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Abstract

Background

This study evaluates the 2014 hospital reform in Ireland, which allowed public hospitals to accommodate private patients in public wards. There were widespread concerns that this reform might incentivise public consultants to prioritise private patients over public ones. However, what was overlooked by the general public is that consultants are bound by contract terms: for every treated private patient, they must treat an additional three to four public patients.

Methods

We utilise nationwide administrative hospital inpatient discharge record data from 2009 to 2015, with 2,323,600 observations. We employ a difference-in-differences method to empirically evaluate the impacts of the 2014 reform on hospital admissions, the ratio of private patients, patients' length of stay, and mortality rate.

Findings

Contrary to the concerns expressed by the general public and media, we do not find evidence that more proportion of private patients were treated. Actually, we demonstrate that the reform positively impacted public patients by increasing their admission rates and improving treatment efficiency. Additionally, these benefits did not come at the expense of their quality of care.

Interpretation

We propose that the success of the 2014 reform can be attributed to the fact that Irish consultants are bound by their contract terms, which dictate a specific ratio of private to public patients. This study provides valuable policy insights, suggesting that permitting private practice within public hospitals could incentivise consultants to treat more public patients, which can be socially beneficial, as long as their contracts are well-designed.

1. Introduction

In many countries, healthcare spending has become a pressing concern. According to the OECD (2023a), the average annual real growth of health expenditure per capita stood at 3.4% in 2019, while the average growth of GDP per capita lagged behind at only 1.5%. To augment the income of hospitals and thus alleviate the strain on public finances, various countries have permitted public hospitals to offer services to individuals with private health insurance (PHI).[1, 2] Specifically, these private patients typically pay a premium for services at public hospitals, receiving benefits such as exclusive wards and expedited outpatient consultations (OECD, 2018).[3] Ireland stands among the nations that enable specialists at public hospitals to provide care to private patients within the same public facilities (Nolan, 2006; HSE, 2008). Nevertheless, the practice of providing private healthcare within public hospitals has long been a contentious issue (Wren and Connolly, 2019). On the one hand, this provision of private care offers advantages such as boosting the profits for both consultants and public hospitals.[4] However, on the other hand, from the viewpoint of public patients, this private practice can potentially lead to longer waiting times and delayed care. Therefore, for countries that incorporate private practices within their public hospitals, there is a trade-off between the additional income generated from private patients and ensuring timely care for public patients.

In 2013, with a target of increasing the revenue from private inpatients in public hospitals (HSE, 2014), Ireland announced *the Health (Amendment) Act 2013*, effective from January 2014 (so-called *the 2014 Public Hospitals' Wards Reform*).[5] The reform fundamentally changed the ward allocation in public hospitals by offering public consultants increased flexibility to engage in private practice. Specifically, prior to this reform, public inpatients were typically accommodated in shared public wards, while private patients were confined to separate, single

[1] The provision of private care within public hospitals is not unique to Ireland. Actually, it is also observed in other countries, including the UK, France (Paris et al., 2010), Indonesia (González et al., 2018), Australia (Shmueli and Savage, 2014), and China.

[2] Some countries permit public practice within private hospitals, which involves government contracting with the private sector to treat patients covered by public funding. For instance, this approach is used in the UK, as noted by Pérotin (2013).

[3] In this paper, the definition of a "private patient" is based on the actual sources of payment. If a patient with PHI attends a public hospital and does not use their PHI, they will be classified as a public patient.

[4] Allowing private care in public settings can make public positions more appealing (García-Prado and González, 2007). Moreover, it may also motivate public consultants to treat more public patients and enhance the quality of care when consultants use their public services to increase their prestige for private care (González, 2004).

[5] The original law document is available here:
https://www.irishstatutebook.ie/eli/2013/act/31/enacted/en/print#sec9

private wards.[6] However, starting in 2014, the distinction in bed designation was eliminated (Comptroller and Auditor General, 2018), and the clear separation between public and private wards ceased to exist (OECD, 2018). In other words, since 2014, public hospitals have been allowed to admit and treat private patients in public beds (Keegan et al., 2018; Flood, 2021). A report by the OECD (2018) mentions that the income from private patients in Irish public hospitals increased by about 20% in 2014, compared to 2013. This reform sparked widespread debate and concern, with fears that private patients might take over beds previously designated for public patients. Media outlets like The Independent (2014) reflected public anxiety over the possibility that the reform would cause private patients to be prioritised and would exacerbate public waiting lists.

However, the general public and media might overlook two pieces of important background information about this reform. Firstly, since 2008, most public consultants in Ireland have been bound by their contract terms, stipulating that the proportion of private patients they can treat must not exceed 20% (or 30%) of their total patient caseload (Appendix B provides details of consultants' contracts). This means that for every private patient they wish to treat, they must treat an additional three or four public patients. Consequently, public consultants may be actually motivated to treat more patients, both public and private. Secondly, due to the 2008 financial crisis, Irish public hospitals experienced a reduction in bed capacity (Walsh et al., 2022; Thomas et al., 2014). This means that any observed reduction in the number of admissions could be due to reduced bed capacity rather than the impact of the policy. Therefore, this paper takes into account these two crucial pieces of background information and addresses the following research question: After ruling out potential confounding factors and considering relevant motivations from the consultants' contracts, did the reform actually discourage public consultants from treating public inpatients?

We employ a difference-in-differences (DiD) approach to empirically evaluate the causal impact of the reform on the outcomes of public patients. Specifically, we compare the patients admitted via the Emergency Department (ED) to those admitted electively. The rationale is that admissions via ED to public hospitals are primarily based on medical necessity rather than their private insurance status.[7,]

[6] This may have exceptions. For example, Beaumont Hospital (2009) states that, in some situations where a private ward is not available, a private patient may be placed in a public bed temporarily. However, this patient will be transferred to a private ward at the earliest time.

[7] For the admission criteria in the ED, see: https://www2.hse.ie/emergencies/the-emergency-department-ed/. Keegan et al. (2018) report that approximately 19% of emergency inpatient services involve private patients, compared to 26% for elective inpatients. This disparity provides side-evidence suggesting that consultants may prefer to admit private patients via elective admissions. Murphy et al. (2020) mention that private patients admitted under emergency

[8] Therefore, we consider that *the 2014 reform* only impacted patients who were admitted electively. In addition, we include hospital-by-year fixed effects to capture any potential bias caused by declining hospital bed capacity over the period. Our aggregate analysis at the level of hospital departments indicates that the proportion of private patients did not significantly change due to the reform. Conversely, the number of admitted public patients increased by about 20%. This finding aligns with the analysis at the individual level, which shows that for both private and public patients, their Length of Stay (LOS) significantly decreased by approximately 0.4-0.5 days. According to Little's Law, these reductions in LOS for both patient groups suggest that the number of public patients increased. Specifically, when consultants are motivated to treat more patients, they tend to expedite care, resulting in a shorter LOS. This result holds up under placebo tests and various robustness checks. Furthermore, we find that this decrease in LOS did not compromise patient outcomes (measured by mortality rates). Therefore, contrary to public and media concerns, our findings demonstrate that giving consultants the flexibility to treat private patients in public hospitals can be socially beneficial if their contracts are appropriately designed.

The structure of this paper is outlined as follows: Section 2 presents the dataset and summary statistics. Section 3 describes the analysis methods, including the empirical strategies and the application of Little's Law. Section 4 discusses the analysis results at both the aggregated hospital department level and the individual level. Section 5 is dedicated to checking the robustness of the results. Section 6 explores the heterogeneous impacts. Lastly, Section 7 concludes.

2. Data

Studying the impact of the 2014 hospital reform in Ireland requires detailed data on both individuals' and hospitals' levels. We use the Hospital In-Patient Enquiry (HIPE) dataset, a comprehensive administrative inpatient micro dataset at the hospital record level provided by the Healthcare Pricing Office (HPO) in Ireland. All acute public hospitals in Ireland participate in HIPE. The HIPE dataset contains demographic, clinical and administrative data on discharges from, and deaths in, acute public hospitals in the country.

circumstances do not receive certain benefits typically afforded to them, such as the choice of consultant or access to a private bed.

[8] In Australia, a similar situation exists where, although private patients generally have quicker access to public hospitals, the advantage diminishes in patients' medical urgency (Shmueli and Savage, 2014).

The timeframe selected for our research spans from January 2009 to December 2015. We choose 2009 as starting point to avoid any confounding effects in 2008: the reduction in the number of hospital beds due to the financial crisis and a reform to consultants' contracts. Our end point is in 2015 to avoid the effect of the Activity-Based Funding payment system reform in 2016 (Valentelyte et al., 2022). Our dataset initially contains 64 hospitals. We exclude 15 hospitals either because they had closed or because they underwent restructuring or reorganisation of services during the study period. We focus on adult inpatients. We exclude data pertaining to maternity care, day cases treatment, overseas patients, and certain public hospitals that underwent structural changes during the study period.[9] After data cleaning, there are 2,323,600 observations from 49 hospitals. Table 1 shows the summary statistics.

Table 1: Descriptive Statistics

	N	Mean	Std. Dev.	Min	Max
Outcome Variables					
Length of Stay (LOS)	2,323,600	6.462	7.818	0.5	34
Death (dummy)	2,323,600	0.03	0.169	0	1
Main Explanatory Variables					
Post (dummy, =1 if since 2014)	2,323,600	0.275	0.447	0	1
ELE (dummy, =1 if admitted electively)	2,323,600	0.26	0.439	0	1
Other Variables					
Male (dummy)	2,323,600	0.506	0.5	0	1
Public (dummy)	2,323,600	0.775	0.418	0	1
Has medical card (dummy)	2,323,600	0.606	0.489	0	1
Experienced ITU (dummy)	2,323,600	0.08	0.271	0	1
Married (dummy)	2,323,600	0.472	0.5	0	1
Diagnosed by senior consultants (dummy)	2,323,600	0.736	0.442	0	1
Experienced procedure by a consultant (dummy)	2,323,600	0.727	0.446	0	1
Experienced procedure by a senior consultant (dummy)	2,323,600	0.532	0.5	0	1
Complexity (1-4)	1,902,549	3.178	0.541	1	4
Age Groups	**N**	**Proportion**			
Overall	2,323,600	100%			
Group 1 (18-27)	196,013	8%			
Group 2 (28-47)	494,743	21%			

[9] The 2014 reform was targeted on inpatient care. Therefore, we concentrate on inpatients admitted to hospital wards. We exclude day cases from our analysis since our length of stay (LOS) value is in discreet days and day cases typically do not require an overnight stay in a bed. In the robustness check, we also control for the complexity of patients' illnesses in our evaluation of their LOS, in order to take account of the possibility that hospitals might reclassify the status of some mildly ill patients—who should have been treated as inpatients—to day-cases.

Group 3 (48-67)	721,514	31%
Group 4 (68-87)	807,311	35%
Group 5 (88+)	104,019	4%

Figure 1 below shows the monthly percentage of private patients in public hospitals admitted electively or via ED from January 2009 to December 2015. We observe an overall decline in the share of private patients admitted through elective admissions.[10] On average, the proportion of private patients admitted electively was 28% prior to the 2014 reform. This fell to 27% post-reform. This trend in the raw data does not support the concern of the general public that consultants would treat a higher percentage of private patients owing to the reform. The proportion of private patients admitted via ED also declined slightly over the period from 21% to 20%. Additionally, the proportion in the ED was relatively lower and more stable over the period, validating our hypothesis that the 2014 reform did not affect consultants' admission behaviours in ED.

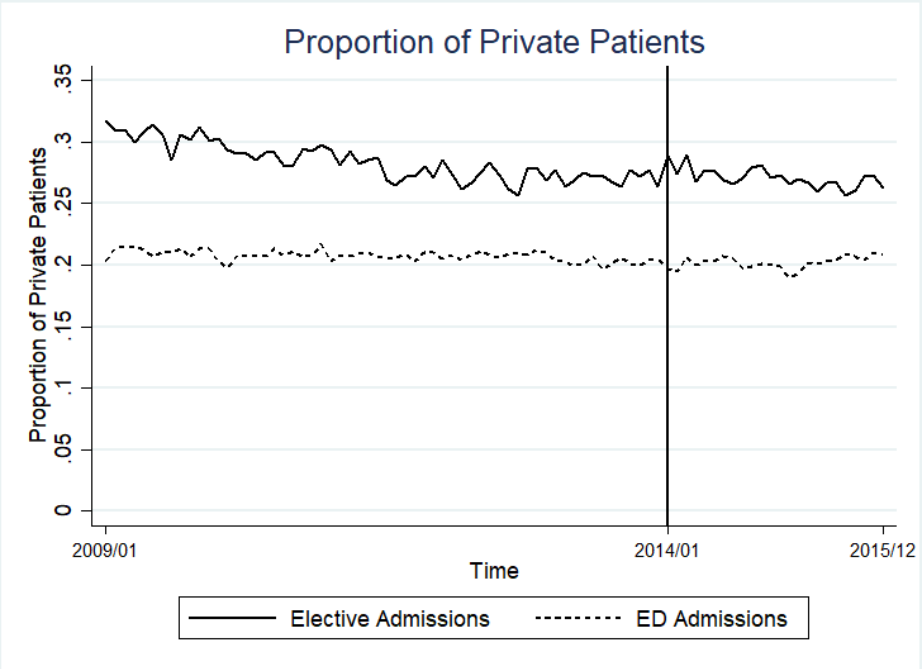

Figure 1: The proportion of private patients admitted via ED and admitted electively

Figure 2 below presents the total number of inpatient admissions per month over the period, categorised by their types of admission. Generally, it is evident that ED

[10] The decreasing trend of proportion of private patients who admitted electively is owing to a voluntary contract reform in 2008 aiming to reduce the public waiting list. Whyte et al. (2020) find there is no evidence supporting that the 2008 reform reduced the waiting time gap between public and private patients. Thus, to avoid of any confounding impact of the 2008 reform, we restrict our sample to since 2009.

admissions dominate the number of inpatient admissions in Irish public hospitals, a finding that aligns with literature (Keegan et al., 2018). The trends for patients admitted electively and through the ED are relatively stable and consistent over time. In particular, prior to 2014, the average monthly count of elective admissions (excluding day-cases etc.) was 7,270. This figure declined to 6,930 following the reform. For ED admissions, the numbers were 20,828 before 2014 and declined to 19,644 afterwards. However, it is important to note that Ireland had been reducing the bed capacity in public hospitals dramatically since 2008. Therefore, with declining capacity, Irish public hospitals have been managing nearly the same volume of patients, indicating that efficiency has been improving over time.

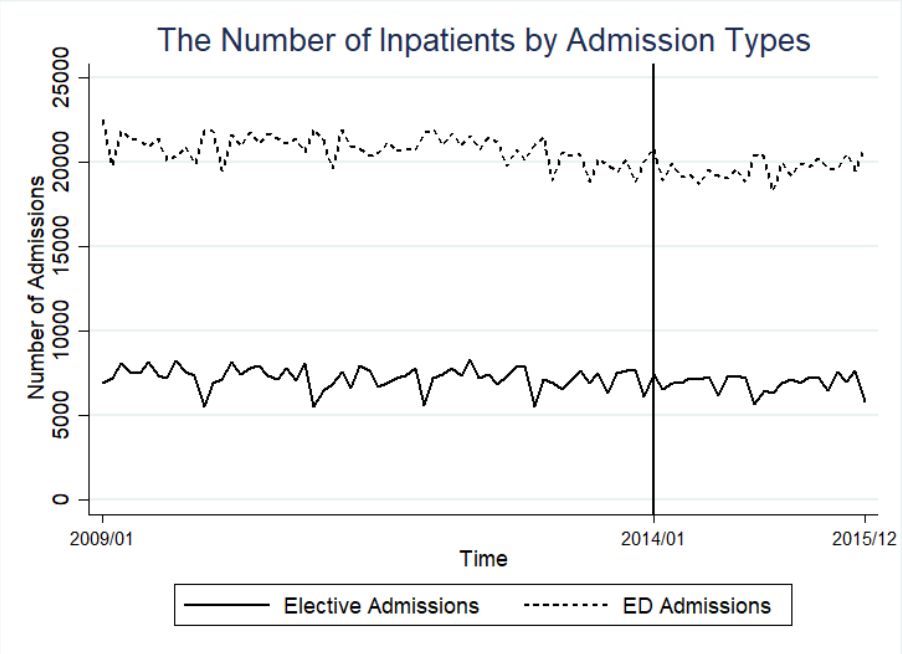

Figure 2: The number of inpatients admitted via ED and admitted electively

Figure 3 below displays the average LOS for inpatients, segmented by their types of admission. The LOS for both admission categories decreased over the period. Specifically, the LOS for elective admissions was 5.73 days before the reform, falling to 5.62 days afterwards. For inpatients admitted via ED, the LOS was 6.71 days on average prior to the reform and changed to 6.78 days after the reform.

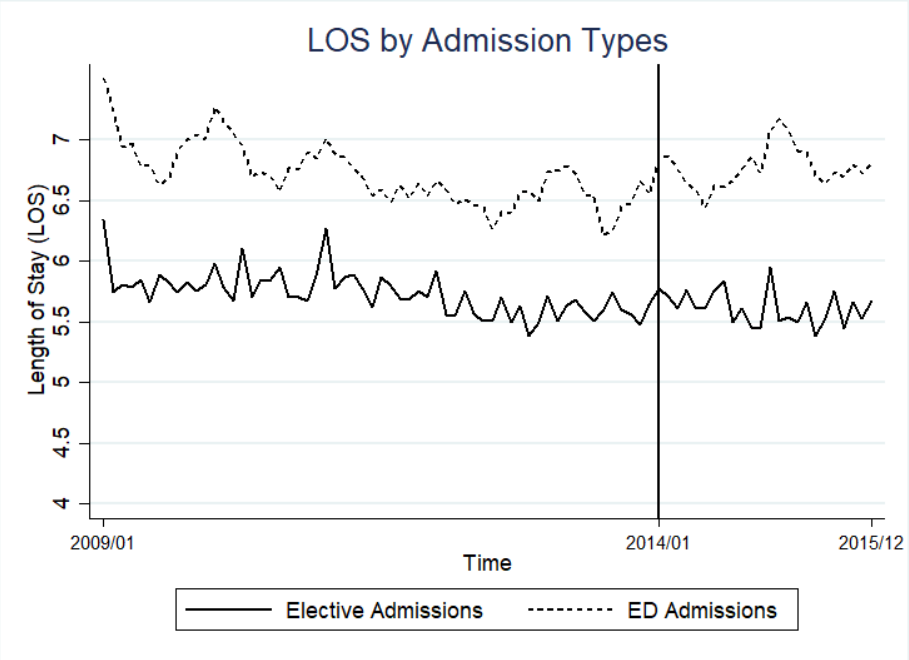

Figure 3: The mean LOS of inpatients admitted via ED and admitted electively

It is important to note that this aforementioned descriptive information does not equate to empirical evidence for assessing the causal impact of the 2014 reform. This is because the above figures of raw data encompass various confounding factors, including technological improvements, as well as reductions in bed capacity and staff.

3. Method

3.1 Analysis on the hospital departments level

We use a difference-in-differences approach to address endogenous issues. Specifically, we consider each hospital to be comprised of two departments. The "elective department" encompasses patients admitted on an elective basis, designated as the "treatment group". Conversely, the "emergency department" consists of patients admitted via the ED, identified as the "control group". The rationale is that within ED, the primary criterion of admission is patient's medical needs, rather than private insurance status or source of payment. We first compare the proportion of private patients between "elective department" and "emergency department", before and after the 2014 reform. The regression function is shown as follows:

$$Y_{d,h,t} = \alpha_0 + \alpha_1 ELE_d + \alpha_2 POST \cdot ELE_d + \theta_t + \theta_y \cdot \lambda_h + \boldsymbol{X_{d,h,t}} \cdot \boldsymbol{\gamma} + \varepsilon_{d,h,t}. \quad (1)$$

The variable $Y_{d,h,t}$ represents the outcome of department d of hospital h in time t. Our analysis focuses on two key outcome indicators: the proportion of private

patients and the total number of admitted public patients. We introduce the dummy variable $ELE_d = 1$ to identify departments classified as "elective department". The dummy variable $POST = 1$ is used to distinguish observations made in the year 2014 or later. Furthermore, considering that hospital departments might handle different types of patients differently in different periods, we incorporate a set of time-varying control variables $\boldsymbol{X_{d,h,t}}$ at the level of the hospital's department. These variables encompass a variety of metrics such as the average gender ratio, age group distribution, private insurance coverage, medical card holder proportion, rate of ICU experience, marital status, rate of senior consultant presence, procedural frequencies, the rate of procedures conducted by senior consultants, and the distribution across Major Diagnostic Categories (MDC). To capture temporal influences such as the population growth and the development of technology, we include time fixed effects θ_t. To account for different characteristics across hospitals which may vary annually, such as changes in bed capacity and staffing levels, we introduce hospital-by-year fixed effects, captured by $\theta_y \cdot \lambda_h$.

3.2 Analysis on the individual level (inpatient records)

As previously discussed, after cleaning the data, we are left with only 49 hospitals which may skew our findings. Besides, the accuracy of our admissions data is confounded by reductions in bed capacity over the period. Thus, to mitigate the distortions caused by bed capacity limitations and to expand the dataset for analysis, we concentrate on the second approach, which analyses the impact of the reform at the individual level. In particular, this method makes good use of our detailed information on individual patients' characteristics, their hospital outcomes (including their LOS), as well as their discharge outcomes (either discharged or died). In particular, we apply Little's Law to link the number of admissions and the LOS of each individual.[11] The basic form of Little's Law is given by

$$N = nL, \tag{2}$$

where N represents the bed capacity of a hospital, and n is the number of treated patients in a unit of time, and L is the average length of stay. The intuition of Little's Law is straightforward: given the capacity of a hospital, if we want more patients to be treated, we have to decrease the average LOS. The assumption of Little's Law is that the hospital is running run at capacity (see Appendix D for the justification).

[11] According to queuing theory, Little's Law states that $L = \lambda W$. It means that given the capacity L, the number of people in the queuing system (λ) is negatively correlated with the average time that each individual spends in the system (W). See Little (1961) for the proof.

We apply Little's Law to both private and public sectors before the 2014 reform. Specifically, suppose the bed capacity for public patients is A, and the number of treated public patients is a, and the average LOS of public patients is L_a. Similarly, we have bed capacity for private patients, the number of treated private patients, and the average LOS of private patients are B, b, and L_b respectively. The rationale behind this setting is that, the private wards and public wards were separate before the 2014 reform. Specifically, we have

$$A = aL_a, \tag{3}$$

and

$$B = bL_b. \tag{4}$$

Besides, the consultant is also subject to the constraint of the proportion of private patients, which is

$$a \geq \gamma b. \tag{5}$$

The above constraint means that for each treated private patient, this consultant needs to see additional γ public patients at least.

Proposition 1:

If there is an increase in the number of treated private patients, then it must be associated with an increase in the number of treated public patients.

Proof: This is directly implied by equation (5). ■

The 2014 reform removed the distinction between the private wards and public wards. Therefore, for the period after 2014, we update Little's Law by looking regard the hospital as a whole:

$$A + B = (a + b)\frac{aL_a + bL_b}{a + b}, \tag{6}$$

where $A + B$ is the total bed capacity of the hospital and $(a + b)$ is the total number of admissions, while $\frac{aL_a+bL_b}{a+b}$ is the average LOS of the hospital. We could rewrite equation (6) as

$$A + B = aL_a + bL_b. \tag{7}$$

Proposition 2:

Given the hospital's capacity (A+B), if there are decreases in the length of stay for both public and private patients (L_a and L_b), then they must be associated with

increase in the number of public admissions (a).

Proof: If we only have a decrease in L_a, we cannot be sure of the change direction of a, because an increase in L_b can also make above equation (7) holds. Similarly, a solo increase in L_b does not provide sufficient inference as well. But if we have decreases in both L_a and L_b, then to ensure the equation (7) holds, we must have either an increase in a, or both increases in a and b (we cannot have a solo increase in b, which has been proved according to Proposition 1). ■

In other words, Proposition 2 shows that a simultaneous decrease in the LOS for both public and private patients must be associated with an increase in public patient admissions. The reasoning is straightforward: a reduction in LOS suggests that each patient's treatment duration is shortened, implying that hospitals have additional capacity to treat more patients. Furthermore, due to the contractual obligations of consultants (20:80 or 30:70 ratio), there must be an increase in the number of treated public patients. Therefore, to empirically test whether this reform leads to more public patients being treated, we will focus on the LOS of both private and public patients. The regression function is shown as follows:

$$LOS_i = \beta_0 + \beta_1 ELE_i + \beta_2 POST \cdot ELE_i + \theta_t + \theta_y \cdot \lambda_h + \boldsymbol{Z_i} \cdot \boldsymbol{\delta} + \varepsilon_i. \quad (8)$$

The outcome variable LOS_i represents the LOS of medical record i. The dummy variable $ELE_i = 1$ if this individual was admitted electively. The metrics $\boldsymbol{Z_i}$ capture individual's characteristics, including gender, age group, marital status, specialty category, MDC, and whether the patient is a public patient, has a medical card, has experienced the intensive care unit, was diagnosed by consultants hired prior to 2008, and underwent procedures (and if so, whether these were performed by consultants hired prior to 2008). Previous fixed effects also apply.

4. Results

4.1 The impact on the proportion of private patients

As shown in Column 1 of Table 2, our findings indicate that the reform does not change the proportion of private patients in the "elective department", compared to that of the "emergency department". Consequently, there is no evidence supporting the concern that public consultants would treat a larger fraction of private patients and that public patients were crowded out due to the reform. As a robustness check, we exclude the smallest 10% of hospitals (5 out of 49) based on their average admission numbers, as shown in column 2 of Table 2. We still

observed similar outcomes. This outcome is due to consultants adhering to the 20:80 or 30:70 ratio stipulated in their contracts, which prevents them from seeing an increased share of private patients.

Table 2. Proportion of Private Patients

	Without dropping small hospitals	Dropping 5 small hospitals
	(1)	(2)
Elective	0.007	0.009
	(0.010)	(0.011)
Elective × Post	−0.003	−0.007
	(0.006)	(0.006)
Observations	7,270	6,831

*Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the level of hospital department. All models include Year × Month fixed effects, and Hospital × Year fixed effects, as well as hospital department's time-varying characteristics (sex ratio, age group ratio, private insurance ratio, medical card ratio, ICU experience ratio, married ratio, senior consultant ratio, procedure ratio, experienced procedure by senior consultants ratio, and ratios of each MDC).*

4.2 The impact on the number of public admissions

Column 1 of Table 3 illustrates that, after controlling for other factors (including changes in bed capacity by employing hospital-by-year fixed effects), the reform resulted in a significant 20.5% increase in public admissions in the "elective department" compared to the "emergency department". To address any concerns that this increase might be predominantly observed in smaller hospitals, we conduct a robustness check by excluding the smallest 10% of hospitals based on their average admission numbers and we still observed similar outcomes, shown in column 2 of Table 3.

Table 3. Number of Public Admissions (Logarithms)

	Without dropping small hospitals	Dropping 5 small hospitals
	(1)	(2)
Elective	−0.224	−0.203
	(0.288)	(0.312)
Elective × Post	0.205**	0.215**
	(0.088)	(0.095)
Observations	7,231	6,811

*Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the level of hospital department. All models include Year × Month fixed effects, and Hospital × Year fixed effects, as well as hospital department's time-varying characteristics (sex ratio, age group ratio, medical card ratio, ICU experience ratio, married ratio, senior consultant ratio, procedure ratio, experienced procedure by senior consultants ratio, and ratios of each MDC).*

4.3 The impact on the LOS of patients

The most important part is the analysis at the individual level, which examines the effect of the 2014 reform on patients' LOS. Unlike the analysis of admission numbers, the LOS analysis for each patient is less susceptible to the change in bed capacity. This approach is grounded in Little's Law, which posits that observed reductions in LOS for both private and public patients imply an increase in public admissions. With further consideration of patient's characteristics, Table 4 below indicates that the 2014 reform significantly shortened the LOS of all patients by about 0.5 days on average.

Table 4. Impact on the Length of Stay of Inpatients

	Length of Stay			
	(1)	(2)	(3)	(4)
Elective	−1.556***	−2.106***	−2.095***	−2.094***
	(0.173)	(0.141)	(0.140)	(0.140)
Elective × Post	−0.198	−0.287**	−0.496***	−0.498***
	(0.184)	(0.125)	(0.078)	(0.077)
Observations	2,323,600	2,323,600	2,323,600	2,323,600
Hospital FE	Yes	Yes	No	No
Year × Month FE	Yes	Yes	Yes	No
Hospital × Year FE	No	No	Yes	Yes
Controls	No	Yes	Yes	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the level of hospital. Controls: sex, age group, marital status, specialty category, MDC, and whether the patient is a public patient, has a medical card, has experienced the intensive care unit, was diagnosed by consultants hired prior to 2008, and underwent procedures (and if so, whether these were performed by consultants hired prior to 2008).

Table 5 shows that, the 2014 reform shortened the LOS of both private and public patients, by approximately 0.46 and 0.50 days, respectively. Figures 4 and 5 depict the dynamic effects of this reform on the LOS of public and private patients respectively: there was no significant "treatment effect" on patients' LOS prior to 2014, but the reform significantly reduced patients' LOS afterwards, for both private and public patients. Therefore, based on Little's Law, the individual-level analysis of LOS also confirms that the reform effectively increased the number of public admissions.

Table 5. Heterogeneous Effects on Public and Private Patients

	Length of Stay		
	Public	Private	DiDiD
Elective	−2.212***	−1.805***	−1.981***
	(0.153)	(0.152)	(0.153)

Elective × Post	−0.461***	−0.497***	−0.587***
	(0.093)	(0.098)	(0.119)
Elective × Post × Public			0.139
			(0.146)
Observations	1,800,123	523,477	2,323,600

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the level of hospital. All models include Year × Month fixed effects, Hospital × Year fixed effects, and control variables. Control variables include sex, age group, marital status, specialty category, MDC, and whether the patient is a public patient, has a medical card, has experienced the intensive care unit, was diagnosed by consultants hired prior to 2008, and underwent procedures (and if so, whether these were performed by consultants hired prior to 2008).

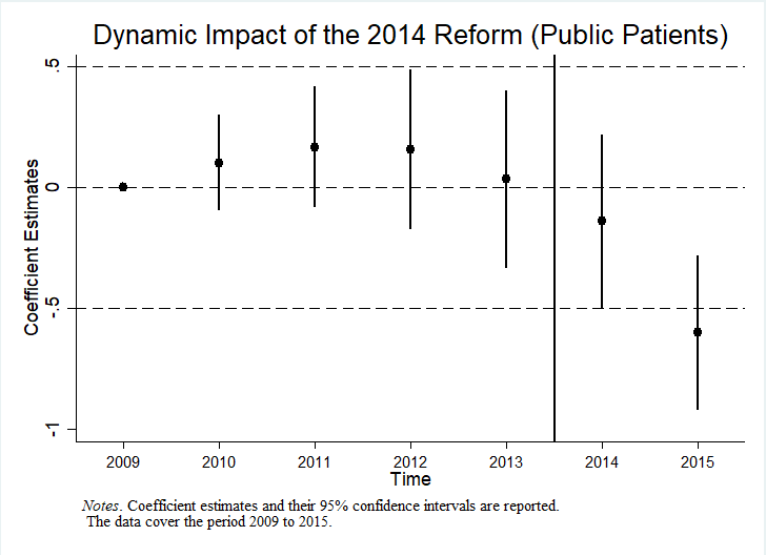

Figure 4: The dynamic impact of the 2014 reform on the LOS of public patients

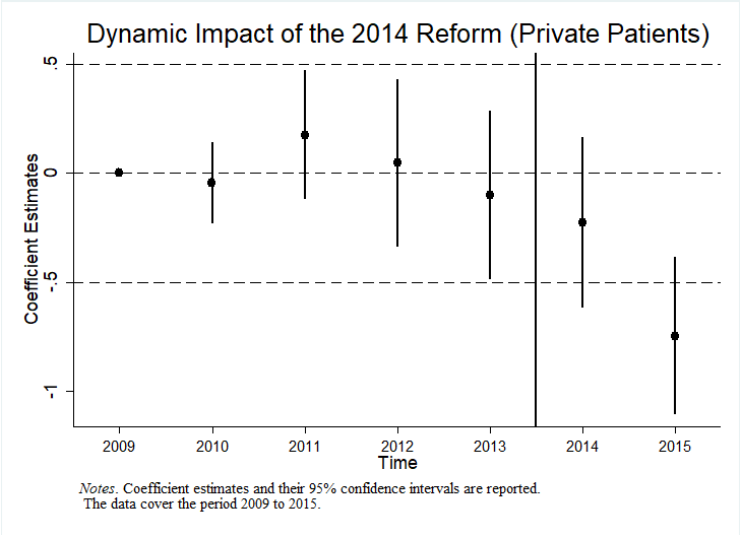

Figure 5: The dynamic impact of the 2014 reform on the LOS of private patients

5. Robustness Checks

To further ensure the stability and robustness of the results, we have implemented several checks to mitigate any factors that might potentially skew our results. Firstly, we divide the sample into two subgroups according to specialties. The first subgroup comprises patients treated by consultants specialising in radiology, radiotherapy, and anaesthetics. We hypothesise that consultants in these fields are less affected by private practice due to the nature of their work, and thus their patients are less likely to be impacted by the reform. The second subgroup includes patients under the care of other specialties. In line with our expectations, Table 6 shows that there is no significant impact on the LOS in the first subgroup, while a noticeable policy impact is still evident in the second subgroup.

Table 6. Radiotherapy Consultants vs. Other Consultants

	Length of Stay		
	Baseline (overall sample)	Radiotherapy, Radiology, and Anaesthetics	All other specialties
Elective	−2.095***	3.497**	−2.146***
	(0.140)	(1.252)	(0.129)
Elective × Post	−0.496***	−0.330	−0.497***
	(0.078)	(0.417)	(0.076)
Observations	2,323,600	17,504	2,306,096

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered by hospital. All models include Year × Month fixed effects, Hospital × Year fixed effects, and control variables. Control variables include sex, age group, marital status, specialty category, MDC, and whether the patient is a public patient, has a medical card, has experienced the intensive care unit, was diagnosed by consultants hired prior to 2008, and underwent procedures (and if so, whether these were performed by consultants hired prior to 2008).

Secondly, Walsh et al. (2022) suggest that the LOS in hospitals is positively correlated with the availability of hospital beds. This raises a question: Is the observed decrease in LOS a result of the 2014 reform, or is it due to the reduction in the bed capacity of Irish hospitals since 2008? Our primary model has incorporated hospital-by-year fixed effects, which account for annual variations in each hospital, including bed capacity and the number of support staff. To further rule out any confounding factors that happened before 2014 (e.g., the reduction of the bed capacity since 2008), thereby skewing our findings, we have also carried out a series of placebo tests. We limit our data to the pre-reform period (February 2009 to November 2013) and re-run our primary regression analysis for every conceivable implementation month (58 regressions in total). If any significant results are observed before 2014, it may suggest that the apparent treatment effects are not due to the 2014 reform, but rather to other factors that occurred earlier, such as the reduction in bed capacity. After testing each possible falsified

implementation time, we consistently find that all these results are insignificant, thereby reinforcing the reliability of our primary findings (see Table A1 of Appendix A for results).

Thirdly, another concern is whether the shortened LOS indicates a decline in the quality of care. Ideally, hospital quality metrics like the 30-day readmission rate is the preferred measure. However, due to the unavailability of this variable, we have to opt for the second-best option: the probability of death, as a proxy for the quality of care. We reanalyse the impact of the 2014 reform on mortality rates. In Table 7, our findings show no evidence that the reduced LOS compromises care quality, as indicated by data from the overall patient sample, as well as subsets of public and private patients.

Table 7. Impact on the Probability of Death

	Probability of Death		
	Overall	Public Patients	Private Patients
Elective	−0.0187***	−0.0201***	−0.0146***
	(0.0015)	(0.0017)	(0.0010)
Elective × Post	0.0006	0.0013	−0.0008
	(0.0008)	(0.0009)	(0.0010)
Observations	2,323,600	1,800,123	523,477
Mean	0.0294	0.0319	0.0206

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered by hospital. All models include Year × Month fixed effects, Hospital × Year fixed effects, and control variables. Control variables include sex, age group, marital status, specialty category, MDC, and whether the patient is a public patient, has a medical card, has experienced the intensive care unit, was diagnosed by consultants hired prior to 2008, and underwent procedures (and if so, whether these were performed by consultants hired prior to 2008).

Fourthly, another issue is the difference in severity of illness between patients admitted through the ED and those admitted on an elective basis, raising questions about their comparability. In fact, even though the LOS between ED admissions and elective admissions differs significantly, as long as their pre-trends are parallel and there are no spill-over effects, the use of the difference-in-differences methodology remains reliable. Initially, as depicted in Figure 3, the LOS trends for both the treatment and control groups run almost parallel before 2014, indicating their comparability. Figures 4 and 5 further support the assumption of parallel trends with empirical evidence. Moreover, the nature of illnesses typically differs between patients admitted via ED and those electively admitted, suggesting a reduced likelihood of spill-over effects (see Appendix C for the composition of ED admissions before and after the 2014 reform). Additionally, to address this concern comprehensively, we also categorise the complexity of

illnesses according to patients' Diagnosis-Related Group (DRG) codes and adjust for this factor in our analysis. Table 8 shows that, despite a small reduction in the magnitude, a significant decrease in LOS for both public and private patients remains.

Table 8. Control for Complexity of Illness

	Length of Stay		
	Overall	Public Patients	Private Patients
Elective	−1.655***	−1.728***	−1.478***
	(0.152)	(0.153)	(0.182)
Elective × Post	−0.395***	−0.393***	−0.361***
	(0.092)	(0.107)	(0.102)
Observations	1,902,549	1,476,819	425,730

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered by hospital. All models include Year × Month fixed effects, Hospital × Year fixed effects, and control variables. Control variables include sex, age group, marital status, specialty category, MDC, and whether the patient is a public patient, has a medical card, has experienced the intensive care unit, was diagnosed by consultants hired prior to 2008, and underwent procedures (and if so, whether these were performed by consultants hired prior to 2008), and the complexity of illness.

6. Heterogeneous Impacts

Our research examines the varied effects on patients' LOS across different MDC, excluding the categories for pregnancy and newborns. Specifically, as illustrated in Table 9 below, we observe a notable reduction in LOS within the categories of ear, nose, mouth, and throat (ENMT), circulatory, digestive, hepatobiliary, musculoskeletal, kidney, male, female, neoplastic, and injuries. The two exceptions are the alcohol and burns categories.

Table 9. Heterogeneous Effects on LOS across MDC

Nervous	−0.654	Skin	−0.233	Neoplastic	−0.762**
	(0.418)		(0.141)		(0.350)
	[207,036]		[139,611]		[43,433]
	{89.75%}		{66.21%}		{43.59%}
Eye	0.214	Endocrine	−0.279	Infectious	0.048
	(0.280)		(0.199)		(0.357)
	[29,387]		[68,670]		[47,078]
	{46.98%}		{70.73%}		{93.92%}
ENMT	−0.356***	Kidney	−0.457***	Mental	0.863
	(0.086)		(0.094)		(1.127)
	[84,607]		[203,181]		[13,482]
	{60.72%}		{78.21%}		{82.52%}
Respiratory	−0.500	Male	−0.597***	Alcohol	2.257***
	(0.307)		(0.152)		(0.581)

	[408,518]		[34,705]		[18,834]
	{87.16%}		{46.03%}		{92.19%}
Circulatory	−0.543***	Female	−0.507***	Injuries	−0.856**
	(0.190)		(0.076)		(0.321)
	[521,939]		[117,623]		[99,805]
	{83.89%}		{33.98%}		{97.14%}
Digestive	−0.308**	Pregnancy	−	Burns	1.527**
	(0.139)		−		(0.702)
	[458,161]		−		[3,385]
	{79.26%}		−		{87.00%}
Hepatobiliary	−0.569**	Newborns	−	Factors	−0.393
	(0.217)		−		(0.467)
	[140,544]		−		[83,172]
	{68.31%}		−		{21.34%}
Musculus	−1.134**	Blood	0.028		
	(0.120)		(0.162)		
	[380,586]		[37,042]		
	{63.40%}		{77.03%}		

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Only coefficients of interest are reported. Standard errors (in parentheses) are clustered by hospital. The number of observations is shown in square brackets. The percentage of ED admissions is shown in curly brackets. All models include Year × Month fixed effects, Hospital × Year fixed effects, and control variables. Controls: sex, age group, marital status, specialty category, and whether the patient is a public patient, has a medical card, has experienced the intensive care unit, was diagnosed by consultants hired prior to 2008, and underwent procedures (and if so, whether these were performed by consultants hired prior to 2008).

Furthermore, we investigate whether the reform's effects vary among consultants of differing seniority levels. We classify consultants hired before 2008 as "the senior group" and those hired from 2008 onwards as "the junior group". The two groups have different incentives, meaning that it is unclear what result we should expect ex ante. On one side, junior consultants could be incentivised to see more patients than the senior group, as junior consultants are in through treating a higher number of patients (González, 2004). On the other hand, senior consultants would be more significantly affected. This is because that their private fees are higher, thus providing a greater incentive to treat a larger patient base. Referring to Table 10, we observe that the impact on the junior group is marginally higher yet not statistically significant. This suggests that the policy impacts within both groups are almost identical.

	Length of Stay		
	The junior group	The senior group	DiDiD
Elective	−0.212***	−2.043***	−2.158***
	(0.176)	(0.139)	(0.173)
Elective × Post	−0.551***	−0.439***	−0.526***
	(0.098)	(0.093)	(0.120)

Elective × Post × Senior			0.066
			(0.140)
Observations	615,626	1,707,974	2,323,600

Table 10. Junior Consultants vs. Senior Consultants

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the level of hospital. All models include Year × Month fixed effects, and Hospital × Year fixed effects. Controls: sex, age group, marital status, specialty category, MDC, and whether the patient is a public patient, has a medical card, has experienced the intensive care unit, and underwent procedures (and if so, whether these were performed by consultants hired prior to 2008).

7. Conclusion

This paper empirically investigates the outcome of the 2014 hospital reform in Ireland, and addresses the public concerns that consultants may prioritise private patients. Theoretically and empirically, we do not find evidence supporting the above concern. On the contrary, this paper reveals that the 2014 reform reduced the LOS for both public and private patients, suggesting an increase in the number of public patients receiving treatment in Irish public hospitals. This outcome can be attributed to the consultant's contract constraints. Specifically, to treat an additional private patient, consultants are obliged by their contract to treat an additional three or four public patients, thereby enhancing work efficiency in public hospitals and leading to a decreased LOS for all patients. Additionally, our findings indicate that the reform achieves Pareto efficiency, implying that the increase in public patient numbers does not come at the expense of other parties or patients' outcomes, as evidenced by the unchanged probability of death. Therefore, allowing consultants some flexibility in treating private patients, when properly managed and contractually regulated, can be an effective way to enhance their motivation to treat both private and public patients.

The existing literature indicates that previously, Irish hospitals were prioritising private patients over public ones, reducing healthcare access for public patients. Considering the period from 2000 to 2004, O'Reilly and Wiley's (2010) find that both private and public hospital beds were underutilised, indicating potential for better resource allocation. They also noted an increasing trend in the over-utilisation of private beds compared to public beds, suggesting a displacement of public patients by private ones. While the insights from O'Reilly and Wiley (2010) are valuable, their analysed period may not accurately represent current dynamics due to subsequent policy changes. During their studying period, there was no explicit cap in consultants' contracts on the ratio of private to public patients, which was later set at 20:80 following the 2008 reform. This introduction of a cap on the ratio of private to public patients treated by consultants fundamentally altered the incentives and behaviours of healthcare providers. Our

study builds on this updated background and adds significant value by evaluating the 2014 healthcare reform in a new context where the 20:80 ratio was enforced. This examination allows us to argue that with proper restrictions on consultants' private practice, allowing the treatment of private patients in shared public wards could be more efficient. This suggests that well-regulated private practice within public healthcare settings can enhance resource utilisation without compromising public patient care.

Recently, Burke et al. (2021) state that since 2017, Ireland has been contemplating the implementation of a healthcare program called "Sláintecare", aimed at achieving universal healthcare and ensuring equitable access to public hospital care. A key component of "Sláintecare" is the radical elimination of private practice within public hospitals. This intention has been strengthened since COVID-19 pandemic. Specifically, on May 31, 2021, a new contract for public consultants was introduced, mandating that consultants employed by the state must engage solely in public practice (Burke et al., 2021). According to our findings, while "Sláintecare" is well-intentioned in its goals of universal and equal access to care, there could be room for improvement. We recognise that allowing consultants to engage in private practice could offer them financial incentives to see more private patients. However, with proper design and management of consultants' contracts, this could yield better outcomes. For instance, a requirement could be set where for every private patient treated, consultants must treat four public patients. This would mean that consultants seeking additional income from private practice would also contribute to reducing public patient waiting lists.

In contrast to the current "Sláintecare" reform in Ireland, some countries are allowing private practices within public hospitals, subject to stringent regulations. For instance, public hospitals in Singapore permit patients to opt for private wards, but these are not covered by the government's subsidies (Kim, 2004; Yip and Hsiao, 2014). Since May 29, 2024, Anhui province in China has promoted "special-needs" services in public hospitals, a concept which is similar to private practice within public hospitals in Ireland, including inpatient, outpatient, and body check services (Health Commission of Anhui Province, 2024). Meanwhile, the document also emphasises that these private "special-needs" services should not constitute more than 10% of the total medical services provided by the hospitals. Greece implemented two significant health reforms concerning private practice, thoroughly summarised by Tountas et al. (2002). The first reform took place in 1983, aimed primarily at separating the public and private sectors. This reform prohibited doctors working in public hospitals from engaging in private practices. However, the reform led to unintended consequences, including the emergence of

a black market for healthcare services, which resulted in serious health inequality and widespread dissatisfaction among citizens. To address these issues, Greece introduced a second reform in 2000, which allowed doctors in any hospital to treat private patients during the afternoon and evening. This change was designed to enhance the efficiency of public hospitals, boost their competitiveness, and provide additional financial resources for both doctors and hospitals. The reform also included strict regulations ensuring that the percentage of private beds did not exceed 20%.

A proper regulation of private workload within contract may not be enough, it is also crucial to note that if private care within public hospitals is permitted, health authorities must ensure the maintenance of care quality. Goodair and Reeves (2014) review studies on the impact of healthcare privatisation on the quality of care and find that, although hospital efficiency (such as the volume of treatments provided or the duration of patient stays) improved, there is generally a negative correlation between hospital privatisation and the quality of care. Implementing proper measures to monitor quality, such as tracking re-admission rates and mortality rates within 14 days of discharge, can be effective in minimising the risks associated with early discharges.

This study has several limitations which remain for future research. Firstly, we lack an ideal measure of care quality, such as readmission rates. Thus, we have to rely on the second-best option which is mortality rates. Although mortality rates can reflect the quality of care for critically ill patients, they may not accurately represent the care quality for those with milder illnesses. Secondly, our analysis is confined to public hospitals, omitting the potential strategic decisions of patients eligible for treatment in private hospitals. For instance, patients with very good private insurance, might be unsatisfied with being allocated to shared public wards, and thus go to private hospitals (Murphy et al., 2020). Despite lacking data on private hospital usage, we believe this does not undermine our findings. Typically, individuals with extensive private health insurance (by extension, greater wealth) are likely to have better nutrition and can recover more quickly. Thus, taking these patients who went to private hospitals into consideration will likely to make our estimated reduction in LOS more pronounced. In other words, our estimated LOS is a conservative result. Thirdly, examining the effects of this reform on the private health insurance market is also worthwhile. Turner (2015) investigates the short-term impact of the 2014 reform on the premiums of private health insurance and posits that the reform led to an increase in premiums. One main reason Turner (2015) mentions is that private health insurers now have to cover costs for private patients who are accommodated in public wards.[12] This

[12] It is crucial to highlight that our paper adopts a different definition of private patients compared

highlights a potential avenue for future research: to explore the longer-term impacts on the insurance market, and the consequent changes in consumer surplus from a welfare perspective.

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to Turner (2015). Our classification depends on the source of actual bill payment, whereas Turner's (2015) definition is based on whether individuals have private health insurance. For instance, prior to the 2014 reform, individuals with private health insurance who opted not to use it, such as those placed in public wards with the Irish government covering their bed costs, are categorised as "public patients" in our study. In contrast, Turner (2015) classifies these individuals as "private patients".

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Appendix

Appendix A. Placebo tests

Table A1: Placebo Test

Year 2009					
2009.01	–	2009.05	0.068	2009.09	0.031
	–		(0.100)		(0.100)
2009.02	−0.069	2009.06	0.044	2009.10	0.030
	(0.140)		(0.104)		(0.098)
2009.03	0.061	2009.07	0.063	2009.11	0.042
	(0.110)		(0.100)		(0.099)
2009.04	0.070	2009.08	0.033	2009.12	0.067
	(0.098)		(0.095)		(0.106)
Year 2010					
2010.01	0.077	2010.05	0.073	2010.09	0.027
	(0.115)		(0.116)		(0.116)
2010.02	0.064	2010.06	0.060	2010.10	0.031
	(0.114)		(0.117)		(0.111)
2010.03	0.070	2010.07	0.050	2010.11	0.035
	(0.117)		(0.117)		(0.110)

2010.04	0.090	2010.08	0.049	2010.12	0.048
	(0.113)		(0.117)		(0.114)
Year 2011					
2011.01	0.054	2011.05	0.016	2011.09	−0.015
	(0.115)		(0.118)		(0.120)
2011.02	0.035	2011.06	0.008	2011.10	−0.014
	(0.116)		(0.121)		(0.116)
2011.03	0.032	2011.07	0.001	2011.11	−0.014
	(0.114)		(0.122)		(0.116)
2011.04	0.021	2011.08	0.010	2011.12	−0.024
	(0.116)		(0.120)		(0.115)
Year 2012					
2012.01	−0.028	2012.05	−0.082	2012.09	−0.091
	(0.112)		(0.099)		(0.097)
2012.02	−0.044	2012.06	−0.087	2012.10	−0.101
	(0.108)		(0.097)		(0.099)
2012.03	−0.052	2012.07	−0.083	2012.11	−0.111
	(0.104)		(0.096)		(0.101)
2012.04	−0.066	2012.08	−0.091	2012.12	−0.104
	(0.101)		(0.095)		(0.101)
Year 2013					
2013.01	−0.104	2013.05	−0.101	2013.09	−0.136
	(0.099)		(0.107)		(0.118)
2013.02	−0.102	2013.06	−0.089	2013.10	−0.151
	(0.098)		(0.110)		(0.120)
2013.03	−0.093	2013.07	0.080	2013.11	−0.157
	(0.100)		(0.108)		(0.121)
2013.04	−0.095	2013.08	0.117	2013.12	–
	(0.102)		(0.114)		–

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Only coefficients of interest are reported. Standard errors (in parentheses) are clustered by hospital. Controls: sex, age group, marital status, specialty category, MDC, whether the patient is a public patient, has a medical card, has experienced the intensive care unit, was diagnosed by consultants hired prior to 2008, and underwent procedures (and if so, whether these were performed by consultants hired prior to 2008), year × month fixed effects, hospital × year fixed effects.

One potential concern is that the reduction in LOS estimated by our baseline regression may not be attributable to the policy itself but to the reduced bed capacity since 2008. In other words, the increased efficiency observed among consultants might primarily stem from the pressures of reduced bed capacity. However, we believe this concern is unlikely to significantly impact our results. As noted, our baseline results include interaction terms of hospital fixed effects and year fixed effects, which should capture the annual changes in bed capacity at each specific hospital. To further address this concern, we conduct placebo tests for our baseline regression results. Specifically, we limit our sample to the time range before the policy was implemented, from January 2009 to December 2013. We then set a fictitious policy implementation time for each potential year and month. Since the policy implementation times are fictitious, we expect the coefficients of the estimates to be insignificant. The results shown in Table A1 confirm that the coefficients are indeed insignificant for every fictitious implementation time.

Appendix B. More information about *the 2008 Consultants' Contact Reform*

The 2008 Consultants' Contact Reform, placed limitations on the private practices of public

consultants (Whyte et al., 2020). Specifically, since 2008, any newly recruited consultant wishing to engage in private practice is limited to a 20:80 ratio, meaning that private patients can only constitute up to 20% of their total caseload. For consultants recruited before 2008, this ratio is set at 30%. In other words, for every private inpatient, the consultant is required to treat at least four additional public patients to comply with their contract.

Appendix C. Composition of ED admissions before and after the 2014 reform.

Another concern is the potential shift in the composition of ED admissions due to the 2014 reform. In other words, there might be a possibility that patients who would typically be admitted to the hospital through elective admissions may instead present at the ED. However, this scenario is unlikely because ED admissions are strictly governed by medical necessity. For instance, a patient needing a hip replacement would typically not use the ED (unless it is an emergency), as other cases like strokes or heart attacks are prioritised. Nevertheless, to address this concern thoroughly, we analyse the composition of ED admissions and find that it has remained stable, which is documented in Table C1 below.

Table C1: Composition of ED Admissions

	Before 2014	**Since 2014**
Outcome variables		
Length of Stay (days)	6.711 (7.925)	6.775 (8.083)
Death (dummy)	0.037 (0.188)	0.037 (0.188)
Characteristics		
Male (dummy)	0.514 (0.500)	0.512 (0.500)
Public (dummy)	0.793 (0.405)	0.798 (0.401)
Has medical card (dummy)	0.614 (0.487)	0.630 (0.483)
Married (dummy)	0.445 (0.497)	0.446 (0.497)
Severity of illness		

Experienced ITU (dummy)	0.083 (0.276)	0.080 (0.271)
Complexity (1-4)	3.179 (0.544)	3.256 (0.568)

Notes: Standard deviations are in parentheses.

Appendix D. Trends of Hospital Beds and Occupancy Rate in Ireland

Figure D1 below illustrates the trends of bed capacity and occupancy rates in Ireland from 2000 to 2021. The blue columns represent the bed capacity, based on Statista.com (2024). The patterns in this dataset are consistent with existing findings by Mercille (2018). Notably, Ireland significantly reduced its bed capacity after 2008. During the research period 2009-2015 (indicated by the green dashed area), the bed capacity remained relatively stable, although there has been a slight upward trend in bed capacity in 2015. According to Walsh et al. (2022), LOS is positively correlated with bed capacity. This suggests that, theoretically, LOS should have increased post-2014, contrary to the decrease observed in our empirical findings. Therefore, our estimates should be considered a conservative lower bound, implying that the actual impact of the reform might be more substantial.

The red line with dots in the figure represents the occupancy rates in Ireland, with data sourced from the OECD (2024). It can be observed that since 2009, the occupancy rates have consistently remained above 90% almost every year. This finding aligns with additional evidence. According to the HOPE report (2017), Ireland's occupancy rate in 2013 was over 93.3%, the highest among the 28 European Member States. Similarly, the OECD (2015) report states that Ireland's occupancy rate was the second highest within OECD countries in 2013. Walsh et al. (2019) note that in 2015, the occupancy rate nearly reached 95%, ranking it first within OECD countries. More recently, an OECD report (2023b) reveals that Ireland's occupancy rate in 2021 was around 90%, maintaining its top ranking among OECD countries. These consistently high occupancy rates in Irish hospitals support the assumption made under Little's Law that the hospital is operating at full capacity.

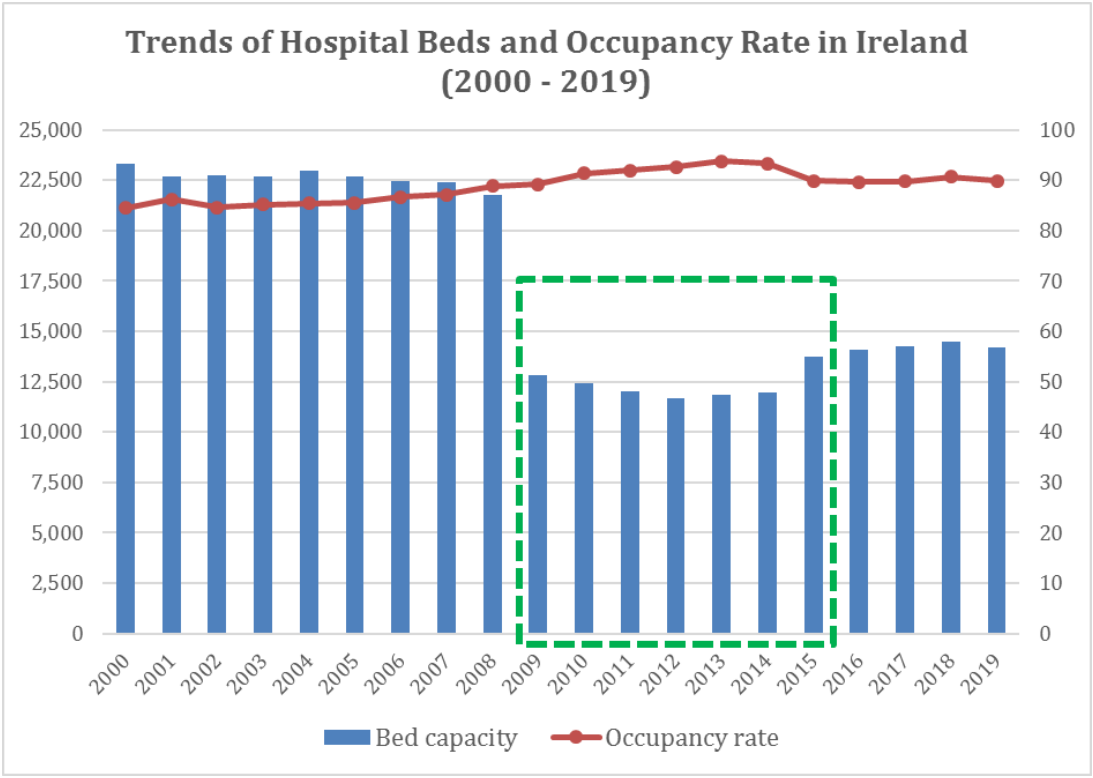

Figure D1: Trends of Hospital Beds and Occupancy Rate in Ireland

Sources: (1) Hospital beds trend: https://www.statista.com/statistics/557287/hospital-beds-in-ireland/ (2) Occupancy rate: https://stats.oecd.org/index.aspx?queryid=24879#