily raise the outputs by the same scale, we calculated the variable-return-to-scale efficiency score of the countries.

The result is shown by Table 3.

**Table 3 Efficiency scores of government expenditure on health care of Asian countries<sup>7</sup>**

**1: Ordinary Efficiency**

	2006	2007	2008	2009	2010	2011	2012
Armenia	48.01	45.51	72	88.13	79.98	78.64	85.64
Azerbaijan	100	97.46	100	77.82	100	100	100
Bangladesh	95.08	96.73	100	100	100	100	100
Bahrain	100	100	100	100	100	100	100
Bhutan	23.28	22.71	23.47	30.21	30.18	31.73	66.87
China	54.33	64.18	67.68	100	97.72	84.80	100
Cyprus	82.3	100	100	100	100	100	100
Georgia	82.94	65.91	59.69	57.42	55	72.99	100
Indonesia	98.13	84.82	89.93	100	100	100	93.69
India	77.81	86.89	70.93	81.17	89.43	81.66	77.92
Iran, Islamic Rep.	100	100	100	92.54	95.96	89.21	92.17
Israel	100	100	100	100	78.73	79.91	55.31
Jordan	34.30	27.24	25.37	30.01	34.39	32.18	35.26
Japan	100	100	100	100	100	100	100

<sup>7</sup> To show the efficiency scores clearly and for the convenience of research, the scores are multiplied with 100.

Kazakhstan	92.17	100	100	86.79	100	97.36	77.94
Kyrgyz Republic	59.13	52.09	72.53	53.27	49.29	47.55	41.53
Korea, Rep.	31.68	29.13	35.18	100	100	100	100
Lao PDR	75.34	92.78	82.34	53.33	80.81	100	100
Lebanon	26.73	25.71	35.65	45.04	47.76	46.35	42.77
Mongolia	76.94	45.01	41.01	63.18	76.72	85.10	100
Malaysia	49.76	48.70	61.99	65.33	59.98	63.04	72.29
Nepal	44.64	41.85	31.33	35.24	36.44	31.61	40.19
Oman	100	100	100	100	100	100	100
Philippines	67.56	69.85	70.59	72.71	69.67	83.66	78.56
Qatar	54.71	56.27	100	100	100	100	100
Saudi Arabia	49.06	58.70	78.39	75.34	89.9	76.16	70.65
Singapore	100	100	100	100	100	100	100
Thailand	68.56	72.35	100	88.72	90.59	74.46	90.69
Tajikistan	82.41	80.64	67.65	90.08	87.73	74.83	72.73
Turkey	39.36	31.76	31.81	38.52	40.08	41.13	39.45
Uzbekistan	75.12	64.03	59.92	87.83	93.46	83.23	94.2
Vietnam	50.09	37.27	59.6	70.86	50.99	49.9	40.96
Yemen, Rep.	56.79	65.31	52.69	74.15	79.51	67.62	56.61

Source: calculation by the authors.

## 2: Adjusted Efficiency

	2006	2007	2008	2009	2010	2011	2012
Armenia	49.73	46.88	74.93	94.05	86.35	85.31	91.21
Azerbaijan	100	95.33	100	78.51	99.58	100	100
Bangladesh	91.42	92.77	100	100	100	100	100
Bahrain	100	100	100	100	100	100	99.65
Bhutan	22.24	21.77	22.85	28.88	28.75	30.26	67.96
China	54.01	64.19	71.17	100	100	90.53	100
Cyprus	79.95	100	100	100	100	100	100
Georgia	91.32	69.69	63.59	61.33	58.57	77.40	100
Indonesia	96.02	81.68	88.09	100	100	100	88.18
India	76.50	83.71	70.03	81.52	89.72	81.98	76.46
Iran, Islamic Rep.	100	100	100	89.55	94.97	91.18	91.35
Israel	100	100	100	100	75.25	76.69	55.05
Jordan	34.10	26.80	25.22	30.23	34.40	32.14	35.65
Japan	100	100	100	100	100	100	100
Kazakhstan	97.39	100	100	90.66	100	100	80.41
Kyrgyz Republic	60.85	51.42	71.43	55.04	50.34	48.60	41.65
Korea, Rep.	31.94	29.40	35.60	100	100	100	100

Lao PDR	73.19	88.27	80.24	52.82	79.87	100	100
Lebanon	26.61	25.50	35.52	45.05	47.85	46.23	41.98
Mongolia	77.56	43.12	39.84	62.00	76.85	84.90	100
Malaysia	47.85	46.80	59.56	62.76	57.60	60.39	71.02
Nepal	43.38	40.16	30.97	35.28	36.50	31.68	39.32
Oman	100	100	100	100	100	100	100
Philippines	64.51	66.49	68.23	71.24	68.57	82.19	73.21
Qatar	51.81	52.31	100	100	100	100	99.19
Saudi Arabia	47.74	56.89	77.59	74.79	89.28	75.65	70.84
Singapore	100	100	100	100	100	100	100
Thailand	72.04	76.52	100	88.87	93.96	79.95	91.32
Tajikistan	79.38	76.76	66.80	86.36	83.87	70.99	69.02
Turkey	40.44	31.43	32.47	39.90	41.11	42.36	39.45
Uzbekistan	76.55	63.21	60.93	89.58	91.76	85.21	90.08
Vietnam	49.34	36.51	59.15	72.79	52.27	52.32	41.89
Yemen, Rep.	54.62	61.51	50.82	72.68	77.77	66.57	54.55

Source: calculation by the authors.

By the observation and calculation, Japan and Singapore are among the most efficient countries, which is similar to the result from Afonso and St. Aubyn (2004) where the efficiency of government expenditure on health care and education is calculated. Another country that is shown to have the highest efficiency through the whole period of observation is Oman<sup>8</sup>. Developed east Asian countries and some resource-rich middle-east countries have higher efficiency. For other countries, the health care expenditure reaches low outcome, in spite that the proportion of expenditure on health care to GDP has been still kept at a relatively high level. The governments of these countries need to raise the efficiency of relevant expenditure. For those countries that are not efficient, there might exist the reasons that may have caused the low efficiency score. In the next section, we explore these reasons, mainly focusing on political factors.

## 5 Effect of political and other factors on the efficiency

### 5.1 Hypothesis

In section 4, we have calculated the efficiency score of government expenditure on health care. In this section, we examine the political effects as well as the effects of other public governance and socio-economic factors on the efficiency. Based on literature and conventional theory, we propose the following hypothesis.

- **Hypothesis 1**

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<sup>8</sup> In the result of ordinary efficiency, Bahrain also has the highest efficiency through the whole period of observation.

**The system of anti-corruption positively affects the efficiency of the government expenditure on health care. Stable political conditions have positive effect on the efficiency. In addition, democracy contributes to higher efficiency.**

Political correctness is expected to substantially contribute to the flexibility of society. Through transparent public management by governments with less corruption, resources are utilized for their purposes and generate high outcome and efficiency. By contrast, if there exists corruption, particularly in fields of medical care and health, corruption may cause high transaction cost for enterprises to operate. For immunization, for example, this lowers the investment by vaccine companies, or even prevents those efficient companies from entering to the market of such a country, and thus leads to a poor quality of immunization, low immunization rate and low efficiency. Similarly, corruption might raise the cost for introducing high-tech medical equipment and reduce the utilization of such equipment, which worsens the quality of treatment, and prevents people from being treated properly. Then people's life quality and the efficiency of expenditure decreases.

Secondly, if political conditions are stable, the efficiency may become higher. Stable political conditions facilitate business and economic development, which contributes to the improvement of people's living standard as well as public health facilities and condition.

In addition, democratic institution allows people to participate in politics and the decision making process with respect to expenditure. People are also able to monitor the fiscal activities of government under such a system, so it may help improve the efficiency.

- **Hypothesis 2**

**Public governance, such as effective government and good rule of law, is beneficial to higher efficiency.**

The quality of governance by the government may affect the efficiency of the government expenditure on health care. An effective government that provides good public service and implements effective policy may contribute to higher efficiency. Also, if law and relevant system is satisfied, the efficiency might be higher, too.

- **Hypothesis 3**

**Socio-economic situation such as the levels of GDP, trade and citizens' education positively affects the efficiency of the government expenditure on health care.**

The outcome and the efficiency of health care expenditure also depend on a country's social situation and economy. A high level of GDP yields high income and developed facilities that raise the outcome, while trade and citizens' education improves transparency, creates innovation and facilitates the monitoring of government, which enhances efficiency. Therefore, economically developed, open and well-educated society may have higher efficiency.

## **5.2 Model and variables**

### **5.2.1 Model**

In order to estimate the effect of various factors on the efficiency of government expenditure on health care, we adopt the Tobit model because the values of the dependent variable, efficiency score, are located in an interval [0,1]. The model is widely used in two-stage analysis, and in this research, it is described as follows:

$$Efficiency_{ij} = F(\text{Corruption, political stability, democracy, governance factors and socio-economic factors, control variables}) + \varepsilon_{ij}$$

, where  $i$  denotes 33 Asia countries and  $j$  denotes the time period from 2006 to 2012.

### 5.2.2 Variables

As variables that may influence the efficiency score, we select several variables that reflect the political and socio-economic factors of these countries, referring to literature and based on the purpose of the research. These variables are as follows:

#### **Corruption, political stability, democracy and expected effects**

- **Corruption Perception**: The degree of corruption of a country is shown by the Corruption Perception Index. Corruption Perception Index has been calculated by Transparency International (TI). The highest score is 10 in the case with no corruption and the lowest is 0. When a large quantity of corruption exists, first, the funds for improving health-related facilities and other investment may be taken away by politicians and governors, or wasted in search for such politicians. This may cause less fund than reported, which means that less expenditure reaches the community (Delavallade 2006) and thus a poor outcome, which is reflected by a low efficiency score. Secondly, when corruption exists, enterprises spend much more time and cost in negotiating with the corrupt governors, so they may raise the price of their products in procurement as they had cost on corrupt governors, which increases the waste of public funds and lowers the efficiency. Thirdly, corrupt governors might use public funds on the purchase of the product of a company who gave the governors bribe, even if it has higher price or lower quality than its competitors, which also causes the waste of public funds. Therefore, this variable is thought to have a positive effect on efficiency.
- **Political Stability and No Violence**: This variable measures the stability of the political condition of a country. Such condition facilitates the implementation of laws and regulations. If a country is not politically stable, the change of political situation may cause conflicts among political groups and even citizens, as well as many other factors that worsen the social environment and put up the cost of anti-corruption actions. An unstable and violent society is harmful for people's living standard and enterprises' business. Generally, it is expected that stable political conditions are effective on raising the efficiency.
- **Democracy**: Under democracy, a country may have an established system to allocate funds efficiently, because people can use their rights to monitor the activities of government. Governors with better performance on utilizing the public expenditure may be elected. Therefore, democracy may improve the efficiency.

### **Public Governance factors**

- **Government Effectiveness**: It reflects the quality of public services and policy formulation and implementation by government. An effective government may be beneficial to the efficiency of its expenditure.
- **Rule of Law**: It measures to what extent the law and relevant system, particularly the court, the police, the protection of property rights and the enforcement of contract in a country is effective. Therefore, Rule of Law may improve the efficiency.

### **Socio-economic factors**

- **Population Density**: Large population density may facilitate the management of a country, and expenditure on public goods such as health care may have economy of scale. As a result, it may raise the efficiency score.
- **GDP per capita**: This variable reflects the level of development of a country. Countries with high GDP per capita may be more efficient, as high GDP generally means better economic environment, wide utilization of science and technology, complete law system and higher quality of lives of citizens. GDP per capita may have a positive effect on efficiency.
- **Trade**: we use the ratio of trade to GDP to measure how open a country is to other countries. Low degree of openness is thought to cause dictatorship, which provides “soil” for corruption and causes bad effects that decrease the efficiency.
- **Private Expenditure (on health care)**: This variable reflects the ratio of private health expenditure to total health expenditure. Citizens’ health condition may be improved through an advanced private system, where people care about their health and spend more to improve it. This may enhance the efficiency of government expenditure.
- **Aging Rate**: The amount and the efficiency of government expenditure on health care may also be affected by the degree to which a country is aging. In models where the dependent variable is ordinary efficiency with input as the proportion of public health expenditure to GDP without adjustment by aging rate, the proportion of aged population is utilized to control the effect of aging on the efficiency. Countries with high aging rate may have higher proportion of public health expenditure.
- **Sanitation**: Access to improved sanitation facilities is undoubtedly important to health. A clean environment helps prevent disease and improves the output of health care expenditure. We assume a positive relation between sanitation and efficiency.
- **Rural population**: It is utilized to control the effect of urbanization. In urban areas, people have better access to electricity, water, sanitation, as well as hospitals and even better medicine. While in rural areas, such environment might not be as good as urban areas, and people might suffer from low-quality facilities. Therefore, when there is a higher proportion of people living in rural areas, the efficiency of health care expenditure may be negatively affected.

As a result, we set the following regression model:

$$\text{Efficiency}_{ij} = \beta_0 + \beta_1 \text{CorruptionPerception} + \beta_2 \text{PoliticalStabilityandNoViolence} + \beta_3 \text{Democracy} + \beta_4 \text{GovernmentEffectiveness} + \beta_5 \text{RuleofLaw} + \beta_6 \text{PopulationDensity}$$

$$+ \beta_7 \text{LogGDPpercapita} + \beta_8 \text{Trade} + \beta_9 \text{PrivateExpenditure} + \beta_{10} \text{AgingRate} \\ + \beta_{11} \text{Sanitation} + \beta_{12} \text{RuralPopulation} + \varepsilon_{ij}$$

Data of corruption is taken from the Corruption Perception Report published by Transparency International. Data of democracy is UDS (Unified Democracy Scores) developed by scholars. Other data are from the database of the World Bank.

Table 4 shows the descriptive statistics of the data and the details of data source in the footnote.

**Table 4 Descriptive Statistics**

Variable*	Mean	Standard Deviation	Min	Max
Corruption Perception <sup>1</sup>	3.89	1.82	1.6	9.4
Political Stability and No Violence <sup>2</sup>	-0.45	0.92	-2.42	1.34
Democracy <sup>3</sup>	-0.087	0.79	-2	1.99
Government Effectiveness <sup>4</sup>	0.07	0.82	-1.28	2.43
Rule of Law <sup>5</sup>	-0.138	0.8	-1.41	1.77
Population Density <sup>6</sup> (thousand per km <sup>2</sup> )	0.42	1.21	0.0016	7.52
GDP per capita <sup>7</sup> (thousand dollars)	19.36	23.54	1.58	129.35
Trade <sup>8</sup> (%)	97.27	63.53	24.49	441.6
Private Expenditure <sup>9</sup> (%)	49.24	19.24	12.12	85.99
Aging Rate <sup>10</sup> (%)	6.46	4.11	1.02	23.88
Sanitation <sup>11</sup> (%)	81.25	20.88	31.5	100
Rural Population <sup>12</sup> (%)	41.48	23.81	0	84.5
Efficiency (Ordinary)	74.98	24.51	22.71	100
Efficiency (Adjusted)	75.05	24.67	21.77	100

Source: calculation by the authors.

\* Data Source:

1)Corruption Perception: Corruption Perceptions Index. Source: Corruption Perceptions Index, Transparency International.

2)Political Stability and No Violence: Political Stability and Absence of Violence/ Terrorism. Source: Worldwide Governance Indicators, World Bank

3)Democracy: Unified Democracy Scores. Source: <http://www.unified-democracy-scores.org/>

4)Government Effectiveness: Government Effectiveness. Source: Worldwide Governance Indicators, World Bank

5)Rule of Law: Rule of Law. Source: Worldwide Governance Indicators, World Bank

6)Population Density: Population Density. Source: World Development Indicators Database, World Bank

7)GDP per capita: GDP per capita, PPP (current international \$). Source: World Development Indicators Database, World Bank

8)Trade: the ratio of trade to GDP, the sum of “Imports of goods and services (% of GDP)” and “Exports of goods and services(% of GDP)” . Source: World Development Indicators Database, World Bank

9)Private Expenditure: the share of private expenditure on health care: Health expenditure, private (% of Total Health Expenditure). Source: World Development Indicators Database, World Bank

10)Aging Rate: Population ages 65 and above (% of total). Source: World Development Indicators Database, World Bank

11)Sanitation: Improved sanitation facilities (% of population with access) Source: World Development Indicators Database, World Bank

12)Rural Population: Rural population (% of total population) Source: World Development Indicators Database, World Bank

### 5.3 Estimation result

The result is shown by Table 5.

**Table 5 Effect of corruption, political stability, democracy and other factors on the efficiency of expenditure**

Variable	Y: Adjusted Efficiency				Y: Ordinary Efficiency			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Corruption Perception	6.613* (3.470)	6.295* (3.498)			8.032** (3.523)	7.493** (3.531)		
Political Stability	9.611*** (3.694)		9.284** (3.735)		8.551** (3.808)		7.847** (3.856)	
Democracy	10.39** (4.464)			8.782* (4.725)	9.371* (5.046)			6.284 (5.285)
Government Effectiveness	-14.07 (9.448)	-6.994 (9.222)	-2.684 (8.632)	-8.672 (9.484)	-14.20 (9.840)	-10.55 (9.863)	-5.478 (9.437)	-8.183 (9.875)
Rule of law	-10.64 (10.50)	-3.002 (10.67)	-1.641 (9.937)	2.489 (9.999)	-12.11 (10.70)	-6.287 (10.81)	-1.830 (10.13)	1.077 (10.22)
Population Density	36.65*** (10.00)	28.92*** (10.65)	35.67*** (10.18)	29.10*** (10.56)	45.32*** (12.17)	42.42*** (13.46)	45.98*** (12.82)	40.49*** (13.16)
Log GDP	37.19*** (6.605)	35.40*** (6.782)	33.07*** (6.382)	40.62*** (7.106)	38.26*** (6.935)	38.88*** (7.215)	36.89*** (7.096)	42.18*** (7.443)
Trade to GDP	-0.204*** (0.0746)	-0.200*** (0.0772)	-0.236*** (0.0748)	-0.175** (0.0782)	-0.148* (0.0843)	-0.101 (0.0868)	-0.143 (0.0874)	-0.100 (0.0874)
Private Expenditure	0.645*** (0.180)	0.627*** (0.190)	0.655*** (0.181)	0.542*** (0.190)	0.736*** (0.188)	0.695*** (0.196)	0.710*** (0.193)	0.633*** (0.199)
Aging Rate					0.229 (1.102)	1.333 (1.096)	1.137 (1.054)	0.864 (1.172)
Sanitation	0.507** (0.202)	0.410* (0.222)	0.415** (0.203)	0.459** (0.222)	0.449** (0.227)	0.285 (0.237)	0.301 (0.225)	0.341 (0.247)
Rural Population	1.187*** (0.291)	1.150*** (0.310)	1.016*** (0.288)	1.277*** (0.317)	1.166*** (0.301)	1.152*** (0.317)	1.037*** (0.305)	1.224*** (0.326)
Constant	-398.4*** (76.15)	-373.5*** (76.61)	-317.9*** (71.54)	-404.0*** (80.17)	-421.2*** (79.78)	-423.6*** (81.74)	-365.5*** (79.96)	-425.5*** (84.13)
Number of Observations	231							

(Note:  $\hat{\sigma}_\varepsilon$  is significant at 1% level .) Standard error is in parentheses. Source: calculation by the authors.

### **Results for Hypothesis 1: Corruption, political stability and other political factors**

We regressed with different models. In model 1~4, the dependent variable is the adjusted efficiency, the efficiency with input as the proportion of public health expenditure to GDP adjusted by aging rate. In model 5~8, the dependent variable is the ordinary efficiency, the efficiency with input as the proportion without adjustment. Aging rate is employed as an independent variable in model 5~8. The results of the two groups of models are similar with each other regarding the effect of corruption perception, political stability and democracy.

From the models, it is shown that the coefficients of “Corruption Perception” are significantly positive. This supports Hypothesis 1, and demonstrates that anti-corruption contributes to higher efficiency. Conversely, corruption is harmful to the efficiency of government health care expenditure. The more corrupt a country is, the less efficient its expenditure is. Corruption may cause less funds than reported to be put into the health care system. It raises cost for enterprises and transaction, and enterprises may convert the cost from corrupt governors to the high price in the procurement process where public funds are utilized. This lowers the efficiency.

In addition, the coefficient of “Political Stability and No Violence” is significantly positive. Stable political situation also enhances the efficiency. It prevents the harm of fluctuation, facilitates business and the development of economy, and helps people improve their living standard in a stable environment.

At the same time, the result shows that “Democracy” affects the efficiency positively. Under a democratic system, people have sufficient right to elect a government that achieves higher efficiency. The scrutiny system on the expenditure activities of government may also be well-constructed. People have sufficient information about the expenditure and they can participate in the decision making process of government expenditure. These enable the government to raise their efficiency and reduce the waste of funds.

### **Results for Hypothesis 2: Public Governance factors**

With respect to the public governance factors, the results show that they are not significant. The reason may be that although countries with effective government and high-quality law system tend to perform better generally, their performance in the field of public health expenditure is not affected significantly.

### **Results for Hypothesis 3: Socio-economic factors**

Some of the socio-economic factors, such as GDP per capita, have positive effects on the efficiency, which is consistent with the hypothesis. The results show that GDP per capita have positive effects on efficiency, so the developed social environment, advanced facilities in countries

with high GDP may have raised the efficiency of health care expenditure. Population density also affects the efficiency positively. Concentrated population reduces the cost and difficulty of government control. Expenditure in densely populated countries may have economy of scale, so the efficiency and outcome is raised.

The coefficient of trade to GDP ratio is negative and significant. The reason may be that health care is not directly related to the degree of openness, or openness did not create a transparent social environment to raise the efficiency.

The proportion of private health care expenditure affects the efficiency positively. Private expenditure plays an important role in the health care system. It helps people improve their health conditions and raises the efficiency of public expenditure.

The results show that the coefficient of sanitation is significantly positive, so exploiting sanitation facilities may create a better environment for people's health and raise the efficiency of public health expenditure.

Rural population is shown to affect the efficiency positively. The difference of the efficiency of government expenditure on health care between rural and urban areas may be not very large. Efficient use of funds in rural area may have larger marginal effect and improve the general efficiency of the expenditure.

## **5.4 Policy implication**

The result of our estimation enables us to provide some suggestions to raise the efficiency of health care expenditure for Asian countries.

First, government need to develop legal system for anti-corruption. This would prevent governors from taking funds for public use secretly, which causes waste of resource. It also encourages citizens' monitoring on whether the financial resource is efficiently used. If the funds are used for its original purpose, they may generate higher outcome through the health care system. The Corruption Perception Index is still low in many Asian countries, so there is enough potential for them to take anti-corruption actions and raise the efficiency.

Secondly, political stability is important to enhance the efficiency. Countries should keep their political environment stable and avoid conflict. Only under a stable political environment, a country develop its economy and health care service constantly. People would improve their living standard with respect to health care in such an environment, and enterprises would do their business without trouble, which yields high efficiency of expenditure.

Thirdly, democracy is shown to have positive effect on efficiency, so constructing a democratic system is important. A good democratic condition is beneficial to the monitoring of government activities. People are given sufficient information about the expenditure, and can take part in the policy making process with respect to expenditure. People's voice on policies can be heard by governors and be reflected on the change of policy rapidly. These contribute to the enhancement of expenditure efficiency.

Moreover, to continue the economic growth is also crucial. With economic development, the social environment around health care industry may be improved. Equipment with high quality and high technology may be put into use, and the quality and the output of health care also becomes higher. Therefore, a developed society that benefits from economic development also would help the government raise its efficiency of health care expenditure.

## 6 Conclusion

Health care expenditure is an important expenditure for Asian countries and it is needed to raise its efficiency. On the other hand, the effect of corruption, political stability and democracy on the efficiency needs examining. This research calculated the efficiency of government expenditure on health care of Asian countries with Data Envelopment Analysis, and explored how the factors such as corruption, political stability and democracy perform on it. We observed that wealthy countries, i.e. developed countries and some resource-rich countries have high efficiency scores, while the efficiency of other countries are still far from satisfaction. With the estimation, we noticed that the policy for anti-corruption has positive relation with efficiency, and democracy may be useful to increase the efficiency.

Therefore, countries which are not as efficient as the countries on the frontier may take advantage of anti-corruption policies in order to reduce the waste in government expenditure. They should also keep a stable political situation to ensure a good environment for development. Improving their democratic system contributes to achieving higher efficiency, too. Furthermore, economic development might be helpful for these countries to raise the efficiency, given that the level of economic development raises the efficiency as well.

For further research, it is required to improve the indicator of output/outcome of health care. We also noticed that it may be important to evaluate the quality of health care facilities as input.

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#### **Data Source**

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