SNF report no. 05/08

Are pharmaceuticals inexpensive in Norway?
A comparison of prices of prescription pharmaceuticals between Norway and nine west European countries

by

Kurt R. Brekke
Tor Helge Holmås
Odd Rune Straume

SNF project no. 2713:
Evaluation of pharmaceutical prices

The project is funded by the Norwegian Ministry of Health and Care Services (HOD)

THE INSTITUTE FOR RESEARCH IN ECONOMICS AND BUSINESS ADMINISTRATION
BERGEN, MAY 2008

ISBN 978-82-491-0564-9 Printed version
ISBN 978-82-491-0565-6 Electronic version
ISSN 0803-4036

Foreword

On behalf of the Norwegian Ministry of Health and Care Services, SNF has conducted the project "Appraisal of Norwegian and foreign prices of pharmaceuticals and comparison of price levels". The object of the project has been to assess the price level of pharmaceuticals in Norway in both the patent-protected and generics segment, where prices levels in Norway are to be compared with those in countries with which Norway can naturally be compared. Part of the project has also involved finding a sound method for comparing prices of pharmaceuticals in Norway and in the countries selected for the comparison. This report documents SNF's implementation of the project.

The project has been undertaken by senior scientific officer Kurt R. Brekke (project leader) at the Norwegian School of Economics and Business Administration (NHH), researcher Tor Helge Holmås at SNF and senior scientific officer Odd Rune Straume at the University of Minho, Portugal. Brekke and Straume are affiliated to SNF. All project participants are also affiliated to Health Economics Bergen (HEB).

Meetings have been held with the sponsor at start-up and during the project. We would like to thank departmental manager Audun Hågå and consultant Kjersti Hernæs at the Norwegian Ministry of Health and Care Services, and also Morten Nordberg at the Office of the Auditor General of Norway, for their many useful suggestions and comments, although this does not in any way make them responsible for the report's content and conclusions.

Bergen, May 2008

Kurt R. Brekke

Abstract

In this report we compare prices of pharmaceuticals in Norway with prices of similar pharmaceuticals in the following nine countries: Austria, Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, Sweden and the United Kingdom. We have data for all pharmaceuticals within the 300 most selling (in sales value) substances in Norway for the first six months in 2007. Based on these data we calculate volume-weighted average prices per dose for each substance at both the producer level (GIP) and the pharmacy level (AUP). We also calculate the wholesale and pharmacy margins given the difference between GIP and AUP. Based on these prices, we construct price indices for all substances, patent protected substances, and non-patent protected substances. We also run regressions, where we control for e.g. pack size, in order to test whether the cross-country price differences are statistically significant. The main result is that Norway has among the lowest prices whether we look at the overall price index or the indices for on-patent or off-patent pharmaceuticals. This result is confirmed by our regressions. We also find that Norway has among the lowest margins. These findings are most likely due to the strict regulation of prices (and margins) in the on-patent segment combined with competition stimulating incentives in the generic segment.

List of tables

Table of contents

1. Introduction

1.1. Object and presentation of problem

In this study we compare the prices of prescription pharmaceuticals in Norway with the prices of the corresponding products in a selection of reference countries consisting of the following nine west European countries: Austria, Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, Sweden and the United Kingdom. These countries constitute the basket of countries that form the basis for setting maximum prices for prescription pharmaceuticals in Norway, and are therefore classed as relatively comparable countries. The object of the study is to see whether prescription pharmaceuticals are less or more expensive in Norway than countries with which Norway can naturally be compared. The study will also compare wholesale and pharmacy margins between countries.

1.2. Data and analyses

In this study we have obtained data from IMS Health for the 300 top-selling active substances in Norway in the first half of 2007. The data set contains detailed information on price, volume, patent status, originals/generics, pack size, presentation, strength, etc. Based on these data, we calculate volume-weighted average prices for each active substance at both producer level – the wholesalers' purchase price (GIP) – and pharmacy level – the pharmacies' sale price (AUP). As we have both GIP and AUP, we also calculate the relative margin per active substance, and compare differences in margins between countries and market segments (patent, generics and graded price).[1]

When prices between countries are to be compared, it is customary to construct price indices in which the various products are assigned weightings to reflect a representative pattern of consumption. In this study, we use primarily Norwegian consumption weightings, in which active substances with high sales levels (measured in volume terms) in Norway are assigned a higher weighting than active substances with low sales levels. In this way, it can be ascertained what a typical Norwegian "shopping basket" would have cost in the various reference countries, which gives us a measure of any cost savings.

The calculation of price indices entails weighing up two aspects: precision versus representativity. For pharmaceuticals, this appraisal is particularly important because many types of pharmaceuticals are involved (for various conditions), and the same pharmaceuticals come in many variants (original/generic, pack size, strength, presentation, etc.). Precision is maximised by comparing the prices of the same packs between countries. The top-selling pack for a given active substance is then typically chosen in the country adopted (here: Norway), and the price of this is compared with the price of corresponding packs in other countries.

[1] IMS obtains information on actual prices from a level in the distribution chain (e.g. GIP). The other prices are then calculated on the basis of IMS's investigations from each country concerning discount arrangements, profit regulation, wholesale margins, repayment arrangements (clawbacks), etc. The quality of price and margin data is therefore dependent on IMS having done a thorough job in this way. IMS leads the market in international price data for pharmaceuticals, and we have little reason to doubt the quality of the data. We go through the data in detail in Chapter 3.

The problem with price comparisons based on identical packs is that a representative sample is *not* obtained. Firstly, it is often the case that the top-selling pack of a given active substance in Norway is not the top-selling (and thus most representative) pack in the reference countries. In many cases, this pack is not found in other countries, an aspect which could typically give a false impression of price differences between countries. Secondly, the comparison of identical packs will typically exclude generics and thus lead to over-representativity of original preparations, resulting in the overestimation of prices in countries with high levels of generic competition.

When we examine the sample of pharmaceuticals, both the number of active substances and average pack sizes vary considerably between countries. This indicates problems with representativity if the price comparisons are based on a narrow product definition, i.e. identical packs. In this study, we have therefore calculated volume-weighted average prices per active substance for each country. The advantage of such an approach is that the most representative price of the product for each country is then generated and the number of missing price observations is reduced substantially by matching active substances instead of identical packs between countries. Most price indices are therefore calculated on the basis of volume-weighted prices, but we also report price indices based on comparisons of identical packs so that we take account of both precision and representativity.

Many price indices are calculated in the study. First, we calculate bilateral price indices, in which we match active substances (packs) for each country with Norway, and compare the prices of the active substances that country has in common with Norway. We then calculate global price indices in which we only compare prices of active substances available in all countries in the sample. The price indices are compared for all active substances, but we also report separate subindices for the patent and generics segment, and also a dedicated index for pharmaceuticals subject to graded price regulation.

1.3. Results

The main result is that Norway is among the very cheapest in the group of 10 countries, whether in terms of all active substances, patent-protected active substances or active substances with (actual or potential) generic competition (see summary in Table 7.1, p. 45). In the case of pharmaceuticals included in the graded price system, Norway is clearly cheapest when we use Norwegian and Danish consumption weightings. If we use Swedish consumption weightings, Sweden is marginally cheaper than Norway. In the generics segment more generally, Denmark (and sometimes Sweden and the United Kingdom) is as cheap as (and sometimes cheaper than) Norway. Denmark is, however, somewhat more expensive in relation to patent-protected active substances. In this segment, the Netherlands is also generally inexpensive. The United Kingdom is inexpensive at GIP level, particularly in the generics market, where it is typically cheaper than Norway. The margins are, however, relatively high for generics, so that the United Kingdom is relatively more expensive at AUP level in this segment. The generally most expensive country is Ireland, followed by Belgium and Germany, with some variation between the individual indices. The price indices for all active substances (both off- and on-patent) show that Norway, together with Sweden and the United Kingdom, has the lowest prices at AUP level.

The results from the price index analyses are surprisingly robust. There is little variation between the bilateral and global price indices in terms of the ranking of countries according to

how cheap/expensive they are. There is also little variation according to whether we base the indices on bilateral price comparisons (paired comparisons between countries) or global price comparisons (active substances sold in all countries). This excludes price comparisons between identical packs versus volume-weighted average prices. Here, both the qualitative rankings and the quantitative differences given by the price indices are somewhat different. This illustrates the potential problems associated with representativity in relation to price comparisons based on identical packs.[2]

We conduct sensitivity tests by calculating price indices based on Swedish and Danish consumption weightings. A well-known finding is that the use of a given country's consumption weightings typically gives a lower price index in this country's favour. The argument is that more pharmaceuticals are purchased which are lower priced. We see this pattern when we use Swedish and Danish consumption weightings. In the case of pharmaceuticals subject to graded price regulation, Sweden in particular becomes less expensive when we use Swedish weightings. We can see the same effect (but slightly weaker) for Denmark. Norway is, however, still inexpensive.

One form of analysis which takes account of both precision and representativity is regression analysis. In regression analyses, we can study price differences between countries at the same time as correcting for various aspects that can influence prices, such as pack size. In analyses of this kind, we can also correct for the fact that all countries are not represented by the same active substances in the data set. The main result is, as for most price indices, that Norway has the lowest pharmaceutical prices when we consider all active substances. The differences are, however, smaller than indicated by the price indices. One reason for this may be that we do not weight the prices with Norwegian consumption weightings. When we break the sample down, we find that the Netherlands is (6%) cheaper than Norway in the patent segment, while Denmark is (12%) cheaper than Norway in the generics segment.

Lastly, we have looked more closely at wholesale and pharmacy margins, as measured by the relative difference between GIP and AUP. We find that the average margin in Norway is approx. 22%.[3] Compared with the reference countries, Norway has among the lowest margins. When we examine all active substances, only Sweden has significantly (2-3 percentage points) lower margins than Norway, while margins in Denmark are on a par with those in Norway. Sweden also has a (3-4 percentage points) lower margin on patent-protected active substances, followed by Norway and the Netherlands, which have roughly identical margins in this segment. In the generics segment, Denmark has the lowest margin, equivalent to 3.3 percentage points lower than Norway and Sweden. Wholesale and pharmacy margins are generally highest in Ireland, which has 20-30 percentage points higher margins than Norway, depending on whether all active substances, patent-protected active substances or active substances with generic competition are considered.

An interesting question is what explains the price differences? In the report we examine theory for price formation in pharmaceutical markets, and provide an overview of the

[2] For example, Austria emerges as very cheap in the generics segment when the comparisons are based on identical packs, but are a good deal more expensive when volume-weighted average prices are considered. This is most likely due to the fact that Austria has few "identical packs" to Norway, so that the price index based on identical packs reflects coincidences rather than a robust pattern. This is confirmed in our regression analyses when we control for pack size.

[3] Note that the Pharmaceutical Charge (1.3%) has been disregarded. Equivalent charges also exist in many of the reference countries. IMS does not adjust prices for (smaller) charges associated with market access and regulation in some countries, so that the differences in margins are in all likelihood not affected appreciably.

regulatory regimes in the various countries. In relation to the patent segment, it is not surprising that pharmaceuticals are inexpensive in Norway. The reason for this is that maximum prices for each pharmaceutical are set on a par with the three lowest prices of the same pharmaceutical in the nine basket countries included in the sample. This should by definition mean that Norway comes out reasonably in this segment. The Netherlands is also inexpensive in the patent market, which can be explained by the fact that the Netherlands is one of only two countries which use therapeutic reference pricing.

With regard to the generics market, the results are possibly less clear. In this context, there are grounds for assuming that the price level in the individual countries depends on how effectively the country's regulatory regime stimulates generic competition. In Norway, Denmark and Sweden, which are typically cheapest in this segment, a number of instruments that promote competition (generic substitution, generic reference pricing, percentage own share, etc.) are used. Ireland, which has the highest prices in the generics market, is one of the countries that uses the fewest instruments that promote competition.

1.4. Earlier studies

Two relatively new studies of pharmaceutical prices have been conducted in Norway and Europe. A brief description and assessment of these is given below. In addition, we present an extensive international study conducted by Danzon and Chao (2000).

LMI (2006)

In spring 2006 the Norwegian Association of Pharmaceutical Manufacturers (LMI) published a report comparing pharmaceutical prices in Norway with a group of 16 European countries. In addition to the nine basket countries we include in our study, this study included Spain, Greece, France, Italy, Portugal and Switzerland. The selection of pharmaceuticals covered the 300 top-selling packs in Norway in September 2005 from 11 pharmaceutical companies. It is worth noting that these were exclusively original producers, so that LMI's sample does not include generics.

LMI's analysis is based on the pharmacies' purchase price (AIP). It has included packs with a deviation of ± 10%. In the case of departures from the Norwegian pack, it has calculated the price of foreign packs. It is not stated how this has been calculated.

The price indices are calculated on the basis of Norwegian consumption weightings. LMI (2006) finds that Spain, Greece, Belgium and France are cheaper than Norway, whereas the rest is more expensive. When it adjusts the prices for purchasing power parity, Norway unsurprisingly becomes decidedly the least expensive. However, it is not clear that prices should be adjusted for purchasing power parity in this connection. The reason for this is that the State covers most of the expenses of pharmaceuticals, which means that consumers pay only a small fraction of the price. Apart from the fact that Norway is relatively inexpensive, there are great differences between our and LMI's ranking of countries, something which is probably due to differences in both sample and method.

IMS (2007)

IMS has recently conducted a study for the Norwegian Pharmacists Association in which it compares pharmaceutical prices (AUP) in Norway and a selection of European countries for March 2007.[4] First it looks at the patent segment, and compares prices of the 50 top-selling products (packs) in Norway (for 2006/7) with equivalent products (packs) in the nine basket countries that form the basis for setting the maximum price (which is also included in our study). IMS finds that Norway is cheapest, followed by the Netherlands and Sweden. Ireland is most expensive with 33 per cent higher prices than Norway for patent-protected active substances.

IMS then compares the prices (AUP) of active substances included in the graded pricing system in Norway with Denmark and Sweden. Here, the price indices are based on average prices (not prices of identical packs). IMS finds that Norway is cheaper than Denmark and Sweden for generics, but particularly so for original preparations. For the latter product group, Denmark is a full 159% and Sweden is a full 125% more expensive than Norway. When IMS combines the price indices for original products and generics in a price index at active substance level, Denmark is only 4% more expensive, whereas Sweden is 26% more expensive. However, it is difficult to understand how the huge price differences in the original product index can be eliminated by including the generics index in a combined index.[5]

With regard to the patent segment, IMS (as usual when comparing prices of identical packs) has a problem with representativity: only 35 of the 50 top-selling packs are available in all nine reference countries. It is difficult to find out how IMS has handled the problem of a lack of price observations. Has IMS produced bilateral indices in which the packs shared with Norway are matched for each country, or has it produced global indices in which it has "adjusted" for a lack of price observations? This is a critical point because the results are typically sensitive to how this is handled.

More critical is the fact that IMS has used value weightings (price x volume) instead of volume weightings when constructing the price indices. This is extremely unusual. The calculation of price indices is usually based on pure volume weightings. It is ascertained in this way what a Norwegian shopping basket would have cost in other countries. Incorporating Norwegian prices into the weightings thus has little point.

Danzon and Chao (2000)

Danzon and Chao (2000) look at price differences between the USA and 6 reference countries (Canada, France, Italy, Japan, the United Kingdom and Germany). This is a much more extensive and thorough study compared with the studies referred to above. Producer prices (GIP) are compared in this study. The price data are obtained from IMS Health and cover all prescription pharmaceuticals sold via pharmacies in the USA in 1992.

The study matches the pharmaceuticals via active substance between the USA and the six reference countries. As these countries are highly heterogeneous, the matching is relatively

[4] The study is not available as an ordinary report, but is presented in slides format. It is therefore somewhat difficult to find out all the details of the study.

[5] IMS states that the original and generics indices have been generated by including products that account for 80% of sales in each of the subgroups, which means that the indices cannot be directly combined. Nevertheless, the differences are so great for original products, and also for generics, that it is difficult to understand how the combined index can be so low.

low, particularly when the number of active substances available in all countries is considered (number of active substances falls from 486 to 171). Danzon and Chao therefore calculate a bilateral price index in which the USA is matched on a paired basis against each country, and a global price index in which only active substances available in all countries are included in the sample. The indices are calculated on the basis of American consumption weightings (Laspeyres index).

A key aim of the study is to show the problems associated with basing comparisons on prices of identical packs instead of on volume-weighted average prices for active substances. The study reveals sharp differences in price indices depending on what approach is adopted. Identical packs typically cause problems with representativity, so that differences between countries are due to measurement errors rather than real price differences. Volume-weighted average prices provide a more representative idea of prices in the individual countries, and the price indices become more robust.

This study also calculates indices on the basis of the individual countries' consumption weightings (Paasche index). A general finding here is that the individual country emerges as cheaper when the respective country's consumption weightings are used. The argument is that more pharmaceuticals which are relatively cheaper are purchased. The study also calculates quantum indices.

Lastly, Danzon and Chao (2000) undertake regression analyses to find out what explains the observed price differences between the countries. They find here that countries with strict price regulation have systematically lower prices for older and global active substances, whereas generic competition is more effective in countries with less strict price regulation.

1.5. Organisation of the report

The report is organised as follows. In Chapter 2 we describe the pharmaceuticals market and various regulatory regimes adopted in this market. We also classify the 10 countries included in this study with reference to the various types of regulatory regimes. In Chapter 3 we provide an overview of data and samples available to us for the price comparisons. In Chapter 4 we present descriptive statistics associated with central variables such as volume-weighted average prices and relative (percentage) margins. In Chapter 5 we present price indices for Norway and the nine reference countries for all active substances, active substances on patent (the patent segment), active substances off patent (the generics segment), and active substances subject to graded price regulation. In Chapter 6 we conduct regression analyses to test whether the differences in prices are statistically significant. We also test for differences in relative margins across countries. In Chapter 7 we provide a brief summary of the report's main findings and make some concluding remarks. At the end of the report is Appendix A, which provides a list of all active substances included in the sample and associated information.

2. Regulation and competition in the pharmaceutical market

In this Chapter we will provide an overview of the main regulatory regimes adopted on the pharmaceutical market, we discuss how the various regimes can be expected to affect price and demand, and place the various countries covered by this price comparison study in categories defined by the regulatory regime. At the beginning, we will also briefly identify the main features of the pharmaceutical market that prompt a need for regulation.

2.1. The pharmaceutical market

The pharmaceutical market is characterised by certain special features which mean that this market differs, in some cases sharply, from most other markets for consumer products. These are features associated with both the supply and demand side of the market.

Demand for pharmaceuticals

Demand for pharmaceuticals is generally characterised by low price elasticity, which means that demand responds relatively little to price changes, at any rate compared with most other consumer goods.[6] There are two main reasons for this. Firstly, users are largely insured against the expenses of prescription pharmaceuticals via third-party payment, which means that consumers often pay a relatively small proportion of the total price. Secondly, the demand side is characterised by a relatively high level of asymmetric information between the patient and prescribing physician, where the consumer (the patient) – in so far as he is given a choice between different pharmaceuticals – is largely reliant on information from the physician. Both these aspects – partial third-party payment and asymmetric information – help ensure that demand for prescription (and reimbursable) pharmaceuticals is less price-sensitive than for very many other consumer goods.

Supply of pharmaceuticals

The cost of supplying pharmaceuticals is largely linked to research and development (R&D). While these costs can be very high[7], the pure production costs for fully developed and approved pharmaceuticals are often relatively low. Development and production of pharmaceuticals is in other words generally characterised by high fixed costs and low marginal costs. This means that pharmaceutical prices must be substantially higher than marginal production costs for producers to be able to cover R&D costs, and thereby be given incentives to use resources to develop new pharmaceuticals.

Under the current system, pharmaceutical manufacturers' R&D incentives are ensured via the patent system, which means that a company that develops and is granted authorisation for a

[6] See, for example, Rizzo (1999) and Scherer (2000).

[7] Figures from the USA show that R&D costs in the pharmaceutical industry account for more than 15 per cent of total sales revenue. The average corresponding figure from other industries is less than 4 per cent (Danzon and Towse, 2003).

new pharmaceutical is given sole rights to sell this product over a certain period (the patent period). By granting such a monopoly licence, which means that the monopolist is given an opportunity to set prices higher than marginal production costs over the monopoly period, incentives for future R&D are promoted.

It is worth pointing out that the patent system also promotes – directly and indirectly – a significant degree of product differentiation on the pharmaceutical market, something which is probably bolstered by extensive use of various forms of marketing. The supply side of the pharmaceutical market can therefore be characterised as a market with imperfect competition in which pharmaceutical companies have a significant amount of market power.

Generic competition

When a patent for an original preparation expires, producers of generic copy products are free to enter the market. This means that the original preparation is exposed to "generic competition". In most cases, original preparations which have come off patent will face competition from a number of such copy products. As these copy products contain the same active substances as the original preparation, a "therapeutic market" consisting of an original preparation and one or more copy preparations can be regarded as a market with homogeneous products. Standard economic theory then predicts that such generic competition should drive prices down to the marginal production costs – both for the original preparation and the copy products. Given that producers compete on price, it would be reasonable to assume that competition from a copy preparation is only needed to achieve this price effect.

This simple account is, however, somewhat difficult to find in reality. Even if generic competition usually leads to lower prices on the pharmaceutical market, it is generally found that original preparations are sold at a higher price than their respective copy preparations. This is not all: a number of studies have also been conducted which show that generic competition leads to increased prices for the original preparation[8], a phenomenon which is usually referred to in the economics literature as the "generic paradox".

These empirical findings show that original and copy preparations are by no means regarded as homogeneous products by consumers (or prescribing doctors). Instead, they indicate that the original preparation is considered (by sufficient numbers of consumers) to be of higher quality than the copy preparations. A possible explanation for this is that the producer of the original preparation is able to achieve such a vertical differentiation effect[9] through extensive use of marketing in the course of the patent period. More recent economic research also generally adopts an approach involving vertical product differentiation to assess generic competition on the pharmaceutical market.[10] Within this framework, it is also possible to explain the "generic paradox".

[8] Grabowski and Vernon (1992); Frank and Salkever (1997).

[9] By "vertical differentiation", we generally mean that the products on the market *are considered* to be of differing quality – at any rate, that the original preparation is considered to be of higher quality than the copy preparations. This may, for example, be due to extensive marketing of the original preparation during the patent period.

[10] See, for example, Brekke, Königbauer and Straume (2007).

2.2. Regulation: Purpose and balancing exercises

As indicated above, the pharmaceutical market is characterised by low price elasticity on the demand side and strong market power on the supply side. From a policy perspective, this is an unfortunate combination as an unregulated market may be expected to result in very high prices, with correspondingly high costs associated with the consumption of pharmaceuticals. Most countries have therefore adopted one or more instruments to regulate pharmaceutical prices and consumption.

The most fundamental balancing exercise that must be taken into account in the regulation of the pharmaceutical market is that between static and dynamic efficiency. *Ex post*, after a pharmaceutical has been launched on the market, static efficiency predicts that the pharmaceutical must be priced on a par with marginal production costs. Dynamic efficiency, on the other hand, predicts that pharmaceuticals should be priced higher to ensure adequate incentives for innovation and the development of new pharmaceuticals. In practice, this balancing exercise means that the purpose of the regulation will be to promote competition and the effective supply of pharmaceuticals without undermining the patent system in an unfortunate manner with reference to dynamic efficiency.

Besides this fundamental balancing exercise, there is a need to ensure adequate availability of pharmaceuticals and to avoid unfortunate distribution effects. The main reason for the public insurance of pharmaceutical costs is to guarantee patients access to pharmaceuticals independently of personal income. The insurance argument thus introduces a new balancing aspect in the regulation of personal payments for pharmaceuticals. Increased personal payment will make demand more price-sensitive and promote greater competition on the market, but at the expense of the aspect of (economic) availability among consumers.

2.3. An overview of different regulatory regimes

We can basically distinguish between two forms of regulation of the pharmaceutical market: (i) Regulation of the supply side, and (ii) regulation of the demand side. Regulation of the supply side essentially entails various forms of price ceiling regulation, whereas regulation of the demand side entails regulation and design of the reimbursement scheme. In other words, we can distinguish between regulation of the price that pharmaceutical producers receive (supply side regulation) and regulation of the price that consumers actually pay (demand side regulation). The latter essentially entails various forms of reference pricing in which the objective is to encourage greater competition through the design of the reimbursement scheme.

Many countries have introduced a combination of different regulatory regimes, and regulate both the demand and supply side of the market. We summarise below the main features of the commonest regulatory regimes, and include a brief discussion of the expected impact on competition and prices. Lastly, we will undertake a rough categorisation of the 10 countries that form the basis of the price comparison in this report, in which we rank the individual countries with reference to various regulatory regimes and instruments.

Reference pricing

Reference pricing means that pharmaceuticals are classified in various groups based on therapeutic effect. A reference price is determined for each reference group, with this being the maximum reimbursement price for all pharmaceuticals in the reference group in question. Any positive difference between the price of a pharmaceutical and the relevant reference price will not qualify for reimbursement. To give an example, assume that a hypothetical reference group consists of *n* different pharmaceuticals, where the price of pharmaceutical *i* is given by p_i, $i=1,...,n$. Under a reference pricing system, the consumer's personal payment for the purchase of pharmaceutical *i* will typically be given by

$$c_i = \begin{cases} f + \alpha p_i & if \quad p_i \le \bar{p} \\ f + \alpha \bar{p} + (p_i - \bar{p}) & if \quad p_i > \bar{p} \end{cases},$$

where *f* is a fixed personal payment, α is a percentage personal payment (own share) and $\bar{p}$ is the reference price.

The effect of reference pricing is that demand becomes more price elastic for prices above the reference price. This will promote stronger price competition and thus lower prices. The lower the reference price is set, the stronger this competition effect will be.

After reference pricing was first introduced in Germany in 1989, many countries have introduced this form of regulation in one or other variant. The difference between various reference pricing systems essentially entails how the reference groups are determined; this constitutes the distinction between generic and therapeutic reference pricing. In addition, the effect of reference pricing will depend on whether the reference price is determined exogenously or endogenously. We will briefly discuss these various alternatives below.

Generic reference pricing

Under generic reference pricing (GRP), the reference groups are constructed so that each group only consists of preparations containing identical active ingredients. This means that GRP by definition only covers the generics market, i.e. original preparations whose patent protection has expired and the respective copy preparations. GRP is therefore a regulatory regime which is essentially intended to promote generic competition, and the expected price effects will primarily be expected to arise in the generics segment of the pharmaceutical market.

It is worth emphasising, however, that GRP can also be imagined to produce cross-price effects in the patent segment. If patent-protected products exist that are sufficiently close to therapeutic substitutes for products which has come off patent, GRP will also have competition effects in the patent segment. Such a cross-price effect between the therapeutically substitutable preparation has been found in a recent empirical study of GRP ("the index pricing system") on the Norwegian pharmaceutical market (Brekke, Grasdal and Holmås, 2008).

Therapeutic reference pricing

Under therapeutic reference pricing (TRP), the reference groups are constructed with reference to therapeutic, but not necessarily chemical, equivalence. This means that preparations that are patent-protected can in principle be included if sufficiently substitutable products, in the therapeutic sense, exist. TRP therefore means that parts of the patent segment are also directly exposed to more competition. It is therefore reasonable to assume that TRP will lead to greater market shares for generic preparations and consequently produce stronger price effects than GRP. TRP is in this respect, too, a much more controversial mechanism than GRP, and critics will assert that TRP partially undermines patent protection by directly exposing patent-protected preparations to increased competition from the generics market. Therapeutic reference pricing is currently used among other things in the Netherlands and Germany.

Endogenous versus exogenous reference price

Regardless of whether patent-protected pharmaceuticals can be included (TRP) or not (GRP) in the reference groups, the price effects of reference pricing will depend on how the reference price is determined. An important point that we would emphasise is whether the reference price is determined endogenously or exogenously. In the former case, the price is set as a function of existing prices in the reference group and is updated frequently. Price changes within a reference group will therefore be reflected in an (automatic) change in the reference price. An alternative to this is that the reference price is set independently of existing prices, so that price changes do not automatically affect the reference price. We can classify this situation as exogenous reference pricing. We can also have an approximately exogenous reference price even if this is in principle determined as a function of existing prices, if the reference price is updated very rarely.

The distinction between endogenous and exogenous reference pricing is important because these two systems can produce very different price effects. In the first case – endogenous reference pricing – the operators in the market will have an incentive to set prices below the existing reference price to induce a reduction in it at the time of the next update, and thus make competing products relatively more expensive for consumers. This incentive disappears, however, if the reference price is exogenous. In this case, reference pricing may still lead to price increases for products which are in principle priced below the reference price. In the light of economic theory, we would, all other things being equal, therefore expect a stronger competition effect from reference pricing if the reference price is determined endogenously.[11] [12]

In this context, we would point out that the Norwegian graded pricing system, even if it is not a reference pricing system in the traditional sense, has elements of exogenous reference pricing, where the reference price (the graded price) follows an exogenously determined price path.

[11] See Brekke, Holmås and Straume (2008) for an analysis of exogenous versus endogenous reference pricing.

[12] This argument assumes that the operators on the market do not enter into tacit collaboration to maintain high prices on the market. A possible objection to the conclusion that endogenous reference pricing leads to stronger price competition is that this system can bring about stronger incentives to enter into such price collaboration as the gain from collaboration can be obtained in the form of a higher reference price, in so far as this leads to increased consumption of pharmaceuticals.

Other competition-promoting instruments

In addition to pure reference price systems, demand can also be regulated by the general design of the reimbursement scheme. An important aspect in this context is whether the personal payment is designed as a fixed or percentage rate (where appropriate, a combination of both). The latter alternative, where the consumer pays a percentage share of the price, contributes, all other things being equal, to more price elastic demand. In many countries, including Norway, there is, however, often a ceiling on private pharmaceutical costs (per year and generally per prescription), counteracting the impact of the percentage personal share on demand elasticity.

The absence of both reference pricing and percentage personal payment will in principle lead to demand for pharmaceuticals being price-insensitive, with a corresponding lack of *de facto* price competition. In the comparison group, this is the case for three countries: Ireland, the United Kingdom and Austria.

Another way of stimulating price competition is to give pharmacies an opportunity to undertake generic substitution, i.e. the pharmacy can, in cases where this is possible, supply a cheaper copy preparation instead of the original preparation specified on the prescription. Such a scheme will most likely be most effective if generic substitution is either imposed directly, or pharmacies are given economic incentives to undertake generic substitution.

Price ceiling regulation

Reference pricing does not solve the problem of cost control for the group of patent-protected pharmaceuticals for which close therapeutic substitutes do not exist. Reference pricing is therefore usually combined with regulation of the supply side. The commonest way of regulating the supply side is by price ceiling regulation, where a maximum price is defined for each pharmaceutical.

International reference pricing

Many countries have gradually introduced price ceiling regulation in the form of international reference pricing. This regulatory regime means that the maximum price for a pharmaceutical is determined as a weighted average of the prices for the same (or equivalent) pharmaceutical in a selected group of comparison countries. The group of comparison countries usually consists of countries with a fairly equivalent general price and income level.

The main price effect of this regulatory regime is that it undoubtedly contributes to increased international harmonisation of pharmaceutical prices. The more countries that adopt international reference pricing, the stronger this effect will be.

A possible unintended effect of this form of regulation is, however, that pharmaceutical companies may have incentives to postpone the introduction of new pharmaceuticals in order, where possible, to achieve a higher price in the country of introduction. Such incentives will arise because the price in the country of introduction will be "exported" to other countries via international reference pricing. The more countries that use this form of price ceiling regulation, the more important it will be for the pharmaceutical producer to achieve a "high"

price in the country of introduction, and the more willing the producer will be to postpone the launch if this may bring about a higher launch price.[13]

International reference pricing is currently the commonest form of price ceiling regulation, and is adopted by a majority of the 10 countries covered by this study.[14] The exceptions are Denmark, the United Kingdom, Sweden and Germany.

Yield regulation

Yield regulation is an alternative to price ceiling regulation. This form of regulation means that producers are free to set prices, but a yield on invested capital is permitted only up to a certain level. Yield regulation will therefore indirectly cap the level of prices that pharmaceutical producers can charge.

This regulatory regimen, which differs substantially from price ceiling regulation, is currently adopted only in the United Kingdom.

2.4 Classification of the 10-country group

We summarise the review of the various regulatory regimes by undertaking a classification of the individual countries in the 10-country group which forms the basis of this study, presented in Table 2.1. The information on the actual regulatory regimes has largely been taken from the PPRI (Pharmaceutical Pricing and Reimbursement Information) project.[15]

In such a classification, it is important to remember that actual regulatory regimes often combine various features of a number of stylised regulatory models (as presented above). It is therefore not always clear how classification in relation to stylised models should be carried out. Ambiguous classifications are asterisked in the table, and concern the regulatory regimes in Ireland, Norway and Sweden.

Table 2.1 Classification of the 10-country group in relation to regulatory regimes

Country	Generic reference pricing	Therapeutic reference pricing	International reference pricing	Generic replacement	Percentage personal share
Belgium	Yes	No	Yes	No	Yes
Denmark	Yes	No	No	Yes	Yes
Finland	No	No	Yes	Yes	Yes
Ireland	No	No	Yes	Yes*	No
Netherlands	No	Yes	Yes	Yes	No
Norway	Yes*	No	Yes	Yes	Yes

[13] Such an effect is confirmed in an empirical study by Danzon, Wang and Wang (2005).
[14] In some cases, an international reference price system is supplemented by the use of other criteria as well – e.g. therapeutic gain – in the setting of the price ceiling.
[15] Available from http://ppri.oebig.at

United Kingdom	No	No	No	No	No
Sweden	Yes*	No	No	Yes	Yes
Germany	No	Yes	No	Yes	No
Austria	No	No	Yes	No	No

In Ireland, pharmacies have access to generic substitution, and we have undertaken a classification in relation to this. It is nevertheless worth emphasising that in Ireland there is no requirement or economic incentive to undertake generic substitution. Norway is listed as having generic reference pricing even if the Norwegian system does not officially have this designation. We have nonetheless chosen to call it generic reference pricing because the Norwegian graded price system has the same essential characteristics as a reference price system with exogenous reference pricing, as discussed above. In the same way, Sweden is also listed as having generic reference pricing. The reason for this is that Sweden has directed pharmacies to undertake generic substitution unless the patient himself decides to pay the difference between the original preparation and the cheapest available alternative. This is therefore entirely equivalent to a generic reference price system, even if this designation is not used officially.

As mentioned previously, it is Ireland, the United Kingdom and Austria that differ in the sense that these countries have adopted few mechanisms, if any, to foster generic competition. These countries do not have generic reference pricing, percentage personal shares or any schemes that provide direct incentives for generic substitution. The Netherlands and Germany are the two other countries that do not have percentage personal shares, but then these are the only two countries that use therapeutic reference pricing, something that will foster competition not only in the generics market, but also potentially in the patent segment.

Chapter 3. Data and sample

Data for the price comparison have been obtained from Intercontinental Medical Systems (IMS).[16] We have obtained data from IMS for Norway and the following nine reference countries: Austria, Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, Sweden and the United Kingdom. The reference countries comprise the nine countries included in Norway's basket for setting maximum prices for prescription pharmaceuticals. In this part of the report we provide an overview of data and the sample of active substances, with particular emphasis on how the prices have arisen.

3.1. Sample

We have obtained price and volume data for the 300 top-selling (measured in terms of sale value) active substances with prescription pharmaceuticals in Norway over the period 1 January to 30 June 2007.[17] To cover all graded price pharmaceuticals, we have also included FLUCONAZOLE and MELOXICAM, so that we have a total of 302 active substances in the sample. The sample comprises exclusively pharmaceuticals sold via pharmacies. Pharmaceuticals purchased and sold in hospitals are not included.[18] The sample includes both patent-protected and non-patent-protected pharmaceuticals, and also original and synonymous preparations (generics). Table A in Appendix A provides a full list of all the active substances in the sample.

The data set contains detailed information on prices and volumes per month for the period in question. In addition, the data contain information on a number of other aspects such as active substance name, therapeutic classification, product name, producer, original or generics, patent status, pack formulation (capsule, tablet, strength, etc.), and pack size.[19]

Patent status proves to be very imperfect for certain (22) active substances. Nor do we know whether these are original products or generics. As we must calculate prices and indices for both patent-protected and non-patent-protected products separately, these are excluded from the sample, which leaves us with 280 active substances in the sample. In Table A in Appendix A, we have indicated which active substances do not have a specified patent status, and thus are excluded from the analyses. These are mainly older pharmaceuticals, including a good number of vaccines, a few combination pharmaceuticals, etc. None of these are among the top-selling active substances.

Prices in Norway are compared with the nine basket countries referred to at the beginning. These countries are regarded as comparable to Norway, so that the sample of countries is relatively homogeneous. Prices in these countries form the basis for maximum prices for

[16] IMS is a company that has specialised in collecting data on pharmaceutical sales throughout the world.
[17] These were the 300 top-selling products over the period September 2006 to September 2007. The turnover figures are based on prescription pharmaceuticals sold via pharmacies.
[18] The sample includes certain pharmaceuticals that can be called hospital pharmaceuticals in the sense that they are prescribed and often consumed in connection with hospital treatment, e.g. Etanercept (Enbrel). However, these are only included in our data if the patient obtains these preparations via a hospital pharmacy or a private pharmacy.
[19] In the case of pharmaceuticals not in tablet form, there may be some deficiencies, particularly with regard to strength.

Norwegian (prescription) pharmaceuticals, with the exception of pharmaceuticals included in the graded price system. This means that Norway must by definition be relatively cheap for the active substances covered by this scheme.

The data set contains information on all 302 active substances in Norway. As expected, not all active substances are sold in the comparison countries. Table 3.1. below indicates how many of the top-selling Norwegian active substances are sold in the other countries. We can see that for the entire sample (all active substances), the number of active substances varies from 302 in Norway to 267 in Ireland. If we limit the sample to active substances with patent status, the number of active substances varies from 280 in Norway to 247 in Belgium. If we consider active substances sold in all countries – which we refer to as *global active substances* – the number is 222 (73.5%) for the entire sample and 202 (72.1%) if we exclude pharmaceuticals without information on patent status. This is a relatively high level of representativity, indicating that the comparison group is good.

Table 3.1. Number of active substances in Norway and the reference countries.

	All active substances	Active substances with patent status
Norway	302	280
Denmark	294	274
Sweden	293	274
Germany	292	269
Netherlands	286	267
Finland	283	263
United Kingdom (UK)	277	258
Austria	275	257
Belgium	271	247
Ireland	267	252
Global active substances	222	202

3.2. Price data

Pharmaceutical prices arise in three forms: producer prices, wholesale prices and pharmacy prices. We follow the established terminology and refer to producer prices as the wholesale purchase price (GIP), wholesale prices as the pharmacy purchase price (AIP) and pharmacy prices as the pharmacy sale price (AUP). In addition, reimbursement prices (public prices) are handled, which is the amount that the public authorities (where appropriate, insurance companies) refund from the pharmaceutical's price, and personal shares, which is the price that the patient faces.

In the study we focus on GIP and AUP. GIP is the price of the pharmaceutical that the producer achieves, and is a price that is often the object of international price comparisons. AUP is the price that the public authorities (insurers) and patients face, and the difference between GIP and AUP indicates the margin for the wholesaler and pharmacy. We have not included AIP in the analyses. This indicates how the margins are distributed between the wholesaler and pharmacy, which is not focused on in this study. Nor have we included information on reimbursement prices. These would have given us an idea of public costs, but they do not provide a good idea of price differences as different reimbursement prices are equally well due to differences in reimbursement schemes between countries.

IMS collects price data in different ways in the individual countries. In principle, it collects information on actual pricing at a point in the distribution chain. It then uses detailed information from each country on discounts, profit regulations and reimbursement prices to calculate the other prices. It also calculates wholesale and pharmacy margins where necessary. The table below provides an overview of how the price data from IMS have arisen for each country.

Table 3.2. IMS price data: Observed price, source, calculation of AUP and GIP.

Country	**Observed price**	**Source**	**Calculation of AUP and GIP**
Belgium	AUP	Association Pharmaceutique Belge	6% VAT is deducted from AUP. GIP is calculated by using reimbursement prices and regulated profit rates.
Denmark	AIP	Wholesaler invoice	AUP is calculated by applying regulated profit rates. GIP is calculated by deducting the estimated wholesale margin (6.6%).
Finland	AIP	Finnish pharmaceutical association	AUP is calculated by applying regulated profit rates and charges. GIP is calculated by deducting the estimated wholesale margin (3%).
Ireland	AIP	Official wholesale prices	AUP is calculated by applying regulated profit rates, and information on reimbursement prices. GIP is calculated by deducting regulated profit rates.
Netherlands	AIP	Pharmacy invoice	AUP is calculated by deducting estimated AIP discounts and then applying regulated profit rates. GIP is calculated by deducting estimated AIP discounts and wholesale profit (3%).
Norway	AIP	Wholesaler invoice	AUP is calculated by applying regulated profit rates. GIP is calculated by deducting estimated wholesaler profit (6%).
United Kingdom	AIP	National Health Service	AUP is calculated by deducting estimated AIP discounts and then applying regulated profit rates. GIP is calculated by deducting estimated AIP discounts and wholesaler profit (2.5%).
Sweden	AIP	Apoteket	AUP is calculated by applying regulated profit rates. GIP is calculated by deducting estimated AIP discounts and wholesaler profit (2.5%).
Germany	GIP	German Health Institute (Lauer-taxe Database)	AUP is deducted by applying regulated profit rates. Repayments (clawbacks) to the sickness insurance funds are then deducted.
Austria	GIP	Official list prices from producers	AUP is calculated by applying regulated profit rates for wholesalers and pharmacies.

The quality of price data in which the actual price has not been observed is dependent on IMS's surveys from each market being thorough and correct. As the table above shows, IMS conducts country-specific surveys related to discount schemes, profit regulations, wholesale and pharmacy margins, clawbacks, etc. For each country, IMS adjusts prices depending on the country-specific schemes. IMS carries out frequent sampling in the individual countries to monitor the quality of the calculated prices, and claims that the calculated prices give a good idea of actual prices. It can also be mentioned that IMS has specialised in generating international pharmaceutical prices and is a leader in this area.

All prices are free of value added tax. Price differences therefore do not reflect differences in value added tax between countries. Most countries in the sample have lower value added tax than Norway, apart from Denmark, which also has a VAT rate of 25%. Sweden, for example, has no value added tax on prescription pharmaceuticals, followed by Belgium and the Netherlands with only 6% VAT. From the analysis of the tax side, we know that high taxes can contribute to producers cutting their prices to avoid losing a lot of sales. As long as demand for pharmaceuticals is relatively price inelastic, however, there are grounds for assuming that patients bear much of the burden associated with high levels of value added tax. For the public authorities, value added tax plays no role.

The prices are quoted in the individual country's currency. We have converted all prices to Norwegian prices. For each month, we use the average exchange rate for the previous six months: For January 2007, we thus use the average exchange rate for the period from August up to and including December 2006; for February 2007, we use the average exchange rate for the period from September 2006 up to and including January 2008, etc.

Price data come in two variants: *price per pack* and *price per dose*. The price per pack will be used when we compare identical packs across countries. We select the best-selling pack in Norway for a given active substance and compare the price of the same pack in the reference countries, where these exist. The advantage of this approach is that precision is ensured in the sense that exactly the same product is compared across countries. The disadvantages are many, however, and essentially relate to a lack of representativity. Firstly, it is the case that the top-selling (and thus most representative) pack in Norway need in no way be the top-selling one in the reference countries. In the worst case, this pack is not sold in the reference countries. Table 3.3 below shows the average pack size for the countries in the sample.

Table 3.3 Average number of doses per pack for the 10-country group.

	All active substances	Global active substances
Sweden	64.3	68.6
Germany	63.3	68.9
Denmark	60.2	63.9
Norway	51.5	53.7
Finland	51.4	51.4
United Kingdom	48.4	48.7
Belgium	48.4	46.8
Netherlands	48.0	51.3
Ireland	46.8	46.4
Austria	35.7	36.7

We can see that average pack size varies widely in some cases between the countries in the sample. When we consider all active substances, Sweden has 64.3 doses per pack on average, while Austria has 35.7. In the case of active substances sold in all countries (global active substances), Germany has 68.9 doses per pack, while Austria has 36.7. It is clear from the table that the top-selling pack in Norway is rarely the top-selling pack in all other comparison countries.

Secondly, comparing prices of identical packs will mean that generics often drop out. In the case of active substances that have come off patent, there are often a number of generic products on the market, and these often have a smaller market share than the original product, at any rate separately. A selection based on top-selling packs within an active substance could then lead to low representativity of generic products in the segment for non-patent-protected products, and not give a true picture of the price because the original preparation is typically higher priced than generics.

Price per dose is indicated by price per IMS standard unit.[20] A standard unit is a proxy for a dose, and is defined by IMS as a tablet, a capsule, 10 ml liquid, etc. It is difficult to find a perfect measure of a dose, but so long as a dose is relatively constant across the countries in the sample, this will be relatively unproblematic. The advantage of price per dose is that these are defined for all packs and formulations. This makes it possible to calculate an average price for each active substance. Such an approach means that we make use of all price information. This also ensures a good representation of generics. As we will explain later, we weight the prices for an active substance by volume, so that we attach greater importance to the price of products that sell more than to the price of products that sell less. The weightings are calculated on the basis of each country's sales, so that we obtain the most representative price for each country. In this way, we achieve a high level of representativity. This approach is in line with Danzon and Chao (2000), who also provide a discussion of these two approaches.

3.3. Volume data

The data set contains two types of volume data: *number of packs* and *number of doses*, where the number of doses is represented by IMS standard units as described above. The volume data are per product (article number) and per month for each of the countries we include in the sample for the whole period (first half of 2007).

Volume data are used primarily to weight prices. The number of packs sold is not especially suitable for calculating weightings as packs, both within active substances and not least across active substances, have differing numbers of doses (tablets, capsules, etc.). Active substances that typically have many doses in a pack will then be given too low a weight, and vice versa. We therefore use the number of doses as a basis for calculating weightings.

We have two types of volume weightings: (i) Weightings across active substance and packs and (ii) weightings within active substances. The weightings within an active substance are

[20] There are other dose measures used such as price per defined daily dose (DDD), price per gram of active substance, etc. These are not available to us via IMS's data set.

used to calculated average prices, as described above. The weightings across active substances and packs are used to calculate indices, where the weightings will reflect consumption patterns so that prices of active substances with high sales (high number of doses) are assigned a higher weighting than prices of active substances with low sales. As Norway is the starting point for the study, the price indices will be calculated with Norwegian consumption weightings. To check sensitivity, we also calculate price indices based on foreign weightings. This is presented in more detail when we calculate prices and indices in the next two chapters.

3.4. The patent and generics segment

The sample contains pharmaceuticals that on patent and pharmaceuticals whose patents have expired and copy preparations (generics) have been launched, or could potentially be launched, as an alternative to the original preparation. It may be appropriate to break down the sample according to whether or not the pharmaceutical is protected, partly because the competition situation is different and partly because many countries, including Norway, engage in different regulation of these two segments. In addition, it is the case that a certain yield (and thus a higher price) will be ensured during the patent period to promote innovation in pharmaceuticals, while the lowest possible price is a natural policy target once the patent has expired.

One way of breaking down the sample could be to use the patent status variable in the data set. It emerges, however, that a number of pharmaceuticals within the same active substance are registered both as being on patent (protected) and off patent (non protected). In addition, this variable is difficult to use across countries. We have therefore had to dispense with using this variable.

However, the data set contains information on whether a pharmaceutical is an original preparation or generic.[21] We will therefore observe whether generics are sold within an active substance. In the light of this information, we construct the following four sub-indices:

1. Active substances without actual generic competition in Norway.
2. Active substances with actual generic competition in Norway.
3. Active substances without actual generic competition in any countries.
4. Active substances with actual generic competition in at least one country.

The first index represents the patent segment, while the second index represents the generics segment. All active substances for which we report the sale of generics in Norway in January 2007 are classified as having generic competition. In the case of active substances that do not have generic competition in the first period (January 2007), but have generic competition in one of the next 5 months, we classify the active substance as being without generic competition up to the month when we first report actual generic competition.[22]

A problem with using actual generic competition in Norway as a basis for classification in the patent and generics segment is that this will typically lead to overestimation of the size of the patent segment. Pharmaceuticals (active substances) whose patent protection has expired, but which have not experienced generic competition, are included in the patent market. In this way, no account is taken of *potential* generic competition. If Norway is also used as the point of departure, it may be that active substances with generic competition abroad (but not in Norway) are included in the patent segment. This classification may therefore give rise to incorrect estimation of price differences.

[21] This information does not exist for certain pharmaceuticals. This group is equivalent to those that do not have patent status, as discussed in the introduction. These (22) active substances are excluded from the data set, so that we are left with (280) active substances with information on whether an original preparation or generic is involved.

[22] In the case of Norway, the following 7 active substances have generic competition only for certain periods: DIAZEPAM (generic from period 2); DICLOXACILLIN (generic from period 4); DOXAZOSIN (generic from period 3); FINASTERIDE (generic from period 4); MELOXICAM (generic from period 3); MOXONIDINE (generic from period 5); OXCARBAZEPINE (generic from period 2); VENLAFAXINE (generic from period 6)

We have therefore included two alternative categories (3 and 4) in which we use information on generic competition from the entire sample. The patent segment is defined by active substances that do not have generic competition in any country, while the generic segment is defined by the rest, consisting of active substances that have generic competition in at least one country. A better and more precise classification of the two groups of pharmaceuticals is obtained in this way. Table 3.4. below shows the number of active substances in the patent and generics segment, depending on which definition is adopted.

Table 3.4. Active substances in the sample broken down according to generic competition in Norway and globally.

	All active substances	Without generic competition in Norway	With generic competition in Norway	Without generic competition globally	With generic competition globally
Norway	280	174 (62%)	106 (38%)	136 (49%)	144 (51%)
Sweden	274	169 (62%)	105 (38%)	132 (48%)	142 (52%)
Denmark	274	169 (62%)	105 (38%)	132 (48%)	142 (52%)
Finland	263	161 (61%)	102 (39%)	126 (48%)	137 (52%)
UK	258	156 (60%)	102 (40%)	121 (47%)	137 (53%)
Germany	269	165 (61%)	104 (39%)	131 (49%)	138 (51%)
Netherlands	267	162 (61%)	105 (39%)	127 (48%)	140 (52%)
Belgium	247	148 (60%)	99 (40%)	118 (48%)	129 (52%)
Austria	257	153 (60%)	104 (40%)	122 (47%)	135 (53%)
Ireland	252	150 (60%)	102 (40%)	114 (45%)	138 (55%)

In the case of the patent segment, we see, as expected, that the number of active substances is reduced in all countries when we go from "without generic competition in Norway" to "without generic competition globally". For Norway, the number of active substances is reduced from 174 to 136. Even if we cannot be entirely sure that we have not included any active substances with potentially generic competition, there is nevertheless good reason to assume that "without generic competition globally" is the most precise definition of the patent segment.

In the case of the generics segment, we see that the number of active substances increases for all countries when we go from the classification "generic competition in Norway" to "generic competition globally". For Norway, the number of active substances increases from 106 to 144. This classification opens up the possibility of including *potential* generic competition in the generics segment. If we purely consider actual generic competition, it may be overestimated how cheap a country is (in this case, Norway). In the analyses in the next two chapters, we present indices for all four definitions of the patent and generics segment.

We could have used the Norwegian substitution list to define the generics segment. An argument for this is that generics not included in the substitution list compete to a lesser extent against original preparations as these cannot be substituted at pharmacy level. It is currently difficult, however, to get hold of substitution lists from other countries, and it is conceivable that such substitution lists vary somewhat between countries. In Table A in Appendix A, we provide a list of which pharmaceuticals are included in the Norwegian substitution list. We see from this that only 18 of 302 active substances are not on the substitution list, but have generic competition in Norway. There is therefore little reason to

believe that including generics not on the substitution list affects the results in any way. It is further the case that we calculate a dedicated index for graded price pharmaceuticals that are all on the substitution list.

4. Descriptive statistics

An overview of the price data underpinning the results in this report is set out below. The aim is to provide an initial overview of price and margin differences between the ten countries we study. With regard to prices, we compare what we have chosen to call volume-weighted average prices. As we return to in the next chapter, it can be asserted that this price target does not take sufficient account of the Norwegian pattern of consumption, and when we calculate price indices we therefore weight the volume-weighted prices with the Norwegian pattern of consumption. Part of the reason why we nevertheless choose to present price comparisons on the basis of volume-weighted average prices is that this can provide a basis for assessing the effect of weighting prices with Norwegian consumption. Besides prices, we also compare the total margins for wholesalers and pharmacies in each of the countries. Before we deal with these comparisons in greater detail, we will, however, explain how the volume-weighted average prices and the margins have been calculated.

4.1. Volume-weighted average prices per dose

For each active substance, we have a number of different pack types and we also have data for six months. This means that, for each active substance, we have a number of price observations (per dose) where some active substances have relatively few observations and others have relatively many. Furthermore, it is the case that some pack types have relatively high sales, while others are sold to a lesser extent. The aim of the volume-weighted average prices is precisely to take account of this, i.e. we want to weight the prices per dose of the top-selling pack types more than the lower-selling packs. To take care of this, we have, for each active substance and for each country, weighted the price per dose with the proportion of sales this pack accounts for out of total turnover for the active substance in this country. We then sum the volume-weighted prices within each active substance, and thereby gain a price per dose per active substance. A single example may make things clear:

Assume that for active substance A (for example in Norway) we have three different packs with the following prices and turnover:

Pack 1A: the price is NOK 10 per dose and turnover is 5 doses
Pack 2A: the price is NOK 20 per dose and turnover is 10 doses
Pack 3A: the price is NOK 30 per dose and turnover is 15 doses

The volume-weighted average price per dose then becomes:

$$NOK10 \times \frac{5}{30} + NOK20 \times \frac{10}{30} + NOK30 \times \frac{15}{30} = NOK23.33$$

The arithmetic (unweighted) mean in the example above is NOK 20. The volume-weighted average price in the example then becomes higher because the most expensive packs are the top-selling ones. If this has been the opposite – i.e. if turnover of the more expensive packs had been relatively low – the volume-weighted average price would conversely have been lower than the arithmetic mean.

Many studies compare prices of identical packs instead of calculating the average price within an active substance. The top-selling pack in the base country is then selected, and the price of this pack is then compared with corresponding packs in the reference countries. In our example, pack 3A is the top-selling one with a price of NOK 30. The problem with this approach is, as mentioned earlier, that this pack may not exist or may have lower sales in the reference countries. In addition, we throw away a lot of information by excluding other pack sizes in the price comparison. Volume-weighted average prices take account of both these aspects, and yield a much higher level of representativity.

4.2. Percentage margins

As we have information on pharmacies' sale price (AUP) and wholesalers' purchase price (GIP), it is possible to say something about how the margins vary between countries. To calculate the margins, we use the commonest method (the Lerner index) for calculating relative margins/price supplements in a market:

$$M = \frac{AUP_i - GIP_i}{AUP_i} \times 100$$

The margin is thus measured as a percentage of the pharmacies' sale price (AUP). For each country, we use volume-weighted average AUP and GIP per active substance and calculate on the basis of these margins as described above.

4.3. Comparison of volume-weighted average prices (AUP) and margins

We start by discussing how pharmacies' sale price (AUP) per dose and wholesale and pharmacy margins vary between countries. Table 4.1 reports AUP per dose, margin, average number of doses per pack and number of active substances in each country for all active substances. We see that, of the 280 top-selling active substances in Norway, the number of active substances sold in the reference countries varies between 247 in Belgium and 274 in Sweden and Denmark. With regard to the average number of doses per pack, the variation is considerable, ranging from 35.7 in Austria to 64.3 in Sweden. Norway has 51.5 doses per pack on average. This illustrates the problem of comparing prices for identical packs.

If we consider volume-weighted AUP per dose, Table 4.1 shows that Germany has the highest price (NOK 500.4), followed by Belgium (NOK 440.8) and Norway (NOK 406.7). At first glance, it may seem surprising that Norway is the third most expensive country if we calculate average AUP based on all active substances. This result is due, however, to the fact that different samples are compared in each country. In Norway, all 280 active substances are included, whereas, as mentioned above, the number of active substances sold in the reference countries is lower (from 247 to 274). Generally, it is the case that if very expensive (or very inexpensive) pharmaceuticals are sold only in some of the countries, this will of course affect volume-weighted average prices. As we see below, Norway has relatively low prices.

The reason why Norway has high prices in Table 4.1 is simply that some very expensive pharmaceuticals among the 280 top-selling active substances in Norway are not sold in the reference countries. This illustrates the importance of matching identical active substances when conducting price comparisons. We do this in two ways: (i) bilateral price comparisons in which we compare prices in pairs for each country in respect of which the active substances

are common to Norway and the reference country in question; and (ii) global price comparisons in which we compare prices of active substances sold in all countries.

In Table 4.2, we report volume-weighted average prices (AUP), margins and the number of doses per pack for various samples of the global active substances: all 202 active substances which are sold in all countries, active substances which do not have generic competition in Norway, active substances which have generic competition in Norway, active substances which do not have generic competition in any of the ten countries, active substances which have generic competition in at least one of the ten countries and active substances which are subject to graded price regulation.

If we consider volume-weighted average prices (AUP), the United Kingdom and Norway now emerge as the least expensive countries, followed by the Netherlands, Sweden, Austria, Germany, Denmark, Finland, Belgium and Ireland. The differences between the least and most expensive countries also seem to be very big; for example, the volume-weighted average AUP per dose is NOK 140.0 in Norway, while it is NOK 220.7 in Ireland. If we consider active substances on patent (without generic competition in Norway or without generic competition globally), we see that the picture changes slightly. The United Kingdom, Norway and the Netherlands are the three cheapest countries, while Finland, Belgium and Ireland are the most expensive. For the segment with generic competition, we have split the pharmaceuticals into three subsamples: active substances with generic competition in Norway, active substances with generic competition globally and active substances subject to graded price regulation. For active substances off patent, too, we find that Norway has low prices. In this respect, Denmark, Norway and Sweden are the least expensive countries, while Austria, the Netherlands and Ireland and the most expensive.

We also find that margins vary sharply between countries. Norway is among the countries with the lowest margins. If we consider the sample of global active substances, Sweden, Denmark, Norway and Belgium have margins between 21 and 25 per cent of AUP. Furthermore, we find that the United Kingdom and the Netherlands have margins of around 30 per cent, while margins in Finland and Germany are above 30 per sent. Ireland has the highest margins in the sample (49.1 per cent). If we break the active substances down according to whether or not they are patent-protected, we see that this has little impact on the ranking of countries. There is nevertheless a clear tendency for margins to be higher for active substances with generic competition. For example, we find that margins are nearly 33 per cent in Norway for active substances off patent (active substances with generic competition in Norway), while the margin for active substances on patent (without generic competition in Norway) is only 16.8 per cent. For active substances that are off-patent and subject to graded price regulation, the margins are even higher: 36 per cent. We can find corresponding differences in margins between active substances on and off patent in all countries in the sample.

The last question we consider in this chapter is how sensitive the results in Table 4.2 are for changes in the sample of active substances. To be able to say something about this, we have calculated volume-weighted AUP and the margin for various samples of the global active substances. We start by examining the 25, 50, 100 and 150 top-selling active substances in Norway (out of the sample of 202 active samples sold in all countries). Based on this, it does not appear as if the results are particularly affected by what sampling of pharmaceuticals is undertaken. Norway is the least expensive country in all the samples; other than that, there are relatively small changes in the ranking of countries. Wholesale and pharmacy margins

also seem to be relatively unaffected by the sample of pharmaceuticals. With regard to the absolute level of the volume-weighted average prices, there are nevertheless a number of changes from sample to sample. We have also examined the 25, 50 and 75 top-selling active substances without generic competition in Norway and the 25 and 50 top-selling active substances with generic competition in Norway. Here, too, it seems as if the choice of active substances does not affect the relative prices or margins particularly.

Table 4.1 Volume-weighted average prices (AUP), margins and number of doses per pack for all active substances in the sample.

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
AUP per dose	406.7	300.9	386.9	288.9	166.7	500.4	283.5	440.8	332.2	331,5
Margin	23.4	21.2	23.2	32.7	28.0	30.8	28.1	24.4	28.0	49,1
Dose per pack	51.5	64.3	60.2	51.4	48.4	63.3	48.0	48.4	35.7	46,8
Number of active substances	280	274	274	263	258	269	267	247	257	252

Table 4.2 Volume-weighted average prices (AUP), margins and number of doses per pack for active substances sold in all countries.

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
AUP per dose	140.0	151.3	164.9	186.9	121.1	161.1	148.6	210.5	158.3	220.7
Margin	24.1	21.2	23.5	33.5	29.4	32.8	29.3	24.9	29.5	49.1
Dose per pack	53.7	68.6	63.9	51.4	48.7	68.9	51.3	46.8	36.7	46.4
Number of active substances	202	202	202	202	202	202	202	202	202	202
Active substances on patent (without actual generic competition in Norway)										
AUP per dose	249.6	270.0	294.9	333.8	211.8	286.0	264.7	373.5	281.3	383.9
Margin	16.8	12.8	18.5	29.9	12.1	21.1	17.2	17.5	25.9	46.5
Dose per pack	51.1	62.2	61.5	51.6	41.2	52.9	43.4	47.0	37.6	38.6
Number of active substances	111	111	111	111	111	111	111	111	111	111
Active substances off patent (with actual generic competition in Norway)										
AUP per dose	6.2	6.6	6.3	7.6	8.2	8.8	7.0	9.4	7.6	21.7
Margin	32.9	31.5	29.6	37.9	50.4	47.2	43.9	33.9	33.9	52.2
Dose per pack	50.5	68.3	65.7	57.8	60.5	52.9	67.6	48.2	45.0	46.3
Number of active substances	91	91	91	91	91	91	91	91	91	91
Active substances on patent (without actual generic competition globally)										
AUP per dose	273.9	290.2	322.8	349.2	211.9	306.8	261.4	406.5	289.5	402.9
Margin	14.9	10.6	17.1	28.9	8.8	17.4	13.1	15.0	25.1	45.8
Dose per pack	42.3	58.2	53.0	57.3	41.5	54.6	41.1	47.2	33.3	36.0
Number of active substances	87	87	87	87	87	87	87	87	88	87
Active substances off patent (with actual generic competition globally)										
AUP per dose	38.7	46.6	45.5	64.0	50.6	51.0	63.3	60.7	57.6	82.9
Margin	31.0	29.2	28.3	36.9	31.0	44.5	41.5	32.4	32.8	51.6
Dose per pack	69.4	71.3	64.5	54.2	51.6	61.0	62.9	42.9	31.1	55.0
Number of active	115	115	115	115	115	115	115	115	115	115

substances										
Active substances in the graded price system										
AUP per dose	4.6	5.0	4.4	5.6	5.7	6.5	8.2	7.4	7.7	15.2
Margin	36.0	32.8	31.6	38.5	55.4	44.7	39.6	33.2	34.5	50.3
Dose per pack	47.1	77.6	52.9	56.1	25.8	68.4	30.2	41.0	27.4	27.6
Number of active substances	31	31	31	31	31	31	31	31	31	31

Table 4.3 Volume-weighted average prices (AUP) and margins for active substances sold in all countries, by turnover.

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
25 top-selling active substances										
AUP per dose	150.6	186.8	226.5	226.1	165.7	210.9	216.8	332.1	240.3	247.1
Margin	18.4	16.3	19.9	30.6	21.5	25.1	22.1	20.4	27.9	47.6
50 top-selling active substances										
AUP per dose	152.0	172.4	219.2	198.8	140.2	173.2	191.1	259.7	192.0	255.6
Margin	20.0	18.0	21.3	31.7	22.1	27.7	22.4	21.2	27.9	48.3
100 top-selling active substances										
AUP per dose	170.0	179.9	198.1	242.7	151.1	175.1	171.1	257.7	205.5	281.5
Margin	22.8	20.1	22.4	32.4	27.9	30.5	25.3	22.1	28.4	48.8
150 top-selling active substances										
AUP per dose	116.7	123.5	135.9	165.9	104.3	120.7	117.3	176.7	141.1	194.2
Margin	25.0	21.9	24.0	33.5	30.0	33.7	28.8	24.6	29.5	49.2
25 top-selling active substances										
AUP per dose	156.3	192.4	233.5	233.7	171.3	217.4	211.7	341.4	247.5	255.3
Margin	15.3	11.5	17.9	29.3	10.0	19.3	14.4	17.4	26.2	46.1
50 top-selling active substances										
AUP per dose	285.2	308.0	340.9	405.8	250.9	292.5	296.2	413.1	357.7	467.6
Margin	14.7	11.0	17.3	28.8	9.5	17.9	13.0	15.1	24.5	45.8
75 top-selling active substances without generic competition in Norway										
AUP per dose	227.0	240.1	265.4	323.3	201.9	232.2	227.5	342.1	274.2	371.0
Margin	15.8	11.6	17.9	29.3	10.0	19.7	14.1	16.2	25.0	46.1
25 top-selling active substances with generic competition in Norway										
AUP per dose	8.5	9.8	9.2	12.4	11.0	13.7	9.9	14.3	12.1	27.4
Margin	33.8	32.7	28.7	37.3	48.8	47.1	42.2	30.2	33.4	53.1
50 top-selling active substances with generic competition in Norway										
AUP per dose	7.6	8.2	7.6	10.6	8.1	11.3	8.7	13.8	9.4	21.5

Margin	33.8	32.1	29.5	37.7	50.7	47.1	41.3	31.7	34.0	52,4

5. Price indices

In this chapter we present the results for the various price indices we have calculated for Norway and the nine reference countries. Price indices are often sensitive to how these are calculated. We have therefore conducted a number of different approximations for calculating the indices. First, we compare prices of identical packs between countries. Volume-weighted average prices for active substances are then used to calculate price indices. We calculate both bilateral and global price indices for GIP and AUP. The indices are broken down into the patent and generics segment, and graded price pharmaceuticals. Before we present the analyses, we provide a brief theoretical presentation of price indices generally.

5.1. General aspects of price indices

A price index is a weighted average of prices for different products, generally calculated over time, such as the consumer price index. If we have two time periods 0 and *t*, and two products 1 and 2, we can express a price index as follows:

$$I_P = \frac{p_1^t w_1 + p_2^t w_2}{p_1^0 w_1 + p_2^0 w_2} \times 100,$$

where w_1 and g w_2 are weightings applied to the respective prices p_1^0, p_1^t, p_2^0 and p_2^t. In calculating price indices, it is customary to use sold quantities as weightings to take account of the relative importance of the various product prices. We can obtain two different indices depending on the choice of weightings. If we choose sold quantities in the last period (period *t*) as weightings, we obtain the so-called *Paasche price index*:

$$P_P = \frac{p_1^t q_1^t + p_2^t q_2^t}{p_1^0 q_1^t + p_2^0 q_2^t} \times 100,$$

where q_1^t and q_2^t are quantities of product 1 and 2 sold over period *t*. If we choose quantities sold over the base period (period 0) as weightings, we obtain the so-called *Laspeyres price index*:

$$L_P = \frac{p_1^t q_1^0 + p_2^t q_2^0}{p_1^0 q_1^0 + p_2^0 q_2^0} \times 100,$$

where q_1^0 and q_2^0 are quantities of product 1 and 2 sold over period 0. Both these price indices will express changes in average prices over time. If prices are less (more) than 100, this means that there has been a reduction (increase) in average prices over the period.

In this study, we calculate differences in average prices across countries to see whether the prices of pharmaceuticals in Norway are higher or lower than in other

countries. Let us assume two countries, Norway and Abroad, where products 1 and 2 are sold (but with potentially different quantities). The general price index can then be expressed as

$$I_P = \frac{p_1^U w_1 + p_2^U w_2}{p_1^N w_1 + p_2^N w_2} \times 100,$$

where p_1^U and p_2^U are the prices of product 1 and 2 abroad, p_1^N and p_2^N are the prices of products 1 and 2 in Norway, and w_1 and w_2 are the weightings to be applied to these different prices. It is customary to use weightings to express the relative importance of the products including when price indices are to be calculated across countries. If we use quantities sold abroad as weightings, we calculate a Paasche price index. It is nevertheless natural in this context to use quantities sold in Norway as weightings, giving us a Laspeyres price index, which can be expressed as follows:

$$L_P = \frac{p_1^U q_1^N + p_2^U q_2^N}{p_1^N q_1^N + p_2^N q_2^N} \times 100,$$

where q_1^N and q_2^N are quantities sold of products 1 and 2 in Norway. If the price index is more (less) than 100, this means that average prices abroad are higher (lower) than in Norway. It does not mean that all prices are higher abroad than in Norway. We can imagine that product 1 has a higher price abroad than in Norway ($p_1^U > p_1^N$), while it is the converse for product 2 ($p_2^U < p_2^N$). The effect on the price index will thus be determined by the weighting, which will here be the product's relative turnover in Norway. If product 1 has low turnover relative to product 2 in Norway ($q_1^N < q_2^N$), this may give rise to a price index of less than 100, i.e. on average the price level in Norway is lower than abroad.

In most price indices, we will use Norwegian quantity weightings. In this way, we measure what a Norwegian "shopping basket" costs abroad. If Norway is more expensive than the reference countries, the differences in the price index may be interpreted as the cost savings that could be achieved by importing the foreign price level. We also conduct some sensitivity analyses in which we use Swedish and Danish quantity weightings to see whether the price indices change. Such a comparison means that we import both foreign prices and foreign shopping baskets into Norway. The latter is a more unrealistic measure of possible cost savings.

5.2. Price indices for identical packs

Let us first compare prices between countries for identical packs. For each of the 280 active substances, we select the top-selling (measured in number of doses) pack in Norway. For certain (28) active substances, the data set does not contain information on strength. To ensure precision in the comparison – i.e. that we do not compare the price of packs with different strengths – these are excluded. We are left with a sample of the 252 top-selling packs in Norway. These packs are then linked to corresponding packs in the reference countries. We do not require the packs to be available in all

countries (global) to be included in the calculation. The linking is carried out bilaterally for each country, so that the number of packs included varies between the reference countries (from 88 in the Netherlands and Ireland to 206 in Sweden). We then calculate paired price indices for each country based on the selected packs. The prices are weighted with Norwegian consumption weightings (number of doses sold of the pack in question/total number of doses sold) which are calculated for each country depending on which packs are included – i.e. we calculate new consumption weightings for each country depending on which packs are included in the sample.

Table 5.1 below summarises the price indices. We can see from the table for the total index (all active substances) that only the Netherlands is less expensive than Norway on GIP and AUP. The differences are, however, marginal (approx. 1% lower prices). The most expensive is Belgium with 59% higher GIP and Ireland with 69% higher AUP. If we consider the two subindices for the patent segment, we see that the pattern is very much the same, except that the United Kingdom is also somewhat less expensive (2.5%) than Norway on the index for active substances without generic competition in any country. In the generics segment, however, the pattern is somewhat different. Here, Austria is least expensive with an AUP approx. 20-25% lower than in Norway. For generics, the United Kingdom is less expensive than Norway on GIP, but not on AUP. Ireland and Belgium are clearly most expensive also in this segment.

A problem with price indices based on identical packs is that representativity is low.[23] We can see from the table that the number of identical packs varies very widely between the various countries. While representativity is good in Sweden with 206 (80%) identical packs, it falls to 88 (35%) in the Netherlands and Ireland, giving a very low level of representativity. This illustrates the fact that the most representative pack in Norway is not the most representative pack in many of the reference countries (even for Sweden, there are a full 50 packs that cannot be matched). For the generics segment, using identical packs as a basis for calculating price indices is a particular problem. The top-selling pack is typically an original preparation, which means that generics are rarely included in the price comparison (see for example LMI, 2006). Countries with substantial generics competition will then typically be assigned higher prices than they actually have, whereas countries with little generics competition are assigned excessively low prices. In the next analyses we will therefore use average prices as a basis for calculating price indices instead of identical packs.

[23] See Danzon and Chao (2000) for a full discussion and analysis of the problems associated with basing price indices on the comparison of identical packs.

Table 5.1. Bilateral indices (GIP and AUP) for packs of the same size and strength, Norwegian weightings

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
All active substances										
GIP per pack	100	115.4	115.2	104.0	102.2	124.7	98.9	159.6	102.1	109.8
AUP per pack	100	112.8	116.7	122.8	102.3	133.2	99.6	150.8	101.7	169.3
Number of packs	252	206	188	167	98	157	88	106	95	88
Active substances on patent (without actual generic competition in Norway)										
GIP per pack	100	112.3	115.7	104.3	106.3	129.9	99.9	155.2	105.7	109.5
AUP per pack	100	108.1	119.4	124.3	101.3	131.9	93.4	149.6	108.9	172.0
Number of packs	153	120	112	103	63	101	66	70	68	55
Active substances off patent (with actual generic competition in Norway)										
GIP per pack	100	125.8	113.4	102.6	83.7	99.5	92.9	180.9	84.3	111.3
AUP per pack	100	125.3	108.9	117.4	106.0	138.1	126.3	155.2	76.1	158.9
Number of packs	99	86	76	64	35	56	22	36	27	33
Active substances on patent (without actual generic competition in any country)										
GIP per pack	100	113.7	116.9	101.7	104.6	130.0	104.1	158.3	106.3	109.5
AUP per pack	100	108.8	121.1	121.6	97.5	131.4	96.5	152.6	109.3	172.4
Number of packs	124	98	94	82	53	87	54	58	59	47
Active substances off patent (with actual generic competition in at least one country)										
GIP per pack	100	118.9	111.3	109.0	94.1	108.9	83.6	163.6	87.0	110.7
AUP per pack	100	119.5	108.5	125.1	115.2	137.7	106.8	146.1	81.0	160.3
Number of packs	128	108	94	85	45	70	34	48	36	41

5.3. Price indices based on average prices for the entire sample

We start out by calculating bilateral price indices based on volume-weighted average prices for the entire sample of active substances. The procedure is the same as for identical packs, apart from the fact that here we match active substances instead. From Table 5.2 below, we can see that representativity is substantially higher. Of the 280 active substances in Norway, 274 of these are sold in Sweden, while Belgium has the lowest number of active substances with 247 active substances.

We can see from the table that Norway is the least expensive on both GIP and AUP when we consider all active substances. Belgium is the most expensive on GIP (60% more expensive than Norway), while Ireland is most expensive on AUP (135% more expensive than Norway). In the patent segment, we can see that only the Netherlands is cheaper (without generic competition globally) or as cheap (without generic competition in Norway) as Norway. The differences are, however, marginal. The United Kingdom is the next cheapest after Norway and the Netherlands.

For the generics segment, Denmark is either as cheap (generic competition globally) or cheaper (generic competition in Norway). The differences are, however, small. It should be noted that Austria no longer comes out as being cheap in the generics segment when we base the price comparison on average prices instead of identical packs. Ireland is very expensive on AUP in the generics segment, while the United Kingdom is actually more reasonable than Norway in terms of GIP (but not on AUP).

An alternative method for calculating price indices for the entire sample is to enter Norwegian prices where there is a lack of observations abroad. In this way, fixed quantity weightings can be maintained across all countries. Table 5.3 sets out the price indices for the use of this method.

We can see that the pattern does not change from the previous table, even if certain indices change quantitatively. As Norway is relatively inexpensive, inputting Norwegian prices where we lack observations could mean that some countries end up being cheaper than they actually are. If we compare with the table above, this may appear to be the case, but the differences are small.

Table 5.2. Bilateral indices (GIP and AUP) for all active substances, Norwegian weightings.

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
GIP per dose	100	115.1	117.1	109.6	100.1	119.8	105.7	160.5	115.3	157.4
AUP per dose	100	109.6	113.8	123.7	104.4	138.7	117.4	156.7	122.7	234.6
Number of active substances	280	274	274	263	258	269	267	247	257	252
Active substances on patent (without actual generic competition in Norway)										
GIP per dose	100	116.8	120.8	105.0	106.9	117.6	100.7	155.9	107.6	125.0
AUP per dose	100	112.0	123.9	124.2	101.7	124.2	100.0	154.2	119.7	196.7
Active substances off patent (with actual generic competition in Norway)										
GIP per dose	100	110.7	108.2	120.4	84.2	125.3	117.1	171.5	133.2	232.7
AUP per dose	100	105.3	95.6	122.8	109.0	166.8	147.3	161.3	128.2	300.5
Active substances on patent (without actual generic competition globally)										
GIP per dose	100	117.0	121.9	102.4	107.4	116.2	98.2	158.5	106.9	117.2
AUP per dose	100	111.2	125.5	121.8	100.8	119.5	96.5	156.8	119.5	184.9
Active substances off patent (with actual generic competition globally)										
GIP per dose	100	112.4	110.7	119.1	90.7	124.9	115.4	163.2	126.6	209.0
AUP per dose	100	107.9	101.4	125.7	108.0	160.7	139.1	156.6	126.2	285.4

Table 5.3. Indices (GIP and AUP) for all active substances, Norwegian weightings and Norwegian prices if no price observation abroad.

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
GIP per dose	100	114.9	116.6	109.2	100.1	119.2	105.4	156.4	114.5	154.0
AUP per dose	100	109.5	113.4	122.7	104.0	136.7	116.6	152.6	121.5	226.6
Active substances on patent (without actual generic competition in Norway)										
GIP per dose	100	116.6	120.1	104.8	106.3	117.2	100.6	152.1	107.2	123.2
AUP per dose	100	111.8	123.1	123.0	101.6	123.4	100.0	150.3	118.3	189.2
Active substances off patent (with actual generic competition in Norway)										
GIP per dose	100	110.6	108.1	119.9	84.8	124.1	117.0	167.0	132.6	230.0
AUP per dose	100	105.2	95.7	122.3	108.6	161.2	147.1	156.7	127.4	295.0
Active substances on patent (without actual generic competition globally)										
GIP per dose	100	116.8	121.0	102.3	106.7	115.9	98.3	154.6	106.5	115.8
AUP per dose	100	111.0	124.4	120.6	100.7	119.0	96.8	153.0	118.3	177.5
Active substances off patent (with actual generic competition globally)										
GIP per dose	100	112.2	110.6	118.6	91.0	123.8	115.1	158.9	125.4	206.6
AUP per dose	100	107.8	101.4	125.0	107.7	156.0	138.2	152.1	125.0	280.2

5.4. Price indices for global active substances

An alternative way of calculating price indices is to limit the sample to active substances for which we have price observations in all countries, i.e. global matching. An advantage of this approach is that we have price observations from all for all active substances in the sample. When we apply the requirement of global matching, the number of active substances in the sample is reduced to 202, which equates to 72% of the total sample of active substances in Norway (see Table 5.4). The reduction is thus very limited, and we have a high level of representativity. (If we had done this for identical packs, we would have obtained very few observations, and too few to base the price comparisons upon).

For all active substances, Norway is again cheapest on both GIP and AUP. The United Kingdom is roughly as cheap on GIP, but somewhat (5%) more expensive on AUP. Sweden and Denmark are respectively 12% and 18% more expensive than Norway on AUP. The most expensive is Belgium (60%) on GIP and Ireland (137%) on AUP, as above. If we consider patented products, the Netherlands is somewhat cheaper and the United Kingdom roughly as cheap as Norway, while for the generics segment Norway is now decidedly cheapest.

5.5. Price indices with foreign weightings

In the indices above, we have used Norwegian weightings as the starting point for weighting across active substances. The differences we have seen in average pack size indicate, however, that the countries we compare have different consumption patterns. It is therefore natural to check how sensitive the results are when we change consumption weightings. Tables 5.5 and 5.6 below report results for active substances sold in all countries (global) where we have used Swedish and Danish weightings respectively.

The results are surprisingly robust. Norway is cheapest on AUP for all active substances, while the United Kingdom is marginally cheaper on GIP. Ireland is still clearly most expensive. If we consider patented pharmaceuticals, the Netherlands is marginally cheaper than Norway, while the United Kingdom is roughly as cheap as Norway. For the generics segment, Norway is cheapest, but Sweden is now nearly as cheap as Norway. This is not unexpected as we are using Swedish weightings. We expect more products that are reasonable in the individual country to be purchased so that the pattern of consumption is related to price. In this way, countries will emerge as cheaper when its own consumption weightings are used, as also for Norway. Danzon and Chao (2000) find corresponding results and conduct a thorough analysis in this area.

When we use Danish weightings, the pattern changes somewhat more. In particular, it is the case that the Netherlands becomes cheaper than Norway, not only on patented products, but also with regard to the total index for all active substances. In the generics segment, we see that Denmark is now clearly cheapest, with Sweden in second place (8% more expensive) and Norway in third place (8-13% more expensive). This is consistent with the discussion above.

Table 5.4. Indices (GIP and AUP) for active substances sold in all countries, Norwegian weightings (N = 202 active substances)

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
GIP per dose	100	117.4	120.0	109.8	100.2	118.4	108.1	160.1	117.0	157.3
AUP per dose	100	112.3	118.7	126.3	105.4	136.0	119.0	158.3	127.9	237.7
Active substances on patent (without actual generic competition in Norway)										
GIP per dose	100	118.8	122.3	105.4	107.7	115.2	102.5	157.1	107.4	117.4
AUP per dose	100	113.5	125.8	125.5	101.7	121.3	101.3	156.0	120.9	184.9
Active substances off patent (with actual generic competition in Norway)										
GIP per dose	100	114.3	115.0	119.5	83.8	125.6	120.3	166.5	137.8	224.5
AUP per dose	100	110.1	106.3	127.7	111.7	161.5	149.6	162.4	140.0	328.8
Active substances on patent (without actual generic competition globally)										
GIP per dose	100	118.4	124.2	101.4	107.1	117.1	99.0	158.8	105.9	118.2
AUP per dose	100	112.5	127.9	121.7	100.5	121.1	97.4	158.0	120.4	186.2
Active substances off patent (with actual generic competition globally)										
GIP per dose	100	116.1	115.1	119.8	92.1	120.0	118.8	161.5	130.1	203.6
AUP per dose	100	112.0	109.5	131.0	110.2	150.8	140.5	158.6	135.4	288.8

Table 5.5. Indices (GIP and AUP) for active substances sold in all countries, Swedish weightings

	Sweden	Norway	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
GIP per dose	100	91.9	107.8	101.2	88.2	109.4	100.1	145.5	110.0	155.2
AUP per dose	100	96.5	110.5	120.6	99.7	130.8	117.0	150.4	124.2	242.3
Active substances on patent (without actual generic competition in Norway)										
GIP per dose	100	87.4	105.1	93.2	93.4	99.7	87.3	136.0	95.8	98.2
AUP per dose	100	91.2	113.3	115.4	92.3	109.5	89.6	140.2	111.3	162.0
Active substances off patent (with actual generic competition in Norway)										
GIP per dose	100	99.8	112.6	115.0	79.3	126.3	122.4	161.9	134.6	253.8
AUP per dose	100	103.3	106.8	126.3	109.8	159.6	154.0	164.1	141.6	350.7
Active substances on patent (without actual generic competition globally)										
GIP per dose	100	88.2	106.9	90.6	92.8	101.2	83.6	138.7	94.8	99.0
AUP per dose	100	92.7	115.8	113.3	91.4	109.3	85.8	143.8	111.7	164.0
Active substances off patent (with actual generic competition globally)										
GIP per dose	100	95.7	108.8	112.1	83.5	117.8	117.0	152.4	125.5	212.5
AUP per dose	100	99.8	106.2	125.7	106.6	148.7	143.0	155.9	134.5	307.5

5.6. Price indices for graded price pharmaceuticals

Lastly, we compare the prices of active substances that are subject to graded price regulation. Table A in Appendix A provides an overview of these. It may be interesting to take a closer look at these pharmaceuticals because they are subject to a different regulatory regime from the other pharmaceuticals on the Norwegian market (which are regulated in terms of maximum price). Table 5.7 below sets out the results for these pharmaceuticals.

As the graded price system is used for selected pharmaceuticals in the generics segment, these results must be compared with other price indices for the generics segment reported above. In the case of graded price pharmaceuticals, Sweden and Denmark are respectively 8 and 9% more expensive than Norway. For the other countries, we see that the price differences increase, in some cases dramatically. Ireland, which is the most expensive, is a full 5 times more expensive than Norway for these pharmaceuticals.

When we use foreign consumption weightings, the picture changes somewhat. In the case of Swedish consumption weightings, Sweden surprisingly does not become cheaper than Norway. The United Kingdom now becomes very much cheaper in terms of GIP, but not in terms of AUP. With Danish consumption weightings, Sweden is still cheaper than Norway, but Denmark is now roughly as cheap, as expected. The results are therefore relatively robust for graded price pharmaceuticals as well.

Table 5.6. Indices (GIP and AUP) for active substances sold in all countries, Danish weightings

	Denmark	Sweden	Norway	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
GIP per dose	100	100.8	90.4	94.6	92.6	112.6	96.9	139.6	108.3	171.8
AUP per dose	100	97.8	93.6	109.8	107.2	128.0	108.3	140.6	119.8	257.5
Active substances on patent (without actual generic competition in Norway)										
GIP per dose	100	97.5	81.9	86.4	89.0	95.4	82.2	127.7	90.7	96.4
AUP per dose	100	90.8	80.0	99.7	81.8	98.5	78.9	122.7	98.7	147.5
Active substances off patent (with actual generic competition in Norway)										
GIP per dose	100	106.4	104.8	108.4	98.8	141.5	121.5	159.5	137.7	298.0
AUP per dose	100	108.2	113.9	124.9	145.2	171.9	152.0	167.5	151.2	421.5
Active substances on patent (without actual generic competition globally)										
GIP per dose	100	94.7	80.7	81.9	86.8	94.7	78.9	128.5	88.0	94.1
AUP per dose	100	87.3	78.6	94.9	79.2	94.1	74.7	123.4	96.3	144.0
Active substances off patent (with actual generic competition globally)										
GIP per dose	100	107.6	101.1	108.5	99.1	132.4	116.8	151.8	130.6	257.3
AUP per dose	100	108.2	108.4	124.6	135.0	161.5	141.5	157.8	143.0	369.9

Table 5.7. Indices (GIP and AUP) for graded price pharmaceuticals (N=31 active substances).

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
Norwegian weightings										
GIP per dose	100	111.4	120.8	122.5	101.9	146.0	203.4	228.6	198.7	403.5
AUP per dose	100	108.0	109.1	127.4	136.4	174.4	215.9	210.1	194.4	518.1
Swedish weightings										
GIP per dose	104.7	100	126.0	129.4	79.5	146.0	187.7	214.3	177.6	381.9
AUP per dose	107.7	100	116.3	137.8	120.3	174.4	206.3	207.0	182.6	509.3
Danish weightings										
GIP per dose	87.0	93.7	100	101.6	81.4	131.0	183.4	197.1	172.7	351.9
AUP per dose	97.8	98.2	100	117.4	124.8	159.6	209.9	202.3	189.9	499.9

6. Regression analyses

In this part of the report we analyse differences in pharmacies' sale prices and differences in the wholesale and pharmacy margins with the aid of regression analyses. An advantage of this kind of analysis compared with calculating indices is that it is possible, for example, to study price differences between countries corrected for the fact that other aspects may also vary. We have for example seen that pack size varies considerably and that correcting for pack size in the regressions means (in somewhat simplified terms) that we compare prices between countries for identical pack sizes. In the analyses we would also like to correct for what proportion of each active substance is sold as tablets (we have also tried to use the strength of the pharmaceutical as a clarificatory variable, but as this had no significant effect we have chosen to omit this variable from the analyses). In analyses of this kind, we can also correct for the fact that not all countries are represented with the same active substances in the data set. We do this by including a dummy variable for each active substance[24] and this means, again in simplified terms, that we are comparing the prices of the identical active substances. In these analyses, we will therefore expect the results (the differences between the countries) to be less sensitive to which active substances we include in the analyses.

6.1. Pharmacies' sale price (AUP)

In the regression analyses, we have chosen to focus on volume-weighted average prices (see Chapter 4.1 for an explanation of how these have been calculated). In these analyses, we use dummy variables to identify price differences between countries. In other words, we have, for each country, constructed a variable that assumes the value 1 for all price observations for that country, while the variable has the value 0 for price observations for all other countries. As we have 10 countries, we obtain 10 such dummy variables. To be able to identify the effect of these variables, i.e. how much of the price variation they explain, we must omit a variable. We have chosen to omit the variable for Norway, which means that we compare prices in the other countries with prices in Norway. For example, we can see from the results in Table 6.1 below that the estimated effect of the variable "Finland" is 0.129. This then means that prices in Finland are 12.9 per cent higher than in Norway (this interpretation is due to the fact that prices are in logarithmic form). A negative value could accordingly be interpreted as how many per cent lower the average price was, compared with the price level in Norway. However, it is important to note whether or not the estimated effect of the variable is statistically significant. If we consider the coefficient for "Sweden", this has a value equal to 0.036. As this is not statistically significant (coefficients that are statistically significant are asterisked), we must conclude that average prices in Sweden do not differ from those in Norway.

In Table 6.1 we present the results from regression analyses incorporating all active substances (columns 2-4) and incorporating only global active substances (columns 5-7). In these analyses, we do not distinguish the active substances according to whether they are on or off patent. In the

[24] This is done by us estimating "fixed effect" models.

same way as when we compared price levels with the aid of indices, we also find here that Norway proves to have relatively low pharmaceutical prices. If we do not correct for average pack size and the share of tablets within active substances, we find that Sweden, Denmark and the United Kingdom have pharmaceutical prices that are not significantly different from Norwegian ones. All other countries have prices that are significantly higher. If, on the other hand, we correct for pack size, we see that Swedish pharmaceutical prices are also significantly higher than Norwegian ones. As expected, the results are relatively similar if we analyse the entire sample of pharmaceuticals or only consider the sample of global pharmaceuticals. We can also see from the table that the price differences are not as great as when we compared the price indices in the previous chapter. Part of the reason for this may be that, in this part of the analysis, we do not weight the prices with Norwegian consumption weightings. If we focus on the entire sample (column 4), we find that Ireland has clearly the highest prices, approx. 63 per cent higher than in Norway. Belgium and Germany also have relatively high prices (28 and 24 per cent higher respectively than in Norway), while Finland has a price level around 15 per cent higher than Norway. The Netherlands, Sweden and Austria have a price level 7-9 per cent higher than Norway, while the Danish and UK price level thus does not differ significantly from the Norwegian price level.

Table 6.1 Differences in AUP (volume-weighted prices), all active substances

	All active substances	All active substances	All active substances	Global active substances	Global active substances	Global active substances
Sweden	0.036	0.079**	0.079**	0.055	0.106***	0.107***
	(0.034)	(0.034)	(0.034)	(0.041)	(0.041)	(0.041)
Denmark	0.035	0.054	0.053	0.047	0.066	0.065
	(0.034)	(0.034)	(0.034)	(0.041)	(0.041)	(0.041)
Finland	0.129***	0.139***	0.142***	0.152***	0.162***	0.166***
	(0.035)	(0.034)	(0.034)	(0.041)	(0.041)	(0.041)
Netherlands	0.057*	0.073**	0.073**	0.088**	0.095**	0.095**
	(0.035)	(0.034)	(0.034)	(0.041)	(0.041)	(0.040)
Austria	0.131***	0.093***	0.092***	0.164***	0.123***	0.122***
	(0.035)	(0.035)	(0.034)	(0.041)	(0.041)	(0.041)
United Kingdom	-0.021	-0.036	-0.044	-0.004	-0.018	-0.030
	(0.035)	(0.034)	(0.035)	(0.041)	(0.041)	(0.041)
Belgium	0.292***	0.280***	0.277***	0.307***	0.295***	0.291***
	(0.035)	(0.035)	(0.035)	(0.041)	(0.041)	(0.041)
Germany	0.236***	0.238***	0.240***	0.247***	0.247***	0.249***
	(0.034)	(0.034)	(0.034)	(0.041)	(0.041)	(0.041)
Ireland	0.648***	0.634***	0.629***	0.664***	0.648***	0.639***
	(0.035)	(0.035)	(0.035)	(0.041)	(0.041)	(0.041)
Pack size	-	-0.0030***	-0.0030***	-	-0.0030***	-0.0030***
		(0.0004)	(0.0004)		(0.0004)	(0.0004)
Proportion of tablets	-	-	-0.194***	-	-	-0.238***
			(0.080)			(0.088)
Constant	2.316***	2.448***	2.256***	2.039***	2.174***	2.308***
	(0.024)	(0.028)	(0.052)	(0.029)	(0.034)	(0.061)
Number of active substances	280	280	280	202	202	202

Number of observations	2641	2641	2641	2020	2020	2020
R^2	0.196	0.220	0.223	0.196	0.218	0.223

In the same way as previously, we also distinguish active substances here according to whether or not they have generic competition globally. We have also tried to distinguish according to whether or not the active substances have generic competition in Norway; as this has not changed the results appreciably, however, we have opted not to include these results in the report. In Table 6.2 we present the results for the active substances for which we do not observe generic competition in any of the ten countries. If we focus on all active substances (column 4 in the Table), we see that Norway has lower pharmaceutical prices than all other countries with the exception of the Netherlands and the United Kingdom. Average pharmaceutical prices for active substances without generic competition are approx. 6 per cent lower in the Netherlands than in Norway, while the price level in the United Kingdom is not significantly different from that in Norway. If we consider the other countries, the ranking is as follows (with the relative price difference from Norway in brackets): Ireland (54%), Belgium (32%), Germany (19%), Finland (18%), Denmark (16%), Austria (11%) and Sweden (9%).

Table 6.2 Differences in AUP (volume-weighted prices), active substances without generic competition

	All active substances	All active substances	All active substances	Global active substances	Global active substances	Global active substances
Sweden	0.057*	0.085***	0.085***	0.085**	0.112***	0.113***
	(0.032)	(0.031)	(0.032)	(0.034)	(0.034)	(0.034)
Denmark	0.141***	0.160***	0.160***	0.168***	0.183***	0.185***
	(0.031)	(0.031)	(0.031)	(0.034)	(0.034)	(0.034)
Finland	0.168***	0.180***	0.181***	0.207***	0.216***	0.217***
	(0.032)	(0.032)	(0.032)	(0.034)	(0.034)	(0.034)
Netherlands	-0.065**	-0.061**	-0.060*	-0.034	-0.038	-0.037
	(0.032)	(0.031)	(0.031)	(0.034)	(0.034)	(0.034)
Austria	0.126***	0.106***	0.107***	0.169***	0.154***	0.156***
	(0.032)	(0.032)	(0.032)	(0.034)	(0.034)	(0.034)
United Kingdom	-0.028	-0.040	-0.042	0.010	-0.001	-0.002
	(0.032)	(0.032)	(0.032)	(0.034)	(0.034)	(0.034)
Belgium	0.319***	0.323***	0.322***	0.359***	0.363***	0.362***
	(0.033)	(0.032)	(0.032)	(0.034)	(0.034)	(0.034)
Germany	0.180***	0.192***	0.193***	0.178***	0.187***	0.189***
	(0.032)	(0.031)	(0.031)	(0.034)	(0.034)	(0.034)
Ireland	0.556***	0.543***	0.543***	0.559***	0.548***	0.548***
	(0.034)	(0.032)	(0.032)	(0.034)	(0.034)	(0.034)
Pack size	-	-0.0028***	-0.0027***	-	-0.0020***	-0.0019***
		(0.0004)	(0.0004)		(0.0005)	(0.0005)
Proportion of tablets	-	-	-0.095	-	-	-0.148
			(0.099)			(0.102)
Constant	3.149***	3.257***	3.304***	2.855***	2.931***	3.005***

	(0.022)	(0.027)	(0.056)	(0.024)	(0.030)	(0.059)
Number of active substances	174	174	174	111	111	111
Number of observations	1608	1608	1608	1110	1110	1110
R^2	0.279	0.303	0.304	0.340	0.353	0.355

If we consider price differences for pharmaceuticals with generic competition in at least one of the ten countries, we still find that most countries have higher pharmaceutical prices than Norway (see Table 6.3). In the same way as when we compared price indices, we find, however, that the Danish price level of pharmaceuticals with generic competition is somewhat lower than prices in Norway, approx. 12 per cent. If we rank the other countries according to how expensive they are compared with Norway, we find the following (we still focus on the entire sample of pharmaceuticals, column 4 in Table 6.3): Ireland (75%), Germany (31%), Netherlands (28%) and Belgium (20%). For the other countries (Austria, the United Kingdom, Sweden and Finland), prices do not, on the other hand, differ significantly from Norwegian ones. Part of the reason for this may be that the number of observations in these analyses is somewhat lower than above, leading to relatively high standard deviation and thus fewer significant results.

Table 6.3 Differences in AUP (volume-weighted prices), active substances with generic competition

	All active substances	All active substances	All active substances	Global active substances	Global active substances	Global active substances
Sweden	0.003	0.076	0.077	0.019	0.097	0.097
	(0.072)	(0.071)	(0.071)	(0.079)	(0.079)	(0.079)
Denmark	-0.138***	-0.120**	-0.122*	-0.101***	-0.083	-0.088
	(0.072)	(0.070)	(0.070)	(0.079)	(0.078)	(0.077)
Finland	0.068	0.072	0.079	0.086	0.091	0.099
	(0.072)	(0.071)	(0.071)	(0.079)	(0.077)	(0.077)
Netherlands	0.243***	0.282***	0.280***	0.238***	0.268***	0.265***
	(0.072)	(0.071)	(0.070)	(0.079)	(0.078)	(0.077)
Austria	0.138**	0.064	0.058	0.157**	0.076	0.070
	(0.072)	(0.072)	(0.072)	(0.079)	(0.079)	(0.079)
United Kingdom	-0.011	-0.031	-0.048	-0.022	-0.038	-0.062
	(0.072)	(0.071)	(0.071)	(0.079)	(0.078)	(0.078)
Belgium	0.251***	0.209***	0.202***	0.264***	0.198***	0.189***
	(0.073)	(0.072)	(0.072)	(0.074)	(0.078)	(0.078)
Germany	0.322***	0.306***	0.307***	0.320***	0.310***	0.310***
	(0.072)	(0.070)	(0.070)	(0.071)	(0.078)	(0.077)
Ireland	0.783***	0.765***	0.750***	0.740***	0.772***	0.751***
	(0.072)	(0.071)	(0.071)	(0.074)	(0.078)	(0.078)
Pack size	-	-0.0036***	-0.0036***	-	-0.0040***	-0.0040***
		(0.0006)	(0.0006)		(0.0007)	(0.0007)
Proportion of tablets	-	-	-0.222*	-	-	-0.277**
			(0.126)			(0.136)
Constant	1.020***	1.202***	1.342***	1.065***	1.244***	1.422***

	(0.051)	(0.058)	(0.098)	(0.052)	(0.064)	(0.108)
Dummy for active substances	Yes	Yes	Yes	Yes	Yes	Yes
Number of active substances	106	106	106	91	91	91
Number of observations	1033	1033	1033	910	910	910
R^2	0.204	0.234	0.237	0.193	0.226	0.231

6.2. Wholesaler and pharmacy margins

In Table 6.4 below, we set out the results from regression analyses in which we can see how wholesaler and pharmacy margins vary between countries. We carry out the same classification of active substances as above (all active substances in the sample, active substances available in all countries (global), active substances without generic competition globally and active substances with generic competition globally) and use the same explanatory variables. The dependent variable is given by

$$\frac{AUP - GIP}{AUP},$$

where *AUP* and *GIP* are calculated as volume-weighted average prices, see Chapter 4.2 for a more detailed explanation. In the same way as previously, we use dummy variables to identify differences between countries. We use Norway as a comparison country; if we look at the table, column 2, we find for example that Finland has a value equal to 0.093. This means that the margins are 9.3 percentage points higher in Finland than in Norway.

If we start by looking at all active substances, we see, as above, that the results vary little whether we use the entire sample or only the global active substances (columns 2 and 3). We find that Ireland has clearly the highest margins, 25 percentage points higher than in Norway. The average margin in Norway is approx. 22 per cent (given by the constant in the model), i.e. the average margin in Ireland is approx. 47 per cent (22 + 25). Finland and Germany also seem to have relatively high margins, with the same applying to a lesser extent to Austria, the Netherlands and the United Kingdom. The margins in Denmark are not significantly different from those in Norway, while Swedish margins are approx. 2 percentage points lower than Norwegian ones. Even if it is not an entirely clear trend (Belgium is for example an exception), there seems to be a link between high sales prices and margins.

If we distinguish the active substances according to whether or not we observe generic competition globally, we see that the results change somewhat. Denmark has, for example, higher margins than Norway in relation to active substances without generic competition, while the opposite is the case for active substances with generic competition. Some of these differences can perhaps be explained by the fact that Denmark has relatively high sale prices for pharmaceuticals without generic competition, while prices are relatively low for pharmaceuticals with generic competition. We also see the same trend for a number of other countries. The Netherlands has, for example, relatively high prices for pharmaceuticals with generic competition and we can see that the margins for this type of active substance are higher in the Netherlands than in Norway. The situation is the opposite in Austria, which has relatively low prices for active substances with generic competition, and here we see that the margins for pharmaceuticals of this kind do not differ significantly from Norwegian ones.

Table 6.4 Differences in wholesaler and pharmacy margins.

	All active substances		Active substances without generic competition		Active substances with generic competition	
	Entire sample	Global active substances	Entire sample	Global active substances	Entire sample	Global active substances
Sweden	-0.022**	-0.028***	-0.028***	-0.038***	-0.009	-0.012
	(0.007)	(0.009)	(0.007)	(0.008)	(0.013)	(0.014)
Denmark	-0.002	-0.005	0.019***	0.017**	-0.033***	-0.033**
	(0.007)	(0.009)	(0.007)	(0.008)	(0.013)	(0.014)
Finland	0.093***	0.094***	0.126***	0.131***	0.044***	0.049***
	(0.007)	(0.009)	(0.007)	(0.008)	(0.013)	(0.014)
Netherlands	0.047***	0.052***	0.005	0.002	0.111***	0.111**
	(0.007)	(0.009)	(0.007)	(0.008)	(0.013)	(0.040)
Austria	0.048***	0.054***	0.072***	0.088***	0.006	0.007
	(0.008)	(0.009)	(0.007)	(0.008)	(0.013)	(0.014)
United Kingdom	0.044***	0.052***	-0.038***	-0.048***	0.168***	0.174***
	(0.007)	(0.009)	(0.007)	(0.008)	(0.013)	(0.014)
Belgium	0.007	0.009	0.007	0.007	0.007	0.009
	(0.008)	(0.009)	(0.007)	(0.008)	(0.013)	(0.014)
Germany	0.079***	0.087***	0.041***	0.042***	0.142***	0.142***
	(0.007)	(0.009)	(0.007)	(0.008)	(0.013)	(0.014)
Ireland	0.254***	0.251***	0.294***	0.296***	0.191***	0.193***
	(0.008)	(0.009)	(0.007)	(0.008)	(0.013)	(0.014)
Pack size	-0.0001	-0.0001	-0.0004***	-0.0002***	-0.0000	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Proportion of tablets	0.040**	0.030*	0.089***	0.088***	0.013	0.009
	(0.017)	(0.019)	(0.022)	(0.024)	(0.023)	(0.024)
Constant	0.215***	0.226***	0.141***	0.132***	0.326***	0.330***
	(0.011)	(0.012)	(0.013)	(0.014)	(0.018)	(0.020)
Number of active substances	280	202	174	111	106	91
Number of observations	2641	2020	1608	1110	1033	910
R^2	0.408	0.414	0.685	0.750	0.411	0.422

Lastly, we would mention that we have conducted a number of sensitivity analyses on the sample. We have estimated the same regression models as above for different subsamples (the 25, 50, 100, 150 and 200 top-selling active substances). A similar thing has also been done for active substances on and off patent. We have chosen not to present the results from these analyses in the report[25], but the main impression is that the results, in terms of both prices and margins, are relatively stable in relation to which active substances are included in the analysis sample.

[25] The results are available on request.

7. Summary

In this study we compare the prices of prescription pharmaceuticals in Norway with the prices of the corresponding products in a selection of reference countries consisting of the following nine west European countries: Austria, Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, Sweden and the United Kingdom. These countries constitute the basket of countries that form the basis for setting maximum prices for prescription pharmaceuticals in Norway, and therefore classed as relatively comparable countries.

Data have been obtained from IMS Health for the 300 highest-selling active substances in Norway in the first half of 2007. The data set contains detailed information on price, volume, patent status, originals/generics, pack size, presentation, strength, etc. Based on these data, we calculate volume-weighted average prices for each active substance at both producer level – the wholesalers' purchase price (GIP) – and pharmacy level – the pharmacies' sale price (AUP). Based on these prices, we also calculate the relative margin per active substance, and compare differences in margins between countries and market segment (patent, generics and graded price).

Data have been analysed in two different ways, by calculating price indices and via regression analyses. In Table 7.1 below, we summarise the results from these analyses in the form of a qualitative ranking of the countries, where 1 is cheapest and 10 is most expensive. The rankings are based on the tables in Chapters 5 and 6, which also indicate the quantitative price differences between the ten countries in the sample.

First, we have calculated bilateral price indices, in which we match the active substances (packs) for each country with Norway, and compare the prices of the active substances this country has in common with Norway. We then calculate global price indices in which we compare prices of active substances available in all countries in the sample. The price indices are compared for all active substances, but we also report separate subindices for the patent and generics segment, and also a dedicated index for pharmaceuticals subject to graded price regulation.

As we can see from the table, Norway is among the very cheapest countries in the sample whether we consider all active substances, patent-protected active substances or active substances with (actual or potential) generic competition. For pharmaceuticals included in the graded price system, Norway is decidedly the cheapest (see Table 5.7). In the patent segment, the Netherlands is equally cheap (and in some cases cheaper) than Norway, closely followed by the United Kingdom. In the generics segment, Denmark is as cheap and in some indices cheaper than Norway. Denmark is, however, somewhat more expensive with regard to patent-protected active substances. Sweden is relatively cheap (but more expensive than Norway) in both the patent and generics segment. The generally most expensive country is Ireland, followed by Belgium and Germany, with some variation between the individual indices.

The results from the price index analyses are surprisingly robust. There is little variation between the bilateral and global price indices in terms of the ranking of countries according to how

cheap/expensive they are. There are, however, major differences when we compare prices of identical packs versus volume-weighted average prices. We give more credence to price indices based on volume-weighted average prices than on identical packs as they ensure a higher degree of representativity, cf. earlier discussions.

Table 7.1 Summary of indices and regression results. Ranking according to lowest AUP and margins.

	Bilateral indices, identical packs (AUP)			Bilateral indices, all active substances (AUP)			Indices, global active substances (AUP)		
	All active substances	Active substances on patent	Active substances off patent	All active substances	Active substances on patent	Active substances off patent	All active substances	Active substances on patent	Active substances off patent
1	Netherlands	Netherlands	Austria	**Norway**	Netherlands	**Norway**	**Norway**	Netherlands	**Norway**
2	**Norway**	UK	**Norway**	UK	**Norway**	Denmark	UK	**Norway**	Denmark
3	Austria	**Norway**	Netherlands	Sweden	UK	Sweden	Sweden	UK	UK
4	UK	Sweden	Denmark	Denmark	Sweden	UK	Denmark	Sweden	Sweden
5	Sweden	Austria	UK	Netherlands	Germany	Finland	Netherlands	Austria	Finland
6	Denmark	Denmark	Sweden	Austria	Austria	Austria	Finland	Germany	Austria
7	Finland	Finland	Finland	Finland	Finland	Netherlands	Austria	Finland	Netherlands
8	Germany	Germany	Germany	Germany	Denmark	Belgium	Germany	Denmark	Germany
9	Belgium	Belgium	Belgium	Belgium	Belgium	Germany	Belgium	Belgium	Belgium
10	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland

	Indices, active substances with graded price (AUP)			Regression results (AUP)			Regression results (Margin)		
	Norwegian weightings	Swedish weightings	Danish weightings	All active substances	Active substances on patent	Active substances off patent	All active substances	Active substances on patent	Active substances off patent
1	**Norway**	Sweden	**Norway**	UK	Netherlands	Denmark	Sweden	UK	Denmark
2	Sweden	**Norway**	Sweden	**Norway**	UK	UK	Denmark	Sweden	Sweden
3	Denmark	Denmark	Denmark	Denmark	**Norway**	**Norway**	**Norway**	**Norway**	**Norway**
4	Finland	UK	Finland	Netherlands	Sweden	Austria	Belgium	Netherlands	Austria
5	UK	Finland	UK	Sweden	Austria	Sweden	UK	Belgium	Belgium
6	Germany	Germany	Germany	Austria	Denmark	Finland	Netherlands	Denmark	Finland
7	Austria	Austria	Austria	Finland	Finland	Belgium	Austria	Germany	Netherlands

8	Belgium	Netherlands	Belgium	Germany	Germany	Netherlands	Germany	Austria	Germany
9	Netherlands	Belgium	Netherlands	Belgium	Belgium	Germany	Finland	Finland	UK
10	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland

We have conducted sensitivity tests by calculating price indices based on Swedish and Danish consumption weightings. A well-known finding is that the use of a given country's consumption weightings typically gives a lower price index in this country's favour. The argument is that more pharmaceuticals are purchased which are lower priced. We see this pattern when we use Swedish and Danish consumption weightings (see Tables 5.5, 5.6 and 5.7). Special use of Danish consumption weightings helps make Denmark a good deal cheaper generally, but in particular for the generics segment, where it becomes the cheapest country in the sample. We can see the same effect (but slightly weaker) for Sweden. Norway is, however, still inexpensive.

One form of analysis which takes account of both precision and representativity is regression analysis. In regression analyses, we can study price differences between countries at the same time as correcting for various aspects that can influence prices, such as pack size. In analyses of this kind, we can also correct for the fact that all countries are not represented by the same active substances in the data set. The main result is – see Table 6.1 – that Norway has the lowest pharmaceutical prices when we consider all active substances. The differences are, however, smaller than indicated by the price indices. One reason for this may be that we do not weight the prices with Norwegian consumption weightings. When we break the sample down, we find that the Netherlands is (6%) cheaper than Norway in the patent segment, while Denmark is (12%) cheaper than Norway in the generics segment. The United Kingdom is roughly as cheap as Norway in all regressions.

Lastly, we have looked more closely at wholesale and pharmacy margins, as measured by the relative difference between GIP and AUP. We find that the average margin in Norway is approx. 22%. Compared with the reference countries, Norway has among the lowest margins. When we examine all active substances, only Sweden has significantly (2-3 percentage points) lower margins than Norway, while margins in Denmark are on a par with those in Norway. For pharmaceuticals on patent, the United Kingdom has the lowest margin, while the margin in the generics segment is relatively high, so that the margin for the United Kingdom is average for all active substances. Sweden also has a lower margin than Norway on patent-protected active substances. In the generics segment, Denmark has the lowest margin, equivalent to 3.3 percentage points lower than Norway and Sweden. Wholesale and pharmacy margins are generally highest in Ireland, which has 20-30 percentage points higher margins than Norway, depending on whether all active substances, patented active substances or active substances with generic competition are considered.

Both for price indices and regression analyses, we have conducted sensitivity analyses to check whether the results are sensitive to which active substances are included in the sample. We have calculated price indices and estimated regression models for various subsamples (the 25, 50, 100, 150 and 200 top-selling active substances). These analyses show that the results are relatively robust and that Norway is among the least expensive countries regardless of which active substances are included in the analyses.

Appendix A

Table A. Active substances in the sample, by turnover

Turnover	Active substance	Generics Norway	Generics globally	On the substitution list	Graded price	Other group
1	ETANERCEPT	No	No	Yes	No	No
2	ATORVASTATIN	No	Yes	Yes	No	No
3	PARACETAMOL	Yes	Yes	Yes	No	No
4	FLUTICASONE;SALMETEROL	No	No	No	No	No
5	ESOMEPRAZOLE	No	No	Yes	No	No
6	ADALIMUMAB	No	No	No	No	No
7	BUDESONIDE;FORMOTEROL	No	No	No	No	No
8	OLANZAPINE	No	No	Yes	No	No
9	METOPROLOL	Yes	Yes	Yes	No	No
10	ESCITALOPRAM	No	No	Yes	No	No
11	HYDROCHLOROTHIAZIDE;LOSARTAN	No	No	No	No	No
12	IBUPROFEN	Yes	Yes	Yes	No	No
13	BICALUTAMIDE	No	Yes	Yes	No	No
14	INTERFERON BETA-1A	No	No	Yes	No	No
15	SIMVASTATIN	Yes	Yes	Yes	Yes	No
16	SOMATROPIN	No	Yes	Yes	No	No
17	CODEINE;PARACETAMOL	Yes	Yes	No	No	No
18	VENLAFAXINE	Yes	Yes	Yes	No	No
19	CANDESARTAN CILEXETIL	No	No	No	No	No
20	DONEPEZIL	No	No	Yes	No	No
21	CETIRIZINE	Yes	Yes	Yes	Yes	No
22	LAMOTRIGINE	No	Yes	Yes	No	No
23	INSULIN HUMAN ISOPHANE	No	No	Yes	No	No
24	METHYLPHENIDATE	Yes	Yes	Yes	No	No
25	ZOPICLONE	Yes	Yes	Yes	No	No
26	LOSARTAN	No	No	Yes	No	No
27	MONTELUKAST	No	No	No	No	No
28	CLOPIDOGREL	No	No	Yes	No	No
29	SALBUTAMOL	Yes	Yes	Yes	No	No

Turnover	Active substance	Generics Norway	Generics globally	På byttelisten	Trinnpris	Annet gruppen
30	HYDROCHLOROTHIAZIDE;IRBESARTAN	No	No	No	No	No
31	TOLTERODINE	No	No	No	No	No
32	CANDESARTAN CILEXETIL;HYDROCHLOROTHIAZIDE	No	No	No	No	No
33	BUDESONIDE	Yes	Yes	Yes	No	No
34	CICLOSPORIN	No	Yes	Yes	No	No
35	DROSPIRENONE;ETHINYLESTRADIOL	No	No	No	No	No
36	QUETIAPINE	No	No	Yes	No	No
37	SUMATRIPTAN	Yes	Yes	Yes	Yes	No
38	MOMETASONE	No	No	Yes	No	No
39	ACETYLSALICYLIC ACID	Yes	Yes	Yes	No	No
40	PREGABALIN	No	No	Yes	No	No
41	DESLORATADINE	No	No	Yes	No	No
42	DARBEPOETIN ALFA	No	No	No	No	No
43	FLUTICASONE	No	Yes	Yes	No	No
44	SILDENAFIL	No	No	Yes	No	No
45	RISPERIDONE	Yes	Yes	Yes	Yes	No
46	BUPRENORPHINE	Yes	Yes	Yes	No	No
47	GOSERELIN	No	No	Yes	No	No
48	IMATINIB	No	No	No	No	No
49	IPRATROPIUM BROMIDE	No	Yes	Yes	No	No
50	LEVOTHYROXINE SODIUM	Yes	Yes	Yes	No	No
51	WARFARIN	No	Yes	No	No	No
52	LATANOPROST	No	No	Yes	No	No
53	INSULIN ASPART	No	No	Yes	No	No
54	OCTOCOG ALFA	No	No	No	No	No
55	IRBESARTAN	No	No	Yes	No	No
56	AMLODIPINE	Yes	Yes	Yes	Yes	No
57	OXYCODONE	Yes	Yes	No	No	No
58	LEVONORWAYSTREL	No	Yes	Yes	No	No
59	HYDROCHLOROTHIAZIDE;VALSARTAN	No	No	No	No	No
60	PANTOPRAZOLE	No	No	Yes	No	No
61	PENICILLIN V	Yes	Yes	No	No	No
62	PEGFILGRASTIM	No	No	No	No	No
63	OXAZEPAM	Yes	Yes	Yes	No	No
64	GLATIRAMER ACETATE	No	No	No	No	No

Turnover	Active substance	Generics Norway	Generics globally	På byttelisten	Trinnpris	Annet gruppen
65	RIZATRIPTAN	No	No	Yes	No	No
66	MYCOPHENOLATE MOFETIL	No	No	No	No	No
67	DICLOFENAC	Yes	Yes	Yes	Yes	No
68	TIOTROPIUM BROMIDE	No	No	Yes	No	No
69	CLOTRIMAZOLE	Yes	Yes	Yes	No	No
70	METFORMIN	Yes	Yes	Yes	No	No
71	FENTANYL	Yes	Yes	Yes	No	No
72	FUROSEMIDE	Yes	Yes	Yes	No	No
73	OMEPRAZOLE	Yes	Yes	Yes	Yes	No
74	OCTREOTIDE	No	No	No	No	No
75	IMMUNOGLOBULIN BASE	No	No	No	No	Yes
76	ALENDRONIC ACID	Yes	Yes	Yes	No	No
77	MESALAZINE	Yes	Yes	Yes	No	No
78	DIAZEPAM	Yes	Yes	Yes	No	No
79	INSULIN ASPART;INSULIN ASPART PROTAMINE CRYSTALLINE	No	No	No	No	No
80	VALSARTAN	No	No	Yes	No	No
81	SIBUTRAMINE	No	No	Yes	No	No
82	LEUPRORELIN	No	Yes	No	No	No
83	RAMIPRIL	Yes	Yes	Yes	Yes	No
84	TADALAFIL	No	No	Yes	No	No
85	DESMOPRESSIN	Yes	Yes	Yes	No	No
86	PIVMECILLINAM	No	No	Yes	No	No
87	TACROLIMUS	No	No	Yes	No	No
88	ESTRADIOL	Yes	Yes	Yes	No	No
89	ACETYLSALICYLIC ACID;MAGNESIUM	No	Yes	No	No	No
90	CHLORAMPHENICOL	Yes	Yes	No	No	No
91	CALCIUM;COLECALCIFEROL	No	No	No	No	Yes
92	ZOLMITRIPTAN	No	No	Yes	No	No
93	CITALOPRAM	Yes	Yes	Yes	Yes	No
94	NIFEDIPINE	Yes	Yes	Yes	No	No
95	SOLIFENACIN	No	No	No	No	No
96	ORLISTAT	No	No	Yes	No	No
97	LEVETIRACETAM	No	No	Yes	No	No
98	ETHINYLESTRADIOL;LEVONORWAYSTREL	Yes	Yes	No	No	No
99	HYDROCORTISONE	Yes	Yes	No	No	No

Turnover	Active substance	Generics Norway	Generics globally	På byttelisten	Trinnpris	Annet gruppen
100	PREDNISOLONE	Yes	Yes	No	No	No
101	ESTRADIOL;NORETHISTERONE	Yes	Yes	No	No	No
102	ISOSORBIDE MONONITRATE	Yes	Yes	Yes	No	No
103	GABAPENTIN	Yes	Yes	Yes	No	No
104	AGALSIDASE ALFA	No	No	No	No	No
105	ANASTROZOLE	No	No	Yes	No	No
106	CARISOPRODOL	No	No	No	No	No
107	FOLLITROPIN BETA	No	No	No	No	No
108	ATOMOXETINE	No	No	Yes	No	No
109	RANITIDINE	Yes	Yes	Yes	Yes	No
110	PIROXICAM BETADEX	Yes	Yes	No	No	No
111	INSULIN LISPRO	No	No	No	No	No
112	TEMOZOLOMIDE	No	No	No	No	No
113	ONDANSETRON	Yes	Yes	Yes	No	No
114	ALIMEMAZINE	No	No	No	No	No
115	AGALSIDASE BETA	No	No	No	No	No
116	ARIPIPRAZOLE	No	No	Yes	No	No
117	ELETRIPTAN	No	No	Yes	No	No
118	MIRTAZAPINE	Yes	Yes	Yes	Yes	No
119	TRAMADOL	Yes	Yes	Yes	No	No
120	METHADONE	Yes	Yes	Yes	No	No
121	GLUCOSAMINE	No	No	Yes	No	Yes
122	CYANOCOBALAMIN;FOLIC ACID;PYRIDOXINE	No	No	No	No	Yes
123	INFLIXIMAB	No	No	No	No	No
124	EMTRICITABINE;TENOFOVIR DISOPROXIL	No	No	No	No	No
125	NAPROXEN	Yes	Yes	Yes	No	No
126	LERCANIDIPINE	No	No	Yes	No	No
127	TAMSULOSIN	Yes	Yes	Yes	No	No
128	LANSOPRAZOLE	Yes	Yes	Yes	Yes	No
129	ESTRIOL	No	Yes	Yes	No	Yes
130	INTERFERON BETA-1B	No	No	No	No	No
131	PEGINTERFERON ALFA-2B	No	No	No	No	No
132	VARENICLINE	No	No	No	No	No
133	PRAVASTATIN	Yes	Yes	Yes	Yes	No
134	ETHYLMORPHINE;MENTHOL;RHAMNUS PURSHIANA	No	No	No	No	Yes

Turnover	Active substance	Generics Norway	Generics globally	På byttelisten	Trinnpris	Annet gruppen
135	ERYTHROMYCIN	Yes	Yes	Yes	No	No
136	TERBINAFINE	Yes	Yes	Yes	Yes	No
137	EBASTINE	No	No	No	No	No
138	FORMOTEROL	No	Yes	Yes	No	No
139	LAMIVUDINE;ZIDOVUDINE	No	No	No	No	No
140	ACETYLCYSTEINE	Yes	Yes	Yes	No	No
141	LOPINAVIR;RITONAVIR	No	No	No	No	No
142	SERTRALINE	Yes	Yes	Yes	Yes	No
143	DOXYCYCLINE	Yes	Yes	Yes	No	No
144	RIBAVIRIN	No	No	Yes	No	No
145	PRAMIPEXOLE	No	No	Yes	No	No
146	GLIMEPIRIDE	Yes	Yes	Yes	Yes	No
147	DORZOLAMIDE;TIMOLOL	No	No	No	No	No
148	DOXAZOSIN	Yes	Yes	Yes	No	No
149	VALPROIC ACID	Yes	Yes	Yes	No	No
150	FOLLITROPIN ALFA	No	No	No	No	No
151	CARBIDOPA;LEVODOPA	No	Yes	No	No	No
152	KETOPROFEN	Yes	Yes	Yes	No	No
153	AZITHROMYCIN	No	Yes	Yes	No	No
154	ACICLOVIR	Yes	Yes	Yes	No	No
155	LORATADINE	Yes	Yes	Yes	Yes	No
156	MEMANTINE	No	No	Yes	No	No
157	INSULIN GLARGINE	No	No	Yes	No	No
158	ENALAPRIL	Yes	Yes	Yes	Yes	No
159	ZIPRASIDONE	No	No	Yes	No	No
160	ROSIGLITAZONE	No	No	Yes	No	No
161	TERBUTALINE	No	Yes	Yes	No	No
162	TOPIRAMATE	No	No	Yes	No	No
163	ATOVAQUONE;PROGUANIL	No	No	No	No	No
164	BETAMETHASONE;CALCIPOTRIOL	No	No	No	No	No
165	CLINDAMYCIN	Yes	Yes	Yes	No	No
166	SUNITINIB	No	No	No	No	No
167	SALMETEROL	No	No	No	No	No
168	TIMOLOL	Yes	Yes	Yes	No	No
169	MORPHINE	Yes	Yes	No	No	No

Turnover	Active substance	Generics Norway	Generics globally	På byttelisten	Trinnpris	Annet gruppen
170	DESOGESTREL	No	No	No	No	No
171	CROMOGLICIC ACID	Yes	Yes	Yes	No	No
172	ATAZANAVIR	No	No	No	No	No
173	BUMETANIDE	No	Yes	Yes	No	No
174	ZOLPIDEM	Yes	Yes	Yes	No	No
175	VARDENAFIL	No	No	No	No	No
176	VALACICLOVIR	No	No	Yes	No	No
177	CARBIDOPA;ENTACAPONE;LEVODOPA	No	No	No	No	No
178	AMOXICILLIN	Yes	Yes	Yes	Yes	No
179	PAROXETINE	Yes	Yes	Yes	Yes	No
180	CARVEDILOL	Yes	Yes	Yes	Yes	No
181	LISINOPRIL	Yes	Yes	Yes	Yes	No
182	CARBAMAZEPINE	Yes	Yes	Yes	No	No
183	CLOZAPINE	Yes	Yes	Yes	No	No
184	BOSENTAN	No	No	No	No	No
185	TIBOLONE	No	No	Yes	No	No
186	DOCOSAHEXANOIC ACID;EICOSAPENTAENOIC ACID	No	No	No	No	Yes
187	METHENAMINE	No	Yes	No	No	No
188	FINASTERIDE	Yes	Yes	Yes	No	No
189	RIVASTIGMINE	No	No	Yes	No	No
190	DICLOXACILLIN	Yes	Yes	No	No	No
191	TESTOSTERONE	Yes	Yes	Yes	No	No
192	BETAMETHASONE	Yes	Yes	Yes	No	No
193	VERAPAMIL	Yes	Yes	Yes	No	No
194	DALTEPARIN SODIUM	No	No	No	No	No
195	ATENOLOL	Yes	Yes	Yes	Yes	No
196	FUSIDIC ACID	No	Yes	No	No	No
197	ALLOPURINOL	Yes	Yes	Yes	No	No
198	ENOXAPARIN SODIUM	No	No	No	No	No
199	DIPYRIDAMOLE	No	Yes	Yes	No	No
200	ISOTRETINOIN	No	Yes	No	No	No
201	LATANOPROST;TIMOLOL	No	No	No	No	No
202	TRIAMCINOLONE ACETONIDE	Yes	Yes	No	No	No
203	MOROCTOCOG ALFA	No	No	No	No	No
204	LIDOCAINE	Yes	Yes	No	No	No

Turnover	Active substance	Generics Norway	Generics globally	På byttelisten	Trinnpris	Annet gruppen
205	RIMONABANT	No	No	Yes	No	No
206	VACCINE, HEPATITIS B	No	No	No	No	Yes
207	VACCINE, HEP.A INACTIV. VIRUS	No	No	No	No	Yes
208	NITROGLYCERIN	Yes	Yes	No	No	No
209	EXEMESTANE	No	No	No	No	No
210	MIANSERIN	Yes	Yes	Yes	Yes	No
211	ENALAPRIL;HYDROCHLOROTHIAZIDE	Yes	Yes	Yes	Yes	No
212	INSULIN DETEMIR	No	No	No	No	No
213	SEVELAMER	No	No	Yes	No	No
214	VACCINE, MEASLES,MUMPS AND RUBELLA	No	No	No	No	Yes
215	CIPROFLOXACIN	Yes	Yes	Yes	Yes	No
216	DILTIAZEM	Yes	Yes	No	No	No
217	DUTASTERIDE	No	No	Yes	No	No
218	ERLOTINIB	No	No	No	No	No
219	ROPINIROLE	No	No	Yes	No	No
220	LETROZOLE	No	No	No	No	No
221	METHOTREXATE	Yes	Yes	Yes	No	No
222	CHLORAMPHENICOL;DEXAMETHASONE	No	No	No	No	No
223	METFORMIN;ROSIGLITAZONE	No	No	No	No	No
224	FLUVASTATIN	No	No	Yes	No	No
225	EZETIMIBE	No	No	No	No	No
226	OLOPATADINE	No	No	Yes	No	No
227	DICLOFENAC;MISOPROSTOL	No	No	No	No	No
228	TRIMETHOPRIM	No	Yes	No	No	No
229	FLECAINIDE	No	Yes	Yes	No	No
230	CABERGOLINE	No	Yes	Yes	No	No
231	FELODIPINE	Yes	Yes	Yes	Yes	No
232	HYDROCHLOROTHIAZIDE;LISINOPRIL	Yes	Yes	No	No	No
233	EFAVIRENZ	No	No	Yes	No	No
234	EVEROLIMUS	No	No	No	No	No
235	ETORICOXIB	No	No	No	No	No
236	MISC.ALLERGENS (PATIENT REQUIREMENT)	No	No	No	No	Yes
237	CALCIPOTRIOL	No	Yes	Yes	No	No
238	TOBRAMYCIN	Yes	Yes	Yes	No	No
239	EFALIZUMAB	No	No	No	No	No

Turnover	Active substance	Generics Norway	Generics globally	På byttelisten	Trinnpris	Annet gruppen
240	ETHINYLESTRADIOL;ETONOGESTREL	No	No	No	No	No
241	AMITRIPTYLINE	No	Yes	No	No	No
242	BETAMETHASONE;SALICYLIC ACID	No	Yes	No	No	No
243	DULOXETINE	No	No	No	No	No
244	EPINEPHRINE	No	No	No	No	Yes
245	GALANTAMINE	No	No	No	No	No
246	DESOGESTREL;ETHINYLESTRADIOL	No	Yes	No	No	No
247	CLOBETASOL	No	Yes	No	No	No
248	METRONIDAZOLE	Yes	Yes	Yes	No	No
249	FLUOXETINE	Yes	Yes	Yes	Yes	No
250	BENDROFLUMETHIAZIDE;POTASSIUM	No	Yes	No	No	No
251	CLARITHROMYCIN	Yes	Yes	Yes	Yes	No
252	CYANOCOBALAMIN	No	No	Yes	No	Yes
253	BUPRENORPHINE;NALOXONE	No	No	No	No	Yes
254	NYSTATIN	No	Yes	Yes	No	No
255	CELECOXIB	No	No	No	No	No
256	LANREOTIDE	No	No	No	No	No
257	DEXCHLORPHENIRAMINE	Yes	Yes	No	No	No
258	FOLLICLE-STIMULATING HORMONE;LUTEINISING HORMONE	No	No	No	No	Yes
259	VACCINE, CHOLERA	No	No	No	No	Yes
260	DARIFENACIN	No	No	No	No	No
261	MOXONIDINE	Yes	Yes	Yes	No	No
262	BENSERAZIDE;LEVODOPA	No	Yes	No	No	No
263	LEVOMEPROMAZINE	No	Yes	No	No	No
264	VACCINE, DIPHTHERIA AND TETANUS	No	No	No	No	Yes
265	CYPROTERONE;ETHINYLESTRADIOL	Yes	Yes	Yes	No	No
266	NAFARELIN	No	No	Yes	No	No
267	DEXAMETHASONE	Yes	Yes	No	No	No
268	FEXOFENADINE	No	No	No	No	No
269	EPOETIN BETA	No	No	No	No	No
270	FILGRASTIM	No	No	No	No	No
271	LITHIUM	No	No	No	No	Yes
272	TRASTUZUMAB	No	No	No	No	No
273	OXCARBAZEPINE	Yes	Yes	No	No	No
274	HYDROCORTISONE;OXYTETRACYCLINE;POLYMYXIN B	No	Yes	No	No	No

Turnover	Active substance	Generics Norway	Generics globally	På byttelisten	Trinnpris	Annet gruppen
275	SULFASALAZINE	No	Yes	No	No	No
276	PROPRANOLOL	Yes	Yes	Yes	No	No
277	PROGESTERONE	Yes	Yes	Yes	No	No
278	FLUCONAZOLE	Yes	Yes	Yes	Yes	No
279	NITISINONE	No	No	No	No	No
280	PERPHENAZINE	No	Yes	No	No	No
281	RILUZOLE	No	No	No	No	No
282	PIOGLITAZONE	No	No	No	No	No
283	AZATHIOPRINE	No	Yes	No	No	No
284	ALMOTRIPTAN	No	No	Yes	No	No
285	OXYBUTYNIN	Yes	Yes	No	No	No
286	ANAGRELIDE	No	No	No	No	No
287	NABUMETONE	No	Yes	Yes	No	No
288	TELMISARTAN	No	No	Yes	No	No
289	CINACALCET	No	No	No	No	Yes
290	CALCIUM;ETIDRONIC ACID	No	Yes	No	No	No
291	BECLOMETASONE	Yes	Yes	Yes	No	No
292	MELOXICAM	Yes	Yes	Yes	Yes	No
293	BRINZOLAMIDE	No	No	Yes	No	No
294	TENOFOVIR DISOPROXIL	No	No	No	No	No
295	LINEZOLID	No	No	No	No	No
296	URSODEOXYCHOLIC ACID	No	No	Yes	No	Yes
297	LEFLUNOMIDE	No	No	No	No	No
298	VALGANCICLOVIR	No	No	Yes	No	No
299	TRAVOPROST	No	No	No	No	No
300	ABACAVIR;LAMIVUDINE	No	No	No	No	No
301	VACCINE, PNEUMOCOCCAL;VACCINE, PNEUMOCOCCAL CONJUGATE	No	No	No	No	Yes
302	VACCINE, INFLUENZA	No	No	No	No	Yes

Reference list

Brekke KR, Grasdal A, Holmås TH, 2008. Regulation and pricing of pharmaceuticals: reference pricing or price cap regulation? European Economic Review, forthcoming.

Brekke KR, Holmås TH, Straume OR, 2008. The impact of regulation on generic competition and pharmaceutical prices: theory and evidence from a natural experiment. NHH Discussion Paper 39/07.

Brekke, K.R., Königbauer, I., Straume, O.R., 2007. Reference pricing of pharmaceuticals. Journal of Health Economics 26, 613-642

Danzon PM, Chao L-W, 2000. Cross-national price differences for pharmaceuticals: how large, and why? Journal of Health Economics 19, 159-195.

Danzon, PM, Wang Y.R., Wang, L., 2005. The impact of price regulation on the launch delay of new drugs. Health Economics 14 (3), 269-292.

Danzon PM, Furukawa MF, 2003. "Prices and availability of pharmaceuticals: evidence from nine countries". Health Affairs, 521-536.

Danzon PM, Towse A, 2003. Differential pricing for pharmaceuticals: reconciling access, R&D and patents. International Journal of Health Care Finance and Economics, 3: 183-205.

Frank, R.G., Salkever, D.S., 1997. Generic entry and the market for pharmaceuticals. Journal of Economics & Management Strategy 6, 75-90.

Grabowski, H.G., Vernon, J., 1992. Brand loyalty, entry, and price competition in pharmaceuticals after the 1984 Drug Act. Journal of Law and Economics 35, 331-350.

Griliches Z, Cockburn I, 1994. Generics and new goods in pharmaceutical price indexes. American Economic Review 84, 1213-1232.

IMS 2007. Price benchmarking of generic and patent protected products in Norway compared with other European countries.

Legemiddelindustriforeningen, 2006. Prisnivået på legemidler i Norge i forhold til andre land i Europa.

Rizzo, J.A., 1999. Advertising and competition in the ethical pharmaceutical industry: The case of antihypertensive drugs. Journal of Law and Economics 42(1), 89-116.

Scherer, F.M., 2000. The pharmaceutical industry. In: Cuyler, A.J., Newhouse, J.P. (Eds.), Handbook of Health Economics. North Holland, Elsevier, Amsterdam, Chapter 25.