İŞLETME ARAŞTIRMALARI DERGİSİ
JOURNAL OF BUSINESS RESEARCH-TURK
2023, 15(3), 2386-2390
https://doi.org/10.20491/isarder.2023.1720

Determinants of Pharmaceutical Expenditure in OECD Countries: Evidence from Panel Data

Hasan BAĞCI [a]
[a]Bağımsız Araştırmacı, Ankara, Türkiye. hasanbagci@gmail.com

ARTICLE INFO

Keywords:
Pharmaceutical expenditures
Socioeconomic indicators
Panel data

Received 2 August 2023
Revised 15 September 2023
Accepted 20 September 2023

Article Classification:
Research Article

ABSTRACT

Purpose – The objective of this study is to identify the main factors affecting pharmaceutical expenditures in the Organization for Economic Cooperation and Development (OECD) countries.

Design/methodology/approach – In this study, it was investigated whether the university graduate rate (UNI), the unemployment rate (UNEMP), gross domestic product per capita (GDP) in Purchasing Power Parity (PPP $), and the number of physicians per 1,000 people (PHY) affected per capita pharmaceutical expenditures (PHAR) (PPP $) by using panel data analysis. The population of the study was 33 OECD countries whose data were available. The data consisted of the time period of 2013-2016.

Results – GDP and UNI statistically significantly increased PHAR ($p<0.05$). The UNEMP and PHY also increased PHAR, but the effects of these variables were not found to be statistically significant ($p>0.05$). The variables included in the model explained 22% of the variance in PHAR.

Conclusion – PHAR are affected by economic factors and sociodemographic factors as well as health systems' structure. Therefore, governments wishing to control pharmaceutical expenditures should also focus on these variables.

1. Introduction

In recent years, significant progress has been made on human health in the OECD countries, with a four-year increment of average life expectancy at birth in the OECD since 2000 (Stat, 2021). The possibility of getting caught in chronic diseases and health problems in later stages of life rises as the average life span of a person increases. Innovative medicines, vaccines and treatments that help prevent, cure and treat some of the leading causes of life-threatening diseases will become more important (European Comission, 2020). OECD countries populations will continue to rely heavily on the governments' healthcare budget given the high burden on socially significant diseases, namely cardiovascular diseases, diabetes, and cancer. The rapidly growing burden of disease on countries, exacerbated by its fast-growing and ageing population, will drive a sustained increase in demand for medicines.

The pharmaceutical industry is also a sector where research and development activities are intense, which is affected by both technological developments and the changing demographic and socioeconomic structure. The pharmaceutical industry is one of the costliest industries for R&D. In addition to these high costs, it is risky and time-consuming (OECD, 2018). Many of the drugs that have been approved in recent years are biologics, which are costly to develop, hard to imitate, and frequently have high prices.

Pharmaceuticals include a long chain of processes from the discovery of novel drugs, the average time it takes to develop a new medicine is 10 to 15 years. The governments acquire to regulate licensing and safety issues, the marketing process, and the provider/consumer behavior (Mousnad, Shafie, & Ibrahim, 2014). However, pharmaceutical companies ensure successful market access, and also need to demonstrate the product's value during pricing and reimbursement negotiations.

PHAR usually include prescription medicines and self-medication (called over-the-counter products). Pharmaceuticals consumed in hospitals and other health institutions are excluded (OECD, 2021). In OECD countries, The ratio of health and PHAR in GDP is included as an indicator. Pharmaceutical spending as a percentage of GDP indicates how much of a country's overall income goes to the pharmaceutical industry.

Suggested Citation
Bağcı, H. (2023). Determinants of Pharmaceutical Expenditure in OECD Countries: Evidence from Panel Data, *Journal of Business Research-Turk*, 15 (3), 2386-2390.

PHAR accounted for 1.6% of GDP on Average in OECD countries, and it represented 15.1% of overall health care expenditure (Stat, 2021). PHAR are the third largest component of health expenditures, following inpatient and outpatient care spending. Retail pharmaceutical spending across OECD countries has tended to increase again in recent years (OECD, 2021). The empirical knowledge on the determinants of out-of-pocket pharmaceutical expenditures (OOPPE) is limited (Sanwald & Theurl, 2017).

Funding from government compulsory insurance schemes plays the most important role in reimbursing medicines across OECD countries (OECD, 2021). Total drug expenditure is a function of demand-side (demographic factors, ageing and prevalence) and the supply side (entry of new drugs, patent expiries), and effective policies must try to control both (OECD, 2019). Various pharmaceutical policies targeting the pharmaceutical industry, wholesalers, pharmacists, patients, and physicians have been enforced in almost all OECD countries to curb the rise in pharmaceutical spending (Ess, Schneeweiss, & Szucs, 2003).

Many studies have identified several factors responsible for the increase in PHAR and have assessed several cost-containment strategies. Different approaches such as the need to control drug expenditures, whether or not to control drug demand, the relative priorities such as promoting drug research and development, employment, positive foreign trade balance) between health policy and industrial policy, reflect the different national policy priorities (Kanavos, Vandoros, Irwin, Nicod, & Casson, 2011).

Physicians, who are very important actors in determining the type and amount of medicine to be used in the diagnosis and treatment of the disease, were included among the determinants of PHAR. Information asymmetry exists in the pharmaceutical sector due to patients' lack of knowledge about the products' attributes and the fact that doctors are the final decision-makers on which prescription drug to use. Today, especially with the rapid development in information technologies, patients have gained more knowledge about both diseases and treatment methods. The information asymmetry range narrowed in favor of the patients as education levels increased.

In this study, which analyzes the determinants of the increase in PHAR in OECD countries between 2012 and 2016, the effects of income measured as GDP, PHY, education level and UNEMP on PHAR were investigated.

2. Methods

2.1.Variables

In this study, it was investigated whether UNI, UNEMP, GDP, PHY affected PHAR in the OECD countries. To determine which variables should be employed as the independent variables of this study the relevant literature was reviewed, and it was discovered that the independent variables stated above are among the key determinants of PHAR. Di Matteo (2005), Cantarero and Lago-Peñas (2010) and Furuoka et al.(2011) revealed the effect of GDP on health expenditure (Cantarero & Lago-Penas, 2010; Di Matteo, 2005; Furuoka, Lim, Kok, Hoque, & Munir, 2011). Rahman (2008) and Hatam et al. (2016) found thateducational factors significantly affected health expenditure (Hatam, Tourani, Rad, & Bastani, 2016; Rahman, 2008). Magazzino and Mele (2012) and Reich et al.(2012) expressed that UNEMP was among the crucial determinants of health expenditure (Magazzino & Mele, 2012; Reich, Weins, Schusterschitz, & Thöni, 2012). These indicators affect health expenditures, which means that they can also affect PHAR, therefore, these were included in the analysis. Additionally, considering that PHY could be an important determinant of PHAR, PHY was also used among the independent variables.

2.2. Data and Analysis

The population of the study was 33 OECD countries whose data were available. Chile, New Zealand, and Turkey were excluded from the analysis because data for the years covered by the study could not be obtained. The remaining 33 OECD countries were included in the study. The 2013-2016 time period data were obtained from the OECD (2020) Health Data.

In the current study, panel data was employed, and the natural logarithms of the variables were calculated, to make sure that the data complied with the assumption of normality distribution. Taking the natural logarithms of the variables also enabled the analysis to avoid the heteroscedasticity problem. The Hausman Test was used

to determine which model (fixed or random effects) was appropriate.The confidence level of the study was 95%. Since the F limer test p value is less than 0.05, it was decided to be suitable for panel data analysis.

3. Findings

The descriptive statistics were obtained as the first step in the study, and they are presented in Table 1. The values for mean, median, maximum, minimum, standard deviation, and the number of observations can be seen in Table 1. Accordingly, PHAR was 520.45±146.11, GDP was 41,793.73±15,654.24, UNEMP 8.33±4.94, PHY was 3.45±9.61, and UNI was 35.53±9.61 respectively.

Table 1. Descriptive statistics

	PHAR	**GDP**	**UNEMP**	**PHY**	**UNI**
Mean	520.45	41793.73	8.33	3.45	35.53
Median	501.40	40635.90	6.97	3.34	36.90
Maximum	994.41	104822.0	27.47	6.59	56.30
Minimum	246.45	17476.50	2.97	2.16	16.00
Standard Deviation	146.11	15654.24	4.94	0.88	9.61
Observations	132	132	132	132	132

The correlation between independent variables was also explored to avoid the multicollinearity problem. It can be seen that the correlation between the independent variables ranges -0,332 and 0.579, which means that there is no multicollinearity problem in the study model.

Table 2. Correlation Between the Independent Variables

	LnGDP	LnUNEMP	LnUNI	LnPHY
LnGDP	1			
LnUNEMP	-0.332	1		
LnUNI	0.579	-0.324	1	
LnPHY	0.076	0.369	-0.194	1

Random effects model was selected according to the Hausman Test (Panel EGLS (Cross-section random effects)) ($p>0.05$). The normality of the model was tested with the Jarque-Bera Test, and the test revealed that the residuals of the model were normally distributed ($p>0.05$). The study model was found to be statistically significant ($p<0.05$). It can be seen in Table 3 that GDP and UNI increase PHAR statistically significantly. UNEMP and PHY also increased the PHAR, but the effects of these variables were not found to be statistically significant (Table 3). The variables included in the model explained 22% of the variance in the PHAR according to the adjusted R-squared of the model.

Table 3. Panel EGLS Results

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LnGDP	**0.268774**	**0.112637**	**2.386199**	**0.0185**
LnUNEMP	0.029765	0.045162	0.659070	0.5111
LnPHY	0.141346	0.154304	0.916025	0.3614
LnUNI	**0.344491**	**0.126801**	**2.716792**	**0.0075**
C	1.941409	1.107792	1.752504	0.0822
	Effects Specification			
			S.D.	**Rho**
Cross-section random			0.272072	0.9702
Idiosyncratic random			0.047642	0.0298
	Weighted Statistics			
R-squared	0.250319	F-statistic		10.35090
Adjusted R-squared	0.226135	Prob(F-statistic)		0.000000
Standard Error of regression	0.048090	Durbin-Watson stat		1.085578

4. Discussion And Conclusion

PHAR are affected by health systems' structure, economic factors (GDP, UNEMP), and sociodemographic factors (education, population, and age). Therefore, this study aimed at explaining the inside and outside factors of health systems that affected PHAR in the OECD countries.

In the analysis of this study, it was found that GDP had a statistically significant and positive effect on PHAR ($p<0.05$). Shaikh and Gandjour (2019) found that GDP has a strong positive impact on pharmaceutical spending (Shaikh & Gandjour, 2019). Blazquez et al. (2016) also found that economic cycles -economic expansions and contractions- affect PHAR (Blazquez-Fernández, Cantarero-Prieto, & Pascual-Saez, 2016). GDP is an important indicator for income, and income is an essential determinant of health expenditures generally, PHAR specifically. Hence, governments should adopt some social policies to eliminate the inequities in access to pharmaceutical products, which are important for improving health status. Reducing the out-of-pocket expenditures of low-income groups for pharmaceutical products may be a vital policy implementation in this regard. In this context, it is recommended to make legal arrangements to reduce the contributions/user fees/charges paid by this group.

Another finding of this study was that PHAR were affected significantly and positively by educational level (UNI) and ($p<0.05$). However, some studies show the opposite of this finding. Sisto and Zanola (2005) found that education level negatively and significantly affected public PHAR (Sisto & Zanola, 2005). Although education level is an important determinant of health expenditures, there may be a negative relationship between education level and health expenditure, and also PHAR in some cases. Socioeconomic status revealed contrasting utilization patterns: while higher-educated individuals are more likely to consume non-prescribed medicines, the less educated are more likely to take prescribed medicines. As prescribed medicines require more expenditure, PHAR for less educated people may be more than PHAR for people with higher education. In an additional analysis, lower socioeconomic groups were more likely to report prescription purposes as the main reason for consulting a practitioner (Mayer & Österle, 2015). Despite these studies, it was discovered that PHAR increased as education level increased, which may result from the fact that income increased as education level climbed.

UNEMP and PHY were shown to increase PHAR, however the effect was not statistically significant ($p>0.05$). Individuals losing their jobs tend to have more psychological problems. In addition, these individuals are more prone to encounter some physical problems due to inactivity. Due to these reasons, the increase in UNEMP may have increased PHAR. The number of physicians per specific population is an important indicator of accessibility to physicians and increasing access to physicians leads to increased use of prescribed pharmaceuticals. Therefore, it is an expected result that the increase in PHY increases PHAR.

The present study has some limitations, it was carried out only with data from OECD countries for the period 2013-2016. It is recommended for future studies to include a more comprehensive time period and to reveal the determinants of drug expenditures in different country groups than OECD countries. Additionally, it should be explored whether drug expenditures improve health status.

References

Blazquez-Fernández, C., Cantarero-Prieto, D., & Pascual-Saez, M. (2016). Is pharmaceutical expenditure related to the business cycles? *Applied Economics Letters, 23*(10), 705-707.

Cantarero, D., & Lago-Penas, S. (2010). The determinants of health care expenditure: a reexamination. *Applied Economics Letters, 17*(7), 723-726.

Di Matteo, L. (2005). The macro determinants of health expenditure in the United States and Canada: assessing the impact of income, age distribution and time. *Health policy, 71*(1), 23-42.

Ess, S. M., Schneeweiss, S., & Szucs, T. D. (2003). European healthcare policies for controlling drug expenditure. *Pharmacoeconomics, 21*, 89-103.

European Comission. (2020). Pharmaceutical Strategy for Europe 2020. https://ec.europa.eu/health/sites/default/files/human-use/docs/pharma-strategy_report_en.pdf.

Furuoka, F., Lim, B. F. Y., Kok, E., Hoque, M. Z., & Munir, Q. (2011). What are the determinants of health care expenditure? Empirical results from Asian countries. *Sunway Academic Journal, 8*, 12-25.

Hatam, N., Tourani, S., Rad, E. H., & Bastani, P. (2016). Estimating the relationship between economic growth and health expenditures in ECO countries using panel cointegration approach. *Acta Medica Iranica, 54*(2), 102-106.

Kanavos, P., Vandoros, S., Irwin, R., Nicod, E., & Casson, M. (2011). Differences in costs of and access to pharmaceutical products in the EU.

Magazzino, C., & Mele, M. (2012). The determinants of health expenditure in Italian regions. *Magazzino, C., Mele, M.,(2012), The Determinants of Health Expenditure in Italian Regions, International Journal of Economics and Finance*, *4*(3), 61-72.

Mayer, S., & Österle, A. (2015). Socioeconomic determinants of prescribed and non-prescribed medicine consumption in Austria. *The European Journal of Public Health*, *25*(4), 597-603.

Mousnad, M. A., Shafie, A. A., & Ibrahim, M. I. (2014). Systematic review of factors affecting pharmaceutical expenditures. *Health policy*, *116*(2-3), 137-146.

OECD. (2018). Pharmaceutical Innovation and Access to Medicines. https://read.oecd-ilibrary.org/social-issues-migration-health/pharmaceutical-innovation-and-access-to-medicines_9789264307391-en#page9789264307380.

OECD. (2019). Improving Forecasting of Pharmaceutical Spending - Insights from 23 OECD and EU Countries Analytical Report. https://www.oecd.org/health/health-systems/Improving-Forecasting-of-Pharmaceutical-Spending-Report.pdf.

OECD. (2021). *Health at a Glance 2021*.

Rahman, T. (2008). Determinants of public health expenditure: some evidence from Indian states. *Applied Economics Letters*, *15*(11), 853-857.

Reich, O., Weins, C., Schusterschitz, C., & Thöni, M. (2012). Exploring the disparities of regional health care expenditures in Switzerland: some empirical evidence. *The European Journal of Health Economics, 13*, 193-202.

Sanwald, A., & Theurl, E. (2017). Out-of-pocket expenditures for pharmaceuticals: lessons from the Austrian household budget survey. *The European Journal of Health Economics, 18*, 435-447.

Shaikh, M., & Gandjour, A. (2019). Pharmaceutical expenditure and gross domestic product: Evidence of simultaneous effects using a two-step instrumental variables strategy. *Health economics*, *28*(1), 101-122.

Sisto, A., & Zanola, R. (2005). The determinants of public pharmaceutical expenditures: Does Italian health federalism impact on them? *Available at SSRN 869762*.

Stat, O. (2021). OECD Health Statistics 2021 https://stats.oecd.org/Index.aspx?ThemeTreeId=9