



Choice in the presence of experts: The role of general practitioners in patients' hospital choice[☆]

Walter Beckert

Birkbeck College, University of London, United Kingdom



ARTICLE INFO

Article history:

Received 20 March 2017

Received in revised form 27 March 2018

Accepted 5 June 2018

JEL classification:

D120

C510

I110

G110

Keywords:

Discrete choice

Patient

Principal

GP

Agent

Expert

Endogenous choice sets

Competition

Hospital choice

Elective medical procedure

ABSTRACT

This paper considers the micro-econometric analysis of patients' hospital choice for elective medical procedures when their choice set is pre-selected by a general practitioner (GP). GPs have a dual role with regard to elective referrals in the English NHS, advising patients and at the same time taking account of the financial implications of referral decisions on local health budgets. The paper proposes a two-stage choice model that encompasses both patient and GP level optimization. It demonstrates that estimators that do not take account of strategic pre-selection of choice sets may be biased and inconsistent. We find that GPs as patients' agents select choice options based on quality, but as agents of health authorities also consider financial implications of referrals. When considering these choice options, patients focus on tangible hospital attributes, like amenities.

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1. Introduction

In conventional discrete choice analysis, e.g. conditional logit (McFadden, 1974) and its variants, choice sets are assumed to be exogenous. In choice situations involving credence goods an “expert” agent with arguably superior information strategically presents a set of pre-selected choice alternatives to a principal decision maker. These pre-selected choice sets are endogenous. Choice

[☆] I thank the editor, Luigi Siciliani, and two anonymous referees for very valuable comments and suggestions that greatly improved the paper. I am also grateful to Richard Blundell, Kate and Clare Collyer, Laura Cornelsen, Richard Disney, Jennifer Dixon, Pinelopi Goldberg, Rachel Griffith, Sandeep Kapur, Elaine Kelly, Alistair McGuire, Chris Pike, Carol Propper, Pasquale Schiraldi, Richard Smith, Ron Smith and Marcos Vera-Hernandez, Chris Walters and seminar audiences at the Nuffield Trust and NHS Improvement for very useful comments and discussions, and to the Health and Social Care Information Centre for providing access to the Hospital Episode Statistics under the Bespoke Data Re-Use Agreement CON-205762-B8S7B. This paper has been screened to ensure no confidential information is revealed.

E-mail address: w.beckert@bbk.ac.uk

of National Health Service (NHS) funded hospital services in England is an important case in point: legislation in the mid 2000s gave patients free choice of hospital for elective medical procedures, but choice is implemented by a referral from the patient's general practitioner (GP) who is mandated to offer patients a set of choice alternatives.¹ This paper discusses the design and estimation of a choice model for the patient/GP decision process and identifies biases in estimation when the potential endogeneity of choice sets is ignored in the econometric model that forms the basis of analysis.

UK legislation (Department of Health, 2004) mandated that, from 2006, patients be given choice among 5 hospital, and from 2008 patients' hospital choice was entirely unrestricted. For common elective procedures, like hip replacements, patients have several hundred choice alternatives. For most patients, in the role

¹ See the National Health Service Commissioning Board and Clinical Commissioning Groups (Responsibilities and Standing Rules) Regulations 2012, available at <http://www.legislation.gov.uk/ukxi/2012/2996/part/8/made>.

of the principal beneficiary of the choice outcome, such a choice problem is intractable. They typically exercise their choice following discussions with a GP who advises on their choice as a medical expert. Patients need a GP referral to access elective care, and medical expertise places the GP in the role of the gatekeeper who narrows the patient's choice problem down to a more manageable set of pre-selected choice alternatives.

GPs arguably possess superior information about salient attributes of the set of conceivable choice alternatives, notably with regard to the quality of medical treatment at a given hospital. Hospital quality is multi-dimensional and notoriously difficult to assess (Gowrisankaran and Town, 1999; Gutacker et al., 2016). In light of such information asymmetries, patients tend to defer to GPs' medical expertise, both when it comes to the need for treatment and the assessment of treatment quality at hospitals.² But GPs, to some extent, are also agents for hospitals and health authorities more generally. In 2011/12, the period of our study, local healthcare budgets were controlled by Primary Care Trusts (PCTs).³ These budgets for the cost of care for the local population were fixed annually, and hospitals were paid a fixed price per referral. So the costs of referrals by GPs fall on the fixed budget of the PCT to which the GP belongs. This raises the question of whether GPs internalize these costs.⁴

Consequently, when pre-selecting sets of choice alternatives for patients, GPs may face a conflict of interest which induces a misalignment of their incentives with patients' incentives. This wedge driven between the GP's and patients' incentives renders choice sets endogenous.

Choice analysis with limited choice-sets has been considered by McFadden (1977) who offers two conditions – positive and uniform conditioning, characterizing an exogenous selection mechanism – that are sufficient to yield consistent estimates in the presence of exogenously limited choice sets; Santos et al. (2013) refer to this result as justification for the consistency of their maximum likelihood estimator with imposed choice sets that are subsets of the true choice sets.

The literature on general econometric choice models that allow for endogenous choice sets is still relatively sparse. The choice modelling literature refers to pre-selected choice sets as consideration sets (Howard and Sheth, 1969). Mehta et al. (2003) estimate a dynamic structural model of consideration set formation and brand choice model in the context of price discovery for experience goods that are frequently purchased. Unlike in the context of the present paper where the pre-selected choice-set for a credence good is governed by a third-party agent, the consideration set formation process in Mehta et al. is part of the sole decision maker's fixed-sample search strategy. Sovinsky Goeree (2008) proposes a model of consideration set formation that treats the inclusion decisions with respect to each choice alternative as endogenously driven by product advertisement, absent a constraint on the choice set size.

In the healthcare literature, the standard approach has been to treat the GP and the patient as a single decision maker (e.g. Beckert et al., 2012). Gaynor et al. (2016) are the first to model the GP led

consideration set formation. In their model, consideration sets are generated subject to a constraint on the choice set size, by requiring that included choice alternatives be within a fixed distance of the alternative associated with maximal utility; the resulting choice sets are allowed to vary by GP and PCT. We offer a complementary approach. In our model the cost across experts (GPs) of acquiring and disseminating information is modelled as a determinant of choice set size and composition, and it is quantified explicitly. This approach has a particularly intuitive appeal in light of information asymmetries.

From an econometric perspective, the endogeneity of the set of choice alternatives constitutes a potential sample selection problem. It essentially arises from correlation between unobservables in the agent-level selection model and those in the principal-level final outcomes (choice) model. Such correlation may bias estimation results. This is similar to the well-known issue of incidental truncation (Heckman, 1976) whereby decision outcomes of interest are only observed for a selected subsample and where failure to properly model the sample selection mechanism induces the estimates of the outcome relationship to be biased and inconsistent. This has also been noted by Eizenberg (2014) and Jacobi and Sovinsky (2016). Similar issues also arise in the analysis of endogenous sample attrition (Hausman and Wise, 1979).

Methodological econometric issues aside, why is the distinction between principal and agent, when agents are imperfect, relevant for applied work? It is well established that misalignment of incentives between principal and agent can give rise to market failures, resulting in suboptimal outcomes. In the present context, patients may be nudged into choosing a hospital that they would not have chosen had they been given different options. The distinction also matters for competition analysis. Demand estimation and merger simulation often feature in antitrust authorities' investigations of mergers. Beckert et al. (2012) discuss conventional hospital choice analysis, under the assumption of exogenous choice sets, and its use in hospital merger analysis. This sort of analysis does not distinguish between patients and GPs and their respective incentives. If hospitals compete for patients indirectly, via competing for GPs, then ignoring this distinction may lead to an incomplete competition assessment.

This paper proposes a micro-founded two-stage choice framework that links the pre-selection of a choice set of hospitals by the GP, as an "expert" agent on the first stage, with the choice of an alternative out of this set at the second stage by the patient, the principal and ultimate beneficiary of the choice outcome. It thereby provides a definition of "expert" agent, as opposed to "layman" principal. The model is applied to Health Episode Statistics (HES) data for hip replacement patients. This type of data is widely used in the empirical health care economics literature (Beckert et al., 2012; Beckert and Kelly, 2017; Gaynor et al., 2016; Santos et al., 2013; Sivey, 2012), notably for the purpose of demand analysis. Importantly, HES data is also a primary source used by the UK competition authority, the Competition and Markets Authority (CMA).

The empirical analysis in this paper presents results that demonstrate the potential inconsistency of estimators when the endogeneity of choice sets is ignored. Estimates for the GP-level model proposed in this paper reveal that pre-selection by the GP is primarily driven by distance to the hospital, hospital quality and cost of treatment to the Clinical Commissioning Group that the GP is accountable to. The latter finding is consistent with GPs' conflict of interest at the intersection of their roles of agents of both, patients and health authorities. Once these drivers of GP-level pre-selection are accounted for by the pre-selected choice set, the results show that patients do not care about residual quality differences and that they focus instead on other tangible hospital attributes. In particular, it shows that waiting times – once their endogeneity is taken account of, residual distance and hospital amenities are

² For example, Monitor (2015), the then sector regulator for health services in England, found that "many [patients] were also thought to be happy to be guided by their GP" as regards their choice of health care provider. As of April 2016, Monitor is part of NHS Improvement, a government authority responsible for overseeing foundation trusts and NHS trusts, as well as independent providers that provide NHS-funded care.

³ Primary Care Trusts (PCTs) are publicly funded local bodies that purchase hospital services for the local population on behalf of their associated GPs. Going forward, the Health and Social Care Act (2012) abolished PCTs and, from 2013/14, transferred budgetary management responsibilities to GP practices, now referred to as Clinical Commissioning Groups (CCGs). This system post-dates the data used in this study.

⁴ See, for example, "GP's referrals fall amid claims of rationed care in stretched NHS", available at <https://www.theguardian.com/society/2011/sep/09/gp-referrals-fall-stretched-nhs>.

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