Supplier Inducement
in the Belgian Primary Care Market*

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All comments are welcome

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Abstract

We address the presence of supplier-induced demand in the Belgian primary care market, which is characterized by a fixed fee system and a high density of General Practitioners (GP). Using a unique dataset on the number of visits of all Belgian GPs, we first investigate whether we can find evidence of demand inducement by Belgian GPs. Novel to this literature is that we furthermore investigate which type of visits GPs typically use for inducing demand.

We extend the theoretical framework of Carlsen and Grytten (1998) to allow for a limitation in the possibility of inducing demand due to the amount of information in the market. As a result, our model predicts GPs to induce demand when the level of competition becomes high, while a further increase of competition triggers a decrease in their inducing behavior.

The results indicate the presence of both availability effects and supplier inducement in the Belgian primary care market. We also find that GPs prefer the use of home visits during working hours to induce demand for their services. However, when competition gets fierce, they substitute toward inducement through office visits.

Keywords: supplier induced demand, GP, Belgium

1   Introduction

In an era of ever-increasing budgets for health care, studying the functioning of health care markets becomes very important[1]. The key to controlling the budget namely lies in providing the correct set of incentives to all parties involved. Only when one fully understands how e.g. consumers and suppliers make their decisions in this market, one can hope to construct a tool to restrain the increase in public health expenditure.

Mostly one looks at demand and supply inefficiencies in the health insurance system for explaining the high consumption levels. However, also the role of the General Practitioner (referred to as GP further on) is important in constructing policies to reduce the overall consumption of medical care. As patients delegate authority to health providers, they control the health consumption of their patients to a considerable extent[2]. It is thus crucial to understand the behavior of the GP and her reaction to changes in her direct environment[3]. One of the most debated issues concerning their behavior is the question whether or not GPs are inducing demand for primary health care.

It should not be surprising that the study of supplier-induced demand (SID) is well documented in health economics since it has far-reaching implications[4]. If it is true that suppliers, and more specifically health providers, induce demand for their services, the standard economic theory no longer applies. That is, the traditional relationship between demand and supply does not exist for the medical care markets. Whether or not SID is present in the health care markets of a country, will thus influence to a large extent the optimality of different public health policies. For example, if GPs engage in inducing demand, restrictions on the number of GPs can be a good idea, whereas drops in fees would not have a significant impact on the budget. However, although SID is well documented, there is no unanimous approach for testing its presence.

The market under investigation in this paper is the Belgian primary care market. According to the literature, the Belgium health care system provides the perfect setting for demand inducement by GPs. It is characterized by third-party payment, GPs are paid according to a fixed fee schedule and the number of GPs per capita is high. Furthermore, a first look at data on consumption levels of care in Belgium, indicates a positive link between
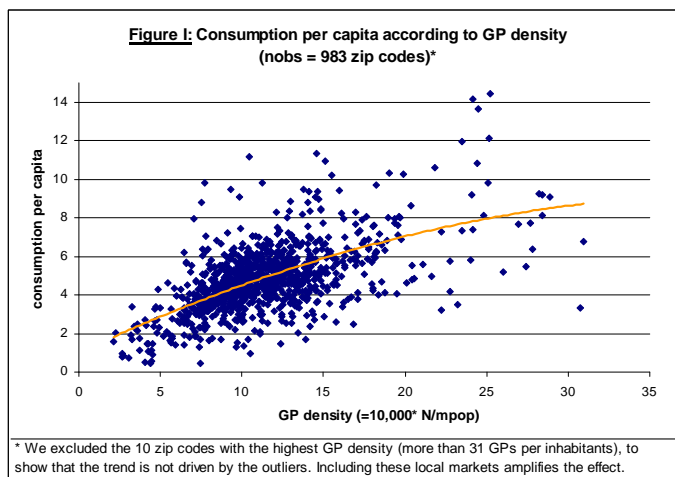
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[1]According to the figures from the country notes of OECD Health Data 2006, on average, OECD-countries spend 8.9% of their GDP on health care (2003). The public health expenditure even amounted to 10.1% of GDP for Belgium in 2003.

[2]Patients delegate authority because of information asymmetry, shifting responsibility and insurance coverage (see Zweifel & Manning, 2000).

[3]For convenience, the GP will be referred to as 'she' and the patient as 'he'.

[4]For an overview of the literature, see e.g. Labelle et al (1994)

consumption per capita and the number of GPs per capita (see Figure 1). Finally, there is some prior indication of SID. Schokkaert & Van de Voorde (2005) study the change in public health expenditure after the increase in co-payment in 1994 and the linear drop in fees for health providers in 1997. They document that the public health expenditure only experienced a small drop. More specifically, the immediate price effect was compensated by quantity increases in the following years (see also Van de Voorde et al., 2001 and Cockx & Brasseur, 2001[5]). There are thus reasons to believe that inducement is a feature of the Belgian health care system.

Figure I: Consumption per capita according to GP density
(nobs = 983 zip codes)*

* We excluded the 10 zip codes with the highest GP density (more than 31 GPs per inhabitants), to show that the trend is not driven by the outliers. Including these local markets amplifies the effect.

In this paper, we perform a direct test for inducing behavior by Belgian GPs. We collected a unique data set on the individual performance of all registered GPs in Belgium and ask whether a GP artificially increases the demand for her services when the level of competition for patients increases. For this aim, the theoretical framework of Carlsen & Grytten (1998) is used, where availability effects can be identified seperately from inducement effects. However, we provide an extension to the model because of the high levels of GP density in Belgium. That is, we introduce a limitation to the opportunity to induce demand into the theoretical model. This captures the possibility that, when the amount of information on GPs is high in the local market, the knowledge of the patients can prevent the GP to induce demand. As a result, the model predicts that GP induce demand when competition becomes considerably

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[5]In both papers, the price elasticity of demand is estimated based on detailed data of Belgian consumers and their consumption of medical care. They use the increase of the out-of-pocket price of primary health care in 1994. The price elasticity of demand provides indirect evidence of SID since, in the presence of SID, the reaction of the demand to price changes is diluted by the reaction of the supply side. Van de Voorde et al (2001) initially find that, at least in the short run, not all reduction in demand due to the price increase is countered by demand inducement by the GPs. There however has been some critique on the estimates by Cockx & Brasseur (2003) which correct the estimates downwardly, leading to stronger indication of supplier induced demand.

high, but that she will reduce her inducing behavior when the GP density becomes very high. In terms of the empirical implementation, we therefore allow for a rich pattern of effects of supply on per capita consumption according to the level of competition. Also novel to the literature is that, next to investigating the presence of inducement, we additionally look at the way GPs induce demand. That is, we look at which type of visits a GP employs for inducing demand[6].

Contrary to the findings of Carlsen & Grytten (1998) and subsequent work on Norway, the results of our cross-sectional study provide evidence of supplier-induced demand by Belgian GPs. There clearly is a positive effect of GP density on per capita consumption of GP services. We find that this relationship can only partly be explained by availability effects and thus conclude in favor of the presence of inducing behavior of Belgian GPs. Furthermore, the analysis on the different types of visits indicates that GPs seem to prefer the use of home visits during working hours to induce demand. However, when competition gets fierce, they substitute towards inducement through office visits because of the risk of loosing patients associated with continuing inducement of home visits (information effect).

The paper is organized as follows. We start in Section 2 by discussing the Belgian primary care market and make the link with issues of supplier-induced demand. In this section, we also introduce our data set on Belgian GPs, as this determines the approach taken to investigate the presence of SID. Section 3 then discusses the methodology to identify inducement from our data set. We develop a theoretical framework and introduce the empirical implementation. We furthermore give some insights in the type of visit a GP uses for inducing demand. Section 4 discusses the results of the estimation for the Belgian primary care market and Section 5 concludes.

2   Primary care and GP induced demand in Belgium

The origin of supplier inducement can be traced to two features of health care markets. First, there is an extensive information asymmetry between a GP and a patient. Second, the GP has a dual role as both the advisor of the patient as well as the provider of the services. These features enable the GP to guide the decision process of the patient is such a way that she maximizes her own utility/profit function, without the patient knowing it. The GP can thus recommend services that do not pass the objective patient cost-benefit

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[6]To our knowlegde, the only related question that has been adressed is the distinction between inducing the number of visits or inducing the content of a treatment. We instead focus only on the number of visits, but split this up in different type of visits: office visits and home visits during working hours.

thresholds (Dranove 1988). Especially if her income/utility is threatened, she will have an incentive to e.g. induce more visits with her patients to maintain her income/utility level. As a result, the inducement hypothesis predicts that, when an additional GP enters the market, there will be a higher consumption level in that market, which is driven by the behavior of the GP[7]. As this would have important implications for policy, it is necessary to investigate whether this behavior is present in the Belgian primary care market.

The hypothesis of supplier inducement remains however hard to test since a sound analysis should capture all the peculiarities of the health care markets. As Grytten et al. (1995) put it:

> A sound analysis requires a model that deals with the provision of suboptimal, optimal and supraoptimal levels of health care; it should account for a world of ill-informed and perhaps misinformed consumers; the model should take into account that physicians are both concerned with the patient's well-being and their own well-being; and finally, institutional factors should be taken into account. Often, health services are provided in markets which are subject to complex government subsidies and regulations.

There is however an extensive literature that models the decision problem of the GP related to supplier inducement. Although one can not account for all the specifics of the problem, empirical research can provide indication of the presence of supplier inducement. The type of information that one can use however determines to a large extent which type of conclusions on inducement can be drawn. Traditionally town-level data was used, as in e.g. Fuchs (1978), but these aggregated approaches were highly criticized due to identification issues (e.g. Auster & Oaxaca, 1981). As in the recent years data availability has improved considerably, a lot of micro-models to refine the testing are developed. However, not only is there no consensus on the methodology to correctly identify inducing behavior, also the results are far from conclusive.

Before presenting a model to identify supplier inducement, we start by exploring the organization of the primary care market in Belgium and relate this to the possibility of inducing behavior of the GPs. Since the availability of data determines the way to and

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[7]Note however that GP inducement is not necessarily a bad thing and we are not willing to make a judgement. Although SID has a negative connotation, it can, at least in the health care markets, also increase social welfare. More care is generally thought of as a good thing, especially when considering the negative externalities of an illness. Furthermore, it might well be that the individual consumer underestimates his demand for care ('illness behavior' (Mechanic, 1968)). On the other hand, of course, supplier inducement results in a possible overconsumption of the medical care, generated by the economic self-interest of the physicians. We investigate the presence of the inducement because of the consequences for public policy.

the extent to which we can test for supplier-induced demand, this section continues by introducing the data set on the Belgian GPs.

2.1 Organization of the Belgian primary care market

Belgium is known for an excellent availability of health care. For the primary care market, there is on average one active GP per 803 inhabitants (2001)[8]. Note only are there many GPs, consumers can also choose freely among them. Moreover, there is no gatekeeping role for the GP, which implies direct access to all care, including to specialists. With a total care density of about 71 general or specialized practitioners per 10,000 inhabitants (Cesifo, 2001), there is a very good health care coverage in Belgium.

GPs typically operate from an office in which they receive their patients and perform home visits at the patients homes. With an average of 37% of all visits being home visits (2001), Belgium is at the top of the ranking. Moreover, GPs are joined in a system of night and weekend duty to guarantee permanent access to primary care.

The GP is reimbursed for her activities through a fee-for-service system[9]. The fee schedules are established periodically, as an agreement between all parties involved (sickness funds, government and GP representation). Although GPs can opt out of the negotiated fees by formally rejecting them, figures of RIZIV/INAMI indicate that 85% of all GPs comply with the fixed fees. Moreover, GPs who commit themselves to continue training and to be involved in the local organization of the primary health care, get an official 'accreditation', which entitles them to charge a higher (fixed) fee[10]. The higher fee however does not translate in a higher consumer price. An important difference with other countries is that GPs do not get any extra reimbursement for the number of laboratory tests they request. This implies that the GP has no benefits of inducing more tests and therefore will not be inclined to do so.

Finally, Belgian primary care is characterized by a third-payer system, in which the patient only pays part of the total cost of care. Although the consumer's co-payment is relatively high in Belgium, the frequency of GP visits is much higher compared to other European countries; the Belgian Health Survey of 2001 indicates that, on average, Belgians

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[8]Note that the physician density is much higher. With physicians defined as all practising doctors that are not specialists (=GPs + others), there were only 257 inhabitants per practising physician in 2001. Or put differently, there were 39 physicians per 10,000 inhabitants, which makes Belgium the third physician dense country in Europe, after Greece and Italy (OECD Health Data and RIZIV/INAMI). Also compared to the rest of the world, these figures are very high: for example, in the US, there are about 27 physicians per 10,000 inhabitants.

[9]That is, per contact with a patient, the GP is reimbursed with a fixed fee.

[10]This can be interpreted as a signal of quality toward the consumers, although not all GPs (a minority) are in a position to get the accreditation.

have yearly 6.5 visits with a GP[11].

Given these features, the primary care market in Belgium provides an excellent setting for GP inducement. First, the high GP density implies a limited pool of patients for each GP. The pressure on the average GP's income is thus considerably high, which adds to persuading her to induce additional demand for her services. Second, due to the fee-for-service system, the income of the GP is positively related to her activity. Any reduction in the consumers' utilization thus automatically leads to a proportional decrease in the GP's income, as she has very few options to increase the revenue per item of service (the only means for GPs to induce demand is through increasing the number of visits). Third, since patients only pays a part of the costs, their marginal costs of a higher utilization are rather low, relative to the benefits for the GP. In other words, consumers are less sensitive to using another consultation.

On the other hand, the high GP density in Belgium, together with the absence of a gatekeeping role for the GP, makes it harder for the GP to control the demand. In case of a high GP density, there are very low travel and search costs for the consumers which results in a high concentration and accessibility of information in the market. This empowers the consumer. If the patient suspects that the GP is not operating entirely in his interests (which the patient will also be able to do better), the threshold for switching between GPs or to go see a specialist is very low. Therefore, high levels of GP density can in principle limit the possibility of inducing behavior.

Finally, the presence of a fixed fee schedule facilitates the interpretation of the increase in the level of consumption due to an increase in the number of GPs in two ways. First, the relation between prices and quantities does not interfere with the analysis, so that the distinction with the neoclassic model is clear[12]. Second, since the prices are fixed at a national level, they are independent of the number of GPs operating in a local market and thus do not influence the supply of care in that market. Furthermore, due to the high GP density, it is unlikely to have demand excesses[13].

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[11]Note that this is the average number of contact with a GP only. The same survey (*Gezondheidsenquête 2001, België*) indicates that the average number of contacts with specialists is a bit more than 3 per year.

[12]Remember that the neoclassic model also predicts that a supply increase results in an increase in the total consumption of the good/service. However, this mechanism is driven by a simultaneous drop in prices.

[13]Remark that the basic characteristics of the Belgian primary health care market is similar to the Norwegian one, studied extensively by *Grytten et al (1995)*, *Carlsen and Grytten (1998)*, *Sørensen and Grytten (1999)* and *Grytten and Sørensen (2001)*. However, Belgium only has contract physicians and no salaried physicians (that work independently of a hospital).

2.2 Data set

RIZIV/INAMI, the National Institute for Sickness and Disability Insurance of Belgium, owns a rich database on the behavior of the individual physicians and patients. For this paper, we are interested in the behavior of GPs as they are mainly responsible for the primary care. The identification of the genuine GPs from the dataset with all physicians, is based on GP performance measures that are in accordance with a new regulation that is effective since July 1st, 2006[14]. This stipulates that a GP will only remain certified if she has at least 500 visits in one of the last five years. We furthermore restrict a GP to have at least 50 patients in one of the last five years[15]. We want to stress that this is not an exclusion of the small GPs, but rather a selection of the GPs that are available to the public, active and somewhat viable. Note also that we do not exclude entrants and exiters out of the dataset[16]. We identify 12,133 GPs in 2001, for which we observe yearly GP level data. Due to privacy reasons, the records are however 'anonymized' which leaves us with little GP-specific information.

We categorize our data into four groups of variables; we have an indicator of the supply of primary care, indicators of the level of consumption of primary care and some GP-specific control variables from RIZIV/INAMI. This dataset is enriched with additional market specific controls for 2001[17]. We now discuss these variables in more detail and refer to Table 1 for the descriptive statistics. Furthermore, Table 2 provides some additional insights by assigning markets to one of five groups according to their GP density: group 1 contains the 20% markets with the lowest GP density, whereas group 5 collects the 20% markets with the highest GP density (GP dense areas).

Supply indicator

As a measure of local supply of primary health care, we work with GP density (denoted by R), defined as the ratio of the number of active GPs in the local market (N) to the number of inhabitants (x10,000). This measure takes into account the magnitude of the market and

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[14]The RIZIV/INAMI dataset also includes e.g. physicians connected to companies/government or those who only do guard duty. Our selection criterium is based on "Ministerieel besluit tot vaststelling van de criteria voor de erkenning van huisartsen (21/02/2006)".

[15]The latter is done to exclude the GPs who only do guard duty, and thus are as such not to be considered as real rivals of the regular GPs. Note that for physicians with at least 500 contacts, the restriction to at least 50 patients is not at all strong.   Note that we use data from 2000 until 2004 to select the GPs.

[16]While their output decisions will be taken into account in evaluating a response on an increase or decrease in GP density (which is caused by these entrants and exiters), we want to draw conclusions on per capita consumption levels and therefore the inclusion of them is needed. The overall conclusions of the analysis for the balanced dataset do however not change - on the contrary, we get more pronounced and stronger effects.

[17]The market specific characteristics are provided by the NIS (National Institute of Statistics), Ecodata (Federal Government Agency for Economics) and RSZ (the National Institute of Social Security).

in such gives a correct measure of the degree of competition in the direct environment of the GP. Since the majority of the population has a fixed GP and since patients in general do not travel far for primary care, the GP density is defined on the level of Belgian zip codes, which can be thought of as the relevant local market of a GP[18]. We identify all Belgian zip codes in which at least one GP is active, which implies that we work with information on 993 out of the $1,144$ zip codes. Looking at Table 1, the average GP density in 2001 is 12.46, which implies that on average there was one GP per 803 inhabitants. Note however that there is a large variance: the first group of markets, with the lowest GP density, have an average of 7.12 GPs per $10,000$ inhabitants, whereas the group 5 markets are characterized by an average GP density of 20.25.

Appendix 1 gives an insight in the spread of the GP density across Belgium zip codes for 2001. It is immediately clear that it will be important to correct for the Belgian Communities; nearly all of the Flemish local markets have a GP density below average. In Wallonia, we find a mixture of markets with high and low GP density, whereas Brussels is mainly characterized by GP densities above average.

Performance/Consumption indicators

Our data includes the yearly number of patients and the yearly number of visits of different types for every GP in 2001[19]. In the subsequent analysis we focus on the yearly number of visits per GP, which is denoted by Q. We find that the average Belgian GP had a total of $3,909$ contacts in 2001, which implies an average of 6.80 contacts with each of her patients[20]. The RIZIV/INAMI dataset also provides a split up of the total number of visits according to the type of visit. We concentrate on the number of office visits (Q_Office) and the number of home visits during working hours (Q_Home). As indicated before, there is a high consumption of home visits, with an average of $1,539$ home visits per year per GP. The average GP finally performed $2,281$ office visits in 2001. There however is a large variation in the performance of GPs.

Note that there are significantly more GPs operating in the markets that are part of group 3 and group 4 (average or higher than average GP density). As their GP density

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[18]Since GPs are anonymized in the dataset, we only have limited information on their location (only zip code). This prevents us to work on a lower level of aggregation.

[19]A patient is uniquely assigned to the GP which he visited most during that year. About 94% of the Belgian population indicates having a *fixed* GP (2001). Patients do come in contact with other GPs in case primary care is needed outside working hours (during guard duty).

[20]To give some idea of the magnitude of this figure, taking that a full time GP works 6 days out of 7 and takes 2 holidays of 2 weeks a year, this implies that the average GP has 13 contacts per day. Note that the performance figures are considerably higher in case we focus attention to those GPs that are neither just entering or have decided to exit the market. For 2001, the yearly average number of visits per GP would then be $4,300$, of which $2,503$ were office visits and $1,702$ were home visits during working hours.

is moderate, this implies that the markets of group 3 and 4 also on average have a larger population size. It is thus not group 5, which collects the markets with the highest GP density, that contains the big cities. Furthermore, the average GP has the highest workload when she is located in a market of group 1 (when the level of competition is low) and this carries over to the different types of visits. However, this group of markets also has the higher number of patients per GP.

GP-level control variables

Because the data is anonymized, there is only limited information on the individual GP. Next to the location in which she operates (zip code), we have information on her level of accreditation (*accr*). This gives the percentage of time the GP chose to work under the accreditation-system in that year; e.g. a GP that becomes accreditated only from July onward will have a level of accreditation of 50%. The average level of accreditation is rather high at 78%. This average can roughly be interpreted as the fraction of the GPs that are accreditated. Upon closer investigation of this GP-level variable (Table 2) we find an important link with the GP density in a market. That is, whereas in areas with a low GP density on average 86% of the GPs is accreditated, the accreditated GPs only account for 66% of the GPs in GP dense areas. To the extent that this relation is not due to the difference between Belgian Communities, this finding is counterintuitive since we would expect that the higher competition in the GP dense areas would urge GPs to get a higher price for every visit they complete.

Furthermore, we are able to identify GPs' medium run decision to operate in a local market. We create dummy variables *entry* and *exit* that indicate for every GP whether she respectively recently entered or is about to exit the market[21]. We identify in total 674 entrants (just before or in 2000 and in 2001) and 1,109 exiters (in 2002, 2003, 2004 or just after) in the data set for 2001. This accounts for respectively 6% and 9% of the dataset. Furthermore, most of the entrants and the exiters operate in markets with the highest GP density. Therefore, the markets of group 5 do not only have the highest number of GPs per capita, but also the highest turnover of GPs.

Although we have no information on GP specifics such as gender and age, we can try to pick up some of it by looking at the GP's choice in composition of her visits. The percentage home visits both during (*perc_H_D*) and outside working hours (*perc_H_O*) are variables reflecting the underlying preferences and possibly characteristics of the individual GP. For

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[21]If the date of entry or exit takes place during the period of 2000 until 2004, the identification of entrants and exiters is straightforward; we identify 1,293 such entrants and exiters. Entry and exit that falls just outside our time window is chosen to be identified by GPs with less than 500 visits in the first or the last year, accompanied with respectively increases and drops in the number of visits by half. In doing so, we identify another 764 GPs.

example, one expects that the percentage of home visits outside working hours is positively correlated with being male and negatively with age and seniority[22]. In 2001, a GP executed on average 37% of her visits at the patient's home. Only a small percentage of all visits is realized outside the working hours of the GP; that is, on average, night visits and visits in the weekend or on holidays only account for 3% of all visits. The split up of GPs by the GP densities in their market indicates that GPs in GP dense areas complete a slightly higher percentage of their visits outside their office (38% versus 35% for home visits during working hours and 4% versus 2% for visits outside working hours). This can be for example due to the characteristics of the GPs over the different markets (e.g. more male GPs in GP dense markets), due to the preferences of consumers in the different markets (e.g. more elderly in GP dense markets) or due to inducing behavior (e.g. induce in home visits because of competitive pressure).

Market-level control variables

As Grytten et al. (1995) indicates, the health status is an important predictor of the number of visits. Omitting variables capturing the health status would lead to biased results. Since the zip code in which each GP operates is known, we add information on demographic characteristics of each market in 2001. We use following indicators of the composition of the population in local market: the age structure of the inhabitants (*kids*, *young*, *adults* and *old*), the gender (*female*) and nationality composition (*foreign*). Furthermore, we add the region of the local market (*Flanders*, *Brussels*), the mean income level (*meaninc*) and the unemployment rate (*unempl*)[23]. These variables will be used as control variables in the estimation of the level of demand for GP services as they proxy the average health status and the health habits of the population. We finally also add data on the location and the capacity of both hospitals (*hospbeds*) and rest and nursing houses (*restbeds*), since the presence of such institutions will have its impact on the workload of a GP, irrespective of her behavior.

The 2001 summary statistics of these variables are presented in Table 3[24].

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[22] According to *Dercq et al (2001)*, women have on average a percentage home visits of 35%, whereas male GPs complete on average 45% of their contacts at the patient's home. Starting GPs use the home visits outside working hours as a way to get in contact with potential patients.

[23] In WIV (2001) the link between the demographic variables and the health status are investigated. It shows for example that subjective health is decreasing in age and increasing in the education level. The subjective health is also better in Flanders compared to the other regions of Belgium. As another example, females are more susceptical to chronicle deceases and men smoke more.

[24] Only four of our explanatory variables show a clear correlation with the different groups of markets (GP density). As discussed before, it are the markets with the (slightly above) average GP density that have the highest population size. We find the same pattern in the number of hospital beds: the highest number of beds is found in cities, which belong to group 3 and group 4. For the age distribution of the markets, we find little differences across the groups: There only is a slightly higher percentage of elderly people and less adults in the higher density markets.. And finally, as indicated before, the percentage of markets in Flanders

3   Identifying GP induced demand

As in most of the empirical research, we investigate the presence of marginal SID through identifying changes in the consumption due to changes in the supply. Since we are working with GP-level data, the yearly number of visits per GP is used as the measure of consumption while the supply is measured by GP density in the zip code (see e.g. Carlsen & Grytten, 1998, Giuffrida & Gravelle, 2001 and Sørensen & Grytten, 2001).

Because of the incentives to increase the demand for her services as the GP's income becomes pressured, inducement is characterized by the finding of a positive correlation between per capita consumption and supply. Consider equation (1), in which the number of visits of GP i which operates in local market j is denoted by Q_{ij} and in which R_j represents the GP density in that local market.

$$\ln(Q_{ij}) = \alpha_1 + \beta_1 \ln(R_j) + controls_{ij} + \varepsilon_{ij} \tag{1}$$

Coefficient β_1 then captures the percentage change in *per GP* consumption due to a percentage increase in GP density. An easy transformation of the model shows that the effect of a percentage increase in GP density results in an increase of $(\beta_1 + 1)$ percent in *per capita* consumption[25]. As a result, the absence of an effect on *per capita* consumption requires that the estimated coefficient of β_1 is not significantly different than -1. Intuitively, if per capita consumption is not increasing with an additional entrant, GPs will now have to share the total workload among one more GP. Thus, the necessary condition for the presence of supplier inducement in a health care system is that β_1 is estimated significantly larger than -1. Furthermore, the absence of an effect on GP workload ($\beta_1 = 0$) implies that per capita consumption is increasing proportionally with GP density. Intuitively, if every GP maintains her workload, but now an extra GP is active, total consumption must have increased.

However, this positive correlation can be ascribed to and explained by some other effects (Reinhardt, 1985). First of all, we can be picking up a rationing effect. That is, it is possible that the increase in consumption reflects a previous excess demand for medical care which is met. A second alternative explanation is that the effect stems from the mere fact that GPs choose to locate their office in markets with a higher demand (reverse causation). We

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is very low in the high density groups (13% in group 5). The other characteristics of the markets are more or less the same over the markets of the different GP density groups.

[25]Given equation 1 and with $QTOT_j$ the total consumption in the area, the effect of GP density on the per capita consumption is given by: $\ln\left(\frac{QTOT_j}{DOC_j}\frac{DOC_j}{MPOP_j}\right) = \ln\left(\frac{QTOT_j}{MPOP_j}\right) = \alpha_1 + (\beta_1 + 1)\ln(R_j)$

thus need to treat the supply variable as an endogenous variable (Stano, 1985). Finally, an availability effect can be the cause of the positive correlation between consumption and supply. Even when prices are fixed, an increase in availability decreases the 'shadow price' of medical care, which in turn increases the consumption level (Birch, 1988)[26]. It is thus due to the preferences of consumers that there is an increase in consumption as a result of an increased supply. It is especially the presence of the availability effect that has proven to be hard to control for (Escarse, 1992).

In the next subsection, we introduce the approach we chose to separately identify inducement and availability effects. We start by presenting a theoretical model, based on Carlsen & Grytten (1998). We chose to focus on the economic intuition underlying the model. For this purpose, we remain brief on the analytical background and make some simplifications in terms of notation. We refer to Grytten et al. (1995) and Carlsen & Grytten (1998) for the algebra. Second, we discuss the empirical implementation of the model and present the equations to be estimated for the Belgium primary care market. A final subsection elaborates on the effects of supply changes on the different type of visits.

3.1   Effect according to GP densities

Theoretical framework

The health literature has developed a considerable amount of theoretical models and several empirical studies have been conducted to investigate the presence of supplier-inducement. To correct for the availability effect, Birch (1988) and others use the distinction between the effect on the number of visits and on the content of visits, whereas Rossiter & Wilensky (1984) and subsequent authors use the distinction between patient- and GP-initiated visits. Due to the nature of our data, these type of analyses can not be applied[27]. We instead employ the methodology proposed by Carlsen & Grytten (1998), to separately identify the inducement effect from the availability effect. Starting from a positive effect of increased GP density on per capita consumption, towns are grouped according to their GP density. The theoretical model shows that availability will especially be an issue in GP scarce areas, whereas inducing demand is especially present in GP dense areas. Carlsen & Grytten (1998) apply this technique to a sample of Norwegian contract physicians, for which no evidence of

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[26]That is, the cost of care for the consumer does not only consist of the price to pay, but also of the time and transportation costs associated with a visit to a GP (cost of access to health care). When an additional GP enters the market, the average distance to a GP and the waiting time decrease.

[27]There is no data on the number of treatment items or on the content of a visit, nor on who initiated what number of visits. Furthermore, the approach of *Birch (1988)* would in general not apply to Belgium, since GP's are not remunerated based on the number of laboratory tests.

inducing behavior is found.

Assume that the utility of a GP in a market, U, is given by:

$$U = U(Y(Q), W(Q), C(\Delta, R)) \tag{2}$$

Her utility is a positive function of the GP's income level Y, which consists of a constant part Y^0 and a variable part pQ, with p the fee per visit ($U_Y > 0$). Utility is furthermore negatively affected by the workload, denoted by W ($U_W < 0$), and the costs of inducing demand, C ($U_C < 0$). The latter is defined as the costs associated to the deviation Δ from an assumed optimal number of visits, Q^{*}[28]. Bacause prices are fixed, the GP maximizes her utility by choosing Q[29]. In deciding whether or not to induce demand for her services, the GP will thus weigh the marginal benefits (increase in income) against the marginal costs (workload and other costs) of inducing an extra visit[30]:

$$U_Y.p \lessgtr U_W.W_Q + U_C.C_Q \tag{3}$$

In terms of economic theory, the micro-model builds on the assumption that GP utility is concave in her income ($U_{YY} < 0$) and in her workload ($U_{WW} < 0$). The former implies that a decrease of income, due to e.g. an increase in competition, has a stronger effect on the level of utility when income is already relatively low. Remark here that, in a fee-for-service system, the GP's income level is directly related to the number of visits. The latter implies that the extra workload associated to more visits, will only decrease utility to a small extent when the number of visits is rather low. Disregarding for now the other costs of inducing demand, the model implies for GP dense areas that the benefits of increasing the number of visits will become greater than the disutility of the increased workload (all other things equal). In these markets, supplier inducement will cause a positive association between the GP density and per capita utilization. However, in GP scarce areas, a decrease in the number of patients will not result in a reaction of inducement. Since the average level of income and the number of visits per GP is high, the marginal benefits of inducing demand do not outweigh the marginal cost of it (all other things equal). Therefore, in these markets, under the inducement hypothesis, no relation is expected between per capita utilization and supply.

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[28] In other words, Δ is given by $Q - Q^*$ (in Carlsen & Grytten (1998) this would be $M - M^*$). We simplify the discussion by focussing on inducement, but in principle the utility function is discontinuous, because the GP incurs costs from both an underprovision and inducement.

[29] In principle, we should write that she maximizes by choosing the number of recall visits instead of the total number of visits. As indicated before, we simplify to give the main intuition of the model.

[30] We follow McGuire and Pauly (1991) and subsequent work on SID in assuming separable utility.

Given the elevated levels of GP density in the Belgian primary care market, we introduce an additional element to the model to capture a limitation to inducement due to the information in the market[31]. The costs of inducing demand, C, do not not consist of the effort and the moral costs (cfr. 'internal conscience' by McGuire and Pauly (1991)), but also the probability of loosing a patient has to be considered (Dranove, 1988). We therefore explicitly model the costs of inducing demand as follows:

$$C = M(\Delta) + L(\Delta, R). \tag{4}$$

The first component, M, is the traditional cost of inducing demand stemming from the moral and effort costs. This part is increasing and convex in the degree of deviation from the GP's optimal number of visits ($M_\Delta > 0$; $M_{\Delta\Delta} > 0$)[32]. The second part, L, consists of the costs of loosing a patient due to inducement. The more the GP deviates from her optimal number of visits, the higher the probability of detection and thus the higher the probability of loosing a patient ($L_\Delta > 0$)[33]. Furthermore, the probability of loosing a patient through inducement increases with the GP density in that market. More precisely, it is assumed that L is upward sloping in R ($L_R > 0$) and that the cost increase due to inducing one visit more is increasing in GP density ($L_{\Delta R} > 0$). The reasoning goes as follows. Due to the asymmetric information in the market, health services can be categorized as search and experience goods (Gaynor, 1994). Experience and external information are the only means to diminish the asymmetry. With a very high GP density, not only are there greater opportunities to get the care elsewhere, also the amount of information in the market will be high. A patient will, as a result, be able to detect inducing behavior more easily. As the number of competitors increases, the GP's cost of potentially loosing a patient due to inducing an extra visit will start to outweigh the benefits of inducing demand. Therefore, as the competition between the GPs becomes fierce (high GP density), the GP will have incentives to act more as a perfect agent, which results in a decrease of the incidence of supplier inducement[34].

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[31] Note that we are not talking about the constraint in the incentives of an individual GP by professional norms. Instead, we are claiming there is a limitation to induce demand for all GPs operating in areas with a very high GP density.

[32] The moral costs of inducing demand are individual specific. Depending on the norms of the individual GP, the decision of inducement is made. This explains why some GPs do and other do not induce demand.

[33] Surveys indicate that the familiariaty with the GP is an important aspect to the choice of the GP. Taken together with the information asymmetry, the GP faces a very low probability of loosing a patient when inducing only a small amount of demand. Only when the inducement behavior of the GP crosses a certain threshold, she will start loosing patients. Therefore, it is expected as well that $L_{\Delta\Delta} > 0$.

[34] Pauly and Satterthwaite (1981) argue that, when the market becomes more concentrated, patients know less about one individual GP, which gives the latter market power and thus the opportunity to increase prices. Remark firstly that in our setting prices are fixed. Secondly, while it is true that you know less about one single GP, you have greater access to comparing your GP with the behavior of another GP, which is the

Finally, we assume that the preferences of consumers for distance and waiting are downward sloping and concave. If the distance and waiting time are large/high, then the marginal utility gain from drops in time and distance is higher compared to lower values of distance and time. Improved availability is thus more likely to have a strong effect on per capita utilization in areas in which the supply is scarce compared to GP dense areas.

In conclusion, the micro-model results in the following predictions with respect to inducing behavior of the GP:

1. In GP scarce areas, the individual GP will have no incentives to induce demand because the marginal benefits do not outweigh the costs of inducing. However, availability effects can play a role in these markets as the average distance/waiting time to a GP is relatively high.

2. As the local market becomes more GP dense, the utility that can be gained from inducing increases, until it outweighs the costs. The GP will thus resort to demand inducement to maintain her income/utility level.

3. However, when the GP density is very high, the degree of information in the market, and the resulting probability of loosing a patient, will keep the GP from inducing demand.

Empirical implementation

In terms of empirical testing, we follow Grytten et al. (1995) and divide the local markets into five equal-sized groups, according to GP density. That is, group 1 contains the 20% zip codes with the lowest GP density, while group 5 collects the markets with the 20% highest GP density. We work with five groups instead of with three (Carlsen & Grytten, 1998), because we want to allow for a richer range of effects. First of all, we expect the middle groups to contain valuable information. Because of the generally high GP density in Belgium, we expect that availability effects might quickly disappear and inducement can be something GPs resort to quite fast (e.g. already in group 3-markets). Secondly, the data shows that for the 20% markets with the highest GP density, there are on average 20.25 GPs per 10,000 inhabitants. We therefore want to allow for a limitation in the inducing behavior. With i referring to the individual GP, j to her local market and DRx_j to dummy variables indicating the group to which the local market is assigned ($x \in [1,5]$), the equation to be

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relevant issue here.

estimated is given by:

$$
\begin{aligned}
\ln(Q_{ij}) = & \ \alpha_1 + \alpha_2 DR2_j + \alpha_3 DR3_j + \alpha_4 DR4_j + \alpha_5 DR5_j \\
& + \beta_1 \ln(R_j) \times DR1_j + \beta_2 \ln(R_j) \times DR2_j + \beta_3 \ln(R_j) \times DR3_j \\
& + \beta_4 \ln(R_j) \times DR4_j + \beta_5 \ln(R_j) \times DR5_j + controls_{ij} + \varepsilon_{ij}
\end{aligned} \tag{5}
$$

We thus split up the effect of GP density on the number of visits over five groups, with β_k the effect of GP density in local markets of group k. It is this splitting up that allows us to separately identify inducement effects from availability effects. Note that this specification only differs slightly from Carlsen & Grytten (1998): there are more groups and GP density is interacted with every group to facilitates interpretation of the estimated coefficients[35].

The availability hypothesis expects a positive effect of GP density on *per capita* consumption only in GP scarce areas. Therefore, we would find a β_1-coefficient that is significantly larger than -1 and possibly close to zero, as this implies a proportional increase with GP density. Possibly these effects remain present in the group 2-markets and to a small extent in the group 3 markets. In the latter markets, the effect of availability should however be less than in the group 1-markets. We thus expect to find that, in the presence of only availability effects, β_2 and possibly β_3 are still significantly larger than -1, but more negative compared to β_1. For the markets with a higher GP density, there should be no more effect. In other words, we expect to find estimated coefficients that make β_4 and β_5 not significantly different from -1.

What if, on the other hand, only inducing behavior of GPs drives the effect of GP density on *per capita* consumption? Since it is expected that inducing behavior will be optimal only given a certain level of GP density (average income), we expect to find coefficients that are not significantly different from -1 for GP scarce areas. In more GP dense areas on the other hand, the estimated coefficients will be such that a higher GP density implies a higher per capita consumption (or a lower drop in per GP workload). However, from which level of GP density onward will it become optimal for a GP to induce demand as a response to intensified competition? Given the generally high levels of GP density in Belgium, we expect this to occur rather soon, perhaps already in the group 2-markets. On the other hand, as GP density becomes very high (group 5), inducing demand might no longer be optimal because of the empowered patients.

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[35]In Carlsen & Grytten (1998), group 1 is used as the base group, which implies that the effect of GP density for markets of group 2 is given by $(\beta_1 + \beta_2)$ instead of by β_2 as in our specification.

We can summarize the implications of the two hypothesis as follows:

	group 1	group 2	group 3	group 4	group 5
H_0: availability	$\beta_1 = 0$	$0 \geq \beta_2 \geq -1$	$0 > \beta_3 \geq -1$	$\beta_4 = -1$	$\beta_5 = -1$
H_0: inducement	$\beta_1 = -1$	$0 > \beta_2 \geq -1$	$0 \geq \beta_3 > -1$	$\beta_4 = 0$	$0 \geq \beta_5 \geq -1$

Finally, both effects can be present simultaneously in the Belgian primary care market. This would result in the finding of significant effects on per capita consumption for almost all groups, depending on how long availability effects last and how soon GPs start inducing demand. We defer further elaboration to the results, because of the many possible combinations. Finally, note again that the positive relation between per capita consumption and GP density can not be attributed to price changes (neoclassic argument) as prices are fixed and fixed independently of the GP density.

3.2 Type of visits

If we find evidence of SID, we are interested in knowing which type of visits is preferably used by GPs to induce demand for their services. From the disutility of discretion model (Evans, 1974 and Rossiter & Wilensky, 1984) we learn that a GP is most likely to induce demand for those visits that have the best trade-off between marginal benefit and marginal cost. In terms of the theoretical model, expression (3) indicates that the likelihood of inducing is higher the higher the fees, the lower the workload intensity (W_Q) and the lower the costs of inducement (C_Q).

We distinguish between two types of visits, office visits ($Q\_\ Office$) and home visits during working hours ($Q\_\ Home$)[36]. For the inducement hypothesis, we can compare the different components of marginal costs and benefits for office and home visits.

- **Fees**: The payment a GP receives for an office visit is relatively low; in 2001 the GP's fee was fixed at 15.53€ for an accredited GP and 14.75€ for other GPs. The price of home visits is substantially higher: for the same year, a home visit during working hours was paid on average 19.9€, independent of being accredited. Since the marginal benefits of inducement are thus higher for home visits, we expect that a

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[36]We do not consider home visits outside working hours, because they do not take place in the same time frame. Furthermore, they only represent a small part of the total visits. Finally, as Giuffrida & Gravelle (2001) indicates, most GPs regard out-of-hours work as a negative aspect of their medical career (a source of stress). Even though the fee for a night visits is often rather high compared to other visits (on average 32.49€ in 2001), for the majority of the GPs the marginal cost of it will be very high as well.

GP will rather be inclined to induce demand on home visits than on office visits, and that this will even be more the case for GPs that are not accredited.

- **Workload intensity**: Office visits have a relatively low effort cost, since the patient incurs the transportation and waiting costs. On the contrary, by definition, the GP incurs the transportation and time costs in case of a home visit. Under the assumption that the difficulty of an average home and office visits are equal[37], the effort costs of the average home visits are higher compared to an office visit. Note however that the cost is mainly time costs, and since the opportunity costs of time are low when the GP has no patients waiting, the expected time cost of inducing a home visit are rather low. Nevertheless, this utlity component suggest a (small) preference of GPs to induce office visits over home visits.

- **Other Costs**: It is hard to maintain that the moral costs of inducing demand are larger for one type of visit over the other. On the other hand, we can argue a difference in effort costs (effort of inducing) and in the probability of loosing a patient. First, when a GP has no work, it might ask less effort to get an additional home visit compared to an office visit. One of the reasons for this is the fact that patients bear no transportation costs and the opportunity cost of waiting is low when a home visit is requested. The total costs for the patient is therefore expected to be lower in case of a home visit[38]. This does not only reduce the effort it takes to induce a visit, also the probability of loosing a patient through inducement is smaller for home visits. So we expect that the decision to induce demand will be taken 'quicker' for home visits. However, since GPs resort more quickly to home visits inducement, the effect of information in the market on the detection probability is larger[39]. We therefore also expect that the costs associated to the loss of a patient are more sensitive to the GP density for home visits.

Finally, remember that the availability effect implies an increasing per capita consumption because of the preferences of the consumers. An additional GP in the market decreases time

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[37]Some argue that a home visit is more difficult becuase the GP has less material at hand to examine and treat the patient. Also, it might be that home visits imply more severe sickness - although this is probably thue for a certain percentage of home visits, it is hard to generalize this. However, when one is considering inducing behavior, these arguments are no longer valid.

[38]A part of the home visits occur because the patient does not feel up to getting up and displacing himself. His opportunity costs of having a GP visit are therefore very low. Also, there can be practical reasons for requesting a home visit - the opportunity costs of going to the GP's office are in this case very high. Therefore, even though the monetary costs of a home visit is 4€ more, we expect total costs to be lower for a home visit.

[39]This is related with the view of treatment as a sequence of actions and learning process (see McGuire, 2000). Since there will be more contacts, there will be more learning and thus a higher probability of detection.

and transportation costs to have access to the primary care, which results in an increase of the demand. Now, since for home visits the GP incurs the transportation costs, the availability effect will be considerably lower for these visits compared to for office visits. And because the opportunity costs of waiting for the GP are generally low for a home visit, we expect availability effects to be virtually non-existing for these type of visits.

To test which type of visits GPs use for inducement, we thus estimate the following equation:

$$
\begin{aligned}
\ln(Q\_type_{ij}) \;=\;\; & \alpha_1 + \alpha_2 DR2_j + \alpha_3 DR3_j + \alpha_4 DR4_j + \alpha_5 DR5_j \qquad\qquad (6) \\
& + \beta_1 \ln(R_j) \times DR1_j + \beta_2 \ln(R_j) \times DR2_j + \beta_3 \ln(R_j) \times DR3_j \\
& + \beta_4 \ln(R_j) \times DR4_j + \beta_5 \ln(R_j) \times DR5_j + controls_{ij} + \varepsilon_{ij}
\end{aligned}
$$

with Q_type_{ij} either the total number of office visits of GP i in market j (Q_Office_{ij}) or the total number of home visits during working hours (Q_Home_{ij}). The interpretation of the coefficients remains the same as above.

4 Empirical results

We now take the above specified models to the data to answer these questions: Do we find empirical evidence of supplier induced demand in the Belgian primary care market? And if so, which type of visits does the GP use for inducing demand for her services?

Figure II: Number of visits per GP according to GP density of market (nobs = 12,076 GPs)*

* We excluded the 10 zip codes with the highest GP density (more than 31 GPs per inhabitants), to show that the trend is not driven by the outliers. Including these local markets amplifies the effect.
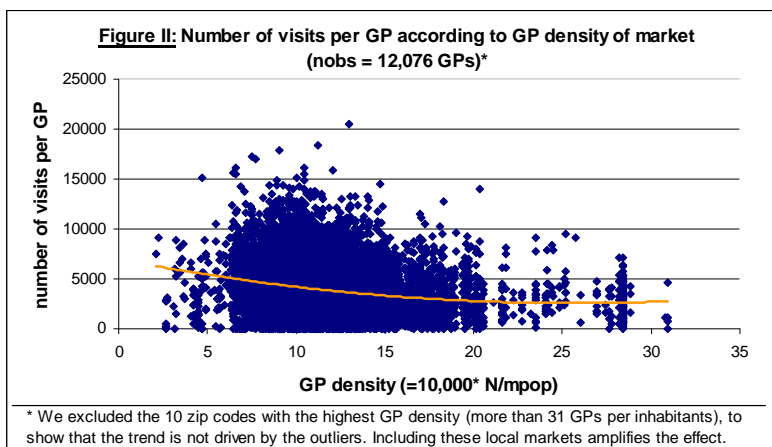
Figure II shows that the number of visits of the average GP is decreasing in GP density. This is the case because more GPs per capita implies that the number of patients per GP is

lower, so that the pool of patients from which the GP can draw is smaller. But secondly, note that this trend is convex: the higher the GP density, the smaller the effect of an increase in GP density on the number of visits per GP. This is a first indication of the presence of inducement and/or availability effects. The econometrical model is needed to identify whether this trend is significant and which type of markets drive the convexity. That is, if the convexity is driven by the markets with a low GP density, the convexity is proof of availability effects, whereas GP dense markets causing convexity of the relation implies evidence of inducing behavior of the GPs. Some further results of an initial investigation for intuition on availability effects and supplier inducement are summarized in Appendix 2.

This section is structured as follows. We start by addressing some issues concerning the implementation of the empirical model. Then we are ready for the estimation of the model. First, we look at the results on the relation between per capita number of visits and the GP density, by estimating the overall effect of GP density on GP consumption (equation (1)). Second, in an attempt to distinguish between availability and inducement effects, the zip codes are divided into five groups according to GP density and equation (5) is estimated. We thus look for evidence of supplier-induced demand in GP visits. We also briefly discuss the effect of the control variables on the number of visits per GP. Finally, as we established the results on the total consumption, we pay special attention to the availability effects and inducing behavior for the different types of visits (equation (6))..

4.1   Identification

We discuss three aspects of the identification of the model; the endogeneity of the supply variable, the control for GP-specific characteristics and border-crossing.

First, we need to correct for GPs locating in the most attractive locations (reverse causation). To get consistent results in the cross-section analysis, GP density is treated as being endogenous and thus instrumented through a two-stage-least-squares estimation. Dranove & Wehner (1994) demonstrate how the use of invalid instruments in a market-level cross-section analysis can lead to false conclusions, by showing that an inducement effect can be found in the market for childbirths. Furthermore, a validity test for the instruments is proposed: the instruments are only valid if the correlations between the residuals of the OLS-estimates and the instruments are low and insignificant, implying that they would be excluded from the demand equation.

Finding valid instruments is easier in case of micro-level data[40]. In line with Carlsen

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[40]We are estimating the demand for a single GP. In this respect, we escape the identification critique by Auster & Oaxaca (1981) where it is shown that the effect of market supply on market demand can not be

& Grytten (1998), we use variables based on the number of inhabitants as instruments for GP density. It is thus assumed that population measures only affect the demand for GP services through GP density, which hinges on the assumption that per capita consumption does not depend on the number of inhabitants in the market. Furthermore, the number of inhabitants measures the market size and market opportunities, what implies a correlation with the number of entrants in the market and thus the density of health providers[41]. We use four instruments: the number of inhabitants in the relevant market (*mpop*) and the logarithm of the population (*lnmpop*), population density in the local market (*dens*) defined as the number of inhabitants per squared kilometre and finally, the number of inhabitants in markets within a range of 5 km (*npop5*). We use a transformation of population to allow for a flexible relation between population and GP density[42]. For population density, again, there is no reason why a patient would demand more visits per GP when there is a higher/lower population density, other than the extent to which this affects GP density. The nearby population measure is added to control for potential demand in the area. Note that for the model in which the endogenous variable is interacted with dummies, the instruments are interacted as well[43].

For all analyses below, correlation matrices indicate that the instruments are valid. Also the first stage estimation results indicates statistical significant partial correlations of all the instruments. Finally, an heteroskedasticity-robust validity test on the overidentifying restrictions is not rejected.

Second, it is important to correct for GP-specific characteristics in the estimation procedure to prevent bias. Suppose e.g. that markets with a high GP density also typically attract a higher percentage of male GPs. As male GPs more often work fulltime and thus have more visits, omitting GP-specific characteristics leads to falsely concluding in favor of demand inducement in GP dense areas. As GPs are anonymized in our data, the GP-specific variables are however connected to the behavior of the GP; the degree of accreditation (*accr*), the decision to enter or exit the market (*entry, exit*) and the percentage visits of different types (*perc_H_D, perc_H_O*). First of all, it is clear that a new entrants will have a lower

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identified.

[41] Think for example of theoretical models of competition (f.e. Cournot competition), which predict more firms to enter when the market size is bigger. Furthermore theory predicts that the more firms there are already present in the market, the smaller the increase in market size needs to be to sustain another entrant (Sutton 1991). So the GP density increases with market size.

[42] The results from the inclusion of other transformations, such as population squared, are the same. The conclusions in terms of inducing behavior in the Belgian primary care market are also checked to be robust against exclusion of some of the instruments.

[43] This implies that we treat the group dummies as being exogenous. Previous work (Carlsen & Grytten, 1998) made the same assumption.

number of visits, as she is still in the process of building up a clientele. Also those GPs that decided to exit the market in one of the following years, will decrease the services they provide and perform less visits. Second, whereas our variables do pick up the underlying characteristics of the GP, they are however endogenous. We opt for the inclusion of the GP-specific characteristics as explanatory variables and accept the possible bias. Robustness of our conclusions is checked by looking at a cross-section that omits the GP specific variables. The main conclusions remain valid[44].

Third and finally, the possibility of border-crossing needs to be taken into account. As indicated in the data section, we define the relevant market as the zip code area. However, it might be that consumers cross the border of the zip code area to e.g. a market with a higher supply. To correct for this feature, we also ran the analyses when the relevant market is the municipality and when GP density is thus defined accordingly[45]. We moreover experimented with the exclusion of big cities from our data in order to limit border-crossing effects. Again, the results on inducement are not sensitive to both experiments, which makes us confident in the robustness of the conclusions.

4.2   SID in the Belgian primary care market

We start by estimating the model that explains the total number of visits in which we make no distinction according to GP density, as presented in equation (1). The first two columns of Table 4 presents the results of this estimation. The OLS-estimation indicates a significant negative effect of GP density on the number of visits. More precisely, the results suggest that a 1% increase in the GP density leads to a significant decrease in number of visits per GP of 0.179%. With the estimated coefficient negative, we can exclude demand rationing since this would imply that individual GPs are not affected by an additional entrant. In terms of per capita consumption, the results imply that a 1% increase in R leads to a 0.821% increase in per capita consumption.

Once we correct for the endogenous nature of the supply, the estimated coefficient is no

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[44]An alternative is to turn to fixed-effect estimation and use the panel structure of our data set (2000-2004). Although this approach would give unbiased results while allowing for GP-specific effects, our dataset does not allow the use of this technique: we have a problem with the instrumentation of GP density, as we only have demographic information for 2001. Making some simplifying assumptions, the conditional results of a static FE estimation seem to support our general conclusions. Note that we also check for robustness of the results by considering the data for the other years, while assuming the demographics did not change in this period. Agian, the main conclusions do not change. Also dif-in-dif estimation is hard since there is both exit and entry in the markets at the same time.

[45]There are on average 1.95 zip codes in a municipality as defined by NIS, ranging from 1 zip code to as many as 20 zip codes.

longer significantly different from zero, whereas it remains different from -1. We thus find evidence of a more or less proportional increase in per capita consumption due to an increase in GP density. Do patients react strongly to increased availability? Or rather, do GPs have so much power over the demand that they can fully absorb an increase in competition? To get a better insight, we move to the model that distinguishes between these possibilities.

The third column of Table 4 presents the results of estimating equation (5), in which the effect of GP density on per GP consumption is split up over five groups. For the interpretation of these effects, we perform Wald-tests on the estimated coefficients. The outcomes of these tests are given in the first column of Table 5. Consider a 5% significance level[46]. We find evidence of the presence of both availability and inducement effects. As β_1 is significantly different from -1, while not estimated significantly different from zero, there is a more or less proportional increase in per capita consumption of primary care with an increase in GP density, for markets with a low GP density (among the 20% lowest). The availability effect however dies out once the GP density increases: for market in group 2, we cannot find evidence of changes in per capita or per GP consumption with GP density. We also find little effects for the market with intermediate GP density (group 3 and group 4). Finally, a proportional increase of utilization with GP density does occurs in the markets of group 5: β_5 is estimated significantly different from -1 while not significantly different from zero. Based on the theoretical model attributes, this positive correlation is attributed to inducing behavior of the GPs in these GP dense areas. We thus conclude to find evidence of availability effects in the markets with the lowest GP density and of inducement in markets with the highest GP density.

Consider also the effects of the variables controlling for GP characteristics. The higher the accreditation level (*accr*), the more visits a GP has on yearly basis. Since this possibly proxies quality and since GPs with a high number of visits have a higher benefit of being accreditated (higher price), this is as expected. The percentage home visits during the working hours (*perc_H_D*) also has a positive effect on the number of visits. This is intuitive as this variable can be interpreted as the willingness to comply with the preferences of the patient as consumer. Furthermore, it captures characteristics such as being male or working full time. *Finally, this may already indicate that GPs who perform more home visits, also find it easier to induce demand for their services.* A high percentage of visits that is completed outside working hours (*perc_H_O*) on the other hand, has a negative impact on the total number of visits. This can indicate that small-sized GPs intent to gain patients from other

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[46]The overall conclusion of the presence of inducing behavior would remain valid if we work with for example the 10% significance level

GPs by taking on a larger part of guard duty. And as expected, GPs that only recently entered the market (*enter*) and are planning to exit the market (*exit*) both complete a lower number of visits.

Remember that these variables are however endogenous, but that dropping them would lead to an omitted variable bias. The conclusions from the estimation without these GP-specific variables are however comparable[47].

Most of the market characteristics have the expected sign. There is significantly less demand from children (*kids*) or from young people (*young*) (depending on the specification) compared to adults, as the former are in general in a better condition and can use the pediatrician as the primary care physician instead of the GP[48]. Remarkable, the percentage elderly (*old*) also has a negative sign, which implies that the number of visits per GP is lower in markets with a more elderly compared to more adults. This might be explained by the fact that elderly perhaps resort to other types of care, such as retirement homes and geriatric care, which results in a lower demand for GP services by this age group. The fact that adults need a sick note to be excused from work, can also help explain these results. It is thus the adults that provide the most workload for the GPs.

Possibly due to different habits and culture, the percentage foreigners (*foreign*) has a negative effect on the number of visits, as has the mean income level (*meaninc*). The latter implies that the higher the income level in a town, the lower the workload of a GP is. This can be due to several reasons. Whereas it is tempting to conclude that money prevents illness, this effect is more likely due to the fact that people with a higher income more easily substitute toward specialist care. It is also possible that we pick up an education effect here and that we find that it is harder to induce demand for your services if your patients are highly educated (Pauly, 1978). We find on the other hand that the unemployment rate (*unempl*) and the region dummy for Flanders (*Flanders*) have a positive estimated effect on the number of visits per GP. As the unemployed has in general a higher need for health care[49] and as the GP density in Flanders is in general lower compared to the region of Wallonia, this is as expected. Finally, we also find the number of hospital beds (*hospbeds*) to have a negative influence on the workload of the GP. Since the proximity of many hospital beds generally implies the presence of many specialists, this variable indicates the ease to refer a patient to a specialist or the ease for patients to substitute toward specialist visits.

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[47]The results of the Wald-tests are all the same, so we also find availability effects in the markets with the lowest GP density and inducement in the markets with the highest GP density. The estimated coefficients of the market level variables do change, but only the significance of the unemployment rate is slightly affected (only significant at a 10% significance level).

[48]There is no gatekeeping system in Belgium.

[49]Note also that often a person is unemployed because of health problems.

Remark that the sign and significance of the market characteristics remain the same over the estimation of the different types.

4.3   Which types of visits are induced?

We concluded in the previous section that we find evidence of supplier-inducement in the Belgian primary care market. Now we are interested in the type of visits GPs then typically use for inducing their demand. Therefore, we estimate two models, one with the number of office visits as dependent variable and one explaining the number of home visits during working hours (equation (6)). We do not report the estimated coefficients of these estimations (they are available from the author on request). Instead, the second and third column of Table 5 report the relevant Wald-tests on the estimated coefficients β_k for both estimations. Consider again a 5% significance level.

Looking at the office visits, we find comparable results as for the total number of visits. That is, we find evidence of both availability effects amongst markets with the 20% smallest GP density and inducement effects in the markets with the highest GP density. However, note that we now do find a significantly positive effect of GP density on per capita consumption in markets with a more moderate GP density as well (group 4 markets).

For home visits during working hours on the other hand, we find a very different pattern. First of all, as expected, there is no evidence of availability effects, since β_1 is not significantly different from -1. As the GP density increases, the effect of GP density on per capita consumption becomes significantly positive. Remarkably, we already find evidence of inducing behavior at the average GP densities (in group 3). Also, the inducing behavior seems to be most present in markets with an average or slightly higher than average GP density (group 3 and group 4 markets), as the estimated effect on per GP consumption is estimated significantly positive[50]. Finally, in the markets with the 20% highest GP density, the estimated effect is still significantly different from -1 but not significantly different from zero. Therefore, while there still is evidence for inducement in the GP dense markets (group 5), this effect is significanlty less than in the markets with a lower GP density. In other words, whereas we find clear evidence of a strong positive relation between GP density and the consumption of home visits for the markets with a lower GP density, the effect is more moderate for the group 5 markets. The very high levels of GP density seem to limit the possibility of inducing demand for home visits[51].

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[50]We suspect that GPs, next to maintaining utility/income levels, also feel the need to show their patients that they are followed-up closely, as a signal of quality.

[51]Remark that we also estimate a constant term per group. Therefore the argument that GPs complete

Comparing both types of visits, we find that GPs use both type of visits to induce demand. However, GPs resort to inducing home visits more quickly (in the sense of less competitive pressure) than to inducing office visits. On the other hand, when the GP density is very high, the information in the market limits the possibility of inducing home visits, resulting in inducement of office visits. We can thus conclude that GPs prefer the use of home visits during working hours to induce demand for their services. But when competition gets fierce, they substitute towards inducement through office visits because of the risk of loosing patients that is associated with continuing inducement of home visits.

5 Conclusion

In this paper, we look for empirical evidence of supplier induced demand in the Belgian primary care market. Using GP-level data of all registered Belgian GPs (rather than a sample), we test whether a higher GP density results in a higher per capita consumption of GP services, due to the behavior of the GP. Furthermore, we investigate the way GPs induce demand. That is, does a GP employ office visits or rather home visits to increase the demand for her services. Our empirical results indicate that Belgian GPs do induce demand for their services and that they prefer to induce through home visits during working hours. However, when competition becomes fierce, the opportunity to induce home visits reduces, resulting in a substitution towards office visits inducement[52].

Evidence on SID by GPs in other countries has been mixed. Rossiter & Wilensky (1983) for example finds evidence of physician-initiated medical expenditures in the US, based on market level data. Some evidence of SID is found in France by Delattre & Dormont (2003), based on a panel data study of a sample of GPs. There also is some clear indication that physicians in general do respond to financial incentives in the UK (Croxson et al., 2001).

On the other hand, in a series of papers on Norway, Grytten and co-authors find no empirical evidence of inducing behavior of GPs who are operating in a system that is comparable to the Belgian health care system. However, whereas the institutional setting is more or less the same, the level of GP density is much lower in Norway. Grytten et al. (1995) documents that for the 20% Norwegian markets with the highest GP density, the average

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more home visits in higher density markets because they have the time for it, whereas in low GP density areas GPs do not have the time, is not explaining our results on inducing behavior. This argumentation is moreover not valid in general as we find that the number of home visits is lower in markets of group 5 (significantly lower for group 3 and group 4) compared to group 1: a GP in a GP dense area completes more home visits, holding everything else constant.

[52] *The fact that over the 5 years that we observe, the total number of visits decrease only due to decrease in the number of home visits supports this finding.*

population per physician is $1,818$. In Belgium on the other hand, the 20% most GP dense markets have an average of only 496 inhabitants per GP. It might therefore be that the level of competition for which the benefits of inducing outweigh the costs of inducing is not yet reached in Norway. Put differenly, if the GP density in Belgium would be decreased to the Norwegian level, it is expected that the incentives for GPs to induce demand will disappear.

Since we have found evidence of SID in Belgium, there are important implications for public health policy. To limit the extent to which GPs induce demand, regulating the number of GPs in a local market can be a good idea. In this sense, our conclusions could be an argument in favor of the existence of the numerus clausus of GPs in Flanders, limiting the inflow in the profession. We do however not take a stand on the magnitude of the number of beginning GPs per year and on the way this numerus clausus is to be implemented, nor on the other effects a numerus clausus has on the functioning of the primary care market. Secondly, our results highlight the presence of positive consequences of the decrease in the number of students that opt for a career as GP. Whereas the media talkes about a daunting shortfall of GPs in Belgium, limiting the inducing behavior of the GPs is an expected positive effect of this evolution. Significantly decreasing the number of GPs however has consequences for the overall availability of primary care, which is something the regulator may not want to abate.

6 Appendix

6.1 GP density across Belgium
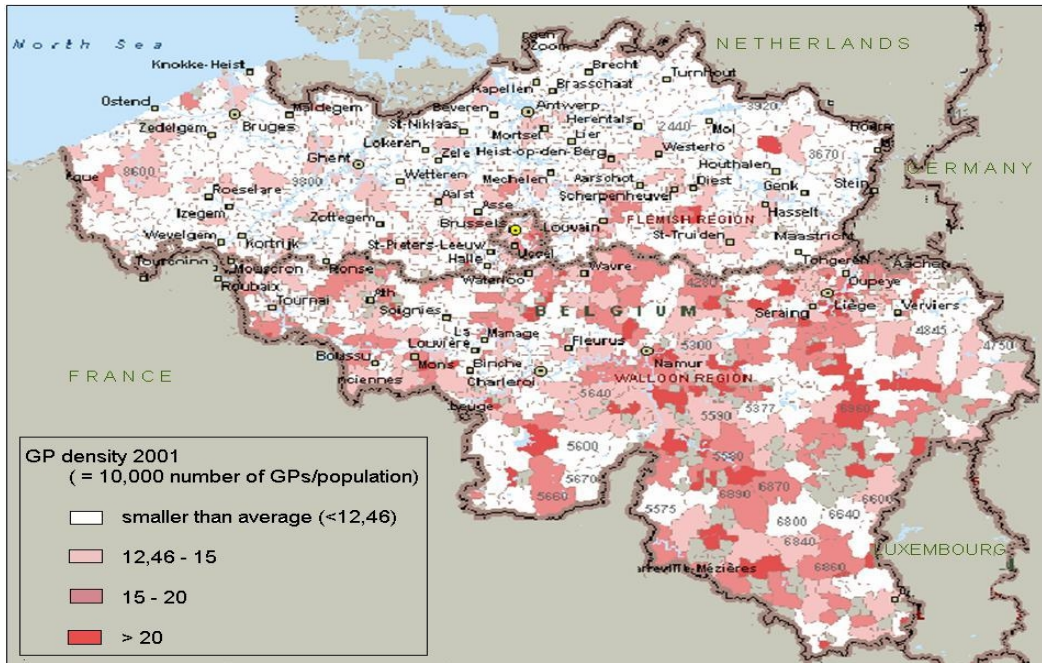
Local markets with a higher than average GP density
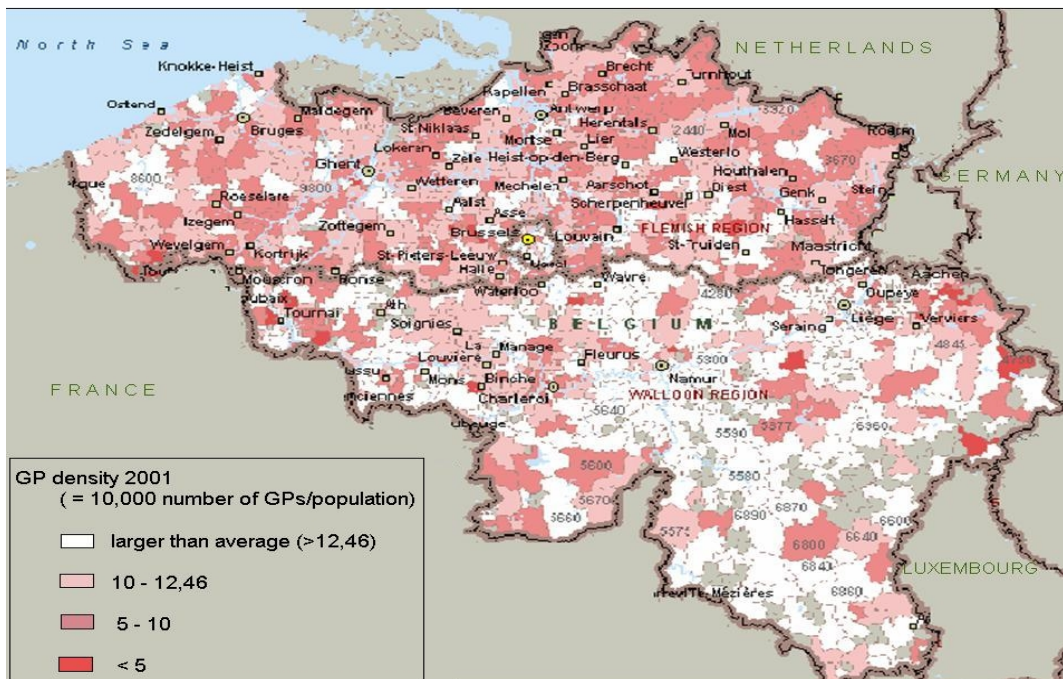
Local markets with a lower than average GP density

6.2 Initial insights in dataset

Before moving to the formal investigation of the presence of supplier inducement in the Belgian primary care market, we take a more detailed look at the data. There are several indications in the data of a positive relation between consumption and supply.

Aggregating the data to the zip code level provides insights on the relation between the total consumption in an area and the number of suppliers. First of all, the correlation coefficient between the number of visits per capita and the GP density over the years is 0.497. This positive correlation indicates that it is worthwhile to investigate the presence of GP-inducement; is this positive correlation due to availability reasons, differences between inhabitants or is there indeed some inducing behavior of GPs?

Secondly, there is some indication that the availability effect is important. When we compute for each zip code the ratio of the number of patients to the number of inhabitants, we find that this percentage has a positive correlation with the GP density ($corr = 0.568$). Thus, the more GPs per inhabitant, the more patients visited one of the GPs at least once that year. This thus indicates either that more people visits a GP because of their availability, or that GPs choose to locate in these towns where there is a high demand for their services. Since the GP has no control over the people that never visit a GP, the visits that stem from new patients can not be induced. Rather, the increased availability of primary care encourages the patients to visit the GP, since the costs decreased.

Going back to the GP level data, the average number of office visits per patient of a GP can give some indication of inducement. Since the costs of establishing the agency relation is important, the marginal cost of inducing is generally smaller for the current clientele (Birch, 1988). Therefore, we believe that the ratio of the number of office visits to the number of patients contains good information on the inducing behavior of the GP, and that this is related to the income level of the individual GP. We thus compute the number of office visits per patient per GP and first relate this to the number of patients per GP. We find that there is a negative correlation between both variables: the higher the number of patients, the lower the number of visits per patient. Secondly, relating the number of office visits per patient to the total GP income from her services, confirms our expectation. Whereas a GP with an income of among the 20% highest on average has 3.90 office visits per patient, a GP in the lowest 20% income category sees each of her patients on average 5.05 times per year. A low income GP thus has one office visit more per patient per year compared to a high income GP, which indicates inducing behavior of the low income GP.

References

[1] Auster R.D., Oaxaca R.R., 1981. Identification of supplier-induced demand in the health care sector. Journal of Human Resources 16(3), 327-342.

[2] Auxim, 2001. Rapport over de beperking van het medisch aanbod.

[3] Birch S., 1988. The Identification of supplier-inducement in a fixed price system of health care provision – the case of dentistry in the United Kingdom. Journal of Health Economics 7, 129-150.

[4] Carlsen F., Grytten J., 1998. More Physicians: improved availability or induced demand? Health Economics 7, 495-508.

[5] Cockx B., Brasseur C., 2001. The demand for physician services. Evidence from a natural experiment. Journal of Health Economics 22, 881-913.

[6] Croxson B., Propper C., Perkins, A., 2001. Do Doctors Respond to Financial Incentives? UK Family Doctors and the Fundholding Scheme. Journal of Public Economics 79 (2), 375-398.

[7] Dranove D., 1988. Demand Inducement and the physician/patient relationship. Economic Inquiry 26, 281-298.

[8] Dranove D., Wehner P, 1994. Physicians-induced demand for childbirths. Journal of Health Economics 13, 61-73.

[9] Delattre E., Dormont B., 2003, Fixed fees and physician-induced demand: a panel data study on French physicians. Health Economics 12, 741-754.

[10] Dercq J.P., Van Loon H., Van Ouytsel A. and Somer A., 2001. Kwantitatieve analyse van de activiteiten van de Belgische huisartsen. RIZIV/INAMI.

[11] Escarce J.J., 1992. Explaining the Association between Surgeon Supply and Utilisation. Inquiry 29, 403–415.

[12] Evans R., 1974. Supplier-induced demand: some empirical evidence and implications. In: Perlman M., 1974. The economics of health and medical care. Edinburgh; Macmillan, 162-173.

[13] Fuchs V., 1978. The supply of surgeons and the demand for operations? Journal of Human Resources 13, 35-56.

[14] Giuffrida A., Gravelle H., 2001. Inducing or restraining demand: the market for night visits in primary care. Journal of Health Economics 20, 755-779.

[15] Grytten J., Carlsen F., Sørensen R., 1995. Supplier inducement in a public health care system. Journal of Health Economics 14, 207-229.

[16] Grytten J., Sørensen R., 2001. Type of contract and supplier-induced demand for primary physicians in Norway. Journal of Health Economics 20, 379-393.

[17] Labelle R., Stoddart G., Rice T., 1994. A re-examination of the meaning and importance of supplier-induced demand. Journal of Health Economics 13, 347-369.

[18] McGuire T.G., Pauly, M.V., 1991. Physician Response to Fee Changes with Multiple Payers. Journal of Health Economics 10, 385-410.

[19] Mechanic D., 1968. Medical Sociology; a Selective view. New York. Free Press.

[20] Reinhardt U., 1985. The theorie of physician-induced demand reflection after a decade, Journal of Health Economics 4, 187-193.

[21] Rossiter L.F., Wilensky G.R., 1983. A reexamination of the use of physician services: the role of physician-initiated demand. Inquiry 20, 162–172.

[22] Rossiter L.F., Wilensky G.R., 1984. Identification of Physician Induced Demand. The Journal of Human Resources 19, 231–244.

[23] Schaumans C., Verboven F., 2006. Entry and Regulation - Evidence from Health Care Professions. CEPR working paper.

[24] Schokkaert E., Van de Voorde C., 2005. Health care reform in Belgium. Health Economics 14, S25-S39.

[25] Stano M.,1985. An analysis of the evidence on competition in the physician services markets. Journal of Health Economics 4, 197-211.

[26] Sørensen R., Grytten J., 1999. Competition and supplier-induced demand in a health care system with fixed fees. Health Economics 8, 497-508.

[27] Van de Voorde C., Van Doorslaer E., Schokkaert E., 2001. Effects of cost sharing on physician utilization under favourable conditions for supplier-induced demand. Health Economics 10, 457-471.

[28] Wetenschappelijn Instituut Volksgezondheid (WIV), 2002. Gezondheidsenquête door middel van Interview België 2001. IPH/EPI REPORTS nr 2002 - 22.

Table 1: Descriptive statistics (2001) - 12,133 GPs in 993 markets

Variable	Description	mean	(st.d.)
A. SUPPLY INDICATORS (MARKET LEVEL)			
N	total number of GPs in the market	12.22	(15.78)
R	GP density = number of GPs per capita (*10,000)	12.46	(5.47)
B. CONSUMPTION INDICATORS (GP LEVEL)			
PAT	yearly number of patients	574.66	(405)
Q	yearly number of patient contacts	3908.6	(2583)
Q_Office	yearly number of office visits	2281.4	(1627)
Q_Home	yearly number of home visits during working hours	1539.3	(1317)
C. GP SPECIFIC INFORMATION (GP LEVEL)			
perc_H_D	percentage of patient contacts that are home visits during working hours	0.37	(0.20)
perc_H_O	percentage of patient contacts that are home visits outside working hours	0.03	(0.06)
accr	degree of accreditation	0.78	(0.41)
entry	dummy variable indicating recent entry	0.06	(0.23)
exit	dummy variable indicating exit in the near future	0.09	(0.29)

Table 2: Descriptive statistics (2001) - markets divided into 5 groups according to GP density

Variable	group 1 mean	(st.d.)	group 2 mean	(st.d.)	group 3 mean	(st.d.)	group 4 mean	(st.d.)	group 5 mean	(st.d.)
A. SUPPLY INDICATORS (MARKET LEVEL)										
N	5.49	(6.81)	12.25	(10.82)	15.38	(14.56)	15.80	(22.39)	12.18	(17.45)
R	7.12	(1.55)	9.81	(0.50)	11.46	(0.53)	13.59	(0.66)	20.25	(6.88)
B. CONSUMPTION INDICATORS (GP LEVEL)										
nobs	1087		2437		3045		3129		2435	
PAT	731.72	(452.4)	681.07	(425.0)	598.06	(406.0)	519.11	(375.5)	440.20	(337.9)
Q	4789.6	(2794)	4462.3	(2739)	4135.7	(2604)	3531.0	(2390)	2962.1	(2093)
Q_Office	2903.1	(1780)	2796.1	(1719)	2425.3	(1665)	2032.0	(1489)	1629.2	(1238)
Q_Home	1789.7	(1465)	1766.8	(1492)	1618.1	(1337)	1420.2	(1312)	1265.5	(1246)
C. GP SPECIFIC INFORMATION (GP LEVEL)										
$perc\_H\_D$	0.35	(0.17)	0.36	(0.17)	0.37	(0.19)	0.37	(0.20)	0.38	(0.22)
$perc\_H\_O$	0.02	(0.05)	0.03	(0.04)	0.03	(0.06)	0.03	(0.05)	0.04	(0.08)
$accr$	0.86	(0.33)	0.86	(0.34)	0.82	(0.38)	0.75	(0.43)	0.66	(0.46)
$entry$	0.03	(0.18)	0.04	(0.20)	0.05	(0.22)	0.07	(0.25)	0.07	(0.26)
$exit$	0.08	(0.18)	0.08	(0.27)	0.08	(0.28)	0.10	(0.30)	0.11	(0.31)

Group 1 collects the 20% markets with the lowest GP density, whereas group 5 contains the 20% markets with the highest GP density. Each group holds approximately 198 markets.

Table 3: Summary statistics of market level variables (2001)

Variable	Explanation	Mean	St.d.	Min.	Max.
(993 obs)					
	MARKET DEMAND CONTROLS				
kids	percentage mpop in age category 0 - 10 years	0.118	0.015	0.067	0.195
young	percentage mpop in age category 10 - 24 years	0.185	0.017	0.118	0.264
active	percentage mpop in age category 24 - 64 years	0.535	0.023	0.445	0.632
old	percentage mpop in age category 65+ years	0.166	0.027	0.065	0.306
female	percentage mpop female	0.509	0.012	0.467	0.575
foreign	percentage mpop foreigners	0.057	0.070	0.001	0.595
Flanders	dummy variable: market is part of region of Flanders	0.488	0.500	0	1
Brussels	dummy variable: market is part of region of Brussels	0.022	0.147	0	1
unempl	unemployment rate	0.058	0.033	0.013	0.162
meaninc	mean income level (in 10,000€)	2.499	0.387	1.641	4.133
hospbeds	number of hospital beds nearby (< 5km) (*1,000)	0.154	0.448	0	3.518
restbeds	number of beds in rest and nursing houses nearby (< 5km) (*1,000)	0.268	0.552	0	5.560
	INSTRUMENTS				
mpop	the number of inhabitants	10282	12088	271	110867
npop5	populations in nearby markets (range < 5km)	8946	26073	0	305282
lnmpop	the logaritm of the number of inhabitants	8.718	1.063	5.602	11.62
dens	population density (mpop/surface)	612.6	1028	16.12	100040

Table 4: Estimation results of cross-section analysis on the total number of contacts per GP, without and with distinction on the level of GP density (2001)

	(1) OLS		(2) IV		(3) IV	
	Coeff.	(St. E.)	Coeff.	(St.E.)	Coeff.	(St.E.)
EFFECT OF GP DENSITY						
β_1	-0.179^*	(0.03)	-0.048	(0.21)	0.135	(0.41)
β_2	-		-		-1.458	(1.28)
β_3	-		-		4.569	(2.86)
β_4	-		-		0.820	(1.09)
β_5	-		-		-0.011	(0.23)
CONTROL VARIABLES GP CHARACTERISTICS						
$accr$	0.484^*	(0.02)	0.489^*	(0.02)	0.485^*	(0.02)
$perc\_H\_D$	0.605^*	(0.04)	0.607^*	(0.04)	0.609^*	(0.04)
$perc\_H\_O$	-1.984^*	(0.12)	-1.985^*	(0.12)	-2.004^*	(0.13)
$entry$	-1.733^*	(0.03)	-1.740^*	(0.04)	-1.731^*	(0.03)
$exit$	-1.068^*	(0.02)	-1.072^*	(0.03)	-1.068^*	(0.03)
CONTROL VARIABLES MARKET CHARACTERISTICS						
$kids$	-1.922^*	(0.68)	-1.644^*	(0.81)	-2.621^*	(0.78)
$young$	-1.214	(0.66)	-1.433	(0.75)	-1.808^*	(0.72)
old	-1.543^*	(0.48)	-1.879^*	(0.72)	-1.651^*	(0.51)
$female$	1.273	(0.94)	1.407	(0.96)	1.061	(1.02)
$foreign$	-0.606^*	(0.14)	-0.572^*	(0.15)	-0.703^*	(0.16)
$Flanders$	0.264^*	(0.03)	0.310^*	(0.08)	0.249^*	(0.03)
$Brussels$	-0.023	(0.05)	-0.029	(0.05)	-0.009	(0.05)
$unempl$	1.556^*	(0.41)	1.662^*	(0.44)	1.713^*	(0.48)
$meaninc$	-0.139^*	(0.03)	-0.156^*	(0.04)	-0.138^*	(0.03)
$hospbeds$	-0.000^*	(0.00)	-0.000^*	(0.00)	-0.089^*	(0.02)
$restbeds$	-0.000	(0.00)	0.000	(0.00)	0.009	(0.02)
α_1	8.290^*	(0.46)	7.968^*	(0.69)	7.996^*	(0.92)
R^2	0.46		0.46		0.45	

Comumn (1) and (2) gives the results for the estimation of equation 1, with no distinction according to GP density. Column (3) reports the estimated coefficients for the estimation of equation 5, with towns divided into 5 equal sized groups according to the GP density. β_1 relates to the towns with a GP density amongst the 20% smallest in Belgium, whereas β_5 refers to the 20% markets with the highest GP density. IV estimation is performed using mpop, npop5, dens and lnmpop as instruments for logaritm of GP density (R). Standard errors are reported between brackets. * indicates significance at a 5% level. The other constants (α_5) are estimated insignificant and therefore not reported.

Table 5: Wald test on the estimated coefficients of the cross-section analysis for the different types of contacts per GP, with zip codes divided into 5 equal sized groups (2001)

| | lnQ | | | | lnQ_Office | | | | lnQ_Home | | | |
| | $\beta_k = -1$ | | $\beta_k = 0$ | | $\beta_k = -1$ | | $\beta_k = 0$ | | $\beta_k = -1$ | | $\beta_k = 0$ | |
	F	(prob)	F	(prob)	F	(prob)	F	(prob)	F	(prob)	F	(prob)
β_1	**7.62**	**(0.0058)**	0.11	(0.7420)	**8.98**	**(0.0027)**	0.74	(0.3889)	0.93	(0.3351)	0.21	(0.6503)
β_2	0.13	(0.7213)	1.29	(0.2562)	0.02	(0.8806)	0.70	(0.4040)	0.32	(0.5745)	0.01	(0.9145)
β_3	3.78	(0.0518)	2.55	(0.1106)	1.00	(0.3172)	0.48	(0.4881)	**9.98**	**(0.0016)**	**8.73**	**(0.0031)**
β_4	2.78	(0.0952)	0.57	(0.4521)	**4.33**	**(0.0375)**	1.63	(0.2024)	**9.79**	**(0.0018)**	**6.73**	**(0.0095)**
β_5	**18.16**	**(0.0000)**	0.00	(0.9631)	**12.40**	**(0.0004)**	0.07	(0.7924)	**9.71**	**(0.0018)**	0.37	(0.5450)

The Wald-tests are based on the coefficient estimates of the IV estimations of equations 5 and 6 respectively. We controlled for GP level characteristics by including the variables accr, perc_H_D and perc_H_O, exit and entry (see Table 1). Controlling for differences in health status is done by including the following market level variables; kids, young, old, foreign, Flanders, Brussels, unempl, meaninc, hospbeds and restbeds. The instruments for GP density (R) used are mpop, npop5, dens and lnmpop. See Table 3 for variable definition.