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Pharmaceutical price comparisons across the European Union and relative affordability in Cyprus

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Abstract

This paper performs price comparisons of branded pharmaceutical products in markets of eleven European Union countries. We follow a Laspeyres index approach, using Cyprus as the base country and analyse prices in the private and public markets and also consider biotechnology products separately. We find that Germany, Denmark and Austria demonstrate the highest pharmaceutical prices in the EU, followed by Cyprus. When adjusting for per capita income, Cyprus demonstrates the highest prices. Given that there is no universal health insurance in Cyprus, and that the country is facing a financial crisis, our findings underline possible affordability problems for patients. In order to remove barriers to access to medicines, pharmaceutical pricing regulation could be adjusted and price revisions should take place more frequently, and, most importantly, Cyprus must move in the direction of adopting universal health insurance.

Keywords: Pricing; Pharmaceuticals; Laspeyres Index; EU

JEL: I110, I130, E62

1. Introduction

Although the EU is a single market, different pharmaceutical pricing regulation applies across EU countries, leading to price differences. These differences have been studied in the past [1-6], but given the dynamic nature of prices, exchange rates and regulation, this topic merits a regular update. Most previous studies focused on the largest five EU markets, and, therefore, a country that has not been included in previous price comparisons and whose pharmaceutical market demonstrates peculiarities is Cyprus. Cyprus is a small market, and total pharmaceutical expenditure was 211 million Euros in 2011[7]. The rate of increase of pharmaceutical expenditure outpaces the increase in any other health related expenditure; in 2011 pharmaceutical expenditure increased

by 4.83% [8], while the economy grew at the rate of 0.5 %. In 2011, Cyprus submerged in a financial crisis and its pharmaceutical market shrunk as an aftermath of the austerity policies and memorandum-impelled reforms. Indicatively in 2013 total pharmaceutical expenditure was constrained to 198.4 million euro, attributed primarily to the reduction of public expenditure[9].

Most EU countries have universal health insurance, meaning that the entire population is covered for healthcare, including pharmaceuticals (subject to co-payments and other restrictions). In Cyprus, however, public health insurance does not apply to the entire population. Only public sector employees, families with an annual income below a certain threshold (about 15,000 Euros per year) and patients suffering from particular chronic diseases are covered by public health insurance. Therefore, it does not come under surprise that private pharmaceutical expenditure in Cyprus exceeds public expenditure (106.8 vs 104 million euros), a unique feature among EU countries. Notably, private pharmaceutical expenditure does not include co-payments applicable in the public health care sector, which is estimated to be around 5-6 million euros per year.

Prior to 2004, Cyprus maximum public retail prices (PRP) were based on the ex-factory price of the origin country. This lacked any clear rationale and clearly created incentives for marketing authorisation holder (MAH) to supply products from expensive countries in order to maximize their profit margins, due to the proportionate system that was implemented. As a result Cyprus had considerably high prices, even compared to expensive countries such as Sweden and Denmark [10]. In 2005 a major reform took place and a new external price referencing scheme policy, which is very popular across the EU, was introduced. The reference price in Cyprus is determined as the average of available prices in Austria, France, Greece and Sweden, plus a 3 percent markup to cover importing costs and a 37 percent pharmacist mark-up fee. The rationale behind the choice of reference countries was to include one expensive, one cheap and two medium-price countries, in order to reflect an average EU price. Five alternative countries were also determined as alternatives when a product is not present in one or more of the reference countries (Denmark, Germany (high price), Italy, Belgium (average price), Spain, Portugal (low price)[10]. However, price revisions have

not taken place in five years (2005-2009), while prices have decreased elsewhere in the EU [11-12]. Moreover, composition and classification of countries in the basket –regarding their price level status – has not been updated and the classification of the basket countries as expensive, medium and cheap was passively carried over, based on 2005 data. The fact that prices have not been updated in such a long period (as opposed to every 1-24 months in other countries) provides a rationale for comparing prices in Cyprus with prices in other EU countries, and for studying the affordability of drugs in this country. This is further substantiated by the fact that the basket of countries and price calculations have not been revised since the introduction of this pricing scheme.

Previous studies on cross-country pharmaceutical price comparisons have shown interesting results. Kanavos et al 2013 compared prices across large global markets and their findings revealed that higher prices in the US may be attributed to earlier uptake of new, expensive products [1]. Kanavos and Vondoros [2] compared prices across OECD countries using own-country weights (an approach commonly known as employing a Paasche price index), while Danzon and Chao (2000) used both Laspeyres and Paasche indexes to show how prices differed across the largest markets globally in the nineties [6]. Danzon and Furukawa, in 2003 and 2008, provided newer evidence on cross-country price comparisons [5-6]. Finally, it has been shown that income does not have a consistent impact on prices, as those of developing countries often exceeded prices in high-income countries [3].

There are many methodological issues surrounding cross-country price comparisons [13]. Prices can be recorded at different levels. For example, one can distinguish between wholesaler and retail prices, and may select a sample of originator or generic products. In addition, when comparing prices, the choice of weights for the prices included in the index is of great importance.

Previous studies have focused on comparisons between the US and other large global markets, usually including only the five largest EU markets. Therefore, price differences between EU countries remain largely unexplored. In addition, exchange rate fluctuations and changes in price regulation, especially following the recent financial crisis, have led to significant changes in relative

prices, thus generating the need for an update on cross-country price comparisons.

This study addresses an important issue of price comparisons from the point of view of a small EU market (Cyprus). However, it has great policy relevance for all EU countries and advances the literature by (a) comparing prices across many EU countries, as opposed to previous studies that largely focused their attention on the largest five markets; (b) providing an update on cross-country price comparisons; (c) considering affordability, as we take per capita income into account; (d) studying both private and public segments of the market; and (e) presenting a separate index for biotechnology products.

3. Data and Methods

3.1 Data

For the purpose of the study we used pricing data on 100 drugs from eleven EU countries in 2011. The initial sample of products chosen were the 100 top-selling prescription only products (formulations/strengths) in the private market in Cyprus, which accounted for about 35 percent of the Cypriot market. In order to ensure a common sample across countries, we excluded 46 products that were not present in all countries, and to avoid restricting the drug sample further, we did not include some countries (Finland, Portugal, Belgium, Poland, Latvia, Slovakia and Czech Republic). The final sample includes 54 products in the private market in eleven countries (Austria, Cyprus, Denmark, France, Germany, Greece, Italy, Norway, Spain, Sweden and the United Kingdom), which account roughly for 20 percent of total market value. The sample consists of 51 active ingredients –three of them were included in two different strengths. All prices are provided at the retail (pharmacy) level, which is relevant from a policy and affordability perspective. Furthermore, ex-factory prices are not officially set in Cyprus. Based on wholesale prices, calculations could lead to an estimated but not actual price. There are several other reasons that justify preferring the retail price over the manufacturer or wholesale price (transparency, data availability, final price paid by patient or insurer) [14]. Moreover, several countries apply clawbacks and rebates on pharmacist margin, and pharmacist profit margins in Cyprus are close to the EU average.

Data for prices in each country were obtained from the health authorities' official drug lists in each country (data sources are provided in the appendix). In case of discrepancies, we contacted the local authorities directly to cross-check our data. For countries that are not part of the Euro zone (UK and Sweden), prices were converted into Euros based on the annual average exchange rate for 2011[15]. In order to standardise packaging disparities we used the price per defined daily dose (DDD) in order to ensure comparability across countries in case packages differed. DDD "is the assumed average maintenance dose per day for a drug used for its main indication in adults" as defined by the World Health Organization[16]. Since private sales data were not publicly available, sales in Cyprus were assessed based on market research in 15 high-volume pharmacies and interviews with twelve key opinion leaders. We did not observe any significant deviations, meaning that the market shares we used are reliable.

All products included in the study are originators, as the purpose of the paper is to perform cross-country originator price comparisons, due to the fact that in the presence of patent protection there are no cheap generic alternatives available. Furthermore, while there are many policy tools available for authorities to regulate prices in generic markets, this is not the case in on-patent markets.

In our study we also assess the prices of products procured by the public health care sector. Sales data for the public health care sector were obtained from the Ministry of Health, based on which we derived market shares, in order to weigh each product accordingly in the price index. We selected the top 50 products of the public market in value, which correspond to 35% of the total market value. Based on availability in the other countries, we ended up with a common sample of 22 products in the public market, whose value corresponds to 20% of public health care value[17]. This will serve as a proxy since discounts often apply to the price that public health insurance pays. Discounts are usually undisclosed and not reflected in the final price in the public segment of the market. As such, these discounts cannot be captured in the price index [18-19]. In Cyprus in particular, the procurement of drugs in the public market is done via tenders, often leading to lower prices than the list price; but significant cuts occur mainly in generic markets rather than originator ones, where there are no

direct competitors[20]. Not being able to capture discounts and tenders is a limitation of the study. However, such discounts do not apply in the private market, so price comparisons on this market segment are not affected by this limitation.

3.2 Methods

Previous work has provided the foundations for a clear and robust methodological approach to cross-country pharmaceutical price comparisons, that we follow in this paper [1-2, 4-6]. We follow a Laspeyres price index approach, according to which the product weights of a single country (the base country) apply to all countries. Therefore, the Laspeyres index compares prices as if all countries demonstrated the same product market shares. The Laspeyres Index is calculated as follows:

$$P_L = \frac{\sum_{j=1}^n p_{ji} q_{j0}}{\sum_{j=1}^n p_{j0} q_{j0}} 100 \quad (1)$$

where p_{ji} is price of product j in country i , p_{j0} is price of product j in the base country, and q_{j0} is quantity of product j in the base country, for a sample of n products.

For the purpose of this study, this approach is preferred to the Paasche index, in which case each country has its own weights, and as such would be a better way of comparing expenditure rather than simply prices. When using the Paasche index, two countries that theoretically have the same prices may demonstrate differences in the Paasche index, if in one country more expensive products have a higher market share than in the other, thus reflecting different consumption patterns. Both indexes have are useful, but in this study we use the Laspeyres index with Cyprus as base country because (a) the study is conducted from a Cyprus perspective, especially as the private market is vital in Cyprus and less important in other countries due to differences in public health insurance coverage; and (b) we were able to calculate weights for the Cyprus market as we

had access to sales data, which we did not have for other countries. We also performed the same analysis for the same sample, excluding VAT from the prices, due to significant variation among EU countries [21]. The purpose of VAT is to fund the government budget, so its importance is restricted to non-healthcare aspects.

In addition to the primary objective of the study, we also performed price comparisons for biotechnology products (anti-TNF, TKIs VEGF inhibitors) due to their high prices and value increase rate¹. Finally, we also adjusted price indexes for per capita GDP PPP, in order to measure affordability, as this highlights the financial burden on individuals via contributions or taxes, in the case of public spending, or out-of-pocket payments, in the case of private spending [22].

With the exception of the United Kingdom, Denmark, Sweden and Germany, all other countries included in the analysis use external reference pricing to set originator prices[23]. The UK employs profit controls (as part of the Pharmaceutical Price Regulation Scheme) [24] and Germany has free pricing [25]. In Sweden, prices are submitted by the marketing authorization holder to the competent authorities and are either rejected or accepted (but not negotiated) based on the cost-effectiveness principle, the human value principle and the need and solidarity principle [26]. Denmark applies free pricing although some restrictions apply at the reimbursement level [27].

4. Results

The price indexes of the private sector are presented in Table 1. These prices reflect out-of-pocket payment since all expenses burden the patient, unless they are covered by an optional private insurance. For countries with universal health insurance, this is not one of the most important issues in healthcare. However, due to the lack of universal health insurance in Cyprus, a significant part of the population relies on the private market, meaning that this is crucial for access to medicines. In the private sector, Germany, Denmark,

¹ One fast growing segment and a cause for serious concerns is the one of low volume high value biotechnology medicines. This section is characterized by oligopoly and lack of generics. Indicatively, in Germany, the turnover of the Top 10 indications according to ATC-3 show that the highest increase (as compared to the previous year) occurs in the areas of “other antineoplastic agents” (annual increase of 33.15 percent and anti-TNF preparations (25,8 percent increase) [28].

Austria, are the three most expensive countries, followed by Cyprus. The countries with the lowest prices are France and Greece (Table 1). When adjusting for GDP per capita, the highest prices are found in Cyprus, followed by Germany and Denmark. The countries with the lowest relative prices are the UK, France and Norway.

We performed the same analysis for the same price cohort without VAT. Germany is still the country with the highest prices, followed by Austria. Cyprus is third, and Greece is last in the sample. After adjusting for GDP PPP Cyprus demonstrates the highest prices, followed by Germany, while Norway and UK have the lowest prices (Table 2)

[Insert Table 1 here]

[Insert Table 2 here]

Table 3 presents the price indexes of biotechnology drugs. The highest prices are identified in Germany, with Cyprus ranking second and Italy third. France, Greece and the UK are in the last positions among the eleven countries of the sample. When adjusting for GDP per capita, Cyprus ranks first, followed by Germany and Italy. In this case, Sweden, UK and Norway have the lowest relative prices.

The price indexes for the public market are presented in Table 4. Germany demonstrates the highest prices, followed by Denmark and Austria, while Cyprus ranks fourth. The lowest prices in the public market are demonstrated in France (30.08 percent lower than Cyprus), Greece (35.10 percent lower than Cyprus) and the UK (40.80 percent lower than Cyprus). When adjusting for GDP PPP, Cyprus ranks first, followed by Italy, Germany and Denmark. France, UK and Norway rank in the three lowest places in the sample.

[Insert Table 3 here]

[Insert Table 4 here]

5. Discussion and Conclusions

We have used a Laspeyres index to compare pharmaceutical prices across eleven EU countries. This study provides insight into a topic that has been mostly limited to the EU G5 (France, Germany, Italy, Spain, UK) and North America in previous studies. Our results show that Germany and Denmark demonstrate the highest private market prices and Cyprus ranks third. When adjusting for income, Cyprus is the highest-priced country in the private market, in which Greece ranks last. Cyprus also demonstrates the second highest prices in biotechnology markets and ranks first when adjusting for income. Results for the public sector are in line with the corresponding findings for the private sector, which conveys more clearly the situation in Cyprus (but they should be interpreted with caution). This verifies our findings, indicating that Germany, Denmark and Cyprus are among the most expensive markets, while when adjusting for affordability Cyprus is in the first place, followed by Germany, while UK, France and Norway demonstrate the best affordability rates.

Currently, pricing is the single supply-side measure applicable in the private health care sector in Cyprus, which is void of other measures frequently utilised by EU countries such as generic substitution, guidelines, monitoring and auditing[29], which underlines the importance of acting on pricing. Furthermore, the current financial situation in Cyprus means that high prices may create affordability problems, leading to barriers to access to medicines, a pattern already observed in other recession countries [30]. In the context of pricing policies, several authors correlate income level with prices. [10, 31, 32] and previous studies found a strong positive correlation of GDP PPP with pharmaceutical prices in EU countries [22]. As a result, by adjusting prices by per-capita GDP we can extract a better picture with regards to comparative affordability.

The fragmentation of the Cypriot pharmaceutical market into public and private sectors creates a heterogeneous environment which impedes the introduction and dissemination of new policies. Private pharmaceutical expenditure does not relate to financial deficit and burdens individuals, and, consequently, the Cypriot government does not have a strong fiscal motive to pursue price reductions in the private sector. This underlines the need for the adoption of a National Health System [33]. Pricing revisions should be performed

in the context of health reforms and transition towards a new healthcare system. Designation of one single payer, in the form of the much-anticipated National Health System will enable a straightforward intervention to prices and will address affordability issues [34].

Currently, the Cypriot health authorities may want to consider seeking alternative ways of pricing drugs, or to perform price revisions more frequently, so that prices can reflect the current situation in the reference countries, especially given the price cuts in many EU countries. Moreover, given the rapid deterioration of its fiscal position, Cyprus should also consider a new basket of countries, based on new data. Alternatively, Cyprus could consider a different formula for price estimations, and price weights could be higher for countries with the same fiscal adversities, such as Spain and Greece. Current data provide an exemplary framework for reassessment of countries, based on price level, which would lead to realignment of classification of referencing countries. In this context, classification of countries as expensive, medium and cheap should be more accurate and final prices should depict more clearly the prices in the country of origin.

In any case, it is worth mentioning that prices include the manufacturer price, the wholesaler and pharmacist mark-ups, and, in some countries, VAT [1,2,4,5,6]. Therefore, price differences may not reflect solely higher manufacturer prices (at which level regulation usually applies), but also differences in mark-ups and indirect taxes.

Due to the size and location of Cypriot pharmaceutical market, a balance must be kept, in order to avoid any threats to continuous and undisrupted supply to the local market, as very low prices may make the market unattractive and may finally lead to shortages. Moreover, very low prices would significantly delay launch of new products in Cyprus, since this would prevent a spill-over effect of its low prices to more significant and bigger markets via external reference pricing. The small size of the market also implies that due to economies of scale issues, dedicated departments for complex pricing methods cannot operate, leading to the adoption of external reference pricing despite the fact that this policy has been criticised as overly simplistic and lacking any theoretical background [35-36].

We performed a separate analysis for biotechnology products, which includes some highly individualised products with a high annual growth rate, that exerts significant pressure on pharmaceutical expenditure. Due to their complexity level, interchangeability between these agents is complicated, which shifts bargaining power to their side and render other reimbursement approaches rather inefficient. Alarming, Cyprus has high prices in this sector, and the highest after GDP PPP per capita adjustment. This is further aggravated by the fact that after patent expiry, these products are subject to biosimilars rather than generics. Biosimilars are subject to a different regulatory framework, which ultimately leads to smaller savings, compared to the steep price reductions reported in generic medicines' procurement [20].

This study is not without limitations. While using the Laspeyres index is perfectly relevant for Cyprus and also gives a picture of prices in other EU countries, any findings for these countries must be treated with caution, due to the fact that weights reflect consumption patterns in Cyprus. Most importantly, the list prices used in the public sector price index do not include any discounts, rebates and clawbacks or any cuts achieved via tendering or managed entry agreements. Moreover, despite our initial study design provided a sample of 35% of Cyprus market, we ended up with a lower sample, as a trade-off to safeguard a common basket of products across sample countries, which would render our findings reliable. Finally, the use of DDD, despite being a rational approach endorsed by the WHO, does not take into consideration any differences in package size.

Cross-country price comparisons among EU countries are important for policy makers, and future research can provide updates after any changes in regulation, and can also study this issue using weights of different markets.

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TABLES

Table 1. Laspeyres price index, private market

Countries	Index	Index adjusted by GDP PPP
Germany	127.54	97.85
Denmark	120.40	94.22
Austria	110.61	76.89
Cyprus	100.00	100.00
Sweden	93.11	67.02
Norway	92.62	50.36
Italy	96.05	91.66
UK	69.65	56.11
Spain	74.10	70.35
France	72.14	59.66
Greece	66.89	73.96

Table 2. Laspeyres price index, private market excluding VAT

Countries	Index	Index adjusted by GDP PPP
Germany	108.68	83.38
Austria	104.32	72.52
Cyprus	100.00	100.00
Sweden	97.85	70.42
Denmark	94.83	74.21
Italy	90.99	86.83
Spain	74.69	70.90
France	74.10	61.28
UK	73.22	58.90
Norway	72.86	39.61
Greece	65.83	72.78

Table 3. Laspeyres price index, biotechnology products

Countries	Index	Index adjusted by GDP PPP
Germany	104.91	80.48
Cyprus	100.00	100.00
Italy	99.63	95.08
Austria	96.30	66.94
Denmark	96.01	75.15
Norway	80.50	43.77
Sweden	73.51	53.90
Spain	71.57	67.95
France	69.55	57.20
Greece	64.75	71.06
United Kingdom	58.35	47.00

Table 4. Laspeyres price index, public market

Countries	Index	Index adjusted by GDP PPP
Germany	114.83	88.10
Denmark	105.75	82.76
Austria	101.35	70.30
Cyprus	100.00	100.00
Italy	99.33	94.80
Norway	81.98	44.57
Sweden	80.67	58.06
Spain	70.49	66.92
France	69.02	57.08
Greece	64.90	71.76
United Kingdom	59.20	47.69

APPENDIX

Table A1. Price Sources

Austria	Common European Drug Database (CEDD)	http://cedd.oep.hu/
Belgium	Common European Drug Database (CEDD)	http://cedd.oep.hu/
Czech Republic	Common European Drug Database (CEDD)	http://cedd.oep.hu/
Cyprus	Pharmaceutical services MoH	http://www.moh.gov.cy/moh/phs/phs.nsf/dmlpricelist_en/dmlpricelist_en?OpenDocument
Denmark	Medicin Priser	http://www.medicinpriser.dk/
Finland	Common European Drug Database (CEDD)	http://cedd.oep.hu/
France	Ministry of Health	http://medicprix.sante.gouv.fr/welcome.do
Germany	DIMDI	http://www.dimdi.de/static/en/amg/fbag/index.htm
Greece	Ministry of Health	http://www.yyka.gov.gr/articles/times-farmakwn/deltia-timwn
Latvia	Common European Drug Database (CEDD)	http://cedd.oep.hu/
Italy	L'Agenzia Italiana del farmaco (AIFA)	http://farmaco.agenziafarmaco.it/index.php
Norway	Statens legemiddelverket	http://www.legemiddelverket.no/templates/InterPage_____38824.aspx?filterB...
Poland	Common European Drug Database (CEDD)	http://cedd.oep.hu/
Portugal	Infarmed	http://www.infarmed.pt/infomed/inicio.php
Slovakia	Common European Drug Database (CEDD)	http://cedd.oep.hu/
Spain	Vademecum	http://www.vademecum.es/
Sweden	The Dental and Pharmaceutical Benefits Agency (TLV)	http://www.tlv.se/in-english/
United Kingdom	British National Formulary; National Health Service Drug Tariff for England and Wales	http://bnf.org/bnf/index.htm http://www.ppa.org.uk/ppa/edt_intro.htm

Highlights

We compare pharmaceutical prices in 11 EU countries, using Cyprus as a base country

We derive indexes for the private and public markets and are also adjusted for income

We find that Cyprus demonstrates one of the highest prices in the sample

Other countries with high prices include Germany, Denmark and Austria

Results from the private market highlight the need for universal health insurance in Cyprus

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