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NANYANG TECHNOLOGICAL UNIVERSITY

SCHOOL OF SOCIAL SCIENCES

Aiming for the Cheap and Good:

How Different Healthcare System Types

Influence its Cost-Effectiveness?

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Abstract

The aim of the study is to compare and explain the performance of the different healthcare system types. Current academic research into healthcare system and healthcare rankings tend to be descriptive and lack a systemic analysis of the trends. Healthcare performance in this study refers to cost-effectiveness, which comprises the efficiency of translating monetary input into healthcare provision and the effectiveness of healthcare provision in delivering the health outcome. Through existing research, the healthcare system of 30 OECD countries and Singapore were classified according to the Rothgang-Wendt Typology. Indicators about their level of health expenditure, provision level and health outcome were collected from databases in WHO and OECD and compared with each other. The better cost-effective healthcare system tends to have state regulation, state provision with state or societal financing. This study provides lessons for the ideal healthcare configuration and advances research in linking typology to healthcare performance.

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A. Introduction

Today, there is no short of ranking on healthcare system performance. This feeds the need of countries worldwide who want to identify whom to learn from to better manage healthcare systems. Healthcare is an area of concern due to the ever-increasing cost which is projected to grow 4.1% annually in 2017-2021 (Deloitte, 2018). This increase in expenditure does not mean better health outcome. According to Bloomberg, the United States (US) was the second highest in health spending per capita but its life expectancy still lagged behind at least 25 countries and territories (Lee & Wei, 2018). This link between expenditure and outcome, otherwise termed as cost-effectiveness will be the main indicator of healthcare system performance in this paper.

There is a research gap among current cost-effectiveness rankings. Their usefulness is limited to identifying those that performed well in their indicators (Schneider et al., 2017; Schütte et al., 2018). The World Health Organization's (WHO) ranking in *The World Health Report 2000* was more useful for policy learning, as it generated policy lessons from high-ranking healthcare systems (WHO, 2000). But it was discontinued after the first report was released in 2000. Hence, this paper will address this lack of policy-relevant healthcare performance studies.

Additionally, healthcare system typology is getting more comprehensive in their description of healthcare system, but their empirical worth is not actively researched. Thus, to fill this theoretical gap, the approach of this study would link cost-effectiveness to the healthcare system types to see if there are variations in performance.

This paper argues that healthcare system typology has its empirical usefulness in understanding healthcare performance. The interaction of the actors in the dimensions of the typology, namely financing, provision and regulation, can shape the cost-effectiveness of healthcare. Ultimately, this paper is designed with both practical and theoretical aims, providing a description of high-performing healthcare system for policy-makers, and advancing typology studies for the academia.

The structure of the paper is as follows. Section B explore how comparative studies of healthcare systems had developed, with a focus on typology and outcome-based studies. This is followed by detailing the research design in Section C. Section D apply the typology classification on Singapore. Section E describe and interpret the results using national examples. Lastly, Section F conclude with implications for policymakers, comments for typology studies, limitations of this study and future research direction.

B. Literature Review

One focus of comparative healthcare research is healthcare typologies which categorizes healthcare systems. The first widely used healthcare typology was OECD's typology in *Financing and Delivering Health Care (*Burau, & Blank, 2006; Scheiber, 1987, pp.24). This typology separated the healthcare systems into three main types with variation in access to healthcare, financing methods and provider ownership. They are national health service type, represented by the United Kingdom (UK); social insurance type, represented by Germany; and private insurance type, represented by US.

Moran's (1999, 2000) typology formalized the use of regulation as one of the dimensions of healthcare system, alongside the more established financing method and provider ownership. Healthcare systems are classified according to "consumption", "provision" and "production". Consumption refers to the financing method and the actor who regulate access between the patients and providers. Provision refers to the actor who owns and regulate the providers. Production refers to the actor who regulates medical innovation. This created four healthcare systems: "entrenched command-and-control state" with the government controlling all three dimensions (UK); "supply state" with the private sector controlling all three dimensions (US); "corporatist state" with non-governmental actors, like the public-law bodies and doctors' association, controlling all three dimensions (Germany); "insecure command-and-control state" also has the government controlling all three dimensions but with more private intervention in provision (Greece).

Wendt, Frisina and Rothgang (2009) improved on Moran's typology by making the dimensions of healthcare system more distinctive through the grouping of the regulation indicators. The typology describes healthcare system according to three dimensions; namely financing method, provision ownership and regulation. Regulation consists of six indicators that governs the relationship between payer, service providers and patients (see Section D).

Each dimension is labelled with an actor that exert the most influence in it. Three actors are considered; state actor is government-linked, societal actor is usually related to non-profit and non-governmental organizations, and private actor usually refers to market actors and for-profit firms. Societal actors are considered as in between state and private; the government have no full control over it, but its behavior is typically not as self-interested as the market players due to the need as non-profit to consider both social and personal concerns (Wendt et al., 2009).

This Rothgang-Wendt typology creates an array of 27 potential healthcare systems. Ideal-types are those with a single actor controlling all three dimensions, which reflects the

classification in OECD and Moran's typologies. Mixed-type have two dimensions with the same actor. Completely-mixed type have different actor in each dimension. However, the flexibility in Rothgang-Wendt typology avoided the classification problem found in the other typologies when there are different actors across the dimensions (Lee et al., 2008). A state-regulated, societal-financed and state-provided, state-based mixed type cannot be classified by past typologies since it is not an ideal-type.

Böhm et al. (2013) further operationalized Rothgang-Wendt Typology by narrowing down to 10 healthcare types that have higher chance of existence. They assume that there are hierarchies within the dimensions and actors. Among the dimensions, regulation is decided first before proceeding to financing and provision. State actors are considered the strongest, followed by societal, then private actors. Once the actor for regulation is chosen, the choice of actors for financing will be restricted to those that are equal or less in strength. If the preceding actor is weaker than the succeeding actor, the former is unlikely to exist. They managed to classify 29 OECD countries, with the exception of Slovenia, into five out of their 10 healthcare system types (*Table 2*). For state-based type, there are National Health Service (NHS), and National Health Insurance (NHI). For societal-based type, Social Health Insurance (SHI) dominates. Only one country is private-based type. For completely-mixed type, Etatist Social Health Insurance dominates. Slovenia was classified as an implausible social-based mixed type because its state provision should not have existed with societal financing.

However, there is a lack of research into the link between healthcare system typology and health outcome (Marmor, & Wendt, 2012; Powell, 2007). Most typology studies remain descriptive without exploring the impact of the differences. Policy lessons will also be harder to derive as there is no criteria to judge and rank the healthcare system type.

Even if there is the use of typology, early health outcome studies relied on non-healthcare typology. For example, Conley and Springer's (2001) researched on the association between healthcare spending and infant mortality using welfare state typology. Academics usually voice caution over the use of welfare state typology for comparative healthcare studies (Alber, 1995; Bambra, 2005; Moran, 2000). They argued that welfare state typology is fundamentally different from healthcare system typology as the latter's relationship with provision is not captured in the former.

One of the closest research attempts to link healthcare system typology with performance was done by Wendt & Kohl (2010). However, the performance over here refers to real input and not health outcome. Their research identified trends between monetary and

real input of NHI, SHI and private-based type. For example, societal SHI had higher provision while NHI had lower provision with lower cost. They picked their performance indicators according to the Healthcare Production Process (*Figure 1*) which was created by them in an earlier paper (Kohl & Wendt, 2004). Here, health expenditure is the monetary input that is transformed into healthcare provision. Provision are the real input that directly meets the health demand. Through their service, real input will then be transformed into real output which refers to both quantity or quality of healthcare services. This first three steps are influenced by the structure of the healthcare system (e.g. politics, policies and regulation). If this process runs smoothly, it should lead to a good health outcome. As such, the indicators measured in this process is a good proxy for healthcare performance.

While it is progress to see the use of healthcare system typology in Wendt & Kohl's (2010), it lacked explanations about the impact of the various actors in the typology and the possible inter-relationship between financing, regulation and provision. This is also the gap that this paper would cover.

C. Methodology

First, this paper built on the healthcare system classification done by Böhm et al.'s (2012, 2013). In total, 31 countries were included, with 30 OECD countries from Böhm et al.'s (2013) classification and Singapore. This paper did a separate classification for Singapore using the Rothgang-Wendt Typology found in Böhm et al. (2012, pp.14-18).

Second, data about Wendt & Kohl's (2010) Healthcare Production Process were collected (*Figure 1*). This study considered the first three elements of the process, monetary input, real input, and real output.

Total health expenditure as a percentage of Gross Domestic Product (GDP) was used as a main reference for monetary input. Expenditure on a per capita basis and government's share of the expenditure were used as supporting evidence. Data from WHO (2013) Global Health Expenditure Database were used for monetary input.

A Healthcare Provision Index was calculated for real input, which included the density (number per 1000 population) of hospital bed, nurses, physicians, dentists, and pharmacists from 2013 OECD data unless otherwise stated in *Table 1* (OECD, 2018c). For occupations, only those still in the labor force delivering care are included (OECD, 2017, pp.152,160,190). The indicators and the index calculation are adapted from Kohl & Wendt (2004). Each density datapoint was compared to its indicator average by using the former to minus the latter, and the positive or negative difference was then converted as a percentage of the average. The resulting percentage is added to 100. As the average was given the value of 100, values above 100 means above average and below 100 means below average. The overall index was created by averaging all the five indicators of each country.

Health outcome was used as a proxy for real output as provision is only meaningful if it can deliver better health for the patients. OECD's Health Care Quality Indicators project (HCQI) was chosen as all the countries in this study contributed to its database, hence allowing for international comparison (OECD, 2018a). Only HCQI indicators that have most of the countries in this paper were considered. Six indicators from the year 2013 met this criterion; half from primary care and another half from acute care (OECD, 2018b). Missing data is supplemented by external data (*Table 1*). Primary care indicators are concerned about admission rate of chronic illnesses (number per 100 000 population), namely asthma, chronic obstructive pulmonary disease (COPD), and diabetes. Primary care should have been sufficient to treat and prevent it from advancing towards the more expensive hospital (acute) care (OECD, 2017). Acute care indicators consist of mortality rate (number per 100 patients) within thirty

day after hospital admission for three life-threatening diseases, namely hemorrhagic stroke, ischemic stroke and acute myocardial infarction (AMI, i.e. heart attack). Thus, the lower the admission rate and mortality rate, the better the care quality. The method of converting the indicators to a Healthcare Quality Index is similar to Provision Index; the only difference is that the average will minus the indicator datapoint. This would create an index that above 100 means lower rate and better than average outcome, below 100 means higher rate and worse than average outcome.

Third, two sets of comparisons between healthcare system types was done: 1) The effect of actors in each element of the healthcare production process, 2) the effect of actors and regulations on the relationships between the elements. Relationships include the efficiency of the amount of expenditure used to purchase or employ the providers; the effectiveness of providers translating their care into health outcome; and the cost-effectiveness of the expenditure in realizing outcome. The two-by-two matrix (*Table 4*-Table *6*) that was used for the second comparison was adapted from Kohl & Wendt's (2004).

Finally, to contextualize the quantitative results, further explanations for the impact of actors on the healthcare process elements and the three relationships were done using case studies of government policies and market actions.

D. Singapore's Classification

As of 2013, Singapore's healthcare was financed mainly by private means, taking up 52.3% of 2013 health expenditure (out-of-pocket:35.7%; private insurance: 2.4%; others:14.2%) (WHO, 2013).

As of 2013, healthcare provision in Singapore remains firmly in the state's hands. Singapore's inpatient care is dominated by the public sector with 78% of hospital beds in public hospitals (Singapore MOH, 2017c). It is the reverse for primary care as 80% of its demand is handled by 1,600 private General Practitioners (GPs) Clinics (Singapore MOH.,2018b). As for specialists, 65% of them is employed by the public sector (Singapore MOH, 2017b). On the other hand, majority of dentists lies in the private sector (72%) (Singapore MOH, 2017a). The share of pharmacists in the public sector (49%) is similar to that of the private sector (51%) (Singapore MOH, 2017e). Given that the inpatient and specialist care tend to be more expensive than dentistry or primary care, hence taking larger share of the health expenditure, the state's high involvement in the inpatient and specialist care would mean healthcare provision is state-dominated.

According to the five components of healthcare regulation considered by Böhm et al.'s (2012), Singapore has both state and private characteristics.

First, given the importance of private financing, private actors decide the financing landscape in Singapore.

Second, providers face state regulation when entering the healthcare market. All public and private health institutions are regulated under the Private Hospitals and Medical Clinics Act to ensure the quality of healthcare (Tan et al., 2016, pp.96). Each licensed institution is given a renewable two-year operating right but subjected to quality inspections. Lapses in quality control can result in the shortening or revocation of the licence (Tan et al., 2016, pp.96).

Third, remuneration of service providers has a mix of state and private characteristics. Remuneration in the private sector is typically set by the providers itself. For example, the private physicians in Parkway Pantai Model are considered as independent contractors and not employees of the hospital, hence setting fees becomes the responsibility of the physicians (Lim, 2013, pp.170). Even in some public hospitals, specialists can derive a portion of their salary by deciding on the percentage of surcharge to apply on non-subsidised patients' bill (Lee & Satku, 2016, pp.27-28; Lim, 2013, pp.165). However, the state retains its presence in the remuneration to contain cost. For instance, public hospitals have to provide the number of subsidised and

non-subsidised ward classes as prescribed by the state (Haseltine, 2013, pp.68). To break-even, public hospitals must ensure that the cost cannot exceed the government subsidies tied to the ward class and the government-prescribed patient's co-payment rate (portion of cost paid by the patient) (Lai, 2016, pp.91).

Fourth, access of patients to service providers also has both state (gatekeeping) and private (free choice) characteristics. Under gatekeeping, access to specialists is only possible after referrals by GPs (Greenfield, Foley & Majeed, 2016). While patients in Singapore can freely choose the type of providers and directly visit the specialists, subsidies for specialist care are only given to patients with referrals from GPs (Tan, 2013).

Fifth, the state is responsible for determining the content of the benefit package. Although Singapore healthcare system relies much on private financing, the state can greatly influence this percentage by regulating the state-based healthcare schemes. If the state wants to reduce out-of-pocket payments, it can increase the type of treatments covered by Medishield Life (public health insurance).

Therefore, it can be concluded that, while financing and provision is private-based and state-based respectively, healthcare regulation in Singapore is more complex as state and private characteristics more or less balanced out instead of being dominated by one actor. With the combined classification list of healthcare system types (*Table 2*), comparison between types can now be done.

E. Results & Discussion

E.1. Description of Relationships

There are three ways to describe efficiency, effectiveness and cost-effectiveness. The most desirable case is when there is a reversal of the intensity of the process elements in the positive direction. For example, when lower than average expenditure produces a better than average outcome, it can be described as "positive" cost-effectiveness. When the reversal goes opposite into the negative, from higher expenditure to poorer outcome, it can be termed "negative" cost-effectiveness.

If there is no reversal in intensity, either from lower expenditure to poorer outcome or from higher health spending to higher outcome, they are considered as "neutral" as it could be achieved most of the time. Evidence from *Table 4* to *Table 6* seems to imply that such situation is common as the majority of the countries can be termed "neutral" for cost-effectiveness, efficiency and effectiveness; though the majority is more pronounced in efficiency (20 countries) and effectiveness (21 countries).

A separate correlation for these neutral relationships was calculated to identify possible association between the production elements. Positive and negative relationships are considered as outliers and assumed to deviate from the neutral relationships because of policies and context.

E.2. Effect of Actors on Monetary Input

As compared to state or societal actors, private financing appears to have the strongest effect in pushing down the monetary input. Singapore maintained its healthcare system with an extremely low level of health expenditure (3.7% of GDP), the second cheapest, completely-mixed type, had twice the percentage (*Figure 2*). Additionally, its total health expenditure per capita is the second lowest (Int$3048.90, *Figure 2*). Since the uniqueness of Singapore lies in its reliance on private actors for financing (53.3%), the downward effect of private financing on expenditure could therefore be concluded (*Figure 3*).

Yet, there is an anomaly in USA's healthcare system. Though it is also privately financed, its total health expenditure was the highest, whether as a percentage of GDP (16.3%) or on a per capita basis (Int$8634.60) (*Figure 2*). This anomaly could be explained by the following two observations.

Firstly, the different composition of USA and Singapore private financing. The majority of Singapore private financing existed as out-of-pocket (35.7%) while that of US was voluntary health insurance (34.6%) (WHO, 2013). Moral hazard in insurance is well-

documented in health economics; since insurance decreases the healthcare cost to the individual, it reduces the need for the patients to optimize their healthcare usage, thereby increasing consumption of health services (Pauly, 1968). The seminal RAND Health Insurance Experiment in the 1970s compared the healthcare spending between families which was given insurance plans with different co-insurance levels. It was concluded that the lower the co-insurance level, which meant that families had to pay less, the higher the chance of the family spending on healthcare (Einav & Finkelstein, 2018). Though the experiment was based on insurance, there are patients in treatment group who received free healthcare (0% co-insurance).

Thus, the findings can be extended to state-financers who use tax-financed system, which allows the patients to enjoy free healthcare with minimum co-payments. (Cylus et al., 2015, pp.54). It can be concluded any financing that weakens personal responsibility and allows the patients to feel that the healthcare is inexpensive, regardless tax-financed (state-based) or insurance-based (societal based/private-based), can have an uplifting effect on monetary input. Indeed, almost all other types had their total health expenditure as a proportion of GDP and per capita basis higher than that of Singapore (*Figure 2*).

The second observation to explain the anomaly is the private actors in regulation in US. Even though Singapore also had some private regulation, it has significant state intervention. Private actors in regulation might make containing health cost harder. Economic individualism is considered as the bedrock of the private market and actors within tend to be pursing their own economic interest (Bozeman, 2007, pp.3-5). Their economic interest could clash with the public interest of health cost containment.

For instance, the high cost of pharmaceutical products in USA illuminates on the disadvantages of private regulation. According to the OECD, spending on prescription drugs per capita grew to US$1011 by 2015, surpassing nine other developed nations by 30 to 190 percent (Sarnak et al., 2017). While the high drug prices are typically justified as reward for investing in experiments with high risk of failure, tension continues to exist between incentivizing the research of the next cure and maintaining reasonable drug pricing for financial sustainability.

The US government is laxer in the price regulation of the pharmaceutical companies, giving market power to the latter to set prices. In contrast, EU nations use various state regulations like negotiations with pharmaceutical companies. Negotiations is about creating a mutual agreement between the financer and the drug company about the price level. State-regulated France and Italy used their monopsonist power as the single purchaser of drugs, to

persuade the pharmaceutical companies who hold the monopoly rights of patented drugs, in accepting a decrease in prices for market access (Kanavos et al., 2011, pp.37).

While such negotiations are common in the US private sector between the pharmaceutical companies and private insurers, but not so for the largest drug customer, Medicare which is a government insurance for the old and disabled that alone took up 29% of pharmaceutical spending in 2016 (Cubanski, & Neuman, 2016). After the lobbying from pharmaceutical companies, legislators banned Medicare from negotiating for lower drug prices on behalf of the private insurers administering the drug insurance portion of Medicare (Kesselheim, Avorn & Sarpatwari, 2016). This decreased the negotiating power of these private insurers during their own negotiations as their market share is smaller than the whole of Medicare. Cost savings from negotiations could be substantial. Smaller public insurance programs like Medicaid receive law-sanctioned discounts from pharmaceutical companies and can negotiate for even more discounts (Blumenthal & Squires, 2016). As a result, drugs for Medicaid are around two-third of Medicare's drugs (Cook & Stocking, 2014). This further proves the that cost-containment is stronger when the state intervenes.

State regulation can also explain the unique case of completely-mixed type and Slovenia achieving frugal standard like Singapore, even though they have societal financing. Though Slovenia is societal regulation, its state and societal actors in regulation are on similar strength instead of being dominated by societal actors or mixed with private actors like other social-based type (Böhm et al., 2012). This affirms the above observation that state regulation can have a downwards effect on cost.

On the surface, private provision appears to be costlier than state provision. Privately-provided USA and SHI spent more than publicly-provided Singapore and Slovenia respectively (*Figure 2*). Yet, the ownership of provision might not as important as that of financing and regulation. Completely-mixed type tends to have lower expenditure even with private provision. Additionally, NHI and NHS had similar total health expenditure as percentage of GDP and per capita even with different provision ownership (*Figure 2*).

Indeed, this observation is corroborated by research in the productivity differences of hospitals under different ownership. Due to agency theory, property rights theory, public choice theory, it is assumed that private ownership will allow market discipline and competition to drive cost-cutting measures in order to remain profitable (Tiemann, Schreyögg & Busse., 2012). However, empirical studies on such behavior reached mixed results as seen in the meta-analysis of 12 research articles about European hospitals by Kruse et al. (2018). Kruse et al. (2018)

found out that at least half of the articles concluded public hospitals were as productive or better than private hospitals. Being public may not limit the hospitals' ability to produce services using the least amount of resources. Furthermore, these articles also concurrently pointed the significant effect of the reimbursement method for providers (component of regulation). For instance, one article studied on Austria and Germany's hospital's efficiency showed opposite results; Austrian private hospital was more efficient than its public hospital but vice versa for Germany (Czypionka et al., 2014). As compared to full funding in Germany, only slightly more than half of the Austrian private hospitals' running costs are covered by the social insurance fund and the state, while the rest is covered by the hospital. Furthermore, the state funding is not guaranteed as the state prefers funding the public hospitals. Hence, private hospitals are incentivized to be more efficient as cost have to be limited for revenue to cover the remaining cost. Since the effect of private provision on cost can be affected by type of regulation, provision can be considered secondary.

This leaves societal actor in regulation unranked. So far, private regulation is shown to be weaker than state regulation. It is likely that the strength of societal regulation to bring down cost is in between private and state regulation. Based on *Figure 2*, SHI with its societal regulation had lower total health expenditure as a percentage of GDP and on a per capita basis than private-based but higher than that of state-based type. SHI typically delegate the power of healthcare regulating to the non-state actors, usually non-profit organizations that represent the various interest groups. The state is usually less interventionist in SHI than the state-regulated types, and act as a supervisory role over the societal actors while providing the legal framework for the societal regulation to exist (Altenstetter, 2003; Busse & Blümel, 2014, pp.59).

This presence of the state could make societal arrangement stronger than private regulation in controlling cost as the government has the option to intervene more if needed. Like the private actors in private regulation, there is a chance that personal interests overtake country interests. Only the state who has the highest authority and amount of resources can correct it. In the 1950s to 1970s, the various associations collaborated to block the cost-containment efforts by the German Government (Busse & Blümel, 2014, pp.33). These trends were only reversed when the 1973 oil crisis made the health cost unbearable, leading to the enacting of the 1977 Health Insurance Cost-containment Act by the German Government (Busse & Blümel, 2014, pp.33). This example also highlighted the weakness of the societal regulation as compared to regulation with state actors. Societal regulation introduces more veto players who can potentially obstruct the policy-making process. SHI have to either wait for the right policy window or put in more effort to get buy-in from stakeholders.

E.3. Effect of Actors on Real Input & Analysis of Efficiency

Contradictory observations are seen in provision, regulation and financing. State provision in NHS yielded higher level of provision but lower levels in state-provided Singapore and Slovenia (*Figure 4*). Similarly, private provision in SHI had less provision, yet private-provided NHI, USA and completely-mixed showed otherwise (*Figure 4*). State regulation in NHS had more provision than that of NHI, completely-mixed and Singapore. Societal regulation also showed differing levels of provision with SHI higher than Slovenia. State financing in NHS led to more provision than that of NHI. Societal-financed completely-mixed and Slovenia also lack behind SHI in provision.

The only observable trend is that private regulation and financing tend to give lower level of provision as seen in USA and Singapore (dual-actor regulation), which are explained when efficiency is analyzed.

Given that most nations attained neutral efficiency, either lower expenditure-to-lower provision or higher expenditure-to-higher provision, it could be theorized that the amount of expenditure is somewhat linked to the size of the healthcare industry (*Table 4*). This is further supported by the statistically significant, strong positive correlation between expenditure and provision for neutral efficiency countries (0.77; *Table 7*). Ultimately, part of the total health expenditure will flow towards the occupations or infrastructure included in the Healthcare Provision Index. This could explain why frugal types, like Singapore, Slovenia and completely-mixed are concentrated in the "lower spending-to-lower provision" category (*Table 4*). Their lower health expenditure could not support more provision as providers have to share a smaller pool of money. The converse is also true for high-spending types as SHI and NHS dominate the "higher spending-to-higher provision" category (*Table 4*).

For countries that attained negative efficiency, from higher expenditure to lower provision, there are two possible reasons to explain the failure of translating money into provision.

Firstly, money could flow to other actors which are not included in the Healthcare Provision Index. Hence, expenditure can flow to those who are not providing direct care. While they are necessary to keep the healthcare system running, US provides a case study on how excessive monetary wastage could happen.

USA's private provision allows more private players into the healthcare system, yet its private regulation means that the state does not have sufficient means to coordinate all the market players. As the private players coordinate among themselves individually, this

inevitably create complexity and administrative burden. Each private plan and state-based insurance comes with its own unique characteristics, like the level of coverage, deductible and billing procedures (Frakt, 2018; Morra et al., 2011). Consequently, this complex arrangement translates into lesser time to provide service and higher transaction cost. As compared to their counterparts in USA, small physicians' practice and their nursing employees in state-financed Canada only need to spend one-fourth and one-tenth of the time respectively to interact with a single-payer (Morra et al., 2011). USA would have saved $27.6 billion if the interaction cost with the payer is the same as Canada (Morra et al., 2011). These transactional wastes could have been redirected to recruit more providers.

Secondly, provision-side policy mismanagement can reduce the provision level. Even with a large pool of expenditure for potential providers to claim, they can be unwilling to grab a share if discouraged by poor government policies. An example is Ireland's management of publicly employed acute physician. Ireland's healthcare system has always faced issues in retaining their locally-trained doctors, as seen from their dependence on international doctors was the third highest among the OECD countries (Merçay, Dumont & Lafortune, 2015). Ireland-trained physicians have a practice of migrating for overseas to hone their skills before they can be promoted to a consultant (specialist) when they return to Ireland (Humphries et al., 2017). The shortage of physicians was exacerbated during the 2008 recession when the high pay of the past was no longer sustainable. The resulting government austerity measures reduced healthcare cost by cutting the number of healthcare employees and hospital beds by 13% and the wages of new consultants by 30% (Humphries et al., 2017). Physicians who survived the austerity faced more workload due to the reduced staffing level (Humphries, Crowe & Brugha, 2018). The decrease in pay further incentivized the Irish doctors to stay and work overseas. Though Ireland has a higher than average health expenditure to support a larger provision, the weakness of staff attraction and retention hindered the expansion.

Ireland's case also highlights the issue of government failure. Like market failures, government has its own sets of flaws (Wu & Ramesh, 2014). Though a government usually has the most resources in the society, their revenue sources can fluctuate according to the economy and hence not a given (Wu & Ramesh, 2014). As such, fiscal sustainability must not be overlooked. Additionally, the Irish government was not flexible enough to adapt their physician management in time to the new context. This flexibility is usually the strength of the market which has a clearer target to aim (efficiency/profits) (Wu & Ramesh, 2014). Reforms that target the root cause of the doctor shortage was also not enacted before the recession, like reducing the need to go for overseas training.

In contrast, the favorable labor conditions for provider recruitment and retention can boost efficiency. As the best performing positive efficient country, Norway's inflow of medical workforce into the country is larger than the outflow to overseas, which is due to attractive renumeration, and lower chance of unemployment (Ringard et al. pp.91). These conditions are lacking in some lower provision nations like Poland who face healthcare worker emigration. Polish healthcare workers cited low wages, exacerbated by limited career development which limits wage growth, as reasons for emigration (Kautsch & Czabanowska, 2011). Norway was also able to better facilitate the inflow of migrants. Norway has a public institution called Aetat that manages the entire recruitment process of foreign nurses for Norwegian employers and even provide language training to facilitate ease of migration (Buchan, 2006, pp.53). This gives Norway market power as the demand to enter their workforce is high. This might maintain wages within tolerable level, with respect to the economy, as Norway need not keep rising wages to attract new employees. This allows Norway to achieve both cost-containment and higher provision at the same time.

However, level of expenditure might still be more significant as all positive efficient countries, except Norway, still have lesser level of provision than the majority of the countries in the "higher spending-higher provision" category (*Table 4*).

E.4. Effect of Actors on Outcome & Analysis of Effectiveness

Financing and regulation by state and societal actors did not produce consistent outcome. NHI was unable to achieve the higher level of outcome of NHS despite both being state-financed (*Figure 5*). Also, Slovenia managed to achieve a better than average outcome, but completely-mixed had poorer outcome while SHI had a mixture of both outcomes. Similarly, state regulation is associated with either poorer outcome in NHI and Singapore, or better outcome in NHS and completely-mixed. Also, societal regulation showed an unequivocal better outcome in Slovenia but a mixed outcome in SHI. This inconsistency could be explained by the ability of the state and non-state actors to either promote public welfare or decrease it through government and market failure.

Despite the chance of government failure, state intervention is still important in the healthcare industry. State provision tends to give better outcome than private provision. Though the anomalous state-provided Singapore has poorer than average outcome (lowest), it was mainly due to the extreme underperformance of primary care indicators (*Figure 6*). Unlike acute care, Singapore's primary care is dominated by the private sector. Most primary care clinics are managed by one physician, hence making the primary care industry more fragmented

than the state-provided inpatient care (Lee & Satku, 2016, pp.23). It should be easier to maintain quality control if the providers are directly employed and coordinated by the state.

Additionally, private financing and regulation in Singapore (dual-actor regulation) and US tend to give poorer outcome. Thus, it might imply that government's high regulatory power and societal actors' dominance over the insurance market can be used to address the market failure in outcome. Information asymmetry is prevalent in the healthcare industry as decisions have to be made under unclear conditions (Arrow, 1963). For example, patients typically do not know about the medical services more than the physicians. Patients might agree to all the treatments suggested without questioning due to the knowledge gap. This provides opportunity for overcharging and overdiagnosis of healthcare. This leads to healthcare wastage as the extra treatments might not improve outcome. Thus, private actors could either succumb to their private interests or might be too fragmented to correct the market failure.

As providers in the Provision Index deliver healthcare directly to the patients, they have a direct impact on the health outcome. As with efficiency, majority of countries are of neutral effectiveness (*Table 5*); the more the provision, the higher the healthcare quality. Therefore, a proportionate relationship exists between real input and outcome. This can be seen as "quantity effect".

One kind of non-access is geographic-based, especially relevant for countries with sizable rural population. Rural areas tend attract less physicians and medical infrastructure due to the low economic incentives in serving an area with low population density (Ono, Schoenstein & Buchan, 2016, pp.133). If providers are too far, this lowers the chances of visiting the provider for treatment. When unable or unwilling to access health providers, patients might delay their diagnosis and treatment or miss out on preventive health. This might lead to poorer health at the onset which can affect health outcome for medical treatment negatively (Prentice & Pizer, 2007). As such, having higher level of provision can reduce the risk of unmet healthcare needs.

However, the correlation between provision and outcome for neutral effective countries is weaker than that of efficiency, with only a statistically significant, moderate positive relationship (0.63; *Table 7*). Even when all countries are included, correlation remains in the moderate range (0.43; *Table 7*). Hence, there could be more difficulty in achieving better outcome with mere increase in provision level. Outcome is likely affected by provision quality ("quality effect").

Quality problems occurs when medical care is not fully translated to health outcome. An example is the overuse for healthcare like medications (Brownlee et al., 2017). Some medical services are delivered even though it does not create notable improvement in health outcome. For instance, the proportion of asthma patients being prescribed excessive medication of short-acting β2-agonists (SABA) in UK was 12.1% and in France was 3.9%, which amounted to roughly 210,000 and 190,000 patients respectively in 2013 (Belhassen et al., 2016). SABA is meant for emergency use and long-term usage could increase the risk of poorer health and stronger asthma attack in the future, thereby requiring even more healthcare (Anis et al., 2001). Hence, overuse can partly explain why UK's asthma had lower than average health outcome (*Table 3*). Extra consumption of healthcare not only decreases the health outcome of a certain treatment, it can also hurt the overall health of the patient, leading to even more healthcare consumption and cost.

The main difference between positive effective countries and countries with poorer than average outcome is the better primary care in the former. Five out of the six positive effective countries can perform above average in at least two of the primary care indicators as compared to three out of the 15 poorer outcome countries (*Table 3*). In contrast, both groups tend to show weaker acute care; only two positive effective and six poorer outcome countries can achieve above average outcome in at least two of the acute care indicators (*Table 3*).

Thus, a well-functioning primary care system could help lower provision countries to partly overcome the quantity effect by allowing the lesser workforce to meet health demand. Positive effective countries like Slovenia stands out in their emphasis on primary care.

Slovenia requires citizens to be registered with a GP around their residence area, who acts as the first source of contact when patients need non-emergency medical attention (Albreht et al., 2016, pp.51). Gatekeeping policy facilitates the flow towards primary care by giving patients access to specialist care only when referral is given by GP. This encourages consistent interaction between the GP and patient, thereby building trust and knowledge about the patient. In a study by Hjortdahl and Borchgrevink (1991), doctors with prior contact with the patient were less likely to prescribe medications. Better knowledge help to reduce the chances of quality problems like medication overuse. With higher level of trust, patients receive the doctors' advice more readily and follow long-term medication regimen with more commitment (Brookhart et al., 2007). This ensures the medication provided will have an effect on the patients' health. Hence, continuity of care from the GP registration and gatekeeping can allow existing providers to provide better health outcome (quality effect).

Unlike Singapore's primary care solo-physician clinics, the ones in Slovenia and Portugal are designed to provide more comprehensive care. Since 2011, the government in Slovenia introduced a reconfiguration of their primary care clinics into "model practices" (Albreht et al., 2016, pp.121). It added one part-time nurse practitioner to the original staff configuration of one full-time family physician and one full-time nurse (Klemenc-Ketis et al., 2014). Nurse practitioners are trained to conduct preventative healthcare like screening for illnesses, promoting healthy lifestyle, and maintaining the health of chronic patients (Klemenc-Ketis et al., 2014). By sharing the role of health prevention with the physician, model practices can devote 25% of the time for prevention instead of the usual 5% (Petrič, 2016). Instead of just focusing on treating individual incidents of illness, model practices could improve the overall health of the patients, thereby reducing the need to seek medical help. Thus, Slovenia improve health outcome by remixing existing providers to move relevant occupations into primary care (quality effect).

Additionally, Slovenia further affirms that state provision can boost outcome and effectiveness. State provision allows government to execute effectiveness-based reforms more easily due to their extensive influence over the providers. In Slovenia, primary care providers are either directly publicly employed or in contract with the societal actor (Albreht et al., 2016, pp.111). Unlike other societal actors in SHI, the Slovene government has more control over their public insurer (Albreht et al., 2016, pp.27). In contrast, reforms in the private-led primary care in Singapore is not as extensive and usually complement the private sector. Primary care clinics remain mostly solo-practice; Singapore GPs usually either have no time or no experience to conduct preventative health (Lim, 2013, pp.234). The only assistance for GP to practice preventative health is the creation of the public community health centres that provide diagnostic screening for GPs' chronic patients (Poon, 2016).

Yet, to achieve even better outcome, provision level will still have to increase. The majority of the positive effective countries (except Portugal and Netherlands) had lower level of outcome than most of the "higher provision-to-better outcome" countries (*Table 5*).

E.5. Analysis of Cost-Effectiveness

Based on the Healthcare Production Process, cost-effectiveness can be broken down into two factors, efficiency and effectiveness. To have a positive cost-effectiveness, countries will need to attain a neutral or positive efficiency and effectiveness. Yet such situations were rare and only achieved in a small minority of countries.

The first case of positive cost-effectiveness occurs when positive efficiency is coupled with neutral effectiveness (higher provision-to-higher outcome). Iceland, Norway, Italy, and Luxembourg achieved in this way. Despite the upwards effect of state and societal financing on cost, most of them has the state actor in regulation to contain costs. Norway, coupled with favorable labor conditions and relevant labor polices, it can use lesser money to recruit more providers than others. These countries then depend on the good health access (quantity effect) and normal provider quality to achieve health outcome.

If efficiency is neutral (low expenditure-to-low provision), a positive effectiveness is needed for the second case of positive cost-effectiveness to occur. Slovenia, Spain, Portugal, and Israel belong to this case. Similarly, cost-containment was done with the strong presence of the state in regulation. With a smaller expenditure, they would face difficulty in funding higher than average level of provision. This would not be a problem if the providers are able to deliver healthcare with above par quality and productivity. In the case of Slovenia, state provision and strong state presence in regulation facilitated the implementation of reforms on primary care, thereby allowing more and better care to be provided with their existing level of providers.

Positive effectiveness also has a secondary effect of cost-containment. The discussion of effectiveness involves the quantity and quality of medical goods and services which can be priced. For example, if Slovene's model practices reduce the demand for acute care, it will decrease cost as inpatient care is more expensive than outpatient care. (Crawford et al., 2015). The cost mainly comes from the overnight stay for inpatient care. In fact, all the countries in the second case (Int$2499.50—Int$2936.30) has lower total health expenditure per capita than that of the first case (Int$3267.40—Int$6345.90) (WHO, 2013). As per capita cost is a proxy for the cost of providing healthcare supply and strength of healthcare demand, a positive effective health system can supply inexpensively and reduce demand, thus bringing a downward effect on expenditure.

This could also explain why correlation between expenditure and outcome of countries with neutral cost-effectiveness is strong. It had a statistically significant, high positive value of 0.86 compared to efficiency (0.77) and effectiveness (0.63) *(Table 7)*. Since both efficiency and effectiveness are linked to cost, expenditure will be a strong proxy for outcome. As concluded in Section E.3 and E.4, to achieve greater provision or outcome beyond the positive efficiency or effectiveness will usually requires higher than average level of expenditure and providers respectively.

Negative cost-effectiveness should be avoided as it signals a waste of resources. Efficiency could have been the problem as seen in Ireland's case where labor policy was not suitable to survive the recession. Alternatively, issue could lie in effectiveness like Germany where quality of providers pulled down the health outcome. The worst configuration appeared in the US as its private regulation and reliance on private insurance boosted expenditure, and private interest caused monetary input to flow to providers that do not deliver care. Furthermore, its effectiveness is affected by both poorer access and quality issues. Healthcare waste related to private interests is substantial in the US amounting to around US$1 trillion, of which US$200 billion and US$120 billion is generated by wasteful clinical care and administrative complexity respectively (Sahni, 2015). Coupled with private provision, private-based system type would also find it harder to reform the system.

F. Conclusion

Going back to main thesis, this paper abounds with evidence about healthcare system type affecting cost-effectiveness. The actors in the healthcare system shapes the type of health policies adopted in the country, which impacts the health expenditure, provision level and health outcome.

Firstly, in terms of monetary input, prominent out-of-pocket private financing remains an important cost-containment tool, while state and societal financing are likely to uplift expenditure. Among the regulation actors, state regulation is the top choice to control the cost, followed by societal and then private actor. Secondly, the only actor trend in real input is the lowered level of provision by private regulation and financing. Lastly, state provision is instrumental in boosting health outcome. The general policy trend of the healthcare actors is the need for state intervention. Healthcare sector is extremely prone to market failure, as such private interest need to be supervised more closely by the state as compared to other types of public policy. However, state actors must also avoid government failure by ensuring health policy remains relevant.

NHS and social-based mixed type performed very well in terms of cost-effectiveness, taking up the majority of positive cost-effectiveness countries. Their actor profile is mostly favorable for cost-effectiveness. In terms of regulation, NHS is state-regulated, and Slovenia is societal-regulated but with a strong state presence, thus allowing for cost-containment. Both types have state provision, improving the chances of reforms implementation. Even though their financing actor may not be conducive for cost-containment, Slovenia and some NHS countries are able to use health policy, like improving primary care and gatekeeping, to boost both effectiveness and cut cost. Alternatively, other NHS countries like Norway boosted efficiency to achieve positive cost-effectiveness. Hence, creating the favorable labor conditions to expand the spending power of their monetary input. If a country needs to choose between boosting efficiency or effectiveness for their first step of reform, focusing on the latter would be more impactful as it has the primary effect of increasing health outcome and the secondary effect of lowering cost.

Positive effective nations' successfulness in keeping the cost low, especially on a per capita basis, offers lessons for Singapore. Singapore used out-of-pocket to successfully achieve cost-containment. Singapore relies on the decision-making of patients to restrict themselves from overconsumption of healthcare. But with the information asymmetry between the patients and providers, patients cannot be certain that providers are giving the right amount of care.

Additionally, patients may not have the knowledge to determine if their illness is serious enough to visit the provider. Private characteristics inside their dual-actor regulation and state provision can lower the health service quality as seen in the primary care sector. Thus, Singapore's model does not guarantee that the healthcare consumed is of optimal and good quality, thereby driving down health outcomes. Slovenia presents an alternative where the state or societal actors take over more of the decision-making from the patients to manage healthcare demand by using physicians as gatekeepers and preventive health.

Through providing practical insights into healthcare system performance, this study validated the usefulness of the Rothgang-Wendt Typology in understanding the differences between healthcare system. The use of the Healthcare Production Process provides a methodology to quantify healthcare system performance. The combination of the typology and process in a framework allow the identification of health policies that could shape performance. More importantly, this framework facilitates the analysis of entire healthcare system by linking different types of health policies together.

Yet, the findings of this paper also point out the improvements that can be applied to Böhm et al.'s (2013) modified typology. Singapore healthcare system would be deemed implausible due to the existence of state provision after private financing and the dual-actor regulation. Even so, the contextual analysis in this paper were made more fruitful through the inclusion of both implausible types and secondary actors in the healthcare dimensions (e.g. Slovenia). They provide a more realistic understanding of the variation of healthcare systems. Hence, at least for comparative studies in healthcare system performance, there is no need to be restricted by Böhm et al.'s (2013) assumption; secondary actors and all system types can be considered.

Furthermore, relationship with medical suppliers should be included into the regulation mix on top of payer, service providers and patients. They have an influential impact on cost-effectiveness. The analysis in Section E.2 showed the private interest of drug companies can increase cost. Additionally, given the importance of medical goods in the provision of care, the influence of those suppliers on the sale and dispensing of goods might impact the effectiveness (e.g. sale of drugs with dubious efficacy).

There are still two limitations in this paper. First, this study focuses on achieving breath instead of depth. In order to analyze the entire Healthcare Production Process, this paper gave a snapshot of health policies that could influence efficiency, effectiveness and cost-effectiveness. This paper may have excluded other important health policies. Second, data

constraints in the HCQI lowers the comprehensiveness of the Healthcare Quality Index. For example, process-based indicators which directly reflect the quality of health services cannot be included due to missing nations (e.g. number of incidents with foreign items left in the patient's body after surgery).

In response to the limitations, there are two diverging future directions. The first limitation would encourage more narrower studies that dive into specific parts of this paper. Indeed, each health policy mentioned in this study could be separately compared to cost-effectiveness to see their relationship. This can check the validity of the arguments in this paper. Conversely, the second limitation suggests broader studies. It could be either with more HCQI indicators or with more countries. It will make the Healthcare Quality Index more representative of the reality and validate the consistency of the trends mentioned.

The race to build the most cost-effectiveness healthcare system is not likely to end and is to be hoped that this paper can advance knowledge in this field. With more complete HCQI data in the future, comparative healthcare studies can be brought to greater heights, both for the theoretical understanding in the academia and practical healthcare improvements in the society.

Figures and Table

Table 1: *Sources for Indicators*

Type	Source & Remarks
Real Input	• Mostly 2013 OECD data • Japan's OECD data except hospital bed density was from 2012 • Singapore's data came from the Singapore Government (Department of Statistics Singapore, 2018; Singapore MOH, 2017a, 2017b, 2017c, 2017d, 2017e) • Portugal's physician data came from World Bank (2018a) • Ireland, Netherlands, Portugal, Slovakia and Spain's dentist data came from WHO (2018a) and World Bank (2018b). Only Netherlands' data came from 2014 • New Zealand's 2013-2014 dentist data came from their Dental Council (2014) • USA's dentist and pharmacist data came from American Dental Association (2018) and Bureau of Labor Statistics (2013) • Ireland and Slovakia's pharmacist data came from WHO (2018b) and World Bank (2018b)
Outcome	• Mostly 2013 OECD data • All Netherlands and Switzerland data are for 2012 • All Japan data is for 2011 • USA's primary care indicators is for 2014, while hemorrhagic stroke, ischemic stroke is for 2012 • Estonia's COPD, diabetes, hemorrhagic stroke, and ischemic stroke are for 2014 • Hungary's primary care indicators are for 2012, and hemorrhagic stroke, ischemic stroke is for 2009 • Poland do not have hemorrhagic stroke, ischemic stroke data

Table 2*: Classification of Healthcare System Type*

Healthcare System Type	Sub-Type	Regulation	Financing	Provision	Countries
State-Based	National Health Service	State	State	State	Denmark, Finland, Iceland, Norway, Sweden, Portugal, Spain, UK
	National Health Insurance	State	State	Private	Australia, Canada, Ireland, New Zealand, Italy
Social-Based	Social Health Insurance	Societal	Societal	Private	Austria, Germany, Luxembourg, Switzerland
	Social-based Mixed Type	Societal	Societal	State	Slovenia
Private-Based	Private Health System	Private	Private	Private	US
Completely-Mixed	Etatist Social Health Insurance	State	Societal	Private	Belgium, Estonia, France, Czech Republic, Hungary, Netherlands, Poland, Slovakia, Israel, Japan, South Korea
Others		State/Private	Private	State	Singapore

Source: Adapted from Böhm et al. (2013)

Table 3: *Index of Individual Components of Healthcare Quality*

Countries	Asthma Index	COPD Index	Diabetes Index	AMI Index	Hemorrhagic Stroke Index	Ischemic Stroke Index
Denmark						
Finland						
Iceland						
Norway						
Sweden						
Portugal						
Spain						
UK						
Australia						
Canada						
Ireland						
New Zealand						
Italy						
Austria						
Germany						
Luxembourg						
Switzerland						
Slovenia						
US						
Belgium						
Estonia						
France						
Czech Republic						
Hungary						
Netherlands						
Poland						
Slovakia						
Israel						
Japan						
South Korea						
Singapore						

Notes: Green=Above Average; Red=Below Average. white=no data.

Source: Table 1

Table 4*: Efficiency Comparison*

Total Health Expenditure	Healthcare Provision Index: Above Average (>100) — Country	% of GDP	Index	Healthcare Provision Index: Below Average (≤100) — Country	% of GDP	Index
Above Average (>9.2%)	Denmark	10.2	105.4	UK	9.9	81.0
	Finland	9.5	119.2	Canada	10.1	88.2
	Sweden	11.1	102.5	Ireland	10.4	99.4
	Austria	10.2	113.6	New Zealand	9.4	96.1
	Germany	11.0	126.4	US	16.3	91.1
	Switzerland	11.4	106.7	Netherlands	10.9	83.7
	Belgium	10.4	115.8			
	France	10.9	110.7			
	Japan	10.8	155.1			
Below Average (≤9.2%)	Iceland	8.7	104.9	Portugal	9.1	98.0
	Norway	8.9	120.9	Spain	9.0	96.0
	Italy	9.0	100.9	Australia	8.8	97.9
	Luxembourg	6.5	106.7	Slovenia	8.8	86.5
	Czech Republic	7.8	102.8	Estonia	6.0	96.7
				Hungary	7.3	99.5
				Poland	6.4	79.9
				Slovakia	7.5	86.8
				Israel	7.1	79.8
				South Korea	6.9	99.0
				Singapore	3.7	55.0

Notes: Dark Blue=NHS, Light Blue=NHI, Dark Green=SHI, Light Green=Social-Mixed, Orange=Private-Based, Yellow=Completely-Mixed, White=Others

Source: Table 1

Table 5*: Effectiveness Comparison*

Healthcare Provision Index		Healthcare Quality Index: Above Average (>100)			Healthcare Quality Index: Below Average (≤100)		
		Country	Provision Index	Quality Index	Country	Provision Index	Quality Index
Above Average (>100)		Denmark	105.4	107.9	Austria	113.6	78.9
		Finland	119.2	113.7	Germany	126.4	96.8
		Iceland	104.9	123.1	Belgium	115.8	87.8
		Norway	120.9	126.7	Czech Republic	102.8	95.2
		Sweden	102.5	128.9			
		Italy	100.9	144.8			
		Luxembourg	106.7	111.7			
		Switzerland	106.7	134.2			
		France	110.7	112.1			
		Japan	155.1	123.9			
Below Average (≤100)		Portugal	98.0	114.3	UK	81.0	89.1
		Spain	96.0	104.5	Australia	97.9	96.4
		Canada	88.2	105.5	Ireland	99.4	83.3
		Slovenia	86.5	105.2	New Zealand	96.1	74.9
		Netherlands	83.7	117.4	US	91.1	94.0
		Israel	79.8	109.2	Estonia	96.7	98.9
					Hungary	99.5	48.2
					Poland	79.9	81.4
					Slovakia	86.8	69.5
					South Korea	99.0	73.6
					Singapore	55.0	42.5

Notes: Dark Blue=NHS; Light Blue=NHI, Dark Green=SHI, Light Green=Social-Mixed, Orange=Private-Based, Yellow=Completely-Mixed, White=Others

Source: Table 1

Table 6*: Cost-Effectiveness Comparison*

		Healthcare Quality Index					
		Above Average (>100)			Below Average (≤100)		
		Country	% of GDP	Quality Index	Country	% of GDP	Quality Index
Total Health Expenditure	Above Average (>9.2%)	Denmark	10.2	107.9	UK	9.9	89.1
		Finland	9.5	113.7	Ireland	10.4	83.3
		Sweden	11.1	128.9	New Zealand	9.4	74.9
		Canada	10.1	105.5	Austria	10.2	78.9
		Switzerland	11.4	134.2	Germany	11.0	96.8
		France	10.9	112.1	US	16.3	94.0
		Netherlands	10.9	117.4	Belgium	10.4	87.8
		Japan	10.8	123.9			
	Below Average (≤9.2%)	Iceland	8.7	123.1	Estonia	6.0	98.9
		Norway	8.9	126.7	Czech Republic	7.8	95.2
		Portugal	9.1	114.3	Hungary	7.3	48.2
		Spain	9.0	104.5	Poland	6.4	81.4
		Italy	9.0	144.8	Slovakia	7.5	69.5
		Luxembourg	6.5	111.7	South Korea	6.9	73.6
		Slovenia	8.8	105.2	Singapore	3.7	42.5
		Israel	7.1	109.2	Australia	8.8	96.4

Notes: Dark Blue=NHS; Light Blue=NHI, Dark Green=SHI, Light Green=Social-Mixed, Orange=Private-Based, Yellow=Completely-Mixed, White=Others

Source: Table 1

Table 7*: Correlation of Monetary Inputs vs Real Inputs vs Outcome*

Comparison	Pearson's R
1. Health Expenditure vs Healthcare Quality Index	0.40**
2. Health Expenditure vs Healthcare Provision Index	0.39**
3. Healthcare Provision Index vs Healthcare Quality Index	0.43^
4. Comparison 1 for only neutral cost-effective countries	0.86^
5. Comparison 2 for only neutral efficiency countries	0.77^
6. Comparison 3 for only neutral effectiveness countries	0.63^

Notes: **p<0.05, ^p<0.01

Source: Table 1

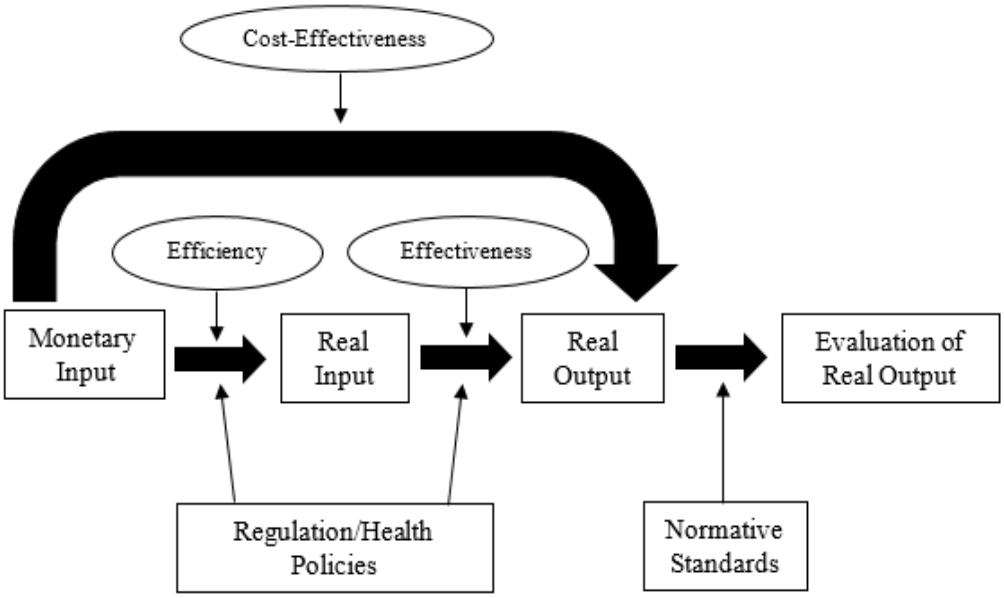

Figure 1: Healthcare Production Process

Source: Adapted from Wendt & Kohl (2010)

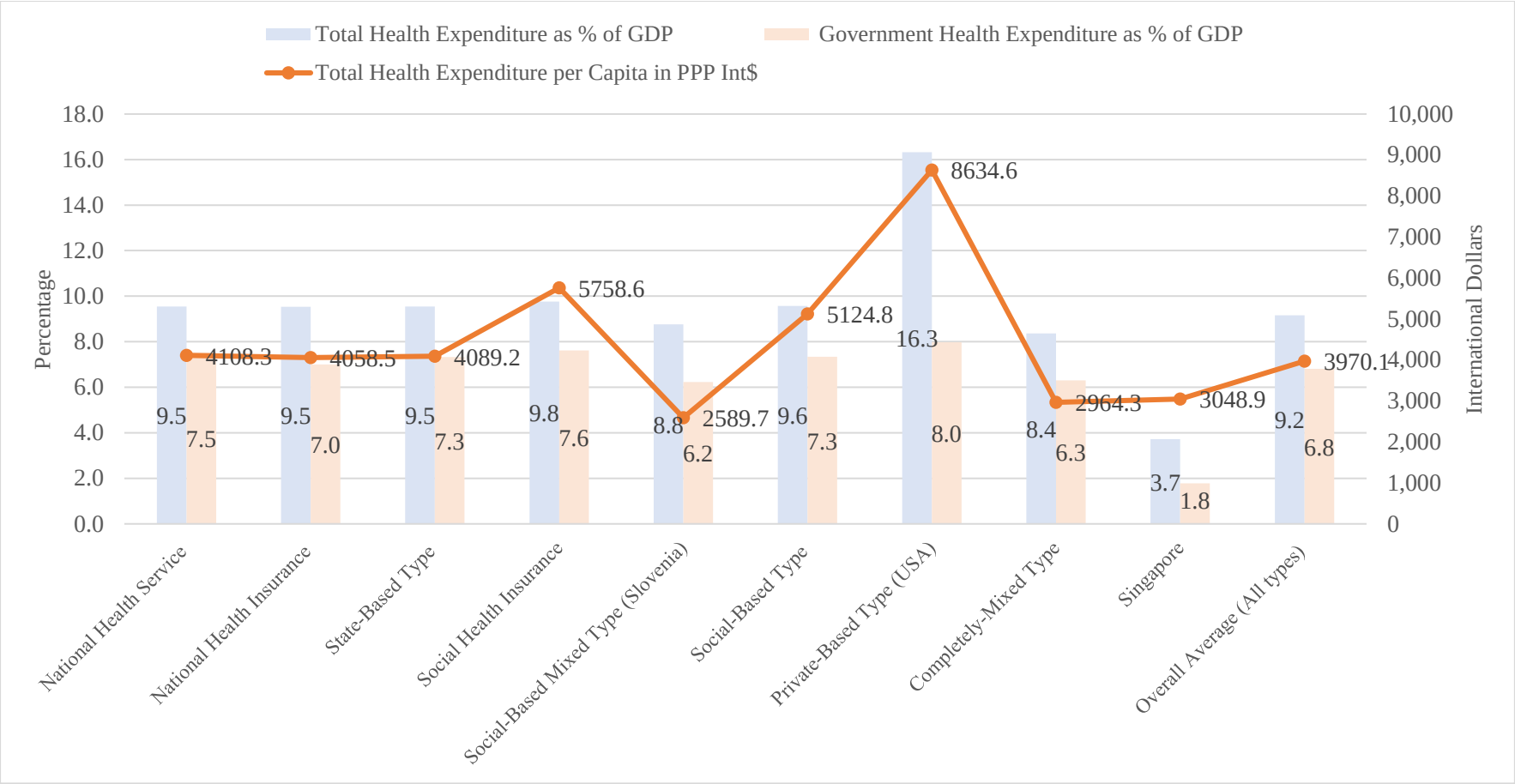

Figure 2: Healthcare System Comparison based on Monetary Input Indicators

Source: WHO (2013)

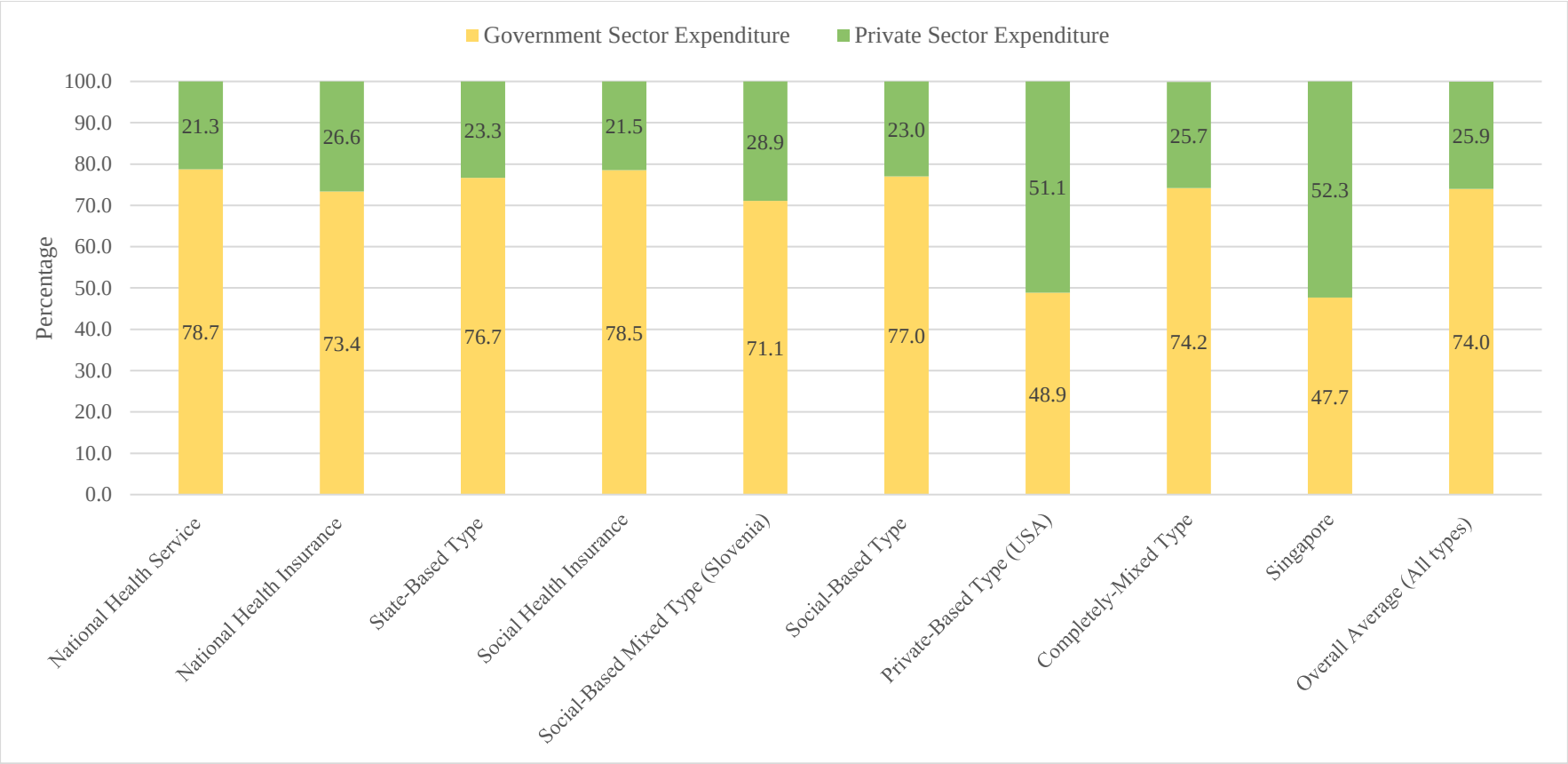

Figure 3: Average Percentage Share of Government vs Private Sector Health Expenditure for Year 2013

Source: WHO (2013)

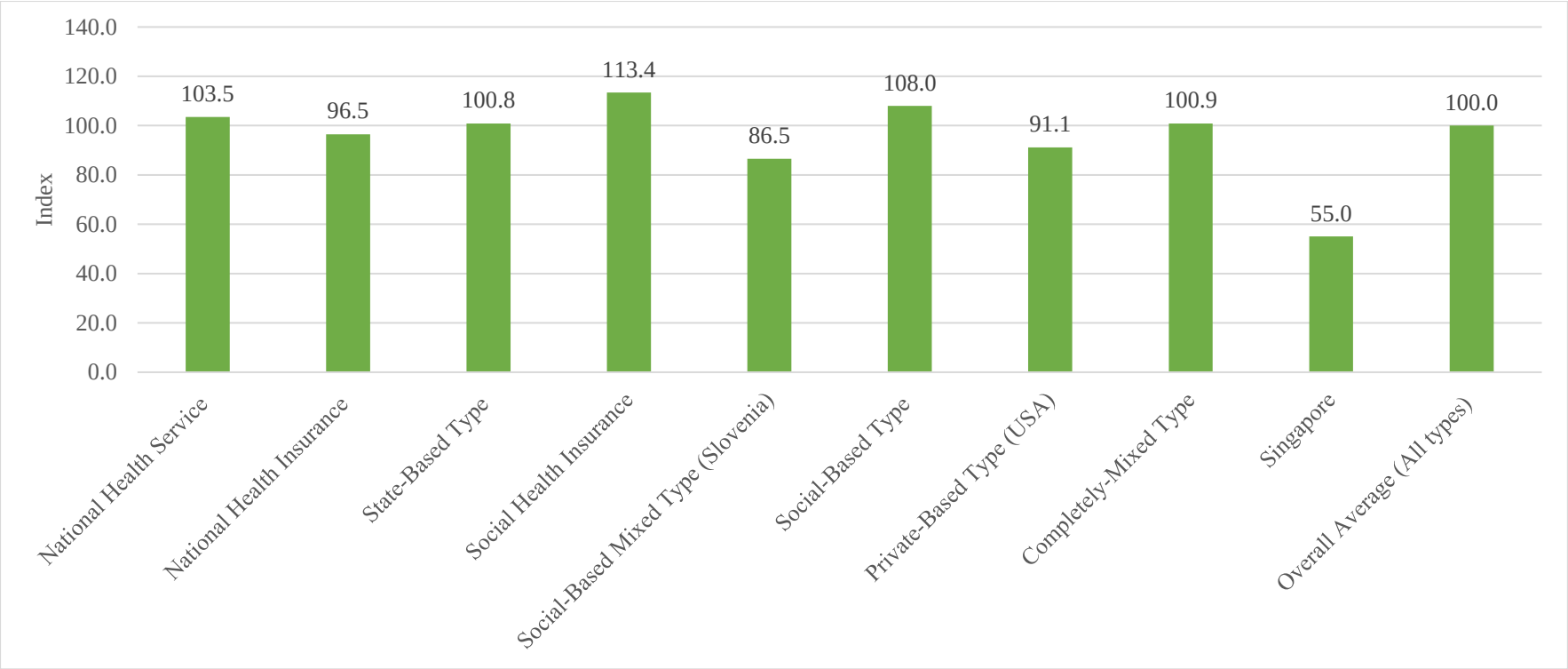

Figure 4: Average Index of Healthcare Provision by Healthcare System Type

Source: Table 1

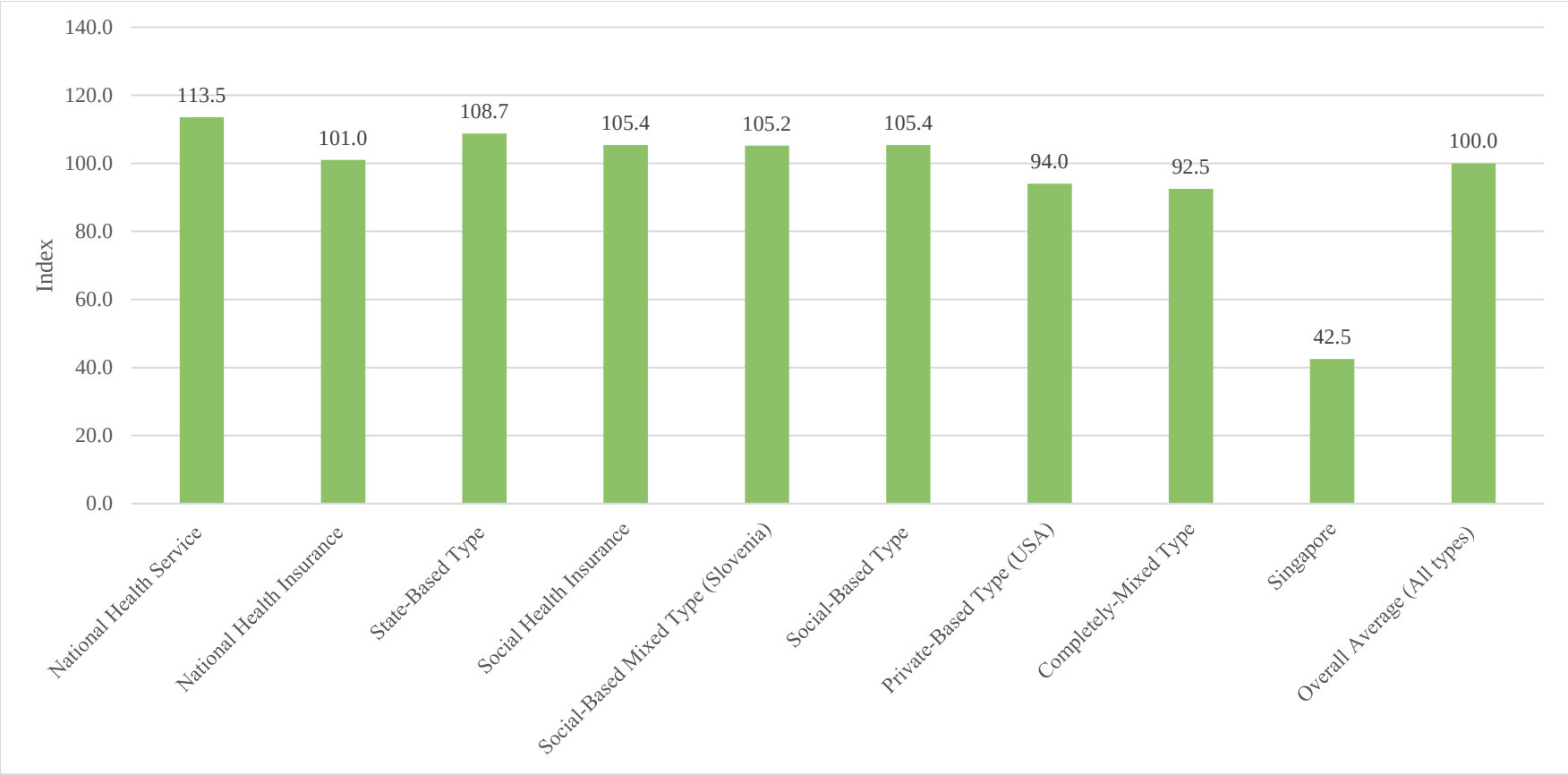

Figure 5: Average Index of Healthcare Quality by Healthcare System Type

Source: Table 1

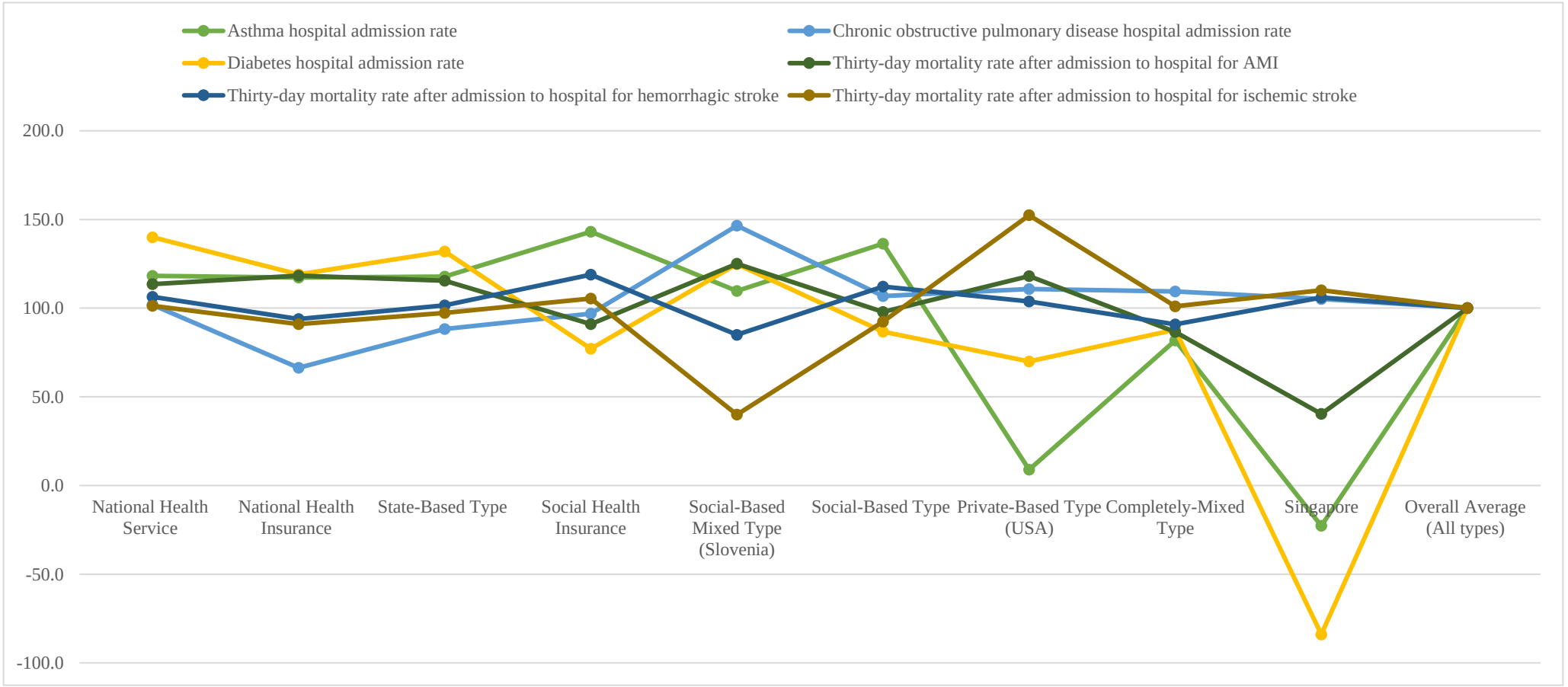

Figure 6: Average Index of Healthcare Quality by Components

Source: Table 1

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