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Supplier-induced demand for newborn treatment: Evidence from Japan☆

Hitoshi Shigeoka[a,*], Kiyohide Fushimi[b,1]

[a] Department of Economics, Simon Fraser University, 8888 University Drive, WMC 4653, Burnaby, BC V5A 1S6, Canada
[b] Division of Health Policy and Informatics, Department of Health Policy, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo 1138519, Japan

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ABSTRACT

We estimate the degree of supplier-induced demand for newborn treatment by exploiting changes in reimbursement arising from the introduction of the partial prospective payment system (PPS) in Japan. Under the partial PPS, neonatal intensive care unit (NICU) utilization became relatively more profitable than other procedures, since it was excluded from prospective payments. We find that hospitals have responded to PPS adoption by increasing NICU utilization and by more frequently manipulating infants' reported birth weights which in large part determine their maximum allowable stay in the NICU. This induced demand substantially increases the reimbursements received by hospitals.

1. Introduction

Economists and policy makers have long argued that medical providers "induce" demand for health services by exploiting an informational advantage over patients and insurers and providing excessive care of dubious value (Evans, 1974; Fuchs, 1978; Pauly, 1980; Rice, 1983). Medical providers' influence over the quantity and types of medical care demanded—as measured by the size of supplier-induced demand (SID)—is the subject of a long-standing controversy in health economics (McGuire, 2000). While there have been numerous empirical studies on SID, researchers have found surprisingly little evidence of it; estimated magnitudes are often insignificant or economically small.[2]

These studies probably underestimated the degree of SID, for three reasons. First, it is empirically difficult to isolate SID from confounding hospital behavior, such as selection of patients (Ellis and McGuire, 1996). Estimates of SID will be biased toward zero if hospitals select unobservably healthier patients for a given treatment intensity. Since it is not an easy task to control for the severity of patient conditions, selection bias poses an important empirical

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* Corresponding author. Tel.: +1 778 782 5348.
E-mail addresses: hitoshi_shigeoka@sfu.ca (H. Shigeoka), kfushimi.hci@tmd.ac.jp (K. Fushimi).
[1] Tel.: +81 3 5803 4025.

[2] For example, Grant (2009) shows that a USD 1000 increase in reimbursement for performing a Cesarean section would increase the Cesarean section rate by little more than 1 percentage point.

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challenge to any analysis of SID.[3] Second, most of the literature focuses on medical procedures—such as Cesarean sections and coronary artery bypass graft surgeries—that pose large risks for both physicians and patients (Gruber and Owings, 1996; Grant, 2009; Yip, 1998). SID for these high-risk procedures may be limited: physicians must persuade patients to consent to them, and may face lawsuits if they are performed excessively. Finally, and most importantly, finding exogenous variation in the financial incentives faced by medical providers is difficult.

We overcome these empirical challenges by focusing on a specific population: at-risk newborns—low-birth weight and premature infants who may need intensive care. A bias due to selection is less of a concern in the treatment of at-risk newborns, because the severity of their condition is difficult to predict in advance (Almond et al., 2010). In addition, newborn treatment allows substantial room for demand inducement, since the informational advantages of physicians over patients and insurers are arguably very large.[4] We also focus on a less-risky medical "procedure": neonatal intensive care unit (NICU) utilization, since it imposes minimal risk to either patients or physicians. While some studies argue that the benefits thereof outweigh the costs (Cutler and Meara, 2000; Almond et al., 2010), others question the effectiveness of increasingly intensive treatment of newborns (Grumbach, 2002; Goodman et al., 2002).

As exogenous financial shocks to medical providers, we exploit two key institutional features of Japan's medical system. First, in 2003 Japan replaced the conventional fee-for-service (FFS) system with a partial prospective payment system (PPS) that made NICU utilization relatively more profitable than other procedures, since it is still fully reimbursed. Second, because NICU utilization is costly, the government caps the number of NICU days for which hospitals will be reimbursed. Newborns with lower birth weights are allowed longer stays, and there are gaps between the decisive thresholds, such as between a birth weight of 1000 grams (g) and 1500 g. Hospitals may thus increase NICU utilization by manipulating reported birth weight.

Our analysis of the NICU stays of at-risk newborns uncovers several factors suggesting SID. First, we find evidence that hospitals manipulated reported birth weights; a relatively larger volume of birth weights are reported just below the cut-off values of 1000 g and 1500 g by hospitals with NICUs; this manipulation was exacerbated following the introduction of PPS.

Second, we find evidence that hospitals increased NICU utilization in response to PPS adoption, especially among infants with very low birth weight (VLBW; less than 1500 g). In fact, we find that following PPS adoption, the NICU stays of VLBW newborns increased by 4.7 days, or 10.3 percent increase. This result is robust to a variety of robustness checks, such as the inclusion of a lead dummy that equals 1 just prior to the year in which a hospital joined the new payment system, and the inclusion of hospital-specific linear trends.

Third, there is little evidence that the increase in NICU use affects treatment intensity; that is, total lengths of stay and the number of procedures received did not change after the PPS was introduced. In other words, the additional number of newborns occupying costlier spots in the NICU would have done as well under normal care.

While we cannot examine all explanations other than SID, we rule out many; for example, we find no evidence that transfers of newborns from hospitals without NICUs to those with increased after the PPS was introduced. Taken individually, each piece of empirical evidence may be insufficient to establish the existence of SID, but taken together they support the possibility that physicians and hospitals game the system by pushing expensive NICU treatment for newborns.

Finally, NICU use increases hospital reimbursement by roughly JPY 440,300 (USD 4900) per VLBW newborn; this would add up to JPY 9.5 billion (USD 106 million) a year if all hospitals in Japan were to behave in the same manner as those observed in this study.[5] Although our results can be applied only to the specific case of at-risk newborns, they indicate the potential for much larger SID, if we were to mitigate selection bias and focus on less-risky medical procedures such as NICU utilization.

Japan is a suitable empirical setting in which to examine the existence and monetary value of SID, for a number of reasons. First, under universal health insurance, medical providers in Japan are all paid through the same national fee schedule, which is uniformly applied regardless of a patient's insurance type or medical provider. Second, there is little room for cost shifting, because all citizens are covered by mandatory universal health insurance. By contrast, in the United States the introduction of a PPS under Medicare has led hospitals to charge higher prices to private insurers (Cutler, 1998).

In addition to the literature on SID, this paper also contributes to the literature on hospital gaming. Dafny (2005) divides hospital responses to price changes into two categories: nominal (e.g., accounting maneuvers, such as upcoding diagnoses) and real (e.g., increased care provision). But unlike Dafny, who finds evidence of only nominal responses to changes in diagnosis-specific prices, we find evidence of both nominal (i.e., manipulation of reported birth weights) and real (i.e., longer stays in the NICU) responses.

Our results may also inform reimbursement policy for newborn treatment in other countries. For example, a few states in the United States have already adopted modified diagnosis-related groups (DRGs) that incorporate birth weight and decide the reimbursement of state Medicaid programs; others are still in the process of implementing such modifications.[6] Our results caution against using birth weight to decide reimbursement, since this offers an incentive for hospitals to manipulate the system.

The remainder of this paper is organized as follows. Section 2 provides background information on the reimbursement system, the treatment of newborns in Japan, and the conceptual framework. Section 3 describes the data used herein, and Section 4 presents the identification strategy. Section 5 outlines the birth-weight distribution and discusses manipulations of reported birth weights. Section 6 discusses the main results in NICU utilization, and Section 7 examines treatment intensity and the monetary value of the induced demand. Section 8 provides concluding remarks.

2. Background

In this section, we briefly describe the reimbursement system in Japan, the treatment of newborns there, and the conceptual framework used in this study.

[3] One notable exception that suffers less from selection bias is Gruber and Owings (1996); they use decline in fertility as an income shock, and find that within-state declines in fertility increase within-state Cesarean section rates, since Cesarean sections are more lucrative than normal vaginal deliveries. However, the magnitude is very small: a 10 percent fertility drop corresponds to only a 0.97 percent increase in the probability of a Cesarean section. This increase accounts for only 0.5 percent of a physician's income.

[4] Parents of newborns are likely to concur with the decisions made by physicians, unlike in cases involving common diseases, of which patients may have more medical knowledge.

[5] All dollar figures in this paper are measured in 2009 U.S. dollars. All yen prices are consumer price index deflated to the 2009 Japanese yen, and then converted to U.S. dollars by using that year's exchange rate of JPY 90 per USD 1.

[6] The examples are all-patient DRGs (AP-DRGs) and all-patient refined DRGs (APR-DRGs). See Quinn (2008) for details.