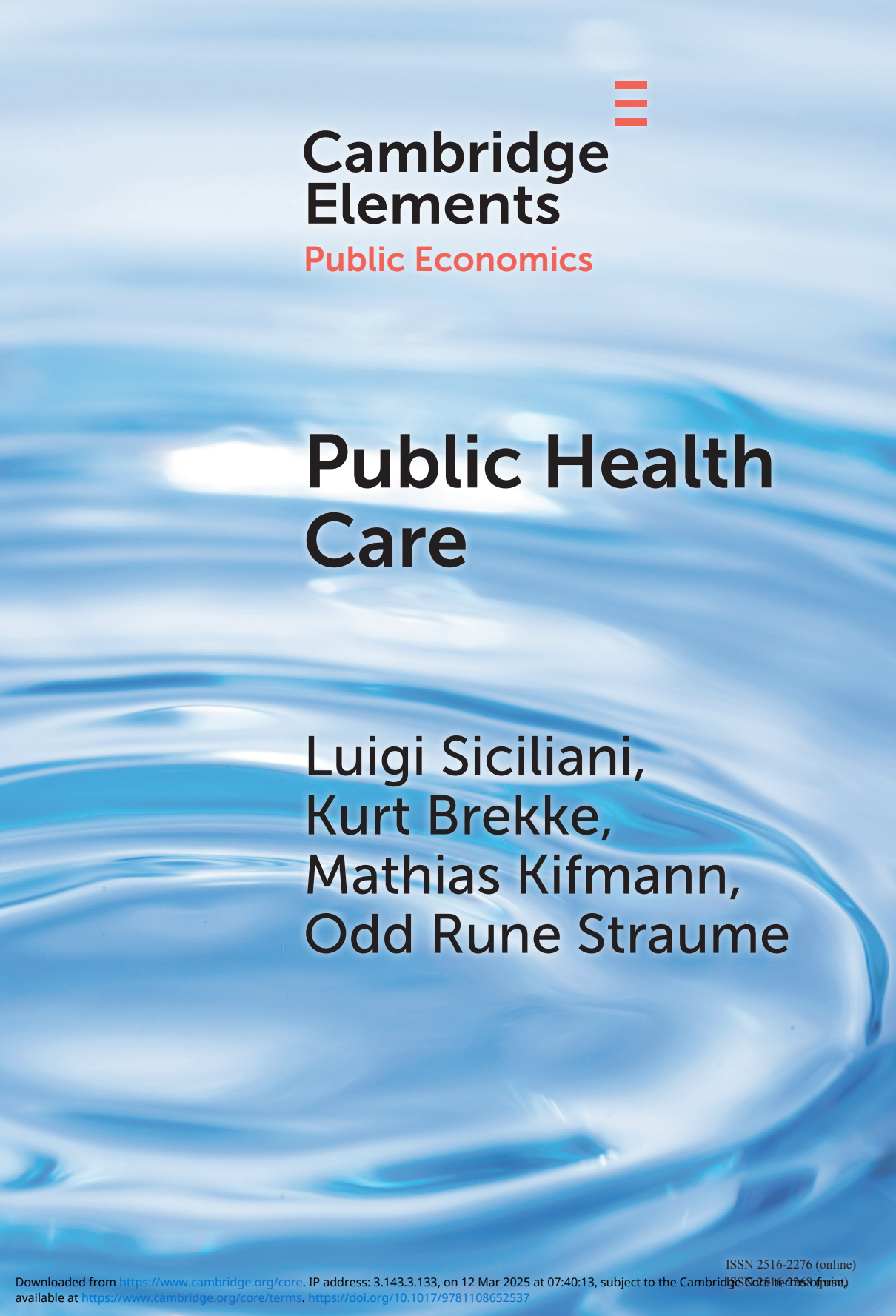

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PUBLIC HEALTH CARE

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Public Health Care

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Abstract: This Element discusses the role of the government in the financing and provision of public health care. It summarises core knowledge and findings in the economics literature, giving a state-of-the-art account of public health care. The first section is devoted to health system financing. It provides policy rationales for public health insurance which rely on both equity and efficiency, the coexistence of public and private health insurance, how health systems deal with excess demand, and the effect of health insurance expansion. The second section covers the provision of health care and the effect of policy interventions that aim at improving quality and efficiency, including reimbursement mechanisms, competition, public–private mix, and integrated care. The third section is devoted to the market for pharmaceuticals, focusing on the challenges of regulating on-patent and off-patent markets, and discussing the main incentives for pharmaceutical innovation.

Keywords: health care, health financing, healthcare provision, pharmaceuticals, public

JEL codes: I1, I11, I13, I14, I18

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Contents

1 Introduction

Most health spending in high-income countries is public. In 2021, 73% of health expenditure was publicly funded across thirty-eight OECD countries. There is heterogeneity across countries in public health expenditure, which reflects a range of institutional arrangements. Public health expenditure was higher and equal to 84–86% in Denmark, Norway, and the United Kingdom, 79% in France and Germany, and 77% in Ireland. It was 74–75% in Australia and Italy, 72–73% in Canada, Poland, and Spain, and 68% in Peru. In the US, where only people older than sixty-five years old and the poor are covered by publicly funded insurance (Medicare and Medicaid), public health expenditure is still 56% of the total. It was 55% in Indonesia, 54% in China, and 50% in Mexico (OECD, 2023). In most countries, public health insurance provides universal coverage for a core set of health services. This is the case for Australia, Austria, Canada, Greece, Ireland, Italy, Japan, Korea, the Nordic Countries, New Zealand, Portugal, and Spain (OECD, 2023).

What is the rationale for such a high proportion of public health spending? The role of public financing in the health sector is incredibly varied across institutional settings and involves many design issues. The very first issue relates to the choice between public and private insurance. If a private insurance model is chosen, this can be mandatory or voluntary. If a public insurance model is chosen, then private health insurance is still likely to coexist along with public insurance and this coexistence is multifaceted. Moreover, within any health insurance system (public or private) policymakers must choose or regulate the extent to which patients are exposed to co-payments, which again can vary significantly across countries and institutional settings. Countries that do not choose to rely on co-payments will still have to manage the excess demand of health care, which can translate into long waiting lists and waiting times unless such demand is matched with increased supply and health spending. We discuss these issues in a systematic way in Section 2.

In more detail, in Section 2.1, we provide the policy rationales for public health insurance which rely on both equity and efficiency arguments. Some countries rely on multi-payers to cover the population and potentially compete with each other. In Germany, these are non-profit insurers, so-called sickness funds, in the Netherlands health insurers operate under private law, with most working on a not-for-profit basis. In Switzerland, health insurers are private companies. In these countries, the health insurance market is heavily regulated, and insurers cannot charge premiums based on individual risk. 66% of health spending is public in the Netherlands, but only 37% in Switzerland. We discuss these systems in Section 2.2.

Despite public health insurance being universal in many countries, voluntary private health insurance coexists with public health insurance with a range of different functions. Private health insurance can be duplicative covering the same services as under public insurance, but with quicker access, greater choice of provider, and amenities. Private health insurance can be supplementary for services not covered by public insurance, or complementary to cover out-of-pocket payments not covered by public health insurance. The heterogeneity of these arrangements and the coexistence of public and private health insurance are discussed in Section 2.3.

Health systems with public health insurance exhibit excess demand in many countries. One policy lever to deal with such excess demand is to introduce co-payments. Most countries with a high proportion of health spending only make limited use of co-payments, and these are used to both raise the funding for and affect the utilisation of health services. Section 2.4 reviews several conceptual issues and empirical evidence related to the effect of co-payments on the demand of health care. In some health systems, the combination of public insurance with tight capacity constraints leads to long waiting lists and waiting times for patients. Section 2.5 argues that waiting times act as a non-monetary price that brings together the demand for and supply of health services, and reviews related empirical literature.

Although most OECD countries have universal coverage, several countries have expanded public health insurance to cover segments of the population who were previously uninsured (e.g., Indonesia, Taiwan, Thailand, and Peru). These policy reforms give an opportunity to test the fundamental question on the extent to which public health insurance expansion improves access to care and health, and provides financial protection through reductions in out-of-pocket payments. These are reviewed in Section 2.6.

Although many countries rely on public health insurance, this does not automatically mean that these health systems will rely on public providers to treat patients. Indeed, several OECD countries have a mix of public and private (non-profit or for-profit) providers to treat publicly funded patients. Regardless of the public–private mix in provision, health systems have to decide how to reimburse healthcare providers for the care they provide and the regulatory setting in which they operate. They also have to decide the architecture of the health sector, and the extent to which healthcare providers compete with each other for segments of healthcare services or they integrate across different types of care along the patient pathway.

We discuss the provision of health care in Section 3. Many policy interventions within a publicly funded health sector aim at improving the quality and efficiency of healthcare providers, whether public or private. Section 3.1

discusses different reimbursement mechanisms that have been traditionally adopted across OECD countries, such as activity-based financing, cost reimbursement, capitation and fee for service, and the effect they have on provider behaviour. One recent development in provider reimbursement is Pay for Performance, which aims at paying directly for dimensions of quality. Although appealing, this approach raises several design issues that are discussed in Section 3.2.

Provider behaviour can be affected not only by financial incentives but also by the market structure in which providers operate. Section 3.3 reviews the literature on provider competition and patient choice and the effect that it can have on quality and efficiency. Although we discuss separately reimbursement mechanisms and provider competition, these themes are interconnected. For example, the effect of provider competition depends on the reimbursement mechanisms, and countries can introduce activity-based financing as part of broader pro-competition reforms.

Across the OECD countries, providers also differ systematically by ownership status. Some providers are public while others are private non-profit or private for-profit, and the mix of providers can differ substantially across countries. Section 3.4 reviews the literature investigating the effect of ownership status on quality and efficiency. Last, the increase in the number of multimorbidity patients driven by an ageing population has stimulated policy reforms that encourage the integration of care within the health sector and between the health and other sectors with the aim of improving coordination of care and patient experience. Section 3.5 reviews key concepts and some limited but growing evidence. Again, although we discuss integrated care on its own, this topic connects other themes discussed in the section. Integrated care can be seen as an alternative to competition, or can coexist with competition if providers compete to offer integrated packages. Integrated care has to be reimbursed in some way and several countries have experimented with bundled payments covering several types of care under one reimbursement tariff.

The market for pharmaceuticals is characterised by several features that are to some extent distinct from healthcare provision covered in Section 3 or other product markets. The pharmaceutical industry is one of the most research-intensive ones and is characterised by high fixed (sunk) costs and low marginal costs. Drug demand is the result of a complex decision-making process that involves the prescribing physician and, in some cases, the dispensing pharmacy. We therefore discuss pharmaceuticals separately in Section 4. To give pharmaceutical firms incentives for drug innovation, most countries offer patent protection that allows them to sell the drug at a price higher than the marginal cost. The combination of inelastic demand and market power poses several

regulatory challenges for policymakers who are concerned about securing wide access to drugs at affordable prices and ensuring that pharmaceutical firms have sufficient incentives for developing new and beneficial drug treatments. The section discusses the main policy options in light of economic theory and available empirical evidence. Section 4.1 focuses on on-patent markets, while Section 4.2 on off-patent markets, which pose distinct regulatory challenges. Last, Section 4.3 discusses the main incentives for pharmaceutical innovation.

2 Financing of Health Systems

2.1 Public Health Insurance

Public health insurance is pervasive across OECD countries. Many countries have universal public health coverage for a core set of services. Countries with 100% of the population covered by public health insurance include Australia, Austria, Canada, Greece, Ireland, Italy, Japan, Korea, the Nordic Countries, New Zealand, Portugal and Spain (OECD, 2023). In Germany, public coverage of the population was 89% in 2021 with the remaining 11% covered by primary private health insurance coverage. In the United States, 38% of the population was covered by public health insurance through the Medicare programme covering the population older than sixty-five years old and Medicaid covering the poor; 53% of the population has (voluntary) private health insurance with the remaining 9% remaining uncovered in 2021 (OECD, 2023). In the Netherlands and in Switzerland, 100% of the population is covered through primary private health insurance, which is mandatory.

The policy rationale for public health insurance is often motivated by equity considerations and has a strong redistributive and solidarity component. Many health systems pursue the objective that access to care should be based on need and not ability to pay. Health systems based on a National Health Services (also known as the Beveridge model), such as in England, Italy and Norway, tend to rely more on income taxation to finance the health system through income tax revenues that are not earmarked. Other health systems, such as France and Germany, are based on social health insurance (also known as the Bismarckian model) with salary contributions from employees and employers, though some countries such as France have expanded over time the tax base towards total income, not only earned income.

Publicly funded health systems redistribute resources both across health states and income levels (Cremer and Pestieau, 1996). They redistribute income from individuals with good health, who have a low probability of falling ill and requiring health care, to those in poor health with a high probability of falling ill. Moreover, for a given level of health, they redistribute from high- to low-income individuals

or households given that health systems are mostly financed through income taxation or proportionate salary contributions.

The redistributive component is strengthened if there is a negative correlation between income and health risk (Cremer and Pestieau, 1996), which is in line with empirical evidence showing that individuals with lower socioeconomic status have poorer health. The 'veil of ignorance' argument can also be applied in the health context (Rawls, 1971). If individuals do not know ex ante whether they will be in poor health or good health, they may be favourable to a health system that redistributes resources across health risks. From a political economy perspective, there may be limits to the extent to which governments can pursue redistribution, and these limits are stronger in institutional contexts where public insurance coexists with (duplicative) private health insurance. If high-income individuals buy private health insurance, they contribute to the public health system through taxation but may not use public health care, which in turn reduces their political support for expanding publicly funded health services (Epple and Romano, 1996).

Public health insurance systems are mostly financed by taxes, social health insurance contributions, or a mix of both. Both forms of finance implicate redistribution from individuals in good health to those in poor health. The degree of income distribution, however, differs. Tax financing, when structured progressively, ensures that higher-income individuals contribute a larger share relative to their income, which can promote equity in healthcare financing. In particular, this applies if health care is financed mostly by direct taxation in the form of a progressive income tax. By contrast, indirect taxes (such as sales taxes) tend to be regressive, disproportionately impacting lower-income individuals. To what extent these forms of taxation are efficient depends on how they keep tax distortions to a minimum, considering the restrictions introduced by the need to raise revenue and the equity objectives for the distribution of the tax burden (Auerbach and Hines, 2002). This calls for a comprehensive assessment of a country's tax system.

Social health insurance contributions are typically income-related and thus similar to income taxation. However, social insurance systems may have ceilings on contributions, which introduces a regressive element into healthcare financing as higher-income individuals are exempt from higher payments beyond a certain threshold (Evans, 2002). For example, this holds for Germany where high-income individuals can also switch to private health insurance beyond an income threshold. Social health insurance contributions may also be levied only on labour income which may disproportionately distort labour supply. An overall assessment, however, should take into account how the tax system is designed, for example, whether social insurance contributions can be deducted from income tax and the extent of progressivity of the income tax.

Overall, both ways of finance can ensure that those who need health care can obtain it. If more income distribution is desired, then financing health care via progressive income taxation is the preferred way. A further aspect is that tax financing combines in one authority both the incentive and the capacity to contain costs to a greater extent than social health insurance (Evans, 2002). Health care is part of the public budget and can thus be adapted more easily compared to social health insurance where contributions tend to be earmarked for health care and healthcare providers have more autonomy. Tax-financed systems may therefore come more under pressure during fiscal crises, potentially leading to reduced funding for health care and erosion of public confidence in the system (Evans, 2002). Here, social health insurance may provide more stability. On the other hand, necessary structural reforms may be more difficult to implement in social health insurance systems.

Several empirical studies have quantified the degree of inequalities in healthcare payments (Wagstaff and Van Dooerslaer, 1992; Wagstaff et al., 1999; Wagstaff and Van Dooerslaer, 2000). These studies use survey data in European countries to compute Kakwani progressivity indices that are based on the concentration curves of healthcare payments and individual income. The studies find that financing a health system through direct taxation or social insurance contributions is generally progressive. Indirect taxation is generally regressive because the consumption of poor people represents a higher proportion of their income. The review by Luyten and Tubeuf (2024), which covers high- and low-income countries, confirms these findings. Tax-based systems exhibit high progressivity, as direct taxes contribute to a favourable redistribution toward low-income households given that poorer households contribute a smaller proportion of income to finance health care. Although indirect taxes are regressive, the combined effect of direct and indirect taxation remains progressive. Social insurance systems are generally found to be progressive but in some cases may be regressive in practice due to contribution ceilings and exemptions for high-income earners. Out-of-pocket payments are systematically regressive as they disproportionately burden lower-income households, and this effect is even more marked in low-income or middle-income countries (LMICs).

There are also efficiency arguments that have been brought forward to justify government intervention in the health sector that relate to adverse selection. Economic theory predicts that in private health insurance markets where the probability of illness is private information of the individual and not observable to an insurer (adverse selection) and where insurance is voluntary, individuals with a lower probability of being ill will have only partial coverage of their medical expenses (Rothschild and Stiglitz, 1976). This is suboptimal relative to a benchmark where insurers can observe the probability of illness and offer full coverage of medical expenses.

Rothschild and Stiglitz (1976) show that with asymmetric information, the only possible stable equilibrium is a separating one where high-risk individuals are offered full coverage of the medical expenses but pay a high insurance premium that reflects their risk, while low-risk individuals have only partial coverage (and a lower premium that reflects both the lower risk and lower coverage). The authors demonstrate that this equilibrium is stable only if the proportion of low risk is sufficiently low. They also show that a pooling equilibrium where the insurer offers only one premium that pools risks across individuals and offers 100% coverage is not stable. This is because other private insurers could offer insurance contracts with partial coverage and lower premiums that low-risk individuals would find more attractive, leaving the insurer offering the pooling equilibrium with a deficit.

It can also be shown that, relative to a separating equilibrium, a Pareto improvement can be achieved by introducing compulsory public insurance with partial coverage provided that individuals are allowed to buy supplementary health insurance on top. This is because high-risk types benefit from the lower premium due to the pooling within the public insurance contract. Low-risk types are better off because the combination of public and private insurance allows an increased overall coverage compared to the separating equilibrium without intervention. However, it needs to the emphasised that this result hinges on the particular equilibrium concept used by Rothschild and Stiglitz (1976). Under other concepts, there is no scope for a Pareto improvement (Zweifel et al., 2009).

There is extensive evidence from the US suggesting that adverse selection is quantitatively important. For example, there is evidence that worse health status increases the probability of choosing insurance plans that reimburse providers based on a fee-for-service scheme, which is considered more generous relative to a managed care plan. Worse health status also reduces the probability of being uninsured (Cutler and Zeckhauser, 2000; Breyer et al., 2011). Panhans (2019) investigates the introduction of the Affordable Care Act in the US which made premiums more uniform by limiting insurers' ability to adjust the premium to reflect individual risk. The study shows that uniform pricing induced healthier individuals to forgo coverage, which increased the premium for those remaining as a result of the higher proportion of less healthy individuals.

One way to enforce a pooling equilibrium is to introduce public health insurance. For example, National Health Services are set up as a single-payer system where one public insurer provides the same coverage to the whole population and the financing is centralised therefore pooling across different health risks (in addition to pooling across income). Social health insurance systems are more varied. They can involve a single payer or multiple payers.

In France, there is one large public insurer, known as the 'Securite sociale', which covers the whole population, though co-payments can differ across segments of the population. In Germany, there is a multi-payer system where non-profit insurers, so-called sickness funds, cover the population and potentially compete with each other. Similar systems are in place in the Netherlands and Switzerland. This type of social health insurance with a multi-payer system tries to enforce a pooling equilibrium by regulating the health insurance market. We take a closer look at such systems in the next section.

2.2 Social Health Insurance with Competition

At first sight, social health insurance systems with competition resemble private insurance models. However, a key distinction remains: contributions are regulated, meaning that insurers cannot charge premiums based on individual risk—a practice known as 'community rating'. Furthermore, insurers are required to accept all applicants through open enrolment, and insurance coverage is mandatory for all or most citizens.

Advocates of such systems emphasise the potential benefits of competition in health insurance markets. According to van de Ven and van Vliet (1992), competition can help to enhance the quality of care, improve the efficiency of care, and increase responsiveness to consumer preferences. These benefits depend on insurers taking an active role in healthcare delivery, such as contracting with efficient providers and monitoring care quality.

Countries differ in the extent to which they allow health insurers to take on such a role. In Germany, collective contracting is dominant. However, sickness funds exert some influence over care delivery as selective contracting is permitted to a certain extent. Funds have incentives to maintain efficient administrative operations as they compete on the contribution rates. Cost savings can be achieved, particularly in the procurement of pharmaceuticals and mobility aids (Kifmann, 2017). In the Netherlands, health insurers are less regulated. Insurers may also contract exclusively with certain healthcare providers (Kroneman et al., 2016). In Switzerland, competition between health insurers is particularly pronounced. Individuals can choose from various managed care plans, including family doctor plans provided by physician networks, Health Maintenance Organizations comprised of group practices or small networks of physicians financially responsible for costs, and gatekeeping models (De Pietro et al., 2015).

A problem in all countries is that community rating incentivises risk selection as individuals with high expected healthcare expenditures (high risks) result in losses for insurers, while those with low expected expenditures (low risks)

generate profits. This can take two forms. Direct risk selection occurs when insurers use observable characteristics correlated with risk, such as age or sex, to selectively enrol individuals, for example, by not or slowly processing their applications. Indirect risk selection involves the design of benefit packages; for example, high-risk individuals can be deterred by offering contracts with high deductibles or inferior quality care for conditions like cancer and HIV, while low-risk individuals can be attracted through policies highlighting comprehensive coverage for athletic medicine or regular check-ups that appeal to individuals who prioritise their health and fitness (Zweifel et al., 2009).

There are only a few studies on the extent of risk selection in social health insurance. Bauhoff (2012) conducted a field experiment. Fictitious individuals from different locations approached German sickness funds and requested a contract form and further information. He finds that funds are less likely to respond and follow-up with applicants from higher-cost regions. Using a similar approach for Switzerland, Baumgartner and Busato (2012) compared insurers' reactions to low risks (young applicants) willing to accept high deductibles and to high risks (old applicants) preferring low deductibles. Applicants exhibiting low-risk signals experience a shorter wait time of approximately one day for a response from an insurer, are presented with lower premiums, and frequently receive offers from a subsidiary within an affiliated group that seemingly focuses on low-risk cases. Stolper et al. (2022) assessed promotional material used by Dutch health insurers in 2019. They find that the majority of marketing initiatives are aimed at financially advantageous groups, while only a small portion of insurers' marketing efforts is directed towards actual care users.

To prevent risk selection, several regulatory measures are available. For direct risk selection, laws penalising insurers for such practices and minimising contact between insurers and the insured can be implemented and enforced. For indirect risk selection, regulating the benefit package to include minimum benefits prevents underprovision for high-risk individuals, while maximum benefits prevent overprovision for low-risk individuals. Restrictions on the co-payments and deductibles can also limit risk selection. Yet, these regulations curtail the freedom of insurers to provide benefit packages potentially in the interest of all individuals, thereby reducing the value of competition.

Risk adjustment schemes are the standard approach to address risk selection. These are transfer mechanisms that aim to equalise expected payoffs for insurers across different risk profiles. They are based on risk adjusters, that is, observable characteristics of individuals. Typically, the risk adjustment payments are based on the predicted healthcare expenditure conditional on these variables. As a consequence, payments are higher for individuals with characteristics that predict high healthcare expenditure such as higher age or diagnosis

of a major illness. All countries mentioned have implemented such schemes. These use multiple risk adjusters such as age, gender, income type, region, health indicators derived from diagnostic data, and pharmaceutical use.

2.3 Duplicative, Supplementary, and Complementary Private Health Insurance

Amongst OECD countries, it is common for public health insurance to cover 100% of the population. Yet, within the same countries private health insurance coexists alongside public health insurance. For countries where private health insurance is not primary, voluntary private health insurance can be duplicative, supplementary or complementary.

Private health insurance *duplicates* coverage of health services already provided by public insurance in countries such as Australia, Ireland, Spain and the United Kingdom. The key feature of private insurance is that it promises quicker access to health services, greater degree of choice of doctors and providers, and better amenities (e.g., a single rather than shared room in a hospital). Individuals therefore have to assess prospectively whether the benefits from quicker access, greater choice and better amenities by private providers are worth the premium charged by private health insurers (Barros and Siciliani, 2011). In several countries, private health insurance coverage remains relatively small. For example, in 2021 only 11% of the population in Mexico and the UK had duplicative private health insurance (OECD, 2023). Similarly, this figure was 15% in Spain and 17% in Greece.

Low coverage of duplicative private health insurance is not surprising. Given that individuals are already covered by public insurance, only a relatively small proportion of the population decides to buy additional insurance. This can include for example individuals with relatively high income, high need or risk aversion, or who have insurance provided through their employer as an additional benefit. Moreover, given that private health insurance is voluntary, some individuals may prefer to pay for private health care out of pocket if they find private health insurance premiums too high relative to the coverage offered. Duplicative private health insurance is instead high in Australia and Ireland with 54% and 47% of the population holding private health insurance in 2021 (OECD, 2023), respectively, possibly due to long waiting times and access issues in the public universal health system. Furthermore, in both countries, the state subsidises private health insurance (Hall et al., 2020; Turner and Smith, 2020).

Private health insurance is *supplementary* instead when it covers health services not covered by public health insurance. For example, public coverage of dental services varies significantly across countries, and this can be targeted

by private insurance. The Netherlands has one of the largest supplementary private health insurance markets covering about 85% of the population. The coverage offered by private insurance could be duplicative and supplementary at the same time, as is often the case in Australia (OECD, 2023).

Last, private health insurance can be *complementary*, which refers to insurance to cover out-of-pocket payments sustained within a public insurance system. In France and Belgium, 96% and 98% of the population had complementary health insurance, which is mostly private. Coverage can be varied. For example, in France about 54% of the population have private insurance on an individual basis, 35% through the employer, and 7% is instead state-funded insurance for low-income households. The key feature of this insurance is that it covers expenses for care not fully covered by a different insurance scheme. When deciding whether to buy complementary insurance, individuals have to trade off the cost in terms of the premium paid to the insurer against the benefits of financial protection from the out-of-pocket payments arising when utilising services under the public insurance scheme.

These examples illustrate how public and private insurance coexist within health systems, but the role and the size of private health insurance varies significantly across countries.

2.4 Co-payments

Economic theory can offer insights into the design and use of co-payments. In a seminal contribution, Zeckhauser (1970) determines the optimal co-payments in a health insurance model where insured patients can choose healthcare consumption. In the absence of co-payments, patients have an incentive to consume health care up to the point where the marginal benefit is equal to zero (and therefore below the marginal cost). Ideally, patients should receive a fixed payment just covering the optimal amount of health care given their health state. This solution, however, is not feasible in a situation in which insurance companies cannot exactly identify the medical condition of the individual. Instead, insurance needs to reimburse part of actual healthcare expenditure to provide protection. In this situation known as 'moral hazard', a trade-off between risk spreading and incentives emerges. Health insurance theory suggests that the optimal co-payment is positive and set such that it trades off the benefit from insurance against excessive consumption. It can be useful to vary co-payments for different classes of disease to optimally deal with this trade-off.

This theoretical finding assumes that it is the patient who rationally chooses health care. In many health systems, however, access to health care is mediated by healthcare professionals. Some health systems have excess capacity and

providers are reimbursed through fee-for-service mechanisms. In such scenarios, providers' financial incentives may align with those of the patients, and this may lead to a high level of healthcare consumption.

Many publicly funded systems have however capacity constraints and access to health care is limited by rationing or long waiting lists. Moreover, healthcare professionals in some countries are salaried. Primary care providers are paid by capitation and secondary care providers have limited capacity that restricts the number of patients they can treat. If the opportunity cost of public funds is high, the health care provided to patients at the margin may be such that the health benefit is higher than treatment costs even in the absence of co-payments. Therefore, whether co-payments increase or reduce expected utility within a publicly funded health system depends on whether they encourage beneficial care or unnecessary care (Siciliani, 2014). Policy initiatives in favour of introducing co-payments argue that they will reduce unnecessary care and help finance the health systems. Policy initiatives that remove co-payments argue that they improve access to care. Moreover, co-payments can increase inequalities if poorer individuals are less likely to afford them further increasing unmet needs.

Given the potential impact of co-payments on access and utilisation, it is not surprising that a large body of empirical evidence has investigated the effects of co-payments. In most studies, moral hazard is identified with a positive effect of insurance on healthcare use. A key study in this area is the RAND health insurance experiment that randomised individuals in the US in groups facing different coinsurance rates ranging from zero to 25%, 50%, and 95%, until the threshold limit of US$1,000 per family (Manning et al., 1987). A main result was that individuals with higher coinsurance had lower levels of healthcare spending. In particular, the difference between zero and 25% coinsurance rate was striking. According to the estimates by Manning et al. (1987), medical expenses were 19% lower in the plan with the 25% coinsurance rate. For higher levels of coinsurance, medical expenses tended to fall further but the effect was less pronounced. Other studies have largely confirmed a positive effect of health insurance coverage on the use of health care (see McGuire (2011) for a survey). Further causal evidence was obtained from the Oregon Health Insurance Experiment which analysed the state of Oregon's expansion of its Medicaid programme through random-lottery selection from a waiting list. Finkelstein et al. (2012) find evidence of higher healthcare utilisation for formerly uninsured low-income adults. For example, the probability of hospital admission increased by 2.1 percentage points or 30%, while the number of emergency department visits by 0.41 visits or 40%.

The interpretation of the empirical findings is controversial. Sometimes it argued (or implicitly assumed) that the extra healthcare consumption generated by insurance is inefficient (see, e.g., Feldman and Dowd, 1991). However, this

reasoning neglects the 'access motive' of health insurance. As Nyman (1999a) pointed out, a significant portion of efficient health care can only be consumed if made affordable by insurance. An example is liver transplantations which would be unaffordable for many patients without insurance. The key mechanism is that insurance requires only a comparatively small premium as few people require a liver transplant. Furthermore, De Meza (1983) and Nyman (1999b) have emphasised that insurance involves a transfer of purchasing power from the healthy to the sick state. Assuming that health care is a normal good, demand will therefore increase when insurance is available and, at least to some extent, this extra demand is efficient. Nyman et al. (2018) provide a decomposition of the demand expansion due to the insurance, labelling the extra demand due to the income transfer 'efficient moral hazard'. For individuals with a priority condition such as cancer or diabetes, they find that this effect is in the range of 13–29% (depending on the subgroup considered) of the additional health care due to insurance.

For an overall assessment of co-payments, it is also important to examine the effects of insurance on health and other outcome variables. In the RAND health insurance experiment, the reduction in services induced by cost sharing had no adverse effect on health for the average adult. However, the poorest and sickest 6% of the sample at the beginning of the study had better outcomes under the free plan for four of the thirty conditions measured (Brook et al., 2006). Baicker et al. (2013) examined the health effects of the Oregon Medicaid expansion. It improved self-reported health and reduced depression, while no statistically significant effect was found on physical health measures (blood pressure, cholesterol, glycated haemoglobin), employment, or earnings.

There is also evidence from other countries. Using difference-in-difference methods, Ma et al. (2020) evaluate the effect of a policy in Ireland which removed co-pays for GP visits for patients who are older than seventy years. The study finds that removing co-payments increased the probability of seeking GP care, and reduced perceived stress, in particular amongst poorer, sicker and single patients. Di Giacomo et al. (2022) use a regression discontinuity design to test the effect of eliminating co-payments for non-invasive screening prenatal tests. The study shows that following the elimination of the co-payment the probability of a non-invasive prenatal test increased by 5.5 percentage points.

An interesting finding of the RAND health insurance experiment was that with higher coinsurance, individuals reduced both medically appropriate and inappropriate hospital admission rates and inpatient days (Siu et al., 1986). This puts into question the ability of patients to rationally choose health care. Such limitations are taken up by Baicker et al. (2015) who develop a model that considers that patients make mistakes which they call 'behavioural hazard'.

Concretely, patients may both under- and overestimate the benefits of treatments when demanding health care. They show that the optimal co-payment according to the standard moral hazard is too high in the first case and too low in the second. Their analysis provides a theoretical foundation for value-based health insurance design where optimal co-payments are set to correct behavioural mistakes (Chernew et al., 2007). In particular, the co-payment should be lower for underused high-value care. An example is co-payments for effective diabetes medications with low adherence.

The studies covered so far in this section focus on *ex-post* moral hazard, which refers to the effect of insurance and co-payments on actions taken by patients after they fall ill, such as healthcare utilisation. A more limited empirical literature has a focus on *ex-ante* moral hazard, which refers to actions taken by individuals before they get ill. Examples include lifestyle choices, such as exercising, smoking or diet, or secondary prevention, for example, screening. De Preux (2011) compares trends in the lifestyle of individuals before and after the age of sixty-five when individuals become eligible for Medicare, and finds no clear effect on alcohol or smoking, but some reductions in physical activity. Similarly, Simon et al. (2017) use difference-in-difference methods to test the effect of the Affordable Care Act on preventive and health behaviour and found no evidence that it affected risky health behaviours. Barbaresco et al. (2015) found that the same reform reduced body mass index but had no effect on preventive care utilisation and increased risky drinking.

2.5 Waiting Times

Several health systems are characterised by public health insurance and limited capacity, which translates into an excess demand for health services (OECD, 2020). Patients are therefore put on a waiting list and can wait a significant time before accessing health care. Waiting times in turn generate dissatisfaction for patients since they postpone health benefits from treatment, may induce a deterioration of the health status of the patient, can prolong suffering and generate uncertainty.

A demand-supply framework can be used to understand the determinants of waiting times. In the absence of price rationing, waiting times act as a non-monetary price (or a disutility) that brings demand for and supply of health services together (Iversen, 1997; Martin and Smith, 1999). Longer waiting times reduce demand because at the margin a longer wait induces patients to opt for care in the private sector where waiting times are typically shorter if patients have private health insurance or if they are willing to pay out of pocket. Some patients may give up treatment if they find it more time-consuming to

engage with the public system as a result of longer waiting times. On the supply side, longer waiting times induce providers to increase volume either because waiting times are often used as performance indicators or because providers have altruistic concerns towards patients and feel responsible for patients waiting for a long time. At the health system level, policymakers may also be willing to allocate more resources to healthcare providers when waiting lists grow, which can be the subject of intense political debate.

Several empirical studies have tested the extent to which waiting times reduce demand and increase supply. Evidence from England suggests that demand is generally inelastic with an elasticity of −0.1 or −0.2 using both cross-sectional and panel data. An increase in waiting times by 10% reduces demand by 1 or 2%. The estimates for the supply elasticity vary across studies and range from around 0.1 to 3 (Martin and Smith, 1999, 2003; Gravelle et al., 2003; Martin et al., 2007). A key econometric concern is that waiting times are endogenous as they simultaneously affect demand and supply, which can be addressed through an instrumental variable approach (e.g., using exogenous determinants of the demand to instrument waiting times in the supply equation, and using exogenous determinants of the supply to instrument waiting times in the demand equation). Demand estimates for Italy also suggest an elasticity of about −0.1 (Riganti et al., 2017) while the elasticity is higher for Australia possibly due to the larger private sector and a significant proportion of the population who holds private health insurance (Stavrunova and Yerokhin, 2011).

A key policy concern with long waiting times is that they do not only deter access, but they can ultimately worsen health outcomes, which could also further increase healthcare utilisation. Moscelli et al. (2016a) find no evidence that waiting times in England are associated with higher in-hospital mortality for coronary bypass but they find a weak association between waiting times and emergency readmission following a surgery. Nikolova et al. (2016) find that long waits in England reduce health-related quality of life for hip and knee replacement patients, as measured by patient-reported outcome measure, but no effect was found for varicose veins and inguinal hernia. Godøy et al. (2024) show that in Norway long waiting times for orthopaedic surgery do not increase healthcare utilisation (e.g., due to worsened health status) but have persistent reductions in labour supply through an increase in work absences and permanent disability receipt. An econometric concern in estimating the relation between waiting times and outcomes is an omitted variable due to unobserved patient characteristics if, for example, more urgent patients are both prioritised on the waiting list and have worse health outcomes, which can be addressed through an instrumental variable approach based on measures of congestion (Godøy et al., 2024).

Several policies have been introduced to reduce waiting times. The most common policy is to introduce maximum waiting time guarantees, which can be used as a performance indicator for providers (OECD, 2013). Propper et al. (2008a, 2010) use difference-in-difference methods with Scotland as a control group to show that the introduction of maximum waiting time targets in England combined with tough penalties for providers not adhering to these targets reduced waiting times significantly without affecting quality proxied by thirty-day mortality.

A second common policy is to stimulate provider competition. Propper et al. (2008b) show that the introduction of internal markets in England which involved splitting purchasers and providers of health services reduced waiting times, but this came at the cost of poorer quality as proxied by higher heart attack mortality. Ge et al. (2024) show instead that the introduction of patient choice which was intended to stimulate competition across providers did not affect waiting times and volume of visits in Norway. Another policy to reduce waiting times is to encourage individuals to hold private health insurance (e.g., through tax rebates), which in turn could reduce demand for public health care and reduce waiting times. Yang et al. (2024) show that in Australia, where about 45% of the population held private health insurance in 2022, increasing coverage by one percentage point has only a small reduction in waiting times (0.34 days). To address possible reverse causality and omitted variable bias they use an instrumental variable approach based on average house prices, which correlates with income and wealth.

With given capacity, one policy to minimise the total disutility from waiting is to enhance waiting time prioritisation, which involves reducing waiting times for patients with higher urgency, need and severity and increasing waiting times for those with lower urgency, need and severity (Gravelle and Siciliani, 2008). Waiting times differ systematically across treatments with waiting times for more urgent procedures (such as coronary bypass) being substantially lower than less urgent ones (such as hip and knee replacement, or cataract) across different OECD countries (OECD, 2013). Gutacker et al. (2016a) show that prioritisation for a given treatment is limited: patients with higher pain and reduced mobility while waiting for a hip replacement in England wait only a few days less than patients with lower pain and higher mobility. Askildsen et al. (2010) show that the introduction of the maximum recommended waiting time in Norway that could differ by health condition did not appear to improve prioritisation. Moreover, there is some evidence of mis-prioritisation with patients with lower socioeconomic status waiting longer for publicly funded care than patients with higher socioeconomic status in England (Laudicella

et al., 2012; Moscelli et al., 2018c), Norway (Kaarboe and Carlsen, 2014; Monstad et al., 2014) and Australia (Johar et al., 2013; Sharma et al., 2013).

2.6 Public Health Insurance Expansion in Low- and Middle-Income Countries

Several low- and middle-income countries have expanded public health insurance to cover segments of the population who were uninsured, often individuals working in the informal sector. This has been achieved by either introducing universal schemes or schemes targeting the poor. Policy objectives included improving access to care and reducing out-of-pocket and catastrophic payments.

One example is the universal public health insurance scheme that was introduced in 2001 in Thailand and extended coverage to eighteen million uninsured citizens (about a fourth of the population). This was combined with supply-side policy measures, such as gatekeeping of primary care and capitation-based budgets, to ensure additional public health spending was cost-effective (Limwattananon et al., 2015). Before the reform, tax-financed public insurance covered the poor, children, elderly and disabled, which comprised 32% of the population. 21% of the population was covered by private health insurance that was subsidised by the government. Civil servants were also covered by insurance. Using a difference-in-different design with public sector employees as the control group, Limwattananon et al. (2015) find that individuals covered by public insurance, mostly workers in the informal sector, experienced reductions in out-of-pocket payments by 28% on average, and by 42% at the 95th percentile of the health spending distribution.

Public health insurance can affect both utilisation and out-of-pocket payments, but the effect can vary depending on the country. Bauhoff et al. (2011) evaluate the impact of expanding health insurance for the poor in Georgia. Using a regression-discontinuity design based on an eligibility threshold, they find that public insurance for the poor reduced out-of-pocket spending for outpatients and inpatient care but did not affect utilisation.

Sparrow et al. (2013) evaluated the effect of introducing a new social insurance scheme for the poor in Indonesia where formal insurance coverage was limited due to many people working in the informal sector, about 60% of the labour force. In this case, the study found that outpatient utilisation improved but that out-of-pocket spending did not decrease, which can be explained by the complementarity between care covered by insurance and additional care demanded that was not covered. Bernal et al. (2017) evaluate the effect of a policy in Peru that introduced health insurance for the poor aimed at

individuals outside the formal labour market. Using a regression discontinuity design based on eligibility criteria, the study found an increase in several measures of curative care, such as the likelihood of receiving medicines, a medical analysis being performed, a visit to a hospital, and receiving surgery. However, out-of-pocket spending increased, and this was due to higher consumption of medicines, hospital visits or surgeries not covered by the insurance scheme, and more awareness of their health needs.

Only a few studies are able to assess the effect of public health insurance on health outcomes. Chen et al. (2007) evaluate the introduction of National Health Insurance in Taiwan in 1995, which increased population coverage from 55% to 92%. Using a difference-in-differences approach the study did not find significant effects on mortality for the previously uninsured elderly after the reform. However, Chang (2012) provides evidence of reduced mortality rates for this group by using more extensive data. Lee et al. (2010) also identify substantial reductions in mortality for deaths considered amenable to health care, particularly among the young and old. Similarly, Keng and Sheu (2013) find significant reductions in mortality rates for the elderly, in particular for women. They also examined the effects on functional limitations and self-assessed health and found that these did not significantly improve. Finally, Chou et al. (2014) used government employees who had insurance prior to the reform as a control group in a difference-in-difference analysis. National Health Insurance improved coverage for both industrial private-sector workers and farmers, the latter being characterised by lower levels of health, education, and income and low-weight infants in worse health than other infants. The study finds that the postneonatal mortality rate of infants born in farm households decreased but there is no effect on infants born in private-sector households. The findings indicate that health insurance enhances infant health outcomes among population subgroups with low levels of education, income, and overall health.

3 Provision of Health Care

This section covers several issues related to incentives of primary and secondary care providers with a focus on quality and efficiency. It first discusses different reimbursement mechanisms that have been traditionally adopted across OECD countries to reimburse providers that treat publicly funded patients. These include activity-based financing, cost reimbursement, capitation and fee for service, and the effect they have on provider behaviour (Section 3.1). It then discusses a more recent development in financing known as Pay for

Performance, which aims at paying directly for dimensions of quality (Section 3.2).

Provider behaviour can be affected not only by financial incentives but also by the market structure in which providers operate. We therefore review the literature on provider competition and patient choice and the effect that it can have on quality and efficiency (Section 3.3). The effect of provider competition is connected to reimbursement mechanisms. For example, reforms that have introduced provider competition have done so in combination with activity-based financing based on the idea that providers that increase quality are rewarded with higher revenues.

Although many countries rely on public health insurance, health systems can rely on public and private providers. Private providers can be non-profit or for-profit, and the mix of providers can differ substantially across countries. Ownership status in turn can affect the way providers take decisions and impact quality and efficiency (Section 3.4).

Last, the increase in the number of multimorbidity patients driven by an ageing population has stimulated policy reforms that encourage the integration of care within the health sector and between the health and other sectors with the aim of improving coordination of care and patient experience (Section 3.5). Integrated care can be seen as an alternative to competition, or can coexist with competition if providers compete to offer integrated packages. A key issue is how to pay for integrated care and several countries have experimented with bundled payments covering several types of care under one reimbursement tariff.

3.1 Financial Incentives and Provider Behaviour

Within secondary care, payment systems based on fixed tariffs have become the dominant model to reimburse hospitals across OECD countries. In the early eighties, Medicare in the US introduced the Diagnosis Related Groups (DRG) system. The idea was that hospitals should be reimbursed a fixed tariff for treating a patient within a given diagnosis or treatment. DRG tariffs are commonly set to reflect past average costs with a lag of one or two years. The DRG system was then adopted in many European countries (such as France, Germany, Italy, Norway, Spain, and the UK) and other high-income countries (e.g., Canada, Australia). In some countries, the change in the reimbursement system was motivated by concerns over rapid health expenditure growth or broader efficiency considerations.

For countries starting with a fee-for-service or cost reimbursement system (e.g., US, France, and Germany), the introduction of a tariff-based reimbursement system should theoretically induce providers to contain costs within

a given treatment (Ellis and McGuire, 1986). For countries where providers were reimbursed with a fixed annual budget (e.g., in the UK), moving towards an activity-based payment can induce providers to increase volume (Chalkley and Malcomson, 1998a) while maintaining incentives to keep costs down. One possible concern with a DRG tariff system is that it will induce providers to skimp on quality to save costs and increase profits. However, if patient demand responds to quality, then providers have an incentive to compete on quality to attract patients and increase revenues (Ma, 1994).

DRG reimbursement systems have been refined over time. Given that one diagnosis can be associated with several treatments, tariffs have been increasingly split to reflect the cost of each treatment. For example, a patient with cardiovascular disease could be treated with a less expensive medical treatment (e.g., beta blocker) or with a more invasive one such as a coronary bypass (McClellan, 1997). This introduces a financial incentive that induces the provider to recommend a more intensive treatment, leading to higher reimbursement and health spending (Hafsteinsdottir and Siciliani, 2010). The provision of more intensive treatment can mitigate the reductions in costs that the DRG system intended to promote. Another concern with a DRG reimbursement system is that it gives a financial incentive to avoid more complex patients (Ellis and McGuire, 1990; Kifmann and Siciliani, 2017) when these patients would instead benefit from treatment. Similarly, there are concerns that the DRG reimbursement system could lead to upcoding or, more broadly, gaming. Given that reimbursement rules are complex, such complexity can be used by the provider to allocate patients to the most remunerative tariffs (upcoding). Other forms of gaming or manipulation include billing services that were not delivered, and splitting or unbundling of a treatment episode into separate ones which lead to additional reimbursement (Kuhn and Siciliani, 2009).

Most countries reimburse providers either based on a DRG system, costs or through fixed budgets. Mixed reimbursement rules are less frequent but possible. One example is Norway, where a mixed payment system is used. The DRG tariff is decided every year and has been varying between 40% and 60% of the average cost. Hospitals also received a block grant component to cover the remaining costs (Brekke and Straume, 2017). Mixed payment systems can be theoretically appealing. While a full DRG-based reimbursement system could give excessive incentives to increase volume and a fixed budget would give weak incentives, a mixed payment system can balance these two concerns (Ellis and McGuire, 1986). In England, there has also been a move away from Healthcare Resource Groups (the English version of DRGs) towards a 'blended' (mixed) payment where, for example, services for Accidents and Emergencies, have about 30% of their costs reimbursed.

The design of reimbursement mechanisms for primary care providers in publicly funded systems faces similar challenges to those identified for secondary care. The institutional details however differ. Primary care providers in several European countries have been reimbursed either by capitation mechanisms, fee for service or a mix of capitation and fee for service. Under capitation, the primary care doctor or organisation receives a fixed payment for each person registered in the practice, which is often risk-adjusted (e.g., in England). Under a fee-for-service system, primary care physicians are reimbursed a fee for each visit (e.g., in France, Belgium). Some countries use a mixed system combining fee-for-service for each visit with a capitation payment (e.g., Denmark and Norway). Depending on the institutional setting, primary care providers can work in solo practices or larger organisations where GPs are employed by larger primary care practices. One concern with capitation is that providers may skimp on quality or services because reimbursement does not vary with the care provided. However, this concern can in theory be mitigated if patients have free choice of primary care provider and providers compete on quality to attract patients and increase revenues. In contrast, fee-for-service systems could incentivise excessive visits and lead to unnecessary treatments.

Several empirical studies have tested the effects of introducing or changing a DRG reimbursement system. The findings are generally mixed. DRG systems affect incentives on the utilisation of health care, while an effect on quality is more difficult to detect. Using difference-in-differences methods, Dafny (2005) exploits an exogenous change in hospital tariffs within the US Medicare program. The prospective payment eliminated DRGs that related to the patient's age (e.g., the patient is older than seventy years), which effectively led to an increase in the tariff for about half of the DRGs, while the remaining were unaffected For the DRGs in the treatment group, the tariff increased by about 12%, while it remained the same in the DRGs in the control group. The study found that the increases in tariff did not increase quality. However, it let to upcoding in the form of a higher proportion of young patients who were coded as having complications. The upcoding effect was stronger in for-profit hospitals than in non-profit ones.

Farrar et al. (2009) investigate the introduction of Healthcare Resource Groups (HRG) in England. The HRG system replaced a reimbursement scheme where hospitals were allocated an annual fixed budget with a marginal revenue for additional treatments of zero. The study uses difference-in-difference methods with Scotland as the control group. It finds that the introduction of a DRG tariff in England had no effect on quality (mortality and readmissions) but improved efficiency by accelerating growth in volume, reducing the length of stay, and increasing the proportion of patients admitted as day cases.

Batty and Ippolito (2017) investigate the effect of State laws in California in the US that limited how much hospitals could charge uninsured patients, also known as 'fair pricing' laws. The reform in 2007 implied a reduction in the tariff received by hospitals for uninsured patients by 25–30% from 2007/8 in California. Using a difference-in-differences design with other US states as the control group, the study finds that length of stay reduced by up to 0.3 days or 7.3%. There was no effect on quality as measured by avoidable mortality and incidence of preventable in-hospital complications.

Shin (2019) exploits an exogenous shock in the DRG tariff that was generated by a change in the definition of urban and rural areas. In 2005 Medicare prospective payment system changed its definition of payment areas from the Metropolitan Statistical Areas to the Core-Based Statistical Areas generating substantial exogenous area-specific tariff shocks. The areas that were originally rural received a higher tariff when they were redefined as urban areas. The study shows that the DRG tariff increase had no effect on the volume of admissions, treatment intensity, and quality of care.

Some studies investigate the effect of relative tariff changes within a diagnosis with multiple treatments. Foo et al. (2017) investigate the effect of tariff changes in California on the probability of a caesarean delivery. The study shows that an increase in hospital tariff difference between caesarean section and vaginal birth by one standard deviation ($5,805 in 2004–2011) increases the probability of a caesarean section by 31%. Papanicolas and McGuire (2015) focus on hip replacement surgery in England. The study examines the change in the difference in hospital tariff reimbursement between uncemented and cemented hip replacement. Using Scotland as a control group, where the tariff was the same across both types of surgery, it finds that the proportion of uncemented procedures increases by 20 percentage points.

Januleviciute et al. (2016) exploit variations in DRG tariffs in Norway in 2003–2007 created by the changes in national average past treatment cost. Using fixed-effect models, the study shows that a 10% increase in tariff leads to 0.8–1.3% increase in the volume of patients treated for medical DRGs but does not affect the volume for surgical DRGs. The study also provides evidence of upcoding. A 10% increase in the tariff ratio between patients with and without complications increases the proportion of patients coded with complications by 0.3–0.4 percentage points.

Overall, these studies suggest that financial incentives do affect provider behaviour in particular in relation to healthcare utilisation as measured by volume and length of stay. The effects on quality are more difficult to detect. The empirical evidence also highlights that DRG reimbursement mechanisms can have unintended effects in the form of upcoding patients in more remunerative groups.

3.2 Pay for Performance

Traditional reimbursement systems based on activity-based payments have limitations because they ultimately do not reward directly what matters to patients, which is improvements in health. A relatively recent policy development is the introduction of pay-for-performance (P4P) schemes that incentivise quality improvements directly, which has been facilitated by information systems that routinely record patient records.

We can identify two main types of P4P schemes that encourage improvements in quality. The first type links financial incentives to measures of health, such as mortality, readmission rates or patient-reported health outcome measures. The second type links financial incentives to process measures of quality. Examples of schemes that incentivise reductions in mortality are the US Premier Hospital Quality Incentive Demonstration in 2003 (Werner et al., 2011), Hospital Value-Based Purchasing in 2012, and Advancing Quality in 2008 in England (Sutton et al., 2012). These focus on specific conditions and procedures such as heart failure, acute myocardial infarction, stroke, hip fracture, pneumonia, and coronary bypass where the mortality rate is relatively high. Mortality rates can be measured as in-hospital mortality or as thirty-day mortality. The latter is arguably a better indicator as low-quality care can affect mortality also after the patient has been discharged from the hospital, which is instead not captured by in-hospital mortality.

Many treatments have negligible or very low mortality risk. For these treatments, a second common indicator is twenty-eight-day emergency readmission rates, which measures whether the patient is readmitted to the originating or some other hospitals following hospital discharge. Examples include elective (non-emergency) hip and knee replacement, where mortality is negligible. Readmissions are also collected for emergency care, as for mortality, and examples include again heart failure, stroke, hip fracture and pneumonia. One scheme that incentivised reductions in readmission rates is the Hospital Readmission Reduction Programme introduced by Medicare (Mellor et al., 2017).

The main advantage of using mortality and readmission rates is that they are routinely collected and therefore easily available. To ensure meaningful comparability across providers, however, these indicators need to be risk-adjusted to control for differences in patients' casemix. The presence of significant unobserved severity would invalidate any comparison across providers.

The use of emergency readmission rates for conditions where the mortality rate is high can also be problematic. This is because providers with high quality that achieve lower mortality are likely to have more severe patients who survive who in turn are more likely to be readmitted as an emergency. This can generate

a bias in the measure of readmission rates, as hospitals with high readmission rates could be those with higher quality and lower mortality. Laudicella et al. (2013) show that readmission rates can suffer from mortality selection bias using data from England for patients who were admitted in an emergency for a fractured hip (see Lisi et al., 2020, for a theoretical analysis).

One limitation of both mortality and readmission indicators is that they only capture health at the lower end of the health distribution, and they are not necessarily representative of the average patient experience. This can be addressed by the collection of Patient-Reported (health) Outcome Measures (PROMS). For example, in England since 2009, PROMS data have been collected for hip replacement, knee replacement, hernia and varicose veins (though data collection for the last two has been discontinued). Health measures are collected both before and six months after the surgery, which allows to compute the average health gain at the provider level (also risk-adjusted for patient characteristics). Health is measured both with the EQ-5D and procedure-specific indicators such as the Oxford hip and knee score that measure different dimensions of pain and patient mobility.

One criticism to P4P based on the measures of health, such as mortality, readmissions, and PROMS, is that health outcomes depend not only on the quality of care provided by physicians but also on patient engagement with their own care (for example, physiotherapy and physical rehabilitation, or lifestyle choices). Therefore, lack of performance is not directly attributable to healthcare providers. A second type of indicator that addresses this issue is the use of process measures of quality that are under more direct control of the provider. Two examples from England are the Best Practice Tariff for stroke and hip fracture patients. For stroke, three dimensions of care were financially incentivised: whether the patient has rapid brain imaging, whether the patient is admitted to an acute stroke unit, and if the patient requires the medicine alteplase (if clinically appropriate to dissolve blood clots) (Kristensen et al., 2016). For hip fracture, providers received a bonus (of about £1350 in 2013) if all these nine processes were provided: surgery within thirty-six hours; shared care by surgeon and geriatrician; care protocol agreed by geriatrician, surgeon and anaesthetist; preoperative cognitive function assessment; postoperative cognitive function assessment; perioperative assessment by geriatrician; geriatrician-led multidisciplinary rehabilitation; secondary prevention including falls; bone health assessment.

Pay for performance has also been applied in the context of primary care. A notable example is the Quality and Outcome Framework in England which in 2004 introduced a scheme which incentivised quality based on 146 indicators that led to an increase in revenues for GPs by 28% in two years (Sutton et al., 2010). The indicators were organised around disease areas (such as diabetes,

coronary heart disease, hypertension) and incentivised the proportion of primary care patients registered in the GP practice that had their blood pressure and cholesterol checked, and their body mass index for diabetes or similar indicators for other conditions.

Economic theory has highlighted several potential issues arising when using P4P schemes. A common concern with P4P is that it causes tunnel vision. Consider a multitasking framework, where some dimensions of quality are contracted for while others are not. Then, financially incentivising some dimensions of quality may improve performance in the dimensions that are contracted but reduce performance in the dimensions of quality that are not contracted (Holmstrom and Milgrom, 1991; Eggleston, 2005). The extent to which P4P crowds out non-contracted dimensions of quality depends on the degree of substitution in provider costs or in patient health benefits between different quality dimensions (Kaarboe and Siciliani, 2011). The presence of cost or benefit substitution between quality dimensions generally reduces the power of the incentive scheme and the extent to which they should be used to incentivise quality. Another common criticism to P4P is that financial incentives may crowd out intrinsic motivation or altruism (Siciliani, 2009). Last, P4P could induce providers to game the performance indicators depending on the complexity of their design (Kuhn and Siciliani, 2009).

Several empirical studies have assessed the effects of introducing P4P in the health sector. For example, Gupta (2021) investigates the effect of the introduction of the Hospital Readmission Reduction Programme which financially penalised hospitals whose risk-adjusted readmission rates were above the average. The penalties were about 5% of the revenues for the conditions included in the scheme (heart attack, heart failure and pneumonia). Using a difference-in-difference design, where hospitals whose readmission rates are below the average are used as a control group, the study finds that the penalty scheme reduced readmission rates by one percentage point or 5% and also reduced one-year mortality, which was not incentivised, by 0.5 percentage points or 2%. However, part of the reduction in emergency readmissions was due to hospitals having changed their admission protocols at the emergency departments though such reductions had no harmful effect on the affected patients.

A different study compares whether performance should be measured with health outcomes or with process measures of quality. Mohanan et al. (2021) conduct a field experiment in Karnakata, a rural area in India, where private obstetric care providers were randomised in three groups, a control group, a treatment group that rewards health outcomes, and another that rewards process measures of quality. Health outcomes are measured through postpartum haemorrhage, sepsis, preeclampsia, and neonatal death. Instead, process

measures of quality are measured through pregnancy care, childbirth care, counselling for postnatal maternal care, newborn care, and counselling for postnatal newborn care. The study finds that providers contracted with a P4P scheme both achieved similar levels of improvements in maternal health. However, the contract payment was substantially smaller for the P4P scheme that rewarded process measures of quality.

Sutton et al. (2010) investigate the extent to which the introduction of the Quality and Outcome Framework for primary care in England affects process measures of quality that were not financially incentivised by the P4P scheme. The study finds that there was no evidence of effort diversion and that instead there was some evidence of positive spillovers onto unincentivised factors for groups of patients that were targeted by the scheme. Gravelle et al. (2010) provide evidence that the same incentive scheme induced some gaming of the performance indicators, as measured by the number of 'exception' reports which affected the number of eligible patients in the denominator of the performance indicators.

Several reviews have summarised the existing evidence on the effectiveness of P4P in the health sector. Within the hospital sector, Cashin et al. (2014) suggest that providers respond only to a small extent to such incentive schemes. Mendelson et al. (2017) find that the largest improvements are concentrated in providers whose baseline performance is lower, but that consistent positive associations with improved health have not been demonstrated. For ambulatory care, there is more consistent evidence that process measures of care have improved. Milstein and Schreyogg (2016) suggest that P4P schemes across OECD countries are highly heterogeneous in design, and that some of the moderate positive effects are also due to public reporting and increased awareness of data recording rather than financial incentives.

One possible explanation for the mixed findings so far is that, with few exceptions, the payments made to reward higher quality (or to penalise lower quality) are still relatively small, often below 5% of the revenues. The small payments may be the result of multitasking concerns and are consistent with the theory which suggests that the power of the incentive scheme should be low-powered when qualities are substitutes (Holmstrom and Milgrom, 1991). But the small payments may also be the reason for the small take up in quality. One possible solution is to ensure that performance indicators have broader coverage of key areas of care based on best practices and available empirical evidence. In those cases, there may be a stronger rationale for increasing the size of the bonus as suggested for example by Kristensen et al. (2016) in relation to a P4P scheme on stroke patients which covered all key dimensions of validated process measures of quality.

Most P4P schemes have a focus on improving quality. Some P4P schemes instead aim at incentivising efficiency. In England, one Best Practice Tariff gave a bonus payment in 2010 if patients were admitted to hospitals as day case treatment or as day surgery therefore avoiding a more expensive overnight hospital admission. The scheme selected thirty-two treatments that were previously identified by the British Association for Day surgery and the British Association for Ambulatory Emergency Care. Using difference-in-difference and synthetic control methods, Gaughan et al. (2019) found that the policy had a positive impact only on fourteen out of the thirty-two treatments, and had no effect on the others. Kreutzberg et al. (2023) show that due to the pressure to reduce health spending, thirteen OECD countries are implementing financial incentive schemes to encourage an increase in the proportion of day surgeries.

3.3 Provider Competition and Patient Choice

Provider competition is a systemic feature of health systems across several OECD countries. In countries such as Germany, France, Italy and the US, hospitals compete on quality to attract patients and increase provider revenues. Other countries, such as England and Norway, had historically limited patient choice and competition but over time have introduced a series of reforms that allowed patient choice with the purpose of stimulating provider competition (Siciliani et al., 2022). In England, a payer-driven competition was introduced with the 1990 NHS internal market reforms. Public hospitals became NHS Trusts which competed for contracts with NHS purchasers. In 2006, patient choice was introduced with the patient being offered a choice of at least four providers, and then expanded in 2008 to choice of any qualified provider. Patient choice was further supported by public reporting of a range of clinical quality measures, such as risk-adjusted mortality, and indicators related to patient experience, such as cleanliness or user rating.

The policy motivation behind introducing or facilitating provider competition is that it will improve the quality of care. The idea is that if providers are reimbursed through activity-based financing (e.g., based on Diagnosis Related Groups) and patients can freely choose the provider based on quality considerations, then providers will have a stronger incentive to invest in quality to attract patients and increase revenues. Economic theory suggests that competition increases quality when tariffs are fixed, the marginal cost of treating patients is constant and providers are profit-oriented. A higher price mark-up (DRG tariff minus treatment costs) and a higher responsiveness of demand to quality strengthen the incentive to compete and increase quality (Gaynor, 2007).

The theoretical predictions of the effect of competition on quality are instead ambiguous in the presence of capacity constraints that feature several publicly funded health systems and when providers are altruistic and their objective function contains patient health and quality in addition to profit considerations. If the marginal treatment costs increase in volume, for example, due to capacity constraints, and providers work at a negative profit margin due to altruistic considerations, then more competition could reduce quality as effectively providers compete to avoid rather than to attract additional patients. If the profit margin is negative, then hospitals make more losses by attracting additional patients, which weakens the incentive to compete on quality (Brekke et al., 2011a).

Several empirical studies have tested the effect of competition on quality. Using an instrumental variable approach, Bloom et al. (2015) show that more competition across providers, as measured by the number of public hospitals within a catchment area, enhances quality, as measured by are reduction of heart attack mortality, and that this driven by better quality of the management of the hospital. One additional hospital reduces mortality by 1.5 percentage points. To address possible omitted variable bias, the number of hospitals is instrumented with a measure of political marginality, the idea being that constituencies where political parties are closer to a winning margin, they are less likely to close hospitals because it is politically unpopular.

Using quasi-difference-in-differences methods, several studies have exploited the expansion of patient choice in 2006 (Cooper, 2011; Gaynor et al., 2013). They test whether hospitals in areas with more providers, therefore facing more competition by other providers, improved health outcomes more quickly when the patient choice policy was expanded relative to areas with fewer hospitals. An increase in competition by 10% reduces heart attack mortality by 2.9%. Using similar methods, Moscelli et al. (2018a) found that competition also reduced hip fracture mortality, in addition to heart attack mortality, but had no effect on stroke mortality. These studies use health outcomes for emergency conditions, such as heart attacks, as a proxy for quality to mitigate possible selection concerns due to unobserved dimensions of severity. If more severe patients choose hospitals with higher quality, hospitals in more competitive areas may have a higher mortality and appear to be of lower quality while this reflects a higher patient severity.

Moscelli et al. (2021) focus on non-emergency treatments, and deal with possible unobserved severity through a two-stage residual inclusion approach. Using a similar difference-in-difference approach, the study finds that competition had no effect on thirty-day mortality for patients in need of coronary artery bypass grafting (CABG) and it increased readmission rates (lower quality) for

patients who had hip and knee replacement surgery. Cooper et al. (2018) provide evidence that competition by private providers treating publicly funded patients increases efficiency, as measured by a reduction in the preoperative length of stay for patients having hip and knee replacements, though private providers treated healthier patients leaving the sicker patients to the public hospitals. Earlier studies in England found that competition increased heart attack mortality when the tariffs paid by the purchasers to the hospitals were not fixed but negotiated with health authorities (Propper et al., 2004, 2008b), and reduced waiting times (Propper et al., 2008b) in the 1990s. This can be explained by purchasers negotiating with hospitals mostly on price and waiting times, while clinical quality indicators were not available. Therefore, competition reduced clinical quality.

The evidence from other European countries is mixed. In the Netherlands, where tariffs are negotiated for some non-emergency treatments, Roos et al. (2020) find that price deregulation in a competitive environment (where hospitals are located close to several other hospitals) did not affect quality as measured by readmission rates for hip replacement patients. In Italy, Berta et al. (2016) find that competition did not affect quality as measured by mortality and readmission rates for coronary bypass.

In Norway, Brekke et al. (2021) use a similar identification strategy as in Gaynor et al. (2013) and find that following the 2001 choice reform, hospitals facing a more competitive environment (as measured by more providers in the hospital catchment area) had lower heart attack mortality rates relative to hospitals facing a less competitive environment, but no effect was found for stroke mortality. The study also finds that exposure to competition reduces all-cause mortality and shortens the length of stay, but increases readmissions, though these effects are small in magnitude. In France, Or et al. (2022) focus on surgical procedures for breast cancer (breast reconstruction after mastectomy and sentinel lymph node biopsy) and find that the likelihood of receiving these procedures is higher in hospitals located in more competitive areas.

There are several studies from the US investigating the effect of hospital competition for publicly funded patients covered by Medicare and Medicaid. A first seminal study by Kessler and McClellan (2000) suggests that competition reduced heart attack mortality and costs after a DRG system was introduced in 1983. It reduced mortality but increased costs when hospitals were reimbursed through a fee-for-service reimbursement system. Kessler and Geppert (2005) confirm that competition increases quality but suggest that this is concentrated in patients with high severity. Gowrisankaran and Town (2003) instead found that competition is associated with higher mortality for heart attack and pneumonia.

One premise for provider competition to work is that demand responds to quality. By increasing quality, the provider can attract more patients and increase revenues. The literature reviewed earlier in this section has investigated how competition affects quality. A different empirical literature has instead tested whether higher quality affects the choice of provider. This empirical approach uses conditional logit models or mixed logit models (Gaynor et al., 2016). It involves modelling individual patient choice of one provider versus other providers in the patient choice set as a function of providers' quality and the distance between each patient's place of residence and the location of the provider. The idea is that patients have a preference for both higher quality and shorter distances, and there is a trade-off between different hospital attributes.

There are several mechanisms through which quality can affect demand. The first is through word of mouth. Some hospitals develop a reputation for being of high quality, and this is communicated informally through verbal communication within social networks. The second mechanism is directed through primary care providers. In many health systems, primary care doctors act as gatekeepers and patients are required a referral from the GP to access specialist care. Primary care doctors can advise and direct patients towards providers with higher quality of care. The third mechanism is through public reporting. Health systems are increasingly keen to provide quality indicators in the public domain, which reduces search costs for patients.

Several empirical studies have investigated the effect of quality on patient choice across a range of health conditions and treatments. Gaynor et al. (2016) show that, following the introduction of patient choice reforms in 2006 in England, patients having coronary artery bypass grafting were more likely to choose hospitals with lower mortality rates. They found an elasticity of −0.05, suggesting that a 10% increase in mortality rates reduces demand by −0.5%, and that this elasticity does not differ for patients with different socioeconomic status. Patients with comorbidities instead have a higher elasticity (in absolute value) of around −0.1, which is consistent with more severe patients being more willing to travel further to avoid higher mortality.

Gutacker et al. (2016b) and Moscelli et al. (2016b) focus on hip replacement in England and show that patients were more likely to choose hospitals with greater health gains, as measured by patient-reported outcome measures (PROMs), and lower readmission rates. The study finds that a one standard deviation increase in quality, measured by PROMS, increases demand by 9.8%, and that the willingness to travel further for the same increase in quality is 1.4 kilometres (9% of the average distance travelled). Beckert et al. (2012) also focus on hip replacement and show that patients are less likely to choose

hospitals with higher overall mortality rates (across all treatments within a hospital) and higher methicillin-resistant Staphylococcus aureus (MRSA) infection rates. Overall, these studies suggest that proximity to the provider remains the most important driver of patient choice, but quality considerations are also taken into account. As a result, the demand is relatively inelastic to quality.

In Germany, there is evidence that expectant mothers are willing to travel to give birth in maternity clinics with higher reported quality as measured by clinical indicators and satisfaction scores (Avdic et al., 2019). Kuklinski et al. (2021) show that colorectal resection patients are willing to travel longer for specialised hospitals. Patients in need of knee replacement travel longer to hospitals with better service quality and higher volume.

In the Netherlands, Varkevisser et al. (2012) provide evidence that patients having angioplasty are more likely to choose hospitals with a good (overall and cardiology) reputation and low heart-failure readmissions. Beukers et al. (2014) show that the choice of hospital for hip replacements is affected by information provided in the public domain on hospital waiting times and a reputation index.

In Norway, Brekke et al. (2018) show that half of patients bypassing their local hospital do so under their own initiative (as opposed to, for example, the GP's initiative), and the effect is reinforced for patients with higher educational attainment. In Italy, Bruni et al. (2021) find that patients in need of angioplasty are willing to travel further to reduce waiting times and avoid higher mortality, with stronger effects of quality for more severe patients. These general findings are also consistent with studies from the US (reviewed, e.g., in Gaynor and Town, 2011).

The studies reviewed so far focus on hospital care. There is less empirical evidence of patient choice within the context of primary care, possibly due to the difficulty of accessing data at the patient level and collecting quality indicators for primary care providers. One exception is Santos et al. (2017) who use data from the Quality and Outcome Framework in England. They find that one standard deviation increase in clinical quality would increase primary care practice size by around 17%.

3.4 Public, Private Non-profit and Private for-profit Hospitals

Countries differ significantly in the mix of public and private providers treating publicly funded patients. For example, in Germany, about 30% of hospitals are public, 35% are private non-profit hospitals and 35% are private for-profit hospitals. In France, private hospitals provide 60% of surgical treatments. In Italy, the mix between public and private providers can differ significantly across regions. Provision is instead dominated by public hospitals in England and Norway, though the proportion of patients treated by private providers has

steadily increased. All hospitals are mandated to be private non-profit in the Netherlands (Siciliani et al., 2022).

This diversity in the mix between public and private (for-profit and non-profit) providers raises the question of whether one type of provision is better than the other in relation to key domains such as quality and efficiency. Economic theory has clear-cut predictions in relation to incentives towards cost containment. Private providers have stronger incentives to contain costs because any reduction in costs will translate into higher profits. Conversely, public providers have weaker incentives to contain costs if profits cannot be redistributed or if providers have a soft budget constraint where the payer can cover deficits or confiscate surpluses (Brekke et al., 2012, 2015a). On the other hand, public hospitals may experience larger excess demand and may also have an obligation to treat all the patients referred to public hospitals, which in turn could increase efficiency.

The theoretical predictions in relation to quality of care are less clear-cut. On the one hand, private providers may skimp on quality to increase profits. On the other hand, if demand responds to quality, private providers may compete more aggressively on quality to attract patients and increase revenues (Sloan, 2000; Glaeser and Shleifer, 2001; Brekke et al., 2012). Moreover, non-profit providers may attract more altruistic or motivated doctors relative to for-profit ones, which can contribute to higher quality. One common policy concern with the provision by private providers is that they will cream-skim less complex patients. Given that hospitals are commonly reimbursed by a fixed tariff system, private providers have a financial incentive to treat less complex patients and avoid the more costly ones.

There is extensive empirical evidence that has tested for differences in quality, efficiency and casemix between public and private providers. Given that hospital status tends to be time-invariant, the evidence is mostly cross-sectional in nature. The meta-analysis by Eggleston et al. (2008) reviewed thirty-one studies since 1990 in the US. It suggested that whether for-profit hospitals provide higher quality than non-profit ones depends on specific contexts such as the region, the data source, and the period of analysis, though as a whole quality seems to be lower among for-profit hospitals.

There are also several cross-sectional studies from other high-income countries. For example, Milcent (2005) shows that in France public and private not-for-profit hospitals did not differ in heart attack mortality, while private for-profit hospitals had lower heart attack mortality. At the time of the study, private hospitals were paid by fee-for-service, while public and private not-for-profit hospitals were subject to a global budget. Jensen et al. (2009) also show that in

Australia private hospitals had lower readmission and mortality rates for patients who had their *first* heart attack.

One possible methodological concern with cross-sectional models is that some dimensions of the patient's severity remain unobservable to the researcher and that more severe patients are more likely to choose hospitals with higher quality. To address this concern, Lien et al. (2008) employed an instrumental-variable approach. Whether the patient is treated by a public or private provider is instrumented with the distance between the patient's residence and the location of the closest public and private hospital. Using data from Taiwan, the study finds that public and non-profit hospitals have higher quality, measured by one-month or twelve-month mortality rates for stroke and cardiac treatment.

Moscelli et al. (2018b) use a similar approach to compare thirty-day emergency readmission rates for public and private providers that provided 133 commonly planned treatments in 2013–2014. The study finds no differences between public and private hospitals in emergency readmissions after controlling for unobserved patient severity. Using also an instrumental variable approach based on distance, Moscone et al. (2020) test for differences between public and private hospitals in Italy (Lombardy) for both emergency and planned care. They find that public and private hospitals do not differ in stroke and hip fracture mortality, mortality for coronary bypass and readmissions for knee replacement. Private hospitals have lower heart attack mortality but higher readmissions for hip replacement. Only a few studies go beyond mortality and readmission rates to measure quality. Pérotin et al. (2013) use a switching regression framework and find no differences in patient satisfaction between public and private providers in England. Chard et al. (2011) compare private and public hospitals in England and find that private hospitals have better patient-reported outcomes for hip and knee replacements, but similar outcomes for varicose veins and hernia surgery.

Although hospital status is generally time-invariant, hospitals can change status for example by converting from private for-profit to private non-profit or the other way around. Some studies in the US have employed a panel-data approach to test whether changes in hospital status affect quality while controlling for unobserved time-invariant factors. Shen (2002) finds that hospitals that changed status from non-profit to for-profit have higher heart attack mortality. Instead, there was no evidence of differences in quality for hospitals that converted from public (government) hospitals or for-profit hospitals to non-profit hospitals. Neither was there an effect for non-profit or for-profit hospitals that converted to public hospitals.

Although most of the recent literature has focused on differences in quality, there is also extensive evidence comparing efficiency between public and private providers using either a production function or a cost function approach. Using a cost function approach, Herr (2008) finds that private hospitals have higher costs than public ones in Germany at a time when private hospitals were paid a fee for service with a per diem for each patient spent in hospitals. Costs were instead similar once both types of hospitals were reimbursed under a common tariff system based on Diagnosis Related Groups (Herr et al., 2011).

Barbetta et al. (2007) use instead a production function approach. They found that private non-profit hospitals were more efficient than public ones though efficiency converged when public and private hospitals were reimbursed based on a common set of tariffs (based on Diagnosis Related Groups). Marini et al. (2008) use a panel-data approach to test whether giving public hospitals greater financial autonomy impacted costs and financial surplus and find no effect of financial autonomy on these outcomes.

Hollingsworth (2008) reviewed more than 300 studies across a range of countries and found that public and non-profit hospitals tend to be more efficient than for-profit ones but there is heterogeneity in findings across institutional settings. A more recent review by Kruse et al. (2018) for European countries has similar findings: most evidence suggests that public hospitals are at least as efficient as private hospitals.

In summary, the empirical evidence does not make a strong case for quality being systematically higher either for for-profit or non-profit hospitals. Neither does the evidence confirm that public hospitals are less efficient than private ones as predicted by standard economic theory.

3.5 Integrated Care

Driven by an ageing population, the number of individuals with chronic conditions and multimorbidity is rising. These individuals can require a complex pattern of care that involves coordination within and across the health and long-term care sector. The lack of coordination within and across sectors leads to fragmented services.

One solution to improve coordination of care is to move towards integrated care. Examples of integrated care are heterogeneous and involve integration across different segments of the health sector or sectors, such as health and social care. A frequent feature of integrated care is that it involves a bundled payment that covers different types of care under one reimbursed tariff. Integration of services can involve schemes covering segments of the population with specific needs with a focus on single disease management models or the whole population (Siciliani et al., 2022).

As an example, in the Netherlands, bundled payments for integrated care were introduced in 2010 to cover patients with type II diabetes, chronic obstructive pulmonary disease (COPD), asthma, and those at high risk of cardiovascular diseases. A 'care group' organises the care necessary for managing these diseases based on clinical standards and offers coordinated outpatient care with the aim of improving coordination, and reducing specialist visits and hospitalisation. Care groups were owned by GPs, and varied in size from 4 to 150 GPs (Schut and Varkevisser, 2017).

In Germany, Disease Management Programmes for chronic diseases were introduced in 2005 by sickness funds for patients with asthma, COPD, diabetes, and ischaemic heart disease with the aim of coordinating ambulatory services. Services were provided mostly by family physicians and specialists based on evidence-based guidelines. Another example in Germany was the 'Integrated care contracts' to cover a population for a given condition such as stroke, or procedure, such as hip replacement to overcome inter-sectoral barriers through case management and coordinated patient pathways that integrated providers horizontally (within ambulatory care) or vertically across sectors (inpatient and ambulatory care) (Kifmann, 2017).

In England, new care models were introduced with the aim of integrating health and social care and motivating providers to design better packages of care. The 'multispecialty community provider' model involved groups of GPs coming together to offer a range of services, including community and outpatient services. 'Primary and acute care systems' aimed at integrating also hospital services with primary, community, and mental health services to improve coordination and to shift care away from the more expensive secondary sector (Siciliani et al., 2022). In the US, several initiatives have integrated hospital services with other segments of the health system for example through vertical integration between hospitals and physician practices or with post-acute care rehabilitation providers (skilled nursing facilities and home health agencies) (Konetzka et al., 2018).

The economic rationale for integrated care rests on the presence of synergies in the patient's benefits through coordination of care and reduction in costs through reductions in duplications and scale and scope economies. This is then implemented through a bundled payment, which is supposed to internalise spillover effects therefore improving the efficiency of the organisation. Integrated care however changes the extent to which patients can exercise choice and the degree of competition across providers. Providers can still compete by offering different integrated services, but patient choice is restricted because different services within a package are offered by the same organisation. Whether competition reduces because of integration is a priori unclear. On

one hand, demand responsiveness to each dimension of quality reduces, which reduces competition. On the other hand, providers receive higher reimbursement for each patient that they attract, which increases competition (Biglaiser and Ma, 2003; Brekke et al., 2024). Therefore, although patient choice is restricted under integrated care, provider competition does not necessarily reduce, and the benefits from integration from synergies and coordination can make patients better off.

The empirical evidence on the effect of integrated care is limited but growing. Baxter et al. (2018) provide a review to summarise the evidence on the effects of integration or coordination between healthcare services, or between health and social care on service delivery outcomes. It cautiously concluded that integrated care may enhance patient satisfaction, increase perceived quality of care, and enable access to services, but the evidence for service costs and health outcomes is limited.

Morciano et al. (2020) evaluate the efficacy of the population-based and care home site integrated care (known as Vanguard) models in England in reducing hospital utilisation using a difference-in-difference model using non-Vanguard sites as a control group. It shows that Vanguard sites had a smaller increase in emergency admissions relative to non-Vanguard sites, but there were no differences in bed days. Konetzka et al. (2018) investigate the effect of integration between hospitals and post-acute rehabilitation care provided by skilled nursing facilities or home health agencies in the US. They find that vertical integration between hospitals and skilled nursing facilities reduces rehospitalisation rates but increases Medicare payments, while other forms of integration have no effect.

Other studies that investigate possible substitution effects across and within sectors can inform policy reforms related to integrated care. Within health care, better access to primary care can reduce emergency hospitalisations. Pinchbeck (2019) exploits a policy that expanded access to primary care in England through the introduction of new primary care services. More than half were ‘walk-in clinics’ that were open also in the evening and at weekends with no need to make an appointment. The study shows that proximity to these convenience-oriented services results in reductions in unplanned emergency department visits by 1.5–4%. The findings therefore suggest that primary and secondary care can be substitutes. Gaughan et al. (2015) focus on the interface between health and social care in England by studying the extent to which greater supplies of nursing home beds or lower prices reduce hospital bed blocking. Hospital bed-blocking occurs when patients in a hospital are ready to be discharged to a nursing home, but no place is available so hospital care acts as a more costly substitute for long-term care. Using panel data measuring delayed discharges across Local Authorities, the study finds that delayed

discharges respond to the availability of care home beds, but the effect is modest: an increase in care home beds by 10% reduces social care delayed discharges by 6–9%.

4 Pharmaceuticals

The market for pharmaceuticals, more specifically prescription drugs, is characterised by several features that distinguish it from most other product markets. Such features are found both on the demand side and on the supply side of the market.

On the demand side, public or private insurance means that the demand for prescription drugs is generally highly price-inelastic, since at most a fraction of the drug price is paid by the patient out-of-pocket. Furthermore, drug demand is not solely a result of consumer choice as for most other products, but results instead from a more complex decision-making process that also involves the prescribing physician and, in some cases, the dispensing pharmacy.

Furthermore, the pharmaceutical industry is one of the most research-intensive, which implies that the supply side is generally characterised by high fixed (sunk) costs and low marginal costs. To give pharmaceutical firms incentives for drug innovation, most countries offer patent protection that implies that innovating firms are granted monopoly status for a given period, which allows them to recover the costs of innovation by selling the drug at a price higher than the marginal cost during the patent period.

The combination of low price-elasticity of demand and considerable market power on the supply side poses several regulatory challenges for policymakers who are concerned about securing wide access to drugs at affordable prices and ensuring that pharmaceutical firms have sufficient incentives for developing new and beneficial drug treatments.

In the remainder of this section, we will describe and discuss the main policy options in the light of economic theory and available empirical evidence. In doing so, we will distinguish between on-patent markets (section 4.1) and off-patent markets (section 4.2) for prescription drugs, which pose distinctly separate regulatory challenges, and then conclude by discussing key incentives for pharmaceutical innovation (section 4.3).

4.1 Pharmaceuticals: Patented Drugs

A patent-holding producer is by definition given the exclusive right to produce and sell the drug during the patent period. However, this does not necessarily mean that the producer is insulated from competition. On the contrary, a patent-holding firm might face therapeutic competition from other drugs that have

broadly similar therapeutic effects. Thus, the potential market power of a patent-holder depends in part on the existence of therapeutic substitutes.

A key policy question is whether patent-holding firms should be allowed to freely set the prices of their drugs, or whether drug prices should be regulated in some way. In the absence of sufficiently close therapeutic substitutes, which curb the market power of patent-holding firms, a general concern among policymakers is that the combination of strong market power and relatively price-inelastic drug demand leads to excessively high prices. Most countries have therefore introduced some form of price cap regulation for on-patent drugs usually related to the approval of the drug for reimbursement. The most common forms of price cap regulation are value-based pricing and international reference pricing, which will be further discussed in subsequent sections.

Another related issue is the extent to which patent-holding firms are able to price discriminate between markets (countries) with different willingness to pay for the drug, which depends in part on regulatory policies, such as the use of international reference pricing and whether or not parallel trade between different countries is prohibited. All else equal, the ability to internationally price discriminate increases the value of the patent, but also implies that countries with a high (low) willingness to pay for drug treatments pay a higher (lower) price than they would have done in the absence of such discrimination (see, e.g., Danzon et al., 2015).

4.1.1 Pricing of Patented Drugs: Static versus Dynamic Efficiency

From the viewpoint of national policy makers, the pricing of on-patent drugs entails a basic policy trade-off between dynamic and static efficiency. On the one hand, incentives for drug innovation require that the innovation costs can be recouped by revenues earned during the patent period, which implies that patent-holding firms are granted the market power to set prices sufficiently above marginal costs. On the other hand, once a patented drug has entered the market, drug purchasers have an incentive to acquire them as cheaply as possible. In particular, small countries without a significant pharmaceutical industry have a strong incentive for free-riding by imposing strict price regulation and letting payers in other countries pay for the drug innovation costs.

Considerations for drug innovation incentives apart, national policymakers also face a potential trade-off between lower costs and higher access for existing drugs. Even if a policy maker is only concerned about acquiring a drug at the lowest possible cost, it might be necessary to accept prices considerably above marginal cost in order to have access to the drug. There is robust empirical evidence of such a policy trade-off. For example, in a cross-country study on the

extent and timing of the launch of new drugs, Kyle (2007) finds that, on average, the probability that a drug will be launched in a market where prices are regulated is 75% lower than the launch probability in a market with free pricing, all else equal.

4.1.2 Value-Based Pricing

Arguably the most ambitious form of price cap regulation of on-patent drugs is so-called *value-based pricing*, where the price cap is based on a monetary valuation of the therapeutic benefit offered by the drug. A relatively widespread method of value-based pricing relies on the calculation of an *incremental cost-effectiveness ratio* (ICER), where the costs and benefits of a new drug treatment are measured relative to the costs and benefits of an existing baseline treatment (in case such therapeutic substitutes exist).[1] By this method, a new drug is included in the health plan only if the price of the drug is such that the cost per additional unit of improvement in expected health benefit is below a given threshold.[2]

A main challenge of value-based pricing is the amount of information required to estimate the expected therapeutic benefit of the drug in monetary terms. In addition, the use of cost-effectiveness thresholds in value-based pricing of new drugs might also create adverse pricing incentives for existing therapeutic alternatives, since the maximum price for new drugs depends on the price of existing benchmark treatments. In particular, Brekke et al. (2022) show that an ICER-based pricing rule might have adverse effects for both payers and patients due to strategic pricing by incumbent producers and argue that the pricing of new drugs should be decoupled from the prices of existing therapeutic alternatives.

4.1.3 International Reference Pricing

A less ambitious form of price cap regulation is so-called *international reference pricing* (or *external reference pricing*), where the price cap imposed by a national regulator is based on the prices of the same drug in a predefined set of other countries, usually through a simple rule in which the price cap is set equal to the lowest price or an average of the x lowest prices in this set, for example. This is a widely used price regulation scheme, particularly in Europe, and its

[1] See, e.g., Paris and Belloni (2013) for a description of value-based pricing in 14 OECD countries and a discussion of the pros and cons of such pricing policies.

[2] For example, the current practice in the UK is informed by the National Institute for Health and Clinical Excellence's recommendation that every new drug approved produces at least one additional QALY for every £30,000 that it costs.

popularity is almost certainly related to the very low regulatory costs, where the only information required is price information from other countries.

However, the widespread use of international reference pricing will inevitably lead to a certain degree of price harmonisation across countries. There are two concerns related to this. One concern is that it undermines drug producers' ability for international price discrimination, which reduces the value of the drug patent and is thus potentially harmful to innovation incentives.

Another concern is that it might harm low-income countries in the form of either lower drug access or higher drug prices. International reference pricing might lead to lower access because drug producers might prefer not to sell to countries with a relatively low willingness to pay for drugs to avoid low prices being 'exported' to countries with a higher willingness to pay, as shown by Geng and Saggi (2017). If drug prices in low-income countries are not set by the producers but instead determined by bargaining, international reference pricing is likely to make producers less willing to accept a low price and, conversely, make low-income countries more willing to accept higher drug prices to secure access to new drugs, as shown by Garcia Mariñoso et al. (2011). Thus, international reference pricing might cause low-income countries to face the choice between restricted access and higher prices.

However, the analysis by Geng and Saggi (2017) also highlights the importance of the choice of reference countries. If international reference pricing is based on prices in countries with much lower willingness to pay for drugs, drug producers will optimally choose to stay out of these markets, which in turn undermines the intended price-reducing effect of the international reference pricing scheme. This is also consistent with real-world practices, where international reference pricing is usually based on drug prices in relatively similar countries. Thus, the potentially detrimental effects of international reference pricing in the form of lower access to drugs are likely to be at least partly counteracted by the choice of a relatively homogeneous set of reference countries.

The widespread use of international reference pricing inevitably implies that countries use partially overlapping sets of reference countries, which means that the price cap imposed by Country A is a function of the drug price in Country B, *and vice versa*. Cross-country differences in terms of willingness to pay for drugs create an incentive for strategic choices of launch sequence by drug producers, where drug launches are delayed in countries with relatively low willingness to pay. Such strategic launch delay effects are empirically documented by Maini and Pammolli (2023), using data on pharmaceutical sales in European countries in the period 2002–2012. Based on a dynamic structural model of entry, they show that the removal of international reference pricing would reduce launch delays by up to one year per drug in some low-income European countries.

4.1.4 Parallel Imports

The use of international price discrimination by producers of patented drugs creates an incentive for arbitrage, where a drug sold in a low-price country is repackaged and sold to a high-price country by parallel traders at a price lower than the price charged by the original producer in that country. Such *parallel trade* of drugs has qualitatively the same effect as international reference pricing, in the sense that it leads to (some degree of) price convergence across countries. Thus, allowing for parallel imports could be seen as an alternative to imposing an international reference pricing scheme. Indeed, the regulatory practices on parallel trade differ. For example, parallel imports are allowed between EU countries but not from countries outside the EU, while it is largely prohibited in the US.

As for the case of international reference pricing, a potential concern with parallel imports is that it might reduce drug access in low-price countries (Roy and Saggi, 2012). In a similar vein, the possibility of parallel imports might also lead to higher prices in the source countries (i.e., the low-price countries), either through a higher regulated price (Birg, 2023) or a higher bargained price (Pecorino, 2002).

In the importing (high-price) countries, on the other hand, competition from parallel importers is likely to have a negative effect on drug prices. Such effects are empirically confirmed by Ganslandt and Maskus (2004), who use data from Sweden and find that competition from parallel importers reduces producer prices by 12–19% on average. Similar effects are also found by Duso et al. (2014), who report structural estimation results based on German data showing that parallel imports reduce prices of patented drugs by 11% on average.

However, the presence of parallel imports might also affect the impact of price cap regulation in less than obvious ways. In a theoretical analysis where retail drug prices are determined by bargaining between producers and retailers, Brekke et al. (2015b) show that the presence of parallel imports shifts bargaining power from producers to retailers, which all else equal leads to lower producer prices. However, the imposition of a price cap on producer prices weakens competition from parallel importers and therefore shifts bargaining power back towards the producers. Because of this effect, stricter price cap regulation might have a negligible, or even positive, effect on producer prices and profits in the importing country in the presence of parallel trade. This possibility is also partly confirmed in an empirical analysis using Norwegian data, where Brekke et al. (2015b) show that stricter price cap regulation leads to lower producer profits in the absence of parallel imports but has no effect on profits in the presence of parallel trade. A similar result is found by Dubois and

Sæthre (2020) who show, based on structural estimation on the same Norwegian data, that stricter price cap regulation would severely reduce retailer profits but only have a modest negative effect on producer profits in the presence of parallel trade. Overall, these results suggest that price cap regulation and allowing for parallel trade are policy complements. In the presence of parallel trade, stricter price cap regulation can potentially improve static efficiency without harming dynamic efficiency.

4.2 Pharmaceuticals: Off-patent Drugs

Once the patent term ends and the drug loses its patent protection, the producer of the drug is in principle exposed to competition from producers of copy drugs, so-called generic drugs, that contain the same active chemical ingredients as the brand-name drug. In the following we will give an overview of how generic competition is likely to affect drug prices in off-patent markets and how such competition is affected by different designs of the drug reimbursement scheme.

4.2.1 Generic Entry and Branded-Generic Competition

Off-patent pharmaceutical markets are generally characterised by two observations that are far from obvious. The first observation is that generic drugs are consistently priced below the brand-name drug without causing the latter drug to exit the market. The other observation is that, although average drug prices tend to fall after generic entry, the price of the brand-name drug has sometimes been found to increase. The latter effect is often referred to as the *generic competition paradox*.

A seminal attempt to explain the generic competition paradox is provided by Frank and Salkever (1992), who present a theoretical model where demand consists of two segments: brand-loyal and cross-price-sensitive consumers. In other words, some patients are not willing to switch from the brand-name drug to a generic alternative, while other consumers are willing to switch to a generic drug if it is offered at a lower price. Based on this model, generic entry might reduce the own-price elasticity of demand for the brand-name drug and thus lead to a higher brand-name drug price.

An arguable weakness of the Frank–Salkever model is that the existence of a brand-loyal demand segment is exogenously given and thus left unexplained. Brekke et al. (2011) use a different approach and assume that all patients are in principle willing to buy a generic drug, but that the brand-name drug is perceived to be of higher quality, for example, because of differences in advertising or physician detailing. Thus, branded-generic price differences

could be explained by (perceived) vertical differentiation. Brekke et al. (2016) present a similar analysis of competition between one brand name and *n* generic drugs and show that increased generic competition leads to lower prices of all drugs.

In the early empirical literature on the price effects of generic entry, which is mainly based on US data, several studies find evidence of price increases for the brand-name drug (Grabowski and Vernon, 1992; Frank and Salkever, 1997; Regan, 2008), although the estimated magnitudes of these price responses are relatively small, and certainly far smaller than the branded-generic price differences. However, other studies (e.g., Wiggins and Maness, 2004) have not found evidence of any brand-name price increases in response to generic entry.

The studies considered so far the effect of generic entry at the extensive margin. However, a related question is whether generic entry at the intensive margin (i.e., an increase in the number of generic drugs) has a significant effect on drug prices. Based on US data, Regan (2008) finds only a modest negative price effect of an increase in the number of generic competitors. In contrast, Granlund and Bergman (2018) report very strong price effects of generic competition at the intensive margin. Based on Swedish data, they find that increasing the number of generic competitors from one to ten has a long-run price-reducing effect of 89% for generics and 29% for brand names. These results are qualitatively in line with the theoretical results by Brekke et al. (2016) and suggest that generic drugs are not perceived as fully homogenous products.

The extent to which generic competition leads to lower prices depends on how willing patients are to switch from expensive brand names to cheaper generics. In an empirical case study on generic entry in the market for a widely prescribed drug in Japan, Ito et al. (2020) find evidence of a substantial effect of *inertia* on drug choices. Patients who used the brand-name drug before generic entry were much less likely to switch to a generic drug than patients without such a history. Such inertia might be partly caused by patient preferences but might also result from (lack of) incentives for generic substitution by the prescribing physician or the dispensing pharmacy. The role of prescribing physicians is explored by Iizuka (2012), who uses data from Japan, where physicians are able to both prescribe and dispense drugs, and shows that brand-name versus generic prescription choices depend on the financial incentives of prescribing physicians. A similar result regarding the role of dispensing pharmacies is reported by Brekke et al. (2013), who use Norwegian data to show that brand-name versus generic market shares are strongly correlated with differences in brand-name versus generic profit margins for pharmacies. These results illustrate the complexity of pharmaceutical markets, where demand is not solely determined by patient preferences.

4.2.2 Reference Pricing

A potentially major impediment to effective generic competition is the fact that patients are partly or fully insured against expenditures for drug treatment, which causes demand to be highly price-inelastic. Many patients will be reluctant to switch from the brand-name drug to a cheaper generic alternative if the difference in patient co-payment is zero or close to zero. During the last couple of decades, policymakers in many countries have therefore attempted to make generic competition more effective by designing the reimbursement scheme in a way that makes demand more elastic at higher prices. This has primarily been done through the use of *reference pricing*, which is now a widely used reimbursement scheme for off-patent pharmaceuticals.[3]

In a reimbursement scheme based on reference pricing, the (public or private) insurer reimburses a patient's drug expenditures (fully or partly) per unit of the drug up to a certain price level: the reference price. If the patient chooses to buy a drug that is priced above the reference price, the difference between the actual price and the reference price must be fully covered by the patient out-of-pocket. In principle, this makes drug demand more price-elastic at prices above the reference price.

There are two main categories of reference pricing, namely *generic reference pricing* and *therapeutic reference pricing*. Under generic reference pricing, the same reference price applies to a group of drugs that only consists of a brand-name drug and its generic alternatives. In contrast, under therapeutic reference pricing, the same reference price applies to a group of drugs that includes two or more therapeutically substitutable brand-name drugs (in addition to their generic alternatives). This means that therapeutic reference pricing can in principle apply also to on-patent drugs, which makes it somewhat more controversial than generic reference pricing.[4]

Additionally, we can also distinguish between two conceptually different ways of setting the reference price, namely *exogenous* versus *endogenous* reference pricing. In the latter scheme, the reference price is endogenously determined as a function of the actual drug prices within the relevant group of drugs (e.g., as the lowest or the average price of the drugs in the reference group). In contrast, under an exogenous reference pricing scheme, the reference

[3] Reference pricing as a reimbursement scheme is sometimes referred to as *internal reference pricing* in order to avoid confusion with international (or external) reference pricing, which is a price cap regulation scheme and not a reimbursement scheme.

[4] Therapeutic reference pricing is used only by a few countries, including Germany, the Netherlands, and New Zealand, which do not use direct price control mechanisms, like price cap regulation.

price is set at a certain level and does not change in response to price changes of the drugs in the reference group.

Reference pricing might affect drug prices through two different channels. In addition to a direct effect through changes in pricing incentives for a given number of drugs, there might also be indirect effects through changes in the incentives for generic entry. The theoretical literature is unanimous in the prediction that reference pricing leads to lower drug prices on average. If the reference price is endogenous, the effect is negative for all drug prices under both generic and therapeutic reference pricing (Brekke et al., 2007; Gonçalves and Rodrigues, 2018). The producers of brand-name drugs (which are generally priced above the reference price) have an incentive to reduce the price because reference pricing makes demand for brand-name drugs more price-elastic. Producers of generic drugs, on the other hand, have an incentive to reduce their prices in order to induce a reduction in the reference price and therefore make brand-name drugs relatively more expensive. The overall effect is a reduction in all drug prices.

However, the exact design of the reference pricing scheme matters. Brekke et al. (2011) analyse the effects of endogenous versus exogenous reference pricing and show that, although the average drug price falls in both cases, the latter scheme leads to an increase in generic drug prices and therefore a price convergence towards the reference price. Thus, the pro-competitive effect of reference pricing is stronger if the reference price is endogenously determined. In a related theoretical study, Ghislandi (2011) shows that the design of the reference pricing scheme might also affect the incentives for price collusion among generic competitors. More specifically, he shows that collusion is less sustainable if the (endogenous) reference price does not depend on the brand-name price.

The empirical evidence overwhelmingly supports the theoretical prediction that reference pricing has a pro-competitive effect on drug prices. For example, Brekke et al. (2011) exploit a quasi-experimental introduction of generic reference pricing (with an endogenously set reference price) in Norway and find that it led to substantial price reductions: 33% for brand-name drugs and 22% for generic drugs, on average. Kortelainen et al. (2024) estimate the effect of reference pricing on expenditures at the market level using the different timing of the introduction of reference pricing in the Nordic countries. They find that expenditure per dose decreases by 44% moving from the laxest to the strictest reference pricing regime.[5] In a survey of empirical studies from ten different

[5] Kortelainen et al. (2024) also consider potential adverse effects on product availability and total quantity, but find no significant effects on these outcomes due to the introduction of reference pricing in the Nordic countries.

countries, Galizzi et al. (2011) report that fourteen out of twenty-two studies found that reference pricing unambiguously led to lower prices, while the remaining eight studies found no or ambiguous effects.

In a study using Danish data, Kaiser et al. (2014) analyse the effects of a switch from exogenous to endogenous reference pricing and find strong negative price effects of around 20% on average, thus providing empirical support for the theoretical prediction of Brekke et al. (2011) regarding the pro-competitive effects of endogenous versus exogenous reference pricing.

Most of the referred empirical studies look at short-run price effects. A potential worry is that these effects might be counteracted in the longer run by changes in incentives for generic entry. In a theoretical study, Brekke et al. (2016) show that generic reference pricing leads to less generic entry and that a long-run increase in average drug prices cannot be ruled out. So far the empirical literature on reference pricing and generic entry is scant and somewhat inconclusive. Whereas Rudholm (2001) finds no significant effect of reference pricing on generic entry using Swedish data, Moreno-Torres et al. (2009) find a weak negative effect using Spanish data. In a study on the effects of price and reimbursement regulation more generally, Costa-Font et al. (2014) find that stricter regulation delays the adoption of generics. However, even if reference pricing reduces incentives for generic entry, it would arguably take a lot for such an indirect effect to outweigh the well-documented direct price-reducing effects.

4.3 Pharmaceutical Innovation

The availability of drug treatments crucially depends on pharmaceutical firms' incentives for developing these treatments in the first place. Such incentives are influenced by public policies both directly and indirectly. In an overview of different innovation policies, Kyle (2022) distinguishes between *pull* and *push* policies. Drug innovations can be incentivised by increasing the reward of the innovation (pull) or by reducing its cost (push), for example in the form of subsidies or tax breaks.

In this section we will start out by giving a brief description of the different roles played by the public sector and private agents in the development of new drug treatments, and how drug innovation is impacted by public funding, which is a key push policy. We will subsequently discuss the main pull policy, namely patent protection, and how it interacts with other regulatory instruments on the demand side of the market. Finally, we will briefly discuss some proposed alternatives to the patent system.

4.3.1 Public versus Private Involvement in Drug Innovation

Both the public and the private sector contribute to the development of new drug treatments, but generally in quite different ways. Whereas the private industry supplies most of the funds devoted to the R&D of drugs, the public sector supports most of the basic biomedical research (Sampat and Lichtenberg, 2011). The dominant role of the private sector is illustrated by Stevens et al. (2011), who document that only 9% of new drugs approved in the US between 1990 and 2007 were discovered by public sector research institutions.

However, this does not mean that public sector funding does not play an important role in pharmaceutical innovations, but rather that this role is predominantly indirect. Several studies show that the basic research undertaken by public institutions has a significant impact on private-sector drug innovation. For example, Toole (2012) finds that a 1% increase in the stock of public basic research leads to a 1.8% increase in the number of new molecular entities developed by private firms. In the same vein, Sampat and Lichtenberg (2011) find that public funding plays an indirect role in almost half of the new drugs approved, as measured by patent citations to government publications or public-sector patents. There is also evidence of a positive effect of more targeted public funding, in the form of research grants targeted to specific diseases, on private sector development of drug treatments for such diseases. For example, Blume-Kohout (2012) finds that a 10% increase in targeted funding yields eventually a 4.5% increase in the number of related drugs.

As stressed by Kyle (2022), the effectiveness of public funding and push policies in general rely crucially on the functioning of governments and relevant public agencies. Importantly, the efficient allocation of research funds requires extensive information acquisition and processing in order to identify the desired innovations and the necessary levels of funding. There are also other agency problems related to publicly funded R&D, such as susceptibility to political lobbying, which has been shown to affect the allocation of biomedical research funding in the US (e.g., Hedge, 2009).

4.3.2 Patent Protection

The predominant pull policy is patent protection, which grants a market reward to innovating firms in the form of market exclusivity for a given length of time. The rationale behind the patent system is at least to some extent supported by empirical evidence.[6] For example, Gaessler and Wagner (2022) exploit variation in the duration of market exclusivity for new drug development projects,

[6] See Kyle (2022) for a more thorough overview of the empirical evidence.

where this duration is lower in case of patent invalidation, and present estimates showing that a one-year loss in market exclusivity reduces the probability of drug approval by almost 5 percentage points. However, the evidence for a positive relationship between patent protection and drug innovation seems to be stronger for developed than for developing countries. For example, Kyle and McGahan (2012) find that the association between patent protection and R&D effort (as measured by the number of clinical trials) varies by country income level. They find evidence of a strong positive relationship for diseases that are prevalent in high-income countries, but do not find evidence of a similar relationship for diseases that are more prevalent in poorer countries.

Similar empirical evidence also exists for the relationship between patent protection and the diffusion of newly developed drugs. In a cross-country study on drug launches, Cockburn et al. (2016) find that longer and stronger patent protection leads to significantly quicker launches and thus accelerates the diffusion of new drugs. Qualitatively similar effects of patent protection on drug launches are also found by Dai and Watal (2021), but only for middle- and high-income countries. For low-income countries, patent protection does not seem to affect the availability of new drugs. Policies that grant market exclusivity for new drugs are also used to incentivise the development of more specific types of treatment. One example is the development of so-called 'orphan drugs' that are used to treat rare diseases (that affect a very small share of the population). A specific policy to stimulate the development of such drugs was first introduced in the US by the Orphan Drug Act of 1983, granting an exclusive seven-year marketing right. A similar policy was later adopted by the European Union, granting ten years of market exclusivity for orphan drugs. Sarpatwari et al. (2018) document that the number of drugs for treating rare diseases has increased substantially since the Orphan Drug Act was introduced. However, they also show that for a large (and increasing) share of newly developed orphan drugs, the orphan exclusivity expires before the relevant patent, suggesting perhaps that specific policies to stimulate the development of orphan drugs are to some extent superfluous. One contributing factor is that a relatively large share of orphan drugs without exclusivity lacks generic competition, since the low demand for such drugs makes generic entry less profitable.[7]

Although there is clear empirical evidence that patent protection stimulates drug innovation, the general effectiveness of the patent system depends on the degree of alignment between private and social incentives for drug innovation.

[7] In the study by Sarpatwari et al. (2018), around 60% of the orphan drugs whose market exclusivity had expired were without generic competition.

There are several market distortions that potentially make this alignment less than perfect. For example, the lack of insurance in developing countries likely contributes to the underinvestment in so-called neglected diseases (Kyle and McGahan, 2012). On the other hand, insurance can also create problems of ex-post moral hazard and thus lead to overconsumption and excessive pharmaceutical spending (Danzon and Pauly, 2002). Private incentives for drug innovation can also be distorted by the fact that some treatments generate externalities, leading to underconsumption in the case of positive externalities, which applies to vaccines (Geoffard and Philipson, 1997), and overconsumption in the case of negative externalities, which applies to antibiotics (Bennett et al., 2015).

Finally, there are also several potential distortions created by imperfect information about drug quality that might affect reimbursement decisions by payers and prescription decisions by physicians, which in turn might distort the incentives for developing the most effective treatments (Kyle, 2022). We will return to this issue in Section 4.3.4 when discussing incentives for developing me-too versus breakthrough drugs.

4.3.3 Price Regulation and Parallel Trade

In addition to the direct effects of the design of the patent system, innovation incentives might also be indirectly influenced by different regulatory policies that affect the value of a drug patent, such as price regulation, the design of reimbursement schemes, and policies on parallel trade.

Intuitively, price regulation reduces the value of a drug patent, all else equal, and is therefore likely to reduce incentives for drug innovation. Vernon (2005) identifies two theoretical mechanisms whereby price regulation might harm R&D incentives; firstly, through a lower expected return on R&D investments because of lower future profits, and secondly, through a higher marginal cost of R&D investments due to a cash flow effect caused by lower current profits. Based on quasi-structural estimations of US data, he also performs simulations showing that the introduction of price regulation (at the 'average level' in non-US markets) would reduce industry-level R&D spending by up to around 30%.

A related and much-debated issue is whether innovation incentives are negatively affected by parallel trade. Intuitively, parallel imports from low-price countries could undermine the patent-holder's ability to charge a high price in countries with a high willingness to pay for the drug and therefore reduce the value of the patent. However, this view has been challenged by Grossman and Lai (2008), who show that the possibility of parallel trade might induce the source countries to relax price regulation in order to ensure access to the drug, which in turn might increase the value of the patent and thereby

stimulating innovation incentives. However, later studies have shown that this result hinges on the degree of policy commitment (Bennato and Valletti, 2014) and only holds if the trading countries are sufficiently similar in terms of drug demand (Reisinger et al., 2019).

The empirical evidence on the relationship between parallel trade and drug innovation is still lacking.

4.3.4 Me-too versus Breakthrough Drugs

A widely expressed concern is that too many resources are spent on developing so-called 'me-too' drugs with little therapeutic value added as compared to more innovative drugs. Indeed, 85–90% of new drugs have been shown to yield little or no advantages over existing therapeutic alternatives (Santos et al., 2019). Such concerns have also been given a theoretical foundation by González et al. (2016), who construct a model in which drugs can be both horizontally and vertically differentiated, and show that pharmaceutical firms have socially suboptimal incentives for spending resources on breakthrough innovations rather than me-too innovations. A similar conclusion is also reached by Brekke et al. (2022) based on a different type of framework.

Additional empirical evidence is provided by Kyle (2018), who analyses the relationship between therapeutic value and market rewards for new drugs, and finds that this relationship is weak. Given that the process of developing breakthrough drugs involves both higher costs and considerably more uncertainty, a lack of sufficient market rewards for breakthrough drugs suggests that drug innovation incentives are distorted in the direction of me-too drugs.

The market rewards for breakthrough versus me-too drugs might be affected by price regulation and reimbursement schemes. In particular, Bardey et al. (2010) have suggested that therapeutic reference pricing might be an effective instrument for steering resources away from me-too innovations and towards breakthrough innovations. The argument seems intuitively appealing. Under therapeutic reference pricing, me-too drugs will be subject to the same reference price as existing therapeutic alternatives, which leads to stronger therapeutic competition and therefore reduces the profitability of such drugs. As a result, pharmaceutical firms will have relatively more to gain by developing innovative drugs for which there are no existing therapeutic alternatives. However, Straume (2023) shows that this argument crucially relies on the premise that breakthrough innovations constitute a feasible option. If, instead, the relevant choices for an innovator consist of various degrees of differentiation from an existing drug within a given therapeutic category, therapeutic reference pricing has the opposite effect and leads to less differentiation (i.e., more me-too innovations).

4.3.5 Alternatives to the Patent System

Despite its potential limitations, the patent system is currently the dominating method of stimulating pharmaceutical innovations. The most commonly suggested alternatives to patents are patent buyouts (Kremer, 1998) or advanced market commitments (AMCs) (Kremer and Glennerster, 2004), where pharmaceutical firms are offered a certain monetary payment in return for unlimited access to a new drug. These types of *innovation prizes* have the appealing feature that they in principle overcome the problems of static inefficiency which is inherent in the current patent system, where patent-holding firms extract the patent rent by charging prices well above marginal costs. On the other hand, there are considerable problems related to informational asymmetries between payers and innovators in the design of such alternatives, which arguably make them less feasible in practice.

A closely related alternative to innovation prizes, which has been recently advocated, is to change the payment scheme for drugs, within the current patent system, from uniform pricing to two-part tariffs. Under a pricing scheme based on two-part tariffs, the (public or private) insurer pays a fixed fee in addition to a (much lower) per-unit price for the drug. Similarly to an innovation prize, a two-part tariff would in principle ensure drug access at a much lower marginal price and thereby alleviate the problem of static inefficiency without harming dynamic efficiency. The pros and cons of such an alternative payment scheme have recently been studied by Brekke et al. (2022), who find that the use of two-part tariffs, in addition to improving static efficiency, is also likely to steer innovation incentives away from me-too innovations and more towards the innovation of breakthrough drugs.

5 Conclusion

This Element has discussed the role of the government in health system financing and provision of public health care. Public health insurance is pervasive in high-income countries and growing in low and middle-income countries, and this is justified on both equity and efficiency grounds. Private health insurance coexists with public health insurance across a range of institutional arrangements. The interface between public and private insurance differs extensively across countries depending on whether private insurance is duplicative, complementary or supplementary. Countries also differ in the extent to which they experience and manage excess demands through co-payments or management of the waiting list. Such diversity of institutional settings gives extensive research opportunities for investigating and understanding the complexities of the health sector and health system financing. The Element also shows that the

behaviour of healthcare providers responds to a range of financial incentives, and therefore its design can contribute to improving the quality and efficiency of health systems. Following the COVID-19 pandemic, health systems are under renewed pressure to increase the efficiency of health spending. Rigorous theoretical frameworks and existing evidence can inform future policy developments on both financing and provision. Last, the Element has highlighted a diverse set of interventions for regulating pharmaceutical markets, addressing both on-patent and off-patent drugs. For on-patent drugs, it highlighted the tension between, on the one hand, ensuring access to new and effective medicines and maintaining innovation incentives, and, on the other hand, managing expenditure growth and implementing regulatory measures for price control and cost containment. For off-patent drugs, the focus has been on the role of competition from generics and the impact of price interventions, such as direct price regulation or reference pricing schemes. Finally, the Element explored alternatives to the current patent system to enhance the rewards for innovation while ensuring that drugs remain accessible and affordable. These issues remain at the forefront of policy discussions to improve access to drugs around the globe.

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