The London School of Economics and Political Science

The effect of social and financial incentives in the provision and organisation of healthcare in the Republic of Korea

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A thesis submitted to the Department of Health Policy of the London School of Economics

for the degree of Doctor of Philosophy

London, May 2024

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Abstract

Expanding health insurance has significantly improved the population's health. However, the modalities and strategies for expanding healthcare provision have taken on a distinctive form in Asian countries, particularly in East Asia, which is sometimes referred to as the developmental welfare state model (Kwon, 2009a). Rather than being based on a social right, welfare expansion was a means of supporting economic policies and rewarding those who contributed to national development. These social policies were strongly driven by government elites, including the president (Kwon, 1995). Rather than providing all social services directly, the government constructed long-term plans and contracted out the provision of services to the private sector.

Among East Asian countries, South Korea exemplifies this characteristic in healthcare provision, with a very different organisation of the health system from that of Western countries. It can be roughly summarised as the rapid introduction of social health insurance and its integration into national health insurance, led by the national elite, the establishment of private capital-driven healthcare institutions, and state control of reimbursement costs to prevent healthcare costs from exploding. While these features have the advantage of ensuring that most people have health insurance in a short period, the government's price control and the profit-seeking of healthcare institutions—many of which are based on private capital—have created an incentive structure that maximises the volume of healthcare and maximises the price per unit of care under the fee-for-service system.

As a result, a range of adverse health outcomes gradually emerged in the 1990s and 2000s, including high antibiotic prescribing rates and caesarean sections. Governments implemented interventions to address the negative consequences of the distorted incentive structure. However,

these solutions were often patchwork or indiscriminate adoption of foreign policy practices rather than addressing the underlying health system failures. Various attempts were made to change provider behaviour, mainly through the use of financial and social incentives. While there has been some evaluation of these attempts, there is still a lack of comprehensive assessment of their effectiveness and side effects.

This thesis examines how social and financial incentives result from policy interventions that aim to improve healthcare efficiency and quality by examining three different interventions where we can establish exogenous variation in some social or financial incentives influencing providers' health behaviours. The thesis aims to evaluate the direct spillover of social and financial incentives in Korean health policies for better policy design and to provide policy implications.

Unintended Effects of antibiotic prescription rate disclosure

The first paper examines the effect of social incentives on healthcare provision in Korea, specifically in the intended and unintended consequences of the antibiotic prescription rate disclosure in 2006. As mentioned earlier, providers in Korea were placed in a situation where they had to generate income based on the volume of services. While reimbursement costs for consultations were low, a structure was formed in a way that providers could supplement part of their income by prescribing medication and directly dispensing medication at hospitals or clinics. In such a situation, even for mild common colds, the prescription of antibiotics or injections increased rapidly, and the prescription rate for antibiotics in acute respiratory infections exceeded 50%. Such high antibiotic prescription rates are a typical waste of the healthcare system and a

factor that causes long-term antimicrobial resistance, resulting in significant economic and medical costs (O'Neill, 2016).

With the separation of prescribing and dispensing in 2000, doctors only issued prescriptions, and patients obtained medication from pharmacies. However, the high antibiotic prescription rate persisted for over 20 years and showed no signs of decreasing. At the urging of civil society, the government hastily introduced a public reporting policy. The policy of disclosing information in 2006 is regarded as having successfully reduced the antibiotic prescription rate in the country. However, as highlighted in this paper, the swift implementation of policies resulted in a coding shift, a significant unintended consequence that undermined the policy objectives. Specifically, this coding shift was particularly pronounced in medical staff with high rates of antibiotic prescription in the past and in departments that encountered acute respiratory diseases subject to information disclosure. Furthermore, we document that the prescription rate for broad-spectrum antibiotics did not decrease as the policy focused solely on the overall prescription rate. It demonstrates that medical staff face varying social pressures, namely social incentives, the influence of which depends on the degree of deviation from the norm shared within the professional society. Not all medical staff chose the ideal approach of reducing prescription rates, with some opting for socially undesirable methods. In this chapter, we draw on the theory of motivation change and explore ways to mitigate these side effects.

Incentives to prevent unnecessary caesarean sections.

The second paper discusses how to correct the distorted incentive structure with financial and social incentives to enhance quality in obstetric care, namely, reducing the share of

unnecessary c-sections. In the late 1970s, when compulsory health insurance was introduced, midwives performed more deliveries than doctors. Not surprisingly, there was a significant difference in the cost between the midwives who performed natural deliveries and doctors who performed c-sections, and this continued to be the case even as the number of c-sections performed by doctors increased rapidly in the 1980s and 1990s. Even after health insurance was introduced, small clinics and hospitals performed c-sections in medically unindicated cases due to the high reimbursement cost for c-sections. The effect of insurance coverage on c-section uptake was stark: the c-section rate, which was only about 8% in the 1980s, reached over 45% in the early 2000s.

In this chapter, we demonstrate that the introduction of both supply and demand side incentives by increasing the reimbursement cost for doctors who perform normal (vaginal) deliveries by 50% and exempting out-of-pocket payments for mothers who choose normal deliveries lead to a reduction in the c-section rate for first-time mothers decreased by about 3.6 pp. The paper also examines the effect of subsequent public reporting on c-section rates that was expanded several times. This effect was more substantial in areas with higher c-section rates before the policy. We propose two mechanisms. First, higher reimbursement fees for regular deliveries resulted in an increase in the number of doctors in small clinics. This increase in medical professionals increased the availability of normal deliveries, which typically require more time compared to caesarean sections. In addition, the expansion of public reporting, which came about a year and a half after the reimbursement cost increase, reduced c-sections in the short term, but the effect was short-lived.

This observation illustrates the adverse effects of a significant difference in payer costs between two elective procedures and low compensation for a time-consuming procedure. At the same time, it shows that governments and insurers can dramatically reduce unnecessary c-sections

by adjusting payment levels. It also reveals that the effect of repeated public reporting is not significant and that while increasing public reporting may have a positive short-term effect, it is only a temporary shock to providers. In turn, it highlights the importance of careful reimbursement design in incentive design.

Do social and financial incentives increase the quality of stroke care?

Finally, the last paper turns to emergency healthcare and looks at the combination of social and financial incentives at the organisational level. Here, the distorted incentive structure encompassed little incentive to provide the best possible medical care for severe emergency conditions resulting from a stroke or myocardial infarction in hospital-level medical institutions. Small and medium-sized hospitals have proliferated due to the lack of consistent government hospital policies and support. In small hospitals, the number of severe emergency cases is also small; therefore, they cannot afford to have specialists available for 24-hour care. In such situations, ambulances transfer emergency patients to nearby hospitals with no medical staff with particular specialities or hospitals with insufficient resources. Patients are transferred to larger hospitals, often missing the optimal golden hour.

This paper examines the impact of public reporting on mortality rates for stroke patients following the government's September 2007 announcement of a financial incentive program in July 2011. The results indicate that neither intervention impacted short-term mortality, with borderline evidence that public reporting reduced 365-d mortality rates by around 2pp. We also found evidence that the incentive program reduced the 365-d mortality rate by about 3.1 pp, mainly due to a reduction in the mortality rate for patients with ischemic stroke. As a secondary outcome,

both policies were found to reduce the length of stay by about 1-2 days, with the incentive program significantly reducing the length of stay for haemorrhagic stroke, which has a longer average length of stay, thus reducing the total cost of care. Finally, we checked for spillover effects, whereby these changes increase outpatient visits or readmissions after discharge but found no evidence.

Overall, we find that healthcare providers not only maximise their economic incentives and patient benefits in their payoff function but also consider broader social incentives. However, as the effect of the social incentive is strong, we document evidence of a high likelihood of side (spillover) effects, and it has been confirmed that some medical providers can engage in various behaviours that undermine policy objectives. In addition, the effects of these social incentives may decrease over time, suggesting that various efforts are needed to align providers' incentives with those pursued in the policy design instead of utilising the tactic of shaming healthcare providers. Second, we show that the side effects resulting from distorted incentive structures can be addressed through incentive corrections, which can significantly contribute to achieving efficiency and quality goals. Thirdly, this paper demonstrates that social and economic incentives have powerful effects even at the organisational level and that support for fixed costs in a hospital environment where market failures occur can achieve hospital service efficiency and promote efficiency through economy of scope.

Table 1. Summary of the empirical chapters

Chapter 3	**'Professional Shame' and Diagnosis Miscoding: Evidence from antibiotics prescribing behaviour**
Research topic and questions	• The chapter examines the effect of professional shame, which can be a particularly strong incentive in the context of a public disclosure event that potentially affects a doctor's professional status.
Method and data	• Korean National Health Insurance Claims data • Event study: the unexpected nature of the PR event allows us to precisely identify the underlying effect of the PR on provider behaviour using an event study
Existing knowledge	• PR, a policy instrument using social incentive, can exert behavioural effects leading to quality improvement in healthcare.
New knowledge	• Coding manipulation after a strong social incentive: we found robust evidence of unintended consequences of PR, the manipulation of disease coding. • The effect was heterogeneous across specialties. • The extent of their strategic behaviour to avoid being shamed is influenced by how much they deviate from professional norms. Providers with high antibiotic prescribing rates before the PR event were more likely to change their diagnosis code. • PR did not improve quality of prescribing. The PR reduced the use of specific types of antibiotics, while the use of broad-spectrum antibiotics remained unchanged. • 'Naming and praising' is not as effective as shaming.
Added value	• We show empirically that professional shame is a powerful tool for shaping provider behaviour Found evidence of the side effect of public reporting. • We presented new evidence of backfire of the social incentive, namely the coding shift. • We contribute to the literature by extending the analysis to examine changes in the quality of prescribing, namely a disproportionate decrease in narrow-spectrum antibiotics compared to broad-spectrum antibiotics
Chapter 4	**Incentives to prevent unnecessary caesarean sections**
Research topic and questions	• This chapter examines the impact and mechanisms of the first financial incentive in 2005 on caesarean section rates. It also measured the impact of public reporting in July 2006 and the second fee increase for normal delivery in June 2007. • Can financial incentives prevent unnecessary caesarean section? How?
Method and data	• Korean National Health Insurance Claims data • The chapter allows us to understand the causal mechanisms of public interventions by leveraging an unexpected policy reform and a rich dataset at the individual and provider levels.
Existing knowledge	• The choice of delivery mode reflects the preferences and incentives of both providers and mothers. On the provider side, a long literature describes three

	main factors that influence choice: financial incentives, leisure, and malpractice litigation. • The reform in Iran consisted of a fee waiver for normal deliveries, a bonus payment to doctors for normal deliveries, and an annual quota for c-section deliveries by public hospital doctors. The high baseline caesarean rate of 55 per cent led to a 5.6 per cent reduction in the overall sample and a 13 per cent reduction in primiparous deliveries. • Little research exists on the effectiveness of financial incentives in privately dominated environments. • How incentives work in supply and demand is not yet understood. • In Korea, public reporting in 2000 had an impact on reducing the c-section section rate (Ko et al., 2001). The NHIC published the c-section rates annually between 2000 and 2003, but the rate stayed high.
New knowledge	• Providing financial incentives in 2005 to both providers and mothers reduces the c-section rates by 3.6 per cent in the short term. • The emergency c-section rates did not change significantly before or after the policy, but elective c-section rates decreased by about 3.9 pp immediately after the policy was implemented. The effects of the intervention were larger in areas that had high c-section rates before the policies were implemented. • We argue that the financial incentive for normal delivery encouraged smaller clinics to hire more doctors. After the reform, the number of doctors in small clinics increased by 0.096. • When the behavioural change in clinical decision-making requiring financial investments, the influence of social incentives is limited. Additional monetary incentives are essential. • In 2006, the expansion of public reporting including clinics reduced the c-section rate temporarily by 5.85 per cent, but the effect diminished soon. • The repeated financial incentive did not work in 2007.
Added value	• We present a rare case that monetary incentive prevent unnecessary c-section and its mechanism. • The Korean case provides insights that the incentive can work in the private-dominant setting by adequately compensating providers without draconian policy instruments. • The effectiveness of incentive program is not guaranteed. Repeated use of a same policy can reduce its effectiveness, and regulatory bodies need to monitor policy effectiveness thoroughly.
Chapter 5	**Do social and financial incentives increase the quality of stroke care?**
Research topic and questions	• The chapter investigates whether social and financial incentives increase the quality of stroke care including short-term and long-term mortality, length of stay, total care cost, and the probability of receiving specialised rehabilitation during the first admission. • The study also investigates whether there are spillover effects, including the increase of the post-discharge outpatient and the use of geriatric hospitals.
Method and data	• The study uses data from the National Health Insurance Service Senior Cohort from 2005 to 2012. • The study employs a difference-in-difference approach for both interventions.

Existing knowledge	• Although there have been studies examining the impact of public reporting on clinical outcomes, the topics of the studies were limited to cardiac surgical procedures and antibiotic prescription rates. • There is mixed literature on the effectiveness of those interventions in the area of stroke.
New knowledge	• Public reporting had no impact on short- or long-term mortality rates, while the incentive program reduced the long-term mortality rate for ischemic stroke, leading to an overall decrease of approximately 3.1% in the 365-day mortality rate for all stroke cases. • Public reporting did not significantly impact total care costs despite the reduction in length of stay. However, the incentive program had a substantial effect, reducing average costs by approximately 531 USD. This effect was mainly attributed to the significant decrease in the length of stay for haemorrhagic stroke. • There was no spillover effect.
Added value	• The study presents novel evidence of the effects of incentives on clinical mortality other than cardiac surgery. • The relative effectiveness of the two incentives provides insight to policy makers. • Contrary to the two interventions above, the effectiveness of the social incentive may be limited. The effect of financial incentive was more substantial than that of social incentive because those improvements required significant investments in human resources and facilities.

Acknowledgements

At university, I read a biography of Dr Lee Jong-wook, the former Director-General of the WHO, and was inspired by his concern for people, determination, and motivation. I studied medicine to study public health and immediately thought of coming to the UK. I am particularly grateful to Dr Donghoon Lee, Dr Oh Myungdon, and Dr Sangmin Park, who not only introduced me to the Korean government scholarship, but also supported me through many difficult moments.

My original goal was to graduate with a master's degree, but my first supervisor, Prof. Elias Mossialos' insightful classes left me with a constant stream of questions. When I approached him with a research proposal that was not yet well developed, he gave me tremendous encouragement and showed me the way with very intensive advice in a short period of time. When I told him that I wanted to continue my studies in the UK, he gave me warm advice and full support in securing generous funding which gave my wife the opportunity to study illustration in the UK. During my studies, he was very generous with his time, always encouraging and complimentary, even when I was struggling during the pandemic, and always encouraged me to ask critical questions, as well as teaching me a compassionate heart for the underprivileged. Having him as my thesis supervisor was one of the best fortunes of my 30s.

My second great fortune was to meet Prof Joan Costa, who is a passionate academic. While supervising many students, he always delves into the core questions that I had. I learnt so many things, including methodological rigor, creativity, and attitude as a good academic. He is also inspiring as a scholar who is pioneering new fields, and he is always there when

students need him. During the PhD programme, most students have a mental crisis at least once, and he gave me his time every week and provided me with absolute strength to get through it. I wouldn't have been able to complete this process successfully without his help.

Special thanks to my programme director, Prof Andrew Street, who was always encouraging and provided incisive feedback in seminars. The same goes for my programme tutors Prof Alister McGuire, Dr Mylene Lagarde, Dr Huseyin Naci, Dr Justin Parkhust, and Dr Ranjeeta Thomas. My friends Namer, Arthika, Mack, Liana, Nilesh, Genevieve, Ilias, Ritesh, and Adelina have also been a great support during this long journey. I am also grateful to my seniors who graduated from the LSE PhD programme before me, Dr Jae Hyoung Park, Dr Kyung Ryul Park, Dr Young Wook Jang and Dr Do Young Oh.

Special thanks also go to my beautiful wife, Sujung, who has provided me with endless support throughout my PhD programme. I am also grateful to my daughter Lael, who has grown up to be a wise and healthy child who has never gotten sick despite moving four times in London. I appreciate my parents, Rev. Kyungyoung Kim and Mrs. Junghee Oh, and parents in-laws, Mr. Giyoung Jang and Mrs. Kyungsook Shin, for their constant prayers, love, and financial support. I also appreciate my brothers SangWon, Seri, Jaepil, and Subin for being my biggest supporters, especially SangWon for his endless supply of the world's most delicious Bridge coffee, and Jaepil for proofreading all my papers and being a great support in so many ways.

I would also like to express my deepest gratitude to my friend Huisang who sent me bitcoins to buy coffee. (I won't tell anyone when I sold it.) I would also like to express my deepest gratitude to Dr Ungki Jung, who has influenced and taught me as much as my academic supervisor during the pandemic. Working with him has taught me how important

the field of 'health politics' is to the healthcare, and how much fun it is to study and collaborate. I would also like to thank Dr Hoonsang Lee and Dr Jinsu Song for sharing their experiences and knowledge of global health with me since I was a student, and Dr Seungman Cha, Dr Sungtae Hong, and Ms Seohyun Jung for sharing their experiences and knowledge of global health with me through the Sudan schistosomiasis project.

While in London, it was a great pleasure and motivation for me to interact with my friends from LSE, LSHTM, UCL, and LSTM at the Korean Global Health Forum. I would also like to thank my enthusiastic friends including Mugyeom, Hanna, Dr Caleb Park, Inseok, Jieun, Hyunju, Jiyoun, Tobias, Jina, Hyolim, Jiwon, Dr Mihye Jung, Dahye, Dr Jimin Kim, Sol, Jisun, Dr Yongsoo Park, and Dr Hojoon Sohn.

The incisive feedback and advice of two examiners, Dr Panos Kanavos and Professor Soonman Kwon were of great help in finalising the thesis and I am grateful to them.

I hope to spend the rest of my life repaying the grace I have received from my God and society.

Table of Contents

Figures and Tables

Abbreviation

UHC	Universal Health Coverage
DRGs	Diagnosis Related Groups
FFS	Fee-for-service
OOP	Out-of-pocket payment
MoHSA	Ministry of Health and Social Affair
MoHW	Ministry of Health and Welfare
NHIS	National Health Insurance Service
ASPs	Antibiotics Stewardship Programs
AMR	Antimicrobial Resistance
WHO	World Health Organization
HIRA	Health Insurance Review and Assessment Service
LTCH	Long-Term Care Hospital
LTCI	Long Term Care Insurance
LTCF	Long Term Care Facility
RDD	Regression discontinuity design
DD	Difference in Difference

Chapter 1. Introduction

1. Motivation of the thesis

Universal Health Coverage (UHC) refers to providing access to essential healthcare services without compromising financial risk protection (WHO, 2017). Countries around the world are on very different paths to UHC. While the process is relatively well understood in Western countries, where many researchers have long studied health system organisation, there needs to be more defining research on how other countries are achieving UHC, what challenges they face, and how they are addressing them.

Since the 1970s, the Republic of Korea has taken a systematic and novel path to achieve UHC, which is unique in terms of the speed at which it has achieved UHC, its political economy, and the policy instruments it has used to achieve it, including financial and social incentives.

First, South Korea's achievement of population coverage of UHC in about 12 years is historically rare. Figure I-1 shows the percentage of the population with health coverage by year (ILO, 2014, UNDP, 2014). The first group of countries (Austria, France, Germany) to achieve UHC needed more extended time to achieve 100% UHC. For example, it took about 60 years to go from 20% to 100% coverage, while the late starters took much less time. Spain and Greece took around 25 years to move from 50% to 100% coverage. On the other hand, countries that have recently achieved UHC population coverage are moving much faster, with South Korea being one example. The results of this coverage expansion are reflected in healthcare access and outcome indicators. According to a study that measured healthcare

access and quality in 195 countries, all countries have improved access and quality between 1990 and 2015. Moreover, some countries, including South Korea, Turkey, Peru, China, and the Maldives, showed substantial increases in healthcare access and quality (GBD, 2017).

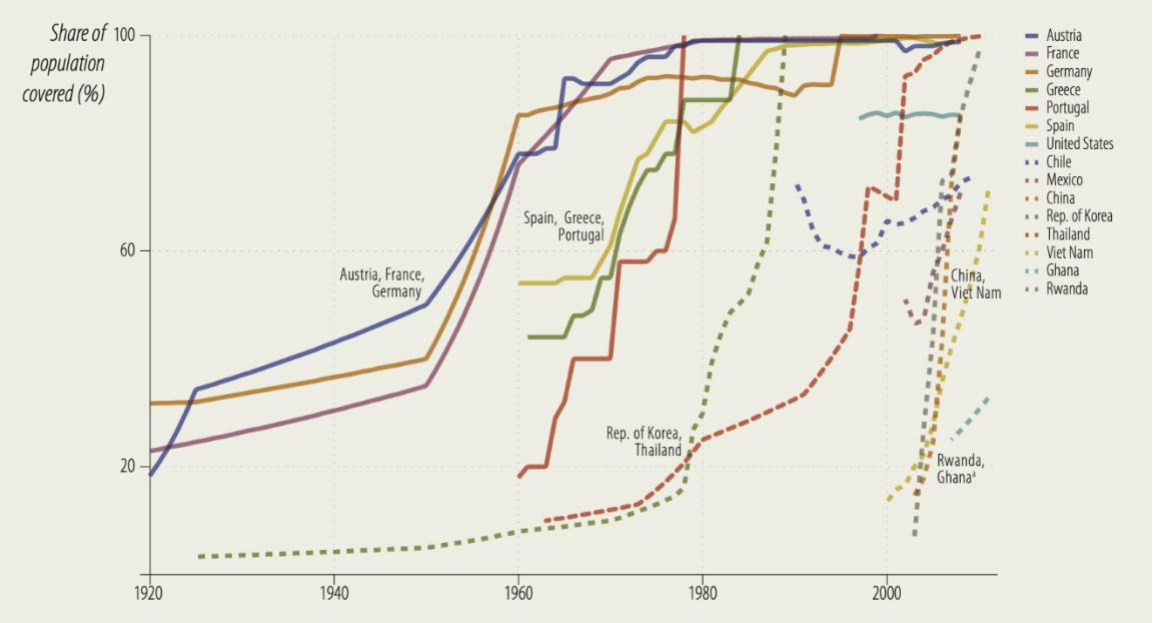


Figure I- 1. Evolution of health protection (ILO, 2014, UNDP, 2014)

Another important research topic is the factors that enabled South Korea's rapid coverage expansion and improved healthcare access. Historically, South Korea also took its idiosyncratic path. Kwon, who has studied welfare expansion in South Korea, labels the country's welfare state a "developmental welfare state". He identifies several characteristics of South Korea's welfare state and the expansion of welfare institutions, such as health insurance and pensions. It is characterised by social policies led by the president and government elites, selective welfare expansion to share the fruits of economic development rather than expanding social rights, and private-led services provision in the 1980s (Kwon, 1995, Kwon, 2009a). The nature of the welfare system is also reflected in the organisation of

the health system, as evidenced by the launch of compulsory social health insurance at the behest of the government elite and the president, the launch of social health insurance targeted at large companies and government employees, and the establishment of hospitals and clinics that rely on private capital. This topic will be discussed in more detail in Chapter 3.

This rapid and distinctive deployment of a health system inevitably creates some challenges. For example, such a rapid expansion of social policy can lead to a rapid expansion of demand, which inevitably leads to an expansion of the supply side without a systematic plan for healthcare delivery. Secondly, the payment system was one of the big challenges that the Korean health system had from the beginning. In the early days of health insurance, the government used fee-for-service as the primary payment model, which was used in many countries at the time. Then it used price controls to ensure fiscal health and sustainability due to the rapid increase in health financing. The official reimbursement cost was set much lower than the fees that medical providers set on their own, forcing providers to generate volume-based income. In addition, the structure of consultation fees created incentives for prescribing drugs and tests rather than patient consultations, which contributed to drug abuse. Finally, the way reimbursement fees are set is also problematic. As an illustration in the context of childbirth, there are two choices available: normal delivery and caesarean section. However, the reimbursement costs for these procedures are set to vary significantly, resulting in a sharp rise in medically unnecessary c-sections. Thirdly, although allocating resources in a democratic society is a matter of consensus and debate among various stakeholders, a rapid expansion of social policy does not allow time for such stakeholder politics to mature.

There are several factors also that make the Korean UHC case attractive. South Korea has been actively introducing financial and social incentives since the 2000s in a way that addresses the issues. For example, strong incentives to prescribe medications led to high prescription rates for antibiotics and injectables, and to address this, public reporting was introduced, followed a few years later by monetary incentives for institutions with low prescription rates. In the case of the c-section, South Korea not only tried several rounds of public reporting but also began to revise the incentive structure to reduce the fee difference between the two modes of delivery. In addition, when the quality issue of managing acute severe diseases, including myocardial infarction and stroke, became intensified due to deficiencies in the healthcare delivery system and regional disparity, the government introduced a series of hospital-level public reporting and monetary incentive systems one after another.

Existing studies have focused on the effectiveness of these policies, and some have reported promising results. However, it is vital to render a fair representation of the successes, failures, and side effects of these policies, and this thesis aims to address these issues. This is not only to help shape healthcare policy in South Korea but also healthcare policies in other low- and middle-income countries that have recently begun to accelerate their efforts to achieve UHC, which need to see the complete picture of the incentive system in South Korea.

The rest of the introduction is structured as follows: Section 2 summarises the main concepts, including the UHC framework, transparency, and human motivation. Section 3 examines two incentives as crucial policy instruments. Section 4 explains the key questions addressed in this thesis.

2. Universal Health Coverage

The UHC framework

The framework in Figure I-2 illustrates the relationship between UHC objectives and UHC goals. There are three intermediate objectives, including ensuring equity in resource distribution, efficiency in care delivery, and transparency and accountability. UHC goals comprise the delivery of quality care, utilisation of the care relative to the need instead of the ability to pay, and financial protection and equity in finance (Kutzin, 2013).

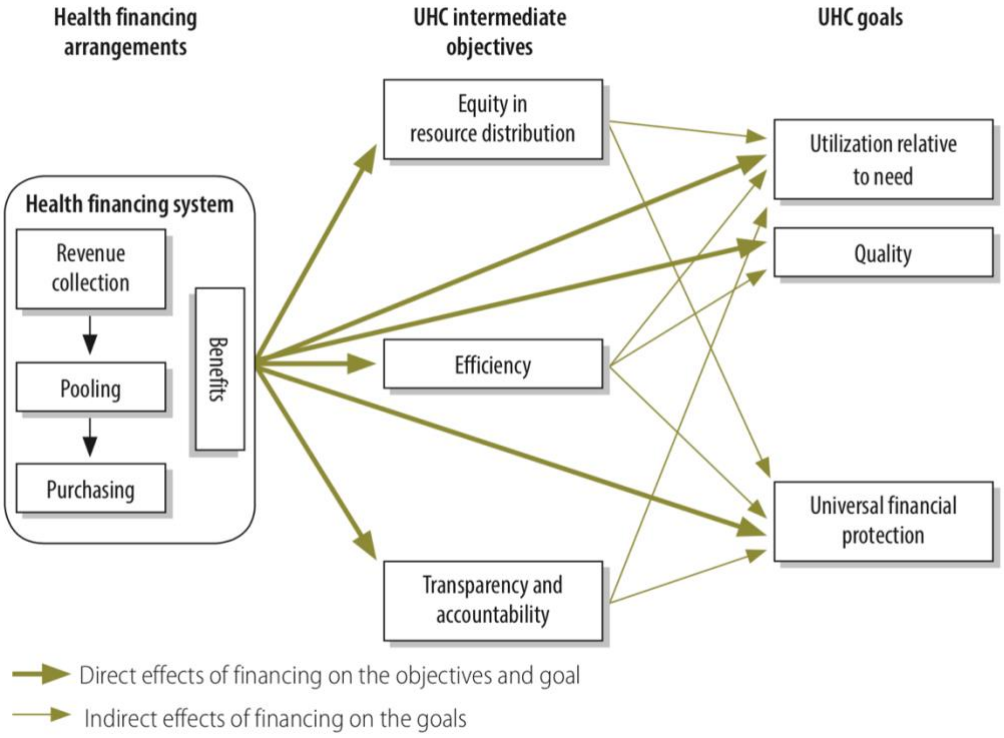


Figure I- 2. The framework of Universal Health Coverage (Kutzin, 2013)

Since health policies involve both financing and delivery, it is necessary to define UHC's efficiency, equity, and transparency in terms of both financing and delivery. Kutzin and colleagues defines major terms in the following ways. Equity in financing refers to allocating contribution to health financing progressively, meaning that the rich contribute

more than the poor (Kutzin et al., 2010). The second aspect pertains to the efficiency of financing, which comprises technical efficiency and administrative efficiency. Technical efficiency focuses on achieving the maximum output of UHC goals with the available funding. By utilizing existing resources more efficiently, a system can deliver more substantial healthcare services. On the other hand, administrative efficiency aims to minimize redundant administrative costs among various health financing agencies, thus optimizing resource allocation. Lastly, transparency and accountability in health financing also consist of two aspects: First, when both beneficiaries and healthcare providers have a clear understanding that the system includes specific services, it leaves no room for undesirable practices such as informal payments. Second, health financing agencies could maintain transparency by receiving audits and public reporting (Kutzin et al., 2010).

In terms of care delivery, allocative efficiency concerns how resources are distributed in the community. To achieve optimal allocative efficiency, duplication or unnecessary services need to be minimised. (Palmer and Torgerson, 1999) Equity in utilisation refers to utilising healthcare relative to the need, not the ability to pay. (Kutzin et al., 2010) Transparency in the delivery enables healthcare users to observe the quality of care. As a result, the information asymmetry would be reduced, leading to an efficient allocation of resources.

Transparency in achieving UHC

In achieving Universal Health Coverage (UHC), transparency can be understood in multiple dimensions. Firstly, from a financial perspective, it is necessary to have a structure in place

where the revenues collectively spent by the community are fairly collected, pooling functions are free from problems, and purchasing necessary health services is done correctly and can be understood by payers. There should be institutional mechanisms to rectify issues in cases where there are issues. Efforts have been made in many countries to ensure transparency in health financing. For example, in the case of the National Health Service (NHS), meeting minutes are made public online so that anyone can understand the direction of the policy. Live broadcasts are also available for board meetings held periodically, and observers can participate if they apply in advance. In South Korea, the Health Policy Deliberation Committee discusses health policies in general, but it could be more active. The Health Insurance Policy Deliberation Committee is the only active central committee dealing with health insurance policies. While the minutes of the committee meetings are published online, there is no live broadcast of the meetings, and interested citizens cannot attend the meetings as observers.

Another area where transparency is necessary for health policy is quality. One characteristic of medical products is that medical services are credence goods, meaning that even after consuming the service, it is difficult to know the quality of the service. While there are cases such as surgeries that determine life and death where patients can objectively know their condition, there are surgeries where this is not the case. It is not easy for the public to know whether the prescription made by the physician for the selection of diabetes drugs, which must consider not only short-term effects but also long-term side effects prevention, is in line with the latest guidelines. Patients also find it challenging to know whether antibiotics are prescribed unnecessarily for cold symptoms that do not require them or whether caesarean sections are induced despite no indication for them. Efforts to

ensure transparency are crucial to addressing these issues. For example, implementing public reporting, which evaluates the quality of medical care by public institutions or voluntary initiatives, helps patients receive the most appropriate and high-quality medical services, prevents overuse of medical services, reduces medical expenses, and enhances the sovereignty of medical consumers.

When applying transparency to healthcare policies, various technical considerations of stakeholders are necessary. First, healthcare providers who practise policies have various methods to undermine them. For example, when a policy is designed based on a specific ICD code, a coding shift can change it to a similar disease. In addition, when a policy is applied based on a cut-off standard, such as a low-birthweight support program, upcoding or down coding of records is possible. Due to the complexity of modern medicine and the unique characteristics of healthcare environments, addressing all these challenges becomes a formidable challenge, even with well-crafted policies in place. Consequently, policymakers face the responsibility of ensuring that healthcare providers possess a clear understanding of the policy objectives. It is crucial to align the goals and incentives of the policy without disrupting the existing incentive structures. If policy targets can participate in the policy design process, it can create an environment for developing enhanced policies.

Transparency policies also require a meticulous design to enable users of such policies to thoroughly understand and assess the content of policies. Heald distinguished transparency in several dimensions, with the distinction between nominal and effective transparency being instrumental in policy design (Heald, 2006). There is an illusion of transparency between nominal and effective transparency, and just because transparency increases quantitatively does not always equate to benefits, as "receptors" capable of

understanding and utilising such information are necessary. Even when a complex aspect of healthcare is transparently disclosed, the policy may not be effective in producing significant benefits if there is no detailed and intuitive explanation regarding it.

3. Professional motivation

When implementing various policies to achieve UHC outcomes and goals, it is essential to have a comprehensive understanding of healthcare provider motivation. However, before understanding provider motivation, a fundamental understanding of human motivation should be reviewed, which can offer valuable insights into provider motivation and policy design.

Research on human motivation and incentives has a long tradition in economics, philosophy, and psychology. Notably, ancient Greek philosophers rendered different explanations of the elements constituting human beings during their debates on justice. In contrast to his mentor Socrates' emphasis on intellect, Plato discussed three independent psychological elements that make up the human soul. These elements include competitiveness, the desire for esteem and self-esteem, distinct from the other two elements, appetite and reason, and equally influential in human motivation and behaviour. In Plato's view, competitiveness encompasses the competitive drive to express oneself within the social value system, self-esteem related to one's achievements, and the desire for respect from oneself and others (Cooper, 1984). This concept closely aligns with the modern notions of social incentives and self-esteem.

The philosophers, notably Thomas Aquinas and Descartes, reduced the tripartite theory of ancient philosophers into a dualistic framework and added an active and passive aspect to their theories. Descartes, in particular, emphasised the will, arguing that impulse merely influences the will, which determines the direction of action, governs bodily desires, and achieves virtue (Reeve, 2018). Esteem, self-esteem, and social value, which were of interest to Plato, were less emphasised in their discussions.

Subsequently, the discussion on motivation led to grand theories which explain behaviour through one or two leading causes. While philosophy made little progress in this field, motivation research based on biology and physiology gained popularity starting in the late 19th century. Through his observation of innate animal behaviours, Charles Darwin shifted the focus from will to inherent instinct in the body. Unlike philosophical approaches, Darwin offered answers to how motivation begins. William James, who theorised Darwin's observations, and various scholars in the early 20th century, such as William McDougall, developed their instinct theories. However, while instinct theory supplied sufficient explanations for various instincts, it faced difficulties in gaining ongoing academic recognition due to its circular explanations. Furthermore, theories that viewed motivation as a "drive," such as Sigmund Freud's and Clark Hull's drive theories, gained attention (Hull, 1943).

In the 1960s and 1970s, theories on motivation delved into individual motives and their characteristics, diverging from the previous grand theories that aimed to explain all motives with one theory. While numerous discussions exist on motives, this chapter will focus primarily on intrinsic and extrinsic motivations and their related theories.

Providers' motivation

In health economics, provider motivation is a traditional and essential research topic. In introductory economics, providers are rational agents whose primary motivation is profit maximisation (McGuire, 2000). It has been reported that providers occasionally engage in undesirable actions to maximize their financial gains (Jürges and Köberlein, 2015, Dafny, 2005, Di Giacomo et al., 2017, Bastani et al., 2018).

Providers have other motivations besides profit maximisation such as upholding medical ethics, adhering to professional norms, and social incentives (Ellis and McGuire, 1986, Philippe Choné and Ma, 2011, Liu and Ma, 2013, Kesternich et al., 2015). The existence of these motivations also lead to gaming behaviour by providers (Bevan and Hamblin, 2009).

Le Grand explains the motivations of public providers based on the nature of the motivation rather than the individual elements of the motivation. He uses the analogy of a knight and a knave, where a knight refers to a provider motivated by altruism. In contrast, a knave refers to a person whose primary motivation is self-interest (Le Grand, 2003). Bevan and Hood extend Le Grand's metaphor further, dividing them into four groups: saints, honest triers, reactive gamers, and rational maniacs (Bevan and Hood, 2006).

Self-determination theory

Research on provider motivation from health economics is valuable, but practical policy design often requires a deeper understanding of provider motivation. Designing all policies based on financial incentives is not preferable and may not yield cost-effective outcomes. Therefore, research and insights into non-financial incentives are necessary, and there is

considerable insight to be gained from psychology, which has studied how human motivation is structured.

Since the 1980s, psychologists Edward L. Deci and Richard Ryan deeply explored intrinsic motivation through self-determination theory and various mini-theories. Self-determination theory discusses the psychological needs inherent in individuals and necessary for motivation: competence, relatedness, and autonomy (Deci and Ryan, 1985).

There are several reasons why policymakers should be interested in intrinsic motivation. If an individual's motivation is more authentic than externally controlled, their actions are more engaging (Deci and Ryan, 2013). They exert more effort towards achieving goals even without positive feedback (Sheldon and Elliot, 1999) and display higher persistence in competitive environments (Vansteenkiste and Deci, 2003). Intrinsic motivation also contributes to creativity, self-esteem, and well-being (Kasser and Ryan, 2001). While many studies have been conducted in experimental settings or limited to educational contexts, they have significant implications for healthcare policies.

The question of how and to what extent to employ extrinsic motivation is also a noteworthy topic. In Western societies, monetary rewards, including provider incentives, are used as policy tools across various fields. However, if these monetary rewards begin to overshadow providers' intrinsic motivation, it poses a significant problem. Psychological studies have consistently shown that extrinsic rewards can undermine intrinsic motivation (Lepper et al., 1973, Condry, 1977, Deci et al., 1999). This phenomenon has been observed in psychological research and physiological studies (Murayama et al., 2010).

Generally, there is a wide range of reward types and methods, necessitating analysis of existing research on the effects of rewards. (Deci et al., 1999) conducted a meta-analysis

examining the impact of verbal and tangible rewards on free choice behaviour and self-reported interest. The results indicated that verbal rewards increase intrinsic motivation. Most of the findings were observed in experiments involving children and students, with more pronounced effects among college students. Additionally, verbal rewards were found to increase self-reported interest. Indeed, the issue lies in the finding that performance-contingent rewards can undermine intrinsic motivation. However, the research also mentions several possibilities for rewards that do not diminish intrinsic motivation. For example, rewards unrelated to a specific task or unanticipated rewards do not undermine intrinsic motivation.

Another usefulness provided by the Self-Determination Theory is the detailed categorisation of extrinsic motivation. "External regulation" refers to behaviours that are maintained by contingencies of rewards and punishments. The remaining three types of extrinsic motivation involve internalising the required behaviours and values, where individuals engage in the expected behaviours through internal regulation even without external contingencies (Gagné and Deci, 2005).

"Introjected regulation" refers to the scenario in which individuals comply with externally imposed specific behaviours without wholeheartedly accepting or endorsing them. Individuals motivate themselves through internal rewards and punishments. They can avoid guilt and experience enhanced self-esteem by engaging in specific behaviours. However, it is still difficult to claim that the autonomy of individuals is fully respected in such situations (Gagné and Deci, 2005).

"Identified regulation" is a more highly internalised motivation than introjected regulation. It can be described as autonomously extrinsically motivated. Although the

specific behaviours are still externally driven, individuals adhere to them because they perceive that these behaviours are beneficial for themselves and others. In other words, individuals feel a greater sense of autonomy and volition because the specific behaviours align with their personal goals and identities. For example, a nurse may willingly assist in bathing a difficult-to-care-for patient. While it may not be intrinsically interesting, it aligns with their goal as healthcare professionals to enhance the patient's well-being. Finally, "integrated regulation" represents the most substantial level of integration, where this motivation is genuinely autonomous and volitional (Gagné and Deci, 2005).

In summary, self-determination theory's taxonomy of extrinsic motivation renders excellent insight into policy design. For example, the sustainability of policies that use incentives, such as public reporting, is often questioned. The theory suggests that identified regulation and integrated regulation of extrinsic motivation allow policy targets to regulate their behaviour by aligning the goals and values of an externally imposed policy with their own values, which is more likely to lead to greater sustainability and performance than those of external regulation. After exploring case studies in the following chapters, Chapter VI will further explore how this integrated and identified motivation can be incorporated into the policy process.

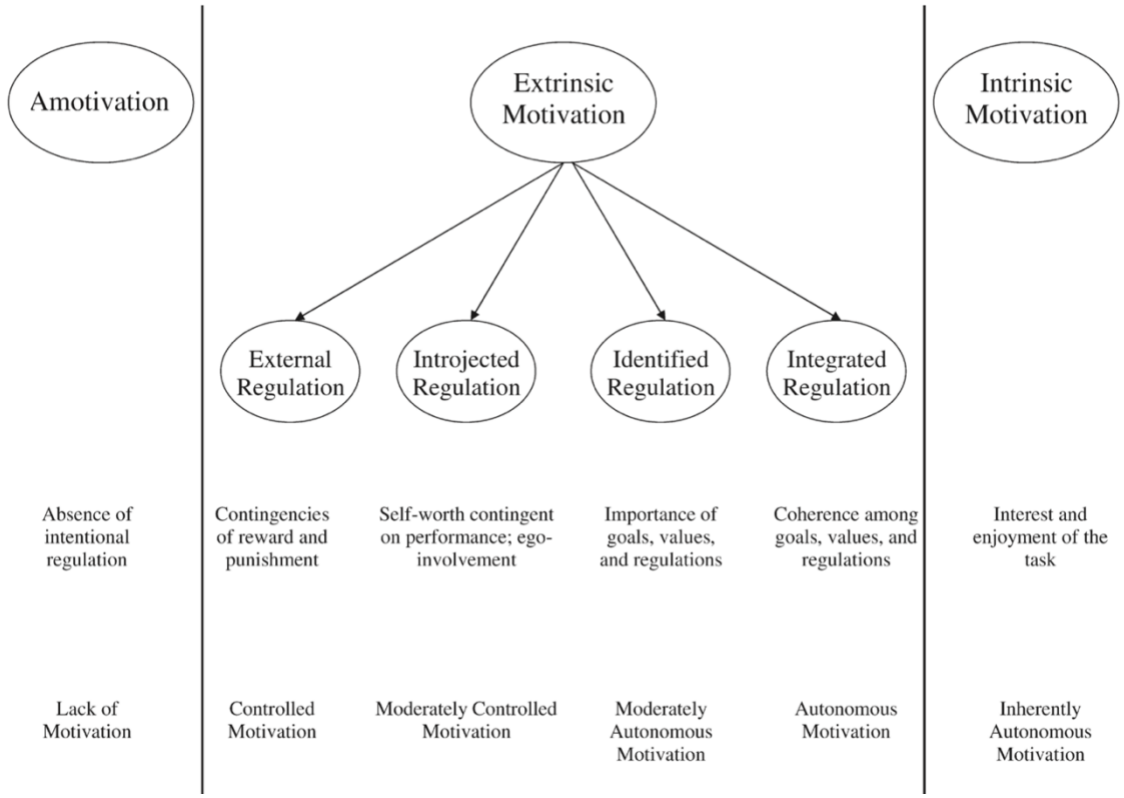


Figure I- 3. The self-determination continuum (Gagne and Deci, 2005)

4. Two incentives: financial and social incentive in healthcare

Provider payment systems are undoubtedly one of the most essential topics in health economics. Macro-level changes, such as the shift from retrospective to prospective payment, are essential reforms to reduce skyrocketing healthcare costs and achieve efficient health financing (Mossialos et al., 2002). Although many countries have implemented these changes (Acemoglu and Johnson, 2008, Kwon, 2003a, Feldhaus and Mathauer, 2018), they faced various challenges due to path dependence (North, 1995). Stakeholders, especially healthcare providers, have invested in fixed costs such as hospital facilities in the given environment, and rapid changes can induce a collective backlash from providers who face financial risks. In addition, the behaviour of healthcare providers is complex and challenging to observe, so it is difficult to expect ideal healthcare outputs from a single payment mechanism. Therefore, many countries prefer and apply mixed payment methods (Mossialos et al., 2002, Robinson, 2001).

The contract between insurers and healthcare providers determines the payment method in a country. Various payment methods have advantages and disadvantages, depending on the goal of the contract between insurers and healthcare providers. For example, the fee-for-service payment is a volume-based payment system in which the insurer compensates the provider at a pre-agreed price for each service. As providers invest their time, skills, and resources to produce services, they earn more income as they generate more services. Therefore, fee-for-service can be used when there is a need for a sufficient service supply within the healthcare system. However, the fee-for-service payment faces notable challenges, including the absence of mechanisms to ensure service quality, limited

control over supply-induced demand and significant variation in the allocation of resources among providers offering the same service.

The Diagnosis-Related Groups (DRG) payment system was introduced by promoting "yardstick competition" among healthcare providers (Shleifer, 1985). It is a type of prospective payment system that groups similar disease categories and supplies the same reimbursement for the same disease category, thus reducing the variability in resource allocation and final price in the fee-for-service system. Under DRGs, providers still have the incentive to generate profits based on the volume of services produced while also having the incentive to reduce costs per unit of service. However, DRG payment system may lower the quality of healthcare and hinder the introduction of new medical technologies. Therefore, countries that have developed DRGs have devised various ways to improve healthcare quality and have established separate funds to promote the adoption of new medical technologies.

Capitation is a payment system in which insurers contract a total payment amount for a quarter or a year with healthcare providers rather than controlling the amount or price of individual services. Under this system, insurers face less financial risk while providers face more significant financial risk. Providers may under-provide services to reduce financial risk.

Pay-for-performance was developed to maintain service volume without compromising quality. It is primarily used in the health provider payment domain rather than the insurer. It yields incentives to providers for high-quality care and incentives to patients to receive the care they need. The pay-for-performance system can enhance healthcare quality, but it is still not a widespread payment method due to various challenges

such as data collection and cost-effectiveness. In this section, we will examine financial and non-financial incentives, also known as social incentives, for providers.

4.1. Financial incentive in healthcare

Pay-for-Performance for hospitals.

In healthcare policy, financial incentives are typically targeted at primary care physicians or hospitals. (Milstein and Schreyoegg, 2016) illustrated an overview of the 34 pay-for-performance programs in 14 countries. This review targeted OECD countries, and first of all, Pay-for-Performance (P4P) can be divided into national and regional programs. The national programs include Australia's "National emergency access target, national elective surgery target," England's "Never event," "Commissioning for Quality and Innovation," "Best practice tariffs," "Non-payment for emergency readmission," France's IFAQ1 and IFAQ2, Israel's "Never events," Japan's incentive program for stroke, South Korea's "Value incentive program," Turkey's performance-based supplementary payment system, and the United States "HQID," "HVBP," "Hospital readmission reduction program," "Hospital-acquired condition reduction program," and others.

According to the review, the regional programs include Queensland's Clinical practice improvement payment in Australia, British Columbia's "Emergency Department P4P," and Ontario's "ED Wait Time Strategy" and "Performance-based Compensation" in Canada. In addition, Southern Denmark operates "Journalauditindikatoren," which incentivizes case managers, and Northwest England has "Advancing Quality" to reduce readmissions, hospital costs, and length of stay. At the same time, Tel Aviv in Israel has pay-for-performance for cardiothoracic surgery. Italy has no national program, but Lazio and Tuscany regions operate

programs for managing waiting times and other quality improvements. Norway operates "Kvalitetsbasert finansiering" in four regions to improve overall quality, and Sweden operates "Målrelaterat ersättning" regionally. In Hawaii, the "Hospital Quality Service" and in Michigan, the "Hospital Agreement Incentive Program" are in operation, which target general quality improvements. Massachusetts operates the "Massachusetts Hospital Pay for Performance Program," which is noteworthy for aiming to reduce racial disparities in inpatient service (Milstein and Schreyoegg, 2016).

When indicators employed by each program across structure, process, and outcome are examined, it is apparent that most programs prioritize the utilization of process indicators. Among the 34 programs, 30 use process indicators, and five use structure indicators to evaluate patient and hospital characteristics. Of all the programs, 20 use outcome indicators to evaluate the patient's condition after discharge (Milstein and Schreyoegg, 2016).

In the programs mentioned above, there were also significant differences in the evaluation scope, reward structure, and the presence and method of penalties. Some programs focused on specific diseases or surgeries while others evaluated entire hospitals. Even within hospital evaluations, some programs scored individual components and were rewarded based on an aggregate score. At the same time, other programs would make a hospital ineligible for pay-for-performance (P4P) if they failed in a specific component (Milstein and Schreyoegg, 2016).

Regarding reward structure, there are absolute and relative evaluations, and each has various methods. Absolute evaluations utilise a fixed score or increase scores annually to enhance overall quality, while relative evaluations utilises awards of three types: "top

performer award," "achievement award," and "improvement award." The “top performer” award applies P4P only to the top or bottom percentiles of participants. In contrast, the “achievement award” evaluates the average score of the hospital being evaluated and the individual hospital's score. And, the “improvement award” compares a hospital's past and present performance (Milstein and Schreyoegg, 2016).

The presence of penalties in the reward structure also varied greatly. When the budget is sufficient, penalties may not be necessary, but in cases where budget neutrality is desirable, penalties can be implemented. There are three types of relative evaluation: "top performer award", "achievement award", and "improvement award". The top performer award applies pay-for-performance (P4P) to only the top or bottom few percent of participants. The achievement award evaluates the average score of the hospital being evaluated and individual hospital scores. The improvement award compares a hospital's past performance to its current performance. Whether or not penalties are applied also creates a significant difference. When the budget is ample, there is no need to apply penalties. However, when aiming for budget neutrality, penalties can be divided into various designs such as "payment withholds", "blended payment", and "penalty only". Of the 34 programs, 14 used only incentives, 6 used only penalties, and 3 used both. Twelve programs used withholds. The incentives paid to hospitals are mostly around -3% to 4%, but the amount is much more enormous when targeting the income of CEOs or physicians (Milstein and Schreyoegg, 2016).

P4P programs have been the subject of considerable controversy regarding their effectiveness. As mentioned earlier, because programs vary significantly in design, it is difficult to evaluate the effectiveness of P4P at the hospital level simultaneously. Therefore,

this chapter will briefly examine the nature and effects of programs in major countries such as the United States and the United Kingdom. In addition, the next chapter will illustrate a detailed description of the history of P4P in South Korea and the current "Value Incentive Program" being implemented.

Financial incentive in the United States

The Centers for Medicare and Medicaid Services (CMS) in the United States introduced the Premier Hospital Quality Incentive Demonstration (HQID) in 2003. This program offered incentives based on the quality of inpatient care.

(Glickman et al., 2007) evaluated various measures for acute non-ST elevation myocardial infarction (non-STEMI) patients, including medication, treatment, and long-term lifestyle modifications. The study found positive effects only for aspirin at discharge and smoking cessation counselling, with no significant effects on other measures or in-hospital mortality. (Grossbart, 2006) measured the effects of HQID on hospitals in Catholic Healthcare Partners and found a significant increase in the composite score for chronic heart failure but no significant increase for AMI or pneumonia.

(Jha et al., 2012) conducted a study on the long-term effect of HQID on patient outcomes. The study compared 252 hospitals that participated in HQID with 3,363 hospitals and measured 30-day mortality for six million patients with AMI, heart failure, pneumonia, and coronary-artery bypass graft. The study did not find evidence that pay-for-performance reduces 30-day mortality. Furthermore, the study also investigated whether pay-for-performance has different effects depending on potential financial incentives for hospitals, the financial health of hospitals, and the competitiveness of the local market; however,

evidence for such differences was not found. Therefore, no long-term evidence exists that pay-for-performance improves patient outcomes beyond process indicators.

In addition to the clinical effects, the financial impact of HQID is also a significant area of concern from the perspective of health finance. (Ryan, 2009) studied the impact of HQID on Medicare payments for AMI, heart failure, pneumonia, and Coronary artery bypass graft surgery (CABG) costs, but no substantial impact was identified. The results also suggested that the HQID did not reduce risk-adjusted 30-day mortality. (Kruse et al., 2012) studied the impact of HQID on hospital finances, including revenues, costs and margins in a four-year study that included approximately 420,000 cases of AMI. Using a difference-in-difference approach, the study found that HQID did not significantly impact hospital finances.

With the passage of the Patient Protection and Affordable Care Act (ACA), Medicare in the United States introduced Hospital Value-Based Purchasing (HVBP). This program, which began in October 2012, introduced incentives into the existing Prospective Payment System, increasing incentives from 1% in 2013 to 2% in 2017. Furthermore, HVBP publicly disclosed quality metrics through the Hospital Compare website (Ryan et al., 2017, Ryan et al., 2012).

The HVBP measures four quality domains: clinical care, person and community engagement, safety, efficiency, and cost reduction, each with a weight of 25%. The clinical care domain measures 30-day mortality for AMI, heart failure, and pneumonia. The person and community engagement domain includes communication with healthcare providers, hospital staff responsiveness, hospital environment, and overall hospital rating. The safety domain evaluates catheter-associated urinary tract infection, central-line associated infection, C. difficile infection, MRSA infection, surgical site infection, and preterm elective

delivery. Finally, the efficiency and cost reduction domain evaluates Medicare spending per beneficiary (Hong et al., 2020).

Two studies that examined the impact of HVBP on patient mortality suggest that incentives have little to no effect on patient outcomes. (Figueroa et al., 2016) compared 2,919 participating hospitals in HVBP with 1,304 ineligible hospitals, with a total of approximately 2.43 million patients from 2008 to 2013. The results showed no significant difference in 30-day mortality for AMI, congestive heart failure and pneumonia, and no significant difference was found for non-target conditions. In addition, (Ryan et al., 2017) evaluated the early 3-year impact of the HVBP by dividing it into the clinical process and patient experience measures. The study evaluated hospitals exposed to HVBP as the treatment group and Critical Access Hospitals as the control group using a difference-in-difference approach. As a result, there was a nonsignificant increase in the clinical process and a nonsignificant decrease in patient experience. Additionally, when examining mortality, there was a nonsignificant decrease in AMI and heart failure, and it was found that only the mortality of patients hospitalised for pneumonia decreased by 0.431 percentage points.

Financial incentive in the United Kingdom

In the UK, pay-for-performance also emerged after hospital payment changed to prospective payment in the 1990s. The UK's prospective payment system began when the Department of Health first became interested in North American DRGs in 1981, and the UK began its own categorization in 1991 after DRGs were introduced in the United States in 1987. The first Healthcare Resource Groups (HRGs) in the UK started with 534 categories and were updated in 1994, 1997, 2003, and 2006. The government introduced "Payment by Results" (P4P) in

2003/4 to address quality issues raised by HRGs, initially applying it to 15 HRGs and gradually expanding its application to many more HRGs (Grasic et al., 2015). In 2005/6, 550 elective tariffs were applied to all acute providers, and in 2006/7, PbR was also applied to the elective emergency, A&E, and outpatient care. In 2008/9, PbR was extended to independent sector treatment centres participating in the NHS choice program (Charlesworth et al., 2014). In 2009/10, all acute trusts were requested to disclose a "quality account" along with their financial accounts. "The Commissioning for Quality and Innovation (CQUIN)" aims to help commissioners achieve mutually agreed goals in contracts with providers. The CQUIN payment framework started at 0.5% of provider income and increased to 1.5% in 2010/11 and 2.5% in 2014/15. In 2014/15, the framework was expanded to include the "Friends and Family Test," dementia and delirium care, reduction of harm, and physical healthcare for mental health patients (Grasic et al., 2015).

Best practice tariffs (BPTs) are another example of quality improvement initiatives in the NHS, mainly introduced in areas where unexplained variation is observed. They were first applied to cataract, cholecystectomy, hip fracture, and stroke care in 2010/11 and have

since been expanded to include haemodialysis, day care procedures, trauma, same-day emergency care, and endoscopic surgery (Grasic et al., 2015).

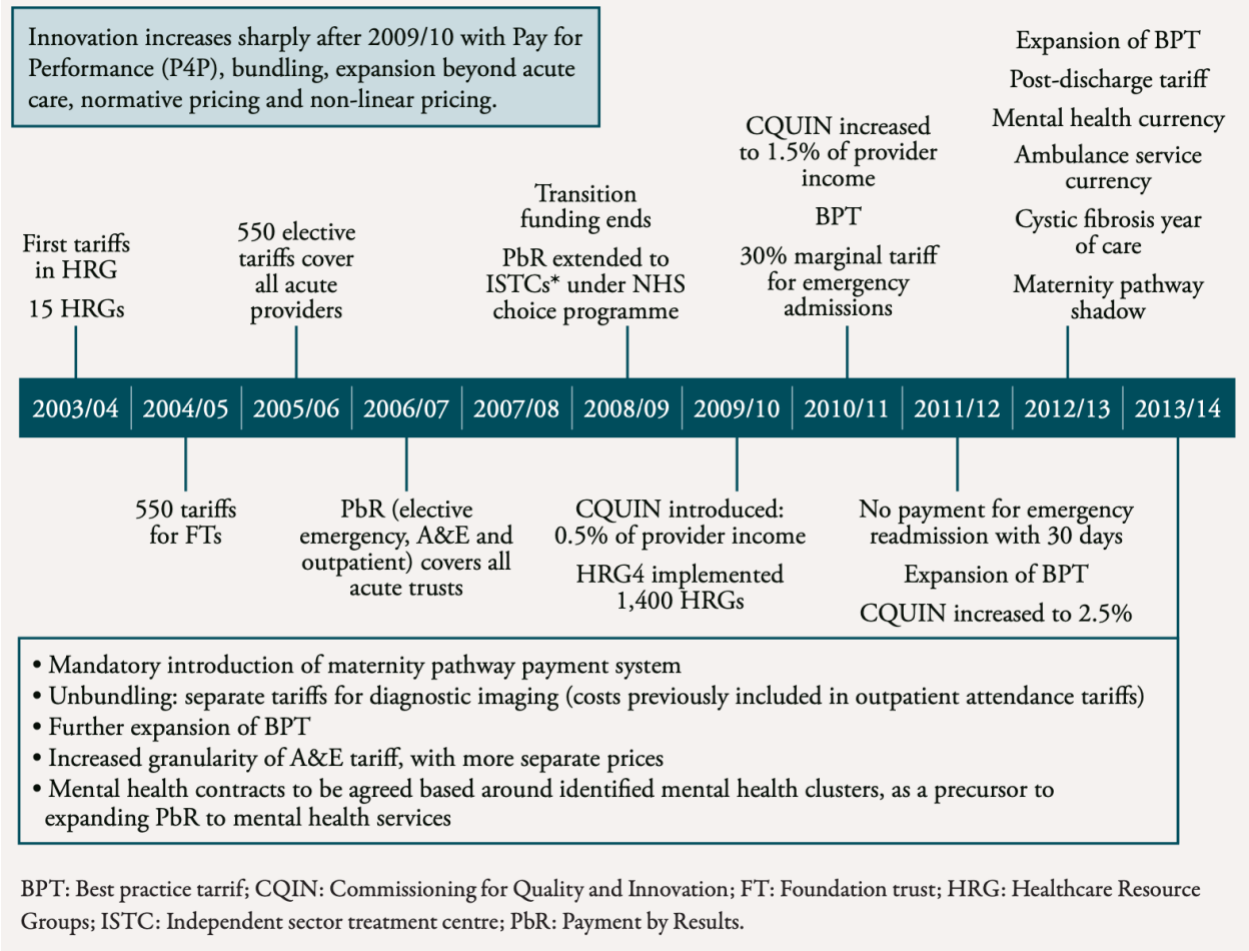


Figure I- 4. The evolution of hospital payment in NHS, (Source: Charlesworth et al., 2014)

Regarding the effectiveness of the P4Ps, (Farrar et al., 2009) demonstrated the effects of PbR using a difference-in-difference approach, with the comparison group being hospitals in England and Scotland that did not apply PbR. PbR reduced length of stay and increased day cases, indicating PbR was associated with unit cost reduction.

Financial incentive program in South Korea

Since completing the integration of health insurance in 2000, South Korea has exerted great efforts to enhance the quality of healthcare through 'appropriateness assessment', especially since the establishment of the Health Insurance Review and Assessment Agency (HIRA) in the early 2000s. The HIRA also conducted a study to introduce financial incentives under the name of the Value Incentive Program (VIP) in 2007. In 2011, VIP was introduced for AMI care, c-section, and stroke care in all tertiary hospitals, and has been extended to preoperative antibiotic use, chronic disease management, etc. Section 6 in Chapter II discusses VIP in more detail.

4.2. Social incentive in healthcare

Social incentive refers to 'external non-monetary stimuli' and refers to the perceived marginal cost or benefit of a particular behaviour by an individual (Costa-Font et al., 2023). Social incentives come from perceptions of other actors or society and are influenced by social norms, social image, and an individual's identity in a particular group. While 19th-century economists mainly considered only economic motives in the individual utility function, modern economists Akerlof and Kranton argued that 'identity' should be added to the individual utility function. They argued that who people think they are and what social category they belong to have an impact on their behaviour and decisions, and they illustrated this through empirical data (Akerlof and Kranton, 2010).

One of the intersections of social identity with health policy is the professionalism of medical professionals. Medical professionals are a group with specific education and training, licensed by a regulatory body, sharing values and professional norms that are invisible to the professional society to which they belong. One of these professional norms is to offer the best possible care to patients based on up-to-date knowledge, even in the absence of oversight. However, healthcare providers often face obstacles that hinder their ability to offer the best care, including specific insurance policies, reimbursement criteria, personal outdated knowledge, and turf battles. These obstacles cause individuals to deviate from the professional norm, but they are unlikely to rectify their behaviour if they themselves are the only ones aware of it. However, if the 'deviation' is exposed, the individuals are likely to be under immense pressure to change their behaviour. This is where public reporting comes in.

Public reporting is a policy used in a wide variety of contexts, not just in health policy, that seeks to achieve policy objectives by closing information gaps and enhancing the quality of services through consumer choice, but also by stimulating the social identity of providers. This is particularly interesting in health policy because, as mentioned earlier, medical professionals have stronger social incentives than those of other professions.

Proponents of public reporting (PR) argue that PR encourages providers to improve quality. In the United States, the PR on CABG changed the hospitals' governance and increased the number of doctors, resulting in quality improvement. In addition, PR seems to lead providers and healthcare organisations to infection prevention activities and reduce antibiotic prescription rates (Haustein et al., 2011). A randomised controlled trial from China reported that PR for antibiotic prescribing reduced the prescription rate by 9% (Yang et al., 2014). Another randomised controlled trial documents that a PR reduced antibiotic

prescribing in low-risk age groups, but not in high-risk groups, including children and the elderly (Liu et al., 2016). Consistent with this, literature from South Korea also shows significant reductions in prescription rates after a PR (Kwon and Jun, 2015, Yun et al., 2015, Jun and Jung, 2011).

Sceptics of PR point to risk adjustment, risk selection, multidimensionality of quality and gaming. First, sceptics claim that risk adjustment can never be perfect (Dranove et al., 2003). For example, a French study shows the instability of measuring healthcare quality without accurate case-mix adjustment (Rabilloud et al., 2001). Second, sceptics ' raise concerns about risk selection', which refers to providers avoiding seriously ill patients. For example, there is evidence of risk-selection shortly after the PR on CABG outcomes in the US. Risk-selection led to inefficient resource allocation and poor outcomes in the short term (Dranove et al., 2003). Third, sceptics point out that the multidimensionality of quality limits the observability of quality improvements by shifting efforts from the monitored to the unmonitored domain. A case on the quality improvement initiative in nursing homes shows that firms simply shift their resources, leading to deterioration in the unobserved dimensions (Lu, 2012). Finally, sceptics contend that gaming further undermines quality improvement initiatives through public reporting. In the clinical setting, gaming can take different forms. One way gaming occurs is through the manipulation of clinical coding. This refers to the behaviour of healthcare providers altering diagnosis codes, patient severity levels, or treatment information. Some providers manipulate codes because they want to receive more reimbursement or to enhance their reputation. The effects and side effects of public reporting are discussed in more detail in Chapter III.

5. The overarching question

The fundamental question of this thesis focuses on examining the methods in which the government has employed diverse financial and social incentives to address the challenges present in Korean healthcare; moreover, this thesis aims to explain the underlying mechanisms associated with these incentives. Through three empirical case studies, we will answer this fundamental question. .

First, we need to consider what the challenges are and why they exist. In the 1970s and 1980s, the government tried to increase public access to healthcare by rapidly introducing social health insurance, expanding healthcare facilities, and launching a healthcare delivery system. However, due to the rapid introduction of healthcare-related systems, developmentalist system design and operation, and over-reliance on private capital for healthcare provision, the modern South Korean healthcare system commenced with several problems that distorted the incentive structure of healthcare providers.

The first problem originated from the fee-setting process, as it created incentives for healthcare providers to prioritize prescribing medications and conducting tests, rather than focusing on spending adequate time with patients, which will be elaborated in the next chapter. The second is that the reimbursement cost setting did not properly reflect the price of the effort, time, and treatment, resulting in supply-induced demand. Finally, leaving the expansion of healthcare infrastructure to the market in the 1980s led to the proliferation of small, relatively under-capitalised hospitals rather than the establishment of large hospitals with large capacity and high-quality patient care capabilities. In particular, small hospitals had relatively little incentive to build adequate capacity and provide high-quality care, as

they expanded in a way that maximises volume under the fee-for-service system without government planning or support.

Table I-1 outlines the causes of the distorted incentive structure in each case study, the problems they are currently experiencing, and the policies the government has introduced to address them, as well as who they have targeted.

The first is the case study of antibiotic prescription rate disclosure, which was introduced by the government to reduce the acceleration of antibiotic resistance due to the overprescription of antibiotics. The reasons for high antibiotic prescription rates in South Korea are many, but the most pivotal reasons have been patient or caregiver preferences and the structure of primary care, where there is a strong incentive to resolve infectious diseases as quickly as possible. In particular, before the separation of prescribing and dispensing, medicines were often dispensed directly by doctors. After the introduction of health insurance, doctors had an incentive to prescribe more drugs, as their consultation fees were relatively low in comparison to the fees they had charged patients before the introduction of health insurance. Over the next 20-30 years, a culture of overprescribing and overusing developed among both doctors and patients. It became common to expect antibiotics or antibiotic injections even for minor infectious diseases, and this overprescription culture persisted even after prescribing and dispensing became separated in 2000. The national average rate of antibiotic prescribing exceeded a threshold that would classify it as a normal practice, although some doctors were following clinical guidelines and adopting behaviours such as minimal antibiotic prescribing and delayed prescribing.

Table I- 1. The misaligned incentives and policy interventions of three case studies

	Misaligned incentives and its historical causes	Major issues, the policy intervention, and the type of incentive	Subject of policy
Case 1: antibiotics	**Supply side:** 1) Volume-based income generation under the fee-for-service payment 2) Relatively low consultation fee 3) Clinics used to prescribe and dispense medications including antibiotics until 2000 **Demand side:** 1) Patients asking for antibiotics even for common cold, mistakenly believing that antibiotics are treatments for common cold.	1) Public reporting in Feb 2006 to tackle high antibiotics prescription rate (social incentive)	Clinics
Case 2: supply-induced c-sections	**Supply side:** 1) Large difference in the reimbursement cost between two modes of delivery 2) Proliferation of small obstetric clinics based on the private capital Supply induced demand in c-section	1) 54.4% increase of the reimbursement cost for normal delivery in Jan 2005 to lower high c-sections (financial incentive for supply-side) 2) the OOP exemption for normal delivery in Jan 2005 (financial incentive for demand-side) 3) Expansion of the recurring public reporting in July 2006 (social incentive)	Mainly clinics and small hospitals
Case 3: acute stroke	**Supply side:** 1) In the 1970s and 80s, the government focused on introducing health insurance, healthcare delivery was relatively dependent on the market, and there was no mechanism to coordinate healthcare delivery. This led to the proliferation of small, under-staffed hospitals.	1) Public reporting of stroke care quality in Sep 2007 to improve the care quality (social incentive) 2) Announcement of incentive program in July 2011 (financial incentive)	All hospitals

To address the culture of overprescribing antibiotics, the government introduced a medical quality assessment system called 'appropriateness assessment', which uses data to analyse doctors' prescribing behaviour and notify them with personal feedback if they deviate too far from the average. Despite this, the high rates of antibiotic prescribing did not fall significantly. The government, which had experienced a major doctors' strike in 2000, was reluctant to adopt a more draconian policy. Unexpectedly, the impetus for reform came from civil society organisations. They filed a lawsuit against the government over antibiotic disclosure. Contrary to the government's lukewarm attitude towards disclosing antibiotics, the court sided with the plaintiffs and forced the government, somewhat unprepared, to disclose antibiotic prescribing rates. Various studies in South Korea have estimated that there has been a 4-9% reduction in antibiotic prescribing rates as a result of the policy. However, unlike the principal of not being able to see into every consulting room, doctors as agents have reacted differently to this drastic change. We document that, contrary to expectations, the policy had serious consequences in terms of upcoding. Moreover, the policy did not reduce the use of broad-spectrum antibiotics at all, and even led to the upcoding of some doctors who had previously practised a low antibiotics policy.

The second is the case study of caesarean section rates. It revolves around the question of whether financial and social incentives can be utilised to rectify the substandard quality of care resulting from the swift reform of the health system. The caesarean section rates, rose sharply after health insurance was introduced, especially in small maternity clinics and hospitals. This increase is strongly related to the introduction of health insurance and the associated changes in the healthcare environment, as well as to the structure of

maternal preferences. To meet the rapidly increasing demand for healthcare, the government increased the number of medical schools and trained doctors, but the supply of large hospitals increased rather slowly, leading doctors to enter primary care with specialisation. Even at that time, the private sector did not have sufficient financial resources, so there were numerous clinics with one or two doctors, and over time, economies of scale were achieved.

Despite this structure, mothers with improved access to healthcare through health insurance preferred to deliver with a doctor rather than a midwife, and many clinics lacked access to emergency surgery and blood transfusions. The problem lay in both the health insurance system and the healthcare structure. One of the two problems with health insurance reimbursement was that the reimbursement costs for caesarean and normal deliveries differed substantially. Not only was the difference between the two modes an incentive for providers to favour caesareans, but the presence of uninsured services created a stronger preference for caesareans, which typically added three to four days to a hospital stay. Changes in the healthcare landscape have also played a role. In the 1970s, when there was a shortage of doctors, midwives played a large role in supporting normal births at home or in midwifery facilities. However, with the introduction of health insurance, demand shifted to clinics and hospitals where specialist care was available. In addition, unlike other countries with active community or hospital midwifery, the role of midwives in South Korea has not been absorbed into hospitals. Most midwives were trained nurses, so they were often employed by hospitals. However, their role in hospitals was limited to assisting doctors rather than taking the lead. In addition, the situation in small practices was not always conducive to the normal delivery of babies. Unless there were several doctors on call in

rotation to attend to deliveries, the doctors were busy running both the outpatient departments while also taking care of the labouring mothers. Consequently, even the most dedicated doctors had little incentive to devote their limited energy and resources to normal deliveries. Normal deliveries were time-consuming and require careful supervision. As a result, the caesarean section rate rose from around 8 percent in the 1980s to nearly 40 percent in the early to mid-2000s.

With the introduction of HIRA in 2000, the government published and released caesarean section rates of hospitals. The disclosure contributed to a decline in caesarean section rates, and the National Health Insurance Corporation has since followed suit by publishing caesarean rates on an annual basis. However, the decline in caesarean rates has stagnated. As the country's declining birth-rate became a serious problem, the government implemented various policies to reduce the burden on mothers, one of which was to reduce the cost of childbirth. Aware of the high rate of caesarean sections at the time, the government and the Health Insurance Policy Review Commission implemented a dual policy of exempting mothers from out-of-pocket costs for normal deliveries and increasing reimbursement for normal deliveries. Our analyses revealed that this policy was effective in reducing the rate of caesarean sections and also in increasing the employment of doctors in small practices.

The last is the case study of acute stroke mortality and related outcomes, which evaluated the effectiveness of public disclosure and the introduction of an incentive program. As described earlier, we reviewed why gaps in emergency and acute care remained despite various government measures. After the introduction of health insurance, the government, which did not have sufficient financial resources, implemented multiple policies to

encourage the introduction of non-profit private hospitals, which engendered several problems. First, private hospitals were naturally located in urban centres where demand was high, while private hospitals that received public loans in low-demand areas struggled or eventually closed, creating regional health disparities in access to hospital care. Second, hospitals had to meet a certain size requirement to ensure providing a high level of care to emergency patients around the clock. Having the medical staff and equipment to perform immediate surgery requires significant investment and has high fixed costs. In other words, there is less incentive for hospitals under deficit to continue providing low-demand, high fixed cost services. If this situation persists, small and medium-sized hospitals will not be able to play a role commensurate with their size, and patient outcomes will be disastrous if they do not have adequate emergency power systems. These situations have occurred throughout the country, particularly in small and medium-sized towns and rural areas. Stroke and acute myocardial infarction are typical examples.

Through these three case studies, we aim to explore how financial and social incentives can contribute to achieving basic UHC. Specifically, we examine how different incentives work, whether they fail to adjust existing misalignments or exacerbate them, and what the policy implications are for achieving full UHC.

Chapter II. Institutional background

1. Introduction

The Korean War destroyed the Korean peninsula between 1950 and 1953, and the country had received global aid for decades. Now it has become a global-aid donor country and the 11th largest country in terms of the scale of its economy. Along with the economic growth, healthcare in South Korea showed remarkable success. For example, it marked the 20th highest country by the Health Access and Quality index and tied with Germany, Singapore, Denmark, and Israel (GBD, 2017). Researchers have pointed out that its success is attributed to the introduction of National Health Insurance (Kim and Joung, 2014, Kim and Kwon, 2015), information systems such as the electronic medical record and national claims data, and investments in preventive care such as national cancer screening (Kim et al., 2015b).

However, the country faces caveats and future challenges. Health financing is one of these. For example, the level of out-of-pocket payment (Ruger and Kim, 2007) and catastrophic health expenditure is the highest among the OECD countries (Doorslaer et al., 2007). Despite a series of policy (Kim and Kwon, 2015, Kim and Joung, 2014, Lee and Cheong, 2017, Kim and Shin, 2017), problems persist. The rapid increase in health expenditure is the other challenge. According to Organisation for Economic Co-operation and Development, the annual growth rate of the health expenditure per capita was 5.7% between 2009 and 2016, which was much higher than that of the OECD average of 1.4% (OECD, 2017). Lastly, South Korea also faces socio-demographic challenges, including rapid ageing (Kwon, 2018) and the

‘possible’ unification with North Korea. Both events are expected to increase the demand for healthcare and health expenditures, which may delay Universal Health Coverage.

To understand the root causes of challenges and how these might be addressed, it is necessary to review the history of health reform in South Korea. Section 2 briefly discusses the political economy of the welfare expansion in South Korea, focusing on health reform. Section 3 looks at demand-side reforms and the background of UHC. Section 4 examines how healthcare governance in South Korea has worked or failed to work and what the consequences have been; Section 5 looks at incomplete health financing reform; Section 6 looks at policies to improve healthcare quality and pay-for-performance in the 2000s; Section 7 illustrates a brief description of the current health system in South Korea; and Section 8 presents the chapter's conclusions and research questions.

2. Political economy of Universal Health Coverage in South Korea

The progress of UHC in South Korea is an essential part of the development of the country's welfare state. To fully understand the nature of UHC in South Korea, it is essential to understand the nature of the South Korean welfare state and how it came to be.

2.1. The emergence of the Korean Welfare State

About 8 years after the end of the Korean War, the army seized political power in a coup. In 1961, the military regime named its ruling body the "Supreme Council for National Reconstruction" and dissolved all political parties and social organisations. The council's chairman, army general Park Chung-hee, proclaimed a vision of economic development and a social security system. In 1962, he sent a document entitled "Establishing a Social Security

System" to members of the Cabinet, outlining his vision for the development of a social security system. He stated that the ultimate goal was to create a "welfare state" by increasing national income and protecting people from life's threats such as unemployment, illness and old age. He also instructed the cabinet to select and prepare a social security system that is relatively easy to implement and to conduct research and development of a suitable system through pilot projects. Behind these announcements was the "Social Security System Review Committee", which had its origins in the 1959 "Study Group for the Introduction of a Health Insurance System," composed of officials from the Ministry of Health and Social Affairs and private experts. These efforts resulted in the first draft of the Health Insurance Act in December 1963, followed by a decree in 1964 (Jo, 2008, Yang et al., 2008).

In explaining the emergence of the Korean welfare state, the various theories explaining the emergence of modern welfare states have fallen short. As the most classical model, the "logic of industrialism", explains, industrialisation brings with it new challenges that individuals did not have to face in agrarian societies. The life cycle challenges of childbirth, illness, and industrial accidents were the reasons why communism became so popular in Europe, and those in power devised various welfare policies as a way of quelling this popularity. Industrialisation also dramatically increased the size of the economy, which in turn produced a sufficient amount of resources to pay for welfare policies. However, as noted above, the proposal for the Korean welfare state came from the elites of a military regime that had no legitimacy, less than a decade after the end of the war, long before the material foundations were laid by industrialisation.

Another explanation, the Power-Resource Theory, argues that the balance of power between different stakeholders in society determines the content of the welfare state and

the level of spending. In particular, this model relies on a number of variables as key explanatory factors, including the extent to which workers, the beneficiaries of the welfare system, exercise political power through trade unions and the strength of left-wing political forces (Korpi, 1978, Korpi, 1983). However, this theory is also ineffective in explaining at least the early stage when the vision of the welfare state was announced. At the time, the Supreme Council for National Reconstruction had dissolved the main political parties and civil society organisations; workers in the industry were very few and unorganised; and the left was not an organised force.

Rather, the beginnings of the Korean welfare state debate are best explained by the combination of the will of policymakers and elite bureaucracy in the East Asian developmental state model. Behind the announcement of the vision towards a welfare state, there was the "Social Security System Review Committee", which had its origins in the 1959 "Study Group for the Introduction of a Health Insurance System," composed of officials from the Ministry of Health and Social Affairs and private experts (Jo, 2008, Yang et al., 2008).

Yang argues that South Korea has become a small welfare state compared to other Western countries for the following reasons. Under the authoritarian developmental state that lasted from 1961 to 1987, South Korea had five structural and institutional characteristics (Yang, 2017).

First, it was characterised by export-led industrialisation and an economy centred on mega-corporations. At the time, South Korea had a small domestic market, so it adopted an export-oriented strategy. In the 1960s, competitive export prices were ensured by an abundance of low-wage labour. In the 1970s, as the heavy chemical industry developed,

there was pressure to raise wages for skilled workers, but the government-controlled wage increases for large companies by suppressing the labour movement.

Second, the presidential system and the single-member district system played a critical role. Under the small constituency system rather than a proportional representation system, members of parliament focused more on local development issues, where policies were more visible. With the state suppressing political parties, it was difficult for competing parties to gain a foothold and lead to welfare expansion. In a presidential system, elections yield a natural opportunity for welfare expansion, but few presidential candidates have advocated general tax increases.

Third, state corporatist control over labour was particularly strong, and corporate or enterprise unions were developed rather than industrial or national unions. Although large companies and the public sector were unionised, the dominance of corporate unions in the labour movement meant that unions were less concerned with welfare expansion for society as a whole but focused on corporate wage bargaining and the welfare of their workers became the primary agenda.

Fourth, a strong economic bureaucracy with excellent centralised bureaucracy produced the conditions for the development of a welfare state. However, the Economic Planning Board and the Ministry of Finance have formidable budgetary power, which can act as a veto unless there is defining will and direction from the president.

Finally, there was the low taxation regime. The government formulated a policy of tax cuts in 1971 to encourage workers and companies to invest, and it also implemented a major tax cut during the oil shock of 1974. These tax cuts had a negative impact on the financing of

welfare expansion. In this way, the foundations of a small, low-burden welfare state were laid.

2.2. The emergence of Korean UHC

Despite the lofty ambitions announced by President Park Chung-hee in 1962, it wasn't until the end of the 1970s that South Korea's UHC got off the ground. The reason for the delay was the lack of a compulsory health insurance clause. The government's original proposal was to make health insurance mandatory for companies with more than 500 employees and voluntary for those with fewer (KHIA, 1997). However, the Presidium of the Supreme Council for National Reconstruction decided to remove the clause from the Health Insurance Act 1963 at the last minute (Kang, 2006, KHIA, 1997). The reasons for this decision are not known in detail, but the decision rendered the Health Insurance Act ineffective in achieving universal coverage. After the passage of the Health Insurance Act, the government recommended the establishment of trade unions, mainly in state-owned enterprises, but companies were reluctant to accept the proposal due to a lack of awareness and the burden of insurance premiums. It was the Central Medical Insurance Federation which applied to the Ministry of Health and Social Affairs for the establishment of the union after the passage of the Medical Insurance Act. Led by Hyundai Hospital, 511 out of 3,424 workers at seven workplaces agreed to join the union. The union designated Hyundai and one other hospital as insured medical institutions. Initially, the union expected the rest of the workers to join within a few months, but in fact, the enrolment rate did not increase and adverse selection occurred. Due to the reluctance of employers and insureds to pay premiums and insufficient resources, the union stopped its reimbursement two months after its authorisation. The

Ministry of Health and Social Affairs inspected the situation and tried to revive the union, but failed, and in November of that year, the ministry revoked the union's registration. The formation of health insurance unions began in a few places after 1965, but only four workers' health insurance unions were formed and operated before compulsory insurance was introduced (KHIA, 1997).

2.3. The Second Amendment to the Health Insurance Act in 1976: the beginning of the squashed UHC cube

Several attempts were made to solve the problem of voluntary enrolment, but it was not until the second amendment to the Health Insurance Act in 1976 that the compulsory clause was reintroduced. At the time, the government was eagerly preparing for the introduction of a state pension, which had been due for introduction in 1975 but had been delayed by the lack of state funding (KHIA, 1997). In addition, it has been suggested that a sudden change in governmental attitude occurred when a new minister took office in 1975. Despite the concerns of the Economic Planning Board in the presidential office at the time, the strong will of Minister Shin Hyun-Hwak and the ministry led to the decision of the highest decision-maker, President Park Chung-Hee (Jo, 2008, Yang et al., 2008).

Another aspect of the revision of the Secondary Health Insurance Act was the establishment of rules on out-of-pocket expenses and criteria for the designation of medical institutions. Firstly, out-of-pocket expenses can be determined autonomously by the union within the limits of 30% of the total inpatient costs and 40% of the outpatient costs of the insured person. For dependents, each union had the autonomy to set the OOP within 40% of the total cost of hospitalisation and 50% of the total cost of out-patient treatment (KHIA,

1997). This is in line with the principle of unionism in that it gives unions autonomy, but it also sets the stage for inequality in the future, with different co-payment amounts for different unions. It is also evident that the co-insurance rates were high, ranging from 30% to 50%. This was one of the key points that made financial protection in the Korean UHC weak in the long run.

The amendment also requires each insurer to designate a medical centre and submit a copy of the contract with the medical centre to each provincial governor. According to the implementing regulations, insurers must designate at least two clinic-level medical institutions for each medical specialty and two hospital-level medical institutions, including public hospitals, for inpatient care. At the time, the government had divided the country into 42 medical districts. While insurers were required to designate medical institutions within each district, they were also allowed to designate medical institutions in other districts if necessary (KHIA, 1997).

Figure II- 1. President Park Chung-Hee (left) and Minister Shin Hyun-Hwak (right). Photo from Dong-a Ilbo.

2.4. Setting the reimbursement level

For a country without a long tradition of corporatism, one of the challenges of the sudden introduction of health insurance was the setting of reimbursement costs. This was because, even where unions were autonomous, it was technically challenging for small insurance companies to set their own reimbursement costs in the absence of a large number of hospital-level institutions. It is likely that they would be unable to contract with independent medical institutions or that they would have inefficient contracts. For this reason, the Ministry of Health and Social Affairs began to develop the reimbursement system in 1976 and announced it in a notice in 1977. At that time, the Korean Medical Association called for a sliding scale of fees in line with inflation, differentiated hospital fees according to the level of the institution, equal payments for all doctors and regions, a distinction between initial and follow-up visits, and tax reductions. However, as the Korean Medical Association did not submit a specific fee proposal, the Ministry of Health and Social Affairs initiated the development of its own fee structure. At that time, fees were set arbitrarily by medical institutions, and the consultation fee was not set separately but was included in the prescription fee. In 1976, the Ministry of Health and Social Affairs investigated the income of 11 hospitals to determine their practice fees (KHIA, 1997).

The general principles for setting fees at that time were as follows. First, since the contractual fees between large mutual insurance companies and medical institutions at that time were 80% of the practice fee, the practice fee should be set at 75% of the practice fee, considering the possible increase in demand. Second, the fees for consultations and procedures were separated from the cost of drugs and supplies. Third, medical providers

receive basic and technical fees, while drugs and materials are reimbursed at a cost to prevent overuse and to protect insurance finances. Fourth, the profit of drugs in the practice fee is reflected in the determination of the basic medical fee and the hospitalisation fee. Fifth, a differential payment system based on the location and size of each medical centre (KHIA, 1997).

At the time of the survey, the fees charged were 1.49% for consultations, 47.31% for technical services, 32.86% for injections and 18.34% for hospitalisation. Government officials assigned a relative standard score to each procedure in each department. Ten doctors per department reviewed the technical complexity of the procedures and the scores were averaged without outliers. They also considered the time and frequency of each procedure, giving more weight to longer and less frequent procedures. For drug prices, we checked drug prices using fiscal survey data and sales data from domestic pharmaceutical companies (KHIA, 1997).

There were a total of 763 items in the published medical fees, and for technologies other than basic medical fees, different rates were applied by region and level of the medical institution. Under the general guideline, we set up a downward adjustment contract with medical institutions for each combination. According to the government's notice, the rate was divided by region and type of medical institution, with Seoul, large cities, small and medium-sized cities, and rural areas receiving the highest rate, followed by general hospitals, hospitals, and clinics. Without the additional rate, the base fee was about 55% of the practice fee. But when the 20% additional rate for General Hospital in Seoul was added, the basic fee was roughly close to the 75% of the practice fee suggested by the guidelines (KHIA, 1997). However, there were complaints from hospitals and clinics in areas with low additional rates.

This was the trigger for the reimbursement scheme to keep reimbursement rates low, and for hospitals to increase volume to make a profit. It was a favourable environment for amplifying the downsides of fee-for-service.

2.5. Coverage expansion after 1977

Health insurance for civil servants and private school teachers was introduced by law, following the gradual introduction of health insurance for employees in 1977. The delay in covering these groups was due to concerns about the government's ability to pay and the government's plans to include healthcare for civil servants in its pension scheme. Under the new law, premiums ranged from 3 to 8 percent of salary. For civil servants, half of the premium was paid by the insured and half by the government. For those employed in the private education sector, the insured paid 50 per cent for private school staff, 30 per cent for the school and 20 per cent for the government. Under the supervision of the Ministry of Health and Social Affairs, the scheme was administered by a 'Health Insurance Steering Council' made up of civil servants, school managers and representatives of medical associations. Figure II-2 briefly summarises the history of health coverage expansion in South Korea.

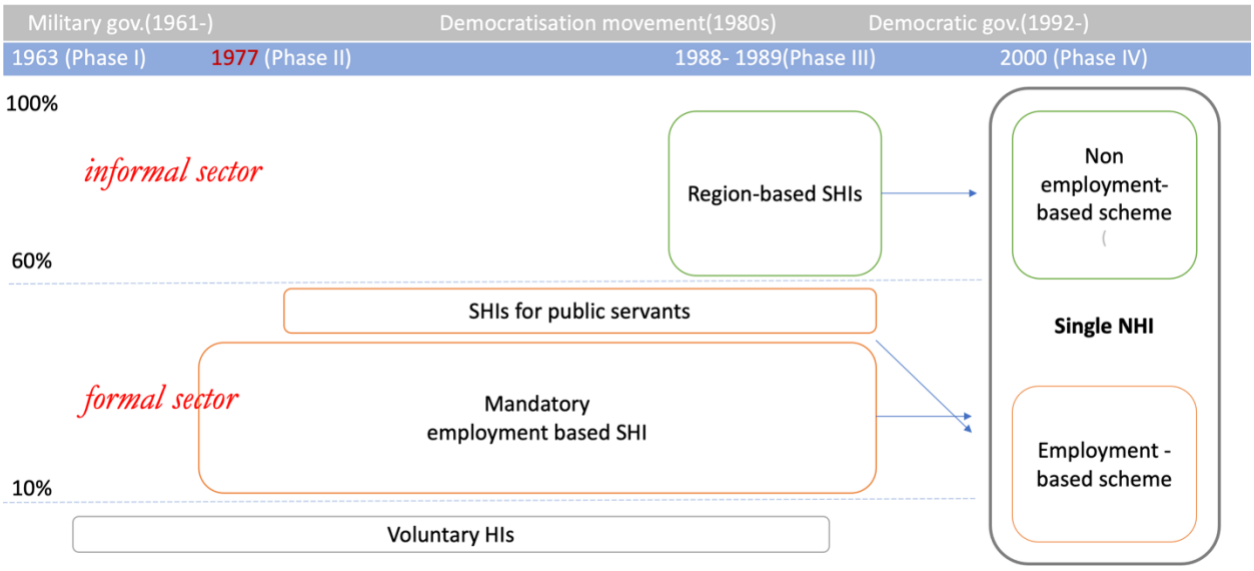


Figure II- 2. History of health coverage expansion in South Korea between 1963 and 2000.

The introduction of this legislation is of particular interest because it included a clause for the compulsory designation of health facilities. The Medical Insurance Act of 1963 introduced a system whereby insurers contracted with medical institutions, but when health insurance was introduced for employers with more than 500 employees in 1977, problems arose due to the uneven distribution of regional medical institutions. In addition, some medical institutions refused to be designated, complaining of losses due to the low statutory tariff. The amendment to the Health Insurance Act of 17 April 1979 changed the contractual designation of medical institutions into a mandatory designation, and medical institutions were not allowed to refuse without justification (Constitutional Court, 2002). In the draft prepared by the Ministry of Health and Social Affairs, there was a provision that a health worker who fails to comply with the mandatory designation will be punished by imprisonment for up to three years or a fine of up to 500,000 won, but the provision regarding imprisonment was removed in the final version (KHIA, 1997).

The extension of coverage continued amid an unexpected event. In 1979, the head of the Central Intelligence Agency assassinated President Park Chung-hee. Amid political turmoil, a new military junta emerged in 1980. It suppressed the calls of the citizens for democratisation and promulgated a new constitution. Interestingly, in August 1980, the junta announced a major expansion of medical care and health insurance. The plan was followed by the first regional health insurance pilot project in 1981 and the second regional health insurance pilot project in 1982. In the 1985 general election, the ruling party's pledge was the introduction of a national health insurance scheme by 1987. Indeed, in 1986, the government announced in the "National Welfare Enhancement Plan" that it would implement national health insurance by 1989 instead of the early 1990s. Rural health insurance was introduced in 1988 and urban health insurance in 1989. Throughout its turbulent history, South Korea's population coverage of health insurance has risen rapidly from 8.8 per cent in 1977 to 94.2 per cent in 1989 (Yang et al., 2008).

2.6. The concerns for UHC outcomes

The manner and pace of the implementation of compulsory health insurance meant that the system failed to achieve one of the goals of UHC: universality in the beginning. The debate over whether health insurance should be administered by the state or by companies continued into the 1970s, with major disagreements within the elite government bureaucracy (Yang et al., 2008). The Economic Planning Board argued in favour of state control because the corporatist approach was more likely to lead to inability and insolvency, while the Minister of Health and Social Welfare thought it was dangerous. After much debate and review, the insurance system was organised on a corporatist basis. The Federation of

Korean Industries, a stakeholder in the debate, created the Health Insurance Council and invested in space and manpower to push for the establishment of corporate-level insurance with the Ministry of Health and Social Affairs. (Yang et al., 2008) argues that economic factors may have played a role in why companies were willing to help set up and run health insurances. The rationale was that many companies had subsidised the cost of healthcare for their employees, the government provided tax incentives for companies to contribute to health insurance, and the government gave unions the right to manage their finances so that health insurance reserves could be used as collateral for bank loans. Initially compulsory for companies with 500 or more employees, the scheme was quickly extended to companies with five or more employees in 1988 (Yang et al., 2008).

Although corporatism was a realistic option, there are two problems with equity, which is one of the goals of UHC: different premium rates and co-insurance rates for different unions. Table II-1 shows the insurance rates for each social insurance scheme. In 1977, out of a total of 486 schemes, those with 3-4% accounted for 92.3%. With the introduction of insurance for civil servants and private school teachers in 1978, those with 3% premiums increased to 94%. Plans with 4-6% premiums accounted for 7.6% in 1977 and 6% in 1978, showing a large variation in premiums (KHIA, 1997).

Table II- 1. Number of social insurances by the level of premium level. (Source: KHIA 1997)

		Premium rate			
	Total	**3%**	**3.1-4.0%**	**4.1-5.0%**	**5.1-6.0%**
1st July 1977	486	327 (67.3%)	122 (25.1%)	25 (5.1%)	12 (2.5%)
31st May 1978	566	402 (71.0%)	130 (23.0%)	23 (4%)	11 (1.9%)

There were also considerable differences in the level of co-insurance for medical services. In principle, many social insurance schemes applied the statutory maximum OOP rate, but some schemes charged as little as 10% for the hospitalisation of the insured person and 20% for the family. Coinsurance rates for outpatient services also varied widely, with most applying the statutory maximum, while some applied 20 per cent for individuals and 20-30 per cent for families (KHIA, 1997).

The distinction between insured and dependents was also problematic. Women's access to healthcare could have been affected by the different co-insurance rates, especially if men were the main breadwinners. This distinction was abolished in the Third Amendment to the Healthcare Act of 1979 and the maximum co-insurance rate was set at 20 per cent for in-patient treatment and 30 per cent for out-patient treatment (KHIA, 1997).

However, until health insurance was unified in 2000, the corporatist system undermined equity, one of the aims of UHC, and caused much conflict. Larger, younger unions were in good financial shape, while others were not. Families who were members of workplace health insurance unions had access to healthcare, but the self-employed and the unemployed were not covered.

Table II- 2. Number of social health insurances by inpatient and outpatient coinsurance rates, 1977 (N=493) and 1978 (N=574). (Source: KHIA 1997)

		Panel A: Inpatient service				
	Coinsurance rate	**10%**	**20%**	**30%**	**40%**	**50%**
Insuree	1977	17 (3%)	19 (4%)	457 (93%)	N/A	N/A
	1978	21 (4%)	37 (6%)	516 (93%)	N/A	N/A
Dependent	1977	0 (0%)	19 (4%)	19 (4%)	455 (92%)	N/A
	1978	0 (0%)	31 (5%)	38 (6%)	505 (89%)	N/A
		Panel B: Outpatient service				
	Coinsurance rate	**10%**	**20%**	**30%**	**40%**	**50%**
Insuree	1977	0 (0%)	22 (4%)	20 (4%)	451 (92%)	N/A
	1978	1 (0.2%)	35 (6%)	37 (6%)	501 (87.8%)	N/A
Dependent	1977	0 (0%)	2 (0.4%)	21 (4%)	19 (4%)	451 (91%)
	1978	0 (0%)	6 (1%)	32 (6%)	35 (6%)	501 (87%)

2.7. The great merger of the social health insurance schemes in 2000

The period after 2000 can be described as the fourth period of health insurance expansion, which was characterised by the consolidation of health insurance schemes. Before 2000, there were disparities in funding levels between social health insurers and the insurance system had little pooling function. With the promise and election of President Kim Dae-jung, health insurance was unified, and the National Health Insurance Cooperation was in place.

The Planning Department of Integrating Health Insurances (PHIDI) was established in March 1998 as an advisory body to the Minister of Health and Welfare (MoHW) to oversee the integration of medical insurance. It operated for about six months as a temporary organisation, consisting of 31 members, including scholars, the media, social organisations, and government officials. 28 professional experts were responsible for practical tasks, and

KIHASA provided administrative support. The planning department was divided into three parts: the operational system team, the premium billing and financial team, and the payment team (PDIHI, 1998).

The healthcare insurance integration designed by this group had two fundamental principles. The first was the principle of social solidarity, which aimed to achieve social integration by ensuring fairness among different social classes. The second was to ensure the stability of insurance finances through appropriate burden sharing and payments. Specific principles included guaranteeing "Comprehensive Benefits" that promote not only disease treatment but also prevention, rehabilitation, and health promotion; enhancing fairness in insurance premium burdens among different income groups and access to medical services across regions and social classes; achieving stability and efficiency in insurance finances; enhancing the quality of medical services through rational adjustment of insurance fees and evaluation of treatment quality; and ensuring the democratic operation of the system in which insurance subscribers, medical providers, insurers, and the government all participate (PDIHI, 1998).

The planning team engaged in in-depth discussions on the establishment of a new body to review medical expense claims. Some members argued that an independent review body that evaluates and assesses medical claims is necessary. They claimed that establishing a review body within the insurer could make it difficult to achieve the goals of improving medical quality and protecting finances due to the rigidity of existing organisations, and that it would be difficult to utilise various approaches based on expertise. Those who opposed the idea argued that creating a new body would increase administrative costs and be contrary to one of the objectives of integrated medical insurance, which is to reduce

administrative costs. They also argued that there were no criteria for judging whether the independence of the organisation would achieve adequate medical assessment and insurance protection, and that creating a new body would weaken the insurer's control over insurance finances and strengthen the influence of medical providers, emphasising medical expertise. They also believed that if the payment method for medical expenses changed in the future to a comprehensive fee or total contract system, the workload of the review function would decrease, resulting in a reduction in the number of problems presented. There was also much discussion about who medical institutions would submit their medical expense claims to if a new body were established, whether the new body would evaluate all cases or only cases requiring special adjustment, and whether the insurer would commission the new body only when necessary (PDIHI, 1998).

Another crucial issue discussed by the planning team was the relationship between medical institutions and insurers. When mandatory medical insurance was introduced in 1977, the government adopted a "mandatory contract between insurers and medical providers" to prevent medical institutions from refusing treatment to medical insurance patients due to the practice of setting insurance fees lower than customary fees. However, it was decided to maintain the designation contract for the time being, considering organisational problems that may arise during the process of integrating medical insurance, financial instability of insurance, and social culture that was not familiar with contracts (PDIHI, 1998).

Under the unified national health insurance, there are two systems: the employment-based system, which used to be the employment-based SHI and civil servants' system, and the region-based SHI, which evolved into the region-based system. The regional health

insurance scheme also covers the self-employed and there is an automatic transition between the two schemes based on employment status.

2.8. Restoring the squashed UHC cube with financial protection measures in the 2000s

South Korea's healthcare coverage has a relatively short history, resulting in a squashed UHC cube with 100% population coverage, low service coverage, and low financial protection (Lee et al., 2016, Doorslaer et al., 2007). After the merger of social healthcare plans in 2000, policy efforts began to bring the UHC cube back to square one. Since 2000, there have been a series of policies to tackle high OOP, including a co-payment ceiling in 2004, a reduced co-insurance rate for serious diseases in 2005, a Crisis Assistance Program in 2006, and an OOP exemption policy for children in 2006.

For example, the government introduced a co-payment ceiling in 2004. The policy introduced in 2004 was a uniform co-payment ceiling, with a cap of 3 million won (about 3000 USD) every six months, regardless of income. In 2007, the ceiling was lowered to 2 million won every six months. In 2009, the policy was changed to a differential co-payment ceiling, with the lowest 50% of income earners having a cap of 2 million won per year, the middle 30% having a cap of 3 million won, and the highest 20% having a cap of 1 million won. The impact of the differential co-payment policy in 2009 was an increase in healthcare utilisation across all income groups. However, the policy did not significantly reduce catastrophic health expenditure among cancer patients, and catastrophic health expenditure increased for all patients during the observation period. The authors speculated that the cost of services not covered by the NHIS may have contributed to this limited impact (Lee and Cheong, 2017).

Reducing the coinsurance rate for patients with high-cost diseases in 2005 was another key measure of financial protection (Kim and Kwon, 2015). Although catastrophic payments affected patients with cancer, their effects were more concentrated in the high-income patient group than the low-income patient group. The authors argued that there should be more protection measures (Kim and Kwon, 2015).

A welfare scheme has also contributed to preventing healthcare-induced impoverishment. The Crisis Assistant program, launched by the government in 2006, provided direct support for hospitalised patients' OOP, with the amount of support ranging from 3 million won to 6 million won. (Kim and Joung, 2014) followed those who received assistance for 1.6 years and found that the program reduced the poverty transition due to serious illness by 16%.

In addition, the government introduced an exemption of the user charge for children. This policy was implemented in January 2006 and waived the co-payment for hospitalisation of children under six years of age. (Kim, 2017) showed the measure increased both outpatient use and hospitalisation. The policy was associated with a higher increase in hospitalisation and an increase in outpatient visits among low-income families, so the increase in total health expenditure was higher among low-income families. The reduction in out-of-pocket expenditure was greater in low-income households than in high-income households. When the health impact of the policy was measured in terms of readmissions, there was no reduction in readmissions. In fact, the probability of some readmissions tended to increase for serious conditions with potentially fatal consequences. In January 2008, the policy was reversed from a zero OOP policy to a 10% co-insurance rate due to concerns about

rising healthcare utilisation and moral hazard. Hospital admissions increased slightly after the policy was implemented, and outpatient visits did not increase significantly.

In the 2010s, policy measures to reduce the financial burden continued. In 2013, there was a coverage expansion for four major diseases. Regarding the coverage expansion, the government has been trying to include more services such as a fee for using an inpatient room with fewer than six beds and caregiver fees in hospitals. At the same time, the government abolished the fee for choosing senior doctors in tertiary hospitals.

In July 2017, Moon Jae-in's government announced 100 national tasks and 487 action items, and he personally announced measures to strengthen health insurance coverage, naming the measures 'Moon care'. In a nutshell, he said he would: first, include all medical expenses in health insurance, introduce a negative list system, and eliminate fees for upper-level hospital rooms, caregiver costs in hospitals, and fees for selecting senior doctors in hospitals; second, lower the out-of-pocket maximum for families with incomes below the bottom 50 per cent; and third, strengthen support for catastrophic medical expenses and coordination across systems (Park, 2017). While agreeing with the overall coverage enhancement measures, (Park, 2017) pointed out the lack of measures to properly control the moral hazard of healthcare consumers and the lack of a comprehensive reform plan to ensure the sustainability of health insurance in the new era of ageing.

3. Expansion of healthcare resources

Unlike the expansion of health coverage, which was the subject of relatively lengthy debate and strong commitment from the top, there was relatively little discussion of health resources and delivery, which later became a major source of problems in Korean UHC.

Researchers have pointed out that the fundamental problem with healthcare in South Korea is its “anarchic, wasteful structure” (Kim, 2002), and the use of bed resources is a classic example of this (Do et al., 2002). This has to do with the explosion of demand resulting from the rapid expansion of health insurance coverage, the over-dependence on private funds resulting from the lack of government funding, the limited scope of incentive in fee-for-service payment, the absence of long-term systematic planning and the lack of good governance. This chapter attempts to identify the roots of the current weaknesses in Korea's UHC by focusing on public health resources such as public health centres, bed resources and healthcare delivery systems.

3.1. The creation of public health centres

Regarding the history of the health centre, it has played a significant role in the provision of basic medical care and public health since US military rule after the liberation of the country in 1945. At that time, infectious diseases, including waterborne diseases, were widespread in South Korea. In 1953, with the assistance of the United Nations, 15 Public Health Centres ("Boghun-so") and 417 Public Health Units ("Jiso") were introduced throughout the country, and the number gradually increased, mainly for epidemic prevention and relief. In 1956, the Public Health Centre Law was enacted, which defined the duties of public health centres to include epidemic prevention and treatment, maternal and child health, school health, environmental health, occupational health, and health statistics. In 1962, the law was completely revised, and public health centres were established in every city ("Si"), district ("Gu") and county ("Gun") in the country. In 1978, a special law was enacted to reduce counties without doctors by assigning public health doctors to public

health units in areas with more than 5,000 inhabitants (NAK, 2016). In addition, in 1980, public health clinics ("Jinryoso") were established in small rural administrative units of less than 5,000 inhabitants and run by community health practitioners. As of 1985, there were 225 public health centres, 1303 public health units, and 2,000 public health clinics (MoWH, 2012, NAK, 2016).

3.2. Planning and implementation of health resources in the 1980s

In the 1980s, the development of the health sector was still led by the government, with the publication in 1981 of the 'Five-Year Plan for Economic and Social Development' and the 'Plan for the Improvement of the Public Health System'. For example, in March 1981, the government published the Fifth Five-Year Plan for Economic and Social Development, which included a plan for healthcare. According to the plan, the government's healthcare plan aimed to enhance the balance and public interest in healthcare based on national healthcare coverage and the expansion of public health. It also showed that the government had set targets for health indicators such as mortality, nutrition, and disease prevalence to be achieved in five years. The plan also included plans for the establishment of a healthcare system and the provision of healthcare resources (NAK, 2016).

Another strategic document, the 'Plan for Improving the Public Healthcare System', discussed deploying public health doctors to rural areas ('Myun') where there were no doctors at the time. It also presented a major structural reform of public hospitals, which were relatively outdated compared to the growth of private hospitals. National university hospitals have been transformed into special corporations to promote management efficiency, and some municipal hospitals have been sold to the private sector or transformed

into local corporations to increase their autonomy. Local corporatisation referred to the establishment of a special purpose company and the transfer of powers to the board of directors for responsible management.

Personnel management was also placed under the authority of the hospital director, and the status of civil servants was changed from civil servant to non-civil servant, and from public enterprise accounting rules to enterprise accounting. In the case of health centres, another pillar of the public health system, the aim was to secure medical staff through the use of public health doctors system, and to expand facilities and equipment to meet the health needs of the rural population through a World Bank loan. There was also a reform of governance, with the creation of the Central Committee for Public Health, chaired by the Ministry of Health and Social Welfare, which centralised the governance system from the previous system in which various government agencies controlled public health facilities. However, due to disagreements between ministries, these governance reforms were not possible until after the Act on The Establishment and Management Of Local Medical Centers was enacted in 2005 (NAK, 2016).

With the introduction of health insurance, the demand for inpatient and outpatient services has exploded, while the supply of healthcare resources, especially beds, has not kept pace (Moon et al., 1992). In 1987 the OECD countries had 15.2 beds per 1,000 inhabitants in Japan, 11 in Germany, 10.2 in France, 6.8 in the United Kingdom, 5.0 in the United States and only 2.3 in South Korea. Even these figures represented rapid growth from the early 1970s when there were only 1.5 beds per 1,000 inhabitants (Moon et al., 1992). The absolute shortage of beds in South Korea was obvious, even considering the history and culture of

each country. Governments needed to increase the number of beds rapidly to keep up with the growing demand, but they did not have the financial resources to do so.

The government's bed policies of the late 1970s and 1980s can be broadly summarised as follows: bed expansion policies, including the expansion of private community beds in industrial zones and rural areas, the introduction of special hospitals and the introduction of health centres; urban bed suppression policies; and attempts to establish a healthcare delivery system (Do et al., 2002). Looking first at the bed expansion policy, the government supplied 67 hospitals and 6,580 beds in industrial zones and medically underserved areas between 1978 and 1983. The government-linked loans from Japan's Overseas Economic Cooperation Fund and Germany's Kreditanstalt für Wiederaufbau were matched to private hospitals (KHIDI, 1999 #74386). The government also supported the construction of hospitals in 26 medically underserved areas between 1986 and 1988, using low-interest loans from the Rural Development Fund to upgrade clinic-level facilities into hospitals (KHIDI, 1999 #74386). Between 1991 and 1993, the National Welfare Pension Fund supported the construction of an additional 10,000 beds, and from 1994, low-interest loans from the Fiscal Financing Special Account and the Rural Special Tax Account were rendered to areas with a shortage of beds (KHIDI, 1999 #74386).

While these measures have clearly improved local access to healthcare (Do et al., 2002) and contributed significantly to the actual number of beds built (KHIDI, 1999), many of the hospitals have also experienced operational difficulties. Approximately half of the hospitals built with the initial loans were operating at a loss and had very low debt repayment rates, mostly because they were in underserved areas with poor accessibility and limited capacity to expand healthcare services. In addition, the lack of feasibility studies in

selecting the location and size of the hospitals and the high initial dependence on foreign capital were identified as problems (Kim, 1991).

The introduction of public health centre hospitals has also contributed to the provision of beds and access to healthcare in rural areas. In urban areas, private hospitals and clinics began to grow rapidly without having to rely on the government. In Seoul, for example, the number of beds per 10,000 patients increased from 24.8 in 1980 to 28.4 in 1985, a 14.5% increase, and 32.4 in 1990, a 30.6% increase from 1980 (Kim, 1991). In rural areas, on the other hand, there were often no facilities at the hospital level, and it was essential to ensure the provision of hospital-level care with the introduction of medical insurance for rural areas in 1988. While the government tried to attract private hospitals, it also set up health centre hospitals in 15 counties where hospital-level facilities were not sufficiently established and made them responsible for hospital-level functions (Kim and Kim, 1992). A study of one county where a Health Centre Hospital was established found that while outpatient use did not change significantly, the number of hospital admissions increased by about 20.9%, and the rate of "self-fulfilment" also increased (Kim and Kim, 1992).

A bed restraint policy was also implemented to address regional imbalances in bed supply. At that time, due to the rapid expansion of hospitals, especially private hospitals in urban centres, the regional disparity in bed resources had reached a considerable level. According to 1989 data, urban areas, where 70.8 percent of the country's population lived, had 89.8 percent of all medical facilities and 85.7 percent of all beds. With an average of 29.6 beds per 10000 inhabitants, Gwangju had the most with 37.3, while Jeonnam and Gyeongbuk (Kyungbuk) had the least with 21.7 (Moon et al., 1992). In 1985, the government issued the Restrictions on Licensing of Medical Institutions by Region, which required medical

institutions in regions with a relatively high number of beds to obtain approval from the Minister of Health and Welfare to open new ones. However, in 1989, in anticipation of an increase in medical demand due to the expansion of the National Health Service, the licensing restrictions were abolished, and the creation of new beds became the responsibility of the regional governors in 2000 (NAK, 2000).

3.3. Planning and implementation of health resources in the 2000s

In the 2000s, the planning of bed provision again became the responsibility of the Minister of Health and Welfare at the national level. Following the integration of health insurance in 2000, the National Health Insurance Scheme suffered a significant short-term financial deficit. To address this, the Special Act on the Financial Sustainability of the National Health Insurance Scheme states that the Minister of Health and Welfare shall establish basic measures for the rational supply and placement of beds, and that local governors shall, on the basis of the basic measures and taking into account local conditions, establish bed supply plans at the city or provincial level and submit them to the Minister of Health and Welfare. The Minister of Health and Welfare could also recommend adjustments to provincial governors' plans. This law was replaced by the Healthcare Act of 2007. The problem is that, as of 2023, no bed supply plan has been published at the level of the Ministry of Health and Welfare, and some regions have included plans for beds in their local health plans, but the specificity of the plans varies greatly from region to region.

In 2005, cities and counties were required to prepare local healthcare plans under the Act on the Establishment and Management of Local Medical Centres[1]. The plan should include a forecast of the local demand for healthcare, supply measures, human resources and the procurement of medical resources. However, as a successor to the Health Centres Act, it dealt mainly with the planning of public health facilities and did not emphasise the planning of private health resources.

3.4. Healthcare delivery: Attempted but failed policies

Along with the expansion of public health centres and hospitals, the government sought to strengthen the healthcare delivery system. In March 1989, when the national health insurance was implemented, the Ministry of Health and Social Affairs announced the "Promotion Plan for the Construction of Medical Delivery System" based on research results presented by a government research institute in the 1980s (Park, 2014). The plan was to divide the country into eight large catchment areas and 140 medium catchment areas, with tertiary care offered by a small number of tertiary hospitals, secondary care within the large catchment areas, and primary care within the medium catchment areas. To leave the catchment area, a patient had to obtain a referral from a doctor, which was a formality. In practice, there was no penalty for leaving a catchment area other than having to pay the full cost of treatment in another area without a referral, and primary care doctors had no incentive to refuse to refer a patient. The restriction on the use of healthcare within catchment areas was finally abolished in the mid-1990s (Park, 2014).

[1] Available at https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=45571&type=part&key=36

A study has investigated the reasons for the failure of the healthcare delivery system from the consumer side. (Park and Yoo, 1999) conducted a survey of tertiary hospital users in 1999 based on Boombs' theory of policy noncompliance. The results showed that healthcare users were unaware of the existence of the healthcare delivery system and made a profit-and-loss calculation that it was advantageous to disobey the healthcare delivery system in terms of cost and potential risk avoidance. This paper shows that it is not only the design of the healthcare delivery system that is flawed, but also the communication with healthcare users and the incentive system that need to be improved.

In 1998, the Kim Dae-jung government included in its national agenda the establishment of a "Five-Year Plan for Healthcare Development" to render specific goals and long-term strategies for enhancing the health of the population and developing healthcare. In fact, a healthcare development planning group composed of private experts and relevant government officials was established in April 1998, and practical work was carried out according to the direction established by the planning group, and a draft plan was prepared in November 1998. However, this has not been confirmed as an official government plan.

On 12 January 2000, the Healthcare Act was enacted, which requires the Minister of Health and Welfare to formulate a healthcare development plan every five years. However, there has never been an official government healthcare development plan until 2023. In 2003, the government prepared a draft healthcare development plan and held public hearings, but it was never finalised by the cabinet. In 2007, 2015, and 2018, draft healthcare development plans were prepared, but they were never presented to the cabinet and finalised.

There are many reasons for this, but the primary reason is the law which states that the government's plan should be presented to the Cabinet through the Healthcare Policy Review Committee, but the Healthcare Policy Review Committee was a virtually invisible committee. The initial Healthcare Policy Review Committee was under the Prime Minister's Office chaired by the Prime Minister. After two meetings held under the chairmanship of the Prime Minister in 2005, the committee was not held for 13 years, and the chairmanship was changed from the Prime Minister to the Minister of Health and Welfare to address this problem, but the committee was not activated. It was not until 2018 that the committee met once again, but it was not able to continue to meet and discuss the healthcare development plan and present it to the cabinet.

As a result, the health system became the state it is today, with no systematic government planning for healthcare and no space for stakeholders to align their interests.

4. Governance

Governance in healthcare provision

As we have seen, governance for healthcare provision has not worked well, in part because the Healthcare Policy Review Committee is not a meeting of stakeholders, but a committee of deputy ministers in government departments. According to Article 4 of the Enforcement Decree of the Basic Healthcare Act, the Healthcare Policy Review Committee is composed of the Vice-Minister of Economy and Finance, Vice-Minister of Education, Vice-Minister of Science and ICT, Vice-Minister of the Interior and Security, Vice-Minister of Environment, Vice-Minister of Employment and Labor, and Vice-Minister of Food and Drug Safety, and is chaired by the Minister of Health and Welfare. In practice, it is not a committee

that can deliberate and discuss healthcare provision, and it is not a structure that can meet frequently, as a single meeting requires significant coordination and bringing top leaders together from different ministries.

In the absence of a functioning Healthcare Policy Review Board, stakeholders have been able to provide input through the Healthcare Policy Review Committee, but this committee is primarily concerned with health insurance reimbursement and insurance coverage and is not a structure for a broader discussion of the healthcare workforce, healthcare infrastructure, healthcare delivery, governance, and data.

To establish governance that reflects stakeholders' opinions in healthcare policy planning and deliberation, it is necessary to create a structure for stakeholder participation and revise the Enforcement Decree so that various problems and solutions for healthcare policy can be considered together.

Governance in health financing

The National Health Insurance Act mandated the establishment of a Health Insurance Policy Review Committee to provide governance in health financing. This was in response to the need for dialogue and compromise among various stakeholders to address the fiscal deficit at the time of health insurance integration and to balance the budget. The role of the committee is to discuss the criteria and cost of the care benefits, the amount per premium point for the local members and the premium rate for the employed members. The committee has eight member representatives from the health insurance scheme, eight member representatives from the medical profession and eight member representatives from the public interest. The member representatives include two each from workers' and

employers' organisations and one each from civil society, consumer organisations, farmers' and fishermen' organisations and self-employed organisations. The Committee was set up on 7 February 2002 and has met once or twice a month, having met 12 times in 2003 and 22 times in 2004 (Shin et al., 2014b).

In a government report, (Shin et al., 2014b) describes the achievements and limitations of the committee. They list the committee's achievements as 1) the creation of a body that enables social consensus on health insurance with equal numbers of members, providers, and public interest members; 2) the establishment of a plan to strengthen coverage every five years and the committee's role in determining the index and premiums for the next year, as well as its various roles in registering new medical technologies and new drugs. Limitations included excessive authority to make decisions, lack of accountability for decisions, lack of coordination where there was a conflict of interest, problems of impartiality and process, and lack of expertise. Researchers in academia have noted similar problems (Han and Kim, 2017). In an effort to overcome these limitations, there have been attempts to take a deliberative and democratic approach to health insurance governance (Oh et al., 2015).

The governance of health coverage, while functioning to some extent despite its limitations, does not encompass the health system. To achieve full universal health coverage, it is essential to establish governance that covers healthcare delivery, public health challenges, adequate supply of health workers, local acute emergency care and unresolved health equity issues.

5. The limited scope of the payment reform

Discussions on payment reform in South Korea began in the 1990s. At the centre of the debate were Diagnosis Related Groups (DRGs), which were developed and used in the United States. DRGs are a typical payment scheme that introduces yardstick competition into a monopolistic market, inducing competition among similar firms and increasing operational efficiency(Shleifer, 1985). In the 1990s, South Korea conducted several pilot projects mainly in public hospitals, and in 2002 introduced voluntary DRGs payment in eight disease groups. In 2003, the government reduced the number of disease groups to seven. The introduction of DRGs in South Korea was aimed at ensuring accountability for medical expenditure and reducing medical costs by reducing the length of hospital stays (Park et al., 2013). In the 2010s, the government introduced mandatory DRGs in both public and private hospitals for seven disease groups. In 2012, clinics and small hospitals became subject to DRGs and in 2013, large hospitals (HIRA, 2013b).

The effects of DRGs can be summarised as follows. First, a large body of evidence confirms a reduction in the length of hospital stay (Kim et al., 2015a, Kim et al., 2016a, Kim et al., 2016b, Moon, 2015). However, there is mixed evidence regarding another policy goal, that of containing costs (Kim et al., 2015a, Kim et al., 2016a, Kim et al., 2016b, Kwak et al., 2017, Moon, 2015). In addition, there have been cases where the spillover effect of the introduction of DRGs has been an increase in the frequency and intensity of outpatient visits before and after hospitalisation (Kim et al., 2016b).

More fundamental issues around DRGs were the narrow scope of DRGs, the conflict with providers during the implementation process, and the failure to resolve the conflict in an effective way.

6. Healthcare quality

Quality assessment

The agency responsible for overseeing the enhancement of the quality of healthcare in South Korea is the Health Insurance Review & Assessment Service (HIRA). This section will briefly examine how HIRA was established and the efforts it has made to improve the quality of healthcare. The Medical Insurance Act, established in 1971, supplied the foundation for the creation of the Federation of Korean Medical Insurance Societies (FKMIS), which was officially established in 1977. In 1981, FKMIS changed its name to the Central Federation of Medical Insurance Societies (CFMIS) with the expansion of health insurance, but later reverted to its original name, FKMIS. In 1988, FKMIS was renamed the National Federation of Medical Insurance (NFMI).

With the enactment of the National Health Insurance Act in 1999, the Health Insurance Review & Assessment Service (HIRA) was established in 2000, inheriting the claims review function from NFMI. In 2005, HIRA was also entrusted with the claims review function for medical aid, which directly supports marginalised groups in paying for medical expenses. In 2008, HIRA was tasked with claims review for Veterans Hospitals, and in 2013, it was also entrusted with claims review for automobile insurance.

One of the essential functions of HIRA, in addition to claims review, is quality assessment. According to documents from The Planning Department for Integrating Health Insurance (PDIHI), which was established for the integration of medical insurance in 2000, two points were made regarding the quality of medical services. First, it pointed out that there was no standardisation of treatment between medical professionals and institutions,

resulting in significant differences in the practice of the same disease, citing antibiotics use and caesarean section. The document also notes that there were inadequate efforts to enhance the quality of medical professionals and institutions, and that there were weak incentives for improving quality, with the fee-for-service system being cited as one of the reasons for this. Another reason mentioned in the document was the lack of a social monitoring system for medical quality, such as experts, professional organisations, and government pressure for quality improvement. PDIHI also reviewed overseas cases and considered strategies such as monitoring or education and support. While the discussion on the quality of medical services is relatively brief compared to the various topics covered by PDIHI, it clearly addresses the tasks that the institutions should undertake after the integration of health insurance (PDIHI, 1998).

The evaluation of the quality of healthcare has been conducted by the Korean Hospital Association and some medical institutions on a self-evaluation basis from the 1980s to the mid-1990s. However, since 1995, the government has taken the lead in this effort (HIRA, 2013a). After the establishment of the Health Insurance Review and Assessment Service (HIRA) in 2000, quality assessment for diseases began in 2001. At that time, South Korea adopted a framework for improving quality and patient safety in six areas proposed by the US Institute of Medicine (HIRA, 2013a).

The quality assessment in South Korea can be divided into three stages: the introduction period (2000-2003), the development period (2004-2006), and the expansion period (2007-). Initially, evaluations were conducted on prescription, social welfare institutions and hematopoietic stem cell transplant centres. In 2003, the system began to cover various fields, including blood transfusions, intensive care units, and high-cost drug

prescriptions. During the introduction period, the most commonly used method was individual feedback on the evaluation results (HIRA, 2013a).

In the development period, the focus shifted to clinical quality evaluations. In 2004, the evaluation of ischemic heart disease began, and in 2005, the list of institutions with low injectable prescription rates was made public, along with evaluations on caesarean section delivery, acute stroke, and the preventive use of antibiotics in surgery. At this time, the emphasis was on the form of information disclosure, rather than individual feedback on the evaluation results (HIRA, 2013a).

During the expansion period, unlike the previous two stages, performance-based payment systems were implemented. From 2007 to 2010, a pilot project was conducted for acute myocardial infarction and caesarean section, and in 2011, the performance-based payment system was introduced. For chronic diseases, an appropriateness evaluation was conducted for hospital treatment in 2008, and in 2013, evaluations were conducted for severe chronic diseases such as lung cancer and asthma (HIRA, 2013a).

The assessment requires a premise that the evaluation method is rational and fair. To ensure a reasonable evaluation, the HIRA operates advisory bodies, including a "Central Assessment Committee" and disease-specific advisory groups. The Central Assessment Committee is composed of medical providers, consumer groups, and experts recommended by NHIS and HIRA, with no more than 20 evaluators. This committee reviews evaluation plans, evaluation criteria, incentive levels, and public disclosure of evaluation results (HIRA, 2013a).

As of 2023, the Quality Assessment is composed of the following categories: primary care and chronic diseases, acute care, mental health, and geriatric hospitals. There are 37

subcategories and 54 specific subjects within these larger categories. Chronic diseases include diseases commonly seen in local clinics, and prescription evaluations focus on acute respiratory infections, injectables, and the number of medications. Acute care includes cardio cerebrovascular diseases, cancer care, and hospital-related general outcome indicators. As the importance of mental health has grown, evaluations of inpatient and outpatient psychiatric care, particularly for depression and dementia, have been included. Evaluations are also being conducted for geriatric hospitals, which have seen a significant increase in healthcare costs. New evaluations added in 2023 include rheumatoid arthritis. Hospital infection, hip arthroplasty, and knee arthroplasty are currently undergoing formative assessment for potential future inclusion (HIRA, 2023).

Table II- 3. List of the Quality Assessment in 2023 (Source: HIRA)

	Category	Sub-category [37]	Subject [54]
Continued	Primary care and chronic diseases	Chronic diseases [7]	hypertension, diabetes, asthma, COPD, tuberculosis, haemodialysis, endodontic treatment
		Prescription [3]	Antibiotics for treating acute upper and lower respiratory infection, injectable, number of medications.
	Acute care	Cardio Cerebrovascular diseases [4]	Coronary artery bypass graft (surgery), stroke, ischemic heart disease (acute myocardial infarction, percutaneous coronary intervention)
		Cancer [5]	Colon cancer, lung cancer, gastric cancer, breast cancer, liver cancer
		General [3]	Hospital standardised mortality ratio, risk-adjusted standardised readmission ratio, length of stay
		Else [9]	Transfusion, preoperative antibiotics use, anaesthesia, pneumonia, intensive care unit (ICU) care, neonatal ICU care, patient experience, small and medium hospital, imaging exam
	Mental health [4]		Medical aid patients, admission, outpatient for depression, dementia

	Geriatric hospital [1]		Inpatient care
Newly added	Primary care and chronic diseases	Chronic disease [1]	Rheumatic arthritis
Formative	Formative assessment [3]		Healthcare-associated infection, knee arthroplasty, hip arthroplasty

Pay-for-performance.

Starting 2001, HIRA began quality assessment and based on this evaluation, HIRA launched a pilot study of the Value Incentive Program (VIP) in 2007. In July 2007, the program was introduced to 44 tertiary hospitals for cases of acute myocardial infarction and c-section. After about three and a half years of the pilot study, the VIP was implemented in all tertiary hospitals for AMI, c-section, and stroke in 2011. In 2012, the program was expanded to include preoperative antibiotic use, hypertension, and diabetes, and in 2013, the program further included prescription rates of antibiotics and injectables, the number of drugs, and outpatient drug costs.

However, the scale of incentives included in the incentive program was not very large. For example, in 2012, the incentive for acute stroke hospitalisation was about KRW 150,601,000 (~ USD 150,601) for a total of 33 institutions (Shin et al., 2014a). If we divide this by the number of institutions, it is about KRW 4,564,000 (~ USD 4,563 a year) per institution, which cannot be ignored but is not a significant amount compared to medical expenses. The situation is similar for outpatient incentives. In 2013, the incentive for outpatient hypertension care was KRW 11,091,226,000 (~ USD 11,091,226) for 10,429 institutions. This amounts to an average of about KRW 1,063,498 (~USD 1,064) per institution per year, which is less than half of the average monthly salary of a clinic employee.

In 2010, the HIRA published a report analysing the first year of the Value Incentive Program. A survey was conducted among 43 participating institutions, including medical staff and administrative teams, to assess their understanding and attitudes towards VIP. Out of 366 respondents, 258 were medical staff and 108 were administrative teams. The operating team showed a high level of awareness (90%) of evaluation criteria, standards, incentive rates, and evaluation results, but medical staff had an awareness level of less than 60% (HIRA, 2010).

Regarding efforts made by each institution to enhance quality after implementing VIP, 34% chose the improvement of medical records as the highest priority, followed by enhancing interdepartmental cooperation and QI/QA education. When asked about difficulties due to the incentive program, 33.2% of respondents cited increased workload, and 20.1% mentioned the challenge of inputting data that meets the standards (HIRA, 2010).

In terms of self-rated impacts, 51.09% of respondents answered that VIP contributed to the enhancement of medical services, while 23.50% disagreed and the remaining respondents answered "neutral". When asked if VIP increased interest in quality improvement activities among medical staff, 48.65% answered "yes" and 25.68% answered "no". 71.31% of respondents answered that the disclosure of VIP evaluation results affected hospital image, while 10.38% disagreed (HIRA, 2010).

When asked about the use of incentives received by the institution, 68.42% of the 19 hospitals included it in their budget, 47.37% rewarded related departments, and 15.79% rewarded medical departments. No hospital used individual incentives. Regarding the dissemination of evaluation results, 41.46% of the 41 hospitals advertised them on banners,

34.15% disclosed them on their homepage, and 14.63% released them to the media (HIRA, 2010).

7. The current structure of the health system

According to OECD statistics in 2014, South Korea spent about 7.1% of its Gross Domestic Product on healthcare expenditures. Life expectancy at birth for females and males were 85.5 and 79.3, respectively. Infant mortality, defined as deaths per 1,000 live births, was 3. There are 2.22 physicians per 1,000 people. Child immunisation rates for both DTP (Diphtheria, Tetanus, and Pertussis) and measles were over 99%. Screening rates for both breast cancer and cervical cancer were about 65.5% and 66.7%, respectively (OECD, 2014).

Figure II-3 illustrates the South Korean health system (Lee, 2015b). The primary source of revenue comprises general taxation, mandatory National Health Insurance, ear-marked tax, private health insurance, and out-of-pocket payment (OOP). OOP takes a large portion of the revenue collection. Regarding purchasing, the government, including the Ministry of Health and Welfare (MoHW) and the National Health Insurance Service (NHIS), are the most significant purchasing bodies with a combined annual budget of more than 50 billion USD. MoHW is also responsible for running public hospitals and public health centres and overseeing NHIS. About 90% of the medical institutions are private providers. However, all institutions should have mandatory contracts with NHIS by law.

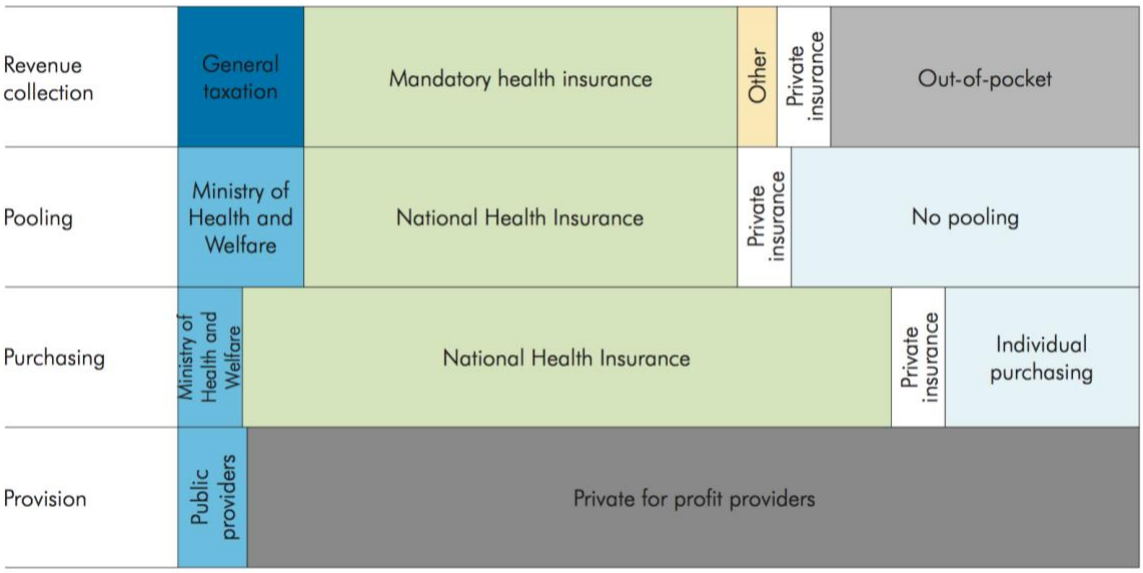


Figure II- 3. A summary chart for the South Korean health system.

Fee-for-service is the primary payment mechanism for both inpatients and outpatients. The government introduced the Diagnosis-Related Groups (DRGs) payment system for public hospitals in 2003 and applied it to small hospitals and large hospitals in 2012 and 2013, respectively. Also, there are incentive payment systems based on performance such as Value-based Incentive Payment (Cashin et al., 2014, Yang et al., 2016). Patients pay coinsurance or co-payment for insured services on the positive list of NHIS. Patients pay 100% of uninsured services, including additional charges for single rooms in hospitals and caregiver fees (Kwon and Busse, 2016).

From the year 2000, the government has enacted healthcare reforms to increase both the scope and breach of UHC, focusing on efficiency, transparency, and equity. Regarding efficiency and transparency measures, healthcare reforms included the introduction of Diagnosis-Related Groups payment (DRGs), an incentive system for quality improvement,

and public reporting. Health Insurance Review and Assessment Service (HIRA) has sought to increase efficiency and transparency in the provider payment mechanism by introducing DRGs since 2002, although DRGs were applied to only seven-disease categories. With high aspiration, the government has created various mechanisms to incentivise clinics and hospitals to increase their quality of care. For example, HIRA reviewed the use of antibiotics in clinics and operation rooms, and the time to intervention in the cases of acute myocardial infarction or stroke.

Table II- 4. A summary of major health policies in South Korea.

Year	Efficiency & transparency	Financial protection & equity in finance
1963		Introduction of the health insurance act
1968		The initial form of community health insurance
1977		Mandatory enrolment of health insurance for employee
1978-1989		Expansion of the population coverage with social health insurance
2000	Health Insurance Review and Assessment Service	Merger of the social health insurance schemes into a national health insurance scheme
	Separation of prescribing and dispensing of medication	
2003	DRGs for public hospitals	Introduction of private health insurance
2004		Introduction of copayment ceiling
2005		Reduction in coinsurance rate for serious diseases
2006	Public reporting on the antibiotics prescription for URI	Exemption of co-insurance for children under six (20% -> 0%) Introduction of crisis assistant program
2007		Lowered copayment ceiling
2008	Reintroduction of user charge for children under 6	Introduction of long-term care insurance Reintroduction of 10% Coinsurance rate for children under six
2009	Mandatory co-payment for private health insurance	Differential copayment ceiling according to the income
2011	Quality based incentive for all hospitals	
2012	DRGs for clinics and local hospitals	
2013	DRGs for general hospitals	Coverage expansion of NHI for four major diseases
2017		Lifted additional charge for choosing experienced doctors

8. Policy objectives

South Korea has not yet developed a comprehensive long-term plan to guide its healthcare policy. Although the Ministry of Health and Welfare has established and updated several subordinate plans, as required by dozens of laws, the most crucial long-term plan that assesses healthcare realities and sets future policy direction is still absent. The Basic Health Care Act of 2000 mandates the preparation of a 'Health Care Development Plan' every five years. Article 15 of the law requires the development plan to include the following: basic goals and directions of healthcare development, policy plans, healthcare resource procurement and management, management of the total number of beds by region, healthcare delivery, efficiency improvement, coordination of work between central administrative organisations, plans for vulnerable groups, and healthcare statistics.

Previous governments have released draft healthcare development plans, but these have never been finalised through the Healthcare Policy Review Committee and the State Council. In 2003, the government completed a policy report titled 'Proposed Healthcare Development Plan of “Participatory Governments”', but it was not finalised. During a discussion in 2022, the head of the healthcare policy department stated that the government has a draft healthcare development plan, which was prepared before the current government. However, in 2024, it remains unclear which official draft of the development plan the MOHW is referring to.

When formal policy objects were absent, policy researcher's analyses provide informative descriptions of the situation. Kim summarises healthcare policy trends and changes in post-2000 in four ways (Kim, 2000). The first issue was healthcare efficiency, which was due to the quantitative expansion of healthcare costs and the instability of health

insurance revenues. Health insurance expenditure increased by an average of 15.7% per year since 1990, but government resources were limited and the public was not in favour of premium increases. Another challenge was improving the quality of healthcare. Although there has been an increase in people's interest in healthcare quality, the government's efforts to improve healthcare quality have been limited by the dominance of the private sector in healthcare provision and limited health insurance financing. The third issue was a shift in policy perspective, with calls for a move from provider-centred to consumer-centred health policy. Finally, he stated that functional separation and coordination among healthcare organisations was an important policy trend.

In 2000, several policies were introduced to address these issues. These included separating drug prescription and dispensing, preparing to introduce DRGs, and establishing HIRA. Particularly, the HIRA's mandates include ensuring efficiency and improving the quality of care by reducing variation in medical service quality (Kim, 2000).

This selects a representative set of policies implemented by HIRA since 2000 that used social and financial incentives, and examines how the introduction of these incentives promoted the efficiency and quality of care that were the policy objectives.

9. Conclusion

South Korea's UHC began as a declaration by the authoritarian regime that came to power in a military coup. Later, the progress of UHC was led by elite bureaucrats within the government, leading to the introduction of compulsory social health insurance. To address the problems of multiple social health insurance schemes, they were unified in 2000. This has improved equity in revenue collection and sustainability by reducing the risk of

individual insurance through a pooling of health insurance. The establishment of the National Health Insurance Corporation also reduced operating costs and increased efficiency by allowing health insurance claims and verification to be handled by a single organisation.

However, the rapid expansion of coverage led to mismatches between supply and demand and regional disparities. The government, which had limited public resources at the time, had to respond to the sudden increase in demand and set up a healthcare system that relied largely on private funding. The problem was that there was no structure in place to engage with different stakeholders in setting fees, which were entirely set and announced by the government. Therefore, the rapidly emerging medical institutions had no choice but to increase their volume in order to quickly solve the financial risk of the institution on top of the fixed price, and they rapidly emerged mainly in metropolitan and urban areas with relatively high demand. Naturally, the urban-rural healthcare gap widened, and the government tried to address it through the public health system by empowering public health centres to provide hospital-level care. While these efforts have worked well for acute infectious diseases and some chronic conditions, they are still inadequate for emergency and severe trauma care, which require high levels of staff and resources at all times. These problems undermine the goals of UHC: utilisation according to need and average quality.

After the consolidation of health insurance in the 2000s, governments and civil society naturally focused on quality issues. Various incentives have been introduced to reduce antibiotic overuse, medically unnecessary surgeries, and so on, including individual feedback on the medical appraisals, public reporting, changes in the fee structure, financial incentives and disincentives at the institution level. In this thesis, we examine whether incentives used by governments to solve various problems arising from imperfect healthcare

structures improve healthcare efficiency and equity through three different cases in the following chapters.

Chapter III. 'Professional Shame' and Diagnosis Miscoding: Evidence from antibiotics prescribing behaviour

1. Introduction

The use of antibiotics has increased significantly worldwide in recent decades, with a 35% increase in 71 countries between 2000 and 2010 (WHO, 2016). This is partly due to the inappropriate use of antibiotics, which reduces the quality of health systems and causes bacteria to develop antimicrobial resistance (AMR), which can be detrimental to patients when antibiotics are needed. Today, the burden of antimicrobial resistance has become a global threat (WHO, 2016). It is estimated that over 700,000 people die each year from AMR (O'Neill, 2014), and the direct medical costs caused by AMR are estimated to be around USD 20 billion, with productivity losses of up to USD 35 billion (CDC, 2013). It is unclear how to reduce the inappropriate use of antibiotics, and this paper contributes to this question.

One of the interventions to reduce AMR relates to public reporting (PR), a policy intervention in which a regulatory body or an independent agency discloses information on prescribing practices at the individual physician level to influence both providers and consumers in clinical decision-making (WHO, 2015a, Dar et al., 2016, O'Neill, 2016). Public reporting has been used in a variety of healthcare settings, including coronary artery bypass graft mortality (Schneider and Epstein, 1996), colorectal surgery (Vallance et al., 2018), hospital quality in the US (Lindenauer et al., 2007), and antibiotic use in many countries (Weinstein et al., 2005, Kwon and Jun, 2015, Yang et al., 2014, Liu et al., 2016).

Although PR can exert behavioural effects leading to quality improvement in healthcare (Haustein et al., 2011, Yang et al., 2014, Liu et al., 2016, Kwon and Jun, 2015, Yun

et al., 2015, Jun and Jung, 2011), it also poses several concerns, including imperfect risk adjustment (Dranove et al., 2003, Rabilloud et al., 2001), risk selection (Dranove et al., 2003), and potential for gaming (Bevan and Hood, 2006, Bevan and Hamblin, 2009). This paper focuses on the latter and examines strategic behavioural responses to a PR event in South Korea, a country where modern cultural norms cling to the role of personal and professional competence (Lee, 1999), leading to unintended consequences of the providers' responses.

In South Korea, the PR on antibiotics use draws attention because of the serious levels of AMR and overuse of antibiotics (Lee et al., 2000, Park et al., 2005, Kwon, 2003b). After a series of interventions on antibiotic prescribing with limited success, the Korean government introduced PRs on antibiotics in 2005. The primary purpose of PR is to create behavioural incentives that can be either 'honour' or 'guilt and shame' (Elster, 1988).

'Shaming' could be a powerful mechanism by influencing the identity of health professionals. More specifically, shame arises when the lower quality of a practice compared to other practices should be made public (Lynd, 2013). The esteem in which health professionals are held by medical societies exposes doctors to a loss of reputation following PR, which can lead to shame. Furthermore, shame is a particularly formidable social incentive in Asian countries, so avoiding shame is a strong motivation among people (Nichols, 2015).

We examine the effect of professional shame, which can be a particularly motivating incentive in the context of a public disclosure event that potentially affects a doctor's professional status. We document the effect of shame in explaining strategic behaviour following two PR events in 2005 and 2006 by a government agency in South Korea, and in particular the unintended consequence of the PR, the coding manipulation. Particularly in

February 2006, the PR publicly listed the names of the 4 percent of clinics that prescribed both the most and least antibiotics, and the level of antibiotic prescription rates of all eligible practices. The unexpected nature of the PR event allows us to precisely identify the underlying effect of the PR on provider behaviour, in particular diagnosis and prescribing. In addition, we examine how the lowest antibiotic prescribers change their behaviour when faced with the risk of professional shaming. We take advantage of the unpredictability of PR in 2006, which allows us to estimate causality using an event study. Due to the richness of individual-level data, we constructed clinic-level prescription patterns to examine any evidence of coding shift using South Korean health insurance claims data from 2004 to 2009.

We find robust evidence of unintended consequences of PR, the manipulation of disease coding. First, some physicians shifted diagnostic codes from monitored to unmonitored codes in response to public reporting. The proportion of unmonitored codes, acute lower respiratory infection and acute otitis media, increased by about 5pp and 10pp at 12 and 24 months, respectively. The effect was heterogeneous across specialties. Second, providers with high antibiotic prescribing rates before the PR event were more likely to change their diagnosis code. Third, PR reduced the use of specific types of antibiotics, while the use of broad-spectrum antibiotics remained unchanged. Fourth, we show that 'naming and praising' is not as effective as shaming.

Our contribution to the literature is as follows. First, we show empirically that professional shame is a powerful tool for shaping provider behaviour. However, we show that it can lead providers to strategically alter diagnostic prescribing when the design of quality reporting is not perfect. It is vital to check for unintended consequences, as imperfect quality reporting may only penalise 'honest' doctors who are simply trying to reduce the

antibiotic prescription rate without changing codes. This concern should be addressed to justify the incentive system. Second, we contribute to the literature by extending the analysis to examine changes in the quality of prescribing, namely a disproportionate decrease in narrow-spectrum antibiotics compared to broad-spectrum antibiotics. As the PR did not monitor antibiotic types, the PR was not effective in reducing broad-spectrum antibiotics for such conditions, which in many cases is clinically unjustified (Park et al., 2017, Yoon et al., 2015). Third, we find significant heterogeneity across providers, suggesting that the effect depends on the professional norm and the intensity of the professional shame to be exposed. In addition to the underlying motivations, we also show that high-quality prescribers change their behaviour when faced with a system that is unfair to them. Finally, we show the relative effect of 'naming and shaming' to the effect of 'naming and praising', which is rarely found in previous literature.

The rest of the paper is structured as follows. Section 2 reviews the relevant literature, followed by the institutional background in Section 3. Section 4 develops the hypothesis. Section 5 describes the data and the empirical strategy. Section 6 presents the main results.

2. Related Literature

Providers' motivation. One of the well-known frameworks for understanding the motivation of public providers is the analogy of knights and knaves. Le Grand describes 'knights' as public providers motivated by altruism, while 'knaves' are motivated primarily by self-interest. He argues that reconciling knightly and knavish motivations is crucial in designing public policy because many conflicting motivations and social norms coexist in an individual

or a provider organisation (Le Grand, 2003). Le Grand also argued that these motivations are not static but dynamic. He mentioned that the balance between knightly and knavish motivations could be shifted towards encouraging more selfish motivations. If monitoring and punishment are too heavy for providers, they may find a way around the system (Le Grand, 2003).

Bevan and Hood extended Le Grand's analogy to describe the gaming phenomenon in the English NHS. They categorised four groups as 'saints', 'honest triers', 'reactive gamers' and 'rational maniacs', based on their willingness to share and follow the goals of policy designers and their potential to undermine interventions (Bevan and Hood, 2006). We call 'knights' those providers who are motivated by altruism and professional norms. They understand the policy objective well and never game the system. For the knights, the reaction to the PR would be minimal because the individual feedback on the prescription has been done since 2001 (HIRA, 2001). In this case, there should be no evidence of gaming as a response to the PR. Honest gamers' are those providers who understand the policy objective and try to reduce antibiotic use, and never game the system because they are honest. Reactive gamers are providers who understand the policy goal but try to change the code. Because they are primarily motivated by self-interest, they do not consider others, such as honest triers. If they face, or are about to face, naming and shaming, they may have a compelling incentive to remove their name from the list. As it is difficult to change practice patterns quickly, there may be a strong incentive to game the system. They may have more than one option. Changing the code may be the quickest and easiest way to get off the list. It does not require more time and energy to educate patients who need antibiotics. Increasing the use of broad-spectrum antibiotics would be more harmful to patients and society.

Because patients can easily switch clinics if they do not see an immediate alleviation in their symptoms, clinics would use broad-spectrum antibiotics to avoid losing their patients. Being an 'indifferent bystander' could also be an option. In the survey mentioned above, only 32.6% of doctors said they prescribed fewer antibiotics after the PR (MoWH, 2007). Even though the survey was conducted shortly after the PR, more than two-thirds of the clinics did not appear to have changed their practice.

This distinction between types of providers may be essential because any financial or non-financial incentive without a commitment from providers may not be as effective as the other option. For example, a public commitment was effective in changing prescribing patterns. An RCT shows that posting commitment letters in doctors' offices reduced inappropriate antibiotic prescribing without changing diagnostic coding (Meeker et al., 2014). A policy that promotes self-commitment may be the option that achieves the policy goal without unintended consequences.

Public reporting. Public reporting works by influencing the patient's provider choice effect, as well as by influencing the status of physicians, thus triggering professional shame. The theoretical basis of the consumer choice effect assumes a market with informed consumers who have the correct knowledge, access to the disclosed information and interpretability of the message. Informed consumers can discern quality of providers (vertical choice) or choose idiosyncratic services of the same quality (horizontal choice).

Unintended consequences of policies targeting incentives. The motivation of providers, where agents are primarily driven by profit maximisation in setting price and quantity under

the constraint of demand (McGuire, 2000). It is constrained by the information gap between regulatory bodies and providers. In the presence of information gaps, providers respond to the financial incentives with unacceptable behaviour (Jürges and Köberlein, 2015, Dafny, 2005, Di Giacomo et al., 2017, Bastani et al., 2018).

Other motivations include medical ethics, professional norms and social incentives (Ellis and McGuire, 1986, Philippe Choné and Ma, 2011, Liu and Ma, 2013, Kesternich et al., 2015). Given the low feasibility of manipulating ethics and incentives in real practice, empirical studies tend to come from experimental settings (Kesternich et al., 2015, Lagarde and Blaauw, 2017). Bevan and Hamblin (2009) found evidence of data manipulation when the government introduced a 'naming and shaming' policy for ambulance services. When a response time target was introduced, a discontinuity was found near the cut-off, suggesting evidence of coding manipulation (Bevan and Hamblin, 2009). On the other hand, Vallance et al (2018) found no evidence of gaming following the introduction of surgeon-specific postoperative outcome reporting in the English NHS.

What explains the mechanism of clinical manipulation of non-financial incentives? To date, we know little about how clinical manipulation occurs and the mechanisms involved. The literature on tax evasion sheds some light on the matter. (Fortin et al., 2007) studied the peer effect from a gaming perspective and distinguished between possible downstream mechanisms of the peer effect in the experimental setting. An individual may gain comfort by conforming to the behaviour of his reference group (social conformity effect), or learn from others how less costly it is to game the system (social learning effect), or evade the tax when he feels unfair (fairness effect).

In the Korean context, both the social conformity effect and the social learning effect may have operated. After the disclosure in 2006, the clinics had a chance to look at the rates of competitors in the area. The social conformity effect, a type of peer effect, may have been the main driver of the initial drop-in prescription rates (Kwon and Jun, 2015). Not only the driver of positive change, but also the excessive pressure of social conformity may have led heavy prescribers to abruptly change their outcomes. If this is true, the degree of coding shift would be strongest among heavy prescribers.

On the other hand, social learning may encourage clinical manipulation. If some providers shift their diagnostic coding, the relative ranking of prescribing rates changes dramatically, and with it their status and professional shame. In a competitive environment, other providers may eventually learn, which may accelerate the coding shift.

3. Institutional background

The unexpected nature of the two disclosures. As mentioned above, the two public disclosures have one feature in common: the unexpectedness of the events. The first disclosure occurred during a legal dispute between a civil organisation and the MOWH. In early 2005, a civil society organisation asked the government to publish the use of antibiotics at clinic level. When the government refused, the organisation filed a lawsuit against the government in June 2005.

Amid this situation, the MoHW suddenly announced an honour list in October 2005. The list included the names of 25 percent of institutions ($N = 2{,}603$) with low antibiotic prescribing rates. Given the MOHW's reluctance to make the list public, it was enough to send shockwaves to the clinics. Figure III-1 illustrates this process.

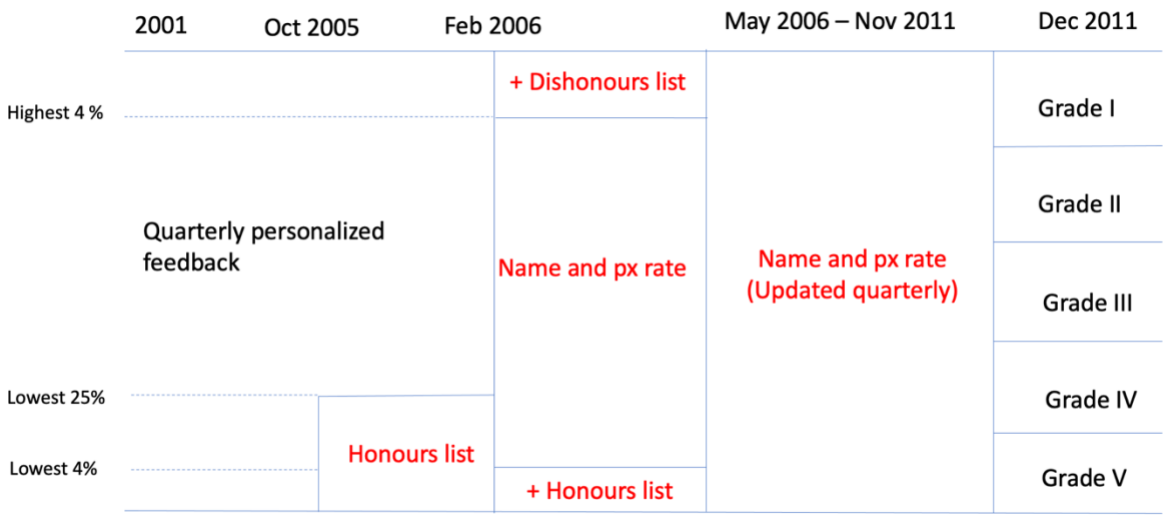


Figure III- 1. History of the public reporting on antibiotics since 2001

The second disclosure in Feb 2006 was even more shocking, as the range and scope went beyond the court ruling and the expectations of the medical societies. The final court decision came in Jan 2006, when the Seoul Administrative Court upheld the public organisation's claim and ordered the government to disclose the list of the top 4% and bottom 4% of clinics using the most antibiotics for Acute Upper Respiratory Infection (AURI). The MOWH published not only the top and bottom 4%, but also all clinics that saw more than 100 patients per month. The list only included clinics such as paediatrics (PED), ear, nose, and throat (ENT), internal medicine (IM), family medicine (FM) and clinics with no specialty, where most patients with upper respiratory tract infections were treated. In the end, 11,558 out of 25,789 clinics were included (MoHW, 2006). Since May 2006, the list has been published quarterly, and since May 2011, it has been divided into five grades instead of antibiotic prescribing rates.

Incomplete public reporting. The MOHW and HIRA disclosed the list only one month after the court ruling. This rapid implementation of the policy has led to several problems, namely insufficient review of the policy design, lack of discussion among key stakeholders, and insufficient policy communication with citizens.

One of the most crucial issues was the monitoring criteria, which is only AURI. As requested by the public organisation, the government agencies included only one coding for the chief complaint, which left room for a coding shift. In the previous study, Kwon and Jun showed that the PR in February 2005 reduced the antibiotic prescription rate by 9%. In addition, they investigated the possibility of gaming by increasing the number of visits so that the prescription rate would decrease as the denominator increased. They rejected the possibility by showing that the total number of visits for colds fell after the policy was introduced (Kwon and Jun, 2015). However, previous literature has only used clinic-level data on the number of common colds, which makes it difficult to show collateral changes. Alternatively, it is possible that the absolute number of visits for AURI would decrease if clinics changed the diagnostic code from AURI to other codes. To check for the possibility of a coding shift, it is critical to look at the number of code changes for similar codes at the clinic level. Clinics may have changed coding from monitored to unmonitored diagnosis codes to avoid a bad reputation, which is the main question of the paper.

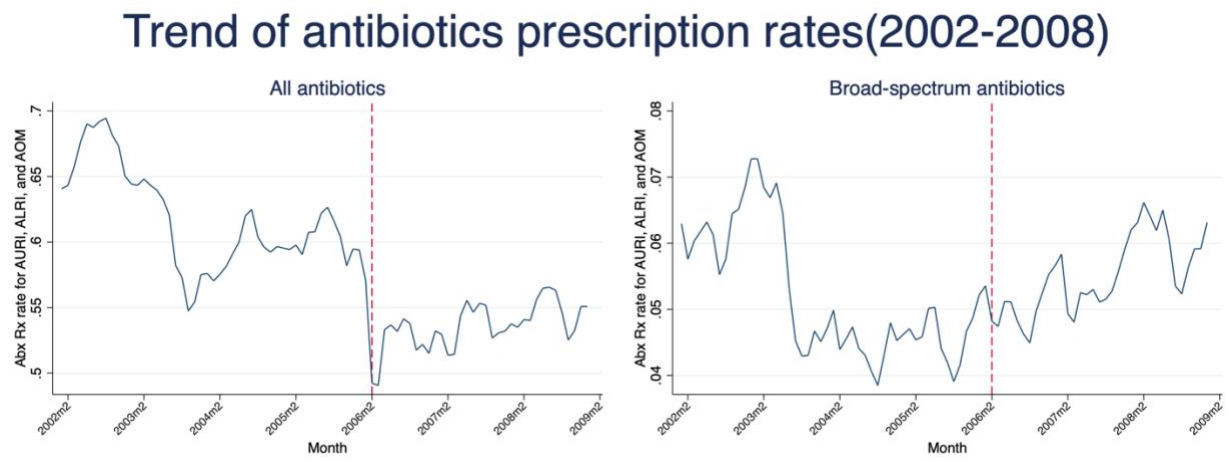


Figure III- 2. The trends in monthly antibiotics prescription rate (2002-2008)

Note. Two graphs show the overall antibiotics use for three disease groups including AURI, ALRI, and AOM. The X-axis refers to the month while the Y-axis refers to the monthly antibiotics prescription rate. The graph on the left shows the overall prescription rate for all antibiotics while the right one shows the prescription rate of broad-spectrum antibiotics, such as the 3rd generation cephalosporins and quinolone.

Another issue relates to the quality of prescribing patterns. When the PR criteria were announced, they did not distinguish between types of antibiotics, which leaves room for antibiotic substitution. Figure III-2 shows the trend in monthly antibiotic prescriptions between 2002 and 2008. At the beginning of 2006, the antibiotic prescription rate dropped sharply from around 58% to 49%. However, there was an upward trend in the use of broad-spectrum antibiotics, and the trend did not decline after the policy. Intuitively, if providers face limited opportunities to prescribe antibiotics, they may have prescribed broad-spectrum antibiotics rather than narrow-spectrum antibiotics in the awareness that they were being monitored. The increased usage of the broad-spectrum antibiotics indicated the side effects of PR (Park et al., 2017, Yoon et al., 2015). The association between public reporting and the use of broad-spectrum antibiotics has never been studied.

Another problem with the policy process was the lack of in-depth discussions among key stakeholders, even though it was an important policy that touched on the identity of doctors. There are many reasons for this, but one of the most important is that there was no permanent forum for discussing key health policies as the government and medical organisations became increasingly conflicted following the implementation of the separation of prescribing and dispensing of medicines in 2000. The Health Policy Review Committee, chaired by the then Prime Minister, was held twice but was short-lived.

The final concern is that the information from the PR did not seem to reach the public effectively. According to a survey, 21.5% of patients who visited clinics for URI were aware of the PR. Furthermore, only a third of them had checked it out, and 40.3% of those who had visited the HIRA website reported that they had changed clinics (MoWH, 2007). Although low public awareness of PR was a pitfall of the policy process, it provides us with useful information that the consumer impact of PR was limited in the early stages of the policy. On the other hand, most providers were aware that their prescription rates were being made public.

In summary, the public reporting in 2005 and 2006 was hastened without sufficient discussion and debate among stakeholders, leaving several loopholes for medical professionals to bypass the policy if they chose to do so. In addition, there was insufficient publicity and understanding of the policy, so patients and families using clinics may not have been able to make full use of the information disclosed. This suggests that both pillars of public reporting were not strong enough.

4. Data and measurement

Data. The study uses Korean National Health Insurance claims data between February 2004 and February 2009. It covers all outpatient use of 1 million cohorts of the national sample population, including the socioeconomic status of individuals, date of visit, diagnosis, drug information, duration and cost of prescription, and clinic and hospital information. The data include approximately 4 million claims for each pre- and post-period. The National Health Service provides the data on request with an approved IRB document.

Outcome measure. We focus on a particular pattern of code shifting where the principal diagnosis changes from a monitored diagnosis to an unmonitored diagnosis. Regulators announced that acute upper respiratory tract infections (AURI) would be monitored. For providers, there were several codes they could use if they wanted, including acute lower respiratory tract infection (ALRI) and acute otitis media (AOM). Notably, patients with ALRI have similar initial symptoms to AURI, including coughing and low-grade fever. Both AURI and ALRI are mostly caused by viruses, with some cases of bacteria.

We first examine whether PR has caused a shift in coding by constructing a composite indicator to track the trend in coding manipulation over time. Based on the International Classification of Diseases, we grouped three disease categories, including AURI, ALRI and AOM. We then created a composite indicator, the proportion of unmonitored diagnoses from all three codes. If the indicator increases significantly after public reporting, we can speculate about the possibility of coding manipulation.

$$\textit{The proportion of unmonitored diagnoses} = \frac{(ALRI + AOM)}{(AURI + ALRI + AOM)}$$

We only include primary care clinics because most patients with these symptoms do not attend large hospitals. In addition, prescribing patterns may be heterogeneous among doctors in a hospital. The initial number of clinics in the data was 13,451, which is higher than the actual number of clinics on the list (N=11,558). Of these clinics, 878 and 1,476 clinics respectively had less than two claims for AURI in 2005q3. If we remove these hospitals, the number of samples is reduced to 11,097, which is less than the number of hospitals on the list. In addition, we also removed clinics that had two patients with AURI in 2005q3 (N=1,224) to avoid underestimating the effect size by including clinics that were not on the list. The final sample, therefore, contains 9,873 clinics. (See Appendix for more information)

We then measured the monthly prescription rate of all antibiotics and broad-spectrum antibiotics, including third generation cephalosporins and quinolones. Figure III-3 shows the percentage of clinics by antibiotic prescription rate constructed from 2005Q3 data. Overall, around 4.3% of practices never prescribed antibiotics to patients with AURI, while around 6.3% of practices prescribed antibiotics to every single patient with AURI. Within the same specialty, the lowest prescribers (grade 1) make up the largest proportion in IM/FM, while the highest prescribers (grade 4) are most common in ENT.

Based on the facts described above, we expect more immediate and stronger effects of PR in ENT and paediatrics compared to IM/FM, as the heaviest prescribers would be acutely pressured.

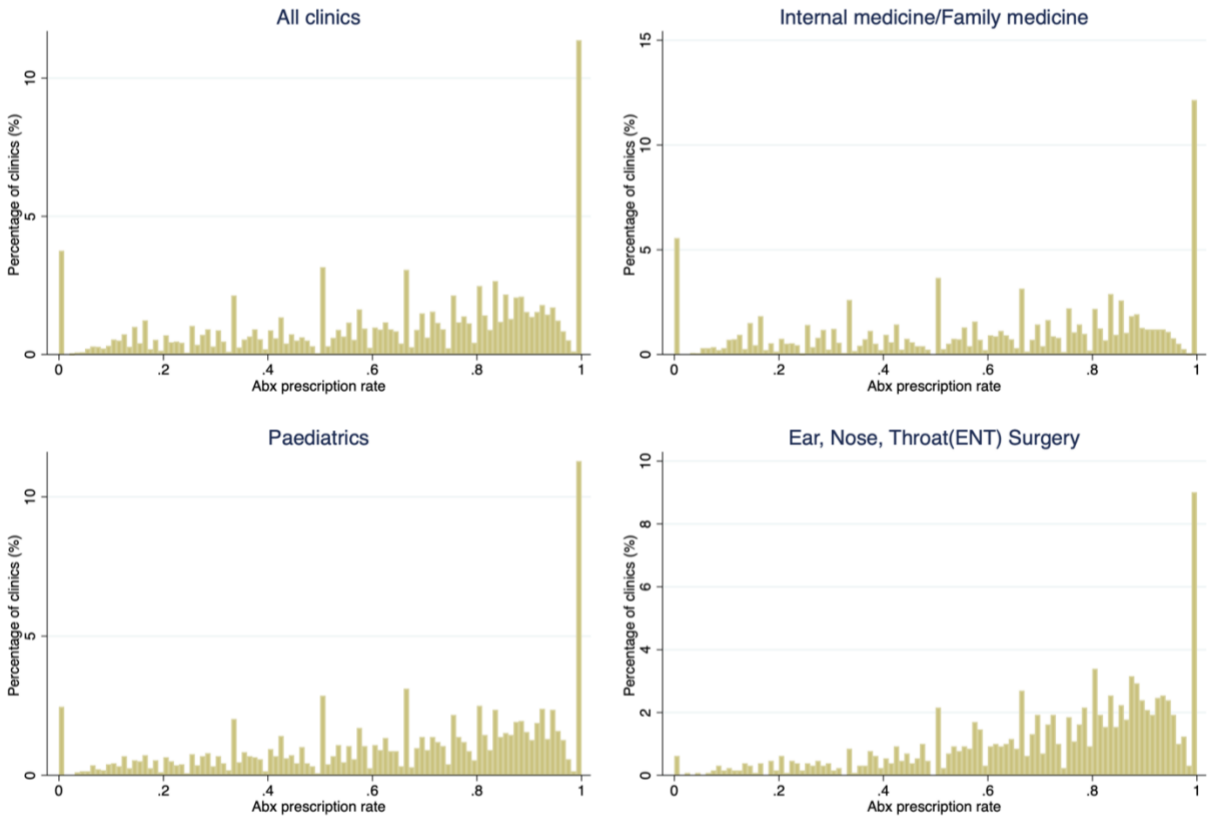


Figure III- 3. Antibiotics prescription rate on acute upper respiratory infection (AURI) in 2005q3

Table III-1 shows the evolution of the data. Panel A shows data on approximately 815,318 visits as of 2006, when public reporting began. Approximately 55% of the visits are for female patients, 46.2% are for patients aged 15 or younger, and 5.49% are for patients aged 65 or older. Internal medicine and family medicine departments account for 46.9% of the data, paediatrics for 31.8% of the data, and ENT for 21.3% of the data.

Panel B shows the proportion of ALRIs and AOMs in all encounters for each clinic and is based on January 2006, the month prior to public reporting. Among IM/FM visits, ALRIs and AOMs account for about 25.3%, PED for 34.6%, and ENT for an average of 26.6%. By department and by grade, defined as historical antibiotic prescribing rates, there are no significant differences between the grades due to the time before public reporting.

Table III- 1. Baseline characteristics in 2006

VARIABLES		N	mean	sd
Panel A: Baseline characteristics in 2006				
female		815,318	0.551	0.497
under15		815,318	0.462	0.499
over65		815,318	0.0549	0.228
IM/FM		815,318	0.469	0.499
PED		815,318	0.318	0.466
ENT		815,318	0.213	0.41
Panel B: Proportion of ALRI and AOM, as of Jan 2006				
Department				
	IM/FM	5,805	0.253	0.302
	PED	2,318	0.346	0.292
	ENT	1,186	0.266	0.293
IM/FM				
	Grade 1	1,776	0.208	0.291
	2	1,455	0.255	0.296
	3	1,186	0.266	0.293
	4	1,388	0.299	0.323
PED				
	Grade 1	440	0.323	0.297
	2	631	0.339	0.282
	3	677	0.343	0.285
	4	570	0.373	0.306
ENT				
	Grade 1	154	0.246	0.266
	2	290	0.197	0.212
	3	416	0.229	0.217
	4	379	0.245	0.238

5. Empirical strategy

Event study. Our empirical strategy is based on the assumption of the exogeneity of PR by conducting an event study (ES). The ES is a widely used methodology to examine the impact of an unexpected event on the market for a short period of time (Khotari and Warner, 2007). ES is particularly useful for estimating a causal relationship when there is no appropriate comparison group. The exclusion restriction for claiming a causal effect of the intervention stipulates that the timing of the intervention should be unexpected or random. As mentioned above, we argue that two public reporting events were unexpected. The first public reporting, an honours list in October 2005, was unexpected in terms of timing and content. Note that the MoHW had initially refused the PR and was in the middle of a legal dispute with an NGO demanding the PR[2].

In addition, the PR in February 2006 was unexpected in its scope. In January 2006, the court surprised both the government and the doctors' association by ordering the government to publish the top 4% and bottom 4% of providers who prescribed the most and least antibiotics for AURI. The court decision itself may have come as a shock to the top 4% of providers, as the bottom 4% were already on the honours list published in October 2005. However, the MoHW surprised most providers by publishing not only the top and bottom 4%, but also most clinics that wrote more than 100 prescriptions in 2005q3. This

[2] The tensions between the government and the doctor's association (Korean Medical Association) were high due to the painful experience and conflicts during the Separation of Prescribing and Dispensing (SPD) in 2000. Since the SPD was only a few years before the PR, and it is understandable that the government did not want to create unnecessary conflict even though AMR is an important issue.

unpredictability of the court's decision and a subsequent action by the MoHW opens the possibility of using an event study.

We use both a non-parametric and a parametric event study. The non-parametric event study refers to a regression-based specification in which the study period can be divided into three parts: pre-event, event, and post-event. It is particularly useful for charting the trend over time. As the paper is designed to track changes in supplier behaviour monthly, the non-parametric event study design is a compelling method for observing patterns. For the main analysis, we limit our pre-event period to Feb 2004 to Jan 2006, set the event period to Feb 2006, and follow up to Feb 2009 for the long-term effect. We used a similar approach for public reporting in October 2005. We have not included the year 2003 because of the SARS outbreak in the East Asian region. In 2003, the national level of vigilance for infectious disease increased between March and July, which had a clear impact on patients' behaviour and doctors' coding patterns. We have also excluded 2009 because of the H1N1 pandemic.

The basic specification of the event study is as follows,

$$y_{it} = X_{it}\alpha + \sum_{t=-24}^{-2} \mu_t + \sum_{t=0}^{36} \mu_t + v_i + \varepsilon_{it} \qquad \dots (1)$$

where y_{it} is the proportion of ALRI and AOM out of the sum of all three disease categories, and X_{it} is a vector of provider characteristics, including the proportion of patients under 15 and the proportion of patients over 65. $\mu_t s$ are the coefficients of non-parametric regression of each month before and after the event. μ_{-1} , the coefficient of one month before the event, is omitted to serve as a baseline estimate. v_i is a clinic-level fixed-effect.

Once we observe the pattern of the trend, we perform a parametric event study. Following Dobkins et al., we adopt a cubic spline regression to allow the flexibility (Dobkin et al., 2018). The cubic spline regression requires at least three tipping points called 'knots'; therefore, we set knots at 0, 12, and 24 months. It is because the impact of the event would be stronger in the short-term relative to the long term. A basic specification of the parametric event study is as follows,

$$y_i = \beta_1 t + \beta_2 t^2(t > 0) + \beta_3 t^3(t > 0) + \beta_4(t - 12)^3(t > 12) + \beta_5(t - 24)^3(t > 24) + \varepsilon_i \quad \ldots(2)$$

We allow the linearity of the pre-trend, $\beta_1 t$, to capture any influence persisting before and after the intervention.

Heterogeneity. We expect strong heterogeneity between specialties because each specialty has different patient characteristics, disease mix and clinical guidelines. For example, PED and ENT would have been sensitive to public reporting because these specialties have a significant proportion of patients with AURI and ALRI. IM and FM would have been less sensitive to reporting because they also see many patients with chronic diseases, and we grouped IM and FM together because they are primary care physicians caring for chronically multimorbid patients in the Korean outpatient setting, and respiratory infections are not the

only part of the patient characteristics. Therefore, we divided the specialties into three groups: IM/FM, PED, and ENT.[3]

6. Results

Hypothesis 1_Coding shift. We ran the event study using the indicator, the proportion of unmonitored conditions, which captures the extent to which clinics changed codes. The result suggests that the coding shift occurred immediately after the PR in February 2006. Figure III-4 is a graphical illustration of the coefficient of the non-parametric event study, which shows that there was an immediate change from the first month in February 2006 and an upward trend thereafter. The baseline of the indicator appears to have been lifted, indicating a significant change in providers' behaviour.

Table III-2 shows the implied impact at 1, 12, 24 and 36 months. As can be seen in column (1), the proportion of unmonitored codes increased by 1.9 percentage points in the first month, which was statistically significant. This trend continued, with increases of 5.1 pp, 10 pp and 13 pp at 12, 24 and 36 months, respectively.

Clinics with high pre-disclosure APR were prone to shift diagnostic coding. Another finding is that the degree of coding shift was strongly associated with each clinic's prescription rate

[3] The grade published online by HIRA was at the clinic level. Given the existence of multi-specialities clinics, we constructed the unit of analysis at the clinic level and the clinic-department level based on the methodology.

before the event. Figure III-4, a graphical illustration of the coefficient of the non-parametric event study by the group, shows a clear divergence after the event. As we grouped all providers into four groups based on their previous antibiotic prescribing rate, the results suggest that providers who had prescribed antibiotics heavily shifted coding the most.

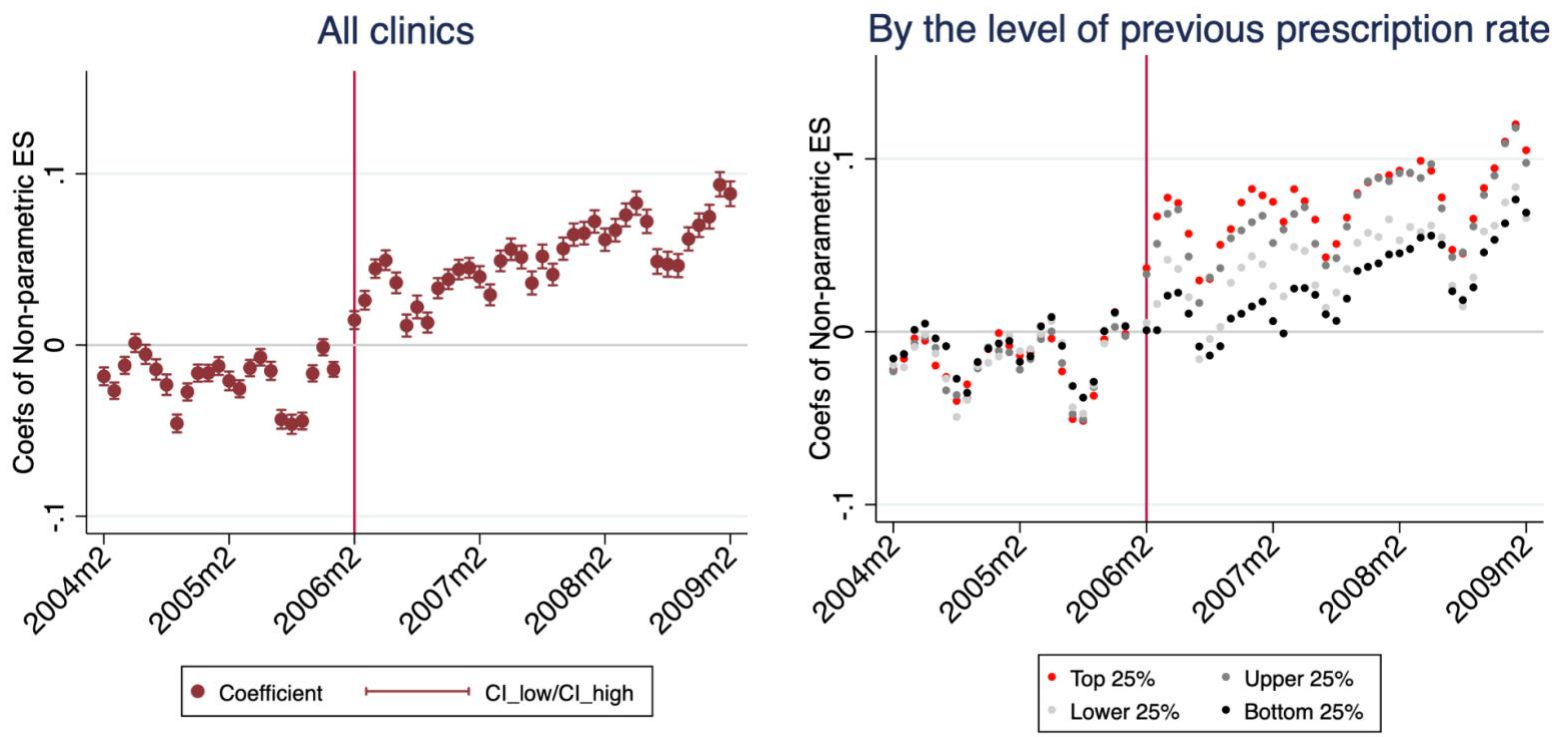


Figure III- 4. Changes in the proportion of unmonitored codes, using non-parametric event study.

Note. The graphs demonstrate the change in the proportion of unmonitored codes out of all codes including AURI, ALRI, and AOM. The x-axis refers to the time (Changes in the proportion of unmonitored codes, using non-parametric event study month) whereas the y-axis shows the coefficients from the non-parametric event study. In the graph on the left side, the dots represent coefficients whereas the hollow dots show 95% confidence interval. On the right, we grouped providers into four groups based on the previous antibiotics prescription rate in 2005Q3. While the red dots represent coefficients of the top 25%, heaviest prescribers, black dots are the coefficients of the bottom 25% of prescribers.

Table III- 2. Implied effect of the intervention at 1, 12, 24, and 36 months

Specialities	All		All					IM/FM	PED	ENT
Previous Rx Rate	All		Bottom 25%	Lower 25%	Upper 25%	Top 25%		All	All	All
	(1)		(2)	(3)	(4)	(5)		(6)	(7)	(8)
Implied impact at 1 month (Coef.)	.019		.0072	.012	.023	.026		.015	.028	.015
SE	(.00075)		(.0012)	(.0013)	(.0015)	(.0016)		(.00096)	(.0016)	(.0019)
p-value	[<.001]		[<.001]	[<.001]	[<.001]	[<.001]		[<.001]	[<.001]	[<.001]
Implied impact at 12 months (Coef.)	.051		.017	.039	.061	.074		.04	.082	.05
SE	(.002)		(.0031)	(.0034)	(.0039)	(.0045)		(.0025)	(.0043)	(.0049)
p-value	[<.001]		[<.001]	[<.001]	[<.001]	[<.001]		[<.001]	[<.001]	[<.001]
Implied impact at 24 months (Coef.)	.1		.062	.076	.1	.11		.087	.15	.094
SE	(.0025)		(.0041)	(.0042)	(.0048)	(.0054)		(.0031)	(.0051)	(.0063)
p-value	[<.001]		[<.001]	[<.001]	[<.001]	[<.001]		[<.001]	[<.001]	[<.001]
Implied impact at 36 months (Coef.)	.13		.1	.11	.14	.14		.12	.19	.093
SE	(.0033)		(.006)	(.0059)	(.0064)	(.007)		(.0043)	(.0064)	(.008)
p-value	[<.001]		[<.001]	[<.001]	[<.001]	[<.001]		[<.001]	[<.001]	[<.001]
Coef of pre-trend (Coef.)	.021		.0083	.013	.026	.029		.017	.032	.017
SE	(.00086)		(.0014)	(.0014)	(.0017)	(.0019)		(.0011)	(.0018)	(.0021)
p-value	[<.001]		[<.001]	[<.001]	[<.001]	[<.001]		[<.001]	[<.001]	[<.001]
N	531,822		133,725	134,579	130,790	132,728		326,412	131,836	73,574
Cluster	9,873		2,532	2,492	2,375	2,474		6,135	2,448	1,290
R2	.018		.0086	.012	.022	.02		.013	.04	.019

Note. Implied impacts were derived from a parametric event study. Column (1) shows overall effects including all specialities while (2) to (4) show heterogeneity by internal medicine/family medicine, paediatrics, and ENT clinics. In addition, columns (5) to (8) contain the results by four groups divided by the level of antibiotics prescription rate before the intervention.

Based on the results of the non-parametric study, columns (2) to (5) in Table III-2 show that the top and top 25% groups responded immediately and strongly, followed by the bottom 25% and bottom 25% groups. While the proportion of unmonitored codes increased by only 0.72 percentage points in the bottom 25%, the top 25% showed an increase of 2.6 percentage points in the first month. When each group was followed over the years, there was a clear increase in the proportion of unmonitored codes. For example, the top 25% showed an increase of 2.6 pp in the first month but reached 14 pp 3 years later. The bottom 25% seem to have had minimal change in the first few years, but then started to increase. The results support our hypothesis that providers under greater identity pressure will change their coding more.

Heterogeneity by specialties. As expected, each specialty shows a different pattern of response. As expected, columns (6) to (8) in Table III-2 show that PED appears to have the largest jump in one month, while others show smaller changes. The impact of PED at 12 months increased by 8.2 pp, which is about twice the impact of the other specialties, 4pp and 5pp for IM/FM and ENT respectively. (See Figure III-A1 in the appendix).

What accounts for these differences? Two explanations are possible. First, parents may be sensitive to the quality of the provider's prescribing, such as the use of antibiotics. Particularly in the Korean context, the reputation of providers is easily shared in online parent communities, which providers are aware of. Therefore, high prescribers who know that their prescription rates are exposed have compelling incentives to reduce the rate. However, it is not easy to reduce the prescribing rate significantly, as providers also bear the

risk of poor prognosis patients or losing patients to other clinics. Therefore, code shifting would be the easiest way to reduce the prescription rate on the Internet. Another explanation could be that a higher proportion of patients with acute respiratory infections is driving the effect. For example, a significant proportion of patients in the PED visit primary care clinics for acute respiratory infections. Compared to PED, IM/FM has a higher composition of patients with chronic diseases, and ENT has more specific diseases such as hearing problems. Therefore, clinics with a higher proportion of AURI should be more sensitive to PR.

Table III- 3. Heterogeneity by the specialities. Implied effect of the intervention at 1, 12, 24, and 36 months

Specialities	IM/FM				PED				ENT			
Previous Rx Rate	Bottom 25%	Lower 25%	Upper 25%	Top 25%	Bottom 25%	Lower 25%	Upper 25%	Top 25%	Bottom 25%	Lower 25%	Upper 25%	Top 25%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Implied impact at 1 month (Coef.)	-.00009	.00001	.00009	.00038	-.00028	.00024	.00057	.00076	.00007	.00021	.00017	.00031
SE	(.00007)	(.00008)	(.00009)	(.0001)	(.00014)	(.00012)	(.00012)	(.00015)	(.00011)	(.00009)	(.0001)	(.00012)
p-value	[.22]	[.88]	[.32]	[<.001]	[.049]	[.041]	[<.001]	[<.001]	[.51]	[.023]	[.091]	[.0076]
Implied impact at 12 months (Coef	.0061	.0089	.012	.029	-.0089	.024	.041	.046	.0052	.015	.014	.016
SE	(.0044)	(.005)	(.0059)	(.0063)	(.0091)	(.0071)	(.0076)	(.0093)	(.0066)	(.0057)	(.0062)	(.0069)
p-value	[.17]	[.076]	[.045]	[<.001]	[.33]	[<.001]	[<.001]	[<.001]	[.44]	[.0087]	[.022]	[.017]
Implied impact at 24 months (Coef	.043	.029	.021	.03	.021	.033	.034	.01	.0017	.018	.014	-.0037
SE	(.0066)	(.0074)	(.0087)	(.0088)	(.013)	(.0097)	(.01)	(.013)	(.011)	(.0075)	(.0083)	(.01)
p-value	[<.001]	[<.001]	[.015]	[<.001]	[.1]	[<.001]	[.0011]	[.43]	[.88]	[.016]	[.091]	[.71]
Implied impact at 36 months (Coef	.078	.045	.039	.056	.045	.054	.044	.017	.022	.025	.019	-.012
SE	(.01)	(.011)	(.013)	(.013)	(.019)	(.015)	(.014)	(.019)	(.016)	(.011)	(.011)	(.015)
p-value	[<.001]	[<.001]	[.0023]	[<.001]	[.015]	[<.001]	[.002]	[.37]	[.17]	[.022]	[.07]	[.44]
Coef of pre-trend (Coef.)	.00049	.0012	.002	.0016	.0013	.0016	.0025	.0036	.00053	.00086	.0015	.0021
SE	(.00017)	(.0002)	(.00025)	(.00025)	(.00036)	(.00028)	(.00028)	(.00037)	(.00028)	(.00021)	(.00021)	(.00026)
p-value	[.0049]	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]	[.06]	[<.001]	[<.001]	[<.001]
N	99,849	81,335	67,626	77,602	24,674	36,283	38,522	32,357	9,202	16,961	24,642	22,769
Cluster	1,909	1,519	1,241	1,466	457	678	705	608	166	295	429	400
R2	.0087	.01	.018	.014	.011	.02	.037	.044	.0063	.025	.031	.034

Note. Implied impacts were derived from a parametric event study. Column (1) shows overall effects including all specialities while (2) to (4) show heterogeneity by internal medicine/family medicine, paediatrics, and ENT clinics. In addition, columns (5) to (8) contain the results by four groups divided by the level of antibiotics prescription rate before the intervention.

In addition, we find heterogeneous responses when we look at groups in each specialty. The higher the previous antibiotic prescription rate, the more frequent the coding shift. For example, out of four groups of PED, all three groups except the bottom 25% showed significant changes in the proportion. As shown in Table III-3, the top 25% showed a change of 4.6 pp, the second top 25% and the bottom 25% showed a change of 4.1 pp and 2.4 pp, respectively. For IM/FM at 12 months, the implied impacts of all four groups showed positive changes, although those of the bottom 25% and the third highest group were not statistically significant. For ENT at 12 months, all four groups showed a positive change, but the implied impact of the bottom 25% was not statistically significant. The variance between groups in each specialty was greater for PED than for IM/FM and ENT (see Figure III-A1 in the Appendix).

However, the long-term trends show a different pattern. Among the four groups in each specialty, the lowest group remained unchanged over time. However, even the lowest 25% of IM showed an upward change at both 24 and 36 months. These results suggest that the lowest prescribers had to participate in the coding change to some extent to avoid disadvantages by being honest prescribers.

The effect of publishing an honour list. We also examined the effect of the government's publication of the honour list in October 2005. As mentioned earlier, the honour list included the names of the 25% of clinics that prescribe fewer antibiotics, and it is worth comparing the difference between those who made the honour list and those who did not. As with the previous analysis, the non-parametric analysis found no clear evidence that honour lists

caused coding shifts. However, there was some variation by specialty, with paediatrics showing some evidence of temporal coding shifts in the treated group. While there were periodic oscillations around the pre-policy baseline, the divergence between groups was never observed. In November 2005, one month after the policy was implemented, there was a divergence between the four groups, with the largest shift in the bottom 25% group, followed by the lower 25%. (See Figure III-A3 and III-A4 in appendix) However, this divergence was temporary and disappeared in December and January before reappearing in February 2006. We ran a separate analysis with only two groups, the bottom 25% and the upper 25% groups. The magnitude of the coefficient was larger in the bottom 25% group than in the top 25% group, but it was not statistically significant due to overlapping confidence intervals. (See Figure III-A4 in appendix)

This is an interesting example that shows that physicians with previously low prescribing rates can respond to positive social incentives and make coding shifts temporarily. While some of the providers in this group may have temporarily shifted their coding to ensure continued inclusion on the honour list, this behaviour did not last long. They remained active policy enablers or knights.

Quality improvement and sustainability. We also measure the change in the prescription rate taking the coding shift into account. The overall prescription rate fell sharply after the event, as shown in Figure III-5. The problem is that this decline has not been sustained: the figure shows that in February 2006, the decline was around 8pp, but it immediately fell back to a decline of 3-5%, and even then it seems to be gradually returning to baseline.

In addition, the use of broad-spectrum antibiotics did not decrease after the PR. Although it is desirable for providers to reduce the use of broad-spectrum antibiotics proportionately as they reduce overall antibiotic use, we find that broad-spectrum antibiotics showed an upward trend regardless of the PR event. Therefore, we conclude that the PR event is unlikely to have improved the quality of prescribing. The policy overlooked the use of broad-spectrum antibiotics, and it appears that some providers are taking advantage of the pitfall. If we look at the proportion of prescriptions for broad-spectrum antibiotics out of all prescriptions for any antibiotic, we find similar results. (See Figure III-A5 and III-A6 in appendix)

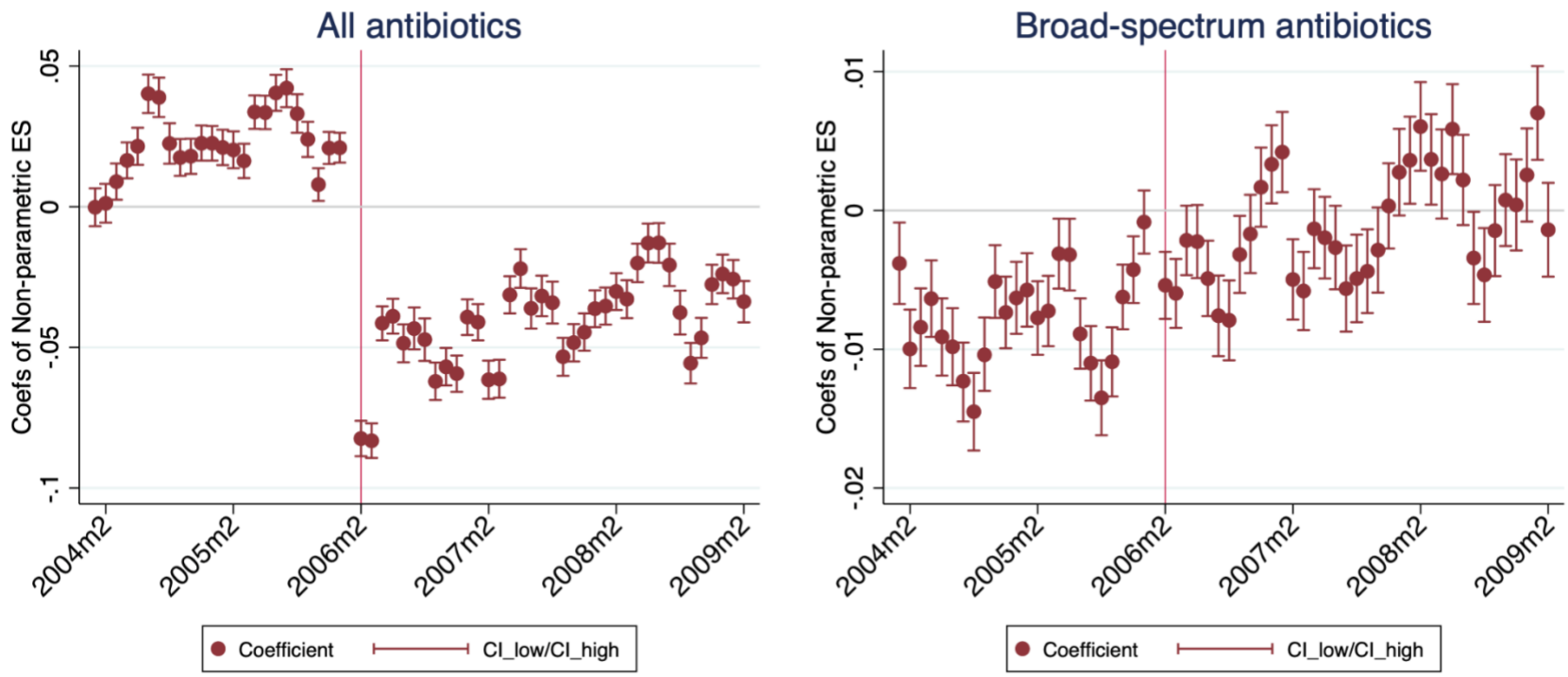


Figure III- 5. Change in the antibiotics prescription rate by the type of antibiotics.

Note. The graphs demonstrate the change in the antibiotic prescription rate before and after the intervention. The X-axis refers to the month whereas the Y-axis shows coefficients of a non-parametric event study. The graph on the left shows discontinuity and a sharp decrease in the antibiotics prescription rate for all three diagnoses, accounting for change of code. Nevertheless, there was no change in the use of broad-spectrum antibiotics prescription rate as seen in the graph on the right.

7. Robustness Checks

Weekly intervention. To check the robustness of the analysis, we examine the coding shift using weekly data (See Figure III-A7 and III-A8 in the Appendix). According to the MOWH press release, the exact release date of the list is 10 February 2006, which is the 6th week of the year. We have generated weekly data to see the robustness of the results. As we see in Figure III-A4 and III-A5 in the appendix, the change in coding started immediately in week 6. The heaviest prescribers showed the strongest response, while the lightest prescribers only followed the seasonal variation along the baseline.

Placebo intervention. We performed a robustness check with the placebo intervention 12 months before the actual public reporting. The results confirm that there was no change before and after the placebo intervention in week 6 of 2005. There was also no change across specialties (see Figure III-A9 and III-A10 in the appendix).

8. Conclusion

Public reporting is a powerful policy intervention that can influence provider behaviour by exposing individuals to consumer choices about quality and peer effects affecting the professional status and shame. This paper empirically documents evidence that public reporting changes prescribing practices, and in particular the coding of diagnoses following public reporting to avoid 'professional shame'. The magnitude of the effect is greater for doctors whose pre-disclosure prescribing rates were high, while the effect is negligible for other physicians. In addition, the results tell us that incomplete policy design

may not lead to desirable change. Without a specific monitoring criterion, providers reduced only some types of antibiotics, while keeping the use of broad-spectrum antibiotics at the same level as before the intervention. In addition, we found that 'professional honour' is not as effective as 'professional shame' in some contexts. The publication of the honour list in October 2005 had little effect on reducing prescribing rates (see Figure III-A6 in the appendix). Finally, when we look at the overall decrease in antibiotic prescribing rates after accounting for the coding shift, we see a decrease of about 8pp in the month of the coding shift, followed by a decrease of only 5pp the following month, and a gradual decrease thereafter, which raises questions about the sustainability of the public reporting.

The findings have several policy implications. First, the use of professional shame is a powerful mechanism to change the behaviour of professionals. However, an imperfect design under information asymmetry can be disastrous because professionals have many other ways of circumventing the policy goals, such as upcoding and substitution, as we have seen in the study. Any policy using this mechanism should be carefully designed, with extensive stakeholder consultation, to avoid unnecessary use of 'shame'. On the other hand, policymakers can give providers enough time to adapt to the new system, as the cost of shame is significant. For example, the HIRA implemented public reporting without giving clinics a chance to change their behaviour after the court ruling. The fact that the HIRA has changed the reporting criteria several times since 2006 suggests to us that the policy was not fully ready for implementation. Allowing more time to design a better policy option could have saved the cost of trust between policymakers and providers.

Second, it is important not to undermine the altruistic motivations of stakeholders. As we have seen in this case, even low prescribers of antibiotics eventually adapted to avoid

professional shame, which is also due to the design of the policy. If the policymaker uses relative measures between providers, even knightly providers come under pressure that could lead to unwanted side effects. If policymakers set and announced an absolute benchmark, with appropriate supportive monitoring, unnecessary pressure on knights could be avoided.

This case also highlights the importance of health governance. In a democratic society, health policy inevitably involves the interaction of various stakeholders. As we have seen in this case, it requires a great deal of understanding and respect between the government and health workers to change long-established health worker behaviour through a radical shaming policy. Therefore, it is important to have in-depth discussions about the implementation of such a policy and to have a careful policy design together with stakeholders in order to promote social benefits. It is also necessary to communicate with providers and give them opportunities to avoid being shamed for their practice. There should also be a way for stakeholders to challenge the design of the policy if it is not sufficient or unreasonable.

The final point is the importance of policy communication. As we have seen in this case, coding changes were more likely to occur in paediatrics, where parents, who are sensitive to antibiotic use, engage in health-seeking behaviour. To make public reporting more meaningful, more patients and their families need to be able to easily understand what it means and make the best decisions based on the information presented. In addition, it is essential to create channels for patients and their caregivers to request information from governments about their healthcare.

9. Appendix

Table III-A 1. Three different disclosures and their contents

Date	Contents of public disclosure	Based on the prescription rate	Number of providers
20th OCT 2005	The honour list	2005 Q1	Clinic (2,603)
10th Feb 2006	The honour list and the dishonour list	2002- 2004	- Honour list: quarterly hospitals (1), tertiary (5), secondary (7), clinics (417) - Dishonour list: quarterly hospitals (2), tertiary (7), secondary (15), clinics (484)
10th Feb 2006	All providers seeing more than 100 patients with AURL a month	2005 Q3	Quarterly hospitals (42), tertiary (221), secondary (438), clinics (11,558)

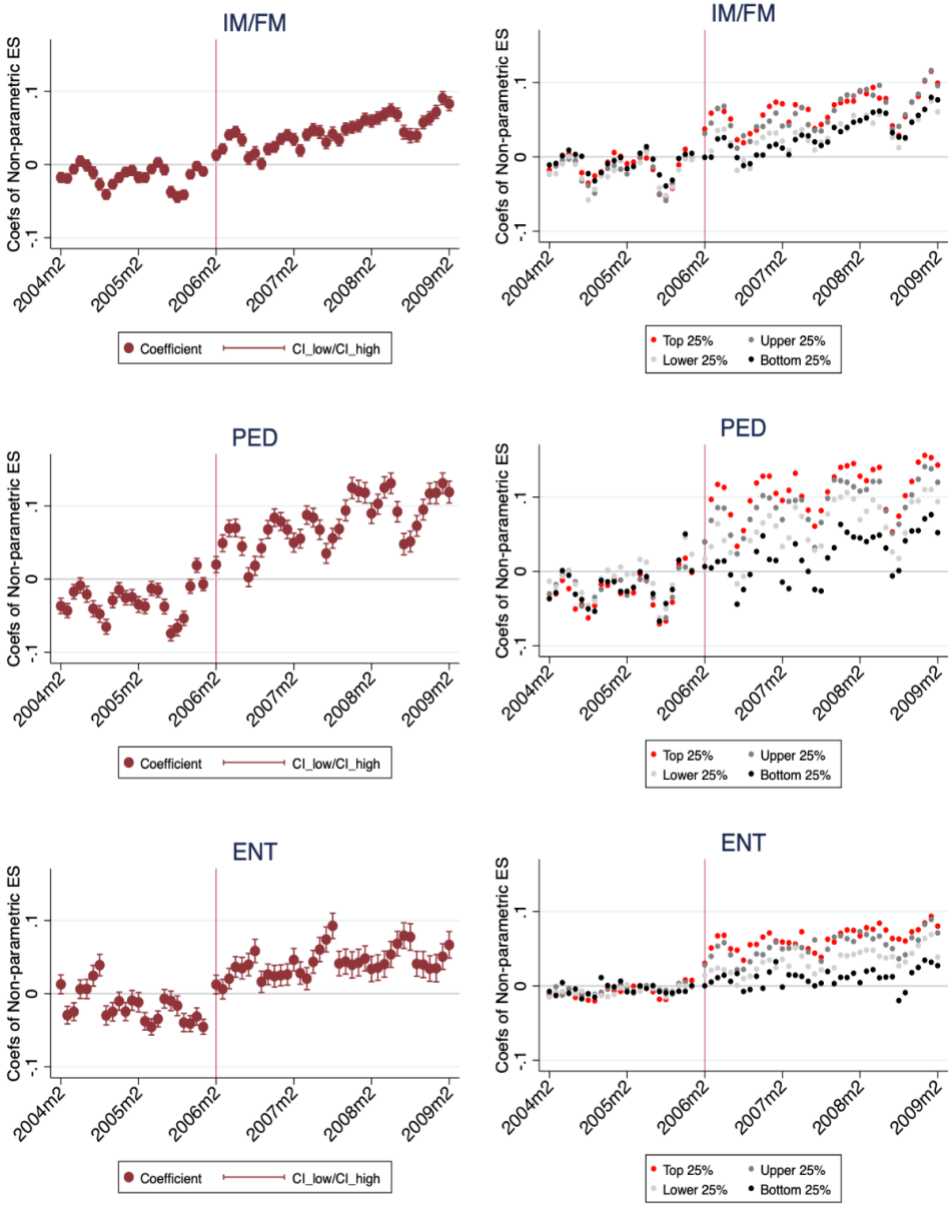
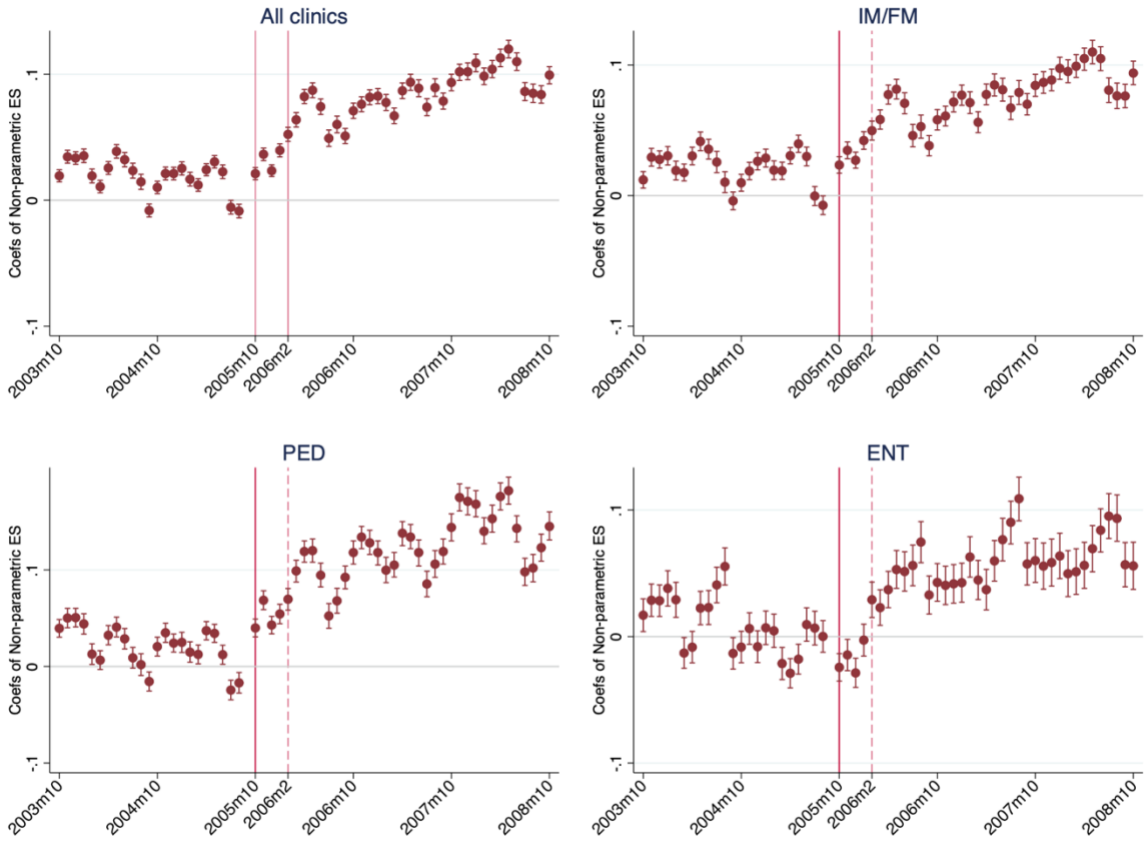


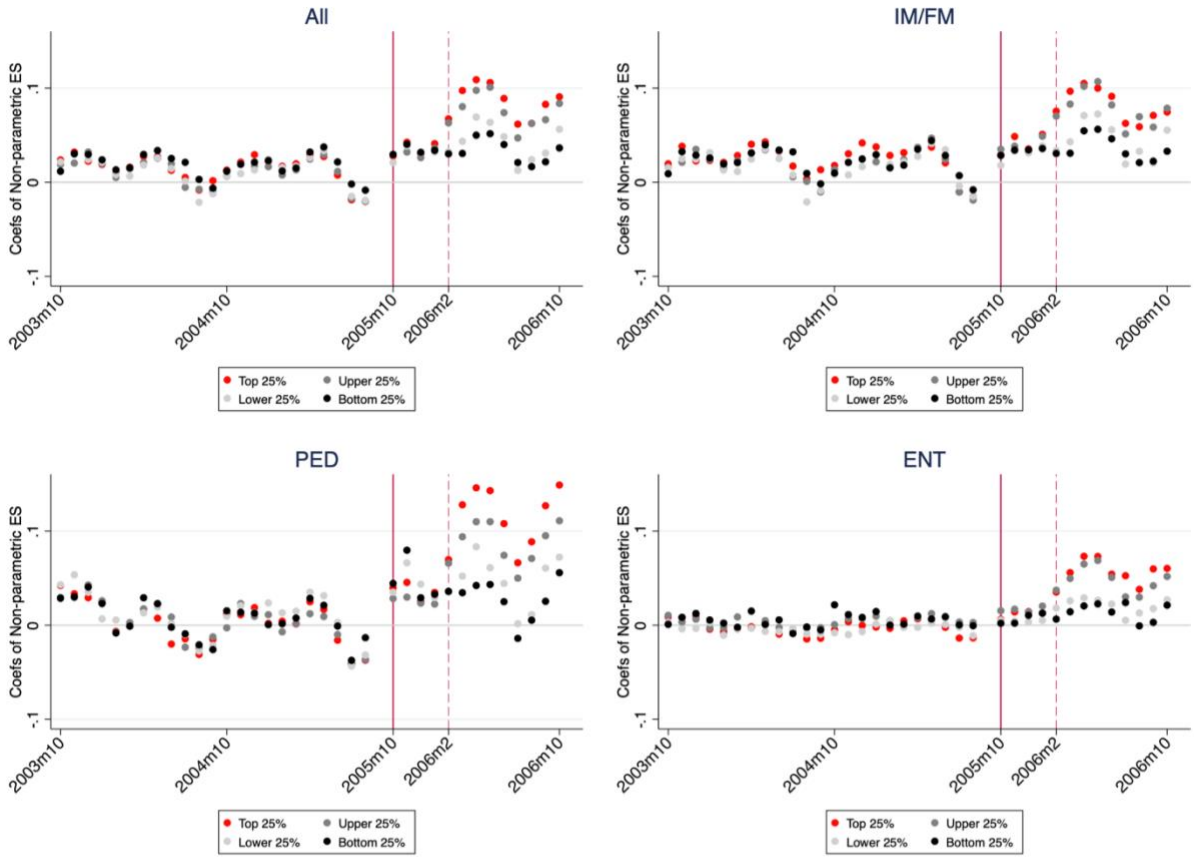
Figure III-A 1. Changes in the proportion of unmonitored codes, using non-parametric event study.

Note. The graphs demonstrate heterogeneity by the specialities, measuring the change in the proportion of unmonitored codes out of all codes including AURI, ALRI, and AOM. The x-axis refers to the time (month) whereas the y-axis shows the coefficients of a non-parametric event study. In each speciality, graphs on the left column show the overall trends of change of coding whereas the right column shows heterogeneity by the previous prescribing behaviours. There are four groups based on the previous antibiotics prescription rate for acute upper respiratory infection in 2005Q3. While the red dots represent the coefficients of the top 25%, heaviest prescribers, black dots are the coefficients of the bottom 25% of prescribers. Figure III-A2. The effect of publishing the honour list in October 2005 on coding shift.



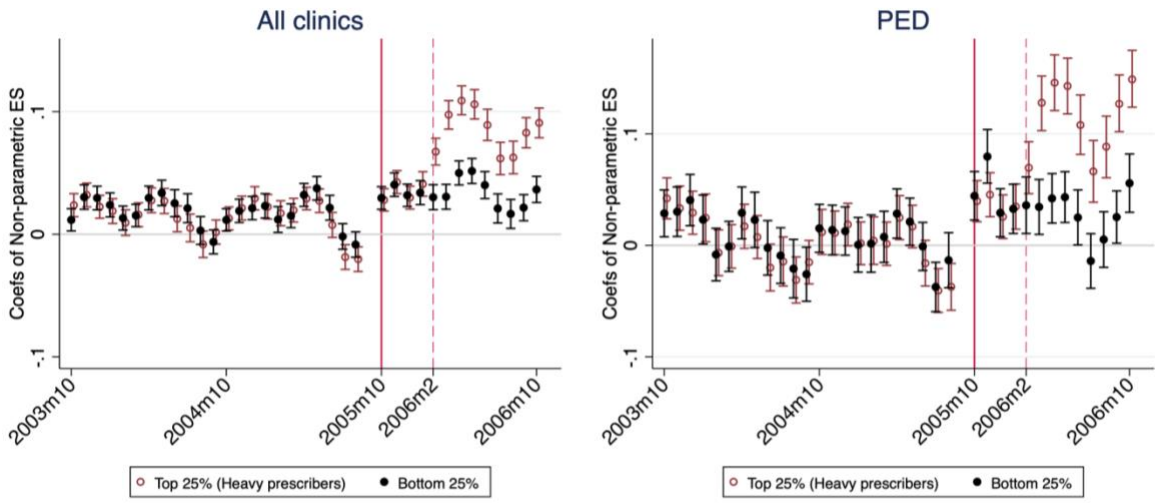
Notes. OLS coefficient estimates are reported. The event time is October 2005.

Figure III-A 2. The effect of publishing the honour list in October 2005 on coding shift.



Notes. OLS coefficient estimates are reported. The event time is October 2005.

Figure III-A 3. The effect of the honour list on coding shift by specialty and the level of previous antibiotics prescription rates.



Notes. OLS coefficient estimates are reported. The event time is October 2005.

Figure III-A 4. The effect of honour list on coding shift, including only the top and bottom 25% group.

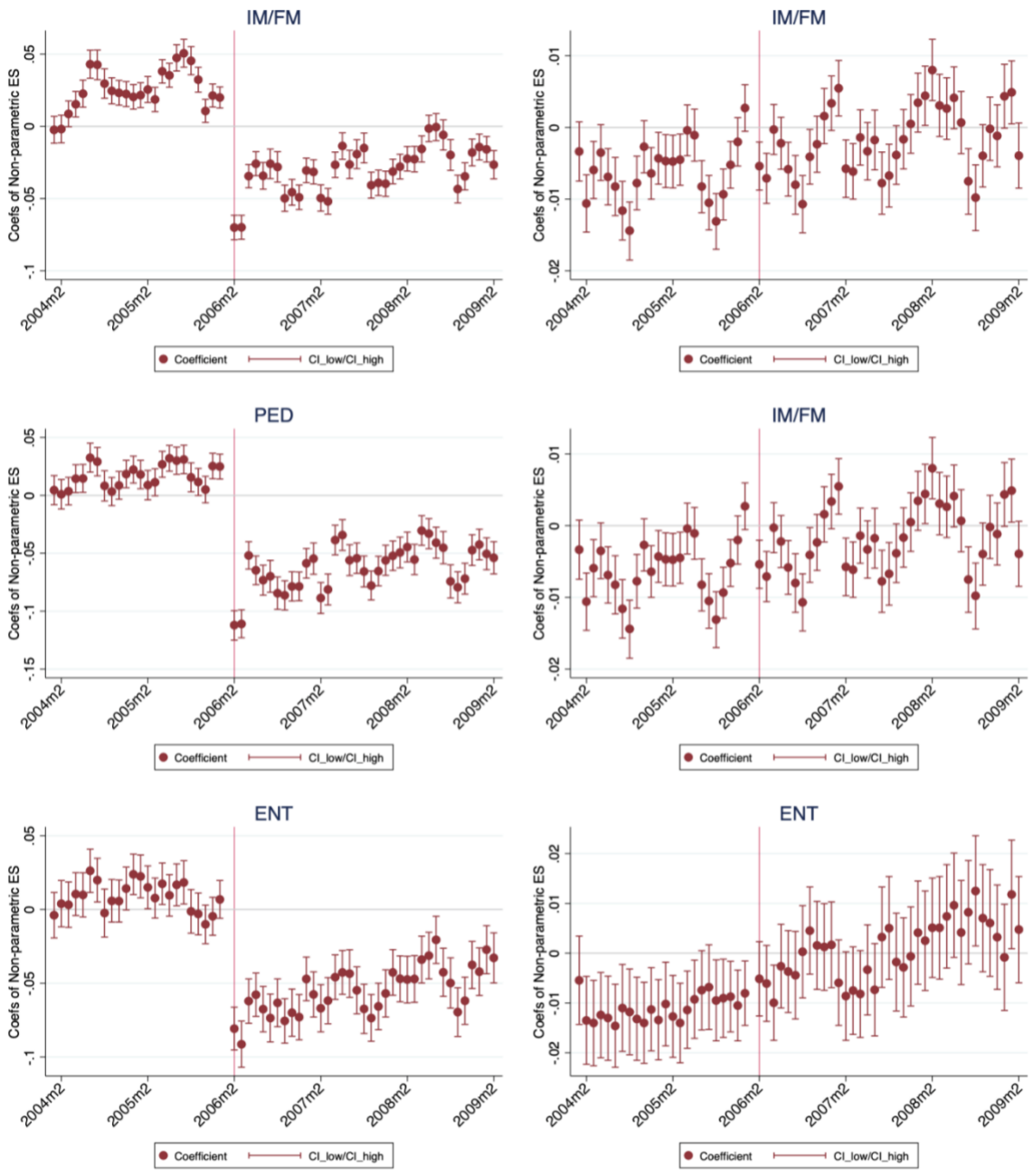


Figure III-A 5. Changes in the antibiotics prescription rate of all (L) and broad-spectrum antibiotics (R) by speciality.

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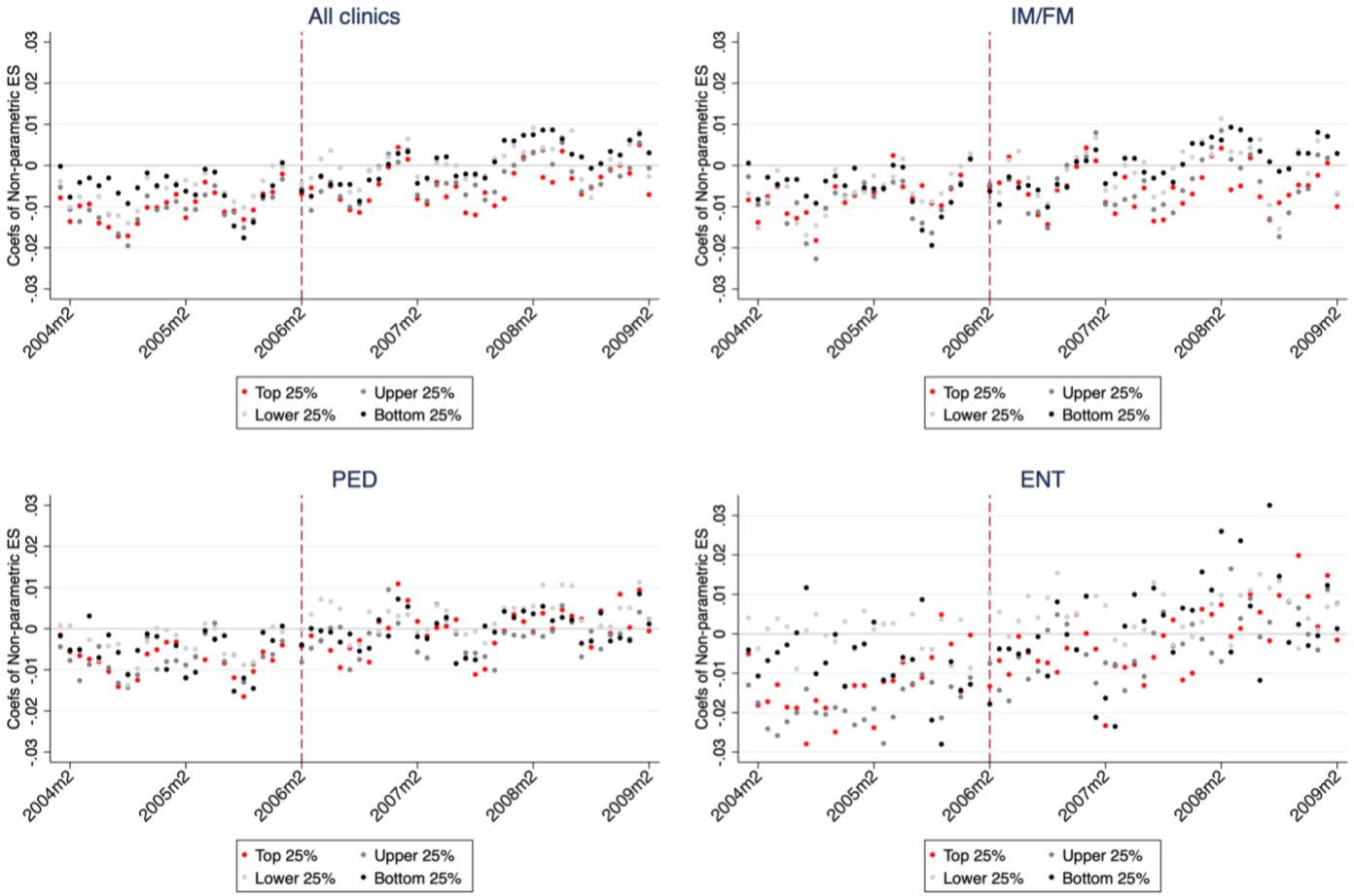

Figure III-A 6. Change in the prescription rates of broad-spectrum antibiotics, by the level of previous prescription rates.

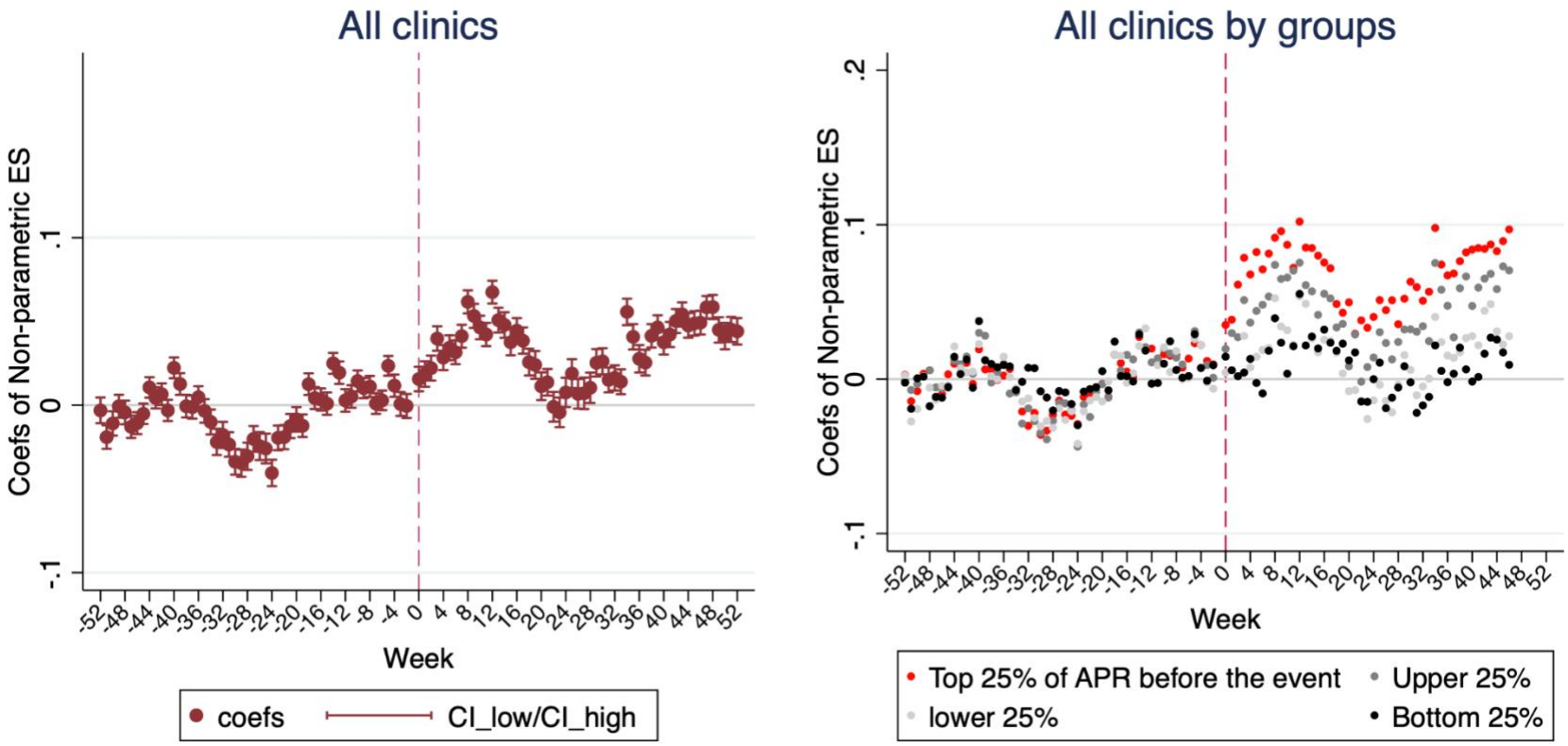

Figure III-A 7. Weekly change in the proportion of unmonitored codes

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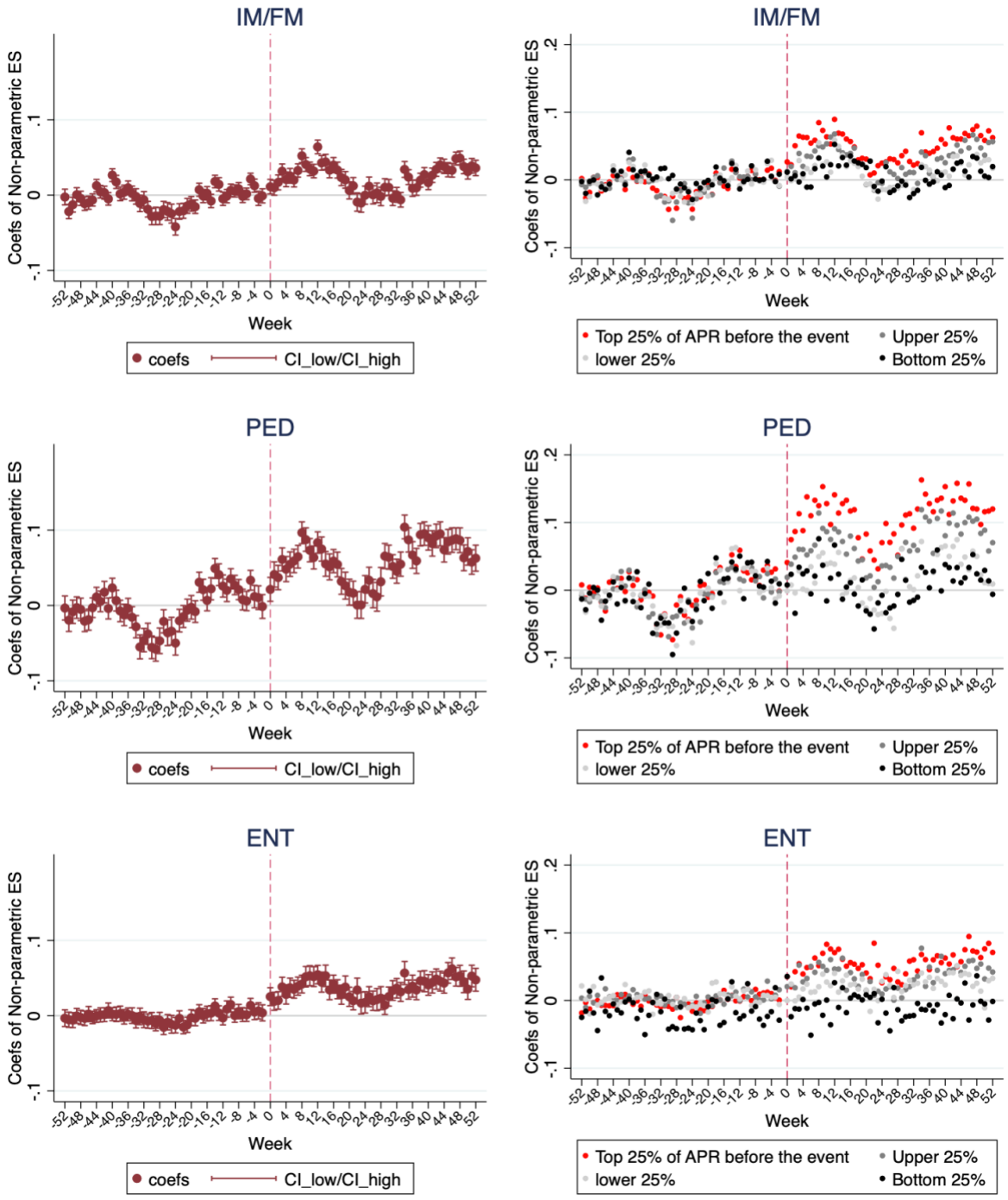


Figure III-A 8. Weekly change in the proportion of unmonitored codes by speciality

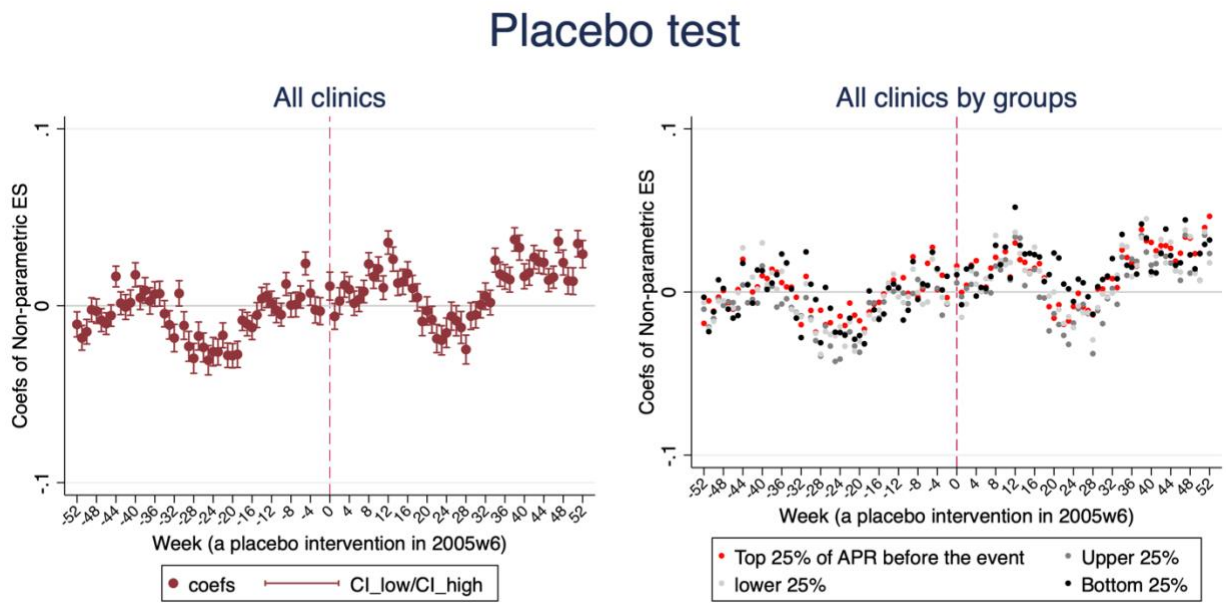


Figure III-A 9. A placebo intervention one year prior to the PR

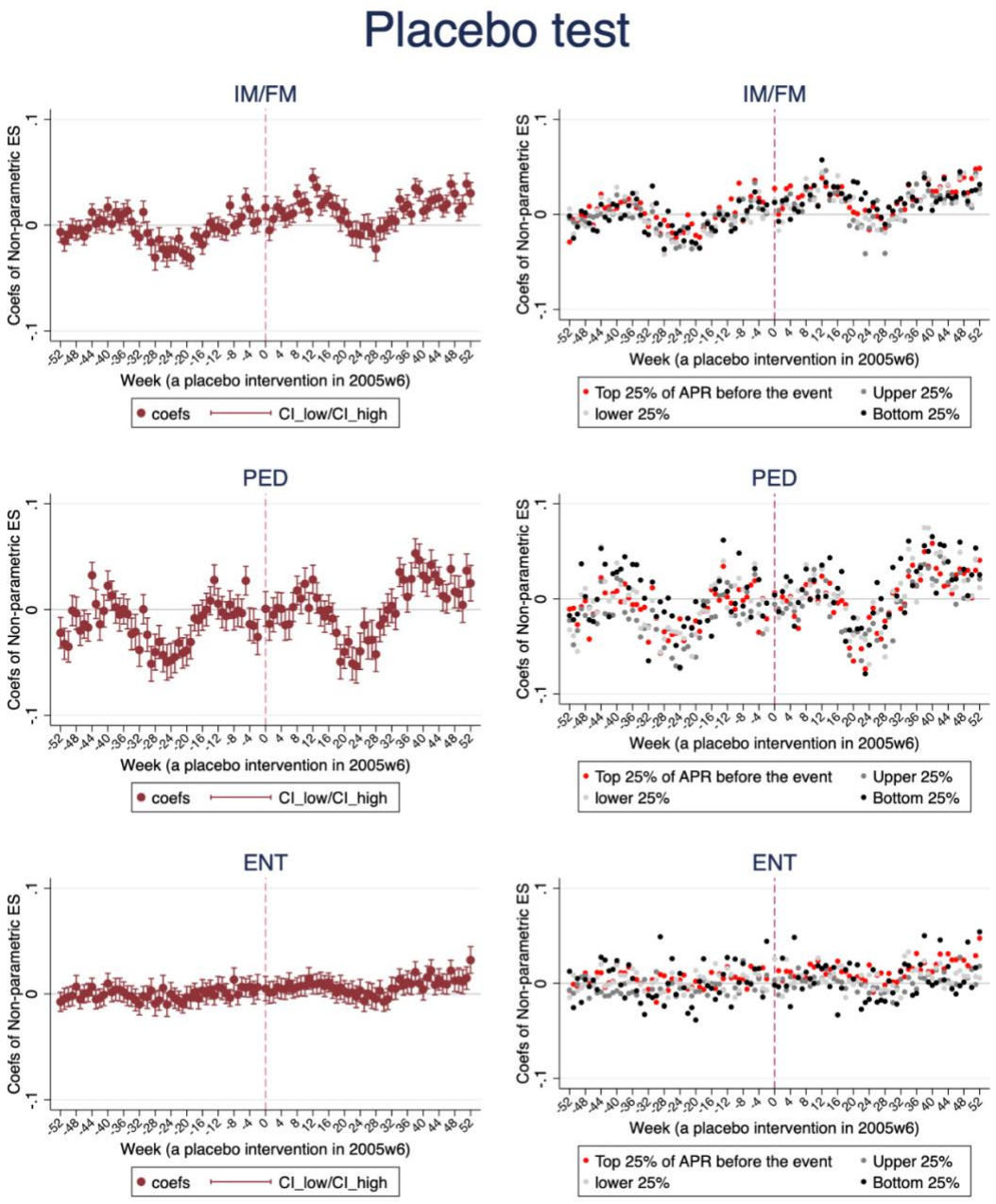


Figure III-A 10. A placebo intervention one year prior to the PR, by speciality

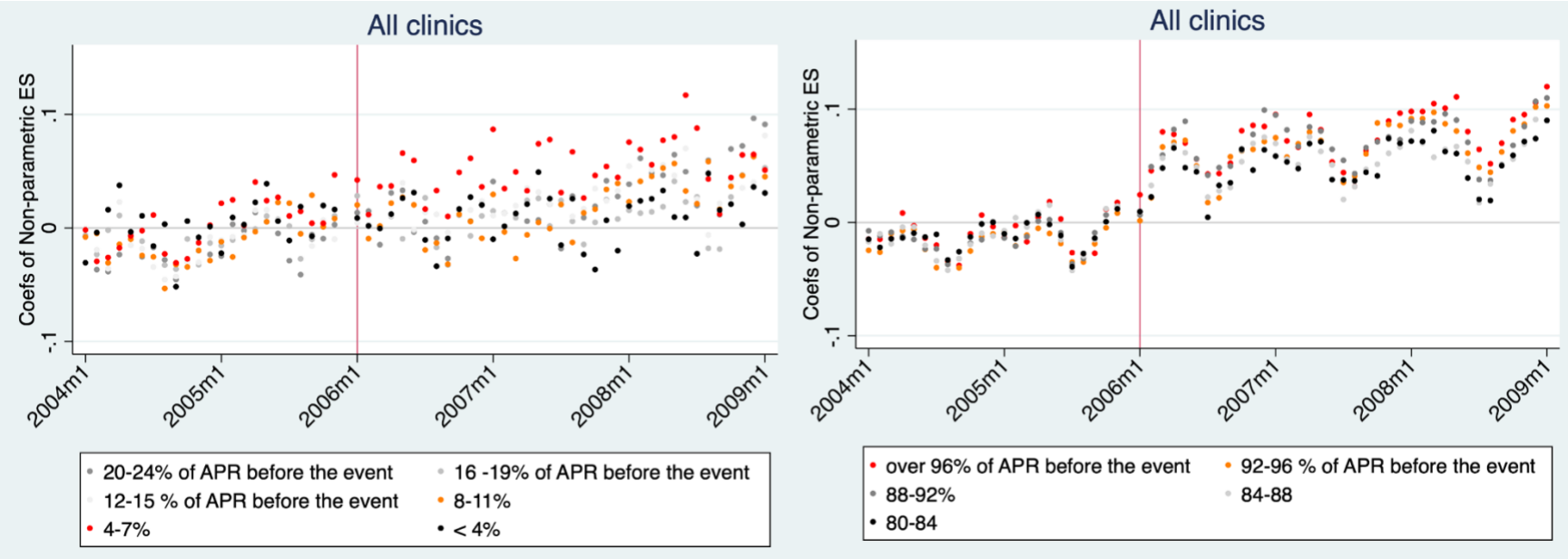


Figure III-A 11. Change in the proportion, the lowest group(left) and the highest group (right)

Chapter IV. Incentives to prevent unnecessary caesarean sections.

1. Introduction

Caesarean section is one of the surgical breakthroughs that can save lives. However, there had been a significant gap between the c-section rate at the population level and the ideal rate of 10 to 15 per cent (WHO, 2015b). Since the 1970s, the caesarean section rate has skyrocketed in high-income countries along with advances in foetal monitoring and surgical techniques (Gruber and Owings, 1996). Not only in high-income countries but global trends also show that caesarean section is becoming increasingly popular in LMICs, which are facing both unmet needs and overuse of the c-section (Betran et al., 2021).

The increase cannot be medically justified by the associated risks to the mother and child. Caesarean delivery is associated with increased mortality, hysterectomy, blood transfusion, and increased use of antibiotics use (Villar et al., 2007). So many studies have come up with compelling interpretations of why unnecessary c-sections are on the rise. In addition, governments around the world introduced various measures, including financial incentives, non-financial incentives such as public reporting, and quotas for c-section rates to providers. However, c-section rates continue to rise in many countries, and several policies have been implemented without much success.

South Korea was no exception to the high C-section rate observed in other OECD countries. In 1985, the caesarean section rate was less than 10 per cent of all births, but by

1999, it had reached 43 per cent (Ko et al., 2001). Evidence from South Korea is especially relevant for the following reasons. First, South Korea has undergone rapid changes in the healthcare structure, where maternal demand and induced demand have converged to increase the number of medically unnecessary c-sections. In the 1960s, local midwives performed most deliveries at home. Facility-based deliveries carried out by midwives, on the other hand, were promoted in the 1970s when the government officially allowed midwives to open birthing facilities. With the introduction of social health insurance in the late 1970s, deliveries at home or in midwifery facilities were replaced by deliveries in hospitals and clinics. As access to healthcare has increased dramatically, it has ironically led to the medicalisation of childbirth. Giving birth in the presence of a doctor or having a painless C-section began to be consumed like a luxury good. In this context, the difference in reimbursement costs between the two delivery modes accelerated the induced demand for c-sections. For example, in 1991, the fee for a c-section delivery was about $390, while the fee for a normal delivery was only about $109 (Kim et al., 1992).

Second, South Korea is dominated by non-profit private healthcare providers, making it difficult to take strong actions to lower c-section rates. In the 1970s and 1980s. The government did not directly supply new public providers due to limited resources, and most new clinics and hospitals were non-profit private facilities, weakening the government's regulatory influence. These environmental shifts are not unique to South Korea but are happening now or are likely to happen in many low- and middle-income countries where healthcare access is enhancing, so taking a deeper look at the causes and solutions will help prevent distortions in healthcare in those countries. In particular, the financial and non-

financial incentives to address this will have important implications for countries that are already facing or will face similar challenges.

Finally, the South Korean case is interesting because of the country's extremely low birth rate. Along with other East Asian countries, Japan, Taiwan, Singapore, and Hong Kong, South Korea has experienced an extreme fertility decline. In 1995, South Korea's fertility rate was 1.64, and by 2005, it had dropped to 1.08 (STRAUGHAN, 2008). Childbirth has become more than a matter of healthcare policy, but a social issue that must be addressed. In this context, the government exempted mothers' out-of-pocket expenses only for normal deliveries in 2005. This decline in births also leads to an increased sensitivity to the safety of mothers and children, favouring larger clinics over smaller ones, and larger hospitals over smaller ones. It would be very interesting to see the impact of the OOP exemption on mothers' choices in this context.

Since 2000, the Korean government introduced financial and non-financial measures. The public reporting in 2000 was the first non-financial intervention to lower c-section rates, although only about 200 institutions were involved. (Ko et al., 2001) showed that this measure was effective in reducing c-section section rates and regional variation in a pre-post study. However, the absolute level of caesarean section rates remained high. The government implemented several rounds of public reporting until 2003, but it does not appear to have been as effective as expected. Since then, the government introduced the first financial incentive in 2005. Despite its importance, empirical evidence on fiscal measures and their mechanisms is lacking.

This chapter examines the impact and mechanisms of the first financial incentive in 2005 on caesarean section rates. Unlike previous interventions examined in the literature,

the intervention consisted of a combination of supply- and demand-side approaches, an increase of more than 50 per cent in the cost of benefits, and an out-of-pocket exemption for normal deliveries. National Health Insurance Service data include proxies for the type of delivery, maternal medical history, and economic status, allowing us to examine the mechanisms.

We find that providing financial incentives to both providers and mothers reduces the c-section rates by 3.6 per cent in the short term. Furthermore, we document that the effects of the intervention were larger in areas that had high c-section rates before the policies were implemented. Among the many mechanisms that led to this change, we observed an increase in physician employment at smaller-sized clinics. Moreover, due to the direct consequence of the OOP exemption, mothers tended to choose larger hospitals over smaller clinics.

This study contributes to the literature in the following ways. First, we show that a unique public intervention can reduce c-section rates at the national level. Second, contrary to previous Iranian studies, we document that even in a setting dominated by private providers, supply-induced demand can be substantially reduced by adequately compensating providers and reducing relative reimbursement cost differentials. Both elective c-sections and c-sections out of hours decreased significantly. Third, we showed a novel mechanism explaining a reduced c-section rate, namely the effect of financial incentives at the organisation level, particularly for small clinics, which could stimulate physician hiring, creating a safer delivery environment as well as spreading the relative load of existing physicians.

The remainder of this paper is organised as follows Section 2 reviews previous literature, and the next section describes the institutional context. Section 4 describes the data and section 5 discusses empirical strategy. Section 6 presents the main results, followed by robustness checks in section 7. Section 8 draws conclusions.

2. Related Literature

Incentives on caesarean section rate. Except in certain emergencies, the choice of delivery mode reflects the preferences and incentives of both providers and mothers. On the provider side, a long literature describes three main factors that influence choice: financial incentives, leisure, and malpractice litigation. (Gruber and Owings, 1996) shows empirically that US obstetricians compensate for the income shock due to declining fertility by substituting highly reimbursed c-section sections for normal deliveries. Their estimates suggest that the cost differential between the two modes of delivery increased the probability of a caesarean section. (Grant, 2009) also identified financial incentives as an important factor in induced demand, although the study estimated that the effect of financial incentives for caesarean section was much smaller.

The legal consequences of the delivery model are an important but overlooked factor in the literature (Shurtz, 2013), and most specifically medical accidents and malpractice lawsuits change the way women deliver. Previous research shows a discontinuous 4% increase in caesarean section rates, which continued to increase after the adverse event. (Dranove and Watanabe, 2009) observed a small and short-lived increase in c-section sections when obstetricians or their colleagues were sued, in the US. Another study from the US shows a heterogenous impact of malpractice claims on c-sections. While a large

indemnity payment was associated with a higher c-section rate, a small payment was associated with a lower c-section afterwards (Grant and McInnes, 2004).

However, there are important gaps in the literature. First, few existing studies have investigated the effectiveness of public intervention to reduce caesarean sections. There have been two pre-post studies on the fee-equalising policy. In 1993, a provider organisation from California equalised the fees for two methods, leveraging financial incentives to lower the c-section rate. The results showed a modest 0.7% reduction in c-section rates after the policy was implemented, likely due to physicians with high c-section rates dropping out (Keeler and Fok, 1996). However, this effect is yet to be understood because the size of the financial incentive was meagre, less than 3 per cent. (Lo, 2008) studied the effect of a fee-equalising policy and additional compensation for VBAC in Taiwan. While VBAC increased by 3.5% after the policy, the fee-equalising policy did not impact the c-section rate. (Pilvar and Yousefi, 2021) is one of the exceptions that investigated the causal relationship between the financial incentive reform on the c-section rate using an event study. The reform in Iran consisted of a fee waiver for normal deliveries, a bonus payment to doctors for normal deliveries, and an annual quota for c-section deliveries by public hospital doctors. Four months later, the government revised the fees for both normal and caesarean deliveries so that doctors earned more if they performed normal deliveries. The high baseline caesarean rate of 55 per cent led to a 5.6 per cent reduction in the overall sample and a 13 per cent reduction in primiparous deliveries.

Second, there is little research on the effectiveness of interventions in privately dominated environments. The Iranian intervention targeted public hospitals, and the behavioural change in private providers was a spillover effect of the policy on public

providers. Due to the high c-section rate at the baseline, the c-section rate also reduced the c-section rate among private providers, but the policy implications for countries with a high proportion of private providers are limited. In addition, strict measures such as quotas for private providers are hardly implementable. The case of South Korea may render a rare example of how incentives can be used to correct a distorted healthcare supply.

Finally, the third gap in the literature refers to the mechanism of the intervention: how incentives work in supply and demand is not yet understood. The South Korean case allows us to understand the causal mechanisms of public interventions by leveraging an unexpected policy reform and a rich dataset at the individual and provider levels.

3. Institutional background

Changes in c-section rates in South Korea. The caesarean section rate in South Korea has shown a remarkable rise, starting at 4.4 per cent in 1982, reaching 13.1 per cent in 1990 and 43.0 per cent in 1999 (Chung et al., 2014). There are several explanations for the dramatic increase in caesarean section rates, including socioeconomic development, increasing maternal age at childbirth, increasing multiple pregnancies, and maternal obesity (Chung et al., 2014). However, these factors cannot explain nearly 38 per cent in 17 years.

Another explanation is that access to hospitals and clinics has changed as the coverage of National Health Insurance has rapidly expanded. Before the introduction of compulsory employment-based social health insurance, only about 10 per cent of the population was covered by voluntary health insurance. After the 1977 reform, the coverage rate gradually increased, reaching almost 100 per cent by the end of 1989. This expansion brought about many important changes, including an increase in the number of doctors, the

number of hospital beds, the number of doctor visits per capita, the number of hospitalisations per capita, and the length of financing per hospitalisation. In addition, the share of OOP decreased significantly between 1983 and 2004, from 63 per cent to 38.1 per cent (Kwon, 2009b). An interesting feature of the surge in caesarean rates in the 1980s was associated with a sharp increase in caesarean sections in small hospitals. In early studies, (Ahn et al., 1991) showed the average c-section rate was 16.3 per cent between March 1985 and Feb 1987, using insurance data comprising government employees and private school teachers. Notably, the rates were only at 7.6 per cent and 24.5 per cent in clinics and general hospitals, respectively. A similar study using the National Federation of Medical Insurance data in 1991 showed that the clinic's c-section rates reached 19.8 per cent while the rates in general hospitals were 37.6 per cent (Kim et al., 1992). At the same time, the rate in tertiary hospitals was 24.5% in the mid-1980s and reached only up to 29.1 per cent, suggesting that the small clinics and general hospitals led to the sharp increase.

The other explanation could be the difference in fees between the two modes of delivery. In 1990, the fee for a normal delivery was 18 per cent of the cost of a c-section delivery, and in 1995 it was 22 per cent. Since then, the fee differential has decreased, but the cost of a normal delivery has reached 62 per cent of the cost of a c-section delivery. Nevertheless, there is no analysis of the change in the fee differential and its impact on the c-section rate.

The unexpected nature of the policy. In 2004, the Ministry of Health and Welfare announced a new policy on caesarean section rates as part of a comprehensive policy package to increase fertility. It was only two months before the introduction of a new policy. The policy

operated through two mechanisms. On the supply side, the government increased the fee for normal delivery by 54.4 per cent, reducing the cost differential between the two modes of delivery. On the demand side, it waived co-payments for normal deliveries.

Figure IV-1 shows the evolution of reimbursement costs and out-of-pocket payments by delivery mode before and after the policy was introduced. As shown on the left, the difference in reimbursement costs decreased significantly starting in the first quarter of 2005, with one more fee increase for normal delivery in the second quarter of 2007. As shown on the right, the OOP for normal delivery has been eliminated since Q1 2005, so the OOP gap between the two delivery modes has increased from approximately $100 pre-policy to $200 post-policy.

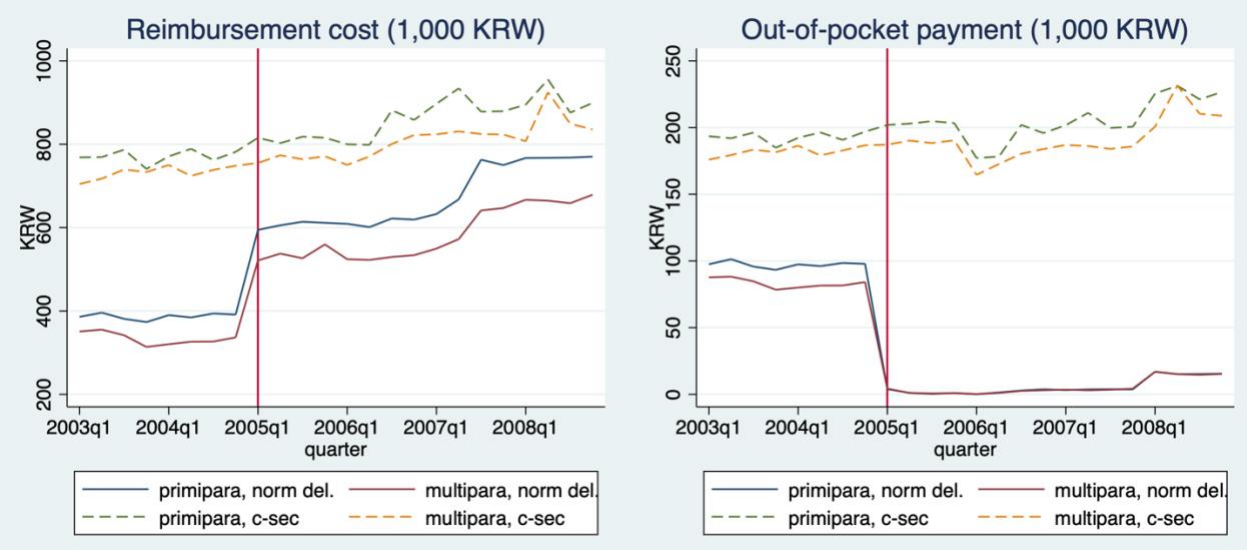


Figure IV- 1. The total reimbursement cost (left) and the out-of-pocket payment (right)

Several minor reforms. Since the reform in 2005, there have been several public interventions: the resumption of public reporting in September and December 2005, another public reporting in July 2006, and a second increase in the normal delivery fee in June 2007.

Regarding public reporting, government bodies had suspended it since August 2003, when the National Health Service published a list of institutions with the highest and lowest caesarean section rates. The Health Insurance Review and Assessment Service (HIRA) resumed public reporting in September 2005. The NHIC's public reporting in 2003 and the HIRA's public reporting in 2005 differed in methodology and the number of organisations. The NHIC disclosed a total of 344 institutions with high and low c-section rates, while the HIRA disclosed a total of 179 institutions with low c-section rates. The HIRA did another round of public reporting in December 2005, before changing its approach in 2006. In 2006, it published the c-section rates of all hospitals that performed 50 or more deliveries in the first half of 2005. The number of hospitals on the list increased dramatically from less than 200 to 680 out of around 1,071. Suddenly, the performance of hospitals that were not likely to be disclosed was made public. Those disclosures were made publicly available on its website, and there was much media coverage of them. (Jang et al., 2011) estimated the effects of that public reporting using a time series approach and concluded that the disclosure in September 2005 had an impact in reducing c-section rates by 0.81 per cent.

About a year after the 2006 release, the government again increased the fee for normal deliveries by an average of 37.7 per cent in 2007. C-section fees remained unchanged, other than an annual adjustment for inflation, and the policy of waiving copayments for normal deliveries remained unchanged.

4. Data and measurement

Data. The study period is from January 2003 to December 2008. The Korean National Health Insurance claims data has tracked 1 million individuals since 2002 and includes basic socioeconomic status, outpatient, inpatient, medication information, costs, and provider characteristics. However, it does not provide information on labour duration, birth weight, and gestational week, which limits the chances to investigate the effects of policies on birth outcomes in response to changes in delivery methods. As the study uses national health insurance data, information on uninsured packages is also not available. Private health insurance in South Korea does not usually cover the cost of delivery. Using normal delivery and c-section section payment codes, we obtained data on 49,942 cases over six years.

Outcome measure. The primary outcome of interest is the c-section rate. The reimbursement code provides us with the delivery mode and the birthday information.

Table IV-1 summarises the cases by the mode of delivery. We check for risk factors (Lee et al., 2005) and the characteristics of the delivery. Dysfunctional labour, old age, foetal distress, and malpresentation of babies were the most common risk factors. Caesarean section was associated with twice the length of hospital stay compared to a normal delivery. Caesarean sections were less common at night and on public holidays.

Table IV- 1. Summary of the cases by the mode of delivery

	(1)	(2)	(3)	(4)
	Normal delivery		C-section	
VARIABLES	mean	N	mean	N
Risk factors for c-sections				
Age over 35	0.101	30,976	0.186	18,966
Malpresentation	0.00190	30,976	0.0729	18,966
Eclampsia	0.0136	30,976	0.0350	18,966
Cancer	6.46e-05	30,976	0.000475	18,966
Placenta	0.00145	30,976	0.0257	18,966
Bleeding	0.00349	30,976	0.00965	18,966
Diabetes	0.00862	30,976	0.0178	18,966
Dysfunctional labour	0.0981	30,976	0.412	18,966
Foetal Distress	0.0334	30,976	0.0731	18,966
Cord prolapses	6.46e-05	30,976	0.000105	18,966
Foetal abnormality	0.0100	30,976	0.0181	18,966
Poly- or Oligohydramnios	0.0191	30,976	0.0209	18,966
Premature rupture of membrane	0.137	30,976	0.0617	18,966
Preterm delivery	0.0112	30,976	0.0200	18,966
Anogenital herpes	0	30,976	0.000316	18,966
Delivery				
Night	0.356	30,976	0.0791	18,966
Holiday	0.115	30,976	0.0255	18,966
Length of Stay	3.249	30,976	7.116	18,966
Total cost	575,846	30,825	1.002e+06	18,889
Out-of-pocket payment	33,085	30,825	194,571	18,889
Reimbursement cost	542,761	30,825	807,172	18,889
Premium (Scale of 0 to 10)	6.147	30,976	6.094	18,966
Clinic birth	0.501	30,976	0.470	18,966
General Hospital	0.318	30,976	0.292	18,966
Tertiary hospital	0.181	30,976	0.238	18,966

Figure IV-A2 in the appendix shows the evolution of caesarean section rates at the institutional level. Tertiary hospitals had the highest caesarean section rates throughout the observation period, hovering around 45 per cent except in the period immediately after the

2005 reform. Both secondary hospitals and clinics had caesarean section rates of around 40 per cent before the reforms and then showed a downward trend after the reforms.

5. Empirical strategy

Event study. We first assume the exogeneity of the policy and use event studies (ES). The event study approach is a widely used methodology for measuring the effects of unexpected events (Khotari and Warner, 2007). Event studies are widely used in policy analysis within countries with minimal heterogeneity. Unlike countries with a federal system or a high degree of local authority, health policy in South Korea tends to be centralised. While a comparative analysis across regions may not be feasible in this setting, event studies enable us to estimate robust outcomes once the exogeneity of the policy is warranted.

The exclusion restriction should be satisfied to claim an intervention's causal impact: the introduction of the policy must be random or unexpected. As described in the previous section, the government announced the policy only two months before its implementation. Given the 10-month gestation period, the decision to get pregnant should not have been affected by this announcement.

We run the regression separately between primiparous and multiparous groups, expecting minimal or no change in the multiparous cases but a sharp decrease in the c-section rate in the primiparous cases. The specification of the study is as follows,

$$y_{ipt} = X'_{it}\alpha + \sum_{t=-8}^{-2} \mu_t + \sum_{t=0}^{7} \mu_t + H'_{gt}\beta + \varepsilon_{igt} \qquad \dots (1)$$

where y_{ipt} is a binary indicator, being one for c-section. X'_{it} is a vector of mothers' characteristics, including the mother's age group and a proxy indicator of their economic status. H'_{gt} refers to the characteristics of the provider, including the level of hospitals and location. The $\mu_t s$ are the coefficient of regression of each quarter before and after the new policy. μ_{-1} , the coefficient of 2004Q4, is omitted. v_i is a clinic-level fixed effect.

Difference-in-difference. We employ the difference-in-difference approach to estimate the causal effect if we confirm a parallel trend between the two groups. In the model, we assume that the average caesarean section rate in the multiparous group will not change, allowing the multiparous group to serve as a good control. Using multiparous cases as a control group is based on current clinical practice, recommending c-sections for women with previous c-sections because of a higher risk of uterine rupture. Even under the new policy in 2005, the practice would be less likely to be changed unless there was a change in guidelines.

Another theoretical ground for employing difference-in-difference is the low popularity of Vaginal Delivery After C-section (VBAC). VBAC was not as popular in South Korea as in the United States, where the rate of VBAC increased from 5% to 28.3% between 1985 and 1996 following campaigns and recommendations by the American College of Obstetricians and Gynaecologists (ACOG). Although the South Korean government introduced new payment codes and fees for VBAC to promote normal delivery in 1999, the rate of VBAC remained relatively low, reaching a maximum of only 4.6% in 2006. Korean obstetricians were concerned about the safety of this method (Chung et al., 2014, Park, 2005). Also, a paper showing the perinatal risks in VBAC was published in December 2004 (Landon

et al., 2004), a month before the intervention. Therefore, we do not expect any increase of VBAC in multiparous mothers even after the intervention in Jan 2005, making multiparous mothers a reliable control group. We tested it empirically and confirmed that the VBAC rate did not change around the reform (see Figure IV-A2 in the appendix).

The basic equation is as follows,

$$Y_{igt} = Primi_{it}\beta 1 + POST_{it}\beta 2 + Primi_{it} * POST_{it}\beta 3 + X'_{it}\beta 4 + H'_{gt}\beta 5 + \varepsilon_{igt} \quad \dots (2)$$

$$Y_{igt} = \{CSEC_{igt},\ COST_{igt},\ LOS_{igt}\}$$

where y_{igt} is a binary indicator, being one if an individual i received c-section at hospital g at quarter t. X_{it} is a vector of mothers' and providers' characteristics, including the mother's age group, a proxy indicator of the economic status, level of providers, and location of the provider. $\mu_t s$ are the coefficient of regression for each quarter before and after the new policy. μ_{-1} , the coefficient of 2004Q4, is omitted.

Heterogeneity. We expect large heterogeneous effects across hospital levels. One of the peculiarities of the caesarean section rate in South Korea is the high rate of caesarean sections in the clinic. C-section rates in tertiary hospitals, where high-risk mothers give birth, are also observed in other countries. However, in South Korea, the clinic c-section rate is almost as high as the tertiary hospital c-section rate and was consistently above 40% before the 2005 intervention.

There are many possible explanations for such high rates of caesarean section, but we believe that during the rapid quantitative growth of the healthcare system in the 1980s,

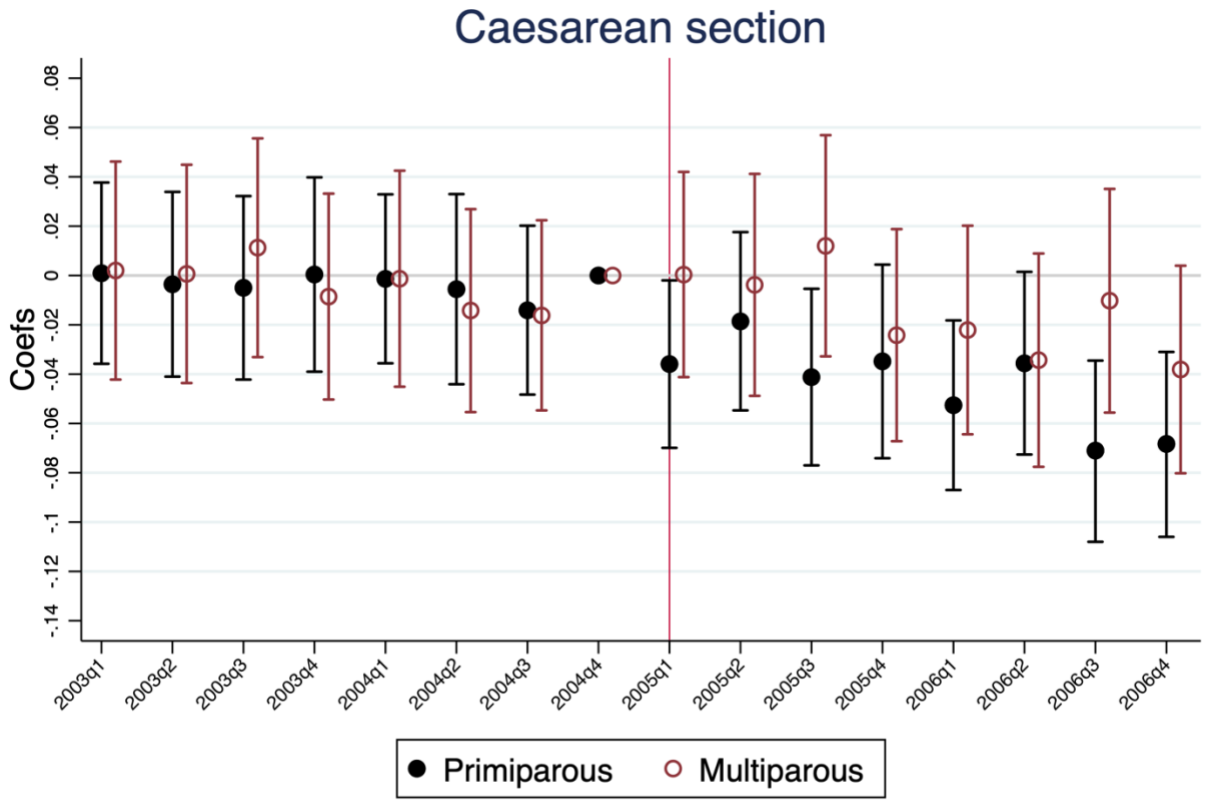
Korean clinics were unable to achieve economies of scale and remained small clinics. To cope with the surge in demand following the introduction of compulsory social insurance in the 1970s, the government approved the establishment of a number of medical schools. However, instead of establishing large public hospitals in the community, the government left the provision of maternity services to the healthcare market. There were insufficient hospital services in rural areas, while non-profit private hospitals competed in large cities. As Figure IV-A3 in the appendix shows, the number of obstetricians and gynaecologists exploded from about 2,000 in the late 1980s to 4,000 in about 10 years. Newly trained doctors usually opened small maternity clinics with little capital because there were not many hospitals in the region to employ them. The number of clinics nearly tripled between the late 1970s and 2000 (Lee, 2015a).

There were numerous variations in the sizes of clinics in terms of the number of doctors and beds. For example, as shown in Figure IV-A4 in the appendix, some clinics have fewer than 10 beds, while others have more than 60 beds. In addition, clinics with one doctor were the most common, but there were also many clinics with more than five doctors. Rather than having many doctors in a health facility, a small number of doctors were busy managing outpatient visits and working shifts at the same time, which may have led to doctors being more time-sensitive and favouring caesarean sections, which require less time and energy and have greater financial reimbursement. Unfortunately, no research has been done on the subject in South Korea on this issue during this period, but this context provides an idea for investigating the mechanisms of change after the reform. If one of the reasons for the acceleration of caesarean sections in small hospitals was economies of scale, we need to investigate heterogeneity across the hospitals.

We also hypothesised that there might well be supply-side changes: mothers expecting a normal delivery without any risk factors might prefer a larger and better-equipped hospital to a clinic for the same out-of-pocket cost. This could be a substitution effect from the mother's side, exchanging fees for normal delivery with the fee for choosing a larger hospital. From the hospitals' perspective, the c-section rate would naturally decrease as more mothers came in expecting or hoping for a normal delivery. This effect is less likely to occur in tertiary hospitals, and we would only expect to see a preference for secondary hospitals over clinics.

6. Results

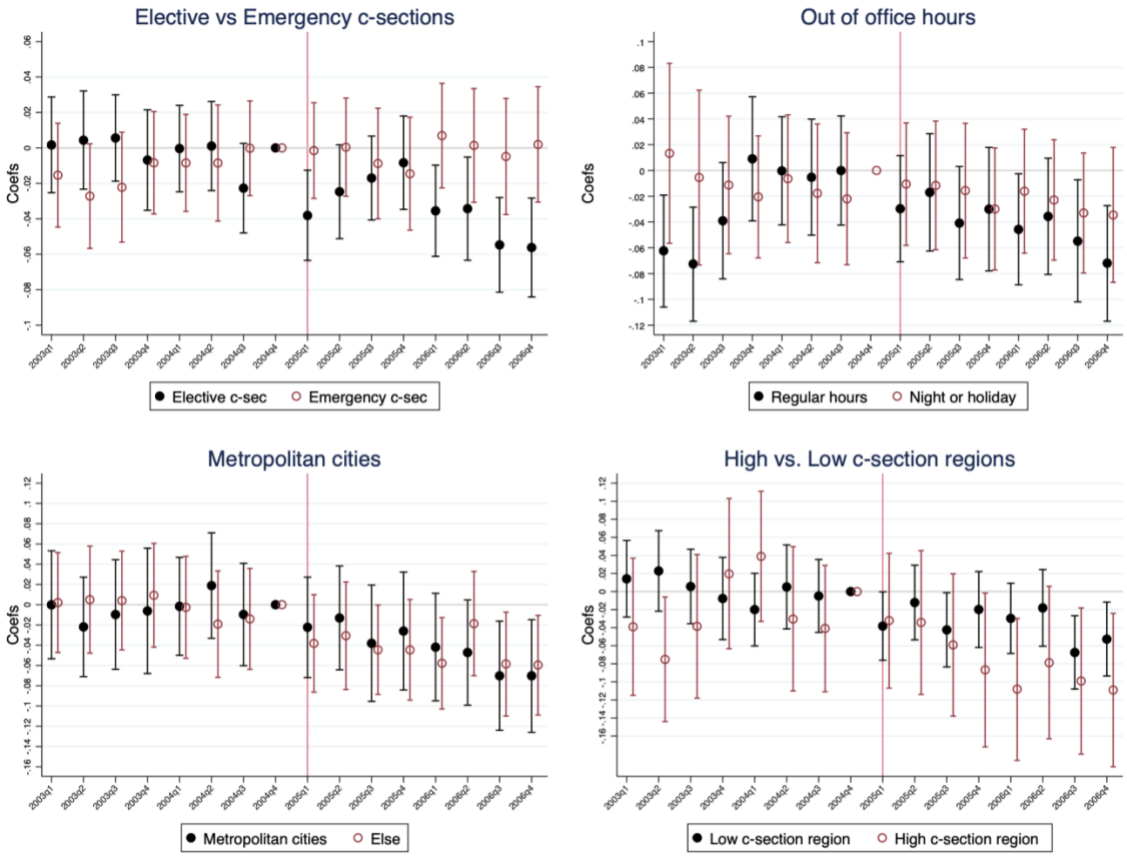
6.1. Phase I in 2005. Figure IV-2 presents the result of the event study. Y axis indicates the change in the c-section rate relative to the one in the fourth quarter of 2004. In the first quarter of the policy, the c-section rate for the primiparous group dropped by 3.6 pp with statistical significance, while the multiparous group did not change. During the first year after the reform, the c-section rate displayed an unprecedented downward trend. Indeed, such a trend has never been observed in the past two years. Then, one year later, the rate decreased by 5.3 pp in the primiparous group. We also confirmed that the absolute number of c-sections decreases over time (see Figure IV-A5 in the appendix). The regression coefficients are presented in Table IV-A2 in the appendix.



Notes. OLS coefficient estimates are reported. The dependent variable is a binary indicator for c-section.

Figure IV- 2. Change in the c-section between primiparous and multiparous mothers.

Heterogeneity. We expect large heterogeneous effects in terms of the type of c-section, time of day, metropolitan status, and pre-policy c-section rates. First, if the policy is effective, we would expect to see no change in emergency c-section rates and only a change in elective c-section rates. As shown in Figure IV-3, emergency c-section rates did not change significantly before or after the policy, but elective c-section rates decreased by about 3.9 pp immediately after the policy was implemented. These reductions tapered off somewhat over time and then dropped significantly in the same period the following year.



Notes. OLS coefficient estimates are reported. The dependent variable is a binary indicator for c-section.

Figure IV- 3. Heterogeneity by the type and timing of c-section

Second, we compared regular hours to out-of-office hours. There was a reduction in the c-section rate during regular hours in the year after the policy was implemented, but this was not statistically significant. While there was an overall decrease, the effect did not appear in all clinics and hospitals.

Third, when comparing metropolitan areas to non-metropolitan areas, the reduction was sharper in non-metropolitan areas, but not statistically significant. There also appears to be regional heterogeneity within non-metropolitan areas. However, the decline in c-section rates was evident in both regions, with the decline in non-metropolitan areas becoming apparent in the third quarter of 2005.

In addition, we examine the effect of the policy by dividing high and low regions based on the pre-policy caesarean section rate. Both regions showed a decreasing trend, with an initial decrease of about 4.0pp in the low c-section rate region and a decrease in the high c-section rate region, but there seemed to be a large heterogeneity. After the third quarter of 2005, the decline was steeper in areas with higher caesarean rates, with a decline of about 8.5 pp in the fourth quarter of 2005 and a decline of about 11 pp in the following quarter, all of which were statistically significant.

Finally, we examined the changes at the clinic level. One of our hypotheses was that the reduction in c-section rates in smaller clinics would be greater than in larger clinics. Based on the number of physicians, we divided the clinics into those with five or more physicians and those with four or fewer physicians. As shown in Figure IV-4, the change in c-section rates was more pronounced in clinics with fewer than five doctors, with a decrease of about 6.7 pp. This change was not seen in larger clinics. It wasn't until the third quarter of 2006 that large clinics began to show reductions. We found that lowering the threshold

for the number of doctors in a clinic from five to three produced almost identical results. (See Figure IV-A6 in the appendix)

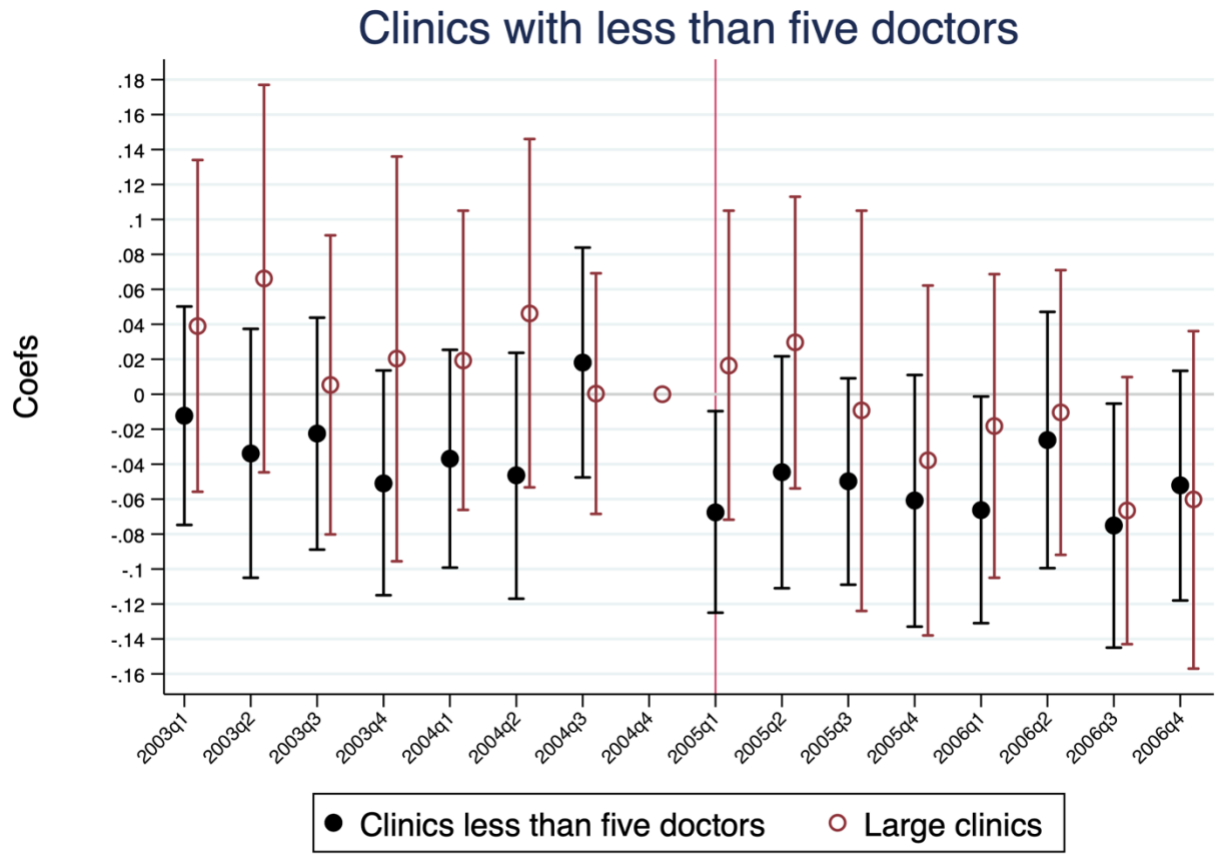


Figure IV- 4. Change in the c-section rates in large and small clinics.

6.2. Mechanism. We have examined both the supply and demand sides. The findings in the previous section led us to question why and where these changes were possible after the first reform in January 2005.

On the provider side, we hypothesised that smaller hospitals would respond more sensitively to reforms than larger hospitals. Normal delivery takes more time than a caesarean section and requires greater patience and attention from doctors. Doctors in smaller hospitals may not be able to give labouring mothers enough attention because they

are busy seeing other mothers in the outpatient department. Encouraging normal births will not increase the absolute time and effort of doctors without hiring more staff, including doctors and skilled nurses. However, because increasing normal birth fees is not enough to cover the additional cost of staff, small hospitals could increase the number of beds to achieve 'economies of scale'. We wanted to test for all changes in clinics and secondary hospitals, but our dataset only offers the number of doctors and beds in the small hospitals. This makes it impossible to observe the number of obstetricians in a hospital, so we focused on changes at the clinics.

Figure IV-5 shows the change in the number of doctors and the number of beds in small clinics with less than five doctors. After the reform, the number of doctors in small clinics increased by 0.096 each, implying that small clinics invested in staff. Given the size of the incentive for normal deliveries, more is needed for clinics to be rewarded for their investment. However, the reforms have led clinics to invest in staff to reduce unnecessary caesarean sections.

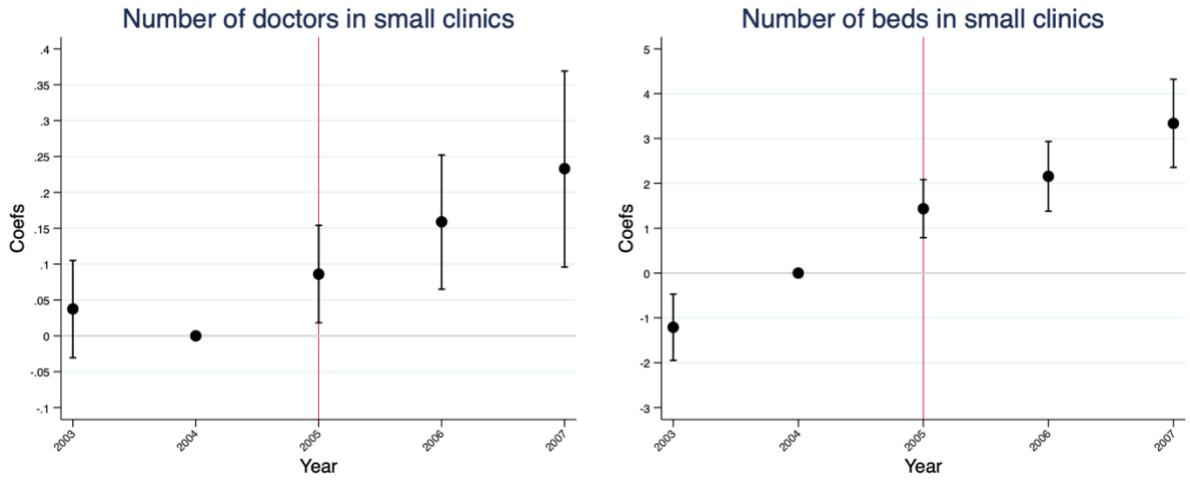


Figure IV- 5. Change in the number of doctors and beds in small clinics.

We also tested for demand-side changes in institutional choice. While deliveries at tertiary hospitals are restricted unless medically indicated, it is relatively easy to choose between clinics and small hospitals. We found that the use of hospitals increased in the second quarter, although the difference was not statistically significant. In the third and fourth quarters after the reform, the use of hospitals increased by 5-7 pp in the primiparous group (see Figure A7 in the appendix). This delay can be attributed to mothers' preference to deliver in the hospital where they usually receive antenatal care. Excluding tertiary hospitals does not change the results significantly.

6.3. Two minor reforms. We also measured the impact of public reporting in July 2006 and the second fee increase for normal delivery in June 2007. The sample includes only clinics and secondary hospitals because tertiary hospitals were in a pilot study testing a different incentive scheme. Figure IV-A8 in the appendix shows the change in caesarean section rates near the July 2006 cut-off. In the first quarter after the disclosure, the c-section rate at the clinics temporarily decreased by 5.85 per cent. At the same time, secondary hospitals have not yet responded to the disclosure as expected, as large hospitals had been exposed to multiple public disclosures between 2000 and 2003. The second financial reform in June 2007 had no impact on clinics or hospitals.

7. Robustness Checks

Difference-in-difference. We employed a double difference to estimate the average change before and after the intervention. Here the control group is the multiparous group. Table IV-

2 shows the change in the c-section rate for the primiparous group after the policy. Column 1 measures the overall change without considering the hospital level, and we observe that the policy reduced the overall c-section rate by about 4.1pp. Column 2 shows the policy effect at the clinic level, which is about 3.8pp and is statistically significant. When we looked at the effect of the policy on tertiary hospitals, we observed a slight decrease in the c-section rate, but this was not statistically significant. Regarding secondary hospitals, we did not include them in the analysis since the parallel trend assumption did not hold in secondary hospitals. In 2004, just before the policy change, there was a similar trend between the two groups in secondary hospitals, but in 2003 the trends were completely different.

Table IV- 2. Primary outcomes of the intervention using DID

	(1)	(2)	(3)
	c-section rate		
VARIABLES	All	Clinic	Tertiary
POST#Primipara	-0.0413***	-0.0382**	-0.0147
	(0.0139)	(0.0110)	(0.0223)
Observations	28,775	14,640	6,380
R-squared	0.002	0.258	0.379
Control	No	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Placebo intervention. As a robustness check, we applied the same methodology to a placebo intervention in January 2004, a year before the actual intervention. Figure IV-A11 in the appendix shows that there was no effect after the placebo test.

8. Conclusion

The study analysed whether financial incentives for normal delivery reduce c-section rates when the magnitude of the reward between delivery modes is large. As part of the government's policy to revive the rapidly declining fertility rate, the government suddenly announced an increase in the reimbursement cost for normal delivery and an exemption for out-of-pocket payments by mothers. Given the sudden nature of the policy announcement, we used an event study and utilised nationally representative health insurance data.

The results showed that the c-section rate decreased by 3.6 pp in the primiparous group, with the magnitude increasing over time. The c-section rate of multiparous mothers did not change. These figures pale in comparison to the 13 per cent reduction in c-section rates in the primiparous group following the policy package introduced by Iran. However, it is important to note that, unlike Iran, these results were achieved without introducing direct financial incentives for doctors and quotas for c-sections in public hospitals. In a country dominated by private providers, it is a very rare policy case that fee-equalising and maternal fee exemptions alone have achieved this change. This contrasts with Spain, where budgetary cuts in 2012 increased the c-section rate by around 3 per cent (Bertoli et al., 2020).

In South Korea, the emergency c-section rate did not decrease after the policy was introduced, but the elective c-section rate did. The elective c-section rate appeared to recover briefly after a large decrease, but quickly resumed its downward trend. This change was likely due to a decrease in elective c-sections performed during regular hours, with larger decreases seen in areas with higher baseline c-section rates.

One of the contributions of this study was to show that financial incentives significantly increased physician employment in small clinics. This is an example of how

budgetary support from the health system can influence individual practices. Facchini studied the impact of workload on c-section rates and found that workload on maternity wards significantly increased c-sections (Facchini, 2022). While this study was unable to determine whether non-physician staffing increased due to data limitations, the gradual increase in physician employment, which remained unchanged after the financial incentive was offered, may be an important tipping point in the reduction of c-sections.

Another outcome of this study is the sustainability of financial incentives. Public reporting, which was previously introduced in South Korea, had a short-lived effect. Reducing c-section rates is difficult to achieve by providing external stimuli to providers' clinical decisions, such as prescribing antibiotics. It requires additional staffing during the day and hiring more full-time staff to make emergency deliveries at night. Once again, we see that it is difficult for social incentives to work consistently under these financial constraints.

Interestingly, increasing reimbursement costs had an effect in 2005, but not in 2007. This suggests that financial incentives are a necessary but not sufficient condition for reducing c-section rates. Insurers are compensated for normal delivery on a fee-for-service basis and for c-sections through DRGs payments. With the increase in the reimbursement fee for normal delivery in 2007, the reimbursement fee for normal delivery is now higher. However, the effect was not significant. The reason is that this reversal is limited to reimbursement for insured services. The overall amount would likely still have been higher for c-sections because providers charge extra for uninsured packages, such as surcharges for single occupancy rooms or extra IV fluids, to the extent legal.

Decisions about delivery mode are not only driven by providers and healthcare settings. It is also heavily influenced by the mother's decision and her trust and

communication with her provider. As this study uses health insurance claims data, it is not possible to determine whether the mother's decision or request was made by her doctor. From the perspective of individual choice and autonomy, there is a need to examine what factors drive c-section rates, and more sociological reflection is needed on how insurers would view medically unindicated c-sections at the request of the mother (Loke et al., 2019).

Various efforts and experiments to reduce c-sections are also needed (Chen et al., 2018). Audits, individual feedback, and the adoption of best practices, for which there is little robust evidence among the various interventions, need to be adapted and refined to each country's healthcare environment (Chaillet et al., 2015). South Korea abruptly ended the VIP program in 2014, with researchers reporting an immediate increase in c-section rates after the policy was terminated (Park et al., 2022). This demonstrates the need for effective use of financial and social incentives, along with close monitoring of c-section rates, which will require continued investment and research.

9. Appendix

A1. History of the Korean Government's Intervention in reducing c-section rate

The sharp increase in the caesarean section rate prompted the South Korean government to initiate a series of policies to address the problem, as summarised in Table IV-A1. In July 2000, the National Health Insurance Service published a list of hospitals and clinics with a high rate of normal deliveries in the second half of 1999. Since then, c-section section rates have been available on the National Health Insurance Service website (Kim et al., 2005). Initially, public reporting had an impact on reducing the c-section section rate (Ko et al., 2001), but the rate stayed high. The NHIC published the c-section rates annually between 2000 and 2003 (NHIC, 2002, NHIC, 2003). After that, the Health Insurance Review and Assessment Service succeeded in the annual reporting in 2006 (Jang et al., 2011). At that time, the government had been conservative in employing financial incentives.

Table IV-A 1. History of the Korean government's intervention in reducing c-section rate (Source: Health Insurance Review & Assessment Service, 2012)

	Measures		Type
Nov 1999	A new reimbursement for VBAC and monitoring of normal delivery		Financial incentive
Jul 2000	Introduction of annual appraisal and public reporting of c-section rate by NHIC. (N < 200)		Social incentive
Jul 2002	Public reporting by NHIC: c-sections rates of the highest and the lowest institutions by regions in 2001. (N=344) Information includes name, number of cases, location, and c-section rate. (NHIC, 2002)		Social incentive
Aug 2003	Annual public reporting by NHIC (NHIC, 2003)		Social incentive
Jan 2005	54.4% increase in the reimbursement cost and exemption of OOP on normal delivery		Financial incentive
Sep 2005	Public reporting by HIRA: Clinics and hospitals in the bottom 25% of the c-section rates, only institutions with more than 50 deliveries in the first half of 2004. (N=179)		Social incentive
Dec 2005	Public reporting by HIRA: Lowest 25% of clinics and hospitals out of facilities with more than 50 deliveries in 2004. (N=200)		Social incentive
July 2006	Public reporting by HIRA: the c-section rates by all the clinics and hospitals that had more than 50 deliveries in the first half of 2005. (N=680 out of 1,071 facilities with more than one delivery)		Social incentive
Jun 2007	37.7% increase in the reimbursement cost for normal delivery.		Financial incentive
Jul 2007	Introduction of a pilot program (the financial incentive for tertiary hospitals)		Financial incentive
Jan 2008	A new reimbursement for trying normal delivery before c-section.		Financial incentive
Jan 2009	Increased reimbursement cost for trying normal delivery before c-section.		Financial incentive
Jan 2010	Expansion of financial incentives for secondary hospitals.		Financial incentive
Jul 2010	25% increase of the normal delivery fee		Financial incentive
Jul 2011	25% increase in the reimbursement cost for normal delivery		Financial incentive
Jul 2012	Introduction of Diagnosis-Related Group payment		

A2. Change in the c-section rate by the level of the hospital.

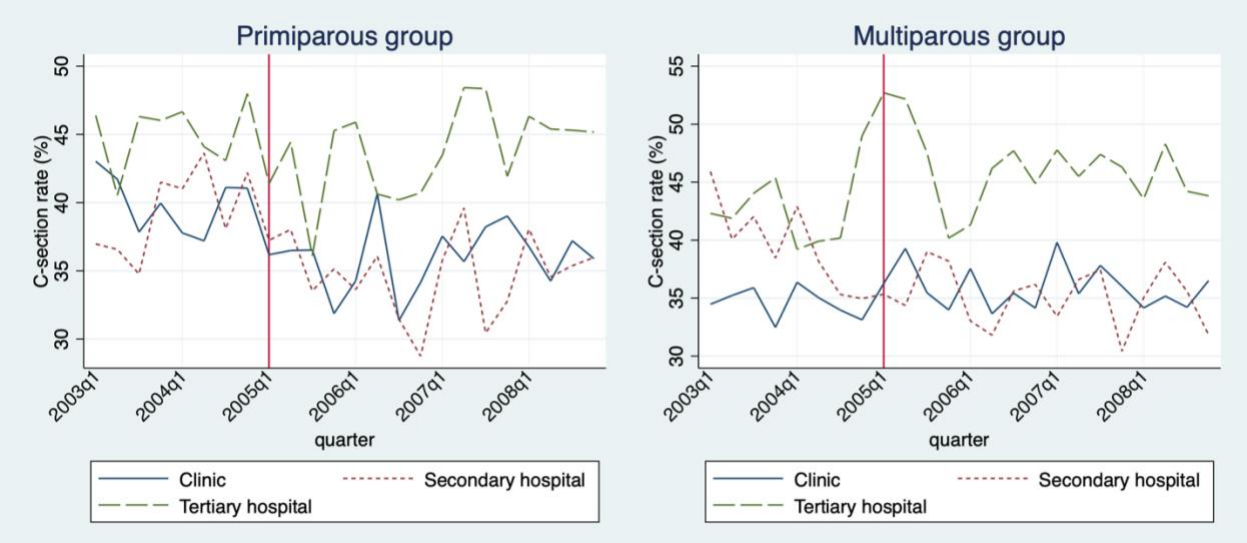
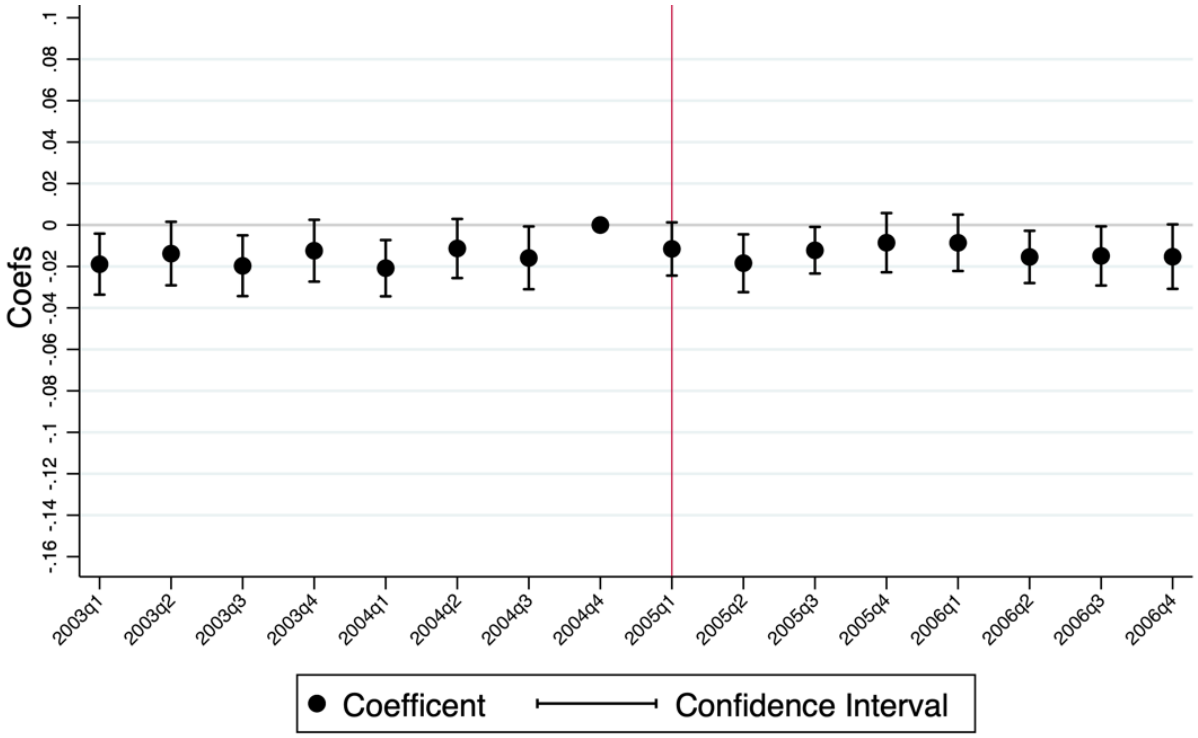


Figure IV-A 1. The trend of the c-section rate by the level of the hospital between 2003 and 2008

Overall, tertiary hospitals had the highest c-section rates in both the primiparous and multiparous groups. When comparing pre- and post-policy trends, tertiary hospital c-section rates did not change significantly, while small hospitals and clinics saw a decrease in c-sections.

A3. The trend of the VBAC rate for multiparous mothers.



Notes. OLS coefficient estimates are reported. The dependent variable is a binary indicator for VBAC.

Figure IV-A 2. Change in the VBAC rates in multiparous mothers.

A4. Change in the number of OBGY doctors in the country since 1984.

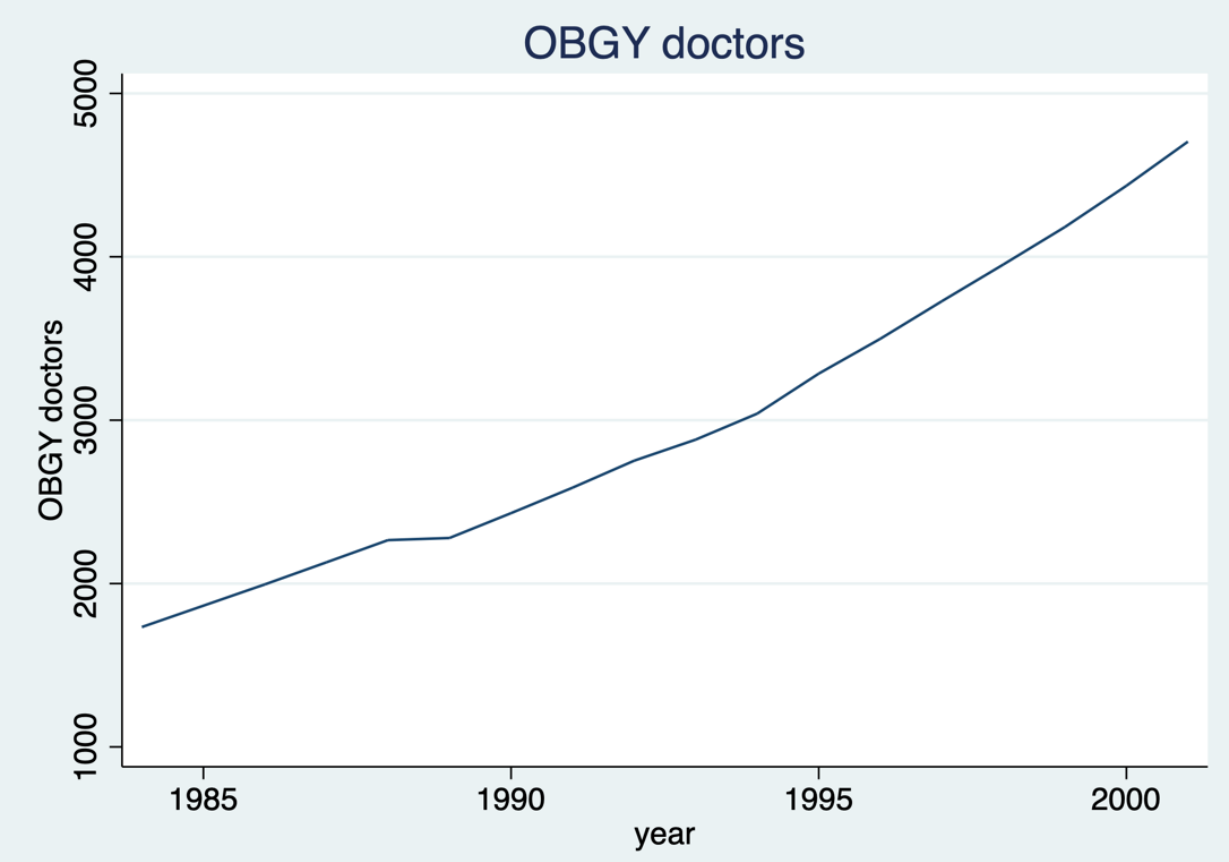


Figure IV-A 3. Change in the number of OBGY doctors.

The graph above shows the change in the number of gynaecologists between 1985 and 2000. In 1985, the number of obstetricians and gynaecologists in the country was less than 2,000, but because of continuous growth, the number increased to more than 4,500 in 2000.

A5. Heterogeneity in clinics in terms of the number of beds and doctors.

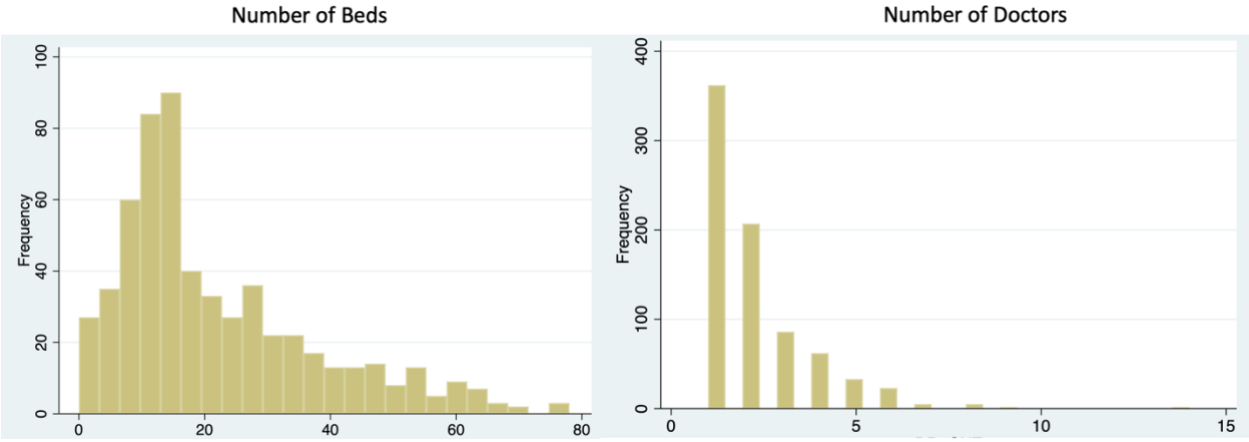


Figure IV-A 4. Heterogeneity in clinics in terms of the number of beds and doctors.

A6. Number of cases by the mode of delivery

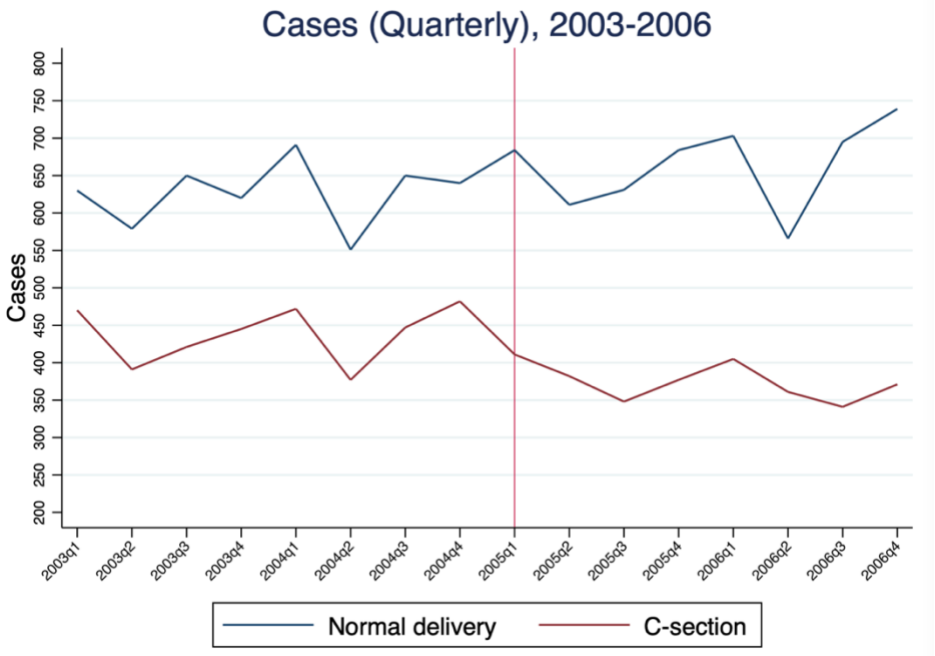


Figure IV-A 5. Changes in the number of deliveries by the two modes

A7. Regression coefficient

Table IV-A 2. Regression coefficients of the main result.

Quarter	coefs	CI_low	CI_high
2003q1	0.000918	-0.0358	0.0377
2003q2	-0.00356	-0.041	0.0339
2003q3	-0.00499	-0.0422	0.0322
2003q4	0.000413	-0.039	0.0398
2004q1	-0.00136	-0.0356	0.0329
2004q2	-0.00555	-0.0441	0.033
2004q3	-0.0141	-0.0483	0.0202
2005q1	-0.0359	-0.0699	-0.00199
2005q2	-0.0186	-0.0547	0.0176
2005q3	-0.0412	-0.077	-0.00539
2005q4	-0.0348	-0.0741	0.0044
2006q1	-0.0526	-0.087	-0.0182
2006q2	-0.0356	-0.0726	0.00148
2006q3	-0.071	-0.108	-0.0345
2006q4	-0.0683	-0.106	-0.031

A8. Heterogeneity by the number of doctors in clinics

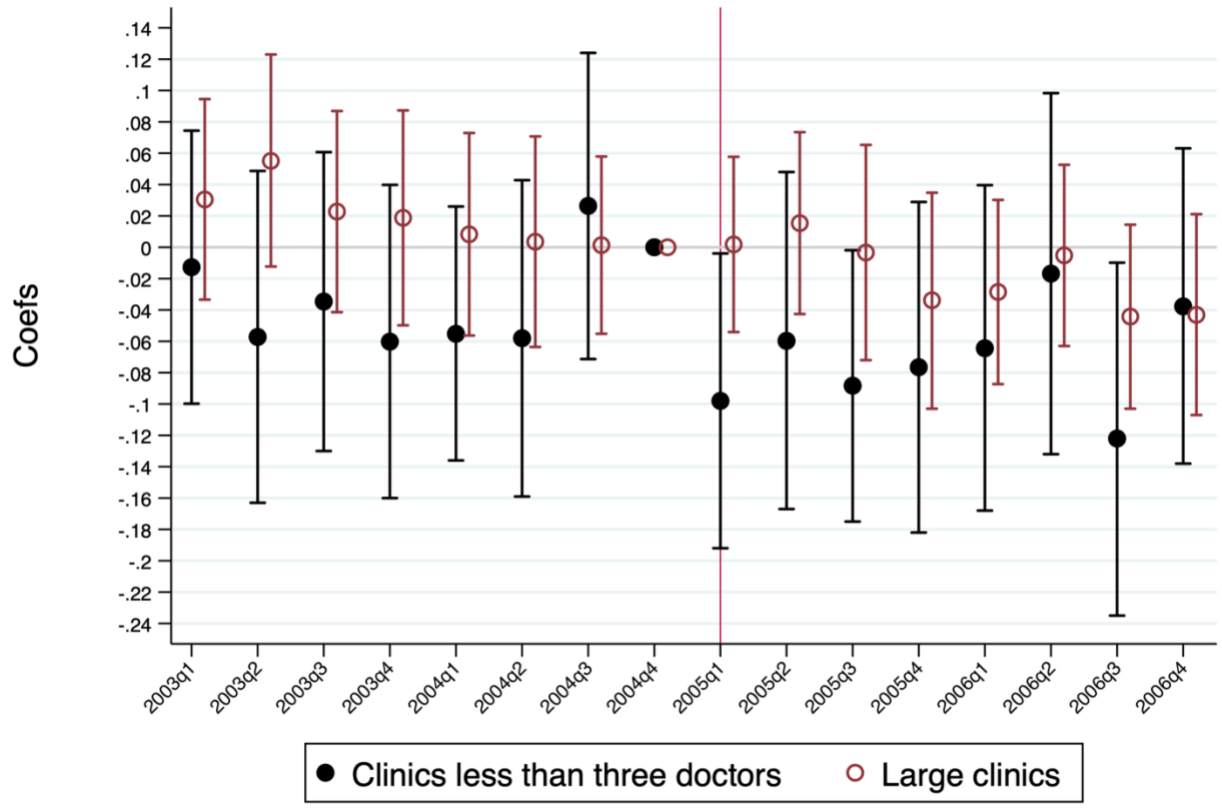
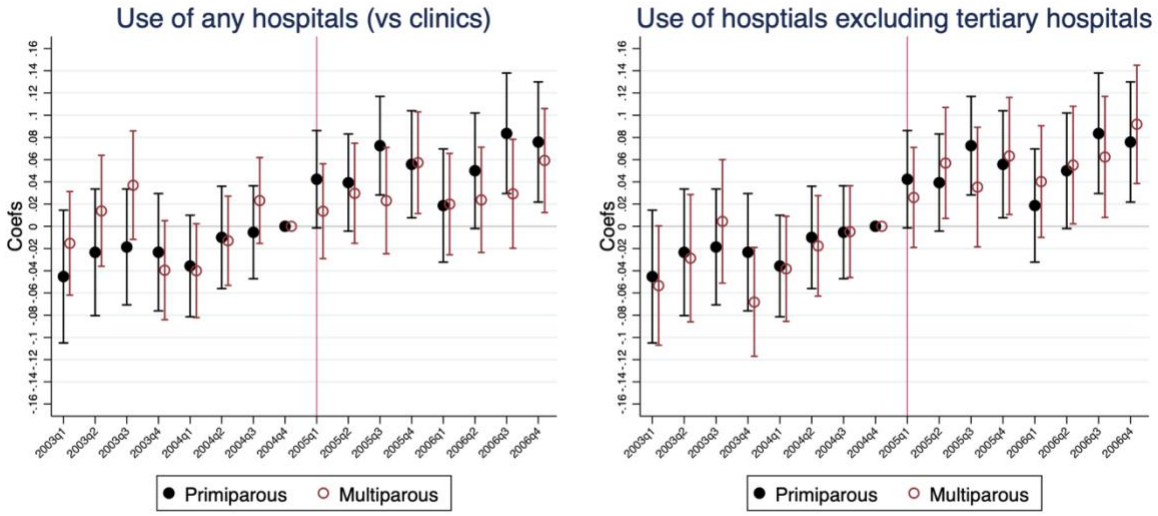


Figure IV-A 6. Heterogeneity of the effect by the number of doctors in clinics

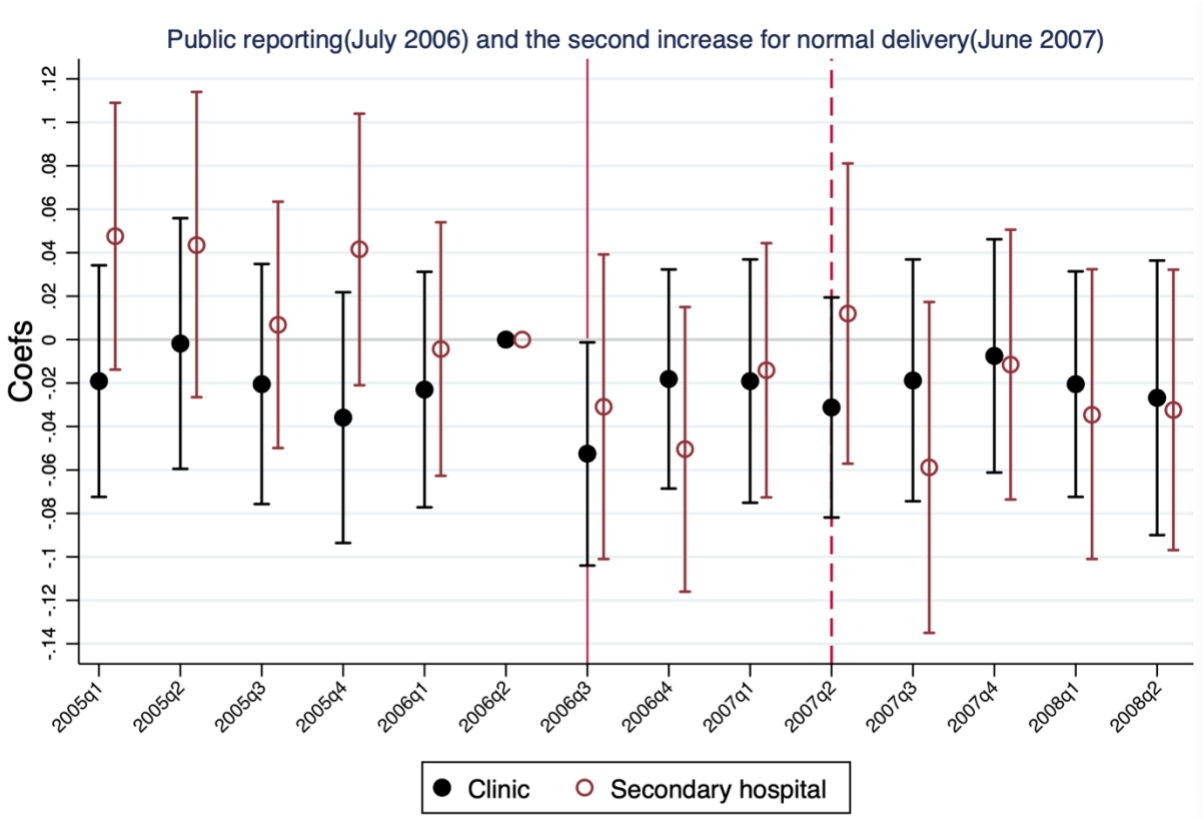
A9. Demand-side changes



Notes. OLS coefficient estimates are reported. The dependent variable is a binary indicator for c-section.

Figure IV-A 7. The demand side's changes in choosing hospitals over clinics.

A10. Two minor reforms.

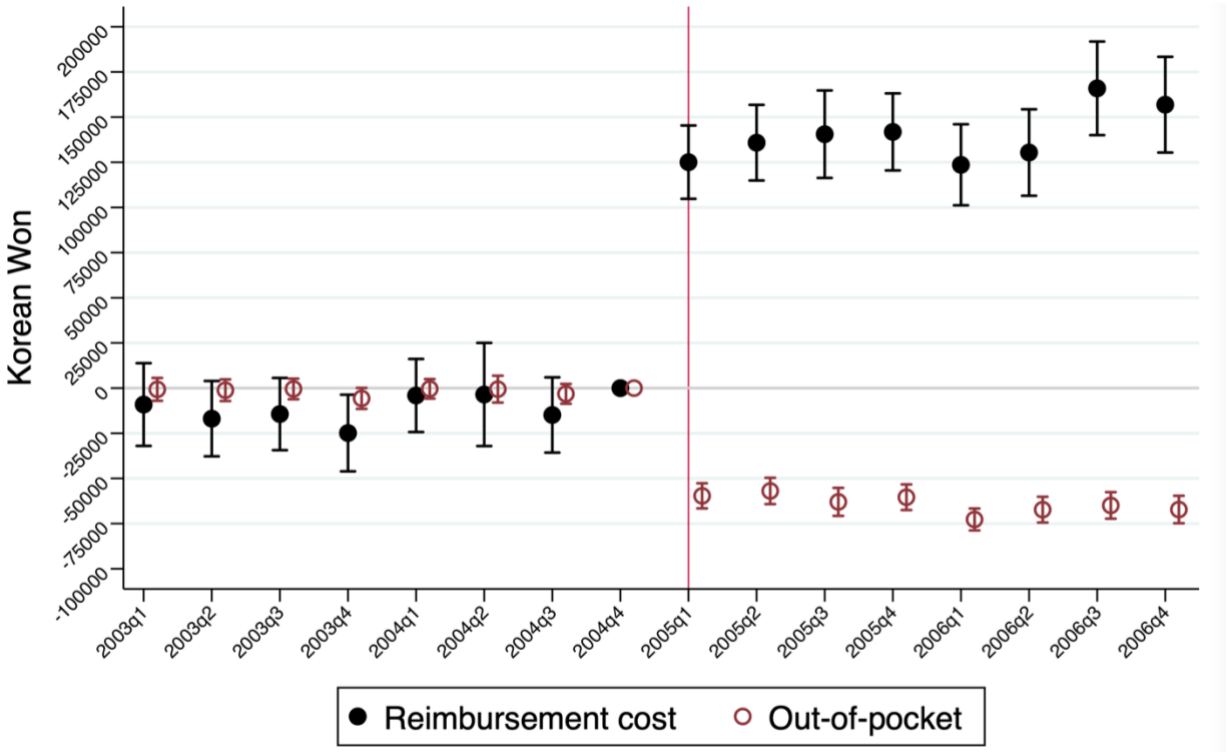


Notes. OLS coefficient estimates are reported. The dependent variable is a binary indicator for c-section.

Figure IV-A 8. Change in the c-section rate after the public reporting in 2006 and the fee increase for the normal delivery in June 2007.

Figure IV-A8 shows the effect of the public reporting and the fee increase on normal delivery in July 2006 and June 2007, respectively. As shown in the figure, public reporting led to a reduction in c-section rates of about 5.2% in the clinic, but this was temporary. Secondary hospitals, which have been subject to public reporting many times in the past, were not affected by public reporting. The fee increase for normal delivery in the second quarter of 2007 also did not have a significant impact on c-section rates.

A11. Average cost change per case.



Notes. 1,000 Korean Won was equivalent to 1 USD in 2005.

Figure IV-A 9. Average cost change per case

To calculate the budget impact of this policy, we calculated the cost of delivery for all first-time mothers. As shown in Figure IV-A9, out-of-pocket costs decreased by about KRW 55,000 (USD 55) immediately after the policy was implemented, while reimbursement costs, those covered by the NHIS, increased by about KRW 125,000 (USD 125).

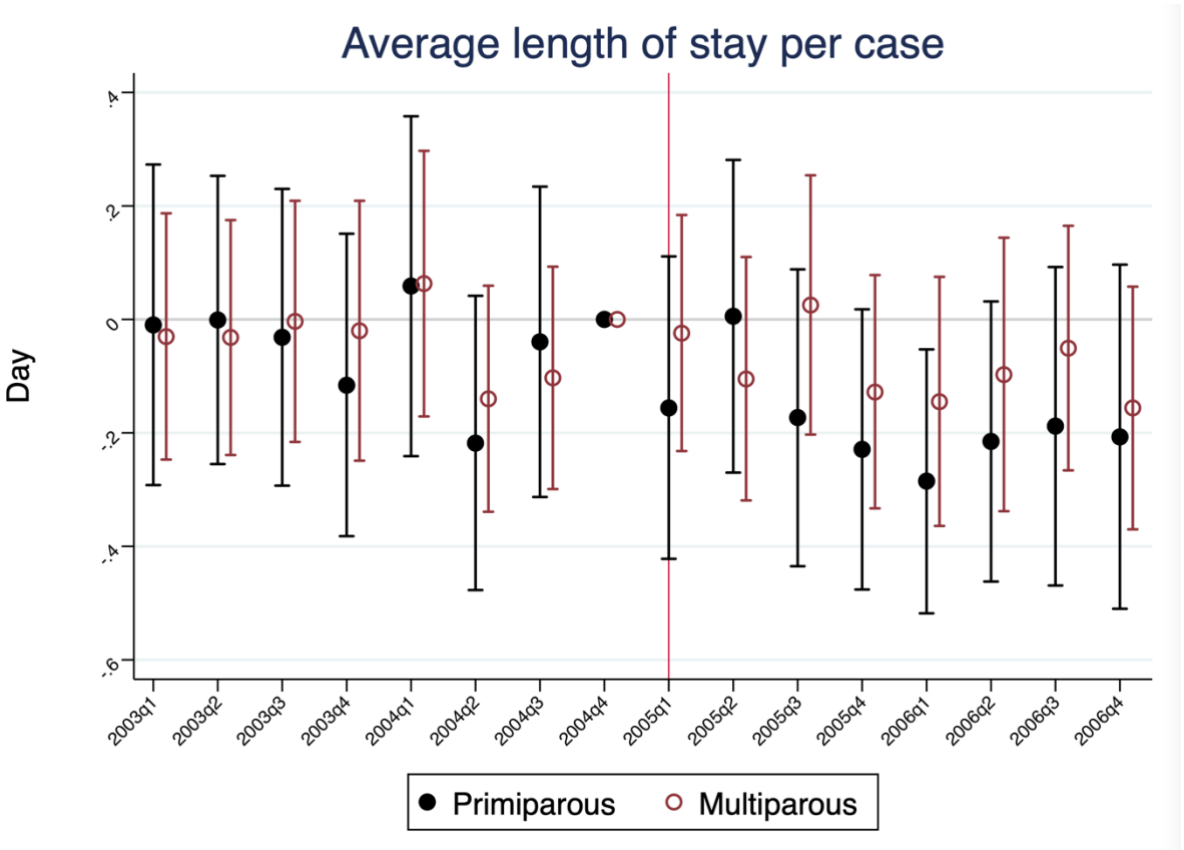
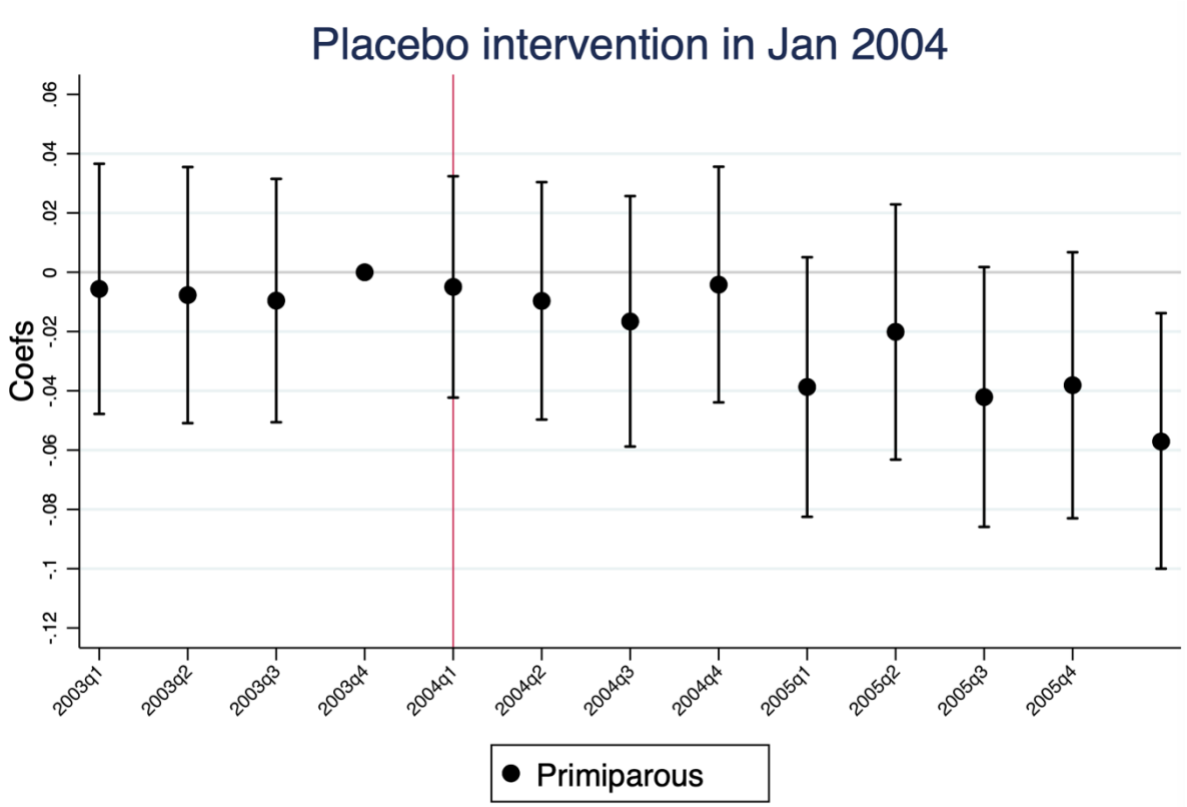


Figure IV-A 10. Average change in the length of stay

A11. Robustness check



Notes. OLS coefficient estimates are reported. The dependent variable is a binary indicator for c-section.

Figure IV-A 11. Placebo intervention in Jan 2004

Figure IV-A11 above depicts a hypothetical intervention one year before the actual policy was introduced. The results show no change in c-section rates before and after the placebo policy.

Chapter V. Do social and financial incentives increase the quality of stroke care?

1. Introduction

Stroke is the second leading cause of mortality worldwide. While age-standardised mortality has decreased, the absolute number of stroke cases and its burden of disease have steadily increased over the last two decades (Feigin et al., 2021). The average cost of post-stroke care in high-income countries exceeds USD 1,000 per month (Rajsic et al., 2019), a significant burden for patients and society. While prevention is one of the core elements of comprehensive stroke management (Owolabi et al., 2022, Langhorne et al., 2020), stroke cases are inevitable, which raises the question of potential interventions to improve the efficiency of stroke care and reduce financial burdens for the society.

Countries have introduced various measures to enhance the quality of stroke care, including audits (Harris et al., 2010, Geoffrey Cloud et al., 2013, Kim et al., 2019), public reporting (Kelly et al., 2008, Baker et al., 2002, Parker et al., 2012), pay for performance (Lindenauer et al., 2007, Cadilhac et al., 2019, Yang et al., 2016), and reorganisation of stroke care (Morris et al., 2014, Morris et al., 2019, Kim et al., 2014). In South Korea, where stroke was the second leading cause of death in 2007, providing high-quality stroke care and reducing regional disparity in stroke mortality were important health policy priorities. As South Korea's industrial structure has shifted from agriculture to industries, urban areas are experiencing a steady influx of people, while other regions lacking infrastructure for new

industries are experiencing a population decline. Hospitals in the metropolitan area did not face much difficulty maintaining hospitals because they have many local patient cases and rural patients who wish to have elective surgeries and cancer treatment in large hospitals. The opposite is true for rural hospitals, which have difficulty maintaining economies of scale. For this reason, acute disease management in non-metropolitan areas has been struggling for a long time, and the trend is unlikely to change much unless the government introduces ground-breaking measures.

In the 2000s, the Korean government introduced three policy measures, including public reporting events, regional cardio-cerebrovascular centres, and pay-for-performance policies (See Figure V-A1 in the appendix). The Ministry of Health and Welfare initially utilised social incentives to improve stroke care quality by publishing related indicators yearly in 2007, 2009, and 2010. Also, the government has designated regional hospitals and financed their fixed costs to expand their workforce and facilities. In addition, the government has also introduced a payment-by-results system to improve the quality of care, paying incentives and disincentives.

Although there have been studies examining the impact of public reporting on clinical outcomes, the topics of the studies were limited to cardiac surgical procedures and antibiotic prescription rates. As seen in previous research, public reporting shows mixed effects depending on the context, with approximately half of the studies reporting improvements in clinical quality. In contrast, the other half indicates no significant impact from public reporting (Campanella et al., 2016). There is mixed literature on the effectiveness of those interventions in stroke.

Stroke cases are unique among many public reporting topics because improving stroke outcomes requires enhancements in prehospital, in-hospital, and post-discharge care. Without comprehensive enhancements to these processes, it can be difficult to see the impact. In addition, measures such as surgery and rehabilitation require significant investment. In the absence of immediate increases in reimbursement costs or patient volume, it is unclear whether hospital executives will decide to make substantial investments based on public reporting alone. It also needs to be determined whether public reporting will be effective in stroke management, which operates at a team or hospital level, unlike surgeon-level public reporting for cardiac procedures.

This paper examines the effect of public disclosure in 2007 on stroke management alongside the announcement of financial incentives in 2011 in South Korea. In September 2007, The Health Insurance Review and Assessment Service (HIRA), a government agency, assessed 187 hospitals with 50 cases per year and published the results on its website. A collaboration between the clinical society and the government planned the public reporting events. The assessment criteria included initial diagnosis, initial treatment, secondary prevention, and management of patient records. A few years later, the HIRA went a step further and announced the introduction of an incentive system in 2011.

We document that public reporting had a limited impact on reducing overall mortality rates. However, introducing the incentive program resulted in a significant reduction of approximately 3.11% in the 365-day mortality rate for the overall stroke patients. This reduction was attributed to a decrease in the long-term mortality of ischemic stroke patients. However, short-term mortality did not change in any type of stroke.

Furthermore, in secondary outcomes, public reporting and the incentive program were associated with reducing patients' length of stay by approximately 1.76 days and 2.28 days in ischemic and haemorrhagic stroke, respectively. While public reporting did not decrease total care costs, the incentive program reduced average per-patient costs by approximately 531,000 KRW (531 USD), primarily driven by reductions in costs for haemorrhagic stroke patients. The policy placed significant emphasis on rehabilitation; however, it did not result in a substantial and rapid expansion of specialised rehabilitation that would improve patients' function. Lastly, we examined whether these changes led to spillover effects into post-discharge medical utilisation, particularly outpatient visits or readmissions, but we found no such evidence.

This study contributes in the following ways. Firstly, while most outcomes have been concentrated in Western countries, we fill the research gap by documenting the effect of public reporting and financial incentives in the Asian context. Secondly, our study expands the literature focusing on cardiac management to stroke management, which is significant. Thirdly, our study compares public reporting and incentive systems for the same clinical outcome in the same clinical setting. Although there is a time lag of several years, researching the same set of hospitals provides an opportunity to speculate on the relative effects of the two policies.

The structure of the paper is as follows. Section 2 discusses the relevant literature to understand how the Korean government has tried to enhance the efficiency and quality of acute care in the 2000s. Section 3 overviews the institutional background. Section 4 presents the data and empirical strategy, and Section 5 reports the results. Section 6 presents the robustness of the results, and Section 7 concludes.

2. Related literature

Public reporting in stroke care. Public reporting (PR) is one of the standard quality improvement methods to influence the social motivation of providers by influencing their professional self-esteem. Public disclosure of quality indicators reduces the information gap between providers and patients and helps patients to identify optimal care according to professional standards. Moreover, PR enhances the quality of providers by inducing competition and social pressure (Dranove and Jin, 2010). PR has also been promoted in many areas of healthcare, including cardiovascular care (Schneider and Epstein, 1996, Wasfy et al., 2015, Joynt et al., 2012) and antibiotic prescribing (Haustein et al., 2011, Weinstein et al., 2005, Liu et al., 2016, Yang et al., 2014, Kwon and Jun, 2015).

To date, there is limited evidence on the impact of PR on stroke outcomes (Parker et al., 2012). The exception is evidence from the USA, which shows mixed results of reduced mortality (Hollenbeak et al., 2008) and increased mortality (Baker et al., 2002) after a PR exercise. The evidence to date is mixed, and concerns about external validity remain as most of the evidence is from the US and has yet to be replicated elsewhere. In addition, public reporting in Asian countries is important given the culture of shame that may lead to regionally specific behavioural responses among providers.

Financial incentives for stroke care. Financial incentives are another means of enhancing the quality of care, either by influencing providers' budget constraints or by signalling desirable behaviour. A systematic review of the effects of financial incentives in clinics and hospitals found that pay-for-performance was associated with enhanced process indicators of

ambulatory care. The evidence suggests no clear association between pay-for-performance and patient outcomes such as mortality, although there may be other effects on the functioning of the health system and other outcomes. Another systematic review, covering the US, UK and France, found that pay-for-performance has a positive effect on quality improvement but little or no effect on patient outcomes such as mortality or adverse outcomes. It also showed that penalties were more substantial than rewards for meeting pre-specified targets (Mathes et al., 2019)

Provided that financial incentives improve the quality of stroke care, what factors contribute to the effect size? There are a handful of studies contributing to the answer to this question. One paper from the US on pay-for-performance suggests that financial incentives improve the quality score of the hospitals treated. The effect is more pronounced in hospitals with higher incentives, sound finances and a less competitive environment. However, the effect lasted only a few years (Werner et al., 2011). An Australian study using a before and after design showed that quality improvement measures, including audits and feedback, financial incentives and workshops, improved quality indicators. Among these measures, financial incentives had the largest impact (Cadilhac et al., 2019). Another study from South Korea reported that a financial incentive program improved five quality improvement indicators and significantly reduced in-hospital mortality for haemorrhagic stroke in general hospitals from 20.8% to 11.6% (Yang et al., 2016). However, the study used a pre-post comparison with a sample of large hospitals, leaving room for further research.

3. Institutional Background

The introduction of public reporting on stroke care. In the mid-2000s, South Korea introduced public reporting in several areas, including acute myocardial infarction in Nov 2005 and antibiotic prescription rates in 2006. The government also introduced PR on acute stroke care at the hospital level in Sep 2007 and updated it annually (see Figure V-A1 in the appendix).

The first PR event was based on acute stroke cases from January 2005 to December 2005. Acute stroke was defined as admission to an emergency department within seven days of symptom onset and confirmed by international classification codes I60, I61, I62 and I63. To minimise bias due to small numbers of cases, the PR included hospitals that treated at least 50 cases per year, 187 hospitals (HIRA, 2007).

Initially, PR focused on structure and process indicators but did not include patient outcomes such as mortality and functional outcomes. One structure indicator was whether hospitals had neurologists, neurosurgeons, and physiatrists. At that time, only 60.4% of hospitals had doctors from all three specialities, while 32.1% did not have at least one physiatrist. The other structural indicator is the number of stroke functional assessment tools in each hospital. The proportion of hospitals using at least five assessment tools was 22.9% (HIRA, 2007). In terms of process indicators, in the first year, PR checked the completeness of patient records for hypertension, diabetes, smoking history, neurological examination and percentage of brain imaging within 24 hours of arrival. For ischaemic stroke patients, additional indicators were included, such as the percentage of regular blood glucose testing within 24 hours of arrival, lipid testing, use of thrombolytics within 48 hours of arrival and secondary prevention with oral anticoagulants at discharge (HIRA, 2007).

These indicators were revised in the second year to improve the completeness of patient records for hypertension, diabetes, and blood glucose testing. An indicator added in 2008 was the percentage of patients who received a swallowing trial within two days. A further modification was made in 2010, adding indicators related to rehabilitation, such as the rate of early rehabilitation review within three days. An indicator for imaging within 1 hour was also added. However, the first three PRs did not include outcome indicators such as mortality. In the fourth PR in 2011, HIRA provided feedback to each hospital but did not publish mortality on the website.

Financial incentive program for stroke care. Between 2007 and 2011, the South Korean government observed improvements in structural and process indicators. Large hospitals performed well on most indicators. However, there were significant variations in these indicators among small hospitals. The government and the HIRA designed a financial incentive structure for stroke to encourage change in these hospitals. In July 2011, the HIRA announced a plan to introduce an incentive scheme for stroke care. They announced that the assessment would occur between October and December 2011 for hospitals that treated more than ten patients. The incentive model was designed to enhance the quality of care in small hospitals by adding or subtracting two per cent of the total reimbursement cost for Grade 1 (the best-performing hospitals) and Grade 5 (the worst-performing hospitals). According to HIRA, 88 out of 189 hospitals, including most quaternary hospitals, received the highest grade, while nine received the lowest (HIRA, 2012a). As promised, HIRA supplied incentives to 33 out of 189 hospitals in 2012, totalling about 150,000 USD (1 USD = 1,000

KRW). The incentives ranged from USD 752 to USD 12,517 in 2012. The HIRA did not apply negative financial incentives in the first year (Yang et al., 2016).

There are two hypotheses about the impact of public reporting on stroke care. First, public reporting and financial incentive did improve mortality because it mainly focused on the in-hospital care process. Second, the effect of financial incentive was more substantial than that of social incentive because those improvements required significant investments in human resources and facilities.

4. Data and identification strategy

The study includes cases of patients diagnosed with I60 - I63. We include acute cases with no previous record of acute stroke because we cannot distinguish regular check-ups from recurrent stroke with the claims data. We measured two interventions, one in 2007 and one in 2011. Each analysis includes two years before and after each intervention. Therefore, the first analysis covers 2005Q1 to 2009Q3, while the second covers 2010Q1 to 2013Q4.

Data. The study uses data from the National Health Insurance Service Senior Cohort from 2005 to 2012. The data follow 550,000 people who were over 60 in 2002. One of the advantages of using the data is that it contains detailed information about the services they received. For example, we can distinguish the type of intervention and rehabilitation from the claim. A disadvantage is that, because of the nature of the data, we cannot measure functional changes before and after stroke treatment.

Main outcomes. The study measures two indicators: mortality at 30 days and 365 days. In addition, secondary outcomes include the length of stay, the total cost of care, and the probability of receiving specialised rehabilitation. For rehabilitation, we measure whether the patient receives specialist rehabilitation during the first admission.

Furthermore, the study examines whether a series of performance measures due to the policy show any spillover effects on patient safety indicators, such as readmissions due to early discharge. First, we will investigate whether there is an increase in post-discharge outpatient at the hospitals where the patients received initial stroke treatment. We will also assess if there is an increase in readmission rates within one year, an increase in both

inpatient and outpatient admissions, an increase in the likelihood of admissions to geriatric hospitals that handle chronic patients, an increase in visits to community-based physicians responsible for rehabilitation, and an increase in inpatient admissions to acute hospitals that provide rehabilitation services.

Identification strategy. The study employs a difference-in-difference approach for both interventions. HIRA launched the first public reporting in September 2007. There are two challenges. One challenge is that we cannot identify the hospitals on the public reporting list in the dataset. Alternatively, we set a cut-off value that divides the control and treatment groups. We know that the total number of hospitals on the public reporting list in 2007 was 187, which is the order in which they treated the most stroke patients. In 2007, the number of hospitals in the treatment group was 183 when we used a cut-off value of 7 or more based on the total number of stroke cases treated by the hospital in the year. It was the closest to the actual number of hospitals on the list. The remaining hospitals in the control group totalled 236. Regarding the study period, we only included cases between January 2005 and September 2009 because there was another public reporting event in October 2009.

For the incentive program in 2012, we set the study period for the incentive program between Jan 2010 and Dec 2013 and used the cut-off in Jul 2011 instead of 2012. This is because HIRA officially invited hospitals to a workshop in July 2011 and announced the incentive scheme. In addition, HIRA said that the next incentive in 2012 would be determined based on data from October to December 2011.

From the hospitals' perspective, they knew whether their hospitals would be included in the incentive scheme based on the average number of patients. It was short notice, but the

tasks were manageable. Of the 11 indicators, three were directly related to the recruitment of physiotherapists, while eight were related to the clinicians' care process (see Table V-A1 in the appendix).

Although HIRA refreshed the annual PR in December 2010, based on data collected between January and March 2010, we argue that the effect would not be significant as there has been sufficient time to change clinical practice since the PR started. Inclusion or exclusion from the list would be limited to certain hospitals close to the cut-off. Again, we approximated the treatment group by the number of patients per year. The total number of hospitals in the treatment group is 180, close to the number of hospitals in the incentive program.

We begin by testing the assumption of a parallel trend between the two groups using risk-adjusted mortality rates and indicators, as shown in Figure V-A6 in the appendix. First, the total number of cases per quarter shows a different pattern between the two groups. While the cases in the treatment group show a downward trend, the trend in the control group shows an upward trend. Regarding mortality, both 30-day and 365-day mortality show similar patterns between the groups with seasonal variations. The cost of care shows a parallel trend before the intervention, but the gap widens after the intervention. Finally, both groups show a different pattern for specialised rehabilitation. The trends after the intervention, specialised rehabilitation, seem to increase in both groups, but the treatment group shows a steep increase over time.

Therefore, the basic equation of the study is as follows,

$$Y_{ijt} = \beta TREAT_{jt} + \gamma X_{ijt} + \delta Z_{jt} + H_j + T_t + \varepsilon$$

$$TREAT_{jt} = \{PR_{jt}\ or\ INCENTIVE_{jt}\ )$$

where outcome variables Y_{ijt} is regressed by $TREAT_{it}$, a binary variable whether each hospital was in the treatment group, and X_{ijt}, a set of individual characteristics, and Z_{jt} is a set of hospital characteristics, H_j is a set of hospital dummies, and T_t is the set of year dummies. The coefficient β captures the impacts of each intervention. The model clusters the standard errors at the hospital level.

5. Results

Descriptive statistics. Table V-1 presents the descriptive statistics of the control and treatment groups included in public reporting. Regarding personal characteristics, the control group has a slightly higher average age, a higher proportion of females, and a slightly lower income decile than the treatment group. This can be attributed to the presence of smaller hospitals in suburban areas. Both groups have ischemic stroke accounting for over 80% of the total cases, while haemorrhagic stroke represents less than 20%. Among these, there are cases where ischemic and haemorrhagic strokes occur concurrently.

Regarding mortality, the control group has approximately 1-2% higher 30-day, 90-day, and 365-day mortality rates than the treatment group. There is no significant difference in length of stay between the two groups. Still, there is a considerable difference in total care cost, with the control group costing around 2,180 USD (1,000 KRW was equivalent to 1 USD), while the treatment group has an average of 3,340 USD.

When calculating the percentage of patients receiving rehabilitation during hospitalisation, the two groups have no significant difference in basic rehabilitation. However, there is a significant difference between the control and treatment groups for specialised rehabilitation, which may contribute to the higher costs in the treatment group. Regarding hospital size and physician numbers, it can be observed that hospitals in the treatment group are approximately 2-3 times larger and have a significantly higher number of physicians. The average number of stroke patients treated within one year is 29.10 in the treatment group, while 5.69 cases in the control group. It is worth mentioning that we used the sample dataset containing about 10% of the elderly over 60; therefore, the actual number

of patients per hospital is approximately ten times larger. Roughly, these numbers are similar to the average number of stroke patients per month.

Table V- 1. Descriptive statistics for public reporting

	Control group			Treatment group		
VARIABLES	N	mean	sd	N	mean	sd
age	3,746	75.77	7.010	15,648	74.29	6.712
female	3,746	0.595	0.491	15,648	0.541	0.498
income decile	3,746	5.165	3.714	15,648	5.966	3.503
ischemic stroke	3,746	0.835	0.371	15,648	0.806	0.396
haemorrhagic stroke	3,746	0.191	0.393	15,648	0.214	0.410
mortality at 30-d	3,746	0.0964	0.295	15,648	0.0881	0.283
mortality at 90-d	3,746	0.151	0.358	15,648	0.125	0.331
mortality at 365-d	3,746	0.198	0.398	15,648	0.163	0.370
length of stay	3,746	14.66	17.28	15,648	15.05	18.65
total care cost	3,746	2.175e+06	2.648e+06	15,648	3.337e+06	4.276e+06
basic rehab	3,746	0.0953	0.294	15,648	0.0723	0.259
special rehab	3,746	0.0553	0.229	15,648	0.172	0.377
hospital beds	3,746	318.9	184.6	15,648	871.7	522.8
number of doctors	3,746	28.63	45.42	15,648	246.7	242.4
number of cases	3,746	5.692	4.352	15,648	29.10	16.05
hospital in the capital area	3,746	0.240	0.427	15,648	0.388	0.487
y2005	3,746	0.186	0.389	15,648	0.218	0.413
y2006	3,746	0.175	0.380	15,648	0.240	0.427
y2007	3,746	0.213	0.409	15,648	0.211	0.408
y2008	3,746	0.239	0.426	15,648	0.197	0.398
y2009	3,746	0.188	0.390	15,648	0.133	0.340

When examining the short-term and long-term mortality rates by stroke type in Table V-2, the 30-day mortality rate for ischemic stroke was 6.84% in the control group and 5.75%

in the treatment group. In contrast, the 365-day mortality rate was 16.4% in the control group and 12.6% in the treatment group. For haemorrhagic stroke, much higher mortality rates were observed. The 30-day mortality rate was 23.2% in the control group and 21.5% in the treatment group. The 365-day mortality rate was 36.7% in the control group and 31.9% in the treatment group.

During the introduction of the incentive program in the third quarter of 2011, the composition of the control group and treatment group was not significantly different in Table V-2. This is because the assignment to the treatment group was based on the annual number of patients treated. When examining the 30-day mortality rate and 365-day mortality rate, they were slightly higher than the results observed in the previous public reporting analysis. This can be attributed to the dataset being a closed cohort and the natural increase in overall cohort mortality rates. Between the two groups used for measuring the effect of the incentive program, the treatment group, which includes relatively larger hospitals with more physicians, showed lower 30-day mortality rates and 365-day mortality rates.

The 30-day mortality rate was 10.7% in the control group and 9.79% in the treatment group. The 365-day mortality rate was 19.7% in the control group and 17.9% in the treatment group. There was no significant difference in total length of stay, but total care cost showed a larger difference compared to the previous period. The control group recorded an average cost of 2,460 USD, while the treatment group recorded an average of 4,020 USD. Similarly, there was no significant difference in basic rehabilitation, but there was a difference of over 20% in specialised rehabilitation.

Table V- 2. Descriptive statistics for the incentive program

	Control group			Treatment group		
VARIABLES	N	mean	sd	N	mean	sd
age	2,364	78.71	6.305	10,739	77.54	5.990
female	2,364	0.601	0.490	10,739	0.545	0.498
income decile	2,364	5.319	3.706	10,739	6.117	3.542
ischemic stroke	2,364	0.837	0.369	10,739	0.808	0.394
haemorrhagic stroke	2,364	0.177	0.382	10,739	0.205	0.404
mortality at 30-d	2,364	0.107	0.309	10,739	0.0979	0.297
mortality at 90-d	2,364	0.150	0.357	10,739	0.138	0.345
mortality at 365-d	2,364	0.197	0.398	10,739	0.179	0.383
length of stay	2,364	14.74	18.44	10,739	14.72	17.53
total care cost (KRW)	2,364	2.460e+06	2.841e+06	10,739	4.015e+06	4.804e+06
basic rehab	2,364	0.0960	0.295	10,739	0.0846	0.278
special rehab	2,364	0.0795	0.271	10,739	0.266	0.442
hospital beds	2,364	313.0	140.2	10,739	860.4	501.9
number of doctors	2,364	27.80	31.80	10,739	277.0	282.1
number of cases	2,364	4.267	3.232	10,739	22.31	12.40
hospital in the capital area	2,364	0.267	0.442	10,739	0.335	0.472
y2010	2,364	0.206	0.405	10,739	0.281	0.450
y2011	2,364	0.275	0.447	10,739	0.255	0.436
y2012	2,364	0.256	0.436	10,739	0.239	0.426
y2013	2,364	0.262	0.440	10,739	0.225	0.417

As shown in Table V-A3 in the appendix, the 30-day mortality rate for ischemic stroke was 6.87% in the control group, while the treatment group showed a rate of 6.25%, indicating a minimal difference between the two groups. However, for haemorrhagic stroke, a significant difference of over 4% was observed, with the control group showing a rate of approximately 28.7% and the treatment group showing a rate of approximately 24.6%. This difference was even more pronounced in the long-term mortality rates. For ischemic stroke, the control group and treatment group had rates of 15.3% and 14.0%, respectively. On the other hand, for haemorrhagic stroke, the control group and treatment group had rates of 41.1% and 34.3%, respectively.

Main result. Table V-3 shows the DiD results for public reporting. Overall, public reporting in 2007 had no effect on the 30-day mortality rate. However, borderline evidence suggests that the public reporting reduced the 365-day mortality rate by 2.03%. In the model without a time trend, the decrease in mortality rate was more pronounced. However, when a time-fixed effect was added, the statistical significance decreased.

When examining the effects of public reporting on different stroke types, there was no impact on short-term and long-term mortality rates. Specifically, in Panel B, for ischemic stroke, there was no change in the 30-day mortality rate, and although some models showed a mortality rate decrease of approximately 1.7%, this effect was not observed when adding a time trend. In Panel C, the impact of public reporting on haemorrhagic stroke mortality was examined, but consistent trends across models were not observed.

Table V- 3. DID results for public reporting.

			Panel A: All stoke			
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	-0.000277	-0.0176***	-0.000715	-0.0204***	0.0109	-0.0203*
	(0.00499)	(0.00604)	(0.00506)	(0.00654)	(0.00803)	(0.0104)
Observations	19,394	19,394	19,394	19,394	19,394	19,394
R-squared	0.029	0.060	0.077	0.108	0.077	0.108
Hospital FE	NO	NO	YES	YES	YES	YES
YEAR FE	NO	NO	NO	NO	YES	YES
			Panel B: Ischemic stroke			
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	-0.00288	-0.0173***	-0.00108	-0.0162**	0.00938	-0.0154
	(0.00435)	(0.00583)	(0.00471)	(0.00663)	(0.00739)	(0.0104)
Observations	15,733	15,733	15,733	15,733	15,733	15,733
R-squared	0.027	0.059	0.074	0.107	0.074	0.107
Hospital FE	NO	NO	YES	YES	YES	YES
YEAR FE	NO	NO	NO	NO	YES	YES
			Panel C: Haemorrhagic stroke			
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	0.0168	-0.00980	0.0278*	-0.00325	0.0306	-0.0236
	(0.0152)	(0.0166)	(0.0160)	(0.0178)	(0.0274)	(0.0305)
Observations	4,069	4,069	4,069	4,069	4,069	4,069
R-squared	0.045	0.076	0.182	0.216	0.183	0.216
Hospital FE	NO	NO	YES	YES	YES	YES
YEAR FE	NO	NO	NO	NO	YES	YES

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Note. mor30: mortality rate at 30 days; mor365: mortality rate at 365 days.

Table V-4 reports the impact of the 2011 incentive program announcement on mortality rates. Interestingly, it had a significant impact on long-term mortality rates. As seen in Panel A, the 365-day mortality rate decreased by approximately 3.11% after the announcement of the incentive program. Given that the average 365-day mortality rate during the specified period is 17.9%, a reduction of 3.11% in long-term mortality due to the announcement of the incentive program is indeed a significant achievement.

To understand the mechanism, the study investigated the outcomes by stroke type. The incentive program substantially reduced long-term mortality in ischemic stroke cases. Various models estimated the size of the policy effect to range from 2.49% to 4.06%. However, no changes or reductions in long-term mortality were observed in haemorrhagic stroke cases. Only the model incorporating time trends showed an increase of approximately 9.51% in mortality. Rather than interpreting this as an increase in mortality in the treated group in the short term, it is more likely to be due to the large reduction in mortality rates in the control group, which included many smaller hospitals.

Table V- 4. DID results for the announcement of the incentive program.

			Panel A: All stroke			
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	-0.0104*	-0.0279***	-0.00380	-0.0232***	0.0114	-0.0311**
	(0.00553)	(0.00668)	(0.00612)	(0.00777)	(0.00972)	(0.0123)
Observations	13,149	13,149	13,149	13,149	13,149	13,149
R-squared	0.031	0.058	0.092	0.124	0.092	0.124
Control	YES	YES	YES	YES	YES	YES
Hospital FE	NO	NO	YES	YES	YES	YES
YEAR FE	NO	NO	NO	NO	YES	YES
			Panel B: Ischemic stroke			
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	-0.0123***	-0.0289***	-0.00659	-0.0249***	-0.00389	-0.0406***
	(0.00471)	(0.00677)	(0.00561)	(0.00788)	(0.00889)	(0.0125)
Observations	10,676	10,676	10,676	10,676	10,676	10,676
R-squared	0.029	0.058	0.092	0.126	0.092	0.127
Control	YES	YES	YES	YES	YES	YES
Hospital FE	NO	NO	YES	YES	YES	YES
YEAR FE	NO	NO	NO	NO	YES	YES
			Panel C: Haemorrhagic stroke			
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	0.0156	-0.00593	0.0198	-0.00465	0.0951***	0.0325
	(0.0169)	(0.0177)	(0.0202)	(0.0220)	(0.0340)	(0.0371)
Observations	2,646	2,646	2,646	2,646	2,646	2,646
R-squared	0.044	0.072	0.200	0.218	0.203	0.219
Control	YES	YES	YES	YES	YES	YES
Hospital FE	NO	NO	YES	YES	YES	YES
YEAR FE	NO	NO	NO	NO	YES	YES

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Note. Mor30: mortality rate at 30 days; mor365: mortality rate at 365 days.

Secondary outcomes. Next, the study examined the impact of public reporting and the introduction of the incentive program on secondary outcomes. The outcomes considered

were the length of stay (LOS), total care cost (COST), and probability of receiving specialised rehabilitation (REHAB).

As shown in Table V-5, public reporting and the incentive program reduced the stay length. In the case of public reporting, it reduced the length of stay by approximately 1.76 days. Considering the average length of stay in the treatment group during the specified period is 15.05 days, this represents a reduction of over 10%. When examining stroke types separately, public reporting reduced the length of stay by approximately one day for ischemic stroke and around 5.54 days for haemorrhagic stroke.

In the incentive program, as shown in panel B, the average length of stay for the entire stroke case was reduced by 2.28 days. When looking at stroke types individually, there was a decrease of 0.79 days in ischemic stroke, although this was not statistically significant. However, there was a significant reduction of 8.01 days in haemorrhagic stroke, which represents a substantial decrease. During the observation period, the patients in the treatment group who received treatment for haemorrhagic stroke had an average length of stay of 21.12 days. The reduction represents a significant decrease, approximately 38%, in length of stay.

In terms of healthcare costs, public reporting had no significant impact on total care costs, whereas the incentive program actually resulted in a considerable reduction in costs. When examining the effects of public reporting on all stroke cases, there was a decrease of 118 USD, but this was not statistically significant. When looking at stroke types individually, both types showed little effect, and although there was a reduction of 593 USD in haemorrhagic stroke, it was not statistically significant either.

On the other hand, the incentive program showed an average decrease of 531 USD in total care costs for all stroke cases. Much of this decrease appears to be driven by haemorrhagic stroke, which exhibited a reduction of approximately 2,270 USD. This can be attributed to the 8-day decline in length of stay for haemorrhagic stroke. The average care cost for the treatment group during the observation period was around 6,990 USD, indicating a reduction of approximately 32%.

Regarding rehabilitation, borderline evidence suggests that public reporting increased the probability of receiving rehabilitation by 1.88%. When considering stroke types, public reporting seems to increase the probability of receiving specialised rehabilitation only in the cases of ischemic stroke patients but not in haemorrhagic stroke cases. The incentive program did not affect overall stroke cases, ischemic stroke, and haemorrhagic stroke in terms of rehabilitation. According to HIRA, the proportion of hospitals employing physiatrists increased from 69.2% in 2010 to 75.4% in 2011 {HIRA, 2012 #74188}. However, additional hiring did not affect the probability of receiving rehabilitation for stroke patients.

Table V- 5. The effects of both interventions on the secondary outcomes.

Panel A: Public reporting									
	All stroke			Ischemic stroke			Haemorrhagic stroke		
VARIABLES	LOS	COST (KRW)	REHAB	LOS	COST (KRW)	REHAB	LOS	COST (KRW)	REHAB
Treated	-1.761***	-117,910	0.0188*	-1.004**	25,475	0.0188*	-5.537**	-592,844	0.014
	-0.532	-110,917	-0.00966	-0.444	-78,602	-0.0108	-2.212	-481,167	-0.0247
Observations	23,712	23,712	23,712	18,717	18,717	18,717	4,521	4,521	4,521
R-squared	0.065	0.084	0.119	0.07	0.103	0.135	0.132	0.153	0.145
Control	YES	YES	YES	YES	YES	YES	YES	YES	YES
Hospital FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Panel B: Incentive program									
	All stroke			Ischemic stroke			Haemorrhagic stroke		
VARIABLES	LOS	COST	REHAB	LOS	COST	REHAB	LOS	COST	REHAB
Treated	-2.282***	-530,770***	0.00996	-0.794	-42,756	0.0158	-8.012***	-2.267e+06***	-0.0191
	(0.583)	(149,699)	(0.0132)	(0.542)	(110,785)	(0.0149)	(2.102)	(623,069)	(0.0319)
Observations	13,149	13,149	13,149	10,503	10,503	10,503	2,473	2,473	2,473
R-squared	0.139	0.105	0.160	0.198	0.134	0.185	0.178	0.200	0.205
Control	YES	YES	YES	YES	YES	YES	YES	YES	YES
Hospital FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Spillover effects. If there is a significant fluctuation in length of stay or care costs due to the initiation of monitoring for a specific condition, it is worth investigating potential spillover effects. Particularly for haemorrhagic stroke, which has a longer hospitalisation period and higher mortality rate, the introduction of the incentive program resulted in a substantial reduction in hospitalisation duration and costs. In countries like South Korea, where there are subacute hospitals or hospitals for chronic diseases, acute hospitals may discharge patients early and manage their conditions through frequent follow-up outpatient visits. However, this approach may increase the total length of hospitalisation and total care costs. Therefore, it is necessary to examine the changes in post-discharge outpatient visits, readmissions, and admissions to other hospitals for patients who received stroke treatment. Additionally, it is important to determine if there has been an increase in the provision of rehabilitation services by community clinics or specialised rehabilitation hospitals, which may not have been fully implemented in acute hospitals.

Table V-A4 in the appendix provides evidence on whether the two interventions resulted in spillover effects. The outcome variables in this analysis focused on healthcare utilisation one year after discharge. Initially, the study anticipated that after discharge, there would be a decrease in mortality and length of stay, accompanied by an increase in follow-up outpatient visits. However, no evidence was found to support this hypothesis. In fact, it was observed that follow-up visits decreased for haemorrhagic strokes after the implementation of the incentive program. In terms of readmissions, there were no statistically significant increases observed in any of the cases. Therefore, the improvement in secondary outcomes due to the policy suggests the absence of spillover effects.

When examining all outpatient visits, inpatient admissions, including those to hospitals other than the one where stroke treatment was received, and geriatric hospital admissions, there were no notable changes observed, except for some opposing effects in ischemic stroke and haemorrhagic stroke after the announcement of the incentive program. Additionally, there were no significant changes observed in clinic visits or inpatient admissions for rehabilitation after the implementation of both policies.

Table V-A5 in the appendix examined the healthcare utilisation of patients who survived one year after discharge to assess the presence of spillover effects, which aimed to focus on mild patients, excluding those with severe limitations in mobility. However, no observed spillover effects were found. Particularly, there was no increase in follow-up outpatient visits to the hospitals where treatment was received, and there was no increase in readmissions. Additionally, there was no increase in any admissions to acute hospitals or geriatric hospitals, and in some cases, there were statistically significant decreases. Lastly, while there was no increase in visits to rehabilitation clinics in the local community, public reporting showed a positive correlation with inpatient admissions for rehabilitation.

6. Robustness check

During the analysis of this paper, two concerns were raised. The first concern pertains to the assignment of the treatment and control groups, while the second concern relates to the effects of the establishment of regional cardio-cerebrovascular centres, which had different policy objectives but were implemented during a similar period as the two interventions.

Firstly, the assignment of the treatment and control groups was based on the previous year's stroke treatment volume, which can be heavily influenced by the size of the hospitals. The size of a hospital is not only indicative of the availability of hospital staff but also correlates with the complexity of procedures that can be performed. Despite confirming the parallel trend in the Difference-in-Differences (DiD) analysis, comparing the performance of small hospitals with a very low annual stroke case volume to that of large hospitals might result in an underestimation or overestimation of the policy effect. To address this concern, it is necessary to conduct further analysis excluding hospitals at the extremes of the size distribution. We will exclude all hospitals with an annual patient volume of 2 or less and proceed with the analysis again. The actual annual patient volume of these hospitals is expected to be approximately 20-30 patients or less.

Secondly, the establishment of cardio-cerebrovascular centres (RCCs) was a policy implemented by the government to reduce the gap in stroke mortality rates between regions. During the study period, approximately 11 hospitals received government support under this policy. Despite controlling for the designation of these centres in the main analysis, it is important to verify whether the policy effects were not overestimated due to the

performance of these specific hospitals. To address this concern, additional analysis should be conducted by excluding hospitals affiliated with these centres.

Appendix V-A6 and V-A7 present the results of the robustness check. In summary, these findings are consistent with the results reported in the main analysis.

7. Conclusion

The study examines the impact of financial and non-financial incentives on stroke care. The ultimate goals of stroke care are to reduce mortality and to promote health and functional life before and after stroke. To summarise, public reporting had no impact on short- or long-term mortality rates, while the incentive program reduced the long-term mortality rate for ischemic stroke, leading to an overall decrease of approximately 3.1% in the 365-day mortality rate for all stroke cases.

When considering secondary outcomes, both interventions reduced the length of stay, with a significant improvement observed for haemorrhagic stroke. In terms of cost, public reporting did not significantly impact total care costs despite the reduction in length of stay. However, the incentive program had a substantial effect, reducing average costs by approximately 531 USD. This effect was mainly attributed to the significant decrease in the length of stay for haemorrhagic stroke.

Public reporting can contribute to quality improvement through two different pathways, including the consumer choice pathway and the provider change pathway. In the case of acute serious illnesses, the change pathway is more likely, as patients are less likely to choose the hospitals where they are treated. In addition, emergency ambulance services

deliver patients according to certain rules or instructions from medical supervisors. Therefore, public reporting works mainly through the change pathway for acute severe conditions.

Weak social incentive in acute care. We need to consider why social incentives are not as powerful in the acute care setting. Firstly, since mortality is a function of pre-hospital, in-hospital and post-hospital management, public reporting focusing primarily on in-hospital management without a comprehensive approach to this holistic process can be limited. According to the HIRA, the percentage of ambulance use was still low at almost 54% in 2012 (HIRA, 2012b). The median time from onset to arrival for patients who did not use an ambulance was 447 minutes, compared with 121 minutes for those who did (HIRA, 2012b), suggesting that a comprehensive approach should be taken to both the prevention and management of stroke (Langhorne et al., 2020). Even if patients arrive at the hospital within gold hours, they will not receive optimal care if there is no neurologist. Positive changes have been made, but not enough. The percentage of hospitals with at least one neurologist was 85.2% in 2011(HIRA, 2012b).

Secondly, mortality was not included as a reporting indicator until 2012. Including mortality in public reporting is challenging as accurate risk adjustment methods may not be available, and publicly disclosing mortality rates without proper risk adjustment can lead to negative perceptions of specific hospitals. However, it is important to establish and announce evaluation plans for mortality indicators, openly share methodologies for risk adjustment that hospitals can agree on and develop a timeline for when mortality indicators will be included in public reporting.

Thirdly, investments in staffing and facilities are essential for improving mortality outcomes, but these improvements require financial investments. Most rational hospital administrators would strive to receive positive evaluations and provide higher-quality services. However, if they perceive that public recognition, as a social incentive, does not contribute to operational improvements due to environmental or regional reasons, they may choose not to take additional actions. To improve overall mortality, it is crucial to have neurologists and neurosurgeons available in the hospital 24/7, as well as to maintain a dedicated ICU capacity for stroke patients. However, if the costs associated with these requirements outweigh the social incentives, hospital management may avoid making the necessary investments. To improve mortality outcomes, hospitals need to consider the financial implications of having specialised staff and reserving ICU capacity specifically for stroke patients. These costs include recruiting and retaining qualified specialists, providing round-the-clock coverage, and allocating resources for stroke care. If these costs exceed the perceived benefits or social incentives, hospital administrators may decide against making such investments. However, monetary incentives can have a more significant impact, as they positively influence overall hospital management and enable investments in additional staff and facilities. Therefore, they have the potential to generate stronger effects.

Economies of scope. The results suggest that the incentives improved efficiency by reducing the length of stay and total costs. However, both interventions did not increase the proportion of patients receiving specialised rehabilitation services. A patient will have to go to other hospitals after discharge for swallowing tests or a review of the rehabilitation plan if the original hospital doesn't provide these services due to a lack of resources and staff.

Hospitals need to invest in staff, dedicated space, and rehabilitation equipment to provide rehabilitation, which may not be a cost-effective decision from the perspective of medium and small hospitals. Although there was no immediate effect on the provision of rehabilitation after PR, some hospitals employed physiotherapists. According to HIRA, the percentage of hospitals with at least one physiatrist increased significantly from 61.3% in 2008 to 74.6% in 2011 (HIRA, 2012b). According to the trends, we can observe an increase in rehabilitation in the control group as well as the treatment group, but not significantly in the treatment group. This may be because the baseline of the control group was very low before the intervention. This is an area for further research with more specific data on the workforce.

Limitations. One of the study's limitations is that we cannot measure the effect of PR on patients' functional gains. Better estimates would be possible if the data could be linked to the stroke cohort data. Secondly, the use of claims data cannot reflect DNR status. Not all patients or families are eager to receive the best care after discharge. Therefore, the results should be interpreted with caution. Third, being treated in a stroke unit is an important factor affecting patient outcomes. However, we cannot reflect changes in the quality and quantity of stroke units in hospitals.

Choosing good quality indicators has been a problem in measuring performance. There has been considerable variation in the use of quality indicators for stroke care in European countries (Wiedmann et al., 2012). In the US, researchers found that measures were inconsistent across report cards(Kelly et al., 2008). On both PR and incentive programs,

there were no patient-reported outcome indicators. Patient experience is as important as other indicators, such as process indicators or patient outcomes.

8. Appendix

Appendix A1. Timeline of quality-improving measures between 2007 and 2012

Figure V-A 1. Timeline of quality-improving measures between 2007 and 2012

Appendix A2. Timeline of public reporting between 2005 and 2009

(a) Public reporting

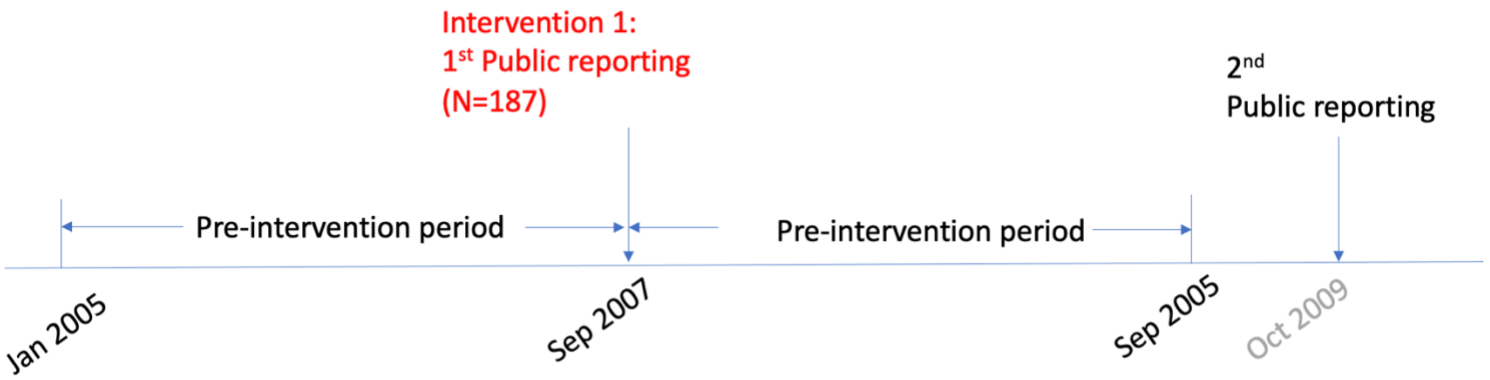


Figure V-A 2. Timeline of public reporting between 2005 and 2009

(b) Announcement of the incentive program

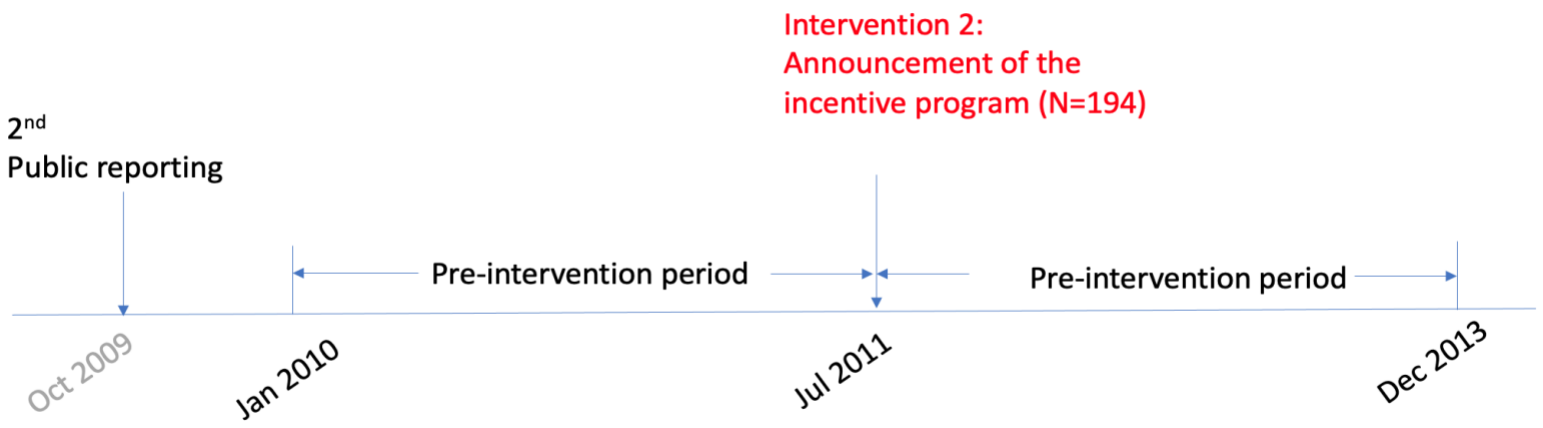


Figure V-A 3. Announcement of the incentive program

Appendix A3. Number of yearly cases at each hospital in 2007

In the sample dataset, there were 236 hospitals (control group) that treated less than seven cases a year whereas 183 hospitals (treatment group) treated seven or more patients in 2007.

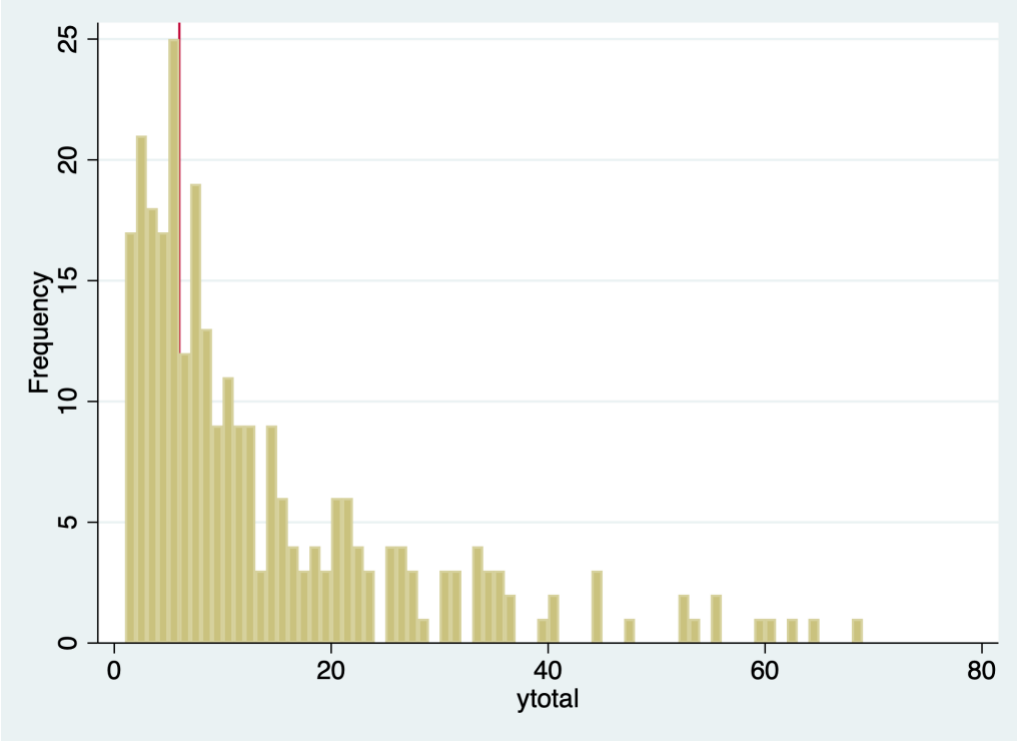


Figure V-A 4. Number of yearly cases at each hospital in 2007

Appendix A4. The incentive structure of the HIRA between 2012 and 2014

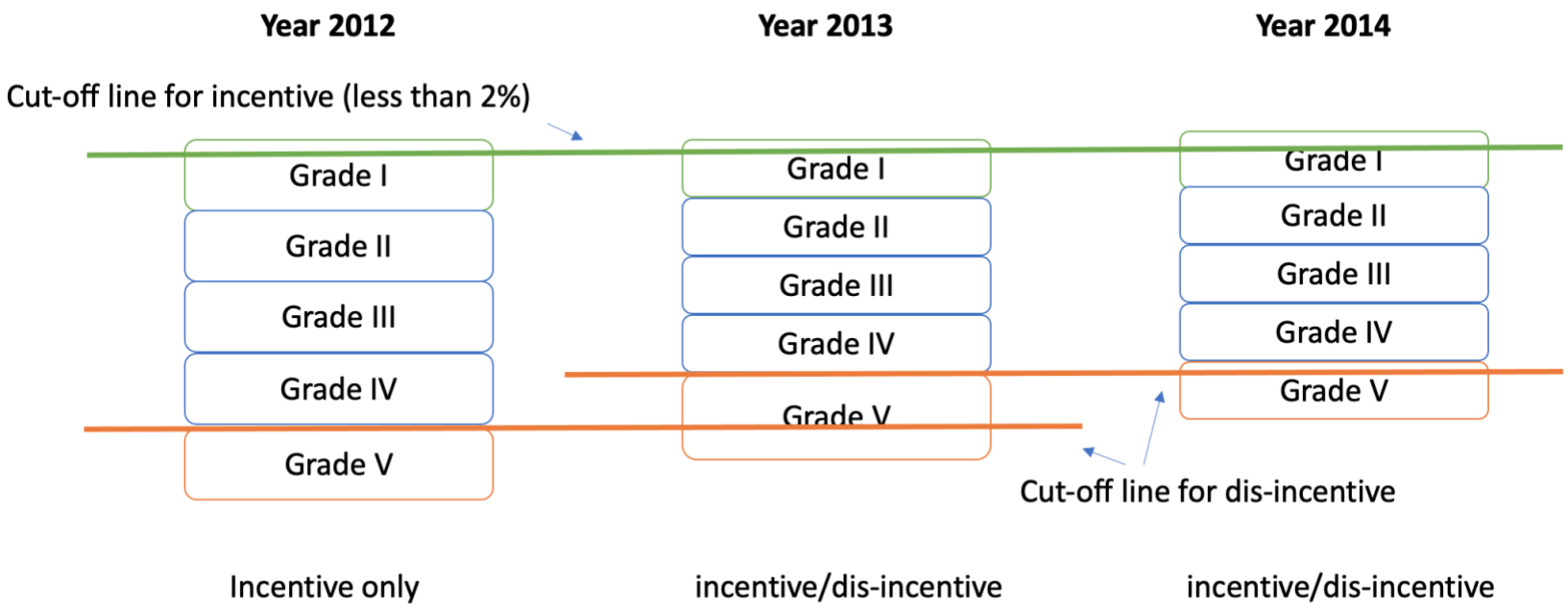


Figure V-A 5. The incentive structure for stroke care between 2012 and 2014

Appendix A5. Trends before and after the PR in 2007

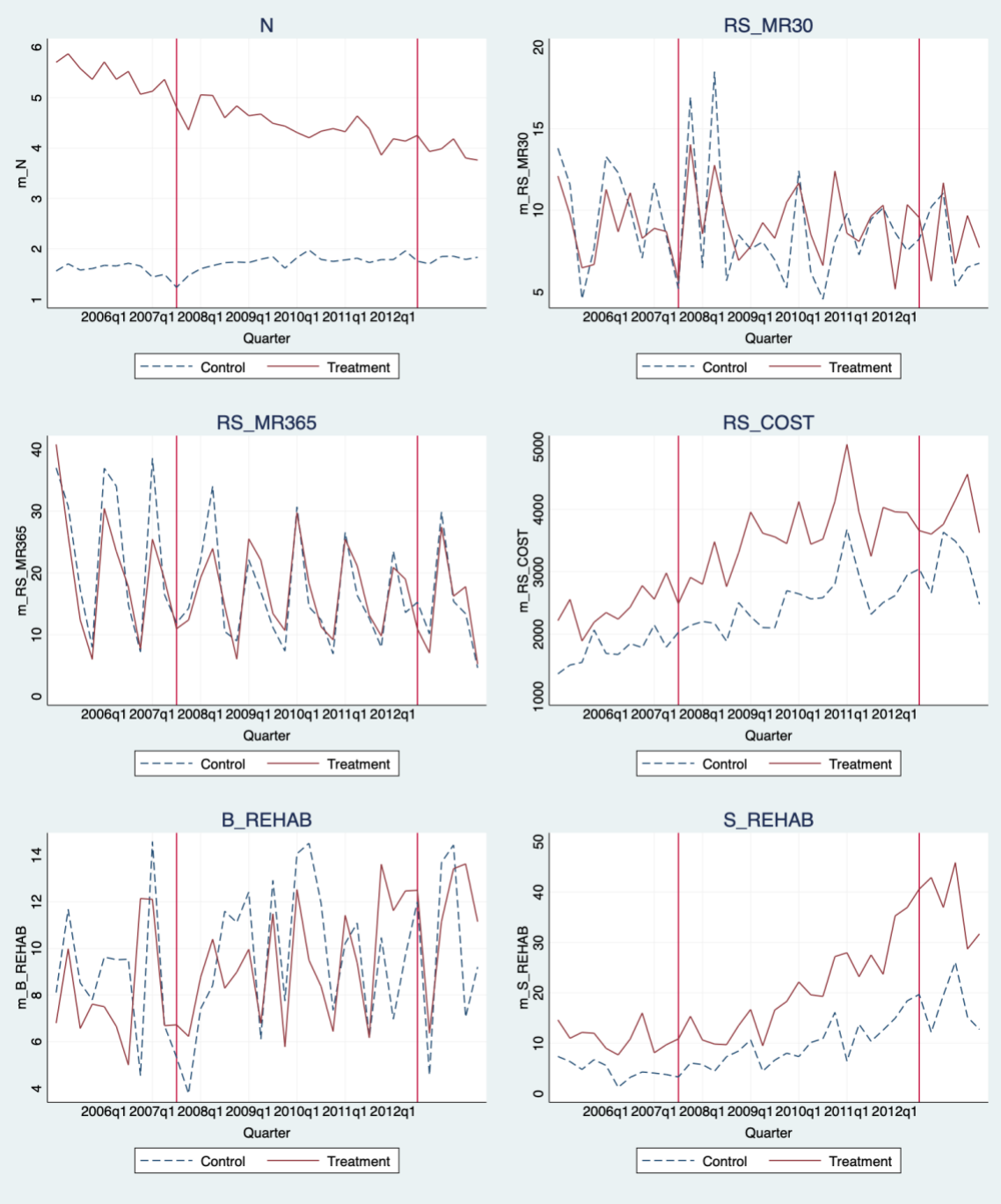


Figure V-A 6. Trends before and after the PR in 2007

Appendix A6. Evaluation indicators of the stroke evaluation in 2011

Table V-A 1. Indicators included in the stroke evaluation in 2011

Area	Indicators
Structure	- Composition of doctors (Neurology, Neurosurgery, and Physiatrist)
Process (All stroke, I60-I63)	- Proportion of patients received smoking cessation sessions. - Proportion of patients went through reviews for a swallowing study (within two days) - Proportion of patients went through reviews for early rehabilitation (within three days)
Process (Ischemic stroke only, I63)	- Proportion of patients received a lipid test (including within 30 days of admission) - Proportion of patients went through reviews for t-PA. - Proportion of patients received t-PA (within 60 min.) - Proportion of patients received antithrombotic agent. - Proportion of patients received antithrombotic agent at discharge. - Proportion of patients, who had atrial fibrillation, received anticoagulant

Appendix A7. Descriptive statistics for the two interventions by type of stroke

Table V-A 2. Descriptive statistics for public reporting by the type of stroke

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Ischemic stroke						Haemorrhagic stroke					
	Control group			Treatment group			Control group			Treatment group		
VARIABLES	N	mean	sd	N	mean	sd	N	mean	sd	N	mean	sd
mortality at 30-d	3,127	0.0684	0.253	12,606	0.0575	0.233	714	0.232	0.423	3,355	0.215	0.411
mortality at 90-d	3,127	0.118	0.323	12,606	0.0895	0.285	714	0.307	0.461	3,355	0.270	0.444
mortality at 365-d	3,127	0.164	0.370	12,606	0.126	0.332	714	0.367	0.482	3,355	0.319	0.466
length of stay	3,127	13.64	15.85	12,606	13.35	15.07	714	20.20	22.78	3,355	21.79	27.72
total care cost	3,127	1.922e+06	2.145e+06	12,606	2.693e+06	2.835e+06	714	3.536e+06	4.271e+06	3,355	5.890e+06	7.108e+06
basic rehab	3,127	0.0956	0.294	12,606	0.0717	0.258	714	0.0952	0.294	3,355	0.0763	0.266
special rehab	3,127	0.0547	0.227	12,606	0.175	0.380	714	0.0602	0.238	3,355	0.161	0.368
hospital beds	3,127	318.1	180.7	12,606	865.9	525.7	714	322.0	197.0	3,355	896.7	517.2
number of doctors	3,127	27.44	42.85	12,606	243.6	243.4	714	33.50	54.04	3,355	258.5	238.5
number of cases	3,127	5.687	4.252	12,606	29.12	16.14	714	5.728	4.887	3,355	29.06	15.63
hospital in capital area	3,127	0.235	0.424	12,606	0.392	0.488	714	0.258	0.438	3,355	0.375	0.484

Table V-A 3. Descriptive statistics for the incentive program by the type of stroke

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Ischemic stroke ischemic						Haemorrhagic stroke haemorrhagic					
	Control group			Treatment group			Control group			Treatment group		
VARIABLES	N	mean	sd	N	mean	sd	N	mean	sd	N	mean	sd
mortality at 30-d	1,979	0.0687	0.253	8,678	0.0625	0.242	418	0.287	0.453	2,200	0.246	0.431
mortality at 90-d	1,979	0.106	0.307	8,678	0.0997	0.300	418	0.359	0.480	2,200	0.300	0.458
mortality at 365-d	1,979	0.153	0.360	8,678	0.140	0.347	418	0.411	0.493	2,200	0.343	0.475
length of stay	1,979	13.97	17.21	8,678	13.24	14.92	418	18.66	23.00	2,200	21.12	25.04
total care cost (KRW)	1,979	2.168e+06	2.255e+06	8,678	3.319e+06	3.392e+06	418	3.893e+06	4.462e+06	2,200	6.987e+06	7.883e+06
basic rehab	1,979	0.102	0.302	8,678	0.0846	0.278	418	0.0646	0.246	2,200	0.0850	0.279
special rehab	1,979	0.0819	0.274	8,678	0.280	0.449	418	0.0646	0.246	2,200	0.212	0.409
hospital beds	1,979	308.8	137.8	8,678	855.7	509.6	418	330.4	148.5	2,200	875.4	469.1
number of doctors	1,979	26.58	29.69	8,678	274.6	285.7	418	33.29	39.36	2,200	284.8	267.8
number of cases	1,979	4.260	3.178	8,678	22.29	12.54	418	4.299	3.501	2,200	22.31	11.88
hospital in the capital area	1,979	0.248	0.432	8,678	0.328	0.470	418	0.359	0.480	2,200	0.355	0.478

Appendix A8. The spillover effects.

Table V-A 4. The spillover effect within 1 year of discharge (all patients)

Panel A : public reporting

	All stroke							
VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-0.0648	-0.0294	0.854	-0.116	-0.0889	-0.0279	-0.115	0.0311
	(0.183)	(0.0277)	(0.720)	(0.101)	(0.0639)	(0.0752)	(0.111)	(0.0324)
	Ischemic stroke							
VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-0.151	-0.0474	0.848	-0.123	-0.113*	-0.0109	-0.151	0.0260
	(0.205)	(0.0309)	(0.812)	(0.106)	(0.0662)	(0.0801)	(0.120)	(0.0285)
	Haemorrhagic stroke							
VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-0.00394	0.0328	0.376	-0.0393	-0.120	0.0809	-0.0217	-0.0499
	(0.392)	(0.0598)	(1.473)	(0.286)	(0.190)	(0.202)	(0.285)	(0.128)

Panel B : Incentive program

	All stroke							
VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-0.0284	0.0115	1.240	-0.0842	-0.0427	-0.0414	0.297	-0.0155
	(0.280)	(0.0354)	(1.004)	(0.138)	(0.0777)	(0.111)	(0.245)	(0.0432)
	Ischemic stroke							
VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	0.172	0.0149	2.573**	-0.0473	-0.0521	-0.00477	0.370	-0.0554
	(0.315)	(0.0391)	(1.136)	(0.152)	(0.0846)	(0.123)	(0.283)	(0.0462)
	Haemorrhagic stroke							
VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-1.682***	-0.0506	-4.948**	-0.111	0.120	-0.194	-0.191	0.238*
	(0.623)	(0.0903)	(2.187)	(0.360)	(0.214)	(0.279)	(0.493)	(0.128)

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note : **f/u opt**: Outpatient follow-up at the hospitals where patients received the treatments; **readmission**: Readmission to the hospital where the patient was treated primarily within 1 year; **any opt**: Any outpatient setting; **any inp**: Any form of inpatient admission; **inp_acute**: Any form of inpatient admission at an acute hospital; **inp_ltch**: Any form of inpatient admission at a geriatric hospital; **rehab_opt**: Outpatient at rehabilitation clinics; **rehab_inp**: Inpatient for rehabilitation.

Table V-A 5. The spillover effect within 1 year of discharge (patients who did not die within 1 year)

Panel A: public reporting

All stroke

VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-0.270*	-0.00417	-0.484	-0.398***	-0.204**	-0.196*	-0.0218	0.0198**
	(0.148)	(0.0428)	(0.334)	(0.134)	(0.0854)	(0.101)	(0.0307)	(0.00968)

Ischemic stroke

VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-0.336	-0.0210	-0.359	-0.399**	-0.256**	-0.147	-0.0381	0.0296**
	(0.225)	(0.0625)	(0.493)	(0.188)	(0.121)	(0.144)	(0.0474)	(0.0144)

Haemorrhagic stroke

VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-0.124	0.0515	-0.128	-0.394**	-0.136	-0.258*	0.00691	0.00123
	(0.158)	(0.0445)	(0.396)	(0.187)	(0.122)	(0.133)	(0.0443)	(0.0105)

Panel B: Incentive program

All stroke

VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-0.496**	-0.0151	-1.529***	-0.722***	-0.149	-0.575***	-0.161	-0.00179
	(0.230)	(0.0673)	(0.575)	(0.216)	(0.116)	(0.172)	(0.103)	(0.0343)

Ischemic stroke

VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	-0.753**	-0.0453	-1.949**	-0.760**	-0.209	-0.551**	-0.266	-0.0108
	(0.341)	(0.0977)	(0.852)	(0.309)	(0.165)	(0.250)	(0.169)	(0.0496)

Haemorrhagic stroke

VARIABLES	f/u opt	readmission	any opt	any inp	inp_acute	inp_ltch	rehab_opt	rehab_inp
treated	0.148	0.114	-0.350	-0.694**	0.0757	-0.775***	-0.0181	0.00234
	(0.301)	(0.0873)	(0.626)	(0.315)	(0.172)	(0.239)	(0.0868)	(0.0578)

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note : **f/u opt**: Outpatient follow-up at the hospitals where patients received the treatments; **readmission**: Readmission to the hospital where the patient was treated primarily within 1 year; **any opt**: Any outpatient setting; **any inp**: Any form of inpatient admission; **inp_acute**: Any form of inpatient admission at an acute hospital; **inp_ltch**: Any form of inpatient admission at a geriatric hospital; **rehab_opt**: Outpatient at rehabilitation clinics; **rehab_inp**: Inpatient for rehabilitation.

Appendix A9. Robustness check

Table V-A 6. Robustness check without small hospitals

			Panel A: Public Reporting			
	All		ischemic		haemorrhagic	
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	0.00655	-0.0239**	0.00615	-0.0138	0.0271	-0.0334
	(0.00838)	(0.0108)	(0.00769)	(0.0108)	(0.0282)	(0.0314)
Observations	18,528	18,528	15,033	15,033	3,882	3,882
R-squared	0.067	0.100	0.064	0.099	0.164	0.197
Control	YES	YES	YES	YES	YES	YES
Hospital FE	YES	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES	YES
			Panel B: Incentive program			
	All		ischemic		haemorrhagic	
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	0.0157	-0.0332**	-0.00303	-0.0406***	0.0957**	0.0188
	(0.0111)	(0.0140)	(0.0100)	(0.0141)	(0.0380)	(0.0412)
Observations	11,028	11,028	8,958	8,958	2,217	2,217
R-squared	0.078	0.112	0.076	0.116	0.181	0.199
Control	YES	YES	YES	YES	YES	YES
Hospital FE	YES	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES	YES

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table V-A 7. Robustness check without regional cardio cerebrovascular centres

	Panel A: Public Reporting					
	All		ischemic		haemorrhagic	
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	0.0101	-0.0220**	0.00904	-0.0168	0.0326	-0.0202
	(0.00850)	(0.0110)	(0.00783)	(0.0110)	(0.0290)	(0.0321)
Observations	17,579	17,579	14,258	14,258	3,698	3,698
R-squared	0.081	0.112	0.078	0.109	0.191	0.226
Control	YES	YES	YES	YES	YES	YES
Hospital FE	YES	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES	YES
	Panel B: Incentive program					
	All		ischemic		haemorrhagic	
VARIABLES	mor30	mor365	mor30	mor365	mor30	mor365
treated	0.0125	-0.0332**	-0.00350	-0.0406***	0.0866**	0.0194
	(0.0104)	(0.0132)	(0.00943)	(0.0133)	(0.0355)	(0.0386)
Observations	12,259	12,259	9,960	9,960	2,456	2,456
R-squared	0.074	0.107	0.072	0.110	0.176	0.195
Control	YES	YES	YES	YES	YES	YES
Hospital FE	YES	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES	YES

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Chapter VI. Discussion

1. Roles of incentives

Roles of social incentive. Through the case study, I document that social incentives serve as one of the motivating factors for behaviour and hold strong potential to increase efficiency and improve care quality. As shown in Chapter 3, public reporting with social incentives has not only contributed to improved quality of primary care by reducing unnecessary antibiotic prescribing by at least 5 per cent, but also to improved health expenditure efficiency through reduced drug costs. In chapter 4, public reporting contributed to a modest reduction in unnecessary c-sections and improved the quality of maternal healthcare, as well as improved efficiency in the use of health expenditures through fewer resource days and lower health expenditures.

However, social incentives themselves do not guarantee desirable outcomes. The social incentive is similar to an engine propelling a ship forward but not determining its direction. As seen in Chapter 4, the policy designed by the government lacked stakeholder participation due to the rapid design of incentives, leading to significant side effects.

Secondly, the effectiveness of social incentives can vary depending on the level of investment required. For instance, as seen in Chapter 3, where simple decision-making is

influenced, public reporting alone can yield substantial effects and exhibit a strong impact similar to that of monetary incentives, as evidenced by previous studies. However, in cases such as c-sections, where specific clinical decision-making is directly linked to providers' profits, the influence of social incentives is limited. Although simple public reporting can produce temporary effects, especially in societies with strong social norms where professional norms are also shared, these effects are short-lived. Moreover, annual public reporting only consumes administrative resources without resulting in positive outcomes. In acute care settings where additional team-based staffing is necessary to provide optimal care, social incentives are not of significant assistance. University hospitals are already trying to acheive the best possible outcomes within the given resources and facilities, making it difficult to expect substantial effects without additional investments in personnel and facilities. Furthermore, in situations such as emergency medical care where patients have limited choices and cannot utilize hospitals outside their region, the establishment of trust in the specific hospital becomes paramount. If public reporting is conducted without investing in facilities and personnel, it can only erode vital trust among local residents towards the hospital.

Thirdly, even with the same social stimuli, the effects can vary among individuals, and this variation is proportional to the degree of deviation from social norms. As observed in Chapter 3, following public reporting, the highest prescribers exhibited the most significant change in coding. This finding closely aligns with the results of previous studies, which

indicated that the higher the antibiotic prescription rate, the greater the reduction in the overall prescription rate.

***Role of financial incentive*.** In healthcare, financial incentives operate on both the demand and supply sides. Introductory economics states that financial incentives work by influencing the budget constraints of individuals who are considering a particular behaviour. It works through two pathways: the income effect, where the relative price of a particular behaviour changes, affecting the individual's budget constraint, and the substitution effect, where the relative prices of different behavioural options change.

As we have seen in the previous empirical chapters, financial incentives work either directly or indirectly. In the case of prescribing antibiotics, the financial incentive is operating indirectly, because there are two ways in which public reporting works: through the peer effect and the consumer choice effect. In Korea, where healthcare consumers have a wide range of choices and are covered by health insurance even if they visit multiple doctors in a single day, the patient-provider relationship is not institutionally established. Therefore, patient choice and visits are related to providers' income, so public reporting is indirectly linked to financial incentives.

The policy implications of this context are how financial incentives are employed. For example, if it is well established in consumers' minds that unnecessary antibiotic prescriptions are harmful, a social incentive may be enough to reduce antibiotic prescribing.

However, if consumers have different perceptions of antibiotic use, and many patients would rather be prescribed antibiotics when they don't need them, then using social incentives alone will only lead to side effects such as upcoding, and financial incentives to support providers to prescribe correctly are essential. In fact, HIRA introduced a pay-for-performance incentive for acute upper respiratory infection in 2014. After four years of operating the incentive programme, HIRA revamped the model in 2018, introducing a sliding scale for uplift and an absolute assessment model for downlift. In addition, HIRA continues to support antibiotic stewardship by providing pre-targets and increasing the incremental payment rate (HIRA, 2019).

Financial incentives for consumers. Financial incentives for consumers to encourage rational and appropriate use of health care are very common in health care, with out-of-pocket payments being a prime example (Mossialos et al., 2002). In general, out-of-pocket payments can work through an income effect to determine how much a service is used, or through a substitution effect to change the relative prices of different options.

The caesarean section policy discussed in Chapter 4 used both a provider-side incentive to increase the reimbursement cost of normal delivery and a consumer-side incentive to eliminate out-of-pocket payments for mothers who chose normal delivery. For mothers, the price of a normal delivery becomes relatively inexpensive, which may act as an incentive to choose it. While it is difficult to assess the effectiveness of each of these

incentives because they were implemented simultaneously, there is scope to introduce additional financial incentives from the demand side. For example, in South Korea, rooms that are used by fewer mothers may not be covered by insurance, and the health insurance system could consider covering the extra cost of a single-patient room or vouchers for postnatal care services.

Further research is needed, but the effectiveness of incentives may vary depending on whether they are applied at the group or physician level. Therefore, the design of incentive-based policies should align with the specific objectives, and more empirical analysis is needed in this regard.

Considering the fragmented health system and competition among primary care clinics in South Korea, enhancing collaboration among providers through social incentives may be challenging. The "competition for quality improvement" mechanism is crucial to public reporting. However, in highly competitive regions, it may lead to unintended consequences. In such cases, introducing a multi-level incentive structure could be considered. For example, applying various forms of naming and praising to individual practices and small regional units could foster peer effects and stimulate multiple activities to improve healthcare quality at the regional level.

Incentive and health system efficiency. Chapters 4 and 5 discuss how incentives can improve health system efficiency. The average length of stay per case in c-sections does not show a

statistically significant difference, but there is a clear downward trend. Intuitively, the length of stay for a c-section is about twice as long as for a normal delivery, so a significant reduction in c-section rates could represent a significant efficiency gain from a health system perspective. Furthermore, the saved beds can be assigned to other patients, resulting in increased efficiency in resource utilisation.

The stroke case study demonstrated that both incentives improved technical efficiency. Public reporting reduced the length of stay by 1.76 days, while the financial incentive programme reduced it by 2.28 days. The financial incentive programme also resulted in cost savings of over USD 400.

There is a clear role for good use of incentive programmes in increasing health system efficiency. However, in the case of financial incentives, insights into marginal benefit and cost-effectiveness are needed, as the cost of the incentive and the savings from the outcome are variable. Social incentives are a much more cost-effective tool because they have very low input costs other than policy development and administration. Nevertheless, social incentives need to be approached very carefully as they mobilise factors that cannot be easily replaced by monetary inputs, such as public trust and shame. Employing social incentives requires thorough and systematic preparation, as the hidden costs of failure are high and have the potential to significantly damage trust between governing bodies and providers in the long term.

2. Motivation and incentive

Mobilising the motivation of the group. What are the targeted policies using shaming? The target of policies utilising shaming is not the providers who previously had autonomous motivation but rather the zero-motivation group. The government has been providing feedback to each provider regarding antibiotic prescription rates for several years, even before public reporting. However, despite these efforts, numerous institutions still had antibiotic prescription rates exceeding 70%. In the case of caesarean section, even though public reporting was implemented in 2000, its effect was temporary, and there were still many institutions with C-section rates surpassing 50%. Rather than simply regarding them as "knaves" who do not understand or follow the policies, conducting a more in-depth analysis of the underlying causes and developing systematic measures based on this analysis is essential.

Among these providers, there are cases where there is little incentive to pay significant attention to antibiotic prescription rates because many patients are satisfied with high prescription rates. Conversely, there are cases where there are so few patients visiting the clinic that healthcare professionals cannot ignore their demands for antibiotic prescriptions. In such situations, providing economic incentives within the boundaries where healthcare professionals can practise at their discretion, along with patient education, is necessary. The challenge is that these circumstances may vary by region and specialty. Therefore, future research should conduct systematic interviews and surveys with

healthcare professionals and patients to understand their thoughts and situations before taking necessary actions.

Integrated motivation. One of the contributions of this thesis is on the role of integrated motivation, which refers to a state of motivation where individuals engage in an activity because they have integrated its value and importance into their sense of self and personal identity. In the context of the first antibiotic policy case, we document that a policy utilising social incentives had a compelling impact on the behaviour of health providers. However, it gives rise to unintended consequences, particularly when medical professionals who strongly adhere to professional norms are suddenly subjected to shaming. They tend to avoid shaming by utilising coding manipulation in ways that the principal cannot immediately observe, thus weakening the effectiveness of the policy. The extent of their strategic behaviour to avoid being shamed is influenced by how much they deviate from professional norms. Furthermore, coding manipulation violates another value held by medical professionals, namely clinical ethics or correctness. This outcome deviates significantly from the ideal external motivation type, such as controlled or introjected motivation, in the self-determination theory's motivation continuum.

A lesson from this thesis is that policymakers should not leave professionals to remain in this state by repeating the public reporting alone. If providers are perceived to be in such a state, not only would their understanding of the policy regarding antimicrobial

resistance (AMR) diminish, but they might also backfire by antagonising doctors with the policy often called as ‘reactance’ ("motivation to regain" their autonomy when they are reduced by policy)(Brehm and Brehm, 2013). It is because their autonomy regarding their own prescribing authority would be compromised, and they would experience damage to clinical ethics due to coding manipulation. Without other proactive activities, if repeated instances of public reporting alone were employed, the effectiveness would be dampened, and the possibility of sustaining adverse effects would also increase.

Even before the information disclosure, some providers who were already minimising antibiotic prescriptions were equipped with the knowledge that excessive prescription of antibiotics leads to unfavourable outcomes for patients. They were persuading and explaining to parents who demanded antibiotics, resulting in reduced prescription rates. Until the mid-2000s, hospitals and clinics sometimes received economic incentives from pharmaceutical companies or distributors based on prescription volume, although such practices were illegal. Despite the potential for financial incentives, these providers had been practising conscientiously. While these providers may not find joy or pleasure in prescribing fewer antibiotics, their motivation as doctors, which is to provide the best treatment for patients and adhere to the latest guidelines, has become integrated into their values. These providers are more likely to continue providing the care that they believe is the best for patients regardless of policy changes.

Among the healthcare professionals who were already prescribing antibiotics at a low rate before public reporting, they can be divided into several groups. There may be medical professionals who initially prescribed a high amount of antibiotics but were subsequently forced to lower their prescription rates against their will after receiving individual feedback. Alternatively, a group may have internalised the knowledge that high antibiotic prescription rates are medically unjustified and have social side effects. From the perspective of the self-determination continuum, the group that has fully internalised knowledge and values is more likely to maintain a consistently low prescription rate in the long run. Therefore, it is necessary to continue promoting the integration of policy values into the professional norms of these already low-prescribing groups, ensuring that the policy's value becomes their professional norm.

In fact, the use of naming and shaming as a strategy should be approached with great caution, as it places a burden on the relationship between the providers and the regulatory bodies. An alternative incentive that can be considered is the proactive use of well-developed positive feedback. Individual feedback has been used for several years concerning antibiotic use, and in October 2005, collective positive feedback through naming and praising was implemented. If there had been a better policy design with a longer-term perspective, clearly conveying the goals and values of the policy, and evaluating its impact, it might have been possible to achieve similar effects without resorting to naming and shaming, while also fostering more sustainable behaviour change.

3. Designing incentive programs in practice

Financial and social incentives can improve healthcare quality and increase health system efficiency. However, implementing these incentives in policy requires careful consideration of factors such as size, targeting, sequencing, and duration.

Size of incentives. Regarding the size of incentives, the crowding out effect is crucial (Lohmann et al., 2016, Frey and Jegen, 2001). Young and Conrad suggests that introducing modest incentives in pay-for-performance (P4P) programs reduces the crowding-out effect on intrinsic motivation and minimises the gamification of incentives (Young and Conrad, 2007). However, the size of incentives should also consider administrators' opportunities and administrative costs (Beaulieu and Horrigan, 2005).

When considering financial incentives for providers, it is necessary to consider the impact on income. Even if the incentive design is sophisticated, if the size of the incentive has a negligible impact on the individual, it may be concluded that the incentive is ineffective (Conrad and Perry, 2009). The same applies to financial incentives for groups or organisations. If the incentive is related to managing a particular disease, but its impact on the organisation's overall income is minimal, it is unlikely to have a significant effect. If it is unable to increase the incentive indefinitely, policy makers need to alter the way in which it is offered.

If it is challenging to implement individual unit incentives or if the policy is not cost-effective, consider altering the method of provider payments. For instance, the NHS has been using a blended payment system for general practice since 2004, where pay-for-performance constitutes at least 25% of the total payment. However, the effectiveness of incentives in improving quality is still uncertain as they become more extensive and intricate (Forbes et al., 2017).

A thoughtful approach is required when applying social incentives, considering the specific targets, scope, incentive size, and potential long-term effects. Continuous empirical analysis and evaluation can provide valuable insights into the effectiveness and sustainability of social incentive strategies in the healthcare system.

Group-based incentive for providers. From a health system perspective, careful consideration is needed regarding the targets and scope of applying social incentives. Previous research has reported limited effectiveness of group-level incentives (Petersen et al., 2006), while (Armour et al., 2001) argues that physician-level incentives are most effective. Additionally, (Sutton et al., 2012) suggests that the stronger the link between incentives and physicians' salaries, the more significant the impact of incentives.

The recipient of the financial incentive is crucial. For instance, if a physician in a solo practice reduces antibiotic prescribing rates, the incentive goes directly to them, creating a strong causal link between the incentive and the output. However, in a group practice, there

is no guarantee that the incentive will trickle down to the prescriber, unless the practice owner has a separate contract with the employer to incentivise prescribing rates. The same is true in the case of stroke management. As stroke management inherently occurs in large hospitals, there is no financial incentive to improve patient outcomes. Even if such incentives existed, they are unlikely to affect individual doctors' incentive structures.

If a competitive healthcare environment exists, team-based incentives should be considered. For example, incentives for local medical association is worth considering. instead of those that increase competition between individuals. Group incentives with local targets can reduce unnecessary competition between individuals and mitigate incentive side effects, such as upcoding. Local medical societies can use the funds to conduct trainings and seminars to strengthen internal motivation and improve public awareness by educating the local population about antibiotics.

Setting a target. When designing policies that involve incentives, it is essential to consider whether the target should be set in relative or absolute terms. Using a relative target can be advantageous for financial stability, as it allows for greater predictability of the required budget (Conrad and Perry, 2009). This is because both the incentive recipients and the scale can be determined during the policy design phase. Relative targets can be used even when a clear scientific target has not been set for a specific practice.

However, the use of relative values may lead to excessive competition among policy beneficiaries and result in side effects, as demonstrated in Chapter 3. Even providers who previously had exemplary antibiotic prescribing practices were found to engage in coding shifts when faced with continued competition, despite the implementation of the policy on disclosing prescription rates. Additionally, the use of relative value has limitations in objectively reflecting the patient population, their conditions, perceptions, and health-seeking behaviour in a given region.

Sequencing incentives. To ensure the greatest and most enduring impact, how should incentives be arranged? While the order in which incentives are introduced may vary depending on the country and context, it is important to consider introducing policies in a way that maximises intrinsic motivation, as this is key to the magnitude and sustainability of a given behaviour. For instance, it may be more suitable to promote intrinsic motivation through personal feedback rather than relying solely on financial incentives from the outset. Additionally, changing provider behaviour is a process that requires time, and it is crucial to allow providers sufficient time to engage in a cycle of reflection, commitment, behaviour change, trial and error, further feedback, and then continuation. In South Korea's case, they initially implemented individual feedback, followed by social incentives, and finally financial incentives.

Transitioning from individual feedback to social incentives requires advanced notice. While some providers may be motivated to change their behaviour by individual feedback, others may be hesitant. Therefore, some providers may choose to modify their behaviour to align with the implementation of social incentives. However, as demonstrated in chapters 3 and 4, public reporting relies on recent data, often from the previous year. Therefore, social incentives should be introduced with ample notice to allow for the capture of target behaviour in the data. Providing policy direction to providers and informing them of the introduction of social incentives, as well as the possibility of future financial incentives, can significantly inform their decisions. This approach also reduces the risk of unnecessary social shaming for providers who respond and cooperate with the policy, allowing them to make the most of their intrinsic motivation.

If these approaches do not achieve enough policy impact, financial incentives can be used. Financial incentives can be divided into three types: bonus-only, penalty-only, and hybrid. Unfortunately, there are not many studies comparing the effectiveness by the type and sequence of financial incentive. Recent systematic reviews showed that there were several large-scale incentive programs for hospitals and outpatient care. However, the studies included in this review do not allow for relative comparisons of the effects of different sequences of policies (Mathes et al., 2019, Milstein and Schreyoegg, 2016, Yuan et al., 2017). Further research is needed.

Sustainability of the incentives. More reflection and empirical analysis are needed to understand why many incentives show short-term outcomes but not long-term effects. It is important to remember that triggering intrinsic motivation effectively, as emphasised in Self-Determination Theory, can lead to more sustainable results (Deci and Ryan, 1985, Deci and Ryan, 2000).

Chapter 4 found that social incentives, particularly public reporting, are less effective when repeated for the same population using the same criteria. As shown in Table IV-A1, public reporting of cesarean deliveries has occurred almost every other year since 2000, but it has not included all providers, only a subset. In July 2006, HIRA began public reporting for about 63% of all birth centres, and as Figure IV-A8 shows, the effect was strong but faded after only one quarter. This appears to be a response by facilities that had not been included in public reporting in the past, and there is no research on why the effect did not persist. Further research is needed.

Heterogeneous impact of the social incentive across the issues. Policy makers need to consider the different ways in which social incentives work, depending on the nature of the target disease. Provider responsiveness to incentives is highest in cases where practices can be easily changed, such as antibiotic prescribing, through provider perceptions and decisions, and patient persuasion. For instance, opting for patient education instead of prescribing antibiotics is a simple change that can be easily implemented if healthcare providers are

willing to do so. Therefore, policy goals can be relatively easy to achieve if providers are motivated.

However, social incentives may not be as effective in improving outputs and outcomes in cases where care requires significant human and material resources. As demonstrated in the case of stroke, social incentives have little impact. In acute and emergency situations, the emergency medical service decides which hospital to go to, usually based on pre-designated locations. In this case, the consumer's choice is not possible, so social incentives, such as public reporting, do not work well. The only way for social incentives to work in these cases is for local patient groups or civil society organizations to exert their political power.

4. Health system and incentives

Although the incentive design is crucial, it is also important to consider how it interacts with other health system elements. Additionally, governance should be taken into account, including the adjustment of the incentive structure, the evaluation process, and the responsible parties.

***Health system structure and incentives*.** In countries with a public healthcare system, well-organized policies can have a significant impact. For instance, limiting the number of caesarean sections that publicly employed doctors can perform in a year or providing

individual feedback or performance reviews for doctors with excessive caesarean section rates can have a powerful effect. However, in South Korea, where healthcare is dominated by private practice, it can be challenging for incentives to be effective. As discussed in Chapter 3, overuse of incentives can have negative consequences.

If incentives are not producing the desired results, it is possible that the issue is being addressed in a different area than the one targeted by the incentive. For example, in the case of stroke, if the government introduced incentives but the proportion of patients arriving within the 'golden hour' remained unchanged, and patient outcomes would not improve. As seen in Chapter 5, stroke management had a significant effect on the output measure, but there was no improvement in short-term mortality, and only some improvement in 365-day mortality. Comprehensive interventions are needed in various areas that affect the quality of care in the prehospital phase. These include awareness campaigns, emergency medical services, medical direction, and paramedic training. Incentives may also be introduced to support these interventions.

Governing incentive programs. The governance of the incentive structure is critical. Incentives can have a powerful and immediate impact on human motivation, leading to strong reactions. In addition, unintended side effects may occur. It is therefore important to have mechanisms in place for the review and, if necessary, adjustment of incentives in order

to avoid a distorted health care structure. The role of governance in this regard is multifaceted.

Firstly, consulting on the impact of policies before implementation can be beneficial. In Chapter 3, the government implemented the first public reporting of antibiotic use within a month of the court decision. Proper consultation prior to policy implementation could have prevented embarrassing consequences, such as upcoding. Extensive communication should precede the implementation of sensitive policies within existing governance.

Even with policy implementation, governance still plays a crucial role in improving the implementation of incentive programs by engaging providers. Maintaining good governance can lead to quick correction of side effects. This can increase provider satisfaction with the responsiveness of the governing body and promote internal motivation rather than external motivation as policy targets. For instance, in Chapter 3, the coding shift was sustained for a considerable period of time, which is an example of the failure.

Legal environment and incentives. The legal environment should support healthcare providers in which the incentive works. As explained in the previous chapter, healthcare providers' behaviour is influenced not only by finances and social image but also by the laws surrounding medical practice. For instance, if a physician is sued for performing a high-risk medical procedure, such as a high-risk surgery or delivery, they may be forced to practice defensively or, in some cases, leave the field.

In South Korea, the rate of c-sections is high. To reduce this rate, incentive programmes should be introduced. However, if the legal risks of delayed c-sections remain high, these incentives may not be effective. In 2023, a recent case in South Korea required an emergency C-section due to placenta previa. Delayed action resulted in a compensation judgement of over 800 million won. Medical errors are always a risk, even in the best healthcare systems. Large verdicts for delayed C-sections can have a significant impact on the daily practice of many doctors.

In South Korea, obtaining evidence for a medical malpractice case can be difficult for patients and their families, leading to the frequent use of criminal proceedings. Medical staff may be affected by criminal proceedings, regardless of negligence. To reduce c-sections, governments should examine the associated litigation risks and align policies with incentives for medical litigation.

Policy communication matters. In the case of South Korea, individual feedback was implemented for about five years before the introduction of public reporting. However, it is difficult to categorise such individual feedback as successful when we look at the trends. To find the clue, it is necessary to investigate the way of communication. As social norms and professional norms differ, there should also be differences in how policies use these norms.

Understanding the target audience's characteristics, having a trusted messenger, and the content of the message are important factors that influence communication effectiveness

(Rickard, 2021). Providers experiencing the same policy can significantly vary in age, region, experience, specialties, and graduation year. Their perception of the public risk of AMR, response methods, and belief in the efficacy of individual efforts can vary. Therefore, understanding the characteristics of the target audience is crucial.

Next is the importance of the messenger. Intuitively, a credible leader should deliver the message, and we have experienced the varying effects of this even during the pandemic period (Nielsen and Lindvall, 2021). Especially when dealing with professional norms, it can be more complex to determine who should deliver the message with what authority compared to appealing to general social norms. The government can officially incorporate the authority of professional societies into its operations by appointing individuals recognised within the professional society as Medical Officers within government agencies. In the UK, Chief Medical Officers within government agencies are professionals trusted by medical associations. The government can leverage the clinical authority of the Chief Medical Officer (CMO) to communicate policies to medical professionals and encourage their cooperation. This approach allows the government to tap into the CMO's credibility and expertise to convey policy messages effectively. By involving the CMO in policy communication, the government can enhance the legitimacy and influence of the feedback provided to individual medical professionals.

Since the separation of prescribing and dispensing in South Korea in 2000, there has been an increased distance between medical professionals and the government. In this

context, it is necessary to consider how effective feedback sent in the name of the head of HIRA, responsible for such feedback and public reporting, would be. Currently, the head of HIRA has virtually no recognition or authority within the clinical group. Therefore, using a feedback mechanism requires careful consideration of who the most credible messenger would be for the medical community in South Korea and which method of message delivery would be best. Additionally, trust in such credible messengers is crucial in policy communication (Davies et al., 2021), necessitating great caution, and further research can be conducted to confirm this.

The composition of the message can also affect the quality of policy communication. According to the advice of researchers who provided guidelines for public health communication during the COVID-19 situation (Bonell et al., 2020), utilising behavioural science's accumulated knowledge and experience of behavioural science seems highly useful. For example, the message "protect each other" in the COVID-19 context is a form of communication that can create collective identity formation and supportive social values. In the past, feedback on antibiotic prescribing only showed personal performance and the average performance of surrounding providers, and the approach involved awarding frames or awards to providers with good performance. While such systems are undoubtedly necessary, there is a need for message development that is more effective based on communication theory. For instance, it is essential to shift the focus from extrinsic incentives to more integrated motivation by using various approaches such as "protector of patients

and the community" or "guardian of antibiotics for future generations." Appealing to the solidarity of healthcare professionals to address the "efficacy failure" that acknowledges that individual behaviour change cannot solve the entire AMR issue could also be a viable approach.

Chapter VII. Conclusion

South Korea has made various efforts to achieve universal health coverage parallel to rapid economic growth in the 1970s. In the late 1980s, South Korea achieved national health insurance, and the number of providers increased rapidly. Throughout this process, a long-term blueprint for the development of the optimal and sustainable health system was not in sight to be produced. Maximising volume to generate revenue became the almost sole incentive structure for many providers under a low-reimbursement structure to maintain the sustainability of health financing. Intrinsic motivation or integrated external motivation that providers experience, including the sense of achievement, satisfaction, and pride derived from caring for patients, was relatively weakened over time. While misaligned motivation may have led to a high output of individual services, it resulted in various unintended consequences in the healthcare system starting in the 1990s—unnecessary prescription of antibiotics, unnecessary c-sections, and low acute care quality, to name a few.

In the 2000s, various policies were implemented by the government, academia, and civil society to address the side effects of integrating multiple social health insurance schemes. These policies predominantly focused on utilising social and financial incentives. However, reforms were designed hastily without carefully calculated consideration of

incentives for healthcare professionals and institutions. As a result, while there was partial success, new unintended consequences emerged.

The goal of this thesis is to evaluate three significant policies that took place in the mid-2000s, with the aim of deeply reflecting on how future incentive-related policies should be designed and what key factors need to be further considered. Over the next 30 years, South Korea is predicted to experience a phenomenal old-age dependency ratio, which will engender a steep rise in medical costs and a heavy burden on the citizens of the younger generation. To ensure the sustainability and efficiency of medical financing, it is critical to introduce incentives in an attempt to change the behaviour of providers and consumers through various policy measures, including the use of economic and social incentives in designing policy interventions. This thesis has contracted the knowledge on this matter, and more specifically, we can add to the literature as follows:

Firstly, the disclosure policy has been shown to be effective in a variety of social policy settings and is credited with drastically reducing antibiotic prescription rates in South Korea. However, in this paper, we show that the rapid introduction of the policy led providers to behave strategically to overcome the effects of shame. In particular, the so-called coding shift occurred actively among medical staff with a history of high antibiotic prescription rates and in departments with a high incidence of acute respiratory diseases that were subject to disclosure. In addition, it was confirmed that the prescription rate for broad-spectrum antibiotics did not decrease because the policy solely focused on the prescription rate itself.

These findings show that medical staff are subject to different social pressures depending on the degree of deviation from the norm shared by the professional society, but not all medical staff chose the ideal method and the reduced prescription rate, and some even opted to choose the socially undesirable method. In this chapter, we use the theory of motivational change to explore ways of reducing these side effects.

Secondly, we document that monetary incentives can be used to prevent unnecessary c-sections. We found that healthcare challenges stemming from the structure of healthcare system, particularly fee-setting, can be addressed by policies that correct the incentive structure. Even when the size of the monetary incentive was not large enough to hire a single provider, small clinics increased their staffing levels. On the hand, providers responded temporarily to public disclosure of c-section rates using social incentives, but the effect was not sustained. The behaviour change that requires additional investment is difficult to sustain with social incentives alone.

Finally, we found that financial incentives were effective in reducing long-term mortality from acute severe illness. In addition, financial incentives reduced length of stay, which caused cost reduction. Social incentives had no significant effect on short- and long-term mortality reduction, but had a positive effect on length of stay reduction and cost reduction. In this case, we can see that social incentives are not enough to improve the care process, which requires a large input of human and material resources, but financial

incentives are essential. Even if the size of the financial incentive is not large, it triggers positive change.

S-frame rather than i-frame. Recently, researchers have been arguing that simply constructing individual-level "choice architecture," also known as an individual frame (i-frame), is not a cost-effective approach to addressing social issues. Instead, they advocate for policy designs that improve the system (s-frame) in which individuals operate, complementing the behavioural limitations of human beings through behavioural science (Chater and Loewenstein, 2022).

In the first case, with regard to setting of the i-frame, if we aim to change patients' preference system so that providers who prescribe fewer antibiotics are perceived as "better providers" at least in terms of antibiotic use, it is necessary to incentivize such behaviour. It is true that it is convenient for both doctors and patients to simply resort to antibiotics prescription and conclude the matter. However, it requires significant effort for doctors to offer detailed explanations to patients, convince them that the use of immediate antibiotics is not necessary, and ensure their understanding of this matter. One way to address this is to design a system that rewards such efforts, such as providing additional compensation for lengthy and detailed consultations within the fee structure.

In the second case, there can be multiple approaches to the s-frame, but a crucial aspect involves implementing measures that can prevent situations where a doctor's social

reputation is at stake due to the death of an infant or a mother. For example, reducing the statutory deadline for medical malpractice lawsuits pertaining to unforeseeable, unavoidable accidents and separating compensation for risk factors, which are incorporated in the health insurance fee determination, into a nationwide insurance system. This approach would help distribute the possibility of the risk arising from legal issues among doctors, thereby establshing a foundation for the effective operation of monetary and social incentives.

In the third case as well, prior to implementing public reporting, systematic and comprehensive support is needed, including enhancingthe perception of local residents, pre-hospital management, investment in hospital personnel and facilities, and post-discharge management.

In summary, to achieve effective policy design, it is necessary not only to construct an i-frame but also to construct an s-frame that allows stakeholders to create social value.

Policy recommendations. Based on this evidence, the following are necessary for the development of health policy in South Korea. The first is the reform of the Healthcare Policy Review Board. As we have seen, South Korea's healthcare system has been structured in a way that addresses emerging issues without providing a systematic, long-term direction. Rather than having a consensual direction for healthcare reform among healthcare providers, the government, and the public, each has pursued its own interests, and there has been no

space for interest groups with a desire for healthcare reform to make their voices heard. This lack of governance has led, for example in the first case, to civil society organisations suing the government to disclose institutions with high rates of antibiotic prescribing, and led to sharp policy changes as a result, leading to various coding shifts and damage to providers' professional identities.

It is essential to establish a system to coordinate opinions and reconcile interests over health policy, just as the 1970s healthcare plan was developed and stakeholder interests were reconciled through the Healthcare Policy Review Commission. To establish this system, certain amendments to the Enforcement Decree are necessary. These amendments involve restructuring the composition of the Healthcare Policy Review Committee, changing vice ministers of government ministries with stakeholders in health policy. Additionally, the formation of a dedicated working group is necessary to identify and prioritise gaps in the Korean healthcare system.

Second, it is critical to actively engage more social science expertise at the policy design stage. For example, policies that exploit so-called social and professional identities, such as public reporting, are likely to have powerful effects, but they are also likely to yield side effects, such as coding shifts. In order to avoid such loopholes, it is imperative to think extensively about the scope, who, how, and when of the policy and to introduce it carefully. For example, the policies should also be designed in a way that promotes the autonomy of medical professionals, based on psychological theories that reinforce understanding of

intrinsic human motivation. In addition to extrinsic motivation, it is necessary to set the pace and direction of the policy so that those affected can concur with the policy objectives and integrate them with their professional values.

Lastly, it is crucial to ensure that government agencies have the capacity to communicate policy. In the context where healthcare providers face significant equity investments in establishing medical institutions and the pressure to maximize volume for profit generation and repayment of investment costs, aligning incentives becomes a complex task if the goals of a new policy contradict the existing incentive structure. Effective and sophisticated communication is crucial to aligning incentives in such contexts. However, the current situation in South Korea is not favourable for such policy communication because trust between the government and medical associations has been damaged in the past through high-profile cases such as the separation of prescribing and dispensing in 2000. In addition, HIRA, which oversees healthcare quality, is forced to take on the role of a villain who must cut back and prevent fee-for-service from mismanaging medical resources. In this environment, inadequate policy communication is likely to exacerbate antagonism, and disincentives are likely to be met with heavy backlash. To address these issues, it is imperative to build the communication capacity of government agencies.

Limitations. The thesis has some limitations. The first is the data issue. For example, in Chapter 5, we dealt with a stroke case, and while we had no difficulty in obtaining mortality

rates, we were unable to observe the impact of the intervention on functional recovery. Such a result occurred because the analysis is predominantly based on health insurance claims data. To solve this problem, we searched for another dataset, and found the "Korean Stroke Registry" to be a valid candidate dataset. It has been run since 2001 by the Korean Stroke Association with the Korean Disease Control and Prevention Agency and has accumulated approximately 300,000 cases to date. One limitation is that it is based on voluntary participation from 92 hospitals, so it does not include data from smaller hospitals. To address these issues in the future, we need to consider improved strategies for data collection and management.

Another limitation regarding the data is that they do not capture the "willingness to treat" of patients and their families. For example, in the case of stroke, there are many families who opt to forgo treatment for financial reasons due to the long duration of the disease, and health insurance data lack variables to identify this social environment. Also, in the case of elderly patients, mortality can vary substantially depending on whether they have a DNR (do not resuscitate), which is not currently recorded in the data. With the implementation of the Law on End-of-Life Decisions in 2018, people who wish to express their DNR preferences are required to register with the National Health Insurance Service. In the future, we believe it is necessary to include DNR status in health insurance data, which will render more sophisticated estimates of policy effects.

Lastly, this thesis relies entirely on quantitative research. It would have been invaluable to interview groups that had different responses to the policy through qualitative research to have their voices heard and reflected in the policy.

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