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GPs' implicit prioritization through clinical choices – evidence from three national health services

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Abstract

We present results from an extensive discrete choice experiment, which was conducted in three countries (Norway, Scotland, and England) with the aim of disclosing stated prescription behaviour in different decision making contexts and across different cost containment cultures. We show that GPs in all countries respond to information about societal costs, benefits and effectiveness, and that they make trade-offs between them. The UK GPs have higher willingness to accept costs when they can prescribe medicines that are cheaper or more preferred by the patient, while Norwegian GPs tend to have higher willingness to accept costs for attributes regarding effectiveness or the doctors' experience. In general there is a substantial amount of heterogeneity also within each country. We discuss the results from the DCE in the light of the GPs' two conflicting agency roles and what we know about the incentive structures and cultures in the different countries.

1. Introduction

The demand for, and total spending on, health services is increasing all over the world. This trend makes the discussion of rationing and prioritization in the health sector, although difficult and sometimes even unpleasant, ever more relevant and necessary. In practice most national and local health authorities recognize the need to ration and to influence doctors' choices of treatment directly or indirectly through guidelines and various types of economic incentives. How authorities try to affect these choices differ between health systems, as do the responses of the doctors.

The general practitioner (GP) is a key decision-maker in the health care sector and in past decades much research has been conducted in order to better understand GP behaviours. Seminal articles have presented theoretical models of GP behaviour (Ellis & McGuire, 1986; Harsanyi, 1955; McCombs, 1984; McGuire, 2000; Thornton & Eakin, 1997) and a substantial amount of empirical research has been conducted on the impact of organizational characteristics on delivery of GP services, focusing mostly on remuneration systems (Ellis & McGuire, 1990; Gosden et al., 2000; Laffont & Tirole, 1993) and the GP gate keeper role (Brekke et al., 2007; Dusheiko et al., 2006). However, much less is known about doctors' behaviour in publicly-oriented systems which have a high degree of focus on cost-containment and guidelines.

Prescription behaviour is an area where GPs' decisions influence implicit prioritization, and it is arguably an important one. A substantial component of health care budgets is drug expenditures; as an example relevant for this study, GP prescriptions in both England and Scotland amount to around 40% of NHS spending in primary care (Department of Health, 2012; ISD Scotland, 2016), which constitutes 10% of total NHS spending (Audit Scotland, 2013; HSCIC, 2015), and there is a large potential for reducing drug expenditures if GPs take a social (cost) perspective when deciding which drug to prescribe. In a principal-agent world where GPs' loyalties are torn between the society as a whole and the individual patient, this would imply that GPs emphasize their role as gate keepers for society relative to the role as the patient's advocate. When it comes to GPs' prescription behaviour, the gate keeper role is in many countries strengthened by national guidelines, encouragement of generic

prescription, audits, and pharmacist visits (Busse, 2005; Dixon, 1997; Granlund et al., 2006; Robert et al., 1997; Rodgers et al., 1999; Søndergaard, 2002).

This paper presents an experimental study, which provides important insights for policy making. Eliciting behavioural patterns is in accordance with present day focus on behavioural economics and represents an example of how experimental economics can contribute to better data and consequently to the design of efficient health policies. More specifically, we present the results from a discrete choice experiment, which was conducted in three countries with the aim of disclosing stated prescription behaviour in different decision making contexts and across different organizational cultures. To our knowledge, this study is the first of its kind.

A total of 907 GPs practicing in three relatively similar, but also very different countries; England, Scotland, and Norway participated in the experiment. Our unique data set allows us to study the relationship between prescription behaviour, different concerns of the doctor, and different institutional and historical health policy contexts. In order to form expectations and help the interpretation of our results, we anchor our analysis to a principal-agent framework. In particular, the weight doctors in different institutional settings put on the often conflicting roles as agents for two different principals (i.e. being a gatekeeper for society while at the same time being the patient's advocate) is discussed.

The paper is organized as follows: The theoretical framework of the dual role of GPs is presented in Section 2. In section 3 we present the aims and set-up of our study. We then outline the institutional background of the health systems in the three case study countries in section 4. Section 5 takes the reader through different aspects of our methodology, from the design of the experiment to the econometric estimations. Results are then presented in section 6, while a discussion is offered in section 7.

2. Theoretical framework

2.1 Dual agency

The originating literature on agency theory in primary care often uses a conceptual approach to describe the principal-agent relationship, where the general practitioner (GP) acts as an agent for the patient as well as for the insurer, the latter often in the form of public authorities (Blomqvist, 1991; Evans & Brown, 1984; Feldstein, 1974; Phelps, 1997). Asymmetric information is typically a problem in both relations; patients are less well-informed about appropriate treatments than the attending GP, and the insurer is less well-informed about the actual needs for treatment and the necessity of induced costs than the GP. Thus, both the patient and the insurer delegate decision-making authority to the GP assuming that the GP makes the best decisions. Perfect agency is, however, difficult to define when the GP faces two principals with often conflicting goals, and typically leaves GPs with dilemmas that can be difficult to solve in daily decision-making situations (Coast, 2001). Perhaps as a consequence, more recent literature shows that the relative weight put on the two roles shifts depending on which of the two principals' concerns are best attended to in the institutional setting the doctors are operating within (Pedersen et al., 2014).

2.2 Patient agency

Patient agency is an equivocal part of a physician's job description, as emphasised by the World Medical Associations international medical oath (World Medical Association, 2006) which reads "The health of my patient will be my first consideration". Taken literally this implies that cost considerations (perhaps with the exception of costs to the patient) should not influence prescription behaviour. This does not necessarily mean that the GP will act in accordance with the patients' wishes under all circumstances (Scott, 2000; Scott & Vick, 1999). GPs with a more paternalistic viewpoint would claim that being the patient's advocate means doing what one thinks is the best for the patient, with no particular consideration to the patient's opinion on the matter. Others argue that making the best clinical choices, leading to the best outcomes will often be influenced by the patient's cooperation and compliance, which in turn is influenced by the patient's preferences, economic situation etc. Finally, some GPs simply take the ethical stand for patient empowerment and shared decision

making.

From the perspective of the patient the perfect agent is seen as one who chooses as the patients themselves would choose if only the patients possessed the same information as the GP (Folland et al., 2006; Gafni et al., 1998). Since other attributes than health are typically included in this principal's utility function, the issue of perfect agency is not limited to apply to health only (Evans & Brown, 1984; Ryan, 1994), but may for example also include levels of co-payment and personal tastes, factors that are not always fully internalised by the GP (Neuman & Neuman, 2009). If patients do not pay for health services themselves, an optimal level of services from their point of view is unrelated to rationing or concern for others, and in systems where this is an option they are likely to choose another GP if they are not satisfied with the agency of their current one. The prospect of losing a patient to another GP may increase incentives to comply with the patient's preferences, which sometimes means to provide more services and prescriptions.

In the context of our experiment patient agency can be observed as a general willingness to prescribe medicines that maximise patient benefits, lower the costs to the patients and that are in accordance with the wishes of the patients, all else equal.

2.3 Social agency

From the perspective of the insurer, perfect agency is defined by some level of cost-consciousness. While the goals of the insurer are typically multifold, one core objective is to ensure technical and allocative efficiency. The perfect agent should consequently make decisions that ensure delivery of equally effective health care services at the lowest attainable cost. In order to minimize opportunity costs and thus the possible negative impact this would have on the quality and quantity of services delivered to other patient groups, the GP should not prescribe expensive drugs unless the higher costs are adequately justified by higher benefits.

Public authorities will aim at planning the organisation and financing of the primary care sector in such a way that GPs act in the best interest of this third party. In systems where the

GPs themselves do not bear the costs of their prescription choices, which to a varying extent is the case in the countries we study, they are not likely to pay sufficient consideration to cost containment in the eyes of the social planner. Since GPs run private practices it is not possible to regulate their behaviour directly, but around the world a number of regulatory and financial mechanisms are applied in various attempts to give GPs incentives to take a social perspective in their treatment strategies. These range from incentives such as guidelines, audits and pharmacist visits, to fundholding schemes, and hard regulation consisting of economic sanctions and fines. The effect of the softer kinds of interventions is difficult to measure, and the evidence in the literature is mixed. There are, however, examples of successful interventions where pharmacists have worked directly with GP practices to control prescribing costs (Rodgers et al., 1999). Olsen et al. (2009) find that a voluntary contractual agreement between health authorities and GPs to decrease prescription costs through audits and feedback on variations in prescription patterns was effective in reducing costs. Also, Robert et al. (1997) show that encouragement of generic prescription in Northern Ireland was effective in cutting costs. England, Scotland, Germany, and Sweden have all experimented with more direct incentives in the form of fundholding schemes where doctors' profits are explicitly linked to operating within budgets, but the effectiveness of such schemes is mixed (Delnoij & Brenner, 2000; Granlund et al., 2006). At the end of the scale some interventions have used sanctions and fines to try to affect GPs' prescription behaviour. In the 1990s France introduced a system in which GPs had to adhere to certain prescription rules, or risk being fined. The scheme led to a reduction in the growth of costs for primary care services outside hospitals, yet it is uncertain whether surveillance costs outweighed savings. Also, the impact on patient health has not been evaluated (Dixon, 1997).

Social agency is in our experiment measured by the GPs focus on containing costs, i.e. on the propensity to focus on the trade-off between total costs and other characteristics associated with prescribing, with the aim of ensuring cost-effectiveness.

3 Aims and set-up of study

In the present study we are not analysing the consequences of a specific intervention, but make cross-country comparisons of stated prescription behaviour with the aim of ascertaining

whether governance structures and the general operating environment are related to GPs' intended prescription patterns. We define governance structure in this context as the contracts, regulations and incentive structures the third party payer/authorities offers the GPs, while the operating environment refers to softer aspects like present and historical cost-containment culture, patient co-payments, focus on patient empowerment, and general debates.

In the design of our experiment, and the choice of attributes, we seek to test the relative influence of patient agency and social agency in prescription decisions across three countries that mainly differ with respect to the strength and visibility of the third party payer.

For each country we measure the importance of cost consciousness relative to 1) the effectiveness of the medicine (2) the patients' preferences for the medicine and the co-payment involved and 3) the GPs' own experience with the medicine The relative importance of total costs and effectiveness reflects cost-effectiveness thresholds and is a social consideration, which aims to maximise total health gains subject to budget constraints. The trade-off between total costs and patient preferences is indicative of the GPs' willingness to compromise resource use to ensure higher patient benefits. In the same vein the total costs versus co-payment signifies the GPs' willingness to trade-off public money in order to reduce the burden of private costs to the patient. Finally, the GPs' preference for following own instincts/experience was included in our experiment in an attempt to capture the GPs' inclination to act as a "free agent" rather than adhering to guidelines or patients' preferences.

We hypothesise that the relative weight put on the two often conflicting agencies relates to the manner in which concerns for the patient and the third party are attended to in the governance structure and the environment the doctors are operating within. However, it is uncertain how GPs react to governance structures. They may act in accordance with such enforced rules, or if they feel it compromises their role as a GP, they may try to counteract. In systems or settings where the patients' rights are well ensured and patients' preferences are given weight in policy making, GPs may feel more at liberty to focus on social agency, consequently focusing less on patient agency and more on the cost effectiveness of health care services. Conversely, in systems or settings where the third party perspective is more pronounced and the governance of the GPs is stricter, the GP may feel a stronger obligation to act on behalf of the patients within the regulatory constraints of the governance structure.

The central research questions that we seek to address in this study are:

1. Does a stronger cost containment culture combined with stricter GP governance lead to GPs taking a more pronounced social agency role (and consequently less consideration of patient agency)?

2. Is the impact of GP governance moderated if the general operating environment is less focused on cost containment and more on patients' access to health care?

These research questions make comparison at two levels necessary. In order to answer the first question we need to compare countries where the basic features of the health system and the needs of the populations are similar, but where the cost containment culture and the governance of GPs vary markedly. For this purpose we compare the UK (Scotland and England) with Norway, countries that all have health systems which to a large extent are based on universal access and the welfare state as a third party payer of services. They do however differ markedly with respect to cost containment culture and the governing of GP behaviour, where the UK has stronger governance structure enforcing a closer link between GPs' and the third party's interest, as well as a more stringent guideline system. In order to answer the second research question, we focus on comparing countries that face very similar governance structures, but where the operating environment with respect to focus on cost-containment and patient rights differs. For this purpose we compare Scotland and England. In the next section, we describe the main features of the health systems of the three countries in more detail.

Causal interpretations based on our stated preference data are not possible. The purpose of our study is rather to empirically generate hypotheses that can give new insights and directions for further research.

4. Institutional background [1]

The three countries included in the study all have health systems that to a large extent are based on universal access and the welfare state[2]. At the same time there are some important

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[1] While we in this section only present a short summary of the main differences in institutions and have organised the information thematically in a table, we have also included an appendix where institutions in each country are described in more detail.

differences between the systems that are relevant to our comparison of doctors' prescription choices.

An important difference between Norway and the two other countries is the governance structure. First, in Norway the municipalities contract individual GPs directly, while in England and Scotland the practices are contracted, not the individual GPs. Prescription costs in Norway are furthermore mainly paid by the National Insurance Scheme (NIS), leading to highly indirect links between the third party and the GPs as well as relatively weak incentives for both GPs and municipalities to keep costs down, since neither patients, GPs nor the contracting municipalities bear the costs of prescriptions directly. In England and Scotland the third party is more present through direct incentives to keep costs down as principals (Primary Care Trusts in England and Regional Health Boards in Scotland) contracting the GP practices have fixed prescription budgets, and practices can be financially rewarded for "correct" (restrictive) prescription behaviour.

The operating environment is also very different in Norway and the UK respectively. While there are large resources available in the Norwegian health system, the Scottish and English NHS's spend substantially less on health per capita. Although the populations in the three countries are relatively similar when it comes to health service needs, and the share of GDP spent on health is in fact quite similar; 9.4% in Norway and 9.6% in the UK in 2010 according to the OECD, there is considerable variation in the absolute amount of money spent on health per capita. For example, in 2010 Norway spent 3502 GBP per capita[3] compared to the 2231 GBP per capita spent in the UK (OECD, 2012). Given that the GPs are torn between the interests of their patients on one hand and explicit or implicit budget restrictions on the other hand, they are likely to accept higher costs in order to prescribe "better" medicines when there are more resources available, all else equal. Thus, one would expect incentive structures that seek to align GPs prescription patterns with the objectives of the third party to be strengthened by a strong cost containment culture.

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[2] We treat the Scottish and the English health systems as two separate systems; even though Scotland and England as part of the United Kingdom share the underlying principles of a national health service, the system in Scotland has devolved and is accountable to the Scottish parliament.
[3] Calculated from USD reported in the OECD tables, using exchange rates reported in (OECD, 2013).

It is noteworthy, however that even though the GPs are governed in the same manner in England and Scotland, there are important differences in the operating environment, which may moderate the impact of governance. Firstly, there are differences with respect to spending per person; In England spending amounted to 1900 GBP in the period of 2010-2011, while the Scots spent 2072 GBP per person in the same period (National Audit Office UK, 2012). This 10% difference may render the cost containment culture more pronounced in England. Another relevant difference is that, while GP practices in Scotland and England are contracted under similar conditions, England has continued to reinforce primary care incentives even after the abolition of the GP fundholding system. Voluntary practice based commissioning has been promoted and now (post survey) a fundamental change in the structure of the NHS in England has been implemented. Through this change all general practices in England are part of a local Clinical Commissioning Group (CCG), which although not in effect at the time of the survey, was very much discussed and debated within the time period of the survey. As part of the CCG, GP practices become the holders of the majority of the NHS budget in England and become commissioners of secondary care as well as commissioners and providers of primary care for their local population. Finally, the Scottish system has abolished patient co-payment completely. This means that there are fewer incentives to keep costs down in the Scottish system. More importantly, this feature of the Scottish system perhaps reflects a more general tendency for patient advocacy in Scotland.

To conclude, we have chosen to compare GPs stated prescription patterns in Norway with those of GPs operating in the UK because Norway is a country with a weak cost containment culture as well as weak third party governance as compared to Scotland and England. Further, comparison of GPs prescription patterns across Scotland and England provides an opportunity for isolating the impact of the more general operating environment on GP behaviour.

5. Methodology

5.1 Attribute and level selection

In the design of our experiment, and the choice of attributes, we seek to test the relative influence of patient agency and social agency in prescription decisions across our three countries. Five attributes with between two and four levels were included in the DCE; they are presented with their respective levels in Table 1. These attributes allow us to measure the importance of cost consciousness relative to effectiveness of the medicine (social agency), patients' preferences for the medicine and the co-payment involved (patient agency), and GPs own experience with the medicine ("free" agency).

The initial identification of relevant attributes was based predominantly on findings from an earlier survey of Norwegian doctors' adherence to guidelines (Carlsen & Aakvik, 2006; Carlsen & Norheim, 2008), existing international research on both prioritization and guidelines (Carlsen & Norheim, 2005; Eccles & Grimshaw, 2004; Farquhar et al., 2002; Stewart et al., 2003; Strech et al., 2008), as well as theoretical expertise and practical experience (with DCEs in general and with conducting DCEs in different local contexts) in the international research team. The choice models applied in the analysis rely on the assumption that respondents are able to make trade-offs between attributes and their levels in order to maximise utility. If the choice alternatives become too complex, there is a risk that respondents adopt simplifying heuristics or lexicographic decision rules (Hensher, 2006; Scott, 2002; Witt et al., 2009). One source of complexity is the number of attributes. The literature is inconclusive on the optimal number of attributes in DCEs but somewhere between three and seven seems to be the most common in health economics (Ryan & Gerard, 2003; Scott, 2002; Witt et al., 2009), and the recent trend has been to reduce the number of attributes to five (de Bekker-Grob et al., 2012). We followed this trend, and applied five attributes in our experiment. Another source of complexity is not the number, but rather the relevance and descriptions of the attributes included (Hensher, 2006). In this study it was considered important to develop simple and non-context-specific attributes that would translate well into the UK setting. This could potentially come at the cost of respondents regarding the choice very hypothetical or their inferring excluded attributes from the included ones. As a consequence, the piloting process was very thorough. The reduction from the initial set of attributes to the five attributes included, as well as the wording of the attributes

and their respective levels were developed in a dynamic process between involved researchers and a convenience sample of eight practicing physicians and two medical researchers, through iterative piloting. In particular the total cost attribute was given much attention since this is essential for our measurement of social agency and patient agency. Furthermore, the goal of designing alternatives and choice situations that, although hypothetical and generic, resemble real life decisions was continuously evaluated in this process.[4] The transfer of the DCE to the context of the Scottish and English health services was aided by the simple and non-context-specific attributes which helped ensure comparability. However, some smaller adjustments were made to ensure that the levels chosen for patient costs and total costs were relevant in all countries. England and Scotland were operating within the same market for drugs as Norway (all within the European Economic Area). The total cost levels applied for Norway were therefore simply adjusted by a value reflecting the exchange rate at the time of the survey. The patient cost attribute levels were more complex to transfer as there is a different system of co-payment across the three countries. The maximum co-payment level of £100 for England was taken from the cost of an annual prepayment certificate that can be purchased by a patient to cover the cost of all prescriptions required. This provides a notional maximum amount that GPs would consider realistic although the vast majority of patients (~90%) are exempt from co-payment. In Scotland prescription charges have historically mirrored those in England. Since the policy of no co-payments for prescriptions in Scotland was a relatively new policy we chose to apply the same patient cost levels in England and Scotland, with a statement asking GPs to consider that the "patient costs are pure out-of-pocket expenses to the patient and are not covered by any free prescriptions or exemption list".

(Table 1 around here)

5.2 The prescription choice

Our interest lies in how GPs balance the different agencies in their daily practice, here exemplified by a prescription choice. The description of the patient is consequently

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[4] More details concerning the choice of attributes and levels in the Norwegian experiment can be found in Carlsen et al. (2012).

deliberately very generic. It is however important that the task is not so generic that it seems meaningless to the respondents. As for the choice of attributes and levels, the patient description was therefore repeatedly tested, discussed, changed, and retested in the piloting process. In the resulting DCE, the respondents were presented with the following generic patient description:

"Imagine a patient, Mrs Howes,[5] 50 years of age, who has just been diagnosed with a chronic condition, which requires preventive medication. Mrs Howes has, with the right medication, a good prognosis for continuing in full employment. However, she currently feels *that she has reduced quality of life with her condition."*

The respondents were then asked to indicate which of two given alternative medicines they would prescribe for this patient. An example of the exercise is given in Figure 1.

(Figure 1 around here)

5.3 Experimental design

To construct the experimental design we used an algorithm that simultaneously created the alternative medicines and paired them into choice situations, resulting in a D-efficient design with 24 choice sets. D-efficient designs offer an efficient combination of orthogonality, level balance and minimum overlap (Hensher et al., 2005). The applied design allowed for estimation of all main effects as well as interactions between some of the attributes (patient preference × total costs, patient preference × patient costs, patient preference × effect) [6]. To avoid exhausting respondents, the 24 choice sets were randomly divided into two blocks, resulting in each doctor making 12 choices. The number of choice sets to include in a DCE is an open question in the literature, but the recent trend has been to let participants make an increasing number of choices (de Bekker-Grob et al., 2012). Considering that it took around

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[5] In Norwegian, this common name was translated to "Fru Hansen."
[6] We did not end up using these interaction effects in the analysis, as they never appeared significant and their inclusion did not alter the main results. The same has been found in other studies (Kolstad, 2011).

10 minutes to answer the whole questionnaire and that the respondents in the pilot did not find the task particularly burdensome, we concluded that 12 was a manageable number of choices.

5.4 Questionnaire design

The DCE formed the main part of the questionnaire. In addition, in a separate section of the questionnaire, the doctors were asked to rank the importance of different criteria for prioritization (corresponding to the attributes in the DCE). This was an attempt to be able to separate norms, attitudes and intentions from actual behaviour and is followed up on elsewhere (Carlsen et al., 2012; Hole et al., 2013).

5.5 Sample and data collection

The Norwegian data were collected through an Internet-based survey during the months of December 2010 and January 2011. In total, 1127 randomly chosen GPs received an invitation to participate in the study electronically. There were three reminders; two in December and one in January.

Data in Scotland was collected by means of a paper questionnaire sent in November 2011 to a sample of 1,500 Scottish GPs drawn at random from the General Practitioner Contractor Database (GPCD) maintained by the Information Statistics Division (ISD, NHS National Services Scotland). One reminder was sent after three weeks.

Data in England was also collected by means of a paper questionnaire. A sample of 1,500 GPs was drawn at random from a list of GPs in GP Practices published by the NHS in England. The survey was posted in November 2011 with one reminder sent three weeks later.

Ethical clearances (where required) were received from the right instances in all countries.

5.6 The choice model and corresponding empirical specification

We assume that the utility doctor n derives from choosing medication j in choice situation t can be written as

$$U_{njt} = -\alpha_n \, p_{njt} + \beta_n' x_{njt} + \varepsilon_{njt} \qquad (1)$$

where p_{njt} represents the total cost of prescribing the medication and x_{njt} is a vector of other attributes of the medication, such as its effectiveness. The coefficients α_n and β_n vary randomly over respondents and ε_{njt} is assumed to be extreme value distributed with variance $\mu_n^2 (\pi^2 / 6)$, where μ_n is an individual specific scale parameter.

The utility function in equation (1) can be divided by the scale parameter without affecting behaviour. This results in an equation with an error term with constant variance $\pi^2 / 6$ for all respondents.

$$U_{njt} = -(\alpha_n / \mu_n) \, p_{njt} + (\beta_n / \mu_n)' \, x_{njt} + \varepsilon_{njt} \qquad (2)$$

Defining the utility parameters as $\lambda_n = (\alpha_n / \mu_n)$ and $c_n = (\beta_n / \mu_n)$, utility can be written as

$$U_{njt} = -\lambda_n \, p_{njt} + c_n' x_{njt} + \varepsilon_{njt} \qquad (3)$$

Equation (3) is referred to as the model in preference space (Train & Weeks, 2005). Using the definition of willingness to pay: $wtp_n = c_n / \lambda_n$, the utility model can be rewritten in WTP space:

$$U_{njt} = \lambda_n \left[-p_{njt} + wtp_n' x_{njt} \right] + \varepsilon_{njt} \qquad (4)$$

Equation (3) and (4) are behaviourally equivalent. We estimate equation (4), where the WTP coefficients are independent of scale since the scale parameter cancels out in the expression, while the price coefficient incorporates scale (Hole & Kolstad, 2012; Train & Weeks, 2005). Greene and Hensher (2010) show that the WTP space model can be expressed as a special case of the generalized multinomial logit model proposed by (Fiebig et al., 2010). The coefficients in the WTP space model are estimated in Stata 12 using the gmnl command (Gu et al., 2013). In the main specification all WTPs have normal distributions, while the total

cost coefficient has a log-normal distribution.[7] The log-likelihood function is simulated using 5,000 Halton draws.

There are several advantages to estimating the models in willingness to pay space instead of in preference space. Firstly, the fact that the WTP distributions are specified directly in the estimation process has been found to result in more realistic estimates of WTP (Hole & Kolstad, 2012; Scarpa et al., 2008). Secondly, since the WTP estimates are independent of scale, we can compare the estimates from models estimated on different country-specific datasets directly, avoiding the usual complications when comparing estimates from different choice models. To further ensure cross country comparability we convert the Norwegian WTP estimates to purchasing power parity (PPP)-adjusted British pounds in the reported results.[8]

It should be noted that our WTP measures cannot be interpreted in the same way as those normally reported in the WTP literature, since our denominator is the total costs to society of prescribing a medicine – not the decision maker's private costs. A better formulation is possibly "willingness to accept costs borne by the society" (WTAC), which we will refer to in the rest of this paper. The WTAC reflects the GPs role as agent for society and as such their willingness for society to pay. Significance tests for differences between the three countries' WTACs are carried out using the complete combinatorial approach described in Poe et al. (2005). The Poe et al. approach involves taking many draws from the distributions of the WTACs and calculating the difference between them. If the proportion of draws in which the WTAC of one country is higher than the WTAC of another country exceeds a given significance level, the difference is concluded to be significant.

Individual-level WTACs were calculated using the method proposed by Revelt and Train (2000). These are estimates of the average preferences of the group of GPs who made the same choices when faced with the same block of 12 choice sets. The distributions of the individual-level WTACs are represented graphically using kernel density plots.

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[7] All the coefficients are assumed to be independent. We have also estimated models with correlated coefficients which led to qualitatively similar results. The results from the models with correlated coefficients are available on request.

[8] Using 2011 data published by the OECD: http://stats.oecd.org/Index.aspx?datasetcode=SNA_TABLE4.

5.7 Additional analyses

To explore whether there is evidence of observed preference heterogeneity we run an additional regression with interactions between the alternative attributes and dummy variables for the respondent being female and having practiced medicine for more than 20 years[9].

We also carry out tests for attribute dominance, i.e. whether respondents choose on the basis of a single attribute. If a respondent is found to always choose the alternative with the lowest total costs for example, that respondent is deemed to have a 'dominant' preference for lower total costs. It should be noted that evidence of attribute dominance according to this simple test does not conclusively rule out that the respondent is using a compensatory decision rule (Lancsar & Louviere, 2006). It could simply be that the ranges of the remaining attributes in the experiment are not large enough to incite the respondent to make trade-offs. Consequently, if a high proportion of respondents is found to choose on the basis of a single attribute this may cast doubt on the appropriateness of the design. We are particularly interested to see if there is evidence for dominance in the case of the total cost and effectiveness attributes, which we consider to be the potentially most problematic attributes in this respect.

6. Results

6.1 Descriptive statistics

Table 2 shows descriptive statistics for our sample of GPs in the three countries. The response rates were relatively low (from 16.9% to 25.2%), which is unfortunately an increasing trend for surveys of clinicians (Carlsen et al., 2012; VanGeest et al., 2007). However the samples reflect the respective populations of GPs in each country[10]. When comparing characteristics of the GPs across countries however, there are some differences.

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[9] We also considered including interactions with age. However, since age is highly correlated with length of practice, and it becomes increasingly difficult to get the models to converge when more parameters are included, we ended up including only length of practice.

[10] Exact and directly comparable statistics for the whole population of GPs in the three countries is unfortunately not available, but the available information supports our statement that "the samples reflect the respective populations of GPs in each country". To the extent that any groups are misrepresented in our sample and the behavior of these groups systematically differ from the others with respect to agency, this may lead to a bias in our results.

The GPs in the Scottish sample are on average about 3.5 years older than those in the English sample, with the average age of the Norwegian GPs somewhere in the middle. Furthermore, the proportion of female GPs is higher in Scotland (48%) and Norway (43%) than in England (35%). There are no substantial differences among the samples in terms of how long the GPs have practiced, but the English GPs have on average about a year more experience than the Scottish and Norwegian GPs.

The results from the tests for dominant preferences are reported in Table 3 which shows that the proportion of dominant preferences for any attribute is generally lower than 10%. Exceptions are the total cost attribute in the case of Scotland and England, and the patient preference attribute, which on the face of it appears to have a very high level of dominance in all countries. However, this is an artefact of the survey design; since we allowed for interaction effects between the patient preference attribute and several other attributes, the levels for the patient preference attribute are the same in 83% of the choice sets. This makes the results of the dominance test uninformative in the case of this attribute, as evidence of dominance can happen purely by chance. For the total cost attribute, this happened in 8% of the choice sets in contrast to the rest of the attributes that were never the same. Since the level of attribute dominance is relatively low for the other attributes we conclude that there is limited evidence for 'dominant' preferences in this application.

6.2 Main results

6.2.1 Absolute differences in WTAC between countries

The pattern that emerges from the upper half of Table 4 is that GPs in all countries are significantly less prone to choose alternatives with higher total costs, all else equal. They are most willing to impose high total costs on society in order to prescribe medicines with high effectiveness, and in order to follow the patient's preferences. However, when it comes to attributes regarding effectiveness GPs in the UK tend to have lower WTACs than Norwegian GPs. Conversely, for attributes directly related to the patient, the UK GPs have higher estimated mean WTACs.

To be more specific, the mean WTAC for higher effectiveness is significantly lower in England than in Scotland and Norway[11]. There is also a significant difference between Scotland and Norway with respect to the 75% effectiveness, with Scottish GPs having the lowest WTAC on average. The mean WTAC for following patient preferences, on the other hand, is statistically significantly higher in Scotland than in the two other countries, with no measurable difference between Norway and England. Norwegian GPs have generally lower WTAC to avoid the lowest level of patient costs than their UK colleagues. This can be thought of as the willingness to avoid imposing costs on the patient, as the reference category is zero patient costs. Within the UK, the English GPs have the highest WTAC. There are no significant differences between the countries with respect to the highest level of patient costs. Finally, GPs in all countries are willing to accept relatively high costs in order to prescribe medicines they have a good experience with relative to having little or no experience. Again there are significant differences between Norway on one hand and the UK countries on the other hand, with Norwegian GPs exhibiting the highest mean WTAC.

6.2.2 Within countries

When studying the indirect ranking of attributes and their levels[12] within each country, an interesting pattern appears; Scottish and English GPs indirectly rank patient preferences over the highest level of effectiveness (differences are significant at 1% level in Scotland, 5% level in England). Hence, in England and Scotland the GPs are on average willing to accept the highest total costs to prescribe the patient's preferred medicine rather than the one the patient did not prefer, while they accept the second highest costs in order to prescribe the most effective medicine rather than the one with 60% effectiveness. In Norway on the other hand there is weak evidence of the opposite; the WTAC for prescribing the medicine with 90% effect is significantly higher than that for prescribing according to the patient's preferences at the 10% level. This is in line with the earlier observation that UK GPs have higher WTACs for patient related attributes than Norwegian GPs. GPs in all countries were willing to accept the third highest total costs in order to prescribe a medicine the doctor had a good experience with rather than a medicine the doctors had little or no experience with.

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[11] See Table A.2 in the Appendix for an overview of which differences between countries that are statistically significant.
[12] We are referring to rankings resulting from the choices made in the DCE.

6.3 Heterogeneity

Perhaps equally important as the heterogeneity between countries is the variation in preferences within each country. As can be seen in the lower half of Table 4, which presents the standard deviations of the WTAC estimates, the within-country variation is quite large for some of the attributes. In particular it is interesting to observe that the weight put on effectiveness, patient preferences, and prescribing medicines the GPs have experience with - which were the most important attributes in all countries - varies significantly and substantially between doctors within each country.

In particular the standard deviation of the WTAC for prescribing a medication the doctor has good relative to little or no experience with, is large relative to the mean in all countries. The standard deviation of the WTAC for prescribing the patient's preferred medicine is particularly large relative to the mean in England, while it is relatively low in Scotland compared to the other countries. Figures 2-4 present kernel density plots of the distribution of individual-level WTACs for those attribute levels with statistically significant standard deviations. The figures reveal interesting differences between the three countries' distributions, which are not directly captured by the statistics presented in Table 4. For example, the distribution of the doctors' WTAC for prescribing a drug which the patient prefers has the same bimodal shape in Scotland and Norway, but the relative position of the distributions indicate that Scottish doctors are generally willing to incur higher costs than Norwegian doctors[13]. The distribution of the English doctors' WTAC has a very different shape, in spite of the mean and standard deviation being similar for all the countries. In the case of the WTAC for the doctor having a good experience with the medication the distributions are very similar for England and Scotland, while Norwegian doctors tend to have somewhat higher WTACs. The picture is similar for the WTAC for increasing the effectiveness of the medication from 60% to 90%, but in this case it should also be noted that as a group Scottish GPs have higher WTACs than English GPs.

In order to dig further into the issue of heterogeneity, additional regressions controlling for observed heterogeneity were run; Table 5 shows the results of a similar model as that

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[13] This is a consequence of the PPP adjustment. Without this adjustment the two distributions almost perfectly overlap.

presented in Table 4, but with interaction effects for gender and practice length included. In Norway there is only one systematic difference between the groups; female GPs are willing to accept higher total costs than male GPs in order to prescribe the most effective medicine, rendering Norwegian female GPs the group of doctors with by far the highest WTAC for this attribute. In Scotland, female GPs are willing to accept higher costs than male GPs in order to prescribe a medicine they have a good experience with. They are also more concerned with avoiding patient costs than male GPs. In both Scotland and England GPs with more experience put less weight on patient preferences. Further, more experienced GPs in England place a greater emphasis on avoiding patient costs.

7. Discussion

Overall we find that while GPs in all three countries have a preference for prescribing less expensive medications they are also willing to accept relatively high total costs in order to deliver the best services for their patients. We also find that the relative weight placed on these two concerns vary among GPs both within and across countries.

However, when it comes to attributes regarding effectiveness or the doctors' experience, GPs in the UK have statistically significantly lower WTACs than Norwegian GPs. Although we cannot draw any definitive conclusions as to causality, our results imply that a stronger cost containment culture combined with stricter GP governance does lead to GPs taking a more pronounced social agency role with increased focus on cost containment.

At the same time we see that WTAC is statistically significantly lower amongst English GPs than Scottish GP, which suggests that the effect of a similar governance structure in the two countries is modified by different operating environments. The stronger cost containment focus in England seems to strengthen the social agency role. Further, the mean WTAC for following patient preferences is statistically significantly higher in Scotland where there has been an active debate about patient interests, which seems to have strengthened patient agency.

Overall, our two core research questions have been answered in the affirmative: a strong cost containment culture combined with strong governance strengthens the GPs social agency role, but cultural aspects appear to be an important moderator.

Our results also indicate that a stronger governance structure, as seen in England and Scotland, may generate a counter reaction from the GPs. We observe that for attributes directly related to the patient (patient costs and patient preferences), the UK GPs have higher estimated mean WTACs than do Norwegian GPs. This is somewhat surprising, as one would expect that a strong social agency role would crowd out patient agency. This does not appear to be the case. As referred to in Section 2, GPs could within their authorised room for decision-making, put more weight on their role as a patients' advocate relative to other concerns when the interests of society are well taken care of through regulations and other features of the system. A recent study on GPs shows that the GPs' role as agent for their patients is clearly strengthened in the presence of national recommendations that to a large degree ensure cost effectiveness (Pedersen et al., 2014).

An alternative, or perhaps additional, explanation of differences in the emphasis on patient preferences is varying degrees of competition in the different systems. In a system with more competition for patients, adhering to patient preferences will be more profitable, or put differently; not adhering to patient preferences will have larger costs. In Norway there is a certain level of competition for patients; there is on average surplus capacity, 44% of the lists were open for new patients in 2010, and patients are allowed to change GP twice a year. However in practice the competition does not seem to be very fierce; in 2010 only 5.8% of patients actually changed their GP. In both Scotland and England, competition between practices is limited by restrictions placed on patients, who can only register with a practice if their permanent residency falls within the practice area boundary. There is little published research that relates to competition for patients within a restricted geographical area, and the little evidence there is (see for example Monitor (2015)) does not indicate that the competition is strong. Hence, we conclude that competition for patients is not a likely driver for our results.

A distinct feature of our results is the large heterogeneity in the responses within countries. The English GPs in particular do not seem to agree on priorities. When looking at the WTAC distributions for following patient preferences in Figure 2, English GPs stand out as a clear outlier group with a markedly different distribution involving a large degree of heterogeneity. There is as noted earlier also significant heterogeneity in Scotland and Norway with respect to the WTACs for following patient preferences, but it is smaller and the GPs in these

countries seem to be more polarized in their implicit prioritization of patient preferences. Even though the Scottish and English GPs in many respects make on average very similar choices, the recent Scottish debates about patient co-payment may have led to more attention to patient preferences and influenced the preferences of the GPs leading to less heterogeneity than in England.

Our preferred interpretation of the observed heterogeneity is that GPs are generally torn between concerns in their double agency role, and react differently based on their preferences, which in turn are most likely reflecting differences in context-related professional attitudes and variations in the degrees of alliance to the two principals. An alternative reason why we observe the relatively large heterogeneity within countries could be that the GPs have different beliefs about what will happen to Mrs Howes, the hypothetical subject of the Discrete Choice Experiment, if they for example decide not to prescribe the most effective medicine. We give a certain indication of how Mrs Howes will do without medicine in the description, but the question is whether this description is taken into account at all and if so, whether it is sufficient to make the respondents have the same beliefs about the consequences of their choice. In the Norwegian setting, two additional versions of the experiment were distributed – in these versions the severity of Mrs. Howes' condition were increased and the consequences of not being medicated described accordingly. The preliminary analysis of these additional experiments shows that the WTACs for improved effectiveness increased when Mrs. Howes' condition became more severe[14], indicating that respondents were in fact taking the baseline alternative into account and adjusting their behaviour when the baseline changed. It is likely that there is some heterogeneity left when it comes to exactly how the GPs conceive Mrs. Howes condition with and without medications with different effectiveness, but the pattern of increased willingness to accept costs as the severity of the condition increases, goes a long way in indicating that the respondents have a relatively similar interpretation of the baseline scenario.

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[14] Results available on request.

8. Conclusion

Our experimental study suggests that GPs respond to information about societal costs, benefits and effectiveness, and that they make trade-offs between them. The degree to which GPs align their role as social or patient agents seems to depend on both the governance structure and the general environment in which the operate.

Three core lessons can be learnt from our study. First, a strong sense of social agency does not necessarily crowd out patient agency. Second, local culture and operating environment may significantly moderate the effect of governance, and so one should be careful in transferring experiences with incentive structures and regulatory settings across cultural settings. Third, a change of culture and norms may be just as effective as direct governance. Policy makers have a choice between enforcing the link between the third party and GPs' interests either through stricter governance or through more soft regulations such as campaigns, influencing the curriculum at medical school, initiating debates, etc. Both venues may be equally effective.

It should be noted that our study cannot pin down any causal relationship, there was no reform or natural experiment we could apply to the comparison of GPs in the different countries, but our results give indicative evidence that the organization of the national health system, national priorities and debates can influence doctors' choices. More targeted studies linking various aspects of local context to priorities and choices seem an interesting and important avenue for further research.

References

Audit Scotland. (2013). Prescribing in general practice in Scotland.

Blomqvist, Å. (1991). The doctor as double agent: Information asymmetry, health insurance, and medical care. Journal of Health Economics, 10, 411-432.

Brekke, K.R., Nuscheler, R., & Straume, O.R. (2007). Gatekeeping in health care. Journal of Health Economics, 26, 149-170.

Busse, R., Schreyogg, J., Henke, K.D. (2005). Regulation of pharmaceutical markets in Germany: improving efficiency andcontrolling expenditures? International Journal of Health Planning and Management, 20, 329-349.

Carlsen, B., & Aakvik, A. (2006). Patient involvement in clinical decision making: the effect of GP attitude on patient satisfaction. Health Expectations, 9, 148-157.

Carlsen, B., Hole, A.R., Kolstad, J.R., & Norheim, O.F. (2012). When you can't have the cake and eat it too: A study of medical doctors' priorities in complex choice situations. Social Science & Medicine, 75, 1964-1973.

Carlsen, B., & Norheim, O. (2005). "Saying no is no easy matter" A qualitative study of competing concerns in rationing decisions in general practice. BMC Health Services Research, 5, 70.

Carlsen, B., & Norheim, O. (2008). "What lies beneath it all?" - an interview study of GPs' attitudes to the use of guidelines. BMC Health Services Research, 8, 218.

Coast, J. (2001). Citizens, their agents and health care rationing: an exploratory study using qualitative methods. Health Economics, 10, 159-174.

de Bekker-Grob, E.W., Ryan, M., & Gerard, K. (2012). Discrete choice experiments in health economics: a review of the literature. Health Economics, 21, 145-172.

Delnoij, D., & Brenner, G. (2000). Importing budget systems from other countries: what can we learn from the German drug budget and the British GP fundholding? Health Policy, 52, 157-169.

Department of Health. (2012). Annual Report and Accounts 2011-2012.

Dixon, J. (1997). France seeks to curb health costs by fining doctors. BMJ: British Medical Journal, 315, 895.

Dusheiko, M., Gravelle, H., Jacobs, R., & Smith, P. (2006). The effect of financial incentives on gatekeeping doctors: evidence from a natural experiment. Journal of Health Economics, 25, 449-478.

Eccles, M.P., & Grimshaw, J.M. (2004). Selecting, presenting and delivering clinical guidelines: are there any "magic bullets"? Medical Journal of Australia, 180, S52-S54.

Ellis, R.P., & McGuire, T.G. (1986). Provider behavior under prospective reimbursement. Cost sharing and supply. Journal of Health Economics, 5, 129-151.

Ellis, R.P., & McGuire, T.G. (1990). Optimal payment systems for health services Journal of Health Economics, 9, 375-396.

Evans, R.G., & Brown, M. (1984). Strained mercy: The economics of canadian health care; Strained mercy: The economics of canadian health care: Butterworths and Company.

Farquhar, C.M., Kofa, E.W., & Slutsky, J.R. (2002). Clinicians' attitudes to clinical practice guidelines: a systematic review. Medical Journal of Australia, 177, 502-506.

Feldstein, M. (1974). Econometric studies of health economics. In M. Intriligator, & D. Kendrick (Eds.), Frontiers of Quantitative Economics II. Amsterdam: North-Holland Publishing Company.

Fiebig, D.G., Keane, M.P., Louviere, J., & Wasi, N. (2010). The Generalized Multinomial Logit Model: Accounting for Scale and Coefficient Heterogeneity. Marketing Science, 29, 393-421.

Folland, S., Goodman, A., & Stano, M. (2006). Economics of health and health care. Pearson: Prentice Hall.

Gafni, A., Charles, C., & Whelan, T. (1998). The physician–patient encounter: The physician as a perfect agent for the patient versus the informed treatment decision-making model. Social Science & Medicine, 47, 347-354.

Gosden, T., Forland, F., Kristiansen, I., Sutton, M., Leese, B., Giuffrida, A., et al. (2000). Capitation, salary, fee-for-service and mixed systems of payment: effects on the behaviour of primary care physicians. Cochrane Database Syst Rev, 3.

Granlund, D., Rudholm, N., & Wikström, M. (2006). Fixed budgets as a cost containment measure for pharmaceuticals. The European Journal of Health Economics, 7, 37-45.

Greene, W., & Hensher, D. (2010). Does scale heterogeneity across individuals matter? An empirical assessment of alternative logit models. Transportation, 37, 413-428.

Gu, Y., Hole, A.R., & Knox, S. (2013). Fitting the generalized multinomial logit model in Stata. Stata Journal, 13, 382-397.

Harsanyi, J.C. (1955). Cardinal welfare, individualistic ethics, and interpersonal comparisons of utility. Journal of Political Economy, 63, 309-321.

Hensher, D.A. (2006). How do respondents process stated choice experiments? Attribute consideration under varying information load. Journal of Applied Econometrics, 21, 861-878.

Hensher, D.A., Rose, J.M., & Greene, W.H. (2005). Applied Choice Analysis - A primer. New York: Cambridge University Press.

Hole, A.R., & Kolstad, J.R. (2012). Mixed logit estimation of willingness to pay distributions: a comparison of models in preference and WTP space using data from a health-related choice experiment. Empirical Economics, 42, 445-469.

Hole, A.R., Kolstad, J.R., & Gyrd-Hansen, D. (2013). Inferred vs stated attribute non-attendance in choice experiments: A study of doctors' prescription behaviour. Journal of Economic Behavior & Organization, 96, 21-31.

HSCIC, H.a.S.C.I.C. (2015). Fast facts; Prescribing

ISD Scotland. (2016). Costs - detailed table; Drugs.

Kolstad, J.R. (2011). How to make rural jobs more attractive to health workers. Findings from a discrete choice experiment in Tanzania. Health Economics, 20, 196-211.

Laffont, J.-J., & Tirole, J. (1993). A theory of incentives in procurement and regulation: MIT press.

Lancsar, E., & Louviere, J. (2006). Deleting 'irrational' responses from discrete choice experiments: a case of investigating or imposing preferences? Health Economics, 15, 797-811.

McCombs, J.S. (1984). Physician treatment decisions in a multiple treatment model. The effect of physician supply. Journal of Health Economics, 3, 155-171.

McGuire, T.G. (2000). Chapter 9: Physician Agency. Handbook of Health Economics: Elsevier Science B.V.

Monitor. (2015). Improving GP services: commissioners and patient choice. UK Government.

National Audit Office UK (2012). Healthcare across the UK: A comparison of the NHS in England, Scotland, Wales and Northern Ireland. Report to the House of commons, HC 192.

Neuman, E., & Neuman, S. (2009). Agency in health-care: are medical care-givers perfect agents? Applied Economics Letters, 16, 1355-1360.

OECD (2012). OECD Health Data: Health expenditures and financing. OECD Health Statistics.

OECD (2013). Country statistical profile: United Kingdom. Country statistical profiles: Key tables from OECD.

Olsen, K., Gyrd-Hansen, D., Boegh, A., & Hansen, S. (2009). GPs as citizens' agents: prescription behavior and altruism. The European Journal of Health Economics, 10, 399-407.

Pedersen, L.B., Riise, J., Hole, A.R., & Gyrd-Hansen, D. (2014). GPs' shifting agencies in choice of treatment. Applied Economics, 46, 750-761.

Phelps, C.E. (1997). Health Economncs.

Poe, G.L., Giraud, K.L., & Loomis, J.B. (2005). Computational methods for measuring the difference of empirical distributions. American Journal of Agricultural Economics, 87, 353-365.

Revelt, D., & Train, K. (2000). Customer-specific taste parameters and mixed logit: Household's choice of electricity supplier. Working paper, Departemnt of Economics, University of California, Berkley.

Robert, S., Bateman, D., & Smith, J. (1997). Prescribing behaviour in general practice: The impact of promoting therapeutically equivalent cheaper medicine. British Journal of General Practice, 47.

Rodgers, S., Avery, A.J., Meechan, D., Briant, S., Geraghty, M., Doran, K., et al. (1999). Controlled trial of pharmacist intervention in general practice: the effect on prescribing costs. The British Journal of General Practice, 49, 717.

Ryan, M. (1994). Agency in health care: lessons for economists from sociologists. American Journal of Economics and Sociology, 53, 207-217.

Ryan, M., & Gerard, K. (2003). Using discrete choice experiments to value health care: current practice and future prospects Applied Health Economics and Policy Analysis, 2, 55-64.

Scarpa, R., Thiene, M., & Train, K.B. (2008). Utility in willingness to pay space: A tool to address confounding random scale effects in destination choice to the Alps. American Journal of Agricultural Economics, 90, 994-1010.

Scott, A. (2000). Chapter 22 Economics of general practice. In J.C. Anthony, & P.N. Joseph (Eds.), Handbook of Health Economics pp. 1175-1200): Elsevier.

Scott, A. (2002). Identifying and analysing dominant preferences in discrete choice experiments: An application in health care. Journal of Economic Psychology, 23, 383-398.

Scott, A., & Vick, S. (1999). Patients, Doctors and Contracts: An Application of Principal-Agent Theory to the Doctor-Patient Relationship. Scottish Journal of Political Economy, 46, 111-134.

Stewart, R.E., Vroegop, S., Kamps, G.B., Werf, G.T.v.d., & Jong, B.M.-d. (2003). Factors influencing adherence to guidelines in general practice. International Journal of Technology Assessment in Health Care, 19, 546-554.

Strech, D., Synofzik, M., & Marckmann, G. (2008). How Physicians Allocate Scarce Resources at the Bedside: A Systematic Review of Qualitative Studies. Journal of Medicine and Philosophy, 33, 80-99.

Søndergaard, J., Andersen, M., Kragstrup, J., Hansen, H., Gram, L. (2002). Why has postal prescriber feedback no substantial impact on general practitioners' prescribing

practice? A qualitatity study. European Journal of Clinical Pharmacology, 58, 133-136.

Thornton, J., & Eakin, B.K. (1997). The Utility-Maximizing Self-Employed Physician. Journal of Human Resources, 32, 98-128.

Train, K.E., & Weeks, M. (2005). Discrete choice models in preference space and willingness-to-pay space. In R. Scarpa, & A. Alberini (Eds.), Application of simulation methods in environmental and resource economics pp. 1-16). Dordrecht: Springer.

VanGeest, J.B., Johnson, T.P., & Welch, V.L. (2007). Methodologies for Improving Response Rates in Surveys of Physicians. Evaluation & the Health Professions, 30, 303-321.

Witt, J., Scott, A., & Osborne, R.H. (2009). Designing choice experiments with many attributes. An application to setting priorities for orthopaedic waiting lists. Health Economics, 18, 681-696.

World Medical Association. (2006). http://www.wma.net/en/30publications/10policies/g1/index.html.

Figures

Figure 1 – Example of a choice situation

	Medicine A	Medicine B
Benefit/effect Patient costs per year Total costs per year Patient's own wishes about medication Your experience with this medication	• The best on the market, 90% normally respond to this medicine • 50 GBP • 5000 GBP • prefers this (rather than the other) • little or none	• 60% normally respond to this medicine • 100 GBP • 1000 GBP • does not prefer this (to the other) • good
Which medicine will you choose? (please cross)		

Figure 2 – Distribution of WTAC for "patient prefers medication"
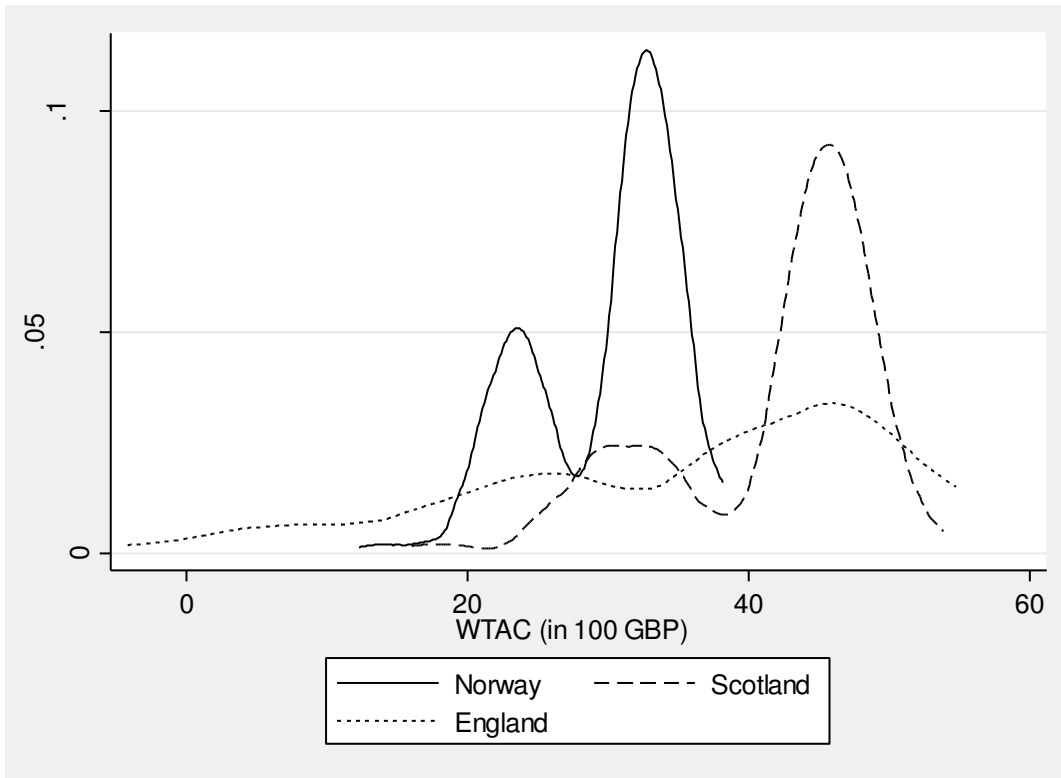
Figure 3 – Distribution of WTAC for doctor having a good experience with med.
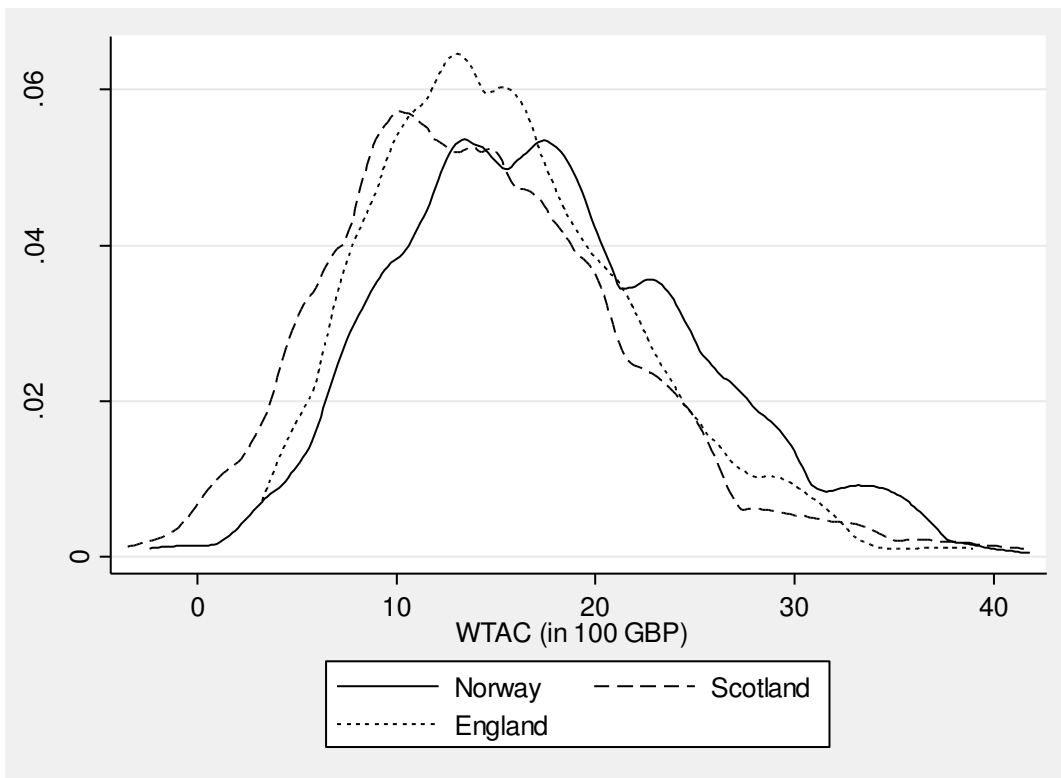
Figure 4 – Distribution of WTAC for 90% effect (compared to 60%)
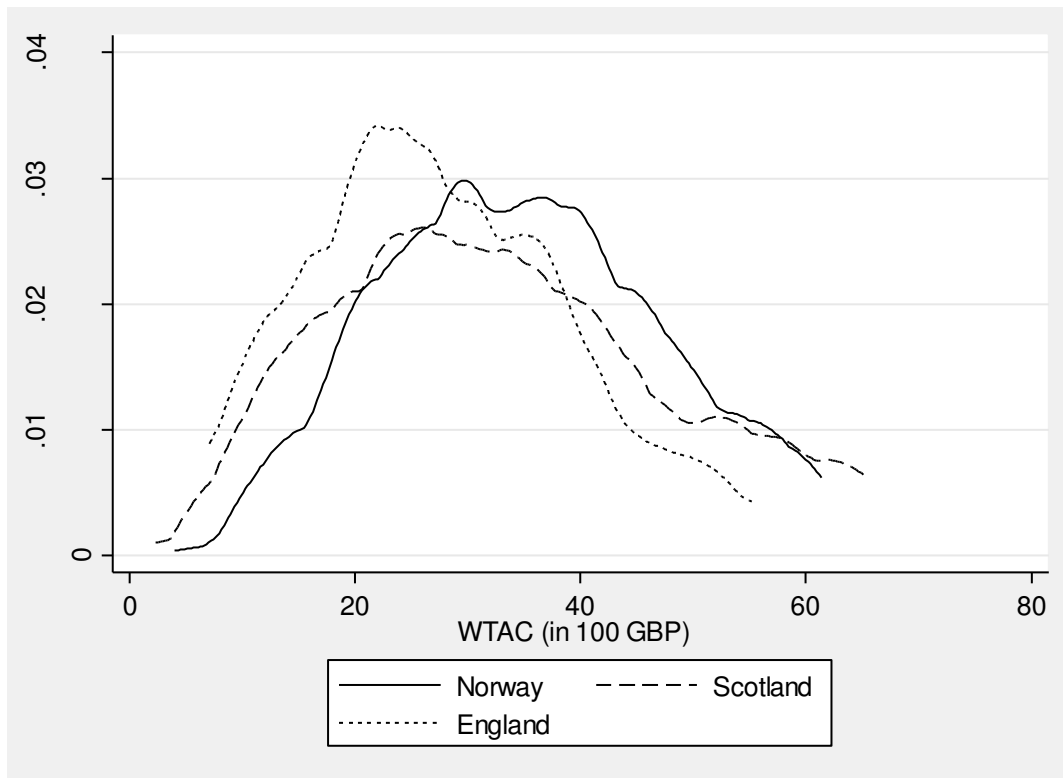
Tables

Table 1 – Attributes and levels

Attributes & levels	Total costs	Effect	Patient costs	Patient preference	Physician's experience
Level 1	500 GBP 5000 NOK	60% normally respond to this medicine	Free	Does not prefer this medicine	Little or none
Level 2	1000 GBP 10 000 NOK	75% normally respond to this medicine	50 GBP 1000 NOK	Prefers this medicine	Good
Level 3	2500 GBP 25 000 NOK	The best on the market; 90% normally respond to this medicine	100 GBP 1800 NOK		
Level 4	5000 GBP 50 000 NOK				

Table 2 – Descriptive statistics

	Norway	Scotland	England
N	284	370	253
Sex (1=female)			
Mean	0.43	0.48	0.35
Age			
Mean	47.01	45.79	49.21
SD	10.64	8.73	8.08
Min - max	28 - 68	33 - 62	33 - 62
Years of practice			
Mean	17.49	17.40	18.78
SD	11.06	10.07	9.01
Min - max	1 – 43	0 – 42	0 – 38

Table 3 – Dominance tests

	Norway	Scotland	England
Total costs	6.3%	16.3%	15.8%
Effect	4.9%	5.7%	2.8%
Patient costs	0%	0%	0%
Patient prefers medicine	66.2%	67.5%	54.5%
Doctor has good experience with the medicine	4.6%	2.2%	3.2%

Note: The patient preference attribute was the same in 83% of the choices in the design, compared to 8% for total cost and 0% for the remaining attributes.

Table 4 - WTAC across countries

	Norway	Scotland	England
Mean			
Effect 75%	14.822***	10.742***	7.607***
(compared to 60%)	[12.689,16.956]	[8.956,12.527]	[5.832,9.381]
Effect 90%	35.038***	33.111***	27.637***
(compared to 60%)	[31.875, 38.202]	[30.351,35.871]	[24.594,30.681]
Patient costs 50 GBP	-7.643***	-10.526***	-13.186***
(compared to 0 GBP)	[-9.976, -5.310]	[-12.643,-8.409]	[-15.757,-10.616]
Patient costs 100 GBP	-9.897***	-10.995***	-10.588***
(compared to 0 GBP)	[-12.076, -7.718]	[-12.825,-9.165]	[-12.763,-8.414]
Patient prefers medicine	29.882***	41.721***	35.444***
	[24.210, 35.554]	[35.442,48.000]	[28.678,42.210]
Doctor has good experience	17.534***	14.220***	15.395***
with the medicine (relative to little or none)	[15.384, 19.684]	[12.440,16.000]	[13.103,17.688]
Standard Deviation			
Effect 75% (compared to 60%)	0.218	0.038	0.622
	[1.920]	[1.525]	[2.086]
Effect 90% (compared to 60%)	16.619***	18.968***	16.262***
	[1.409]	[1.306]	[1.668]
Patient costs 50 GBP	1.018	0.111	2.668
(compared to 0 GBP)	[6.579]	[5.976]	[3.360]
Patient costs 100 GBP	0.185	0.031	3.996*
(compared to 0 GBP)	[1.942]	[1.434]	[2.041]
Patient prefers med.	13.896**	17.560***	25.782***
	[5.863]	[5.664]	[4.243]
Doctor has good experience	11.014***	10.891***	10.210***
with the med. (relative to little or none)	[1.185]	[0.966]	[1.410]

Total cost

Mean of ln(coefficient)	-2.468***	-2.400***	-2.489***
	[-2.610,-2.326]	[-2.516,-2.284]	[-2.716,-2.263]
Standard deviation	0.455***	0.418***	1.347***
of ln(coefficient)	[0.118]	[0.107]	[0.184]
Number of observations	6816	8718	6028
Number of respondents	284	370	253
Log Likelihood	-1317.166	-1597.448	-1266.804

All WTAC measures are reported in 100 GBP (PPP adjusted in the case of Norway). The figures in brackets are 95% confidence intervals for the means and standard errors for the standard deviations. The total cost attribute has been multiplied by -1 to make its coefficient positive. ***: p<0.01, **: p<0.05, *: p<0.1

Table 5 – Willingness to accept costs - WTP space, with interaction effects

	Norway			Scotland			England		
	Main effect	**Female**	**Practice > 20 years**	**Main effect**	**Female**	**Practice > 20 years**	**Main effect**	**Female**	**Practice > 20 years**
Mean									
Effect 75% (compared to 60%)	13.734*** [10.254, 17.213]	3.219 [-1.157, 7.595]	0.304 [-3.862, 4.470]	9.612*** [6.510, 12.715]	1.292 [-2.329, 4.913]	0.305 [-3.222, 3.833]	5.814*** [2.660, 8.968]	0.098 [-3.512, 3.709]	2.568 [-1.211, 6.347]
Effect 90% (compared to 60%)	32.600*** [27.435, 37.765]	7.144** [0.700, 13.588]	-0.026 [-6.248, 6.196]	29.937*** [24.761, 35.113]	4.695 [-1.122, 10.511]	0.608 [-5.155, 6.371]	25.131*** [19.779, 30.484]	3.816 [-2.842, 10.474]	3.114 [-3.028, 9.256]
Patient costs 100 GBP (compared to 0 GBP)	- 8.250*** [-12.170, -4.330]	-0.890 [-5.875, 4.095]	1.935 [-2.785, 6.654]	-7.259*** [-11.339, -3.179]	-4.388* [-8.971, 0.195]	-2.601 [-7.118, 1.916]	-10.702*** [-14.913, -6.492]	0.817 [-4.430, 6.065]	-5.608** [-10.481, -0.734]
Patient costs 180 GBP (compared to 0 GBP)	- 8.396*** [-11.997, - 4.795]	-3.627 [-8.223, 0.968]	0.341 [-3.984, 4.666]	-9.573*** [-13.012, -6.134]	-1.814 [-5.780, 2.152]	-2.209 [-6.087, 1.669]	-7.082*** [-10.784, -3.381]	-3.924* [-8.440, 0.592]	-4.283* [-8.618, 0.051]
Patient prefers med.	28.420*** [20.240, 36.600]	7.241 [-2.046, 16.528]	-3.263 [-12.133, 5.606]	46.711*** [36.434, 56.988]	-1.292 [-10.403, 7.819]	-10.793** [-19.970, -1.616]	40.757*** [29.462, 52.051]	-0.479 [-11.742, 10.784]	-10.407* [-22.248, 1.434]
Doctor has good experience with the med.	18.081*** [14.633, 21.529]	1.998 [-2.348, 6.345]	-2.941 [-7.062, 1.181]	12.919*** [9.613, 16.225]	5.722*** [2.024, 9.421]	-2.328 [-5.993, 1.338]	15.162*** [11.763, 18.560]	-0.011 [-4.037, 4.015]	1.007 [-2.915, 4.929]
Standard Deviations **Effect 75% (compared to 60%)**	0.116 [2.139]			0.119 [1.534]			2.186 [3.090]		

Effect 90% (compared to 60%)	16.406*** [1.445]			18.119*** [1.345]			16.892*** [1.672]		
Patient costs 100 GBP (compared to 0 GBP)	0.366 [4.737]			0.078 [3.518]			0.811 [2.400]		
Patient costs 180 GBP (compared to 0 GBP)	0.133 [1.758]			0.002 [1.379]			4.915*** [1.438]		
Patient prefers med.	11.561* [6.432]			16.093*** [6.145]			26.470*** [4.548]		
Doctor has good experience with the med.	10.978*** [1.174]			10.010*** [1.049]			9.625*** [1.006]		
Total cost									
Mean of ln(coefficient)	-2.642*** [--2.903, - -2.383]	0.030 [-0.217, 0.276]	0.009* [-0.001, 0.020]	-2.322*** [-2.606, -2.038]	-0.158 [-0.390, 0.073]	0.001 [-0.011, 0.012]	-2.818*** [-3.370, -2.266]	0.467* [-0.049, 0.984]	0.012 [-0.013, 0.036]
Standard deviation of ln(coefficient)	0.448*** [0.115]			0.529*** [0.115]			1.441*** [0.252]		
Number of observations	6696			7752			5766		
Number of respondents	279			328			242		
Log Likelihood	-1280.801			-1412.054			-1205.744		

All WTAC measures are reported in 100 GBP (PPP adjusted in the case of Norway). The figures in brackets are 95% confidence intervals for the means and standard errors for the standard deviations. The total cost attribute has been multiplied by -1 to make its coefficient positive. ***: $p<0.01$, **: $p<0.05$, *: $p<0.1$.

Appendix

Table A.1 – Institutional context

	Norway	England	Scotland
General financing of primary health care	State & local taxes	General taxation	General taxation
Coverage/accessibility (criteria for inclusion)	Universal	Universal	Universal
Contract/organization/location	Independent GPs contracted directly by local municipalities. Individual patient lists Sometimes co-located with others, sharing administrative expenses.	National Health Service, Westminster Parliament 152 Primary Care Trusts (PCTs) that commission primary and secondary care for the population within their geographic area Independent GPs contracted through practices. GPs are owners or employees Practices enter into a contract with the PCT Three types of contracts; GMS (55%), PMS (40%), APMS, PCTMS Some practices participate in practice based commissioning from 2005	National Health Service, Scottish Parliament 14 Regional Health Boards (RHB) Independent GPs contracted through practices. GPs are owners or employees Practices enter into a contract with the RHB Three types of contracts: GMS (90%), 17c (same as PMS), 2c
Incentive level	Individual GP Relatively weak (indirect) incentives to keep costs down	GP practice Strong incentives to keep costs down at practice level	GP practice Relatively strong incentives to keep costs down at practice level

GP payment	Fee-for-service 70% from the public security system, (NAV) Capitation 30% from local municipality	Majority of income through capitation (GMS contract) 25% through Quality and Outcomes indicators (GMS contract) Rest enhanced services (GMS contract) Practices in the practice based commissioning system can keep profits => strong incentives to keep costs (prescriptions) down.	Majority of income through capitation (GMS contract) 25% through Quality and Outcomes indicators (GMS contract) Rest enhanced services (GMS contract) No practice based commissioning
Guidelines & recommendations for prescriptions	For some conditions and procedures, but in general not enforced "Blue-list" indicating which medicines are cost-effective. Prescriptions of medicines on the list are free/cheap Third party (NAV) refunds prescription costs, if on the blue list	NHS through NICE provides a well incorporated system of guidelines and national recommendations of procedures NHS prescriptions indicating "approved" prescriptions with regard to effectiveness, and prices. Incentives to adhere to NHS prescriptions through the Quality and Outcomes framework PCTs pay for the prescriptions => have direct incentive to influence prescription behaviour PCTs sometimes have their own prescription guidelines and list of approved drugs	Scottish Medicines Consortium (SMC) provides advice on new and older drug formulations. NHS prescriptions indicating "approved" prescriptions with regard to effectiveness, and prices. Incentives to adhere to NHS prescriptions through the Quality and Outcomes framework HBs pay for the prescriptions => have direct incentive to influence prescription behaviour HBs sometimes have their own prescription guidelines and list of approved drugs
Patient co-payment **Should vary**	On prescriptions and consultations, annual cap of 1800 NOK Some focus	Flat user charge on prescriptions, but with exemptions => 90% of all prescription items free Little focus	Since 2007: staged reduction in user fees – full abolition in April 2011 No focus
Competition for patients **Criteria – should be present**	Patients free to choose GP list. Possible to change list twice a year, 5,8% did so in 2010. 43,9% of lists	Patients free to choose a GP list within their geographical catchment area. Possible to change list anytime. Most lists were open for new patients in 2014. Information about the number of switchers is scarce, but in general the	Patients free to choose a GP list within their geographical catchment area. Possible to change list anytime. Most lists were open for new patients in 2014. Information about the number of switchers is scarce, but in general the

| | were open for new patients in 2010.

L | competition seems to have been low in the period studied. | competition seems to have been low in the period studied. Less information available to patients interested in switching GP in Scotland. |

Table A.2 – Significance tests

	Norway vs Scotland	Norway vs England	Scotland vs England
Effect 75% (compared to 60%)	***	***	***
Effect 90% (compared to 60%)		***	***
Patient costs 50 GBP/ 1000 NOK (compared to 0 GBP/NOK)	**	***	*
Patient costs 100 GBP/ 1800 NOK (compared to 0 GBP/NOK)			
Patient prefers med.	***		*
Doctor has good experience with the med.	*	*	

Note: the tests are carried out using the using the complete combinatorial approach described in Poe et al. (2005).

A.1 More on institutional background in the three study countries

Norway is among the countries in the world that spend the most on health, and the amount has increased over the last decade; from 4074 USD[15] per capita in 2004 to 5388 USD per capita in 2010 (OECD, 2012). Primary health care services in Norway are universally accessible and financed by a mix of state and local taxes. All residents in Norway are enlisted to a GP either by active choice or by designation. It is possible to change GP twice a year, and everyone has the right to seek help from whichever GP they want, while the GPs can receive any patient they want, but have obligation only to see patients on their respective list. The majority of Norwegian GPs are private practitioners contracted by local municipalities. Even though many are co-located with other GPs, this is mainly a matter of sharing administrative expenses, as all GPs have their own income and their own private list of patients that they are responsible for. GPs are paid partly by fee-for–services (70%) from a third party (the national insurance scheme, NIS), and partly by capitation (30%) from the local municipality. A very small share of their income comes from patient co-payments. The GPs are regarded important gatekeepers in the Norwegian health system, but they have very few binding responsibilities when it comes to keeping costs and referrals to specialist care down. Clinical guidelines have been developed for some conditions and procedures, but are in general not enforced. With respect to prescription decisions, Norwegian health authorities have developed a list of medications accepted for public refunding by NIS. If a GP without well-documented and accepted reasons chooses to prescribe medications that are not on the list, the patient is responsible for all costs. Pharmacies are encouraged to dispense the cheapest generic substitute, but GPs have the opportunity to deny generic prescription. Incentives to keep costs down are thus both indirect and relatively weak for the Norwegian GPs, while the system with competition for patients may drive costs up.

Scotland and England have in many aspects similar health systems, with the majority of health services provided through their common National Health System (NHS). The NHS is based on a principal of universal free healthcare at the point of access, financed through general taxation. The Scottish Parliament in Scotland and the Westminster Parliament in England have responsibility to allocate funds and regulate the health service provision to their

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[15] US dollars measured in current prices and PPP.

respective populations. All together the UK health system has like Norway increased its spending over time; from 2540 USD in 2004 to 3433 USD in 2010 (OECD, 2012).

In England, at the point of survey, there were 152 Primary Care Trusts (PCTs) that commissioned primary and secondary care for the population within their geographic area. Primary care was commissioned through GPs who are private practitioners organized in practices, which in turn were contracted by the PCTs. The most common contractual arrangement was (and remains at present) the UK agreed General Medical Services Contract (GMS) where the practice is allocated funds across three main dimensions. The largest proportion, just over half, is derived from a capitation based formula referred to as the global sum. Around one quarter of practice income is generated through the Quality and Outcomes Framework which awards points (and subsequently funds) across a range of quality indicators. Practices are also able to generate funds through the provision of additional "enhanced services". In 2011, 55% of GP practices were contracted through the GMS contract in England and around 40% contacted through the Personal Medical Services Contract (PMS) where the contract is negotiated locally. The remaining practices were covered by the Alternative Provider Medical Services Contract (APMS) and the Primary Care Trust Medical Services (PCTMS).

The system in Scotland is similar; 14 Regional Health Boards (RHB) commission universally accessible primary and secondary care for the population within their geographic area. Primary care is commissioned through contracts with GP practices where, as in England, GPs are independent contractors who operate within a practice. Around 90% of practices in Scotland are contracted under the UK-negotiated GMS with the remaining practices contracted under 17C contracts (equivalent to PMS in England) and a few "2C" practices, run by Regional Health Boards.

With slightly different twitches to the general formula, PCTs and RHBs are allocated budgets using a weighted capitation formula that provides a unified budget for the commissioning of hospital and community health services, primary medical services and prescription costs. The PCTs and RHBs set an indicative annual prescribing budget for each practice but once prescriptions are dispensed, the invoice for payment is sent to the respective PCT or RHB. The PCTs and RHBs have accordingly clear incentives to influence prescribing behavior,

which they do through local prescription guidelines. In addition to national advice on prescriptions (by the National Prescribing Centre, the Institute for Clinical Guidance (NICE) and the Scottish Medicines Consortium (SMC) respectively) GPs are thus given guidance also by local bodies appointed by the PCTs and RHBs, with the local guidelines often being more restrictive. As independent contractors GPs are not obliged to follow non-statutory guidance provided by local formularies however, even though there is within the GMS contract, a clause that states that practices can be in breach of contract if they prescribe excessively or inappropriately.

GP practices in both England and Scotland are provided with direct financial incentives for prescribing "right" through the GMS contract where in 2011 an additional 28 points were offered to reward GPs on reviewing their prescribing with local NHS managers. However these points are only a small proportion of the total points on offer (1000). English GP practices that at the time of survey were part of the practice based commissioning system, a reform in England introduced in 2005, also had the incentive that any savings against the indicative prescribing budget could be utilised in other forms of patient care as chosen by the practice. While there are many similarities between the two countries, this system did not exist in Scotland. Indeed the system in England has since the time of survey been substantially reformed; PCTs have been abolished and new NHS Commissioning Boards (NHS CB) been made responsible for commissioning of primary care in England through 211 GP-led commissioning groups which GP practices are required to join. This represents a substantial reform to the NHS in England and is in effect a return to GP fund-holding for general practices within England, but on a mandatory scale.

GPs in both countries prescribe medicines to patients using NHS prescriptions. NHS prescriptions are covered by the drug tariff which outlines the price that will be reimbursed for the drugs. A flat user charge is levied on patients in England, but an exemptions system results in around 90% of all prescription items being free. In Scotland there has since 2007 been a staged reduction in user charges with the full abolition of prescription charges coming into effect in April 2011.