

Public Medication and Health Services Demand in Greece: The Relationship between Generics and Prototype Drugs

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Abstract

This article aims to delve into the contemporary landscape of the pharmaceutical industry, specifically focusing on the demand for generic and prototype drugs. The research comprises two segments: theoretical and empirical. The theoretical section provides a literature review with accompanying clarification of terms related to drugs, emphasizing prototypes and generics, while also exploring the fundamental functions of pharmaceutical markets globally and in Greece from 2004 to 2020. The article investigates various theories detailing the factors influencing demand in the health and drug sector. In the empirical segment, a questionnaire survey involving 461 participants in the Athens area was carried out between January 2021 and April 2022. The sample, ranging from 18 to over 70 years old, was selected through random stratified sampling, employing on-site surveys in municipalities. Logistic multinomial regression identifies factors influencing this demand, including higher age, occupation in the private sector with moderate income, and residence in the southern or western suburbs. Findings indicate that the demand for generic drugs in this sample is not particularly high despite the fact that it contributes to social welfare and the national economy by saving resources.

Keywords

Drug Demand, Drug Supply, Generic Drugs, Prototype Drugs, Private Pharmaceutical Spending, Public Pharmaceutical Spending, Greek Pharmaceutical Sales

1. Introduction

Health is the most important factor for the existence and development of indi-

viduals in all societies, as its “provision” is the primary condition for further creative engagement with other areas of human activity. Therefore, the implementation of policies aimed at improving the health sector as a whole or in parts is of crucial importance. Equally important is the study of health policies that have been implemented in previous periods in order to draw conclusions about their correctness and their contribution to the upgrade of the specific sector, with the aim of making decisions for their further continuation or partial or total modification (Kyriopoulos & Athanasakis, 2012).

It is generally accepted that the progress of a country and its economic stability are directly related to the well-being and good functioning of the pharmaceutical market, which is at the center of a broader and continuous effort to promote public health, which is one of the five public goods in which one state has an obligation.

The pharmaceutical sector is of particular interest, as it is not only a part of the economy, but also has a social character as it is directly related to the health of citizens. At the same time, it maintains the specificity of being a consumer product, as it circulates in the market with specific indications and prices.

The pharmaceutical industry is defined as the transformation sector that produces pharmaceutical and chemical products for medical purposes. Despite the economic crisis of recent years that our country is facing, and the consequent general rearrangement of its economic prospects that have questioned the sustainability of its main economic sectors, the pharmaceutical industry continues to offer and contribute to the national economy. In particular, with the development of new original innovative drugs, but also the promotion of generics, social welfare and the saving of resources are promoted.

In the Greek pharmaceutical market, despite its relatively satisfactory organization, technological modernization and mechanization of the healthcare system, in general, are deemed necessary in order to continue providing immediate access to new, branded, and safe drugs as well as effective and high-quality health services to the community. At the same time, the sector faces challenges and distortions related to the fragmentation of the factors that determine demand (supplier, buyer, consumer), the uncertainty on both the supply side (inadequate information) and demand side (asymmetry of information between physician and patient), as well as the lack of a stable institutional framework with constant changes in legislation, leading to a constantly changing business environment without strategic planning and conflicting pharmaceutical policy goals.

Additionally, the pharmaceutical industry is linked to the long-term trend of increased healthcare spending and pharmaceutical expenditure, a phenomenon resulting from population growth and aging, as well as the treatment of diseases that were previously untreatable. However, the increase in pharmaceutical expenditure often leads to a reduction in overall healthcare spending as it replaces certain other forms of care, such as hospitalization. Furthermore, pharmaceutical care helps reduce deaths and increase life expectancy, significantly reducing the

high cost of hospitalization, while also contributing to the psychological benefit of avoiding the patient-consumer's entry into the hospital (Dagkalidis, 2011; Kyriopoulos, Maniadakis, & Stournaras, 2011; Vitsou, 2009).

A crucial and highly dynamic parameter in the pharmaceutical industry that contributes to improving the quality of life for citizens, sometimes to the point of avoiding expensive surgical interventions and prolonged hospitalization, is the research and development of new drugs within the laboratories of pharmaceutical companies and scientific researchers. Innovation, development, and implementation of new ideas are essential in this specific field (Dagkalidis, 2011).

Combining basic research into the way a disease functions and applied research evaluating new compounds as potential drugs by testing them in laboratories, the industry seeks to open new avenues in its efforts to confirm its expectations, with the impact of combating diseases, increasing the average lifespan, and boosting morale, highlighting the appropriate value for the final recipient, namely human beings. Regarding Greece specifically, the health sector is a significant field of research and study, not only due to its social and ethical dimensions, but also because Greece spends a considerable portion of its GDP on healthcare, and consequently, any change in healthcare expenditures, whether for political and hierarchical reasons or unforeseen crises, such as an economic crisis, has dramatic implications for the level of healthcare services provided to citizens (Anastasakou, 2013; Kyriopoulos, Maniadakis, & Stournaras, 2011).

This article examines a specific topic in the healthcare sector in Greece, namely the relationship between the economic crisis in Greece in 2009 and the development of pharmaceutical healthcare expenditures in Greece up until 2014. The main objective of the study is to provide the reader with an understanding of how the pharmaceutical industry operates and is shaped in our country. To evaluate the market for generic drugs in Greece, which is quite sound in the Global market and contributes the most to the country's economy. Primary data will be collected through a questionnaire distributed to the general population of the wider Athens area. Specifically, the article analyzes the drug market and its unique characteristics, both from the supply side, which is pharmaceutical companies, and from the demand side, which is patients-consumers. It clarifies the pharmaceutical policy implemented through the institutional framework at the time and refers to the need for promoting innovation and research and development in the field, in order to produce new, safe and effective products. Additionally, the issue of increased pharmaceutical costs and efforts to reduce them is examined. The article presents the current situation in Greece after the implementation of fiscal measures aimed at reducing healthcare costs, the broader problems facing the pharmaceutical industry, and briefly refers to the international environment. The article is organized as follows: the literature review, the empirical research, the data, the empirical quantitative analysis, and finally, the conclusion.

2. Literature Review

The structure of this article consists of a literature review that draws information from books, studies, and articles, both Greek and international, related to health economics, pharmacoeconomics, and the overall policy followed in pharmaceutical care in Greece. Specifically, introductory information is presented regarding the definition of drugs, types of drugs, drug categories, drug production, as well as European legislative pharmaceutical issues such as the central authorization procedure for prototype drugs, the phases of clinical trials, the intellectual property rights, the process of generic drug circulation, and more. These theoretical foundations set the groundwork for understanding the most important terms governing the pharmaceutical market. Finally, the main European and Greek pharmaceutical organizations are presented. We will discuss patents and the strategies followed by big originator companies to prevent the entry of generics into the market. We will also mention price policies that have been applied in various countries and their results. Statistical information on general health expenditure in Greece for the period 2004-2014 is presented, while an analysis of pharmaceutical health expenditure and drug consumption in Greece for the same period is provided through detailed tables and graphs. The results of the statistical research conclude with the presentation of conclusions related to the effect of the economic crisis on pharmaceutical health expenditure in Greece until 2014 and to the proposals and measures that could be taken to further rationalize the system towards resource-saving and more efficient use of the health sector budget, including the pharmaceutical expenditure.

Based on international literature and studies, the factors determining the demand for pharmaceutical products include demographic characteristics (age, gender, family size, place of residence, etc.), disposable income, the health status of the population, economic conditions, the characteristics of the drugs (effectiveness, side effects, etc.), the prestige of each brand, the commercial policies of the companies (promotional activities, indirect incentives to doctors through international conferences or vacations, etc.), and government policies (pricing, restriction of pharmaceutical expenditure during a crisis, protection of public health from epidemics, etc.). However, the most significant factor influencing demand is the overall health status of the Greek population, which depends on demographic factors (aging, etc.), dietary habits (obesity), and lifestyle (Dagkalidis, 2011; Golna, Paratsiokas, & Ventouris, 2013; Kyriopoulos, Maniadakis, & Stournaras, 2011; Vitsou, 2009; Anastasakou, 2013).

The relationship between medicine pricing and the supply chain, including the mechanisms and components of pharmaceutical prices, as well as the pharmaceutical supply chain, was explained. Key elements of the pharmaceutical value chain, such as manufacturers, market warehouses, distribution centers, wholesalers, and retailers, were outlined. Additionally, legislative context aspects, including regulations related to private healthcare facilities and services, tariff exemptions, and external and international reference pricing, were

discussed. Lastly, aspects of patient medicine spending, including out-of-pocket spending and costs, were reviewed. Regulating mark-ups without a price control strategy results in reduced medicine prices. Implementing this policy is less complex compared to other options as it requires minimal cost and supply chain-related information along with enforcement details. However, this policy might negatively impact availability and access by altering prices. Moreover, there is a risk of higher prices if the mark-up structure lacks transparency (Lee et al., 2020).

Yaser et al. (2021) explored the knowledge and beliefs of patients regarding generic medicines and identify factors influencing their use. Conducted in 2017, this mixed-method study included 310 participants. It found that patients have limited knowledge and negative perceptions of generic medicines. There is an urgent need for specialized and well-designed programs to educate patients and healthcare professionals to improve their understanding and beliefs about generic medicine.

In a review of 44 articles from Medline, Scopus, Web of Science, and Embase, encouraging policies and practices were categorized into four groups: Prescribing, Dispensing, Patients/consumers, and Healthcare organizations. Each category included subthemes such as education, financial incentives, generic substitution, advertising approaches, and enforcement. Various policies should be considered to promote the successful prescribing, dispensing, and use of generic medicines on both the supply and demand sides. Economic, political, socio-cultural, technological, legal, and structural factors can accelerate the impact of these policies. Studying the experiences of successful countries can provide valuable insights for policymakers (Shahmoradi et al., 2021). Accordingly, Russian and Asian manufacturers have the opportunity to expand their market influence. However, many components of medicines produced in Russia are sourced from Europe, including packaging. The Russian population is aging, and consumer purchasing power is declining, leading to a shift from mid-priced medicines to cheaper generics. Conversely, expensive medicines are in high demand due to the influence of pharmacists, doctors, and media. Homeopathic and antiviral drugs, despite unproven efficacy, are also popular. The shortage of foreign-made medicines is expected to be addressed by producing generics. However, experts note that while generics have similar active ingredients, they may differ in manufacturing technology and additional components. Thus, the issue of import substitution in Russia is critical. A well-crafted state policy can develop the domestic pharmaceutical market without limiting consumer choices (Ismailov et al., 2022).

In these three groups, opinions on generic drugs have improved, but some mistrust remains, especially among patients who strongly believe that lower cost equates to lower quality. Acceptance of generic drugs is higher among consumers with higher education levels, while patients from lower socioeconomic demographics, who generally have lower education levels, tend to have greater dis-

trust of generic drugs. A key factor in improving trust in generic products is providing information and education, particularly in areas of equivalence, regulation, and dispelling myths about generic drugs (such as the belief that they are counterfeit). Additionally, since patients' trust in their doctor often outweighs their mistrust of generics, strengthening doctors' views on generics may be particularly significant in strategies to promote the use and acceptance of generic drugs in the future (Allenet, 2003).

In Nigeria, a survey of 154 pharmacists showed that many did not trust the quality of generics available in the market, but the majority did. In the Czech Republic, a sample of 600 pharmacists mostly considered generics equivalent and therapeutically equivalent, with a small minority considering them of lower quality and with serious contraindications. In South Africa, a sample of 73 consumers and 15 doctors felt that generics needed more information. In the United States, a sample of 500 doctors showed significant barriers to the use of generics, suggesting a need for a strategic information campaign targeting older doctors. In Ireland, among 42 patients, there was a variety of knowledge about generics, although patients were supportive of the use and safety of generics, while in Denmark, a sample of 2500 patients saw a future trend towards the use of generics. In Australia, a sample of 47 patients showed significant concern about generics, indicating a need for more clinical bioequivalence studies. In Canada, a sample of 81 patients and 110 doctors mostly accepted the equivalence of generics compared to brand-name drugs. In Saudi Arabia, a sample of 772 doctors showed that most supported generics but indicated a need for further clinical studies to prefer generics. In Greece, among 1200 doctors, there was openness to the use of generics, but serious doubts remained about their positive impact on patient treatment. In Japan, among 1200 patients, public information about generics needed to be expanded to improve understanding (Dunne & Dunne, 2015).

From a global study, we have the following results indicating the impact of four different pricing policies for generic drugs in four countries from the WHO Western Pacific region. Mandatory price reductions, combined with subsequent price disclosure policies, resulted in similar relative percentage reductions over 4 years (Australia). In comparison, mandatory price cuts upon general entry as the sole measure were associated with the smallest relative price reduction over the 4-year follow-up (Republic of Korea). This study underscores the need for continuous evaluation of the effectiveness of implementing policies for generic drugs and considering a combination of strategies that maximize value for money (Roughead et al., 2018).

The results of a qualitative study in Denmark showed that the price of drugs was considered an important factor influencing prescribing decisions. Additionally, pharmaceutical industry sales representatives significantly influenced doctors. Their studies demonstrate that doctors considered the cost of drugs an important criterion in the prescription choice, and this was even more significant when patients were uninsured (Reichert et al., 2003).

However, this parameter was not considered in the study design because, as mentioned, Greece and Cyprus do not have office-based systems, and patients have free access to any doctor of any specialty and level of care. The conclusions from the article provide valuable information regarding the prescribing behavior of doctors in Greece and Cyprus. Further analysis will help us better understand the relationship between prescription choices and physical characteristics. This knowledge will assist policymakers in both countries to develop measures that could be used to achieve greater clinical effectiveness and economic efficiency in drug prescribing (Theodorou et al., 2009).

The health status of the population is limited by certain risk factors, such as poor dietary habits and obesity, smoking and other abuses, limited physical activity (sedentary lifestyle), and stress. A comparative study from 2006 to 2011 for the Greek population shows that these risk factors were at high levels compared to other European countries in previous years but tended to mitigate. Research indicates that the overall health status of Greeks and demographic factors play a crucial role in the demand for drugs and health services (Karadimas, 2005; Golna, Kontiadis, & Souliotis 2005).

Furthermore, there is an observed aging of the population as, according to OECD estimates and based on the existing dynamic population changes, the percentage of the population over 65 years old in Greece is expected to increase from 18.9% in 2010 to 32.1% in 2050, while the percentage of the population over 80 years old is estimated to rise to 11.4% in 2050 from 4.8% in 2010. These rates are close to the average for the EU-27, but significantly higher compared to the global average. The increase in life expectancy combined with the expected increase in the population aged over 65, who typically use health services more, is anticipated to have significant impacts on future health expenditures, which will burden our insurance system (Maniatis, Athanasiadis, & Demousi, 2013).

Based on all the above, the following characteristics were selected for investigation in our research.

2.1. Education, Profession, and Income as Determinants of General Health Levels

The level of education, profession, and income are key factors determining the general level of health. Education contributes to reducing mortality and morbidity rates by enhancing human skills, thus improving prospects for professional and social advancement and promoting the adoption of a healthier lifestyle.

2.2. Profession's Impact on Health

Profession influences the general health level of the population because it determines an individual's position within society and access to its resources and structures. Additionally, it often involves specific conditions regarding employment, hygiene, and workplace safety. For example, individuals in lower professional categories tend to experience more health problems due to adverse working environ-

ments. Finally, professional employment affects lifestyle and the adoption of behaviors such as smoking or alcohol consumption.

2.3. Other Social Determinants Influencing Health Services Demand

Other social determinants affecting the demand for health services include ethnicity, gender, geographic location, degree of social networking and solidarity, sociopolitical environment, and the effects of macroeconomic policies and social protection policies.

2.4. Information Asymmetry in Health Decisions

Patients often cannot gather information about their current health status, alternative treatments, or their progression independently, so they authorize the doctor to decide for them. In this scenario, there is an asymmetry in information between the doctor and the patient regarding both the price and the quality of the treatment. Consequently, the patient-consumer cannot act rationally. The quality is difficult to determine when the expense is covered by social security, as it then depends solely on the discretion of the attending physician, while the price is determined based on the microeconomic theory of supply and demand.

2.5. Income and Health Expenditures: A Case Study from China

To understand how family income correlates with health expenses, a study on health expenditures in China from 1988 to 1995 in 18 rural regions, specifically the eastern and central provinces was referenced. This research examined four income categories and found that while household disposable income increased, health expenditures did not rise at the same rate. In fact, when disposable income increased rapidly, the proportion spent on health expenses decreased, indicating a positive but less than unitary demand elasticity. More specifically, an elasticity of demand between zero and one means that if an income increases by, for example, 10.0%, the demand (consumption) for that good will increase, but not proportionally, and less than the income increase (less than 10.0%). This behavior is typical for essential goods; for instance, if incomes double, we will not consume double or triple the bread, only a little more. Thus, health is shown to be an essential good, and poorer households from rural areas spend a large portion of their income on inelastic health expenses (Gustafsson & Li, 2013).

Therefore, higher-income populations, with fewer issues related to bill payments, a positive view of the pharmaceutical industry and drugs in general, and acceptance of the prescription and distribution of generic drugs, are more likely to consider generics safe and effective. Additionally, higher age and trust in the medical community positively correlate with the perception of generics' safety. This suggests that older populations and those who trust the medical community are also more likely to perceive generics as safe.

2.6. Generic Drug Market before and during Economic Recession

According to a 2009 survey conducted before the economic recession in Europe and Greece, nearly half of the pharmaceutical products available in Europe were generics, while the corresponding percentage for Greece was significantly below the EU average (35.0%). Nevertheless, consumption levels were not the same; in Greece, only 32.0% consumed generics, compared to 50.0% in the EU (Tsiantou et al., 2009).

According to Papadopoulos et al. (2016), Greece had the highest average unit price for generic drugs among EU countries. However, there are clear indications of a strong negative relationship between the average unit price and the market share by volume. The current price levels of generics in Greece align with the expected price levels concerning their market share by volume.

Recent data shows that the contribution of generics to the European market is significant. A recent study in Germany by the Institute for Health and Social Research (IGES) indicated that in most European countries, the market share of generic drugs by volume exceeds 40.0%. Germany, with the largest pharmaceutical market in Europe, had the highest volume share of generic drugs at 73.0% in 2014. In the UK, the fourth-largest market in Europe, the volume share of generics was 66.0% in 2014. However, volume shares vary significantly among European countries, with Greece having the lowest volume share at 37.0%.

According to another study by the Organization for Economic Co-operation and Development (OECD) on the generic drug market in Europe, all EU countries see the development of generic markets as a good opportunity to increase the efficiency of pharmaceutical expenditures, but many do not fully exploit the potential of generics. In 2014, generic drugs accounted for more than 70.0% of the volume of pharmaceutical products sold in the United Kingdom, Germany, the Netherlands, and the Slovak Republic, while the market represented less than 20.0% of the market in Luxembourg, Italy, and Greece (OECD, 2016).

Several countries have expanded their efforts to encourage the consumption of generics since the onset of the economic crisis in 2008, including Greece. These policies are related to the expiration of patents in recent years, which have contributed to the increase in the general market share observed over the past decade in Europe. Beyond encouraging general consumption, it is also important to promote the lowest possible price for generic drugs. The price difference between branded and generic drugs is much higher in the United Kingdom and Germany than in Austria (OECD, 2016).

The fact that the US market is more developed than that of Europe is also reflected in additional studies conducted at a later date. According to Pontiki (2013), among the countries studied, the USA holds almost half of the global market share of generics (47.0%), followed by Germany, which also has a fairly developed drug market (14.0%).

Closing, according to forecasts for the future development of the global generics market, it is expected to increase at a compound annual growth rate of

10.53% from 2016 to 2020. In fact, according to ReportsnReports.com, the global market for generic drugs will benefit from the expiration of patents on prototype drugs by a total of \$150 billion by 2020 (Modern Medicine Network, 2016).

In a study by Kontodimopoulos et al. (2013) on the cost savings in Greek hospitals from substituting branded drugs with generics, it was found that expenses gradually decreased during the years 2009–2011. In 2011, the substitution rate of prototype-generic drugs was 26.0%, very close to the target of 32.0% set by the Ministry of Health for the end of 2012. Psychiatric health units and small hospital units were more favorable regarding the adoption of generics (47.7% and 38.2%, respectively), while specialized hospitals and children's hospitals (14.1% and 12.0%) had lower performances in this area. Based on the type of drug, substitution was higher for antibiotics (51.9%), cardiovascular drugs (38.2%), and antidepressants (48.2%).

Regarding legislative regulations in the substitution of prototype—generics, the research by Vogler et al. (2011), which studied and analyzed the pharmaceutical policies of selected European countries, including Greece, in the context of the economic recession of recent years, reports that in 21 EU countries, pharmacists are allowed to substitute branded drugs with cheaper generics voluntarily, while in 6 countries it is mandatory unless the doctor or patient has a different opinion that must fall under fully clarified situations by the responsible authorities.

2.7. Perceptions of Physicians regarding Generic Drugs

There are studies in the literature that investigate physicians' perceptions of generic drugs. The research by Tsiantou et al. (2009), mentioned earlier, studied the prescription profile of doctors in Greece, focusing on the factors influencing their decisions regarding the prescription of generics. The results of the study showed that Greek doctors have a positive view of generic drugs but prefer to prescribe prototype products. The age of doctors and their opinion on the efficacy and effectiveness of generics were found to be significant determinants in the decision to prescribe them. The main reason that could change their prescribing habits was the occurrence of side effects.

In more recent research by Labiris et al. (2015), the aim was to evaluate the beliefs and preferences of Greek doctors regarding generics during the years of the economic crisis in Greece. Doctors working in Athens and generally those working in surgical units demonstrated lower rates of prescribing generics than those working in the rest of Greece and those working in medical clinics, respectively. The results of the study reveal an overall poor acceptance of the national initiative for generic drugs by Greek doctors.

Even more recent research by Tsaprantzi et al. (2016) aimed to evaluate the impact of information on doctors' attitudes and perceptions towards generic drugs in public hospitals in Greece. The study concluded that providing quality information on generic drugs influences doctors' attitudes and prescribing prac-

tices toward generics. This is not a static process but rather a dynamic issue concerning the policies of providing information to enhance doctors' attitudes towards generics and prototype drugs, respectively.

3. Empirical Research

3.1. Methodology

Various factors will be examined that affect the demand for drugs (both generic and prototype ones), such as demographics, social, economic, and psychological factors, in order to create the profile of people who use drugs. To achieve this, 461 specially designed questionnaires were distributed during the months of Jan 2021-April 2022, to consumers aged from 18 to over 70 years old, from various areas of Athens. The questionnaire contained 18 questions about the use of drugs, as well as various personal factors that affect usage and frequency, in order to gather the necessary data and obtain the profile of users. The limited knowledge within the sample regarding the use of generics contributes to a pessimistic perspective on these drugs. The onus falls on physicians to educate their patients about generics. Qualitative traits like smoking and less severe conditions such as hypertension or prostate diseases, compared to cardiovascular issues, further influence patients' preferences for generic medications. The perception of generic medicines as inferior serves as a justification for the choice of these drugs by such patients.

The gathering of these data took place after conducting field surveys in the Municipalities of Athens and sending targeted messages to the email addresses of the interviewees through the Secretary of School or Google Form, while the sampling method that was followed was random stratified sampling since this method is characterized by higher sample accuracy and representativeness.

Simultaneously with the above sampling process, a questionnaire was drawn up, against which research hypotheses were tested. More specifically, the questionnaire (**Table 1**) consists of two sections: Demographics, Personal characteristics of the persons, and Quantitative/Qualitative data. The first section included questions about the general characteristics of consumers (age, gender, educational background, income, marital status, professional status), while the second section included questions about the qualitative characteristics of persons and their opinions and views that affect the consumption of drugs.

3.2. Data

All data were gathered via a stratified sampling method. The Attica region was divided into four geographic areas. The selection of the participants in each of the four geographic areas was done in such a way that their percentage in the sample is equal to the percentage of the population of that geographic area in the total population of Attica. The subject of our research requires us to address drug users. We approached them and the questionnaires were answered with

Table 1. Variable definitions and summary statistics.

	VARIABLES		<i>N</i>	<i>%</i>	<i>MEAN</i>	<i>ST.DEV</i>
SEX	SEXM	MALE	229	49.70	0.497	0.500
AGE	AGE1	18 - 30	114	24.7	0.247	0.450
	AGE2	31 - 40	116	25.2	0.252	0.434
	AGE3	41 - 50	66	14.3	0.143	0.350
	AGE4	51 - 60	39	8.5	0.085	0.218
	AGE5	>60	126	27.3	0.273	0.446
EDUCATION	EDU1	ELEMENTARY	70	15.2	0.152	0.359
	EDU2	SECONDARY	60	13.00	0.130	0.336
	EDU3	UNIVERSITY	121	26.2	0.262	0.440
	EDU4	MASTER/PHD	210	45.6	0.456	0.498
MARITAL STATUS	MAR1	UNMARRIED	187	40.6	0.406	0.491
	MAR2	MARRIED	245	53.1	0.531	0.499
	MAR3	OTHER	29	6.3	0.063	0.243
INCOME	INC1	0 - 6000€	60	13.0	0.130	0.246
	INC2	6001 - 12,000€	114	24.7	0.247	0.431
	INC3	12,001 - 20,000€	122	26.5	0.265	0.431
	INC4	20,001 - 30,000€	83	18.0	0.180	0.384
	INC5	>30,000€	82	17.8	0.178	0.230
OCCUPATION	OCCU1	STUDENT	36	8.1	0.081	0.268
	OCCU2	FREELANCERS	63	14.3	0.143	0.343
	OCCU3	PUBLIC SERVANTS	78	17.6	0.176	0.375
	OCCU4	EMPLOYEES	136	30.8	0.308	0.456
	OCCU5	PENSIONERS	129	29.2	0.292	0.449
ARE YOU UNEMPLOYED	UNEMP	UNEMPLOYED	19	4.1	0.041	0.199
PERSONS IN HOUSEHOLD	HOUSE1	1 PERSON	163	35.4	0.354	0.423
	HOUSE2	2 PERSONS	274	59.4	0.594	0.478
	HOUSE3	3 OR MORE PERSONS	24	5.2	0.052	0.271
UNDERAGE PERSONS IN HOUSEHOLD	UNDERA0	0 PERSON	262	56.8	0.568	0.478
	UNDERA1	1 PERSONS	19	4.1	0.041	0.026
	UNDERA2	2 OR MORE PERSONS	180	39.1	0.391	0.495
AREA	STAYC	CITY CENTER	91	19.7	0.197	0.381
	STAYN	NORTH	81	17.6	0.176	0.431
	STAYS	SOUTH	114	24.7	0.247	0.382
	STAYW	WEST	82	17.8	0.178	0.401
	STAYE	EAST	93	20.2	0.202	0.217
TOTAL AMOUNT SPEND ON HEALTH	SPENDH1	<200€	205	44.5	0.445	0.497
	SPENDH2	201 - 500€	145	31.5	0.315	0.471
	SPENDH3	>501€	111	24.0	0.240	0.431

Continued

AMOUNT SPEND ON DRUGS	SPENDD1	<200€	222	48.2	0.482	0.501
	SPENDD2	201 - 500€	130	28.2	0.282	0.451
	SPENDD3	>500€	109	23.6	0.236	0.421
SPENDING ON DRUGS IN COMPARISON TO PREVIOUS YEARS	SPENDCOMP1	LESS	87	18.9	0.188	0.391
	SPENDCOMP2	MORE	153	33.2	0.331	0.471
	SPENDCOMP3	THE SAME	221	47.9	0.479	0.500
DRUG PREFERENCE	GPI_1	GENERIC	60	13.0	0.130	0.336
	GPI_2	PROTOTYPE	230	49.9	0.498	0.500
	GPI_3	INDIFFERENT	171	37.1	0.371	0.483
CHECKING WHETHER DRUGS ARE GENERIC	CHECK	YES	220	47.7	0.477	0.500
ARE GENERIC DRUGS BETTER THAN PROTOTYPES?	BETTERN	NO	204	45.3	0.453	0.389
	BETTERS	SAME	246	54.7	0.547	0.499
	BETTERY	YES	0	0	0	0
BASED ON WHAT OF THE FOLLOWING DO YOU CHOOSE DRUGS?	CHOOSEPHYS	PHYSICIAN RECOMMENDATION/ INFORMATION	390	84.6	0.846	0.361
	CHOOSEPHAR	PHARMACIST	16	3.5	0.035	0.183
	CHOOSEINFOR	PERSONAL INFORMATION-PRICE	55	11.9	0.119	0.185
LIFESTYLE	LIFE1	WORK OUT AT LEAST 2 TIMES/WEEK	192	41.6	0.416	0.500
	LIFE2	SEDENTARY LIFE	238	51.6	0.516	0.499
	LIFE3	SMOKING	11	2.4	0.024	0.348
	LIFE4	DRINKING	20	4.3	0.043	0.261
DIET	DIETB	BALANCED	160	34.7	0.347	0.476
	DIETMED	MEDITERRANEAN	219	47.5	0.475	0.499
	DIETOTH	OTHER	82	17.8	0.178	0.163
CHRONIC DISEASES	DISNO	NONE	259	56.2	0.562	0.496
	DISHBLOOD	HIGH BLOOD PRESSURE	92	20.0	0.200	0.400
	DISDIAB	DIABETES	47	10.2	0.102	0.302
	DISCHOLEST	HIGH CHOLESTEROL	62	13.4	0.134	0.341
	DISHEART	HEART CONDITIONS	41	8.9	0.089	0.2849
	DISPROST	PROSTATE	20	4.3	0.043	0.203
	DISCANCER	CANCER	46	10.0	0.100	0.300
	DISMENTAL	MENTAL PROBLEMS	46	10.0	0.100	0.300
	DISTHYR	THYROID	21	4.6	0.046	0.208

personal interviews at the following points: Hospitals, Private doctors' practices, and Municipal Centers for the Elderly. In order to balance our sample in terms of participant age, 50.0% of the responses were collected online from an anonymous and random sample via the Google Forms application. Our final sample ended up with 461 participants. Since all responses (variables) are binary, we employed the Cochran Q test to investigate if independence is violated. The resulting Cochran Q test was highly significant and led us to reject the hypothesis that the responses differ across individuals.

The highest percentage of holders, standing at 50.3%, was females, while males accounted for 49.7% which is expected regarding the structure of the population (**Table 1**). Similarly, most of the results were expected while the educational background of the sample was quite strong, with most of the participants being post-graduate degree/doctorate-PhD holders (45.6%), which is not that expected while regarding their marital status, most of the users were married with children (53.1%). Consequently, the high quality of well-educated, well-informed consumer with children cannot promote the consumption of generic drugs that are less than the originals.

The amounts spent by households on health issues other than drugs, and amounts spent on drugs show that the majority of the patients (75.9%) spend on health up to 500€ per annum, while the corresponding annual amount spent on drugs reflects, at a rate of 76.4%, the argument expressed by consumers that they try to cut down on spending as much as possible, even on health, due to the economic crisis and their reduced income.

In terms of other qualitative and quantitative characteristics of the demand for drugs, as it is also illustrated, a high percentage of the sample (54.7%) believes that generic drugs are as good as prototype drugs. There are also some results with regard to the preference for prototype drugs answered 49.9% but only 13.0% prefer generics in contrary to the belief that generic are as good as prototype.

As expected, the most common disease was high blood pressure (20.0%).

4. Empirical Quantitative Analysis

Our dependent variable is non-metric. Each participant is classified according to whether he/she prefers *Generic* drugs, or *Prototypes* or is *Indifferent*. The three choices are distinct but have no inherent ordering. Hence, the appropriate model is a multinomial one. We used the Multinomial Logistic Regression to predict participants' preferences among choice alternatives. For obvious reasons, the choice *Indifferent* is selected as the reference choice, and the following two equations were estimated.

$$\ln\left(\frac{\hat{p}_1}{\hat{p}_3}\right) = \beta_{0,1} + \sum_{j=1}^k \beta_{j,1} X_j + u_1 \quad (1)$$

$$\ln\left(\frac{\hat{p}_2}{\hat{p}_3}\right) = \beta_{0,2} + \sum_{j=1}^k \beta_{j,2} X_j + u_2 \quad (2)$$

where p_1 is the probability of selecting *Generic* ($GPI_1 = 1$). p_2 is the probability of selecting *Prototype* ($GPI_2 = 1$). And p_3 is the probability of being *Indifferent* ($GPI_3 = 1$). The three alternatives are mutually exclusive, exhaustive and represent all possible choices. Therefore $p_1 + p_2 + p_3 = 1$ holds. β_{hj} , $h = 1, 2$ & $j = 0, 1, \dots, k$ are the unknown regression coefficients. And X_j , $j = 1, \dots, k$ are the k independent variables. The estimation of the unknown coefficients was then accomplished by maximum likelihood estimation.

In **Table 2**, the estimated coefficients are illustrated regarding the probability of preference for generic-prototype drugs, in terms of age, educational background, family income, area of residence, daily habits and lifestyle-diet, the presence of diseases, along with their corresponding statistical significance. **Table 2** reports the results of the Multinomial Logistic Regression model in two main columns for the corresponding two choices: *Generic* and *Prototype*. The likelihood ratio test (the appropriate goodness-of-fit statistic) is highly significant (less than the 1% level), and the percentage of correctly predicted cases is high (76.6%).

Table 2. Multinomial logistic regression model of the determinants of choosing generic or prototype drugs.

Variable	<i>Generic</i>			<i>Prototype</i>		
	Coefficient	St. Error	<i>p</i> -value	Coefficient	St. Error	<i>p</i> -value
Constant	-6.213	1.445	0.000 ***	-4.909	1.243	0.000 ***
AGE4	2.423	1.101	0.028 **	3.217	0.989	0.001 ***
AGE5	4.784	1.089	0.000 ***	3.853	1.021	0.000 ***
MAR2	1.715	0.567	0.003 ***	0.526	0.358	0.143
OCCU4	-1.445	0.720	0.045 **	0.326	0.346	0.346
STAYS	-0.930	0.604	0.124	-1.011	0.469	0.031 **
STAYW	1.802	0.586	0.002 ***	0.735	0.428	0.086 *
CHECK	2.180	0.507	0.000 ***	2.880	0.375	0.000 ***
BETTERS	1.188	0.598	0.047 **	2.096	0.354	0.000 ***
LIFE2	1.061	0.506	0.036 **	0.434	0.344	0.208
DIETOTH	1.305	0.629	0.038 **	0.716	0.439	0.103
DISNO	0.862	0.559	0.123	1.430	0.403	0.000 ***
DISHEART	1.879	1.186	0.114	1.911	1.115	0.087 *
SPENDCOMP1	-0.305	0.586	0.603	-0.877	0.418	0.036 **
Log-likelihood	-220.415					
Log-likelihood χ^2 (26) test	405.413					
<i>p</i> -value χ^2 (26) test	0.000***					
Number of cases correctly predicted	331 (76.6%)					

Note: ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.

Individuals aged 51 - 60 (AGE4) are more likely to choose the prototype over the indifferent at 3.21 with a positive effect on probability at a significance level of 1%, while for the generic compared to the indifferent at 2.42 with a positive effect on probability to use the prototype drugs at a significance level of 5.0%. Thus, individuals in this age group are more likely to consume generic drugs instead of prototype drugs.

Individuals aged 61 - 70 (AGE5) are more likely to choose the prototype over the indifferent at 3.85 with a positive effect on probability at a significance level of 1%, while for the generic compared to the indifferent at 4.78 with a positive effect on the probability to use prototype drugs at a significance level of 1%. Therefore, individuals in this age group are more likely to consume generic drugs instead of prototype drugs.

Married individuals (MAR2) are more likely to choose generic drugs over the indifferent at 1.71 with a positive effect on probability at a significance level of 1%. Thus, married individuals are more likely to consume generic drugs instead of prototype drugs.

Private sector employees (OCCU4) are less likely to choose generic drugs compared to the indifferent at -1.44 with a negative effect on the probability of using generic drugs at a significance level of 5%. Therefore, individuals in this occupation are less likely to consume generic drugs.

For residents in Western Athens (STAYW), there is a greater likelihood of choosing generic drugs over the indifferent at 1.8 with a positive effect on probability at a significance level of 1%, while for the prototype compared to the indifferent at 0.73 with a positive effect on the probability of using prototype drugs at a significance level of 10%. Thus, residents in these areas are more likely to consume generic drugs instead of prototype drugs.

For residents in Southern Athens (STAYS), there is a greater likelihood of choosing the prototype over the indifferent at 3.21 with a positive effect on the probability of using prototype drugs at a significance level of 1%. Thus, residents in these areas are more likely to consume prototype drugs.

For the variable examining whether drugs are generic or prototype (CHECK), there is a greater likelihood of choosing generic drugs over the indifferent at 2.18 with a positive effect on probability at a significance level of 1%, while for the prototype compared to the indifferent at 2.879 with a positive effect on the probability of using prototype drugs at a significance level of 1%. Thus, the sample equally considers whether drugs are generic or prototype drugs.

For the variable Sedentary lifestyle (LIFE2), there is a greater likelihood of choosing generic drugs over the indifferent at 1.06 with a positive effect on the probability of using prototype drugs at a significance level of 5%. Thus, the sample chooses drugs to be generic.

For the variable diet other (DIETOTH), there is a greater likelihood of choosing generic drugs over the indifferent at 1.30 with a positive effect on the probability of using prototype drugs at a significance level of 5%. Thus, the sample

chooses drugs to be generic.

For no illness (DISNO), there is a greater likelihood of choosing the prototype over the indifferent at 1.43 with a positive effect on the probability of using prototype drugs at a significance level of 1%. Thus, healthy individuals are more likely to consume prototype drugs.

For cardiovascular illness (DISHEART), there is a greater likelihood of choosing the prototype over the indifferent at 1.91 with a positive effect on the probability of using prototype drugs at a significance level of 10%. Thus, individuals with these conditions are more likely to consume prototype drugs.

For spending more on medications than before (SPENDCOMP1), there is a lower probability of choosing the prototype over the indifferent at -0.87 with a negative effect on the probability of using prototype drugs at a significance level of 5%. Thus, there is a decreased likelihood of the sample consuming prototype drugs.

5. Conclusion and Discussions

The empirical investigation of the issue that refers to the preference of consumer patients for drugs in correlation to the various factors that affect consumer behavior, such as demographics (age, gender, etc.), economic factors (income), social factors (e.g. family), as well as psychological factors (attitudes, views and opinions, etc.), show that these factors either largely encourage or prevent the use of generic pharmaceutical products, creating new opportunities in drug markets at the same time.

The demand for drugs within markets concurrently exhibits practices that align with a significant portion of the reviewed literature. Additionally, this study has unveiled several intriguing findings, presenting potential avenues for further research.

The pharmaceutical industry, especially in the field of drug manufacturing, has affected human life for many years now, contributing to human health, supporting national economy, and establishing and affecting key market areas on both a national and global level. The importance of this industry makes imperative the continuous development of its operations at any level, in line with global technological development and economic growth, always producing new and innovative products. Generic drugs have emerged as a key, constantly evolving drug industry over the last few years. Their special product features were combined with the efforts made by numerous researchers worldwide, in an attempt to evaluate the contribution of this pharmaceutical product to consumer behavior, getting results about the factors that determine consumption and usage frequency, and creating the profile of patient consumers. The aim of this research report, which was conducted by gathering data with the aid of an anonymous questionnaire and statistical and econometric data analysis, was to establish the profile of persons using drugs. At first, it should be reported that, demand by this sample did not seem to be extremely high. More precisely, it was demon-

strated that, in terms of the personal characteristics of the members of the sample, i.e. their gender, these persons were equal, as it is also the case in other surveys.

Variables such as a fairly strong educational background (Tertiary education graduates and postgraduate degree/doctorate-PhD holders), middle income, and retired/pensioner status, with an area of residence in north or east Athens, play a role, whereas the gender of the members of the sample did not seem to be able to affect the consumption of generic drugs. Furthermore, the majority of interviewees were either married with children or married without children. Interestingly, there doesn't appear to be a notable increase in the likelihood of using generic drugs with age. Income was again correlated to the use of generic drugs, where the higher the income, the lower the probability of consumption, due to the belief that they are inferior.

The sample does not have a high level of information about the use of generic drugs, which results in a negative opinion about them, entirely left to their doctor's recommendation.

In terms of the use and qualitative characteristics of smoking and patients with high blood pressure or prostate problems, due to the fact that they are not considered as serious diseases as heart conditions or cancer, combined with the view that generic drugs are inferior, is in line with the reason behind this choice.

This specific sample seemed to be affected by views, such as that the use of prototype drugs adds to the image or social status, whereas information that generic drugs are as good as prototype drugs did not seem to have any effect on usage, however, showing that there is a special relationship between them.

Generally speaking, the members of the sample tend to be unaware of the economic benefits from the overall use of generic drugs, which result both for themselves and public insurance funds. Findings indicate that the demand for generic drugs in this sample is not particularly high despite the fact that it contributes to social welfare and the national economy by saving resources. Considering that and based on the empirical analysis and literature approach followed in this study, it can be understood that, by informing patient consumers about usage and effects, spending on health and drugs could be streamlined. Thus, there is a need for further research to be conducted, in order to be able to establish the view held about the safety and quality of the products, and also determine to what extent awareness can affect their consumption. Beyond that, in addition to conducting an inquiry into the above factors and taking into account the current adverse economic climate, it would be strongly recommended to keep consumers constantly updated on this product, either through special seminars held at facilities for the elderly (medical practice/clinics, Open Care Centers for the Elderly (KAPI) run by Municipalities), or through advertisements and TV programs.

Finally, companies should carry out any required inspection and monitoring, and introduce strict standards to manufacturing their products, in order to pre-

vent any side effect that would result in giving the industry a bad name and cause consumers to avoid buying these products, derailing both the market and government budgets.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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