Effects of Social Health Insurance on Out-of-pocket Payments: A Panel Study from OECD Countries

Fariha Kadir[1]
Muhammad Ihsan- Ul- Kabir[2]

Abstract

Social health insurance safeguards people against health as well as financial burdens and is a potential method of financing health care. It has a prospective contribution in obtaining universal health coverage (UHC) in the coming years. It is evidenced that introduction of social health insurance results in reduced employment in the economy and increased out-of-pocket healthcare costs in a particular country but its broader value remains unknown. This paper aims to estimate the role of social health insurance on out-of-pocket payments in OECD countries. Using 62 years of panel data for 33 OECD countries, we have assessed the Random Effect, Fixed Effect, and Pooled OLS estimates. It has been found that social health insurance has a very small, but negative effect on out-of-pocket payments. Although these results are encouraging, it is suggested that financing healthcare through social health insurance should be accompanied by proper regulation along with other means of healthcare financing mechanisms.

Keywords: Social Health Insurance, Out-of-pocket Payments, GDP, OECD countries, RE model, FE model

1. Introduction

Social health insurance (SHI) is a potential mechanism for financing healthcare services. In this particular system, employers and their employees including the self-employed workers contribute to cover a package of health services attainable for the beneficiaries. Generally, both the employers and employees make contributions by law and governments, in some cases, subsidizes these systems to safeguard their economic viability. SHI system depends on the combination of characteristics to achieve the level of viability and sustainability.

[1] Lecturer, Institute of Health Economics, University of Dhaka, E-mail: fariha.ihe@gmail.com
[2] Research Associate, Institute of Health Economics, University of Dhaka, E-mail: ihsan.khabir.ihe@gmail.com

When it comes to funds, SHI revenues exhibit less annual variation than any other type of spending on health (Nonneman & Van-Doorslaer, 1994). However, SHI systems are susceptible to the economic downturn and can be susceptible to both downtrends and upsurges. Besides, incorporating the informal sector is a critical task in this system. Since the number of non-poor informal workers in the population is expediting, their inclusion in the conventional health coverage can be a major concerning issue in the future.

To set priority and formulate a plan for achieving the ultimate goal of healthcare financing, it is essential to assess whether SHI is suitable. By exploring its essential features, especially the effect on healthcare expenditures, countries with a significant proportion of formal workers may consider the implementation or expansion of SHI schemes.

In this study, we use a panel data model of 33 OECD countries for the years 1955-2017 to investigate whether the inclusion of SHI may lead to an effect on out-of-pocket expenditures. This paper estimates the association between OOP payments of healthcare costs and the inclusion of SHI in the economy of OECD countries.

2. Related Literature

Evidence suggests that any correspondence between OOP payments and social health insurance could be identified in developed countries rather than in developing countries due to the existence of large informal sector and financial constraints.

Nikolaos, Christos, Haritini, & Vangelos (2014) revealed that the out-of-pocket (OOP) expenditures is correlated with SHI funding in the case where SHI funding is inadequate to cover private inpatient costs in Greece. Wagstaff & Lindelow (2008) conducted a study for social health insurance in China and identified some distortions. Among which the existence of high co-insurance rates, the physicians' supplementary fees, demand inducement from public health facilities and the excessive-high prices charged by private hospitals affect the insured by resulting in a significant amount of OOP spending. However, Wang, Li, Chen, & Si (2018) observed that middle-aged and elderly adults who do not have social health insurance, underutilized healthcare services. Wagstaff & Rodrigo Moreno-Serra (2007), using the annual data from 1990 to 2004 for the 28 ECA countries, added that national health spending and hospital activity rates increased by adapting social health insurance. In addition, Wagstaff (2009) indicated that social health insurance increased per capita health spending by 3 to 4 percent but reduced the formal employment by 8 to10 percent. Reconsidering these results, Wagestaff (2007) concluded that in a particular context, social health insurance sometimes provides workers an incentive to leave formal sector employment. Sasaki, Izawa, & Okada (2015) estimated OOP spending was on average 2.9% of total household consumption for thirty four OECD countries. By conducting a social health

insurance system, Japan limits OOP spending less than 15% as a share of total health expenditure. On the other hand, Sanwald & Theurl (2017) suggested that a number of household characteristics including the structure of household, age, income, physician visits, and literacy have strong effects on the OOP expenditure whereas the effects of health insurance were not substantial in that study.

Ensor (1999) analyzed the determinants of feasibility of SHI by using an index of four indicators (Figure 1).

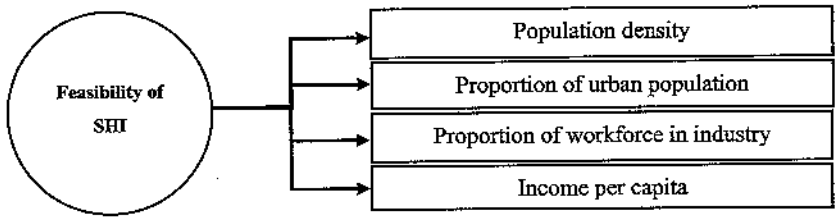

Figure 1: Structural characteristics in determining the feasibility of SHI [Reconstructed from Ensor (1999)]

It was observed that the possibility and contribution of SHI are extensively relied on the concentration of the people, proportion of urban inhabitants, share of the working population, and per capita GDP. These indicators contributed to the determination of variables to be assessed in this study.

While the impacts of SHI systems remain inconclusive for developed countries, it is rarely explored in terms of affecting the OOP payments in healthcare. Drawbacks with previous studies are both their reliance on relatively small size samples and using relatively less suitable econometric modeling with the available data sets. The current study has overcome those limitations by adopting a simple regression model. A major contribution of the present paper is the identification of any effective relationship between these two so that SHI could contribute more elsewhere to achieving universal health coverage in the future, especially for the context of developing countries.

3. Data and Estimation Method

3.1 Data

Based on the indicators used in Ensor (1999) (Figure 1), we have considered the following variables for our analysis: OOP (as % of total healthcare expenditure), SHI coverage (% of the population), unemployment per 100,000 population, GDP per capita, life expectancy at birth. We used annual data of 33 of the Organization for Economic Co-operation and Development (OECD) countries covering a period of 1955-2017. Some countries are excluded which rely largely on private insurance and tax-based system. We have collected the secondary data from OECD statistics and World Development Indicator Data by World Bank.

3.2 Estimation Method

We have employed a simple regression model to estimate the effect of SHI on OOP in OECD countries. The model takes the following form:

$$y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + u_{it} \quad \ldots \quad \ldots \quad \ldots (1)$$

Where,

$$u_{it} = n_i + v_t + e_{it}$$

Here, y_{it} is OOP expenditures as share of current healthcare costs (%) in country i at time t; X_{1i} is SHI coverage as percentage of total population; X_{2i} is life expectancy at birth in years; X_{3i} gross domestic product (GDP) per capita in current USD; X_{4i} is number of unemployed persons in per 100,000 population; u_{it} is disturbance term; n_i is unobservable country-specific effect; v_t is time-specific effect; e_{it} is error term. Notably, all expenses that are charged directly to the health care users are categorized as direct payments, formal costs and informal payments and is known as OOP payment (Mossialos & Thomson, 2002). On another note, SHI is an arrangement for funding and dealing healthcare expenditures based on risk pooling.

This empirical investigation technique consists of the following steps:

I. Unit Root Test (Stationarity Test)
II. Hausman Model Specification Test
III. Panel Regression Model Estimation
IV. Pesaran's Cross-sectional Dependence (CD) test

The variables are tested for stationarity to check the data is stable even with the effect of shock with Augmented Dickey-Fuller (ADF) unit root test (Fisher-type) considering both with intercept and without intercept. If one or more variables are non-stationary at the level form; the next step is to differentiate the variables once to perform stationary tests on differenced variables. Table A1 in the appendix shows that all variables were stationary at level form with the specification that has intercept except GDP per capita and the number of unemployed. These two variables became stationary after the first differencing. Our basic model now becomes:

$$yit = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 \Delta X_{3it} + \beta_4 \Delta X_{4it} + u_{it} \quad \ldots \quad \ldots \quad \ldots (2)$$

3.3 Limitations of the Study

The pitfall in addressing time-variant and unobserved heterogeneity correlated with social health insurance was one of the specific limitations that our study encountered. There might be problems in study designing and data collection due to transition to and from the SHI mechanism. Distortion of measurement

errors and selectivity problems may arise as we considered only developed country settings. Other than these there is cross-sectional independence which indicates there are no serial correlations among the error terms. Further research could concentrate on the limitations stated above to specify the relationship.

4. Findings

4.1 Descriptive Studies

From Table 1, we can see that the average OOP is 26.55% share of current expenditure on health among the OECD countries with a lowest rate of 1.7% and highest 89.3%. The average inclusion of social health insurance of the countries being considered is 94% where the highest percentage is 100% and the lowest rate is 14.5%.

Table 01: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Out-of-pocket payments (% of current expenditure on health)	1,064	26.56	12.68	1.7	89.3
Coverage of Social Health Insurance (% of total population)	1,064	94.15	14.76	14.5	100
Unemployment, total (per 100,000 population)	1,064	910.40	1,443.09	0	14,825
GDP per capita (current USD)	1,064	22,965	17,476	1,051	103,059
Life expectancy at birth (years)	1,064	76.75	3.70	58.02	83.79

The number of unemployed persons was on an average 910 per hundred thousand population. On average, GDP per capita is 22,965 in current USD. The average life expectancy rate is 77 years which has a lowest of 58 years and the highest is 84 years.

4.2 Test for Stationarity (Unit Root Test)

The null hypothesis states the presence of a unit root and alternative is trend stationary. According to the values of the test, we may reject the null for all the covariates except GDP per capita and unemployment (see appendix Table A1). These two are stationary at first difference which means the data considered is stable when lag one period.

4.3 Hausman Model Specification Test

Hausman specification test implies the comparison of two different estimators of a panel data regression model. Apparently, it identifies; under the null hypothesis, both estimators' consistency and efficiency in the model whilst under the alternative hypothesis the estimators show inconsistency. Particularly, random effects estimators and fixed effect estimators are consistent and efficient showing that the model is correctly specified. On that premise, the regressors are invariant of the individual-specification. In this present study, we found that probability > chi^2 is not less than 0.05 so we cannot reject H_o, therefore the model should be Random Effect model (see appendix Table A2). The variance between the random effects estimators and the fixed effects estimators will thus be small. However, we have constructed both the RE and FE estimates in this case.

4.4 Panel Regression Model Estimation

Estimated results with panel data models have been reported in Table 2.

Table 2: Panel models with OOP as the dependent variable

OOP payments (% Share of current health expenditure)	RE Model Coefficient (Std. error)	FE Model Coefficient (Std. error)	Pooled OLS Coefficient (Std. error)
SHI coverage	-0.438*** (.021)	-0.436*** (0.021)	-0.495*** (0.023)
Life Expectancy at birth	-0.152*** (0.058)	-0.156*** (0.059)	-0.189** (0.091)
Change in unemployment	-0.001* (0.001)	-0.001* (0.001)	-0.002 (0.001)
Change in GDP per capita	0.00006 (0.00005)	0.00006 (0.00005)	-0.00003* (0.00011)
Constant	80.545*** (4.250)	79.545*** (3.928)	87.757*** (6.498)
Number of observations	1,064	1,064	1,064

*Significance level at 1%, 5% and 10 % as ***, ** and * respectively*

Estimation shows that a one percentage unit increase in SHI coverage decreases OOP by, on an average, 0.438 if the model is RE model and 0.436 for the FE model. Consequently, it is 0.495 in Pooled OLS model. All these effects were significant at 1% for all models. This significant negative relationship between OOP expenditures and participation in SHI shows compliance with Nikolaos et al (2014) which might be a result of unresolved different circumstances. Life

expectancy in years has a negative impact on OOP which is on average, 0.15 if the assumed model is RE model. It possibly explains the situation of a healthier nation with higher life expectancies induce a reduction in OOP. But for FE and Pooled OLS model, these are not significant at the 1% level. If unemployment increases by one percentage point unit per 100,000 population, it results in a 0.0012 percentage reduction in OOP which shows the elasticity between change in unemployment and OOP. This happens maybe owing to the fact that financial constraints due to unemployment might cause underutilization of expensive healthcare services. One unit change in the difference between GDP per capita results in increased OOP by 0.001 (in Current USD). It is a very small amount and does not have any significant influence on the outcome also.

This paper assesses the effect of SHI on OOP in OECD countries. From the analysis, it is evident that there is a negative and significant relation between OOP and SHI. But unemployment and GDP per capita do not have any significant effect but these confirm their effect on OOP through expected signs.

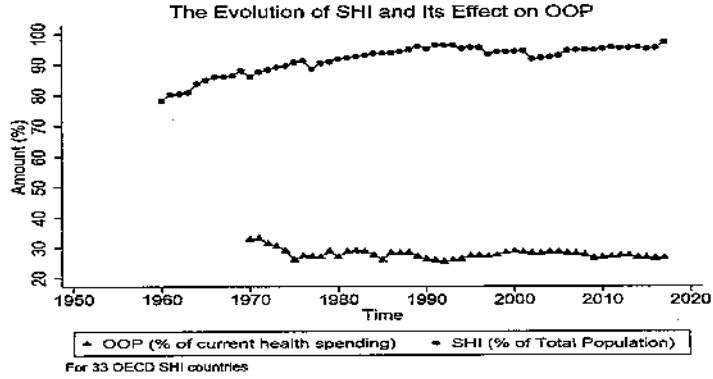

Figure 2: Evolution of SHI and its effect on OOP

Figure 2 shows the inclusion of SHI has evolved on average for 33 countries from the years 1955-2017. Through the years, while the percentage of participation in SHI increased, it slightly affects the OOP share of health spending by reducing it. OOP achieves a secure condition when SHI is stable.

4.5 Pearson's Correlation Matrix

Pearson Correlation matrix is one of the techniques to detect multicollinearity. The correlation between the covariates and correlation among the variables do not exceed 0.60 in any cases so that we can say that multicollinearity problem may not exist in this model (see appendix Table A3).

4.6 Pesaran's Cross-Sectional Dependence (CD) Test

Pesaran CD (cross-sectional dependence) is conducted to avoid Contemporaneous Correlation (bias in the test results) which examines whether the residuals are correlated across individuals. Under this test, the null hypothesis possesses that residuals are uncorrelated which means there is no serial correlation. Meanwhile, we can assume that the presence of unobserved common factors and therefore perceived through the disturbance term causes cross-sectional dependence. But these are not correlated with the regressors of this paper. Hence, the standard FE and RE estimators are consistent though not efficient.

Pesaran's test of cross sectional independence = 1.553, Prob = 0.1204 (prob>0.05)

The average absolute value of the off-diagonal elements = 0.469
Therefore, we may not reject the null hypothesis and accept that this model has no serial correlation.

5. Discussion

According to OECD (2015), the main source of funding tends to be OOP payments after public financing. On average 19% of health spending was directly financed by the households in 2013. Mexico, Korea, Chile, and Greece had share of OOP payments over 30% for and 10% or lower in France and the United Kingdom. OOP spending has been increasing since 2009, although at a sluggish rate.
Sasaki, Izawa, & Okada (2015) compares health insurance systems of OECD countries and Japan's SHI and found that the share of OOP as a share of total health expenditure in Japan is less than 15%, which indicates less burden on patients.

Our study differs from Sanwald & Theurl (2017), conducted in Austria, and found that OOP expenditures have no substantial effects on public health insurance and the presence of private health insurance, possibly due to different study settings. It also contrasts with the findings of Wang, Li, Chen, & Si (2018) concluding that the rapid expansion of SHI coverage has improved the utilization of healthcare significantly among Chinese middle-aged and elderly but indicated a significant positive correlation between SHI schemes and OOP healthcare costs. The reason behind this difference could be the developing status of China and OECD countries, where most OECD countries are developed.

In case of hospitalization in private establishments, in Greece, SHI does not sufficiently protect its people against financial hardship resulting from a high percentage (52.68%) of OOP payment (Xu, et al., 2003) which is consistent with Nikolaos, Christos, Haritini, & Vangelos (2014) based on a cross-sectional survey in 2013 in Greece. However, our study was conducted on all

OECD SHI countries whereas Greece suffers from subsequent recession and economic crisis in recent years.

It was evidenced that implementation of SHI largely relies on socio-economic development, advancement of financial sector, and employment status, especially a large formal employment (WHO, 2003). It is consistent with our study setting where most developed countries adopt the SHI mechanism and enjoy the benefits in terms of healthcare spending.

Wagstaff (2007) provided a study where SHI disincentives people to affix and stay in formal employment, SHI may thus not raise unemployment, in our results we estimate that rising unemployment may reduce OOP and it would end in underutilization. As stated by Wagstaff & Moreno-Serra (2007), SHI systems typically struggle to hide the informal sector and also the poor. However, our study may help to constitute a shred of evidence using OECD data of SHI countries and their subsequent OOP in healthcare spending.

Some argue that SHI induces higher spending on health care. According to them, the people are more willing to contribute to SHI than paying taxes as the SHI contributions are earmarked for health services. On the contrary, some argue that SHI systems are more efficient at converting money into health by allowing a separation between provision and purchasing of healthcare. Our estimates suggest that adoption of SHI intrinsically decreased OOP as a share of current expenditure on health, however, the matter may not be resolved and require further relevant information. We also obtain some evidence about other indicators that affect OOP such as increased life expectancy reduced OOP. This evidence supports the progress of OOP in countries that favored SHI and decelerates by the change in the number of unemployment which was expected as income levels are driven down in that circumstances.

6. Conclusion

In absence of a standard definition of SHI, it can generally be apparent as a financial protection mechanism for healthcare through sharing health risks and pooling fund for a large population group. It can also be assumed as a component of a broader social security framework, covering all incidents which require financial protection and risk-sharing. While prioritizing and developing an idea for achieving the desired objectives, it is essential to assess whether SHI is indeed the paramount option and how the specified outcomes can be achieved. Implementing SHI could be a major undertaking requiring sustained support from the government, other important stakeholders and interest groups within the society. Probably these are lacking in terms of setting SHI in developing countries. Meanwhile, SHI is believed to increase

financial risk protection to more people or provide greater protection to insured ones, as an example, replacing OOP spending with some form of prepayment, switching from private health insurance to SHI, at least for some basic health services. This can allow more people to access required services without any financial hardship and thus gradually move closer to universal health coverage.

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Conflict of Interest

The authors have no financial arrangements that might give rise to conflicts of interest in the research reported in this paper.

APPENDIX

Table A1: Augmented Dickey-Fuller Unit root test

Variables		With intercept		Without intercept	
		Levels	1st diff	Levels	1st diff
OOP of healthcare costs	Inverse chi-squared	249.6929***		121.4181***	
	Inverse normal	-10.4444***		-2.6409***	
	Inverse logit	-11.5265***		-3.3750***	
	Modified inv. chi-squared	15.5800***		4.5806***	
GDP per capita	Inverse chi-squared	57.7652	959.2125***	5.6084	908.4539***
	Inverse normal	0.5845	-27.6949***	9.3522	-26.5867***
	Inverse logit	1.0978	-45.4792***	9.6605	-43.0714***
	Modified inv. chi-squared	-0.8776	76.4208***	-5.3500	72.0683***
Life expectancy at birth	Inverse chi-squared	280.4975***		253.5835***	
	Inverse normal	-3.7947***		3.227	
	Inverse logit	-9.4343***		2.3964***	
	Modified inv. chi-squared	18.2215***		15.9137***	

SHI of total population	Inverse chi-squared	303.4063***	240.7790***	
	Inverse normal	-10.6830***	-4.6167***	
	Inverse logit	-15.4309***	9.3589***	
	Modified inv. chi-squared	23.9991***	14.8157***	
Number of unemployed	Inverse chi-squared	156.6154***	45.4336	604.9755***
	Inverse normal	-6.8557***	2.0461	-20.2006***
	Inverse logit	-6.8613***	1.9695	29.0700***
	Modified inv. chi-squared	7.8871***	-1.7901	46.9118***

*Significance level at 1%, 5% and 10 % as ***, ** and * respectively*

Table A2: Hausman Model Specification Test

	(b) Fixed	(B) Random	(b-B) Difference	sqrt (diag(V_b-V_B)) S.E.
SHI of total population	-0.4362094	-0.4383613	0.002152	0.0038926
Life expectancy at birth	-0.1557651	-0.152028	-0.003737	0.0069656
Change in unemployment	-0.0011603	-0.0011613	0.0000010	0.0000323
Change in GDP per capita	0.0000565	0.0000561	0.000000418	0.00000251

H_o: The individual-level effects are adequately modeled by a random-effects model

H_A: The individual-level effects are adequately modeled by a fixed-effects model

b = consistent under Ho and H_A; obtained from xtreg

B = inconsistent under H_A, efficient under H_o; obtained from xtreg

$chi^2(4) = (b-B)'[(V\_b-V\_B)^{(-1)}](b-B) = 0.43$

$Prob>chi^2 = 0.9797$

As probability $>chi^2$ is not less than 0.05 so we cannot reject H_o and so the model should be Random Effect model.

Table A3: Pearson's correlation matrix

	OOP of healthcare costs	SHI of total population	Life expectancy at birth	Change in unemployment	Change in GDP per capita
OOP of healthcare costs	1.0000				
SHI of total population	-0.5941	1.0000			
Life expectancy at Birth	-0.2646	0.3638	1.0000		
Change in unemployment	0.0235	-0.0899	-0.0255	1.0000	
Change in GDP per capita	-0.0191	0.0244	0.0425	-0.1109	1.0000