COMPETITION IN HEALTH PROVISION AND INSURANCE

Xavier Martínez-Giralt (Dir.)

Fundación BBVA

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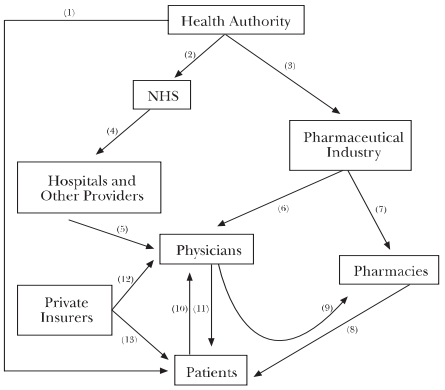
Introduction

HEALTH is the element in life that citizens value most. Accordingly, *healthcare* is a top priority in governments' policy design. In modern societies, the level of health among the population is determined by a complex set of activities developed in the framework of a social structure. This has led the World Health Organization to refer to the *health system* as all the activities whose primary purpose is to promote, restore or maintain health (WHO 2000); a set of interrelated elements (environment, education, labour conditions, etc.) aimed at the transformation of some medical resources (inputs) into a health status (final output) through the production of health services (intermediate output).

This project aims at studying some aspects of the relationship between the different agents interacting in the healthcare system. A proper description of the healthcare market must start by describing the agents interacting in it. Figure I.1, borrowed from Narciso (2004), illustrates this. The agents involved are the health authority, the National Health Service, providers, third party payers, patients and the pharmaceutical sector.

FIGURE I.1: Agents in the healthcare system



Quoting Narciso (Narciso 2004), *health authorities* play a strong regulation role that works in several directions. One task is to stipulate the type and/or value that patients have to pay for medicines and several services in the NHS providers (arrow 1). It also defines the organization of this public health system (arrow 2). For example, it decides the types of appointments and treatments provided in hospitals or by other providers and the geographical distribution of patients through health providers (arrow 4). Finally, health authorities regulate the pharmaceutical sector (arrow 3) through the price of medicines, both pricing applied to pharmacies and patients.

Both *hospitals and other public providers* (such as health centres) hire physicians, nurses and other staff (arrow 5) who deal directly with patients.

The *pharmaceutical industry* produces and sells medicines to the *pharmacies*, which in turn sell them to the patients (arrows 7 and 8). The agency relationship between physicians and patients creates in the pharmaceutical industry incentives to promote their products to physicians with the purpose of influencing their choice of medicines (arrow 6). Nevertheless, when countries have substitution laws, it is possible for pharmacies to sell a medicine that is different from the one prescribed by the physician. That is, under substitution rules, when the doctor prescribes a branded drug, the pharmacy is allowed to sell a generic version of that medicine to the patient (arrow 8); in this case, the relationship between pharmacists and patients becomes closer and more important than when the pharmacist only acts as a seller. When substitution is allowed, the pharmacist participates in the decision process.

However, the medicines that patients consume are typically prescribed by *physicians* who act as agents of the patients, in the sense that they decide on the consumption of medicines on their behalf (arrow 9). This is very peculiar to the healthcare market, since patients who consume the good (the medicine) are not the ones who choose the good to consume. Finally, arrows 10 and 11 represent the central relationship in this process: the interaction between patients and physicians, which gives us the final outcome of the whole system and the reason for its existence. The *patient*

consults a doctor when he finds some symptoms of illness or when he is advised in a previous appointment to do so. Based on the symptoms reported by the patient and on possible additional examinations, the physician prescribes the treatment he deems appropriate.

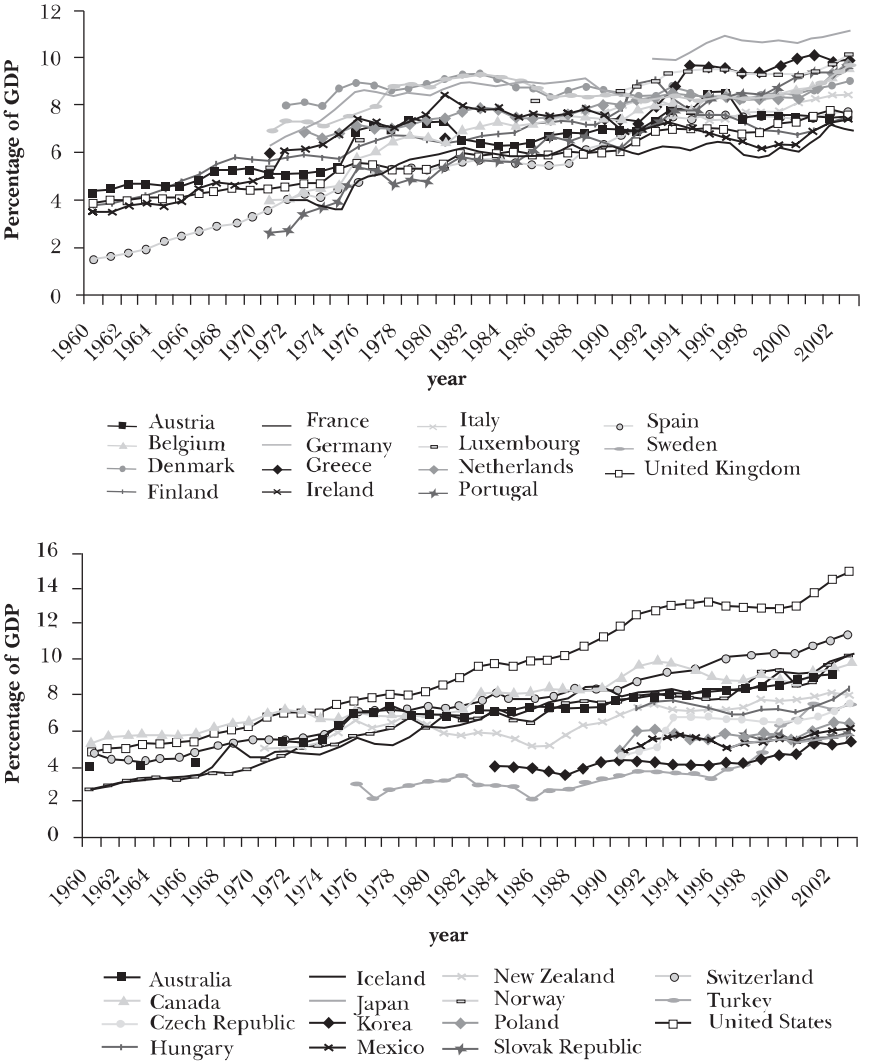
It is still possible that patients buy *private insurance*, which will be alternative or cumulative to the public one. In this case, private insurers will contract both with physicians and patients the appropriate payment schemes (arrows 12 and 13). A detailed overview of the relationships among those agents, also including the pharmaceutical industry and politicians, is provided by Thurner and Kotzian (2001).

We will focus on three types of agents. *Patients* represent the part of the population that, facing a certain sickness, demand healthcare services. *Providers* supply healthcare services. Among those, we can distinguish "first level providers", including general practitioners and primary care services, and "second level providers", where we find specialized healthcare hospital and specialists. Finally, the third type of agents is the *third party payers* that finance the provision of healthcare services. These may be private insurance companies or a public agency (social security). These third party payers buy healthcare services from providers on behalf on their insurees, thus granting coverage to insurees and defining the protocols to reward providers.

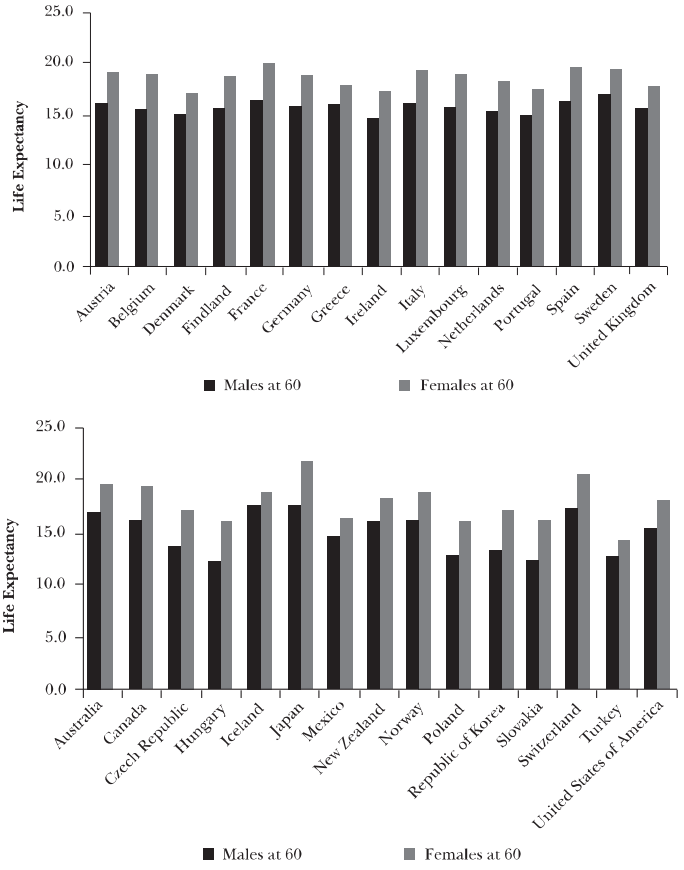
There are several reasons to justify the relevance of the healthcare sector in the economy. Among them, its relative size in the overall economy. Graph I.1 (OECD 2005a, b) shows the increasing share of healthcare spending as a percentage of the GDP for a selection of 30 OECD countries, including the EU-15 (top) between 1960-2002.

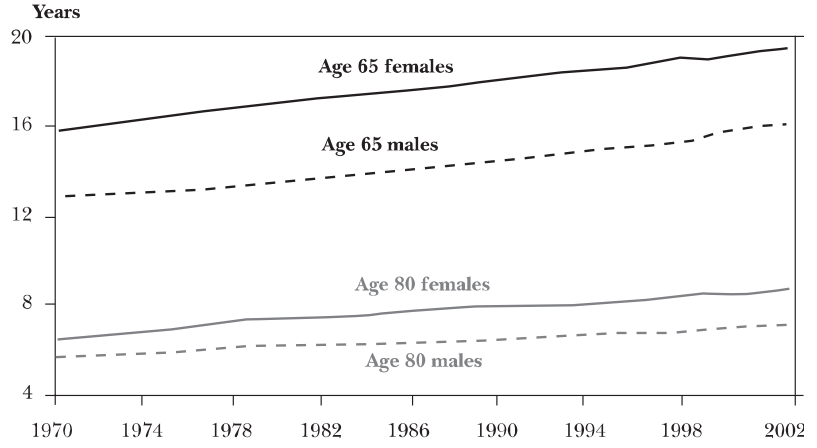
This trend in spending in the context of those OECD countries is consistent with the aging of population and technological development. Graph I.2 shows in the upper part life expectancy at age 60 in the OECD countries in 2002 according to the WHO (2003). The lower part of the figure compares the trend in life expectancy at ages 65 and 80 corresponding to the OECD average for the period 1970-2003 (OECD 2005a, b).

GRAPH I.1: Share of healthcare spending as a percentage of GDP. 1960–2002



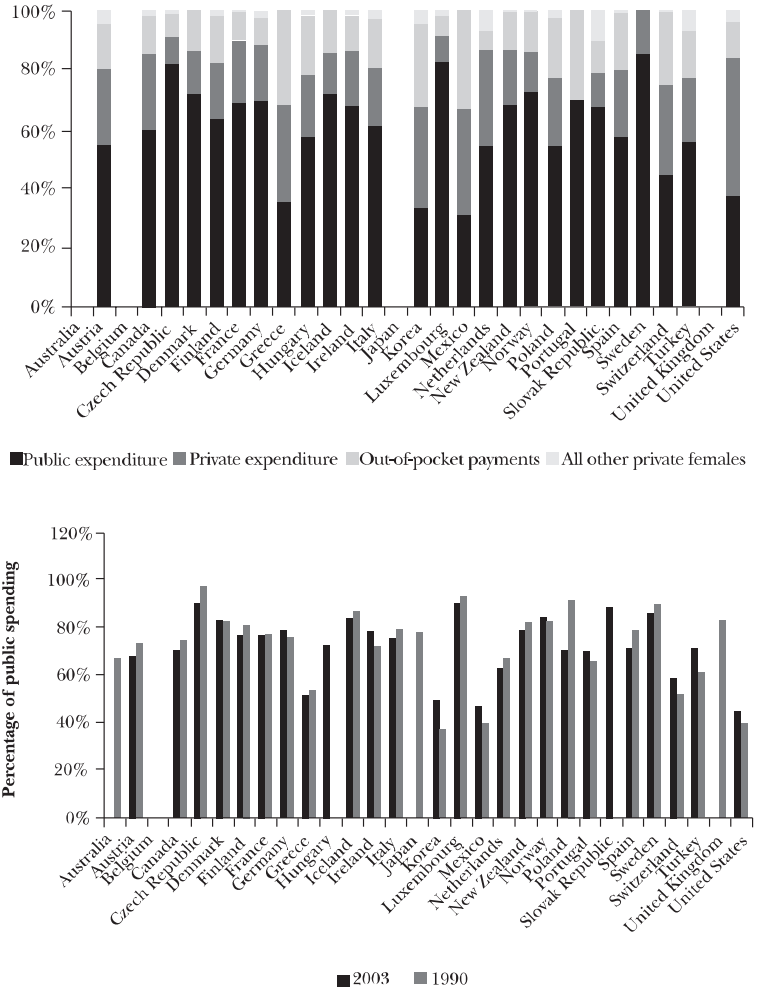
GRAPH I.2: Population aging in the OECD countries





Control over these expenses given the constraints on public spending imposed by the Treaty of Maastricht constitutes one of the main problems faced by governments in the EU. Thus, the design of health policies soundly based on formal economic thinking is an important element of health economics. Graph I.3 shows at the OECD level health expenditures by source of funding in 2003 (top) and changes in the public share of health expenditure comparing the years 1990 and 2003 (OECD 2005a, b).

GRAPH I.3: Sources of funding for health expenditure

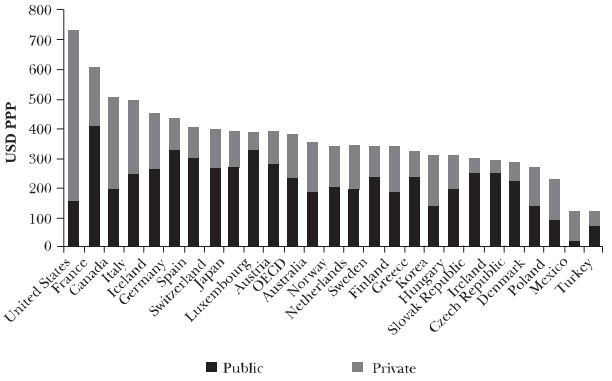


Pharmaceutical expenditure is an important component of the increase in health budgets. They have increased by more than 5% per year on average since 1997, most of it borne by public funds. Graph I.4 shows for a selection of OECD countries (OECD 2005a, b), pharmaceutical expenditure per capita in 2003 and its growth in real terms between 1997 and 2003. On average, per capita spending on drugs has risen by more than a third in real terms since 1997. There are considerable differences across countries, reflecting differences in volume, consumption, prices and income levels. In 2003, the United States spent 728 USD PPP per capita on pharmaceuticals. This is almost double the OECD average of 380 USD PPP. However, this represents less than 13% of total health expenditure in the United States, somewhat lower than the average of 17.5% observed across the OECD. At the other end of the scale, both Mexico and Turkey only spent around a third of the OECD average. Pharmaceutical expenditure accounted for more than 20% of total health spending in France, Italy and Spain, and considerably more in some Eastern European member countries.

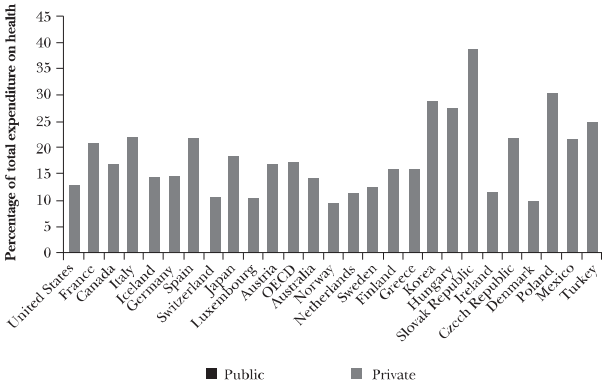
The recent history of modern societies allowed for an obvious progress in the access and equity of health systems. This access in turn generated a variation in the population pyramid, with a higher participation of the elderly (that, together with children, are groups demanding most of medical services). As is well known, there is a positive relationship between health status and income. There are two explanations for this phenomenon. Thanks to technological innovation and investment in public infrastructures, higher health levels are easier to attain and maintain over time. The second explanation relates to changing preferences of individuals over time. Accordingly, for a given level of income, individuals become more concerned about their health status. Either way, this relation bears two consequences. Following Jack (1999), on the one hand, as populations become healthier, they also age. This is known as demographic transition. On the other hand, the pattern of disease changes. This is known as epidemiological transition.

GRAPH I.4: Pharmaceutical expenditure

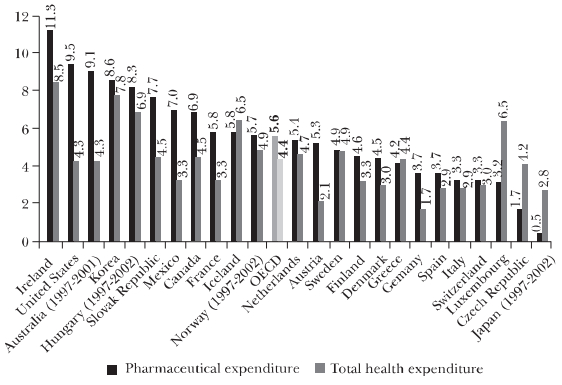
Expenditure on pharmaceuticals per capita, 2003 (USD, PPP)



Pharmaceutical spending as a percentage of total health expenditure, 2003



Real annual growth in pharmaceutical spending and total health expenditure, 1997-2003



Finally, we should not forget technological progress, which has provided physicians with more efficient treatment possibilities and diagnosis techniques (e.g. cobalt bomb, ecography, magnetic resonance). All these factors have generated a substantial increase of expenses in healthcare, threatening the future of the so-called welfare state. Therefore, we face a dilemma between efficiency and equity in the health system that has generated debate on the reform of health systems in Western countries.

Together with cost control efforts, health administrations are also considering efficiency criteria. Altogether they are bringing about important changes in the financing of national health systems. Parallel to these trends, the debate on the equity aspect of public health provision has encountered the usual trade-off between efficiency and equity. In particular, it has been argued that the introduction of competition involves sacrificing equity, and in some cases a reduction in the quality of services.

We intend to contribute to this debate by focusing on two of the main topics of controversy, namely price regulation in the pharmaceutical industry and regulation and competition in healthcare markets.

The main conclusions of the study are as follows. Regarding *pharmaceutical price regulation*, we distinguish three levels of analysis: (i) at the country level, we show that, ceteris paribus, in a bargaining procedure between a pharmaceutical corporation and a state agency, negotiated prices are increasing through the level of copayment. The opposite is true if prices were assigned through the market mechanism, as higher subsidies would make demand more inelastic; (ii) in international markets, we study how parallel imports and external referencing can be used as welfare improving policies. Parallel trade always decreases the company's profits net of public expenses and hence welfare can only increase if gains in surplus for patients in the high price countries more than offsets the loss in surplus for patients in low price countries. Regarding external referencing, we show that the company and the imitated country lose income from external referencing; but also, the ability of the referencing country to benefit from the policy depends on the design of the policy and the initial asymmetries in prices between countries; (iii) on the recoupment of

R&D costs, we assess the problem of how to divide financing of R&D costs using Ramsey pricing, pointing at the fact that there is ex post moral hazard due to co-insurance that will affect demand elasticity and there are crucial divergences in the way countries organise their subsidy system.

On *regulation and competition in healthcare markets*, we address the relationship between providers and third party payers (be it a private insurance company or the public NHS), recognizing that they often interact directly. We look at the determinants and implications of different ways of organizing such interaction: (i) first, we consider a setup where providers negotiate on an individual basis with the third party payer. Two alternatives have been considered: bargaining with providers and "any willing provider" contracts. The main finding of the analysis is that whenever the surplus to be shared in the bargaining is relatively high, the third party payer prefers the "any willing provider" system because the implicit commitment to be tough is more valuable in the case of larger surplus; (ii) second, we argue that the strategy of public healthcare provision to hold idle capacity allows for increasing bargaining power against private providers. Idle capacity works as a commitment to extract surplus from more efficient private providers that negotiate prices with the public payer; (iii) finally, we allow providers to set an association to bargain with the third party payer. We examine whether a NHS (or a third party payer in general) prefers to negotiate prices for health care services with professional associations or should it negotiate only with the most efficient ones and apply the resulting price to all providers. We find that the apparent benefit of negotiating with the more efficient providers (obtaining lower prices) can be more than outweighed by a stronger bargaining position of the provider when compared to dealing with an association. This is so because a representative association also incorporates in its decisions the (relatively larger) decline in profits of less efficient companies in the event of negotiation failure.

1. Price Regulation in the Pharmaceutical Industry

1.1. Introduction

Healthcare sectors are characterized by the widespread use of insurance for the consumption of healthcare goods and services. In other words, patients only pay a fraction of the costs for the services they demand—a copayment that may be fixed or proportional to the expenditure generated. The role of insurance reimbursements in healthcare is a cornerstone of Western health care systems, given the distributional and insurance roles of governments. Yet, it is generally recognized that insurance results in an excessive consumption of healthcare, a phenomenon referred to as moral hazard, which has been extensively studied. The most comprehensive research on this topic is the Rand Health Insurance Experiment, where a number of families were randomly assigned to 14 different health plans with varying copayments. The study shows that there is a significant effect of copayments on the use of care—especially acute and preventive care (Keeler 1992). Hence, insurance is a double edge sword: on the one hand, it protects consumers from adverse health states of nature and results in a more equitable distribution of healthcare, but on the other it is partly responsible for raising levels of healthcare consumption and public costs. Because of this, there has been an international trend to increase copayments, although low copayments are still the best way to ensure equity in access to health care and insurance.

Given the impossibility of avoiding insurance, governments have developed several policies aimed at limiting growth in final prices of medical devices and drugs. However, whilst the effects of copayments on consumption levels have been widely studied, much less attention has been devoted to the influence of copayment levels on the final prices of healthcare services and their

interplay with other policies. The traditional microeconomic argument points at the fact that insurance reimbursements reduce the elasticity of demand and increase prices, just as subsidies do. This argument can only take us so far, as it is based on a setting with no public intervention. In her paper, Pavcnik (2002) confirms this. She studies the effects of copayments on pharmaceutical prices in Germany. The change from a maximum reimbursement for a drug to a flat prescription in 1989 has given her a unique opportunity to empirically test the effects of reducing insurance reimbursements. Her conclusion is that the decrease in reimbursement results in smaller prices, and this is more pronounced in the case of brand drugs. However, low elasticities should not be a concern for researchers and policy makers if the market was healthily competitive. However, market power is one of the main characteristics of healthcare provision, stemming from patents and other barriers to entry, product differentiation and informational asymmetries.

Consequently, our first concern in this research is to analyze the interplay between insurance and other public interventions and their effect on prices. In particular, we focus on the following public intervention: The health authority negotiates drug prices with the pharmaceutical company for the drug to be listed for reimbursement (see "Pharmaceutical price negotiations and copayments", discussed in section 1.2). In a model using the Nash bargaining solution to explicitly represent this negotiation process, it is shown that when the price of a drug is the outcome of a negotiation process, it is increasing in the level of copayment. This result contrasts with the negative relationship between price and copayment when a company with market power sets the price without any negotiation.

Some healthcare goods, like pharmaceuticals and medical equipment and devices, can be exported. Moreover in most of these markets multinationals sell their products in several countries. If one restricts one's attention to such goods, empirical evidence suggests significant differences in pharmaceutical expenditure per capita from one country to the next. Research in the differences on prices is scarcer but there are several papers stating that such price differences are significant (Malueg and Swartz, 1994).

Such price differences can be explained by differences in institutional frameworks, including copayments and socioeconomic factors. Since pharmaceutical companies are mostly multinationals and have the ability to internationally price discriminate, observed differences in prices are unlikely to reflect differences exclusively in production and transport costs. These price differences have prompted higher priced countries to adopt policies to take advantage of lower prices abroad. Those policies include allowing parallel imports of pharmaceuticals and external referencing, among others. Parallel imports are goods produced genuinely under intellectual property right protection placed into circulation in one market and then imported into a second market without authorization of the copyright holder. They are identical to the legitimate products, except that they may be packaged differently and may not carry the original manufacturer's warranty (Maskus 2000). External referencing policies consist in imposing a price cap for pharmaceuticals based on prices of identical products in other reference countries. Both in the Netherlands and Switzerland such a policy came into force in 1996 under the Pharmaceutical Prices Act and the Health Insurance Law, respectively. In the Netherlands, the maximum price for a drug is established as an average of the drug prices in Germany, France, UK and Belgium. In Switzerland, the Health Insurance Law introduced a "positive list" of reimbursed pharmaceuticals. For a drug to be included in that list, its price should not exceed average prices in Germany, Denmark, the Netherlands and the UK in general. Therefore, the issue with external pricing is how a country, say the Netherlands, may use the pricing process in another country, say France, to define its own pricing policy.

Those policies bring about spillover effects: direct spillover effects in the sense that prices converge; indirect spillover effects in the sense that policies in one country affect policies in another, and thereby prices in both countries; and informational spillover effects, when outcomes in one country inform the health authority in other countries about company's costs. Given those policies and spillovers, companies are likely to behave strategically. This suggests the methodological tools necessary to tackle these issues from a theoretical point of view, namely game theory and partial

equilibrium analysis. As we can see, there are many interesting issues regarding the interaction between multinational companies and health authorities in diverse institutional settings. We focus on a few of them.

One of our studies analyzes the implications of parallel imports of pharmaceuticals produced by a monopoly from one country to another (see "Parallel imports and copayments" discussed in section 1.3). In particular, it analyzes the pricing and welfare implications of parallel trade. It uses a model where countries differ in the patients' level of copayment for buying pharmaceuticals, and patients differ in the utility obtained from the consumption of pharmaceuticals. The main contribution of this paper is that it stresses the importance of identifying the main determinants of international price discrimination to understand welfare effects associated with parallel trade. It identifies three cases where the effect of allowing parallel trade on the total welfare can be stated unambiguously.

When studying the consequences of external referencing, we have taken a complementary approach to explain how external referencing can limit the opportunities for the company to price discriminate. We assume that one country, say the Netherlands, is capable of committing to a pricing rule based on pricing negotiations in another country, say France. This two-country example is a real case. We then analyze how different pricing rules in the Netherlands affect the bargaining process in France. We also compare these results with the hypothetical benchmark where the Netherlands carries out independent negotiations with the pharmaceutical company.

This constitutes, on the one hand, a partial approach to external referencing, as we take the particular rules of the whole game (timing, commitment capabilities, etc.) as exogenous, although we do perform comparative statics on these rules. On the other hand, we take a very general view of the negotiation process in the country were prices are set in the first place. In particular, we carry out the analysis for general bargaining powers in the negotiation. In this sense, the analysis is flexible enough to encompass many real world negotiation patterns. The general message of our analysis is that France may be greatly hurt by the external referencing process in the Netherlands.

The last paper triggers a question that motivates our third study: if the Netherlands is able to offer in some cases the price set in France without further negotiation, why doesn't it set the price at marginal cost? Or, if fixed costs or increasing returns to scale exist and transfers from the administration to the pharmaceutical company are costly, why doesn't the Netherlands set the price at average cost? Moreover, could the Netherlands use as a benchmark for negotiations drug prices in other countries? Yet, wouldn't this depend on the timing of launches by the pharmaceutical company? The third study aims at answering precisely these questions. As for the first one, we assume realistically that there are information asymmetries between the administration and the pharmaceutical company. In particular, we assume that actual production costs are the company's private information. This, however, brings a new difficulty into the analysis. Namely, that price negotiations are carried under asymmetrical information. It is well known that most bargaining theories have very little predictive power in this case. In consequence, we take a less ambitious approach and assume that countries have full bargaining power when negotiating with companies. Indeed, agencies may not subsidize the drug in case of negotiation failure or even forbid sales of the drug altogether. At least in the last case, the «weak bargaining power» of the country argument seems somewhat implausible. Moreover, by assuming that countries have full bargaining power we focus on an alternative explanation for prices exceeding marginal costs: the existence of asymmetrical information. We prove that sometimes it is impossible to make a marginal cost-pricing offer due to information asymmetry. As for the second question, the model allows us to determine the optimal timing of launches for the pharmaceutical company as a function of the size of aggregate demand in each country, how impatient the company and the countries are, the level of patient copayments in each country and each country's prior knowledge of the company's true production costs.

Finally, in section 1.6, we address the question of sharing of R&D expenses among the outlets of a multinational (pharmaceutical) enterprise or among partners of some kind of agreement towards the development of new drugs. This is an important

issue, as transfers from governmental budgets are usually not allowed. Thus, pharmaceutical companies must recover their investments in R&D through sales. Then, country characteristics such as the level of copayments and public/private provision of healthcare become relevant because they affect domestic demand elasticities. We detail the optimal adjustment in the Ramsey pricing formula, its interpretation and implications.

1.2. Pharmaceutical price negotiations and copayments

In this study, we analyze the influence of patients' copayments on purchasing pharmaceuticals on the price of a drug. We consider that the price of a pharmaceutical product is the outcome of a negotiation between a health authority and a pharmaceutical monopoly. To represent this negotiation, we use a model based on the bargaining theory, in which gains derived from bargaining are explicitly defined. In particular, we consider that when the price is negotiated, the drug is listed for patients' proportional reimbursement. On the contrary, in case of negotiation failure, the drug is not listed for reimbursement and patients pay the full price.

The features captured in our study are prevalent in the pharmaceutical sector, and some of them have been widely discussed in the literature (Scherer 2000). On the demand-side, consumers' purchases of prescription drugs and healthcare services are often reimbursed in whole or in part by insurance plans. There is a divergence between the demand curve derived from consumers' income and the full price and the (higher) demand curve reflecting quantities consumed at prices net of insurance payments. This divergence of demand functions leads to reduced demand elasticity and increased purchase of the insured item.

On the supply-side, the wide use of patent protection on new drugs gives the pharmaceutical producer a monopoly power. Microeconomic theory states that a monopolist maximizes its profits by setting a price that is negatively related to the price elasti-

city of demand. Since insurance reimbursement leads to a reduction of price elasticity of demand, we expect that the price set by a monopolist depends positively on the level of reimbursement, that is, negatively on patients' copayment. This would hold for the pricing of pharmaceuticals if there were no price controls on pharmaceutical products imposed by governments.

However, as noted by Scherer, "the perception, correct or incorrect, that pharmaceutical prices and profits have been excessive, the taxpayer burden from rising public health care costs, and the belief, especially in smaller nations, that reducing drug prices and profits will at best have a minor impact on R&D expenditures by companies oriented toward serving worldwide markets, have led many governments to impose more or less thoroughgoing price controls on pharmaceutical products". Item by item negotiation and control is one of the five categories of drug prices government regulations cited by Scherer. According to Danzon (1997), a government has a significant monopsony power since it negotiates drug prices on behalf of an entire country. Another policy used by governments in Europe, where reimbursement levels have been traditionally generous, is to raise the patients' payment shares for buying pharmaceuticals for cost-containment purposes. There is no reason to believe a priori that these policies, drug price negotiation and copayment variation, do not interact with each other.

To our knowledge, no study has been made on the relationship between the level of patients' copayment and drug prices when these are negotiated for the drug to be listed for reimbursement. Only the following observation, reported by Scherer (2000), gives some insight about our problem. To control the rising costs of prescription drugs, many Health Maintenance Organizations (HMOs) and traditional hospitals in the US introduced forms listing the drugs suitable for use against certain illnesses. As the use of forms gained acceptance, healthcare organizations realized that they could use the threat of a drug's exclusion from their forms as a lever to elicit discounts from pharmaceutical manufacturers.

The main conclusion of our paper is that drug prices resulting from government-producer bargaining are unambiguously increa-

sing with the level of patients' copayment for buying drugs. This conclusion contrasts with the negative relationship between copayment and price, when the monopolist sets the latter without any negotiation. Our result can be explained as follows. The threat faced by the monopolist of failing negotiations (thus, of having the drug not listed for reimbursement) is stronger when the level of copayment is lower. Indeed, the monopolist has more to gain from negotiation when the patients' demand is less price elastic, thus when the level of copayment is lower. This implicitly gives more bargaining power to the government. This ultimately results in lower negotiated prices, if we consider that the government aims at lower payments for drugs, both with respect to its public finances and on behalf of patients.

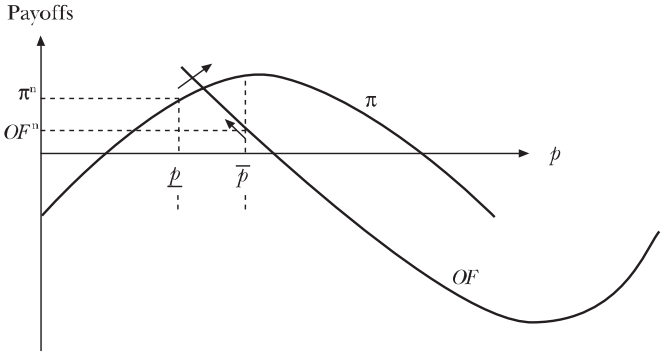
In our model, the price of a pharmaceutical product affects the objectives of three parties: the patients, the government and the pharmaceutical monopoly producer. The patients' total demand for the drug is assumed to be decreasing in the copayment, which is proportional to the drug's full price. This demand is assumed to be the outcome of the patients' utility maximization, each patient having a utility additively separable in the consumption of one or zero unit of the drug and the consumption of a numeraire composite good. The objective of the government is assumed to be the maximization of the consumers' surplus, net of the public expenses associated with partial reimbursement of drug expenses. We also assume that the objective of the monopoly producer of drugs is to maximize its profits, assuming that the variable cost of producing the drug is zero.

As a preliminary step, we present in Jelovac (2005) the price set by the monopolist if there were no negotiations, which is the outcome to the profit maximization of the monopolist. This monopoly price is shown to be decreasing in the level of patients' copayment.

If a drug is not listed for reimbursement, its price is set by the monopolist without any prior negotiation, and patients pay the full price of the drug. Hence, the price derived previously for the case of monopoly pricing can be adapted using the equality between the copayment and the full price of the drug. This new price reflects the outcome achieved if no agreement on the drug price were reached during negotiations.

Starting from this status quo situation, with no negotiation and no reimbursement, it is relevant to ask whether a price negotiation between the government and the monopolist can lead to a Pareto improvement.[1] The answer to this question is affirmative. Whenever the price belongs to a given range, we have a Pareto improvement. This Pareto improvement is shown on figure 1.1.

FIGURE 1.1: Comparing status quo payoffs with payoffs from successful negotiations



We first notice that prices limiting the range for Pareto improvement through negotiation are increasing in the level of copayment. The lower limit price is the price that leaves the monopolist indifferent between a negotiated outcome and having the drug not listed for reimbursement. A lower level of copayment would make the monopolist's profits higher for any given price if an agreement were reached. Therefore, given that the monopolist's profits are increasing in price in the relevant range of prices, only a smaller lower limit price would result in monopolist's profits when an agreement is reached as low as when having the drug not listed for reimbursement. In other words, with a lower patients' copayment, the monopolist has more to gain from negotiation. The opposite argument holds when we consider the government. The upper limit price is the price that makes the government indif-

[1] By Pareto improvement we mean that the objectives of both government and monopolist are higher than in the status quo situation.

ferent between a negotiated outcome and listing the drug for reimbursement. A lower copayment makes the government's objective lower for any given price. Therefore, and given that the government's objective is decreasing in the price when the relevant prices range is considered, only a lower upper limit price would make the government's objective when an agreement is reached as high as having the drug not listed for reimbursement. In other words, with a lower copayment, the government has less to gain from negotiation.

In Jelovac (2005), we solve the Nash bargaining program corresponding to the government-monopolist negotiation to derive analytically the negotiated price of a drug (i.e. the Nash bargaining solution). To prove that the Nash bargaining solution price is also increasing in the level of copayment, we apply the Implicit Function Theorem to the Nash bargaining solution and obtain the positive relationship between negotiated price and copayment.

Last, we perform some numerical simulations suggesting that a higher patients' copayment results not only in higher negotiated prices, but also in lower consumers' surplus, monopoly profits and public expenses.

To sum up, we proved that the price of a pharmaceutical product increases with patients' copayment when it is the outcome of a negotiation between a profit-maximizing monopoly drug producer and a government aiming at maximizing the consumers' surplus net of public expenses. This result is obtained using a model of Nash bargaining, where gains from bargaining are explicitly defined. In particular, we consider that when the price is negotiated, the drug is listed for patients' proportional reimbursement. On the contrary, in case of negotiation failure, the drug is not listed for reimbursement and patients pay the full price. The main rationale for our result is the following: the lower the patients' copayment, the lower the price elasticity of demand, the higher the monopolists' profits if the drug is listed for reimbursement and the more the monopolist has to gain with a negotiated outcome. Our result suggests that when governments use several policies simultaneously to control the costs corresponding to the consumption of pharmaceutical products, they should

carefully weight possible interactions between the different policies. In particular, when a government uses item by item negotiation and decides to raise the level of copayment for drug purchases, it should take into account that a higher copayment would result in higher negotiated prices, thus countervailing the effects of the first price control policy.

1.3. Parallel imports and copayments

With this study (Jelovac and Bordoy 2005), we participate in the ongoing debate over the benefits and drawbacks derived from parallel imports among countries. In particular, we study pricing and welfare implications of parallel trade of pharmaceuticals between two countries.

One important reason why parallel imports might arise is to arbitrage away international price differences, which is widely observed for pharmaceutical products (Maskus 2000). One expected effect of parallel imports is a convergence in prices between countries. Ganslandt and Maskus (2001) provide evidence on price convergence resulting from parallel trade of pharmaceuticals in EU countries.

The expected effect of parallel trade in terms of social welfare is not so clear cut. Welfare is shown to either increase or decrease with parallel imports, depending on whether authors consider any of the following aspects: different drug price regulations across countries (Pecorino 2002); efforts of IPR owners to exert vertical price control (Maskus and Chen 2002); the level of demand dispersion across markets (Malueg and Schwartz 1994); and the need for manufacturers to recoup their global research and development costs (Danzon 1998).

The main contribution of our paper is stressing the importance of identifying the main determinants of international price discrimination to understand welfare effects associated with parallel trade. We use a model that accounts for the differences between countries in terms of health insurance reimbursement policies and of drug needs reflected in the patients' valuation of a drug. We neglect effects associated with different income levels across

countries, even though this difference is likely to be an important determinant in international price discrimination. When we consider differences in income only, parallel imports are expected to flow from low income countries to high income countries. Since parallel imports generate price convergence between countries, richer countries might benefit from parallel imports while poorer countries might be worse off (Danzon 1998). However, international price discrimination is likely to be caused not only by differences in income across countries, but also differences in other relevant characteristics of the demand. Otherwise, how could we answer the question raised by Maskus (2001): Why might prices be higher in poor countries? Maskus (2001) reports the finding that prices are elevated in such countries as South Africa, Mexico and Brazil compared to Canada, Spain and Italy.

Characteristics of the demand that are especially relevant for pharmaceuticals rely both on insurance and drug needs. Both can be specific of these countries. On the one hand, huge variations among national health systems can influence the pricing strategies of pharmaceutical firms. In particular, the level of insurance reimbursement influences the pricing of drugs, since it directly affects price elasticity of the demand for drugs. If there is no other regulation on drug prices, as is the case in Germany and in Denmark among other countries, pharmaceutical manufacturers would charge higher prices in countries where insurance is more generous, taking advantage of a lower price elasticity of demand (Pavcnik 2002). On the other hand, pharmaceutical companies might also take advantage of differences in needs for a given drug among countries, charging higher prices where some endemic illness raise the need for the appropriate drug with respect to countries where this illness is not active.

We tackle these issues using a model with the following timing. In the first stage, a multinational monopoly producer sets the price of a patented drug for two countries. In the second stage of the game, if prices are different between the two countries, parallel traders can buy drugs in the low price country and resell them in the high price country at a price depending on whether the market for parallel imports is monopolistic or competitive. In the third stage of the game, individuals in both countries choose to

consume either one unit of the drug supplied by the monopolist or one unit of the parallel imported drug, or nothing, so as to maximize their utility. We solve the game by backwards induction to derive the Nash sub-game perfect equilibrium. We compare the solution to this game to a benchmark case where parallel trade is forbidden. This benchmark game is similar to the one described above, except that the second stage of the game vanishes. Assuming differences in copayment and drug needs between the two countries, the monopoly producer price discriminates as much as possible in equilibrium when parallel trade is forbidden. This leads us to categorize the countries as "high price country" and "low price country".

We first confirm a result already reported in the literature: parallel trade makes prices converge between countries. As a reaction to the possible entry of parallel traders in the market, the pharmaceutical monopoly producer trades off the benefits from price discrimination with the losses associated with competition from parallel imports in the high price country. Therefore, the monopolist increases the price in the low price country and decreases the price in the high price country so as to deter some amount of parallel imports. Price convergence is shown to be stronger when the parallel import market is competitive rather than monopolistic. This happens because the aforementioned trade-off and its resulting price effect are stronger when the threat of competition from parallel importers is stronger, thus when the parallel imports market is competitive. Consequently, all the remaining effects associated with parallel imports are stronger when the parallel import market is competitive.

The aforementioned convergence in price does not mean that parallel trade results in global uniform pricing. Contrary to other papers (Malueg and Schwartz 1994; Richardson 2002) where parallel imports are assumed to imply de facto global uniform pricing, we obtain global uniform pricing only if consumers value the original drug and the parallel imported drug equally. However, as noted by Maskus (2001), goods that are parallel imported may not be perceived to be of the same quality between markets, even if the manufacturer placed them on the market originally, because of differences in packaging or guarantees. This

difference in perception leads in our model to the persistence of some level of price discrimination between countries, even when parallel imports are permitted.

Furthermore, we show that the effect of parallel imports on total welfare is ambiguous. We prove that the sum of profits net of public expenses always decreases as a result of parallel trade. Therefore, total welfare can increase with parallel trade only when the gain for consumers in high price countries is large enough to compensate the loss for consumers in low price countries. This happens when we consider countries with similar health systems but different valuations for the drug due to differences in endemic illnesses suffered by the population, for example. In this situation, the increase in consumers' surplus in the high price country more than compensates the decrease in the low price country, and parallel trade increases total welfare. One explanation could be reallocation of drug consumption from the low price country to the high price country. Parallel imports would make individuals with a low valuation in the low price country give up consuming the drug. While in the high price country, individuals with a higher valuation start consuming the drug thanks to parallel trade. Therefore, we have a reallocation from individuals valuing the drug less towards individuals valuing the drug more.

This result is similar to Schmalensee's (1981): if all demands are linear and all markets are served under any regime, then prohibiting a monopoly from practicing third degree discrimination produces a net welfare gain. In our model, parallel imports decrease rather than prohibit third degree discrimination. In that sense, we compare different degrees of third degree discrimination while Schmalensee (1981) compares unrestricted third degree discrimination with uniform pricing. Therefore, this first result on welfare can be seen to a certain extent as a generalization of Schmalensee's result.

Another interesting case considers two countries differing only in their healthcare system reflected in the copayment for buying the drug. We can think of countries with similar health needs and different social security systems. Some countries in the European Union satisfy these characteristics. Parallel imports decrease total welfare in this case, even when the sum of consumers surplus varia-

tion is positive. We have now a reallocation of drug consumption from individuals in the low price country with a higher valuation towards individuals in the high price country with a lower valuation.

At first sight, this second result seems to contradict Schmalensee's. However, we must consider discrimination (or convergence) in consumer prices to interpret Schmalensee's result in the presence of differentiated copayments. In the present case, parallel imports actually imply a divergence in consumer prices together with a convergence in full prices. This divergence in consumer prices explains why parallel imports decrease total welfare. Therefore, our second result confirms rather than contradicts Schmalensee's.

Last, we discuss the case where market conditions in both countries are so different that allowing parallel trade induces the following corner solution: the market is not served in the low price country while the high price country is in the same situation as if parallel imports were forbidden. Therefore, forbidding parallel trade would yield a Pareto improvement by opening the market in the low price country without damaging the market in the high price country (Hausman and MacKie-Mason 1988).

To sum up, we identify three cases where the effect of parallel trade in terms of total welfare can be stated unambiguously. Parallel trade increases total welfare when taking place between countries differing exclusively in their drug needs. The rationale behind this positive effect relies on the reallocation of consumption from individuals with relatively lower needs in the exporting country towards individuals with relatively higher needs. The opposite reallocation of consumption is the result of parallel trade when countries differ only in their health insurance reimbursement policies. In that case, total welfare decreases with parallel trade. Allowing parallel imports would also decrease total welfare if it induces the monopolist to stop selling drugs in the originally low price country. The rationale for this case follows a result of Hausman and MacKie-Mason (1988): if one market is not served under uniform pricing, then price discrimination yields a Pareto improvement.

Our analysis is made maintaining the level of income equal between the countries. Therefore, our results are applicable to

trade taking place between countries of similar income levels. A direct interpretation of our results would be the following: On the one hand, parallel trade would increase total welfare when it takes place between two developing countries with the same level of income and patients copayments and different drug needs, to account for the higher needs for malaria or AIDS treatment in some developing countries. On the other hand, parallel trade between industrialized countries, characterized by levels of (high) income and similar epidemiological conditions and different drug reimbursement levels would decrease total welfare.

When we consider parallel trade between countries with different income levels, such as trade between developing countries and developed ones, we should carefully add the well known effects of parallel trade between a poor country and a rich country (reallocation of consumption from the poor country to the rich one) to the effects identified in the present paper.

1.4. External referencing

External referencing is a policy by which a country commits to use price information from other countries to set domestic price caps for drugs. The institutional detail of these policies varies from jurisdiction to jurisdiction. For example, in the Netherlands external referencing came into effect in 1996 under the new Pharmaceutical Prices Act and the Health Insurance Law. Such legislation established that the maximum price of a drug in the Netherlands would be an average of prices in Germany, France, UK and Belgium. In Switzerland, the Health Insurance Law established that for a drug to be included in the positive reimbursement list, its price should not exceed average prices in Germany, Denmark and the UK. The reason for external referencing is to achieve some reduction in final drug prices that will reduce the burden of pharmaceutical expenses in healthcare systems.

In this study, we identify the circumstances in which a country will find it worthwhile to engage in external referencing as opposed to negotiating the price directly with the pharmaceutical com-

pany. We focus exclusively on the role of the level of copayments in determining whether a country should or not engage in external referencing. Hence, our aim is to identify the interaction of subsidy levels with the suitability of external referencing. We assume that such patient copayments are a fixed amount and do not depend on the final price of the drug. This implies that the demand of drugs is not dependent on the final prices but only on copayment levels.

In approaching this question, we study how a commitment to external referencing by a country affects the bargaining of the drug price in the referenced country and ultimately determines the company's profit. Hence, our setting is based on a situation where there is bargaining between the multinational and each country. We take as a benchmark the case where there is no external referencing and bargaining is independent from country to country. A standard approach for the modeling of bargaining is the Nash bargaining solution, which assumes that parties engaged in bargaining share the excess surplus of the transaction in proportions determined by the strength of their bargaining power. The Nash bargaining model shows that an important determinant of the sharing of the economic profit between agents is how much each agent could guarantee for themselves if negotiations failed, as no agent will accept an outcome where he is left with less profit than with failed negotiations. Hence, we must identify which would be the situation if negotiations failed; this means identifying the "disagreement point" for each party.

This is troublesome, as one of the limitations of this study is that we have no real world information about the disagreement point of the company when bargaining with a country, say F, if that country is later on used as external reference by another country, say N. We do however have partial information about the disagreement point of F. Indeed, if negotiations fail then, in most occasions, the drug is not included in the country's positive list but the company can still market it, although consumers must pay the full price. Because of this reality check, this is the assumption that holds throughout our analysis. Hence, F's disagreement point is determined by the unsubsidized monopoly solution for the drug in question. We say that this information is only partial

because the market that the company faces once it is unsubsidized in F may include or not the market in country N. This depends on the particular form of the reference pricing policy in N. Let us analyze this in depth. To simplify exposition, we assume that a country (N) bases its external referencing policy on another single country (F). (The notation is taken from the Netherlands-France case described above.)

That country N establishes an external referencing policy ex ante implies that N has some degree of commitment power vis-à-vis the company.[2] Indeed, once country N observes the price in F (say 100 euros per unit), it establishes this price as the maximum price it will pay. This is tantamount to a take-it-or-leave-it offer in the following terms: "Either your price is 100 euros or less or else…". The question is what this "else" means. This is no trivial question, as country N may ex ante commit to make the answer depend on any previous observed events (game history). For instance, country N could commit not to list the drug in case of negotiation failure in country F, no matter the price observed in country F. The number of possible cases is potentially very large. Ideally, we would like to base our model on the real world practice, but unfortunately as almost all negotiations are successful we have no such real world information.

In this paper, we have made several assumptions aimed at reducing the number of cases:

1. If country N sets a maximum reference price (note that we are not defining what this price is yet), then if the company chooses to set a price above this she will not be allowed to sell the drug at all. This is a standard form of a take-it-or-leave-it offer, and it is the actual threat to the company in the case of the Netherlands.
2. If the company abides by the maximum reference price set by N, the drug is listed for reimbursement in country N, regardless of the previous history.

[2] Commitment and bargaining powers are related but should not be confused. In a way, a take-it-or-leave-it offer is similar to having full bargaining power.

We now explain what the reference price offer of country N might be:

3. In the case of successful negotiations in country F, we assume that N always offers the price observed in F as a reference price, regardless of what this price is, as long as it results from successful negotiations. We believe that this captures the spirit of external referencing.
4. In case of negotiation failure in F, we limit our attention to three possibilities. From harshest to mildest threat, these possibilities are:

   a) N prohibits sales altogether.
   b) N ceases to list the drug but still allows the company to sell the drug at full price without subsidy.
   c) N still subsidizes the drug if the price is not above the price in F, i.e. the reference price is the price in F.

Combining each of the three possibilities (a) through (c) with assumptions 1 through 3, we obtain the following three reference price policies:

(i) The harshest one combines assumptions 1 through 3 with 4-a. We refer to it as the "Tough Conditional Price Cap" policy. We say "conditional" because only under successful price negotiations in F does N offer listing the drug at the observed price (or less); we say "tough" because in case of failure in F, the drug is banned in N.
(ii) By combining assumptions 1 through 3 with 4-b, we obtain a policy that we refer to as the "Weak Conditional Price Cap" policy; "conditional" for the same reason as before, "weak" because the company is still allowed to sell in N in case of negotiation failure, albeit unsubsidized.
(iii) The weakest policy results if one combines assumptions 1 through 3 with 4-c. We refer to it as the "Unconditional Price Cap" policy, as N's offered price cap is the same regardless of whether negotiations in F succeeded or failed: the price in F.

In addition to the three reference price policies described, we also study the benchmark case of independent price negotiations.

The first result of the paper refers to this benchmark case and stems directly from the result described in section 1.2. From there, we know that a higher copayment results in higher negotiated prices. Hence, if the copayment in N is larger than in F, N will experience larger prices and might opt for using external referencing. Other things equal, we would expect countries where patients have larger copayments to engage in external referencing.

The situation with an Unconditional Price Cap shows in a very extreme way what the problem with external referencing might be: it weakens the bargaining power of the country of reference! Essentially, this is due to the combination of two facts: (i) the demand in N is independent of the final price and (ii) by setting such an external referencing policy, country N chooses not to negotiate its price with the company. In this case, the firm opts for setting really unreasonable demands in the bargaining at F (despite the fact that they lead to a failed negotiation), and sets an infinite (or as high as possible) price for the drug in country F, with F rejects. The reason is that N's commitment allows this price to generate infinite profits in N, albeit no profits in F. This implies that an unconditional price cap when copayments are fixed is non-optimal, resulting in really adverse results for all countries, both referencing and referenced. This is the reason why we would expect external referencing to be conditional, this is, for price caps to be based on negotiated prices only, and why we take this case more as an extreme illustration of the adverse effects of external referencing. In fact, one may say that this negative result further motivates our research, as it is telling us that reference pricing has more to it than the mere "copying" of other countries prices. Either more sophisticated policies should be in place (normative approach) or are in place despite not being actually observed as negotiations succeed (positive approach).

With a Weak Conditional Price Cap, we find a similar effect into operation. The external referencing of country N improves the bargaining stakes of the company relative to country F. In

the one to one negotiation with country F, the firm has now a larger disagreement point, since if negotiations fail it will have (monopoly) profits both in the N and F markets as opposed to the situation with independent negotiations, where failed negotiations in F result only in profits in the F markets. Because of this, the company can request a larger price to country F, which will be accepted. The resulting price under this external reference policy falls between the price obtained in N under independent negotiations and the price obtained in F, again under independent negotiations. With external referencing, public expenses fall in country N but increase in country F. Consumers in either country are not affected by external referencing because copayments are fixed. Finally, company profits decrease, implying that the decrease in N's expenses compensates for extra expenses in country F.

Finally, in the situation with a Tough Conditional Price Cap, we find another extreme. Here, if negotiations in F fail, the drug cannot be sold in country N. This is a crucial difference with the other two cases, as it implies that in the one to one negotiation between the company and country F, the disagreement point is the same as if there was no external referencing. On the other hand, success in F not only implies that the corresponding profits accrued in F, as it would under independent negotiations, but also secures the corresponding profits in N. In this case, the policy greatly improves the stakes of the company and the resulting negotiated price in F is smaller than with no external referencing. In this situation, external referencing by N results in smaller expenses for both N and F. It is of course the worse scenario for the company.

Finally, we wish to relate our results to what is shown in a paper by Pecorino (2002) on drug re-imports from Canada to the US, as both external referencing and re-imports are known to undermine the ability of pharmaceutical firms to price discriminate between countries. In Pecorino's paper, a model is developed where a good sold in a foreign country (Canada) is subject to a negotiated price determined in a Nash bargaining game. When imports back into the home country (the US) are allowed, this negotiated Canadian price also becomes the domestic price. This causes the

home (US) firm to make fewer price concessions in the Nash bargaining game and results in higher prices in Canada and smaller prices in the US. This is very similar to our result in the case with a Weak Conditional Price Cap: the bargaining power of the reference country is worsened under external reference. In Pecorino's paper, the home company profits are found to rise under the re-import regime, which is opposite to our result. The main difference between Pecorino's paper and ours is that he ignores the option for the US to negotiate their home price with the company independently.

1.5. Strategic sequence of drug launches

This study concentrates on the impact of asymmetric information about costs on final prices for drugs. We show how and when asymmetric information results in prices that exceed a measurement of costs. In order to focus on the role of asymmetric information, we abstract from the "weak bargaining power considerations" that were incorporated in the analysis reported in subsection 1.4, where prices exceed marginal costs just because the company can bargain the price with the country. Hence, we assume that the country can make take or leave offers from the company. Moreover, in our setting the company can either be low or high cost and this fact is unknown to the countries, who place some initial belief on the chances of the company being low cost.

In this setting, and due to the fact that bargaining is sequential (that is, some countries bargain prices with the company before others), informational spillovers are important. The outcome of a negotiation in a first country advises the subsequent country to negotiate an acceptable price for the company. In consequence, the second country can use this information to reduce its take it or leave it price. In particular, the study shows that a high cost company will never accept offers below its cost; by doing so, chances are that if there is a follow up negotiation the price will be low as well. We analyze the international pricing of a drug in the presence of such informational spillovers and how these spillovers

affect the sequence of launch decisions by the company. If the company is aware that the second country will use the information revealed in the first country, it will carefully choose which country to enter first.

The type of model we use resembles that of a signaling game, yet with a snatch. In a signaling game, an efficient type (low cost) finds it worthwhile to use some resources to differentiate itself from the inefficient type and get better conditions ex post. In our game, the efficient type (low cost) may find it worthwhile to give up some resources (by rejecting a low price in the first bargaining) to mimic the behavior of the inefficient type (high cost) and get better conditions ex post (in the second bargaining). Indeed, our study identifies the circumstances under which, depending of the precise order of launches, the low cost firm may or may not mimic a high cost firm. In these circumstances, by altering the sequence of launches the company can prevent this information disclosure.

To be more precise, the circumstances under which the previous argument holds are determined by several parameters: first, copayment levels in each country, which determine individual demand; second, each country's population size, which is a level effect determining aggregate demand; third, the company's inter-temporal discount rate, which determines the costs of strategically delaying launch in a large demand country; fourth, each agency's inter-temporal discount rate, which determines the agency's benefits of attracting an early launch; and finally, each country's prior beliefs about the company's true production costs that determine the agencies' evaluation of the risk of rejection by a high cost company of a low price offer.

We concentrate on a specific case where the following three hypothesis hold: (i) country A has a larger population than country B, (ii) individuals in country A bear a lower copayment for the drug than individuals in B, (iii) the company's discount rate is less than 1. Note that (i) and (ii) imply that demand in A is larger.

Our main result is the identification of circumstances where there is information disclosure. This would happen if, under assumptions (i)-(iii), the company entered first the large demand

country and prior beliefs were intermediate.[3] In this case, A could offer a low price to the company and not fear rejection, as the company would not lose that much in the second negotiation by disclosing in the first negotiation its efficient status. In contrast, we find that in this case, by entering first the small demand country, the low cost company would manage to hide its costs and obtain a high price in country B, although country A would still set a low price. Underlying this is the idea that the low demand country could not risk offering a low price, as the efficient company would reject it in order to hide its true costs to the upcoming large demand country. Indeed, the study shows that in this case the company would prefer to enter first the small demand country.

This is in contrast to arguments made in previous literature (Danzon et al. 2003), which insist that due to information spillovers companies would enter large demand countries first. The reason is that Danzon assumes that information spillovers will occur and therefore the natural choice for the impatient company (given that prices will be low anyway) is to enter first the large demand country and wait to enter the low demand country. This argument ignores the fact that by entering the small country first, informational spillovers can be prevented to the benefit of the company.

We conclude the study by showing how robust our main result is. The crucial assumptions for the main result are: first, that countries differ in copayment rates; second, that the agency in the large-population/low copayment country (A) has a discount rate below one. Namely, if this agency does not discount the future, then it is always indifferent to the sequence of drug launches. This is, in our opinion, the other surprising result in our analysis. It means that information spillovers are irrelevant in the absence of discounting.

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[3] If prior beliefs are very high, both countries offer low prices and the company is indifferent among all possible launching sequences. A low cost company is unable to hide its low costs. If prior beliefs are very low, both countries would offer a high price and then the company would prefer to launch first in the large demand country. In equilibrium, not only is a low cost company able to hide its costs, but it also manages to get a high price from both agencies.

Finally, there are several assumptions that can be easily relaxed. For example, the set of parameters under which the main result holds shrinks if the low copayment country has a smaller population size than the other country; yet the main result still holds for some parameter combinations. The implicit assumption that agencies do not try to infer information by observing which country is entered first can also be relaxed.[4] Indeed, we can extend our results for the case where agencies do infer information from the sequence of launches: this only reduces the set of parameters for which the main result holds.

1.6. International sharing of R&D expenses

An old debate developed since the late 1950s is the link between the level of profits of a company (and thus, its monopoly power in the market) and the source of funding of R&D activities. Recent years have witnessed the rising of economic globalization in developed nations. Together with globalization, increasing costs associated with the pace of technological change (and decreasing marginal returns to investment) force companies to review their R&D organization and spending.

In response to this new environment, companies and governments have developed partnerships to cope with (i) the rising cost and risk of R&D activities, (ii) the appropriability of the full array of applications allowing to capture a greater return on technology investment, (iii) bridging the gap between technology creators and users and (iv) the complex and multidisciplinary new technologies.

Partnerships can come in many forms—among companies, between companies and research universities, strategic alliances within a supply chain and of course partnerships with governments. Among the most common types of partnerships, we distinguish resourcing, outsourcing, collaboration and cooperation.

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[4] This assumption may be justified on the grounds that agencies do not know whether the sequence of launches was strategically chosen or determined by other factors that are independent of company's costs, like the length of the approval process.

Following the European Association of Contract Research Organizations, *resourcing* may be defined as buying a specified product or service «as a commodity». This corresponds to classical subcontracting, where a product or service is bought from a supplier according to a detailed, mutually agreed specification. The strategic risk to the client firm is low and managerial requirements are not onerous.

Outsourcing may refer to the transfer to outside suppliers of in-house activities. While resourcing generally means defining inputs to be furnished by the outside supplier, outsourcing by contrast tends to mean defining performance targets (i.e. *outputs*) to be achieved by the external provider. Outsourcing represents a more risky strategy and requires a different managerial approach.

Collaboration is defined as the pooling of R&D facilities and resources by two or more companies and is generally motivated by a desire to share costs and/or to profit from mutually complementary expertise. Collaboration is generally unlikely among competing companies; it is more common among non-competing complementary companies (e.g. members of the same value chain) or companies in different product markets but using similar technologies.

Cooperation refers to a form of collaboration whereby two or more companies join forces with a third party R&D supplier. Cost sharing is an important reason. On a large scale, it can be an effective mechanism for undertaking R&D of general interest to large numbers of small and medium enterprises in certain sectors, spreading results throughout industry.

Contract and cooperative research are complementary because both are included in the same menu of R&D options available to the industry. Practical considerations lead companies to choose one or the other for particular projects. For a strategic investment in new product technology, for example, competition considerations are likely to encourage a company to favor a one-to-one contract research solution. By contrast, to tackle environmental disposal problems or to improve stock control, the same company might favor a cost-sharing cooperative R&D arrangement with other companies in the same or similar sectors. For financial reasons, cooperative R&D arrangements can be especially attractive

for small and medium enterprises and are often the only viable option for them.

In policy terms, these trends make new and increased demands on governments. The accelerating pace of market and technological change, the high costs of essential investment in many areas of technology and the strategic importance of technology in many product markets are all factors that may justify new government action. Failure by governments to respond to these challenges puts at risk economic competitiveness, not only but especially among small and medium enterprises and employment.

We focus on pharmaceutical companies and address the issue of how to assign overall R&D costs among partners in collaboration and/or cooperation agreements, or in the case of a multinational company among its different local outlets.

Scherer (2001) assesses evidence on the link between profits and R&D effort in the US pharmaceutical industry. He concludes that as profit opportunities expand, companies compete to exploit them by increasing investments, primarily in R&D, until the increase in costs dissipates most, if not all, supranormal profit returns.

Danzon studies recent governmental strategies to limit drug reimbursement expenditures by using reference prices or allowing wholesalers to arbitrage by importing drugs purchased abroad at lower prices. She claims that those practices are harmful to R&D efforts. Quoting her: "The dilemma posed by these high R&D costs is twofold. R&D is a global joint cost—that is, the cost is the same no matter how many consumers worldwide use the drug. Since R&D costs cannot be rationally allocated as a direct cost of serving a specific country or consumer group, there is a strong incentive for each country to free ride, leaving others to pay for the joint R&D costs. This free-rider incentive is exacerbated by the fact that R&D and other significant fixed costs are sunk by the time that price is negotiated. Manufacturers rationally continue to supply existing products as long as price covers the marginal costs of production and distribution. However, in the long run, if prices are inadequate to pay for the joint costs of R&D and other sunk costs, the revenues will not be there to develop new drugs."

Also, Danzon stresses the fallacy of uniform prices associated to parallel imports and reference pricing: "Healthcare consumers differ greatly in their ability and willingness to pay for innovative medicines. If all are charged the same high price, then low income countries will be unable to afford innovative medicines, even though they would have been willing to pay the marginal costs of serving them. But if everyone pays the same low price, then R&D investments will target only the most common medical needs where high volumes can offset low prices. In the long run, consumers will be deprived of innovative drugs that they would have been willing to pay for, had differential pricing been permitted. Such differential pricing is commonly permitted in other industries with high joint costs, such as utilities and airlines." In this line, Maynard and Bloor (2003) conclude that price controls must be supplemented with volume controls to constrain overall spending.

We assess the problem of dividing funding of R&D costs of new drugs across several markets. Our starting point is Danzon and Towse (2003) use the principle of Ramsey pricing to define price differentials across markets to cover (fixed) R&D costs.

In applying Ramsey pricing, we have to take into account two issues. The first one stems from the fact that participation of patients in paying for drugs through copayments generates an ex post moral hazard element. The second deals with the way countries define copayments, as equity and access problems have to be considered.

Our contribution to this literature is to provide some building blocks for an economic theory merging Ramsey pricing, equity concerns by governments and strategic incentives, as the government also aplies the instrument of reimbursement level in countries with a NHS-like system. Of course, the arrangements actually implemented influence the incentives of companies to perform R&D.

The issue is not trivial, as countries participate in the recoupment of R&D costs indirectly. Usually, transfers from government budgets to companies are not a viable option. Pharmaceutical companies recover investment in R&D through sales (mainly under the monopoly provided by patents). At country level, sales

volume is determined to a considerable extent by how is health insurance (private or public) related to pharmaceutical consumption. Of particular interest is the role of copayments in determining the optimal sharing of costs. Ramsey pricing problems typically lead to a rule that assigns higher prices to low elasticity demands (distortion in such markets is smaller, though distributive impact may be higher). By providing more or less health insurance, governments are able to influence demand elasticities, and therefore the way a supranational entity distributes the burden of recoupment of R&D costs. Therefore, the usual discussions on how to share R&D costs over markets cannot be seen independently of government decisions. Even for a given health insurance policy, it is not clear how Ramsey prices should be adjusted, as insurance creates a divergence between what consumers pay at the moment of consumption and what companies receive. We detail the optimal adjustment in the Ramsey pricing formulae, its interpretation and implications.

2. Negotiation Mechanisms in Healthcare Markets

2.1. Introduction

The trend of increasing resources devoted to the healthcare sector in OECD countries has given rise to the need, in the last decade, of designing cost control policies. One of them, the introduction of competition and regulation in healthcare markets, has been controversial. It is argued that the introduction of competition involves sacrificing equity and, in some cases, a reduction in the quality of health services.

The agents financing the healthcare system have implemented cost control mechanisms. These are private insurance companies and/or the public social security, depending on the particular way health insurance is provided in each country.

Under traditional health insurance arrangements, citizens were covered by some insurance scheme (either public or private). When sick, insurance arrangements allowed citizens to go to a healthcare provider, pay the price of the care received and be reimbursed later. Alternatively, the healthcare provider could be owned by the insurer (as in integrated national health systems). In this case the patient pays nothing at the moment of consumption. In such arrangements, providers would freely set their prices or have no price to set at all (in a NHS-like system).

Recent developments in healthcare financing include independent institutions that negotiate (bargain) prices with the financing institution. This is true with respect to health maintenance organizations (HMOs), managed care in general, but also in national health systems where decentralization and separation between provision and financing was implemented.

In this scenario, negotiation over contractual terms, including prices as one major element, becomes a relevant issue in the analysis of performance of healthcare systems. It is only recently

that bargaining theory has found room in the analysis of the healthcare sector. In many situations, the healthcare sector has the structure of a bilateral monopoly/oligopoly. In this context, bargaining becomes the natural way to approach interactions among agents.

Most economic analyses of contract design in healthcare assume in fact that the part that moves first, typically the payer, makes a take-it-or-leave-it offer to the provider. We take here a broader view, looking at other types of negotiation procedures. We focus on models of explicit bargaining between two parties, which we call *the payer* and *the provider*. On theoretical grounds, simple bargaining models can have their results transposed in a straightforward way: higher bargaining power and higher alternative-option values from providers originate higher prices. Therefore, a first empirical question comes to mind: how strong negotiators are providers? Or, in other words, financing institutions/payers are usually large relative to providers, although the latter can have a natural exclusive "catchment area" (in geographic terms or medical specialty). Thus, what is the effect on prices from moving to an explicit bargaining situation? This, being a relevant question, it is certainly not the only one. The special setting of healthcare markets brings to attention the optimal design of negotiation procedures. In particular, the timing and format of negotiations between payers/financing institutions and healthcare providers may lead to different outcomes.

Even though explicit negotiations take place in countries with national health services (like the UK and Canada) and with private insurance-oriented systems (like the United States), a crucial difference can be found. In national health services, negotiations often take place between third party payers (the government or health plans) and professional associations (like medical associations). This sets the negotiation in terms of bilateral monopoly. On the other hand, health maintenance organizations like the ones that emerged in the United States use negotiations with providers in a competitive setting. The third party payer uses the outside option, looking for an alternative provider, to pressure providers and obtain lower prices.

With these simple predictions from bargaining theory, we can review the available empirical evidence.

The first empirical issue addressed in the literature is whether managed care organizations are able to obtain advantageous conditions through bargaining. The debate has one side claiming that lower costs associated with managed care are the outcome of quality degradation. The other side claims that lower costs are due to the ability of managed care organizations to obtain lower prices from providers. The existing empirical evidence favours the last interpretation over the former, as reported in Cutler et al. (2000), Ho (2004), Maude-Griffin et al. (2001), Melnick et al. (1992) and Sieg (2000), among others.

Also in the UK NHS, changes in bargaining power seem to have produced visible effects. One of the main policy experiments in the UK, the fundholding GPs (present in the system until 1999, when concern over risk selection issues led to their elimination) implied an important shift of bargaining power in favor of GPs, especially those that were fundholders. Empirical research looking at hospital discrimination (favouritism of patients associated with fundholders) can also be used to address the impact of bargaining power shifts. According to Propper et al. (2002), fundholding GPs were able to obtain lower waiting times for their patients. The ability of GP fundholders to channel money reinforces their bargaining position vis-à-vis hospitals, and prompted better conditions for patients of GP fundholders. Thus, understanding "time" as a sort of *price* in a health system where monetary prices are administratively fixed, the increased bargaining power of GPs, created by the different institutional arrangement (fundholding), has lowered the price/time paid.

Since lower prices have been obtained by payers whenever the interaction between third party payers and providers turned into an explicit bargaining process, a second empirical question arises: the source of bargaining power of insurers and providers. Theory suggests that size and the existence of outside options do increase a side's bargaining strength. Studies on the sources of bargaining power in healthcare can be divided into two lines: one looking at bargaining power of third party payers; the other detailing the bargaining power of providers, usually hospitals.

On the latter line of empirical research, Brooks et al. (1997, 1998) and Town and Vistnes (2001) look at hospital competition and ownership type as sources of bargaining power. Their findings conform well to what we should expect (and explore below in terms of theoretical background): competition between hospitals to attract health plans and patients reduce their bargaining power and result in lower prices. Moreover, the increased HMO penetration over time was associated with a decrease in hospitals' bargaining power.

With respect to third party payers, evidence from existing studies suggests that availability of alternatives is a more significant source of bargaining power than size alone. Availability of alternatives means for healthcare third party payers the ability to channel patients to different providers. Studies by Ellison and Snyder (2001), Pauly (1998), Sorensen (2003) and Staten et al. (1988) give empirical support to this view. Pauly (1998) noted that size did not preclude small managed care organizations from obtaining significant discounts from hospitals. Sorensen (2003) takes a step further and finds that the ability of third party payers to direct patients to designated providers has a greater impact than size.

The basic bargaining model (Osborne and Rubinstein 1990; Binmore et al. 1986) assumes a single third party payer bargaining with a single provider over the division of a given surplus. Whenever total surplus is constant, the greater the bargaining power, the larger the share of surplus captured. This simple model does not allow for outside options. When they are present, these outside option values also drive the outcome of the bargaining process. In particular, the higher the outside value of the third party payer (the provider), the lower (the higher) the equilibrium price will be.[5]

The empirical papers reviewed above can be interpreted in this simple framework, as they attempt to identify the sources bargaining power for third party payers and/or providers, or the impact of increasing the value of the outside option, or

[5] A useful illustration supporting this solution and other alternatives can be found in Clark (1995) and Cuadras-Morato et al. (2001).

decreasing the value of profits should negotiations fail. The theoretical works by Gal-Or (1997, 1999a, 1999b), Barros and Martínez-Giralt (2004, 2005a,b), Milliou et al. (2003) and Fingleton and Raith (2005) elaborate on this model. The particular market structures used to contextualise the simple theoretical bargaining process allow discussing different aspects. These are the impact of (i) product differentiation across providers and (ii) mergers of providers in the outside values. Gal-Or (1999b) and Milliou et al. (2003) discuss the role of vertical mergers between hospitals and physician practices in increasing the bargaining power of third party payers. In Gal-Or (1997, 1999a), Barros and Martínez-Giralt (2004, 2005a,b) and Fingleton and Raith (2005), attention is paid to the way the bargaining process is organized.

The next logical step is, in our view, to use the bargaining model to discuss the particular institutional arrangement for bargaining in healthcare. In particular, two types of choices need to be considered. On the one hand, we may choose between the bargaining game and the use of "any willing provider" clauses. The other is whether it is preferable to negotiate with each provider on a one-to-one basis, or to do it with providers association.

Both institutional arrangements can be found in real life. The "any willing provider" approach has been debated mainly in the United States, where the enactment of "any willing provider" laws by some states has been taken to the Supreme Court and upheld by a recent decision. These laws require managed care organizations to disclose contractual conditions to providers (prices, quality, etc.). A provider that accepts such conditions can enrol in the network of the managed care organization. But in some European countries we also find "any willing provider" provisions. Empirical work on the implications of the "any willing provider" laws by Carroll and Ambroise (2002), Glazer and McGuire (1993), Morrisey and Oshfeldt (2004) and Vita (2000) have been complemented by the novel theoretical treatment of Barros and Martínez-Giralt (2004).

The analysis of "any willing provider" clauses and its comparison with pure bargaining situations suggests that depending on the underlying context, namely surplus to be shared, either one

can lead to lower prices. This imposes further demands on empirical work related to the impact of such laws. It also raises econometric issues: countries, states or third party payers may introduce them because they fulfil the conditions to get lower prices that way. As far as we know, this endogeneity issue has not been tackled yet in empirical work.

As to the second issue dealing with the convenience of bargaining with an association, we do find in several European countries examples of centralized negotiations of third party payers (national health services, health plans or insurers) with providers associations. For example, in several instances, third-party payers negotiate prices of healthcare services with providers. Barros and Martínez-Giralt (2005a) identify conditions under which a third party payer may prefer to deal with a professional association than with the subset of more efficient providers, and then apply the same price to all providers. In this respect, the general literature on bargaining, mostly with applications to the labour market, provide rationales for providers to join forces and to negotiate as a single entity vis-à-vis the third party payer. Gal-Or (1997) studies the way third party payers select providers. She considers two differentiated providers and finds that when consumers' valuation of accessing a full set of providers is small (large) relative to the degree of differentiation between payers, both payers choose to subscribe to only one of the (both) providers. Barros and Martínez-Giralt (2004) note that a feature present in countries with a national health service is the co-existence of a public and a private sector. Often, the public payer contracts with private providers while holding idle capacity to gain bargaining power vis-à-vis the private provider. Finally, Chae and Heidues (2004) point out that, when studying negotiations within and across groups, it is essential to define the preferences of the group. Their analysis provides a theoretical foundation for treating groups as single decision makers.

The next sections describe in detail the economic intuition and policy relevance of the analysis of explicit bargaining processes in healthcare provision.

2.2. Bargaining in healthcare markets

The main objective of this section is to discuss how agents financing healthcare provision, the so-called third party payer, be it a private insurance company or the National Health Service, select providers. We propose two different mechanisms. One is a bargaining procedure where the third party payer carries negotiations simultaneously, but independently with providers. Within this framework, we will tackle the situation where the provider is a single institution or the result of a colluding agreement among some providers within an association. The second mechanism is of different nature. It consists in the third party payer announcing a contract. Any provider willing to sign it becomes part of the network. Finally, we will compare the different scenarios to identify under what conditions the third party payer should choose one mechanism or another. The formal analysis is found in Barros and Martínez-Giralt (2004). Also, we report on some extensions dealing with the strategic holding of idle capacity by a public provider (subsection 2.2.3), with the role of associations of providers as a negotiating party (subsection 2.2.4) and on the impact of payment schemes on the competitive process among providers for patients (subsection 2.2.5).

2.2.1. Introduction

A major change in the healthcare sector worldwide appears in contractual arrangements between payers and providers of care. Countries whose provision of healthcare is organized around explicit contracts, like the US, moved from retrospective to more prospective payment systems. Preferential provider arrangements have also been introduced. Countries whose delivery of healthcare is based on national health systems seek to introduce some sort of explicit contracting. Again, the definition of a contract implies specification of which organizations enter the contract. Frech (1991) provides an overall account of the elements involved in the design of doctors' fees (Charatan 2000). Moreover, Brooks et al. (1997) documents empirically the importance of bargaining and the evolution of the bargaining position

between third party payers and a hospitals in the case of appendectomy pricing.

An alternative procedure is for the third party payer to follow the "any willing provider" approach: it discloses price and conditions, and any provider that finds them acceptable is allowed to join the network. The empirical relevance of this approach is clear. In the US, "any willing provider" laws have recently been the subject of intense debate (and of a Supreme Court decision).[6] Such laws force managed care organizations to take into their network of providers all those willing to accept the terms and conditions of the contract (price, quality and licensing). In the economics literature, we find a couple of relevant studies. Vita (2001) tests the hypothesis that "any willing provider" laws increase costs because they reduce the set of available instruments to payers while selective contracting creates inefficient risk selection. The inefficient risk selection leads to higher aggregate costs, as some people left out will drive costs up by taking the fee-for-service regime. Vita's findings give more support to the first hypothesis than to the second. These results have not been confirmed by subsequent research. Carroll and Ambrose (2002) report no impact on profitability from "any willing provider" laws. More recently, Morrisey and Oshfeldt (2004) re-examine the issue, including also in the analysis "freedom of choice" laws (which force managed care organizations to pay a fraction of the cost even if patients use a provider of their choice outside the selected network of the health plan). They look at market share of health maintenance organizations in markets under different "any willing provider" laws, finding a negative effect, though smaller in magnitude than "freedom of choice" laws.

Here, we address the question of how a third party payer decides what type of procedure to follow in contracting with providers. We insert this issue in a more general research project analyzing the relationship between third party payers and providers in the healthcare market. The interest of this research line lies in the study of mechanisms combining healthcare insurance con-

[6] See http://www.supremecourtus.gov/opinions/02pdf/00-1471.pdf

tract in a differentiated product setting aiming at the control of expenditure in the healthcare sector. We can think of that relationship as the outcome of a three stage game. In the first stage, the third party payer (be it a NHS or private insurance companies) offers health insurance contracts to consumers. Such contracts specify the insurance premium, the providers that individuals have access to and the associated copayments. In a second stage, each insurance company defines the set of selected providers to which the individuals that have subscribed to a health insurance plan have access to. Finally, in the third stage of the game, providers compete in prices and qualities in the market. The competitive process among providers is influenced by the selection decision of providers by insurance companies to provide healthcare services to their population of insured individuals. This sequence is the most natural for health systems where the third party payer has a very strong commitment to provide healthcare in case of need or when third party payers and providers are able to renegotiate terms and conditions after insurance contracts have been signed with consumers.[7] The third stage of the game is treated in Barros and Martínez-Giralt (2002), which addresses the competitive effects on providers from different reimbursement rules. Subsection 2.2.5 reports on this.

In the second stage of the game, we analyze how an insurance company decides the selection of providers to which the individuals subscribing a healthcare insurance plan will have access to. To make the problem tractable, we consider one third party payer and two providers. We take the perspective of a third party payer that at the beginning of its activity has a set of providers to choose from. The decision of the third party payer consists in determining the price at which to reimburse healthcare services offered to patients insured with the company. We look at this problem from two different angles. The third party payer may bargain the

[7] Of course, in certain circumstances a different timing assumption is needed. For example, there are states in the US where insurers have to show evidence that providers are willing to accept the insurance plan within a given geographic region prior to marketing the plan. If there is no renegotiation of prices after consumers sign insurance contracts, a different timeline of decisions would result. We see our timing assumptions as describing most situations though.

reimbursement policy with each provider or may decide on an "any willing provider" policy. In this case, health plans accept any healthcare provider who agrees to conform to the plan's conditions, terms and reimbursement rates. The question we address is which of these procedures should a third party payer select.

Comparison between the bargaining protocol and the "any willing provider" mechanism hinges upon the size of the surplus to be shared. Given that the "any willing provider" mechanism represents a commitment to be tough, the larger the surplus, the more valuable this commitment is.

In this respect, the general literature on bargaining, mostly with applications to the labour market, provides rationales for providers to join forces and to negotiate as a single entity vis-à-vis the third party payer. The direct application of most bargaining theory results to healthcare settings faces a difficulty: the existence of market interaction between participants in one side of the negotiation (the provider). This often makes in healthcare the value of one negotiation to be conditional on the outcome of some other (simultaneous) negotiation(s). Company-unions bargaining issues have similarities, allowing for useful analogies to healthcare settings. Our analysis relates to the works by Davidson (1988) and Gal-Or (1997, 1999a,b). Davidson looks at a model of wage determination where two companies bargain either with (i) the unions representing their respective workers or (ii) a single union representing all workers. This latter scenario corresponds to our bargaining setting between the third party payer and the providers. Davidson aims at investigating the impact of the bargaining structure on wage determination. Our interest differs in two aspects. On the one hand, the consequences of the failure of negotiation with one company/provider is to leave the rival company as a monopolist in Davidson's model, while for us it implies that consumers patronizing that provider must bear the full cost of service. On the other hand, we also aim at providing rationale to the "any willing provider" mechanism. Davidson's scenario (i) represents an extension of our analysis where several (two) payers negotiate with providers. This multipayer set up is also used by Gal-Or (1997) to study the way third party payers select providers to contract with. She considers two differentiated providers and

finds that when consumers' valuation of access to a full set of providers is small (large) relative to the degree of differentiation between payers, both payers choose to contract with only one of the (both) providers. Also Gal-Or (1999b) addresses the related issue of whether and how the formation of vertical coalitions between physicians and hospital enhances their bargaining power. It is worth mentioning the work of Glazer and McGuire (2002), who analyze the interaction between a public payer (contracting on an "any willing provider" basis), a private one (selecting providers and adjusting prices according to quality) and a provider. This is a problem complementary to ours, as we consider only one payer and two providers, and no quality choice.

There are other possible mechanisms of interest. Among them, we can point out at sequential bargaining, so that after the third party payer has finished the procedure with one provider, it starts a new one with the second provider. Conducting sequential negotiations may nevertheless increase considerably transaction costs. The implications of sequential bargaining are left for future research.

2.2.2. Choosing between AWP and simultaneous bargaining

To explain the main economic effects at play in the choice between "any willing provider" contracts and the use of simultaneous negotiations with relevant healthcare providers, we need to provide more structure to the discussion.

Consider a population of consumers with a potential health problem. Each member of the population has a given probability of being sick. The expected mass of consumers demanding healthcare is distributed uniformly on a *space of characteristics*. The identifying characteristics of the consumer are independent of the probability of occurrence of the illness episode. In terms of insurance choice models, this adds a background risk to the demand for insurance, thus reinforcing it (Eeckhoudt and Kimball 1992). The population we study is made up of patients and it is conceivably a subset of all people insured. In the first stage of the game, individuals face several possible situations (for example, being healthy or sick). The uncertainty faced at that stage determines health insurance demand. After realization of uncertainty, if an

individual is sick, he/she demands one healthcare unit. The individual characteristics represent the differences providers have in consumers' eyes. It can be objective, like geographic distance, or subjective, such as personal taste for one provider over the other.[8] Whenever a patient cannot patronize his/her best-preferred provider, he/she suffers a loss in utility (or under the geographical interpretation, he/she has to bear a transport cost). We assume that patients' utility loss increases at a constant rate with the distance to his/her preferred provider.

We also assume that consumers are subject to compulsory health insurance. Even in the presence of operating costs (recovered by insurance companies through a loading factor) and/or not all providers being included in the insurance plan, we take the consumer to contract full insurance. The assumption is made for simplicity and again does not change the qualitative features of the model. We see it as a result of the insurance company offering only this type of contract. To justify our assumption, we also consider that, when signing the insurance contract, a consumer does not know beforehand the position he/she will have in the horizontal differentiation line when sick. This implies that when both providers are successful in reaching an agreement, consumers can patronize either of them only bearing the disutility cost. In case of disagreement between the insurer and one provider, consumers have the choice of patronizing the in-plan provider at zero cost or the out-of-plan provider at full cost. If no provider reaches an agreement with the insurer, the latter gives back the premia to consumers, while providers compete in prices in the market.

The insurance contract defines the premium to be paid by consumers, which is taken as given at the moment of contracting with providers. When selecting providers, the third party payer (in line with the complete three stage game described above) has already collected the insurance premia/contributions from con-

[8] Implicitly, we assume that there are no quality differences across providers. Otherwise, a vertical differentiation dimension would have to be added to the problem. For quality issues in the provision of healthcare in the context of vertical differentiation models, see for example Jofre-Bonet (2000) and the references therein.

sumers. Thus, total revenues of the insurance company are exogenously given at the stage in which negotiation between the third party payer and healthcare providers must take place.

We restrict our attention to equilibrium scenarios where the third party payer contracts with at least one provider. In case of not contracting with any provider, no insurance will in fact be given. It cannot be an equilibrium contract of the full, three stage game. We ignore it in the ensuing analysis.

As mentioned above, two pricing mechanisms will be studied. The "any willing provider" contracts are frequently used by governments and to some extent by private health plans or insurance companies. Simon (1995) studies both the characteristics of the states that have enacted "any willing provider" laws and their effect on managed care penetration rates and provider participation. Also, Ohsfeldt et al. (1998) explore the growth of "any willing provider" laws applicable to managed care organizations and the determinants of their enactment.[9]

Alternatively, the third party payer may choose to negotiate explicitly with providers. We propose the Nash bargaining solution as the equilibrium concept. The Nash bargaining solution yields outcomes that satisfy a set of four conditions (axioms). These axioms have been interpreted as the guiding principles that an arbitrator should follow to solve a conflict.[10] The solution was shown to maximize the product of each bargainer gains over the fallback position. The Nash bargaining model can be linked to alternating offers models, thus providing some justification to bargaining power. The alternating offers model may the bargaining process as a sequence of offers and counteroffers. This allows for an explicit treatment of bargaining as a time consuming activity depending on time preferences of bargainers.

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[9] Within this framework, providers may be allowed to balance bill patients, that is, they may charge an amount to consumers on top of the price received by the third party payer. Balance billing has received some attention in the literature. See Glazer and McGuire (1993), Zuckerman and Holahan (1991) and Hixson (1991). Since balance billing in not crucial to our arguments, we assume it away. This assumption is also supported by its prohibition in several countries.

[10] The axioms are: invariance to equivalent utility representations, symmetry, independence of irrelevant alternatives and Pareto efficiency. See Osborne and Rubinstein (1990).

Typically, alternating offers models are able to establish a relationship between bargaining power in the Nash bargaining model and the discount rates of agents, costs of delay and the time between offers.[11] In our case, it would involve the same degree of arbitrary judgment to endow the third party payer and healthcare providers with distinct time-preference rates or to directly set their bargaining power parameter in the Nash bargaining solution. For simplicity, we opted for the latter modelling option.

In our setting, the conflict between both sides of the bargaining process appears because the insurer's cost represents providers' revenues. Naturally, the outcome of negotiation hinges on the parameters of the bargaining problem. These are the distribution of bargaining power among players and the so-called "status quo" or the fallback values. That is, the outcome that would arise should negotiations fail. We assume that providers do not collude, that is, negotiations are carried simultaneously with the two providers who decide their actions in a non-cooperative way. The issue of collusion among providers is tackled in a companion paper, Barros and Martínez-Giralt (2005a). We report on this issue in subsection 2.2.4.

There is a difference with the existing literature that is worth noting. In our setting, fallback values in one negotiation depend on the outcome of the other negotiation. This happens because providers after each negotiation compete in the market. Thus, the outcome of each negotiation is conditional on the expected price offered by the other provider. We force expectations to hold in equilibrium.

A detailed analysis of all these elements is beyond the scope of the present study. Extensive presentations of bargaining theory are found in Binmore et al. (1986), Osborne and Rubinstein (1990) or Roth (1985). Also, a short introduction is found in Sutton (1986).

Generally, providers have different bargaining powers, so that distribution of bargaining power will involve a parameter conste-

[11] For a textbook treatment of the alternating offers model and its relation with the Nash bargaining solution, the interested reader can consult Muthoo (1999).

llation for the third party payer and the two providers respectively. However, we are interested in comparing different negotiation systems between a third party payer and a set of providers. To focus on this issue, we will assume that all providers have the same bargaining power, so that they will be symmetric in all respects. We could think of asymmetries in bargaining power as a way of capturing differences in technology, size, quality, etc., among providers. In turn, this would imply that we would have to allow providers to react to differential characteristics (e.g. invest in size, R&D, quality, etc.), introducing an additional stage in the game. In our view, this implied modelling would add little to the determination of prices. We discuss the implications of this assumption at the end.

2.2.2.1. "Any willing provider" contracts

"Any willing provider" contracts have the third party payer announcing a price and leaving to (symmetric) providers the option of joining the agreement.[12] Providers are assumed to be equal in the relevant dimensions except for location in the space of characteristics and (possibly) prices. In the context of two providers, the set of possible decisions defines four different subgames in prices, which in turn define previous stage profits for providers. When both providers choose to join the agreement, each receives the price announced by the third party payer and demand is split in half (a consequence of uniform distribution of consumers in the space of characteristics and of symmetric location of healthcare providers). In case both providers choose not to join the agreement, the market game is back to the (Hotelling) price game. The last possible scenario has one provider joining the agreement and accepting to receive the announced price under the "any willing provider" contract, while the other stays out and sets its price freely. Providers are not allowed to balance bill patients. Thus, someone visiting the provider that accepted

[12] Although in reality "any willing provider" contracts also include conditions on dimensions other than price, here we concentrate on the price aspect to be able to compare the outcome of "any willing provider" contracts with the corresponding outcome of the negotiation procedure.

the "any willing provider" contract pays nothing while if visiting the other independent provider pays the full price charged by the latter.

The solution to this game is represented in figure 2.1. We find three regions. For prices above a certain (high) threshold, both providers decide to join the agreement. This is the *(J,J)*-region. When the third party payer announces a price below another (low) threshold, no provider joins and we obtain the *(NJ,NJ)*-region. Finally, for intermediate price levels both equilibria may arise. Using Pareto dominance (from the providers' viewpoint) as selection criterion, it turns out that the *(NJ,NJ)* equilibrium dominates. Hence, the equilibrium where both providers join the agreement occurs above the high threshold only. Note that no asymmetric pattern of the type can be sustained in equilibrium. Although this may appear natural given the symmetry of players, a priori, one could not rule out that asymmetric equilibria may result from an ex ante symmetric market structure.[13] Figure 2.1 illustrates this case, p being the price, t being the (constant) cost per unit of distance from the preferred to the available location of healthcare providers. The first, high threshold is given by $p=2/3\ t$, while the second low threshold occurs for $p=1/4\ t$.[14]

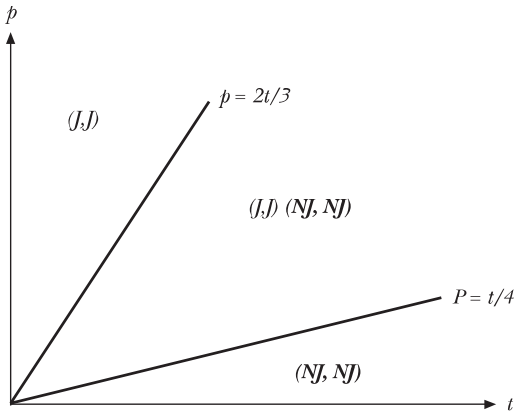
We take now the optimal choice of the price set by the third party payer. The criterion is the minimization of total health expenditure. Given the initial assumption of full insurance, all expenses will be paid irrespective of the provider chosen by each particular consumer. The optimal value of the price to be announced in the "any willing provider" contract is the lowest price that allows for both providers to accept it. Thus, the optimal price corresponds to the high threshold in figure 2.1, $p/t = 2/3$. This optimal price is also lower than the cost per unit of distance when no provider is located in the preferred point of the space of characteristics t, which guarantees that the third party payer pre-

[13] Most textbooks of game theory provide 2x2 games of symmetrical agents where only asymmetrical equilibria exist. More structured market situations, like vertical differentiation, also result in asymmetrical equilibria with ex ante identical firms.

[14] For a detailed description of how these thresholds are determined, the interested reader should see Barros and Martínez-Giralt (2004).

fers to announce "any willing provider" contracts instead of allowing free competition between the parties (and having to reimburse consumers for the care they would seek in a pure private market equilibrium).

FIGURE 2.1: AWP equilibrium regimes



Note that the payer needs to announce a fee high enough to induce participation of at least one provider. But in equilibrium with both providers participating, the fee is lower than the take-it-or-leave-it offer. In other words, the payer is willing to give away some monopoly (bargaining) power in order to induce an equilibrium with providers' participation. Thus, softening the (full) bargaining power that a too rigid payer would reflect in committing to a high fee.

2.2.2.2. Explicit simultaneous bargaining

By bargaining we refer to the situation where the third party payer carries negotiations simultaneously but independently with the providers. The distribution of bargaining power between the third party payer and providers is exogenously given. Note that this situation does not correspond to a process where after failing to close a deal with one provider, the third party payer addresses the second one. In our scenario, when accepting or rejecting a deal, the provider *does not know* the outcome of the other parallel negotiation process.

Three scenarios may appear. Providers successfully close negotiations with the third party payer, none does or only one is successful. When negotiation fails, the third party payer faces a penalty. It captures the fact that an insurer giving access to a smaller set of options in healthcare provision faces a cost (for example, reputation, value of variety and freedom of choice to consumers, or money returned to insured people).

Profits obtained by the third party payer when negotiations are successful with both providers are given by the difference between the (exogenous) premia collected from insurees and the payment to providers following the terms of negotiations. When only one provider reaches an agreement, the revenues to the third party payer are given by the difference between its revenues (the premia collected) and the sum of the payment to that provider plus the penalty. Finally, if no negotiation succeeds, the third party payer obtains zero revenues (as no insurance is contracted). In the latter case, the market game is just a Hotelling price game between providers with fixed locations in the space of characteristics relevant to consumers. The symmetry of the solution implies equal demand and price to each provider.

Two successful negotiations

We first deal with the conditions to be met such that both negotiations are successful. As we assume full insurance, equilibrium with both providers exists, given the symmetry between providers, when the same price prevails for both. Hence, providers will share the market evenly and their profits will be given by half of the respective equilibrium price, since total demand is normalized to the unit.

Two simultaneous bargaining problems have to be solved. As we use the Nash bargaining as solution concept, the difference between net revenues and fallback values for the agents involved in the negotiation are the crucial elements. The fallback level of the third party payer is defined by the profits it obtains under the agreement with the other provider, net of the penalty associated to a smaller set of providers than the maximum possible. The fallback for the provider is given by the profits available when the rival provider succeeds in his/her negotiation. These profits are obtained when the provider is out of plan, so that those patients

patronizing it have to bear the full cost while its rival is an in plan provider.

Every negotiation problem yields a price as solution. These (positive) prices are equilibrium prices if two additional consistency conditions are met: (i) no provider wants to leave the agreement and (ii) the third party payer obtains non-negative revenues.

One successful negotiation only

Take now the case of only one provider accepting the price determined in the negotiation process. A similar reasoning will lead us to conclude that we cannot have equilibrium with only one provider successfully terminating the negotiation with the third party payer. In other words, under explicit bargaining with identical providers, there cannot be only one successful negotiation. Again, in our scenario, the symmetry of players does result in a symmetric equilibrium. This is so because the disadvantage in terms of demand from being left out is higher than the advantage of being a price setter.

Although most of the analysis assumed the presence of two providers only, we can apply the same arguments to an arbitrary number of providers. Moreover, under the simmetry asumptions used, the feasible equilibria with an arbitrary number of providers are characterized either by all providers joining the agreement with the third party payer, or none accepting the third party payer proposal.

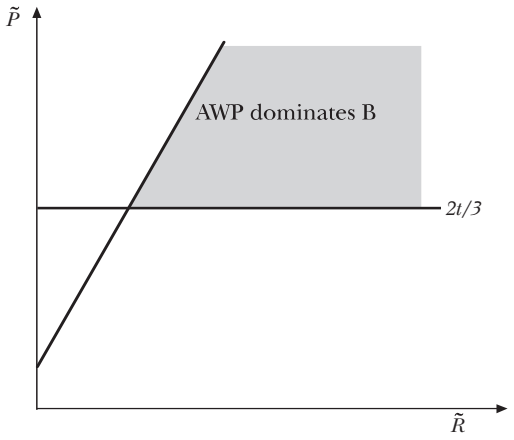
3.2.2.3. The preferred negotiation format

Note that the comparison between the bargaining mechanism and an "any willing provider" contract is only relevant when the price is above the threshold that leads to the use of "any willing provider" contracts by the third party payer (that is, for $p \geq 2/3\, t$). Prices also need to meet conditions (i) and (ii) above. Figure 2.2 illustrates, from the point of view of the third party payer, the combination of values of the equilibrium price $\bar{p}$ and net revenues $\bar{R}$, where the "any willing provider" mechanism dominates the bargaining procedure.[15]

[15] Again, for a precise description of the assumptions underlying figure 2.2, the interested reader is referred to Barros and Martínez-Giralt (2004).

The intuition runs as follows. If net revenues are small, there is not much surplus to bargain. Hence, prices will be below the price required in the "any willing provider" case to generate the acceptance outcome. The opposite occurs with high net revenues. Since the bargaining process transfers surplus to providers, the "any willing provider" contract is equivalent to a "tough" bargaining position. The commitment to a price is more valuable when the aggregate surplus to share is large.

FIGURE 2.2: Optimal negotiation procedure



A remark should be raised now. We have seen that under bargaining and given the symmetry of the model, both providers accept the same price. Why is it not the case that under "any willing provider" announcing that price is not an equilibrium? Actually, under "any willing provider" scenarios, we found that for any price above a certain threshold ($p \geq 1/4\ t$) both providers join. Also, we have shown that there are two equilibria in the same parameter region, one where both providers join and another where no provider joins. Artificially (since the Pareto criterion does not select among the two equilibria), we are forcing the price to be above the high threshold ($p \geq 2/3\ t$) in order to eliminate the equilibrium where no provider joins, as it cannot be equilibrium of the full three-stage game. In other words, we are imposing on the third party payer a conservative behaviour, in the sense that we are not allowing it to announce a price in the inter-

mediate range (between the two thresholds defined in the "any willing provider" setting) so that no provider would accept.

In our two provider scenario, it is never the case that one provider decides to join negotiations with the third party payer while the other remains outside. One may question whether this is a general feature. In particular, we want to address whether this is due to the small number of providers. Actually, the basic intuition carries through to scenarios with more providers. Under reasonable assumptions, reported in Barros and Martínez-Giralt (2004), an increase in the total number of providers makes it less likely for any willing provider contracts to prevail. This is so because the equilibrium price under bargaining will be lower the higher the number of providers, while the optimal price under the any willing provider procedure is insensitive to the number of providers.

Some caveats to the analysis deserve mention. The first one is the symmetry across providers. We conjecture that introducing asymmetries across providers, be it in the bargaining power vis-à-vis the third party payer or in the production costs of healthcare services, will not change the qualitative results, especially if price discrimination by the third party payer across providers is not feasible. This seems to be the case in general. Payments to providers can differ according to patient characteristics, but not according to providers' efficiency level. Of course, some exceptions exist (for example, highly reputed doctors may be able to obtain a better value per visit).

Second, we conjecture that the introduction of asymmetries would allow us to obtain equilibria characterized by some providers being associated with the third party payer, while others remain independent. Once again, we believe the relative advantages and costs of the different bargaining procedures still to be present.

The third issue is quality. We have assumed away quality considerations. Thus, our analysis applies to the provision of services where quality can be easily monitored or does not have a major impact on patients' selection of provider. Again, we conjecture that the essential trade-off in choosing between "any willing provider" contracts or an explicit bargaining procedure would pre-

vail. It would not change our insight on the incentives of the third party payer to choose one of the bargaining procedures proposed. This is left for future research.

The analysis renders some testable predictions. The simplest is that whenever a high surplus to be shared exists, one should observe "any willing provider" contracts more frequently. Another one is that the number of providers should not have an impact on the selection of the bargaining procedure, as long as the surplus per patient treated is kept constant. If per capita surplus grows (decreases) with the number of providers in the market, then one should observe "any willing provider" more (less) often. It is beyond the scope of the paper to empirically test these implications. The empirical testing of the model is left for future research.

2.2.3. Extension 1: Maintaining idle capacity

A feature present in countries with a National Health Service is the co-existence of a public and private sector. Often, the public payer contracts with private providers while holding idle capacity. This is one of the most striking features of some national health systems and it is often seen as inefficiency from the management of public facilities.[16] We present here a different rationale for the existence of such idle capacity: the public sector may opt to use idle capacity as a way to gain bargaining power vis-à-vis the private provider, under the assumption of a more efficient private sector.

We consider a setting where a third party payer, say a National Health Service (NHS), has to negotiate prices for healthcare services with providers (Barros and Martínez-Giralt 2005b). We assume the presence of two providers. The public sector may or may not be capacity constrained. Both situations will be discussed below.

The NHS has a budget to pay providers. The NHS positively values free funds as it allows for its productive application elsewhere in the health sector. The gain to the NHS from negotiation is given by the difference in the net surplus under negotiation

[16] For a review of several countries, see Busse and Howorth (1999), Crainich and Closon (1999), Engelbert (1999) and Lancry and Sandier (1999).

and in the case of failure. Since a positive level of insurance coverage is always guaranteed to patients, that gain net of the fallback value will be the payment to be made by the NHS to ensure provision in the private market, plus the value in monetary terms of the extra insurance level provided to patients (a copayment).[17]

Healthcare providers organize themselves as an association. The association negotiates contractual conditions (price) with the NHS representative. The price agreed by the association with the NHS is common to all members of the association.[18]

We assume profits of both providers to be equally weighted in the objective function of the association. An alternative assumption would be that the more efficient provider has a greater influence over the association's objectives. This would leave the qualitative results unchanged, as it would fall between the two extreme cases we discuss.

The setting we have in mind includes a first stage with the public sector deciding its capacity and a second stage where price bargaining occurs. The model is solved, as usual, by backward induction.

We also assume a less efficient public sector. Otherwise, in the absence of capacity constraints and equal efficiency in public and private facilities, the third party payer trivially would provide only public sector treatment.

The net surplus for agents (providers and NHS) is given by the difference between the surplus or profits earned from treating patients at the agreed price and the corresponding surplus or profits at the free market equilibrium price (in case of negotiation failure). Also, if negotiations fail, the fallback value for the NHS is defined as the budget left after reimbursing those patients exceeding the public sector capacity and paying the cost of the capacity installed.

In the capacity sub-game, decisions take into account the continuation of the game and how they will affect the negotiated price.

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[17] See subsection 2.2.4.

[18] Further details on the role of associations of healthcare providers are presented in the next section.

The objective function of the third party payer is the surplus generated. That is the budget left after paying for the patients treated in public and private facilities, and the cost of the capacity installed.

Under the stated conditions, it turns out that the optimal capacity utilization is zero. On the other hand, depending on the parameter values, there may be a positive equilibrium value for capacity, which will be kept idle. The only reason to build capacity here is the strategic effect associated with the negotiation stage. Increasing capacity reduces the fallback value of providers, valued at the margin by the price paid by patients that exceed public sector capacity. This helps in obtaining a lower price during the negotiation stage. On the other hand, it may reduce or increase the fallback value of the third party payer, as it depends on whether using the extra capacity costs more than using the private market. In such circumstance, the third party payer would prefer to buy in the private market.[19] Each of these marginal changes in fallback values resulting from capacity decisions is weighted by the bargaining power of each side. Of course, if the cost difference between public and private treatment is high enough, the optimal capacity may well be zero in the public sector, and there will be a capacity constraint. However, the important point we want to convey is that the public sector may choose to have slack as a way to improve its negotiation terms. Naturally, this only has value if there is some gain from using the private sector vis-à-vis public facilities.

The argument is akin to the Dixit-Spence (Dixit 1979, 1980; Spence 1977, 1979) excessive capacity result, where a firm builds extra capacity as a commitment to be aggressive in the market. The idle capacity works as a commitment to extract more surplus from more efficient private providers that negotiate prices with the public payer. Therefore, empirical assessments of the role of idle capacity in the public sector must take into account whether negotiations with the private sector exist.

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[19] We assume that in case of negotiations failure, the public sector will use all its capacity. If this was not the case, the only equilibrium price would be the private market equilibrium price.

2.2.4. Extension 2: Bargaining with an association

The simultaneous existence of a public financing entity (third party payer) and private healthcare providers motivates the existence of contracts governing the relationship between the third party payer and providers.

A popular contractual form is the setting of a fee for service: the financing institution pays a predetermined amount for a given service per patient treated. Despite a general trend towards different contractual forms, in some countries, and for certain services provided, this approach is still dominant.[20]

In public systems, it is often the case that the National Health Service (NHS) contracts with private providers the provision of healthcare services. Typically, the value of the fee is set in a negotiation procedure between the NHS and either an association representing providers or providers individually. An interesting economic question here is whether the NHS would do better negotiating with an association instead of selecting the largest companies as preferential partners. At first sight, negotiating with the largest companies, which are also more efficient in production, may lead to lower prices. These companies can accommodate lower prices due to lower production costs. Negotiating with an association would mean that the interests of smaller, inefficient companies would be considered, driving prices up. It is important to keep in mind that professional associations may act as devices to disclose information (mostly aggregate) for its members, but not as collusive devices. It is beyond the scope of our analysis to go into the governance rules of professional associations.

This view, however, ignores the fact that the more efficient companies may be tougher negotiators, and thus obtain a better (higher) price, extended afterwards to all other companies. This is the case, for instance, in the Portuguese dialysis sector, where the NHS negotiates the price of a dialysis session with the two largest companies and extends the agreed price to all companies. The bargaining strength comes from the fallback value (outside

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[20] See Mossialos and Le Grand (1999) for a review of payment systems for healthcare providers in the European Union.

option) in case of failure in negotiations. For instance, assuming that patients will be treated, even at the cost of direct payments, the more efficient companies will have relatively higher profits. Thus, they will be more demanding in negotiations than a sectoral association, because the latter takes into account the relatively low profits of less efficient companies. Consequently, the association is willing to concede a less favourable surplus division in order to avoid failure of negotiations. In other words, negotiation with the more efficient companies may benefit all providers and lead to higher expenditure by the NHS. If we assume that these providers in case of negotiation failure will not treat patients, then the reinforcement of bargaining power of providers associated with the negotiation procedure, including only the more efficient, ones does not exist.[21] Only the first effect persists: more efficient companies are more willing to take lower prices. In this case, the NHS benefits from negotiating with the more efficient providers only, instead negotiating with a sectoral association.

A seemingly attractive alternative system is to reimburse patients. However, doing so leads to higher prices than under the negotiation process (as companies have pricing freedom and patients, under full insurance, are insensitive to price differences).[22] In our motivating example, the nature of the disease justifies the presumption that patients will be treated even if by out-of-pocket payment (chronic renal insufficiency, if not compensated by dialysis or a kidney transplant, leads to death).

The formal analysis (Barros and Martínez-Giralt, 2005a) tells us that the apparent benefit of negotiating with more efficient providers (and thus obtaining lower prices) can be more than outweighed by a stronger bargaining position of the provider when compared to dealing with an association. This is so because a representative association also incorporates in its decisions the (relatively larger) decline in profits of less efficient companies in the event of negotiation failure.

The policy implication is that the NHS should avoid negotiating with the largest providers, if they are significantly more effi-

[21] The NHS may resort to its own facilities, for example.

[22] See subsection 2.2.5.

cient and have a valuable outside option in the private market (a possibility in the event of chronic conditions and lack of capacity in the public system). Instead, it should promote negotiations over prices with an association representative of all providers' interests. According to our findings, all providers benefit from partial negotiation with efficient companies. So the association will not take over price negotiations without pressure from the NHS for that to happen. From the provider's point of view, they should try to force a negotiation between the NHS and the largest ones.

In the Portuguese dialysis sector mentioned above, surprisingly enough, smaller companies have not been claiming a role in the price determination process. Since it is reasonable to assume larger providers are more efficient, being subsidiaries of vertically integrated multinationals, our analysis provides explanation for the current satisfaction of all companies with the status quo. All companies benefit from the tougher position of the largest companies, compared to an association representing all providers. Thus, it seems that these providers are able to force the terms of negotiation on the NHS.

Naturally, negotiations between the payer and healthcare professional associations are not specific to Portugal or to dialysis. We found it in Belgium for determination of hospital fees, specialized ambulatory care and dental care, for example (Crainich and Closon 1999). Also in Germany, France and Austria, where negotiations took place between payers and representatives of providers of ambulatory care.[23]

Some caveats apply. Given our results, it is tempting to draw another policy implication. By reversing the argument, the NHS should attempt to negotiate with less efficient providers and then apply this price to all. In this case, we can show that it is better to negotiate with the professional association. Nevertheless, this

[23] In Germany, negotiation takes place between sickness funds and physicians' associations (Busse and Howorth 1999); in France, there were agreements between Assurance-Maladie and private doctors unions (Lancry and Sandier 1999); and in Austria, between the regional chambers of doctors and the social insurance funds (Engelbert 1999).

alternative seems to be quite difficult to implement, especially if the less efficient providers are also the smaller ones in the market. In addition, if inefficiency is large enough, an excessively high price may result anyway. Thus, considering that the NHS enjoys freedom of choice, negotiating with the more efficient/largest providers seems the more reasonable option.

A second issue not treated explicitly is the governance and decision making mechanisms of the association, as well as membership decision by providers. This is left for future research, though we believe that the main forces identified here will not be reversed.

A third aspect to be discussed is the assumption that providers do not collude in the market, even in the presence of an association. This is reasonable, since competition rules explicitly forbid such role for sectoral associations. Nonetheless, if we allow for collusion, in the case of negotiation failure prices will be equal to the reservation price of patients (or an even higher amount if there is a reimbursement rule by the third payer). Since out-of-pocket payments put patients at financial risk, there is room to negotiate prices above this collusive level. The major difference regarding our analysis is that, under collusion, breakdown of negotiations does not introduce product market asymmetries across providers. The third party payer would be indifferent between negotiating with an association or with a sub-set of providers, extending afterwards the settled price to all providers.[24]

Another assumption deserving discussion is that only one negotiation is carried out. This implies that there is no room for price discrimination. Alternatively, one could think of a sequential bargaining procedure. In such case, the NHS would first negotiate with one provider and then with the other. We provide some explanation for two alternative scenarios. Negotiating with the most efficient provider is better when, after failing in the bargaining with the more efficient provider, the third party payer negotiates with the less efficient provider and excludes the former from coverage. Also, if the negotiated price with the less efficient provider is exten-

[24] If some providers can be excluded, we fall in the analysis of subsection 2.2.2.

ded to the more efficient provider, then again it is more advantageous for the third party payer to negotiate with the more efficient provider rather than engage in sequential negotiations. In the present analysis, we also rule out these situations because price discrimination on the fee per session is typically seen as undesirable and usually faces strong opposition by providers. Also, conducting sequential negotiations adds considerably to transaction costs. The settlement of prices may take several months and involves the use of real resources by both parties. Taking these two elements together, we find it reasonable to assume that only one negotiation takes place and the resulting price applies to all providers.

Summarizing, our analysis reassesses the role of professional associations in the process of price determination, in some healthcare markets. We do not claim that our insight applies to every price negotiation in the healthcare sector. Rather, it calls our attention to some subtleties that have been so far ignored.

2.2.5. Extension 3: Providers competing for patients

A common characteristic of the welfare state in OECD countries is the desire (need) to reform the public healthcare system. This arises from the increasing difficulties in financing the system. Also, within the European Union, the Maastricht criteria (particularly on budget deficits) to participate in the euro area have created an additional pressure to lower public expenditures. This pressure is challenging the notion of a universal system of public healthcare. New organizational forms to improve efficiency are being tested, such as the private management of public hospitals implemented in Spain and Portugal.[25]

Due to the elements of moral hazard involved in the healthcare insurance contracts, third party payers are implementing mechanisms to control expenses. One of these mechanisms is the definition of a set of providers to which the insured patients have access in order to obtain treatment when ill. Associated with this goes the definition of the indemnity the patient obtains should he/she address a provider outside that set.

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[25] Other examples of experiments aimed at cost containment can be found in Mossialos and Le Grand (1999).

Surprisingly enough, there is very little literature on the process of selecting providers and on competition among providers when different reimbursement rules apply, according to the provider chosen by the patient. This section specifically addresses this last issue.[26]

The results and their implications are of interest to insurers (private or public) whenever they set special agreements with a subset of providers, as is the case in some managed care experiments, and to National Health Services that use private providers (they may also define preferred sets of providers) and/or provide healthcare services themselves, which competes with private providers.

We deal with the competitive effects on providers of different reimbursement rules (Barros and Martínez-Giralt 2002). They translate into being included in the list of selected providers by an insurer, which in turn will have an impact on their decisions regarding quality and price. Also, we assume that our providers are always active in the market. Generally, patients have to bear part of the cost of treatment provided by an in-plan care provider. If he/she visits an out-of-plan care provider, he/she pays the full price and obtains indemnity from the insurer specified in the insurance contract.

We consider three basic alternatives for the indemnity associated with the out-of-plan provider. The first one simply does not provide coverage for choices outside the "preferred provider" set. This captures a pure public system of health provision, such as the Spanish one, where a patient visiting a private provider (instead of a public one) has to bear the full cost of treatment. The second alternative defines an indemnity equal to what the patient would have obtained should he/she visit a preferred provider. This alternative tries to capture the idea of indemnity based on a reference price. It captures some features of the French system. Also, it captures some important features of the pharmaceutical sector. Finally, the third alternative is equivalent to the scenario where the insurer has selected both providers. It captures some features of the German system, where together with public providers there is a fringe of private providers regulated through bilateral agreements.

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[26] Subsections 2.2.1 and 2.2.2 address the former.

The type of questions we address refer to the characteristics of market allocations according to the type of insurance contract offered by the insurer and to different assumptions about the timing of decisions on prices and quality taken by the providers.

We identify providers making simultaneous decisions on prices and quality as an approach to the primary care sector, while sequential decisions (first quality, then prices) approaches the specialized healthcare sector. Our main conclusion is that enforcing the fixed co-payment rule on the primary healthcare sector is enough to make providers choose the optimal (welfare maximizing) prices and quality levels. In contrast, in the specialized healthcare sector we need to consider a regulated (public) provider to reach the first-best solution in prices and quality and implement either the fixed copayment or the fixed reimbursement rules.

Next, we turn to the implications of our analysis for the health system organization. All governments in European Union member states have looked at ways to contain health expenditures. Direct and indirect controls over healthcare providers have been imposed in some countries where copayments play an important role. In several countries, we find controls on prices (pharmaceuticals, per day treatment in hospitals), while in others such controls do not exist. Copayment changes have been frequent in European countries, mostly limited to the value of the copayment while maintaining its structure (fixed reimbursement rates).[27] Moreover, copayments are designed with insurance coverage in mind (typically, they have an upper limit). No role as a market mechanism underlies the choice of the structure and the value of copayments. Thus, according to our analysis, the relative unsuccessful episodes of cost containment through copayments are not totally surprising. The structure of the copayment has been kept constant, while our results highlight the fact that changing its structure would have a greater impact.

The market most closely related to our setting is the pharmaceutical market. Reference prices, present in several countries,

[27] See Mossialos and Le Grand (1999) for an overview of recent experiments in cost containment in European countries.

are much in the spirit of our approach.[28] Under a reference price system, a single price is set by the insurer (government or other institutions number) for a number of similar products. Any excess above the reference price has to be paid by the patient. Companies have freedom to set their prices in those countries that have adopted reference price systems. One objective behind the adoption of a reference price system has been to foster competition in the market. Several countries use this system (New Zealand, Germany, the Netherlands, Denmark, Sweden and Italy). Providers (pharmaceutical companies) have argued against the reference price system on the basis that it distorts clinical decision making and limits freedom of choice. Our analysis shows that, in this respect, a fixed copayment system performs as well as a fixed reimbursement rate system, and adds the advantage of tougher price competition among providers. It also reveals that exclusion of some providers from the reimbursement system (the pure preferred provider case) does induce distortions in the decision to visit a provider, which can be seen as a limitation on the freedom of choice.

Although the pharmaceutical market is a very good application of our analysis, we do believe it can be applied in a fruitful way to other providers. For example, visits to general practitioners in some countries (e.g. Ireland, France, Portugal, Sweden) are associated with copayments, aimed at demand control. As long as GPs retain some control over the prices they charge, namely in private practice, we suggest that fixed reimbursement rate regimes should be changed to fixed copayment systems.

[28] See Bloor et al. (1998) for a short review of reference prices and Mossialos and Le Grand (1999) for a more detailed discussion.

3. Findings

HEALTHCARE demands in OECD countries have risen as a combination of the aging population and higher expectations of society. Even though productivity increases are present, the growth in demand continues to imply an alarming rise in the cost of healthcare. In a context of competition for scarce public and private funds, these increases in expenditure have forced countries to develop all sorts of cost-containment policies.

These policies tackle the increase in the cost of providing healthcare in five different ways. On the one hand, they aim at reducing the cost of provision by: (i) directly regulating the prices of healthcare providers, (ii) encouraging direct or yardstick competition between healthcare providers, (iii) making better use of the monopsony power of healthcare payers by designing cunning negotiating schemes. On the other hand, they try to limit the use of healthcare services by: (iv) passing part of the costs of the services to the patients, so that their demands are more price-reflective and (v) designing incentive schemes for providers aimed at limiting demand.

A sound economic analysis of these policies is necessary to understand their effects. The analysis must start with an understanding of how these markets operate and partial equilibrium analysis is the main tool to do this. Moreover, given the prevalence of negotiations between providers of healthcare services and payers (whether these are insurance companies, HMOs or national health services), it is sensible that most of our work focuses mainly on this[29]: trying to identify who are the drivers of bargaining power in negotiations, as these drivers will impact on the sharing of rents between payers and providers (costs) and deter-

[29] With the exception of sections 1.3 and 1.5.

mine the quality and level of access to healthcare of population (equity). This is a crucial point, because the determination of costs for payers is not driven by the market mechanism, but rather by the ability of the two sides to bargain and the ways and mechanisms by which they reach a deal.

This monograph summarises a series of papers aimed at fulfilling this point: to study the effects and identify the pros and cons of several policies implemented in different countries, focusing on the issue of cost containment.

The first set of papers looks at policies aimed at reducing pharmaceutical expenditures, as those are one of the main causes of the increase in healthcare costs. In the first contribution (section 1.2 and Jelovac 2005) we see how, ceteris paribus, in a bargaining outcome between a pharmaceutical company and a government agency, negotiated pharmaceutical prices are increasing in the level of copayments: as patients are more subsidized, prices fall. This is contrary to what would happen if prices were assigned through the market mechanism, as there higher subsidies would make demand more inelastic.

The rest of contributions in part 1 reviewed policies by which high price countries try to encourage arbitrage in international markets to lower the national prices of drugs. The policies aimed at encouraging arbitrage are parallel imports and external referencing. With the first, the country approves imports of drugs by a third party even in the absence of consent by the patent holder. With the second, the country negotiator uses prices set in other countries to benchmark the negotiation. Both policies result in a convergence of prices. In section 1.3, Jelovac and Bordoy use a model that ignores income differences and focuses on other characteristics of demand for drugs to identify the conditions for parallel trade to increase welfare. Parallel trade always decreases the company profits net of public expenses and hence welfare can only increase if the gain in surplus for patients in the high price country more than offsets the loss in surplus for patients in the low price country. As a result of this, parallel trade unambiguously increases welfare if countries only differ in their need for drugs—this would be the case for countries with similar socioeconomic variables but different epidemiological characteristics. If there

were differences in income per capita for countries, the effects of parallel trade on welfare would also reflect the fact that consumption is reallocated from poor to richer countries.

In the analysis of external referencing (section 1.4), García, Jelovac and Olivella identify under which circumstances a country (say A) benefits from applying the policy of requiring, as a condition for reimbursement, that the drug price does not exceed the price set in another country (say B). They find out that the answer to this is very sensitive to the details of the external referencing policy. The reason is that when A announces that it will use external referencing based on the prices in B, this may change the negotiation outcome in B. In particular, the rules of the policy affect the pharmaceutical firm's status quo (or threat point), given by the profit ensured by the pharmaceutical company if the negotiation fails. When we compare this threat point under external referencing with the threat point that stands when all countries carry independent negotiations, we have two cases. First, if country A bans the drug whenever there is negotiation failure in country B, then the status quo of the firm worsens. This is in fact beneficial to country B. If country A, in case of negotiation failure in B, is unable to ban the drug and can only delist the drug for reimbursement, then the firm's status quo improves and this hurts country B. The firm still looses out from the external referencing policy because profits in country A decrease enough to more than compensate the rise of profits in B. A crucial assumption for these results is that country A find it beneficial to implement an external referencing policy. This is the case if copayments in country A and in country B are sufficiently far apart, or more precisely, if country A subsidizes drugs much less than B.

In section 1.5, García and Olivella abstract from external referencing and consider more generally whether a country can make use of prices in other jurisdictions to inform its take-it-or-leave-it offers in a negotiation process with a pharmaceutical company. The idea is simple: in the absence of public information about costs, if a company accepts a price level elsewhere, this suggests a lower limit to the prices to be negotiated subsequently. If the payer has strong bargaining power, he will suggest this lower limit as a take-it-or-leave-it offer. The contribution identifies what

are the consequences of this argument, pointing at the possibility that companies reject low price offers, fearing that they might be used by large demand countries in their negotiations. Also, it analizes the impact of all this strategic interaction on the international timing of pharmaceutical launches. The main conclusion of this section is that companies will only accept low price offers from sufficiently large countries, but this will sometimes imply that pharmaceutical companies launch their products first in small demand countries.

Section 1.6 (Barros and Martínez-Giralt) provides a discussion of Ramsey pricing in the context of the important issue of how R&D pharmaceutical costs should be financed internationally. The standard argument states that the inability to price discriminate between rich and poor users implies that poor users lose out, as they are priced out of the market. Hence, policies such as external referencing or the allowance of parallel imports result in less access to drugs for poor jurisdictions and impair the financing of R&D costs. The contribution assesses the problem of how to divide the financing of R&D costs using Ramsey pricing, pointing at the fact that there exists ex post moral hazard due to co-insurance, which will affect demand elasticity (patients' demand is dissociated from the company's price) and there are crucial divergences in the way countries organise their subsidy system. The particular interest of the paper is to identify how copayments determine the optimal sharing of costs as copayments will feed in Ramsey prices through their effects, on demand elasticity.

Part 2 of the monograph addresses the relationship between providers and a third party payer (be it a private insurance company, or a public NHS) from a different perspective. Instead of the anonymous market interaction, we recognize that healthcare providers and third party payers often interact directly. We look at the determinants and implications of different ways of organizing such interaction.

First, we consider a scenario where providers are acting on individual basis with the third party payer. We address the following question: what negotiation procedure should a third party payer select when contracting with healthcare providers? Two alternatives commonly observed have been considered: bargai-

ning with providers and "any willing provider" contracts. In the latter case, contract conditions are announced by the third party payer, and providers either accept the terms and join the network of providers associated with that third party payer, or they refuse and stay out of the network.

The main finding of the analysis is that whenever the surplus to be shared in the bargaining is relatively high, the third party payer prefers the "any willing provider" system. This is so because the simple price announcement in the "any willing provider" case constitutes an implicit commitment to be tough. This commitment is more valuable in the case of larger surpluses.

Second, we tackle the economic rationale of a public sector healthcare provision that may decide to hold idle capacity, a frequent criticism of national health systems. We argue that such behavior allows for increasing bargaining power against private providers that contract with the public payer. The argument is akin to the Dixit-Spence excessive capacity result, where a company builds extra capacity as a commitment to be aggressive in the market. The idle capacity works as a commitment to extract surplus from more efficient private providers that negotiate prices with the public payer. Therefore, empirical assessments of the role of idle capacity in the public sector must take into account before drawing conclusions about inefficiencies in the public sector organization.

Finally, we open the possibility of providers to organize themselves in an association to bargain with the third party payer. We examine whether a NHS (or a third party payer, in general) prefers to negotiate prices for healthcare services with professional associations or with the more efficient ones, and apply the resulting price to all providers. The first alternative has been widely used, but the second can also be found in the healthcare sector.

We find that the apparent benefit of negotiating with more efficient providers (and thus obtaining lower prices) can be more than outweighed by a stronger bargaining position of the provider, when compared to dealing with an association. This is so because a representative association also incorporates in its decisions the (relatively larger) decline in profits of less efficient companies in the event of negotiation failure.

The policy implication is that the NHS should avoid negotiating with the largest providers if they are significantly more efficient and have a valuable outside option in the private market (a possibility in case of chronic conditions and lack of capacity in the public system). Instead, it should promote negotiations over prices with an association representative of all providers' interests.

We conclude that, in general, the driving force behind the relationship between a third party payer and a set of providers is two-fold. On the one hand, the size of the surplus to be shared. On the other, the distribution of bargaining power. The way these two forces interact is not always obvious, and the analyst must take into account the particular details of each case. This analysis renders testable predictions that we hope will foster further research.

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